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InfiniteFocus G6

Product Information

Product Information

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Alicona Imaging GmbH
Dr.-Auner Strasse 19
8074 Raaba/Graz, Austria

To obtain a free copy of this publication, please contact:
marketing.alicona@bruker.com

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That's metrology!

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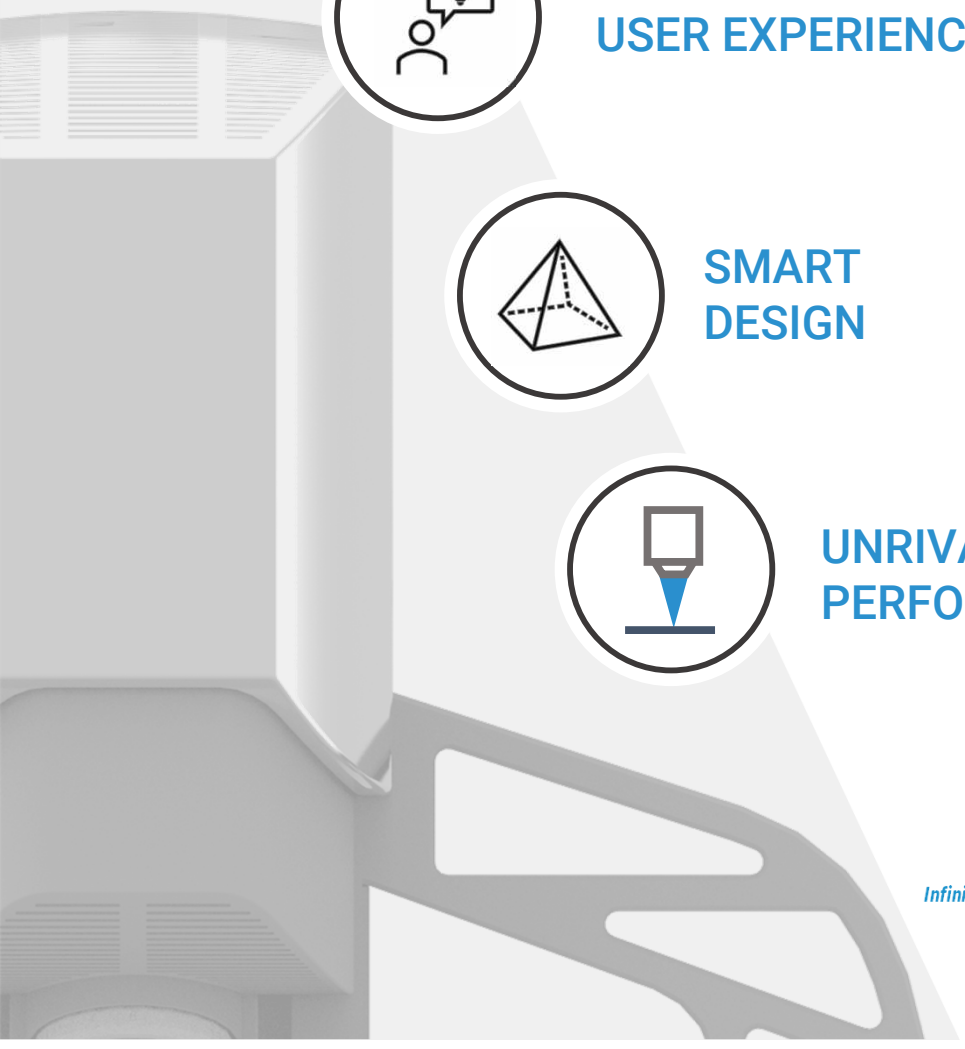
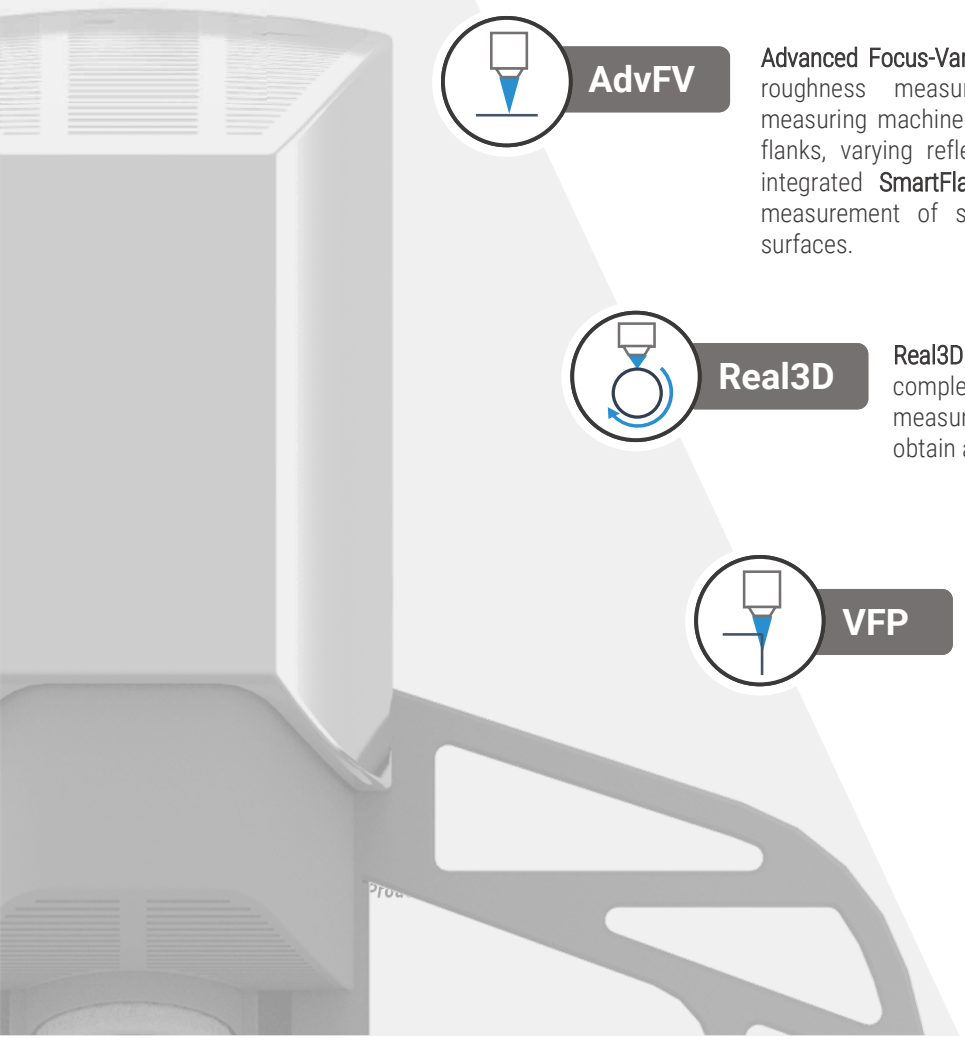


InfiniteFocus G6

TRUSTED INNOVATION



Future-proof technologies

Combining 3 technologies, the optical sensor sets new accuracy standards.

AdvFV

Advanced Focus-Variation combines the functionalities of a roughness measuring instrument and a coordinate measuring machine. Users measure workpieces with steep flanks, varying reflections and structured roughness. The integrated SmartFlash technology ensures high-resolution measurement of smooth, reflective and highly polished surfaces.

Real3D

Real3D is the key for 360° measurement of complex micro-geometries. Based on single measurements from different directions, users obtain a complete 3D data set.

VFP

Vertical Focus Probing enables the optical lateral probing of components. Users measure holes and vertical flanks (> 90°).

FAST MEASUREMENT

FAST AXES MOVEMENTS

METMAX

- Intuitive measurement planning on CAD
- Integrated reporting
- Automated workflows
- Full offline simulation
- Built-in expert know-how

LOW MEASUREMENT NOISE

MOTORIZED POL-FILTER

Groundbreaking user experience

InfiniteFocus is made for users, focusing on their requirements. It is all about speed, ease of use and efficient workflows.

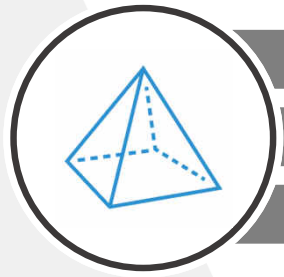
- Fast axes and innovative optics with modern algorithms ensure short measurement times. Defined surface parameters are quickly measured, and 3D data is captured at high speed.
- The MetMaX software sets new standards in usability. Users specify measurements already on the CAD model of a component. A digital twin combined with a virtual measurement simulation enables safe operation of the measuring instrument.
- Single-button solutions and automated measurement sequences ensure efficient workflows and measurements without user interaction.

InfiniteFocus G6

TRUSTED INNOVATION

Smart design

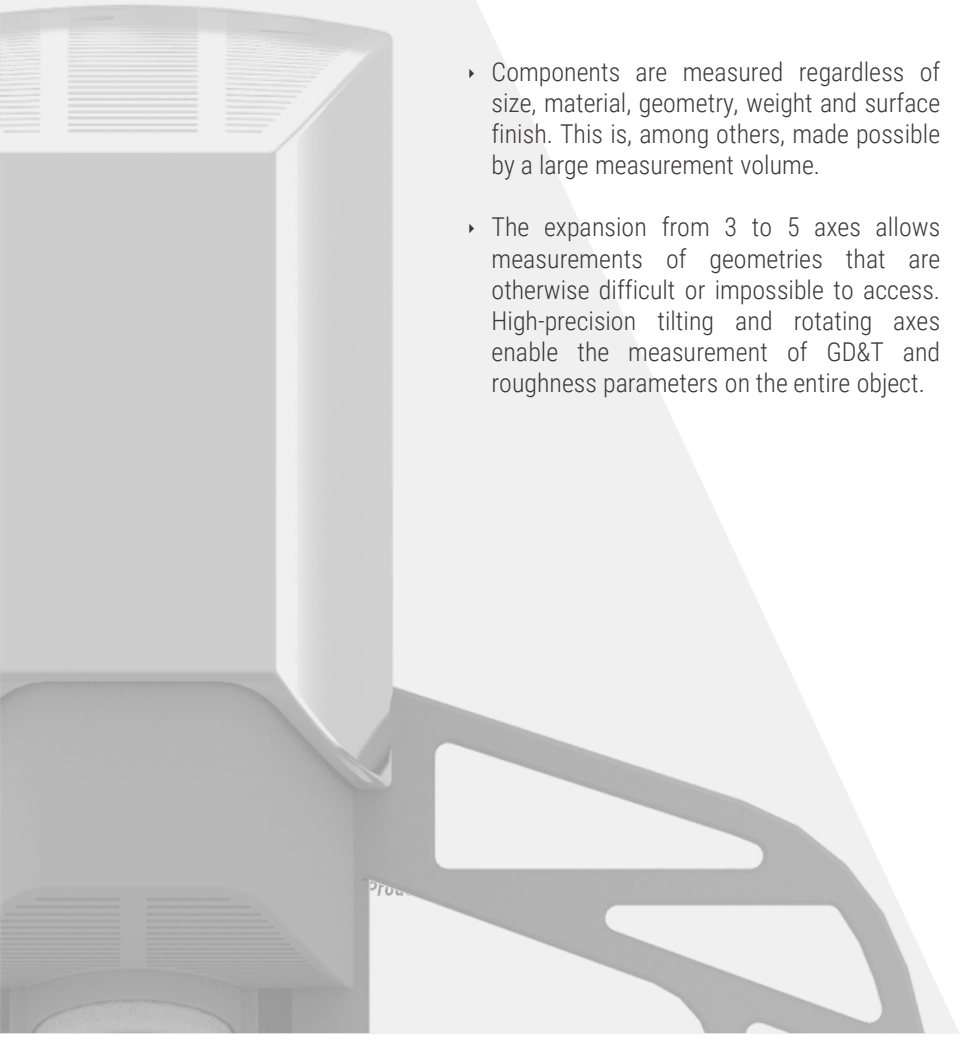
Thanks to its architecture, the measurement system offers high flexibility for operators. InfiniteFocus measures a wide range of components with only one sensor.



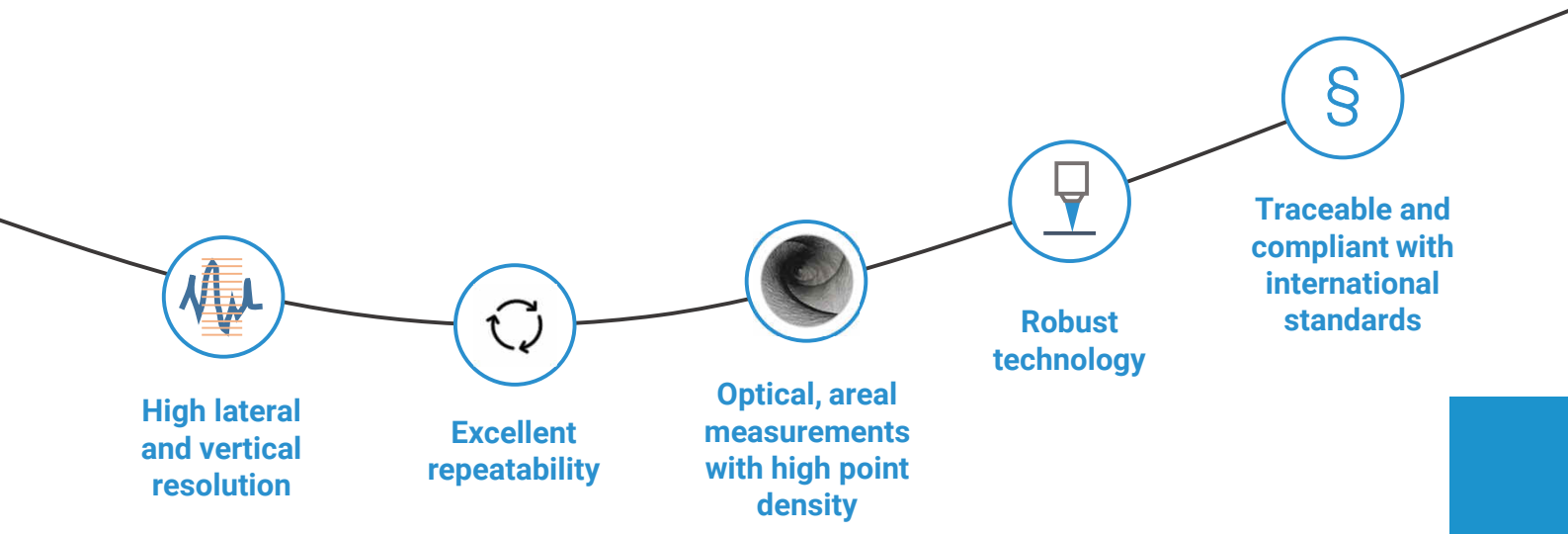
Flexible: large and heavy samples

Production-ready: vibration insensitive

And it looks nice....



- Components are measured regardless of size, material, geometry, weight and surface finish. This is, among others, made possible by a large measurement volume.
- The expansion from 3 to 5 axes allows measurements of geometries that are otherwise difficult or impossible to access. High-precision tilting and rotating axes enable the measurement of GD&T and roughness parameters on the entire object.
- InfiniteFocus is ideal for manufacturing. The robust Focus-Variation technology and the vibration-insensitive design ensure high-resolution and repeatable results, even directly next to the machine tool.
- Modern manufacturing strategies further benefit from automation solutions, interconnectivity with production machines, IT systems and integrated closed-loop processes.



Unrivaled measurement performance

A number of factors determine the quality and reliability of measurements. InfiniteFocus stands for:

- High lateral and vertical resolution
- Excellent repeatability
- Optical, areal measurements
- High measuring point density
- Robust technology
- Traceability and conformity with international standards

InfiniteFocus G6
Product Options

InfiniteFocus solution

InfiniteFocus G6

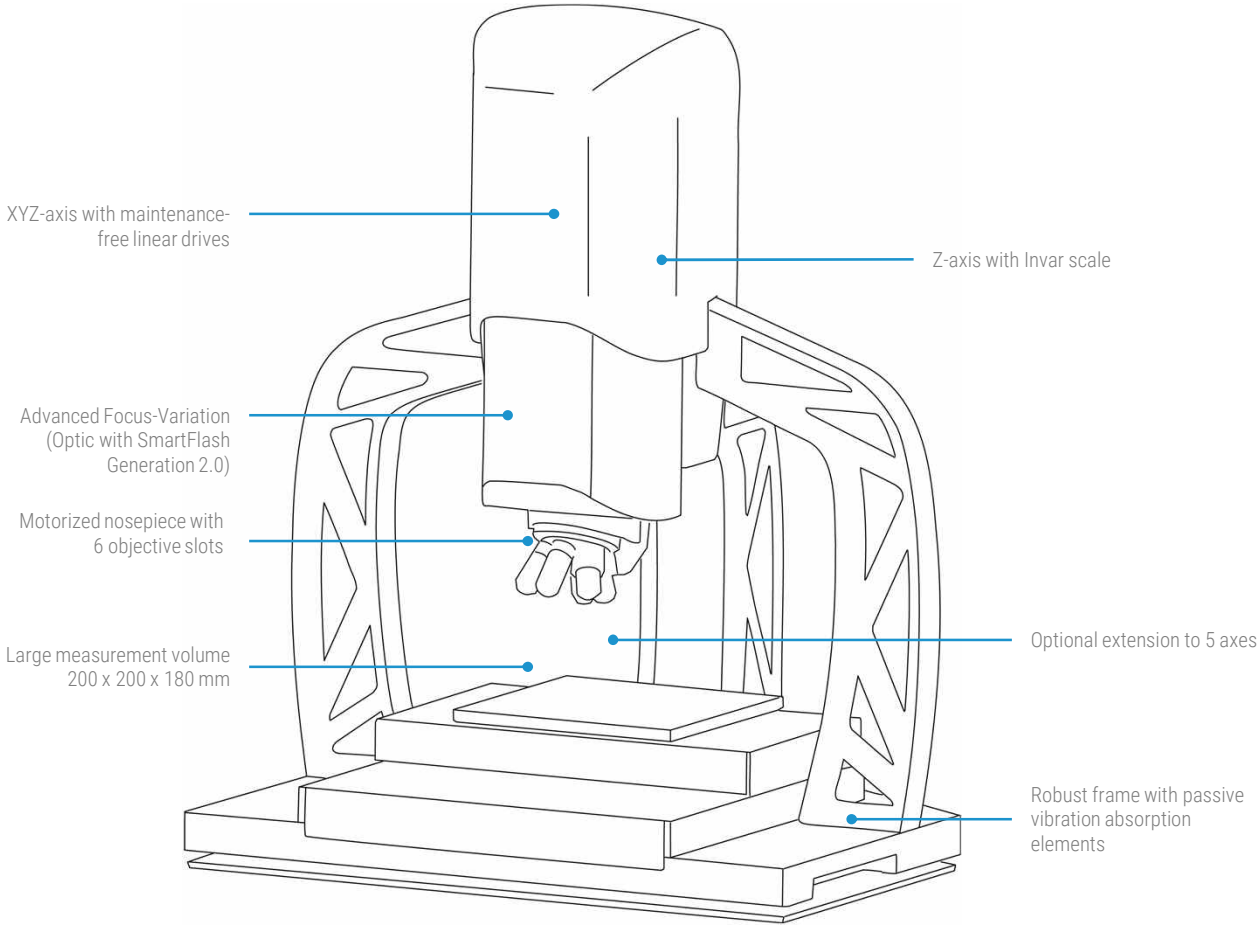
Travel range
200 mm x 200 mm x 180 mm

Grip solution

AdvancedReal3DUnit

Motorized 360° endless rotation
and motorized tilt

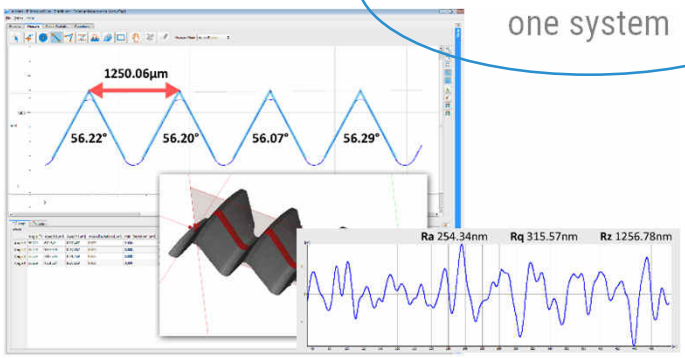
InfiniteFocus G6
System Components

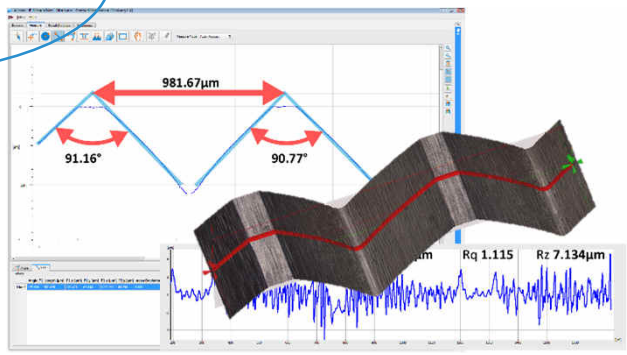


What makes InfiniteFocus distinctive

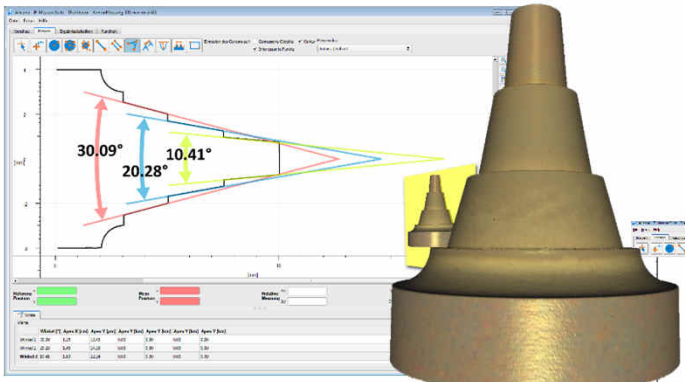
Features

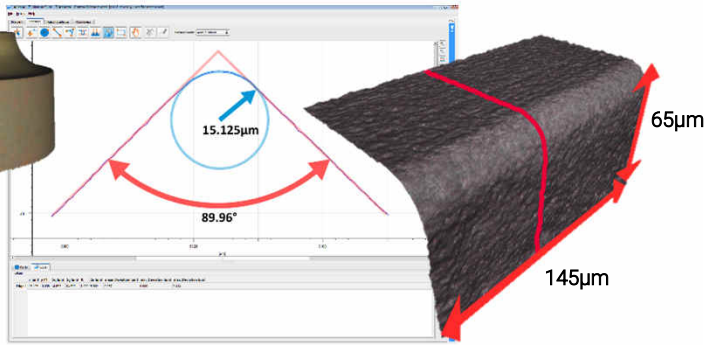
Form and roughness measurement with only one system



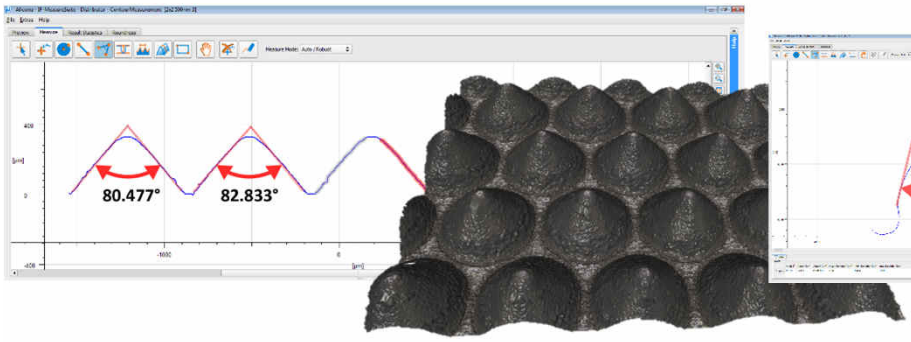


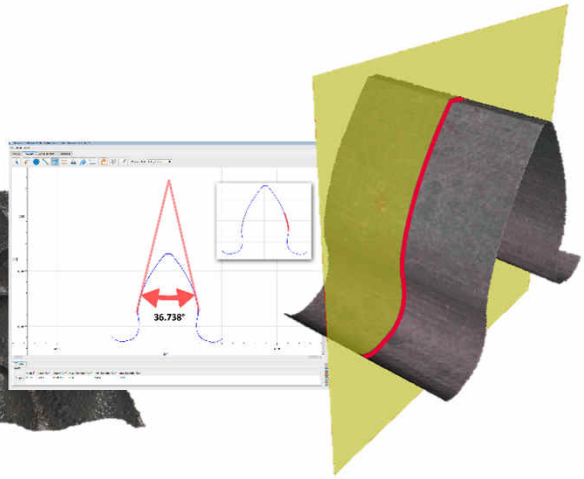
Traceable measurement of small and often hard-to-access radii and angles





Measurement of steep flanks and other complex geometries





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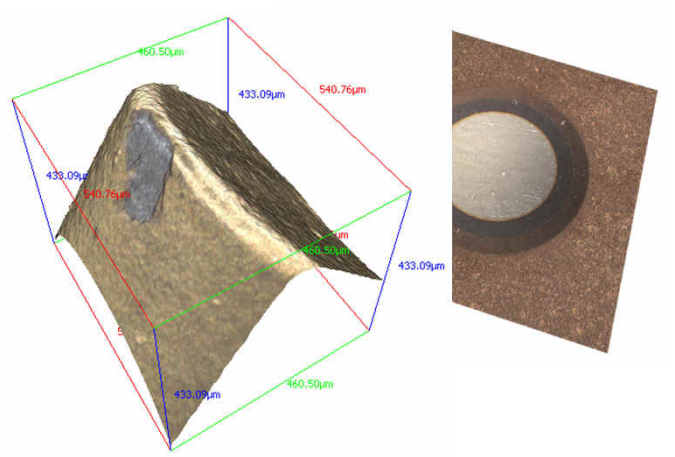
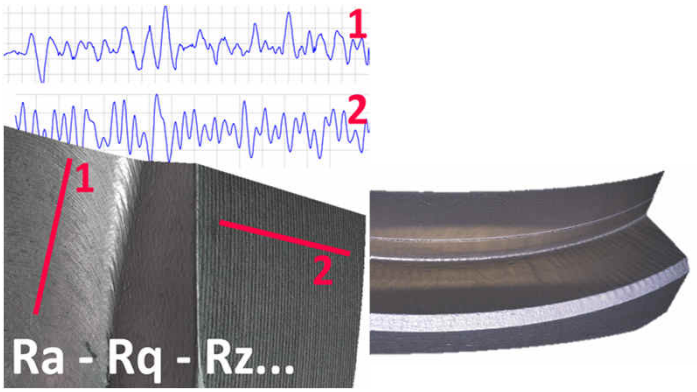
What makes InfiniteFocus distinctive

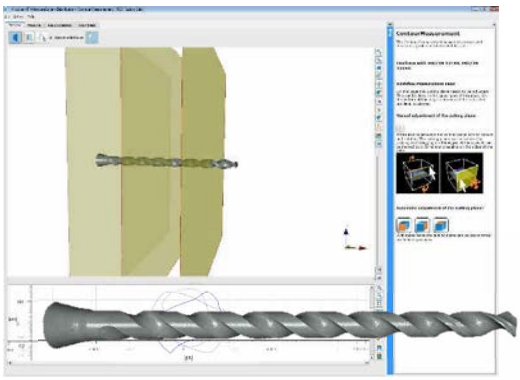
Features

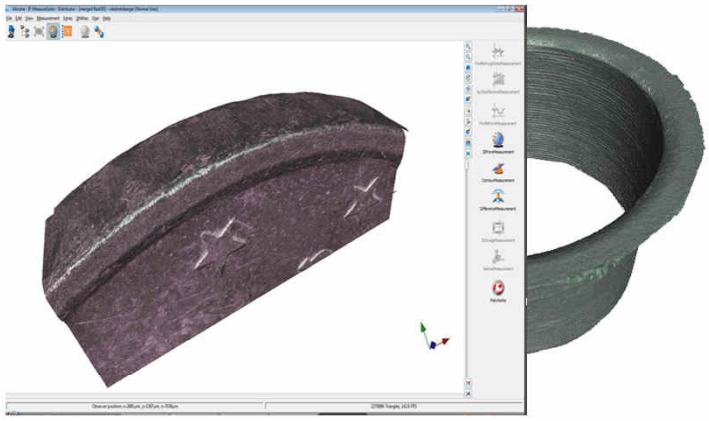
Measurement of components with varying surface finishes or coatings

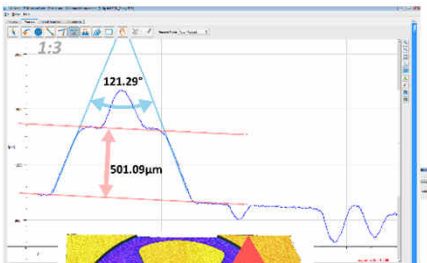


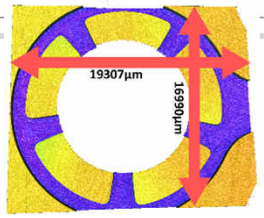


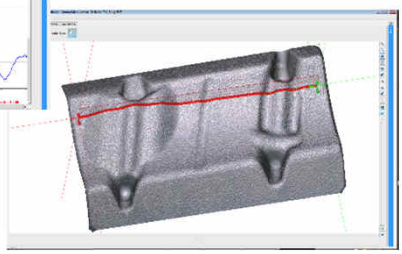
Full form measurement with Real3D









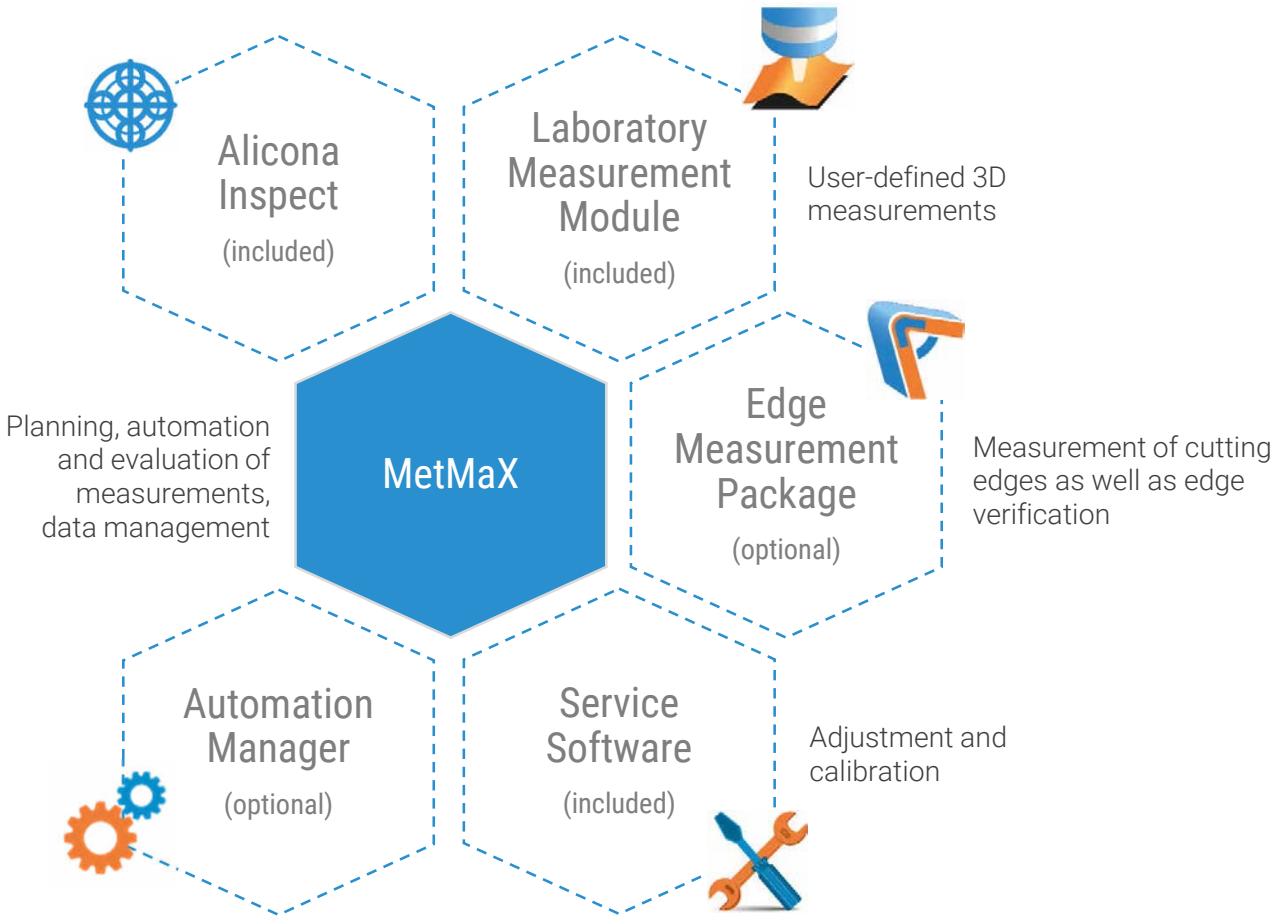


Measurement of form and roughness even on heavy and large components

The Product

The Bruker Alicona
Software Architecture

The figure below displays the structure of Alicona's software products. MetMaX, in which all measured 3D data is organized and evaluated, functions as the basis from which the user starts all other modules such as the LaboratoryMeasurementModule, the Edge Measurement Package and the ServiceSoftware.



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MetMaX

Planning, automation and evaluation of measurements

All measurement modules included in MetMaX are designed by Alicona and optimally tailored to each other.

Standard

ProfileRoughnessMeasurement
SurfaceTextureMeasurement
ProfileFormMeasurement
VolumeMeasurement
2DImageMeasurement
Alicona Inspect

Optional

ContourMeasurement
MicroGearMeasurement
3DFormMeasurement
DifferenceMeasurement
Real3DFusion
Alicona Inspect Professional

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Standard Measurement Modules

ProfileRoughnessMeasurement
SurfaceTextureMeasurement
ProfileFormMeasurement
VolumeMeasurement
2DImageMeasurement
Alicona Inspect

Optional Measurement Modules

3DFormMeasurement
ContourMeasurement
MicroGearMeasurement
DifferenceMeasurement
Real3DFusion
Alicona Inspect Professional

Utilities

Dataset reduction
Dataset roughness removal
Form removal
Dataset conversion
Real3DFusion
Real3D Editor
3D Editor

Importing Functions

CAD data
STEP
Datasets
STL, AL3D, AFM, D2, DAT, TXT LEI, PLU PNG, SDF, SMD, SUR, DFR, TIF, TFR, TRR, ZFR, ZRR, PTB XYZ, UB3, X3P, G3D
Optical Image
PNG, BMP, TIF, TIFF, ICO, JPG, JPEG, PPM, XPM, XBM

Also available as offline version

Exporting Functions

Datasets
ALPRJ
Optical Images/ 3D view
PNG, BMP, TIF, TIFF, ICO, JPG, JPEG, PPM, XPM, XBM
Depth Images
PNG, BMP, TIF
3D-Data points
Plain text, VRML2.0, SUR, STL, OpenGPS X3P, G3D
Object Properties
TXT

Supported Standards

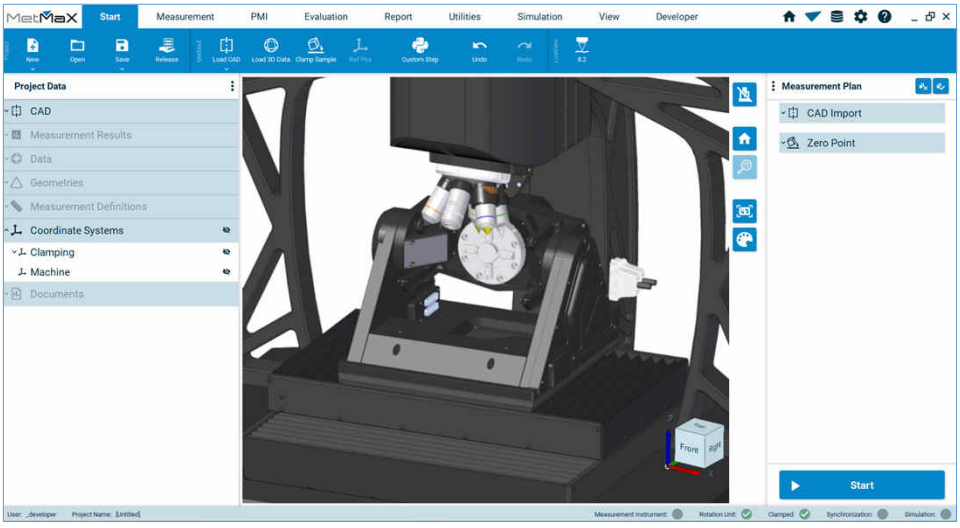
ISO 25178-6:2010, ISO 25178-606:2016
VIM ISO IEC:2007
ISO 4287:2010, ISO 4288:1998,
ISO 16610-1:2015, ISO 16610-20:2015, ISO 16610-21:2013
ISO 25178-2:2012
ISO 16610-61:2016, ISO 16610-71:2014
ISO 13565-2:1998
ASME B46.1:2009
ISO 1101:2017, ASME Y14.5:2009 (Alicona Inspect, Alicona Inspect Professional)
ISO 21771:2014, DIN 21772:2012, DIN 21773:2014,
DIN 3961:1978, DIN 3962-1,-2,-3:1978
DIN 3963:1978, ISO 1328-1:2013, VDI/VDE 2607:2000,
VDI/VDE 2612:2000, VDI/VDE 2613:2003

Planning, automation and evaluation of measurements

From “How do I measure?” to “What do I measure?”

This is the core thinking behind MetMaX, the InfiniteFocus G6 operating software. Thanks to this evolution, users do not need any specific metrology knowledge to perform robust measurements with the optical measuring machine. MetMaX contains all the necessary knowledge on how to acquire and evaluate 3D data.

When the CAD data set for a component is uploaded, operators can use a simple mouse click to select which GD&T parameters to measure. MetMaX automatically configures the ideal measurement strategy for an optimized 3D measurement of the part. MetMax software autonomously calculates probing directions, tilt, rotation angles and travel directions in XYZ. Before measurement starts, a virtual simulation ensures a collision-free measurement sequence. The measurement is started by the operator with a click of the mouse and is fully automated. Once the 3D measurement is finished, data is automatically analyzed. If, for example, form deviations are to be verified, the InfiniteFocus G6 equipped with MetMaX software chooses which geometric form (cylinder, plane, sphere, etc.) must be fitted. The MetMaX reporting system gives an ok/not ok report which complies with the latest industry standards and can be configured according to user specifications.



A digital twin of your instrument shows the measurement situation in real time when you work with MetMaX.

MetMaX algorithms possess optical metrology expert knowledge

MetMaX takes the InfiniteFocus G6 to a new level of metrological performance. Algorithms behind MetMaX are the result of our 20+ years of experience, knowledge and technological expertise in the field of optical measurement. Today, this knowledge offers the possibility to use a high-precision optical measuring system to improve production. Users no longer need to overthink their measurement strategy. MetMaX algorithms take care of this process for them. The InfiniteFocus G6 optical measuring system is not "only" a metrology device to measure complex geometries with high precision based on a robust areal measurement principle; it also is a planning and reporting measurement system. In combination with MetMaX operating software, we implemented our holistic definition of a production-ready measuring system. It goes beyond the basic requirements of measuring process capabilities to define production suitability where the operator is included.

In our opinion, measuring systems must not only be able to measure components with the necessary accuracy, but also record and evaluate data at any time and independently of the knowledge or experience of the operator.

This combination enables monitoring processes at any stage during production or at different locations while - at the same time - giving the necessary flexibility to react swiftly and efficiently when components are not within the required specifications.

MetMaX

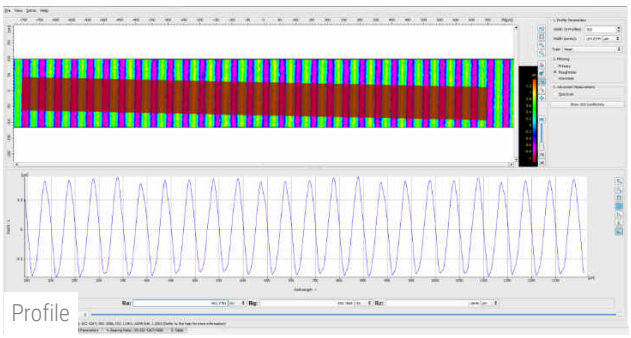
KEY POINTS

- Create and evaluate your measurement tasks **directly on the CAD** data of your sample. However, CAD samples are not a necessity - measurements can also be performed and evaluated without CAD
- By recording your steps in a **measurement plan**, you can make procedures repeatable at any time and thus **automate** them with just a few clicks.
- **Collisions** are automatically detected and can be resolved in advance thanks to offline simulation.
- **Measurement reporting** is flexible in configuration and easy to automate.
- Store and **organize** your measured data in a structured database.
- Start all Alicona software modules from MetMaX. Retrieve previous measurements and pass them on to available measurement modules for evaluation.
- Export and import existing data sets.

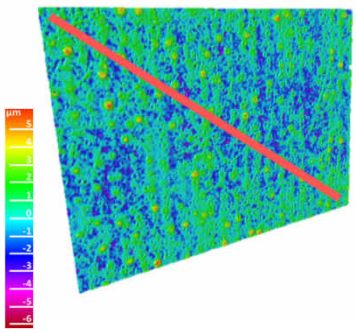
Standard Measurement Modules

Profile Roughness Measurement: Profile based roughness measurement

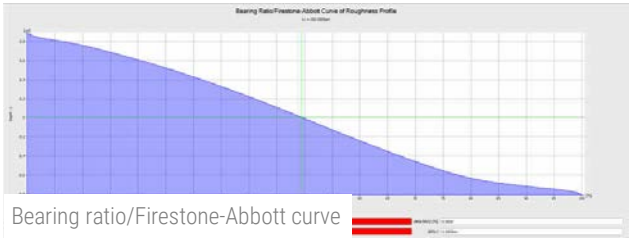
This measurement module allows measuring roughness and waviness values of the extracted profile according to ISO 4287, 4288. Statistical evaluations and bearing ratio curve or spectral analysis are graphically visualized.



Profile



Roughness profile parameters



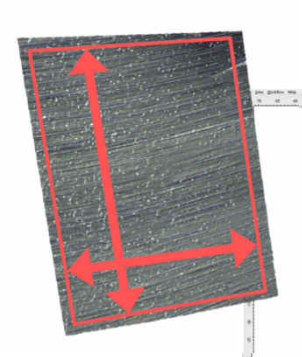
Bearing ratio/Firestone-Abbott curve

TYPICAL ROUGHNESS PROFILE PARAMETERS
Ra, Rq, Rt, Rz
Calculation of average roughness (based on multiple profiles) possible as well

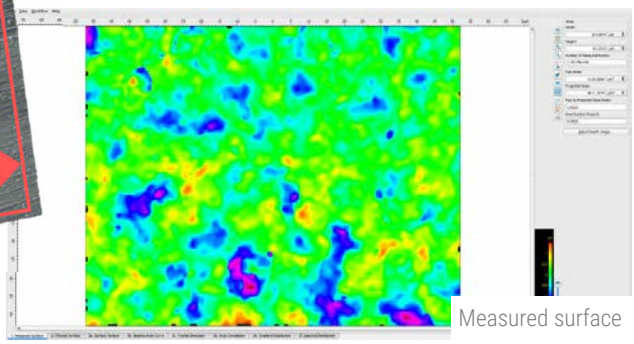
MATERIAL RATIO PARAMETERS	
Rk	core roughness depth, height of the core material
Rpk	reduced peak height, mean height of the peaks above the core material
Rvk	reduced valley height, mean depth of the valleys below the core material
Rmr1	peak material component, the fraction of the surface which consists of peaks above the core material
Rmr2	peak material component, the fraction of the surface which will carry the load

Surface Texture Measurement: Area based roughness measurement

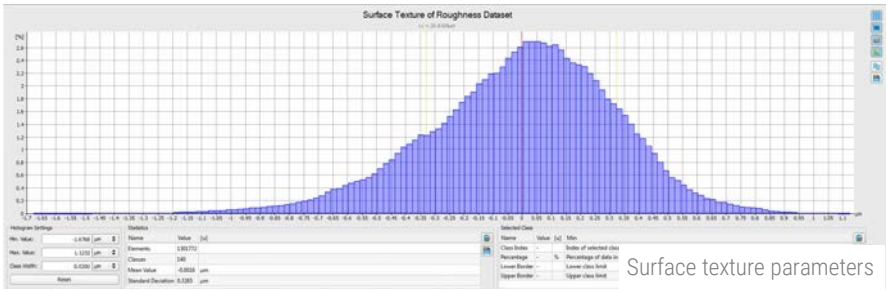
Instead of measuring the roughness of a single profile only, this module allows area based roughness measurement according to ISO 25178, ISO 12781-1 and ASME B46. Statistics include bearing area curve, fractal dimension, autocorrelation, gradient distribution, local homogeneity and spectral distribution. A specially designed filter allows form removal to verify roughness on large measurement fields.



Area based roughness measurement



Measured surface



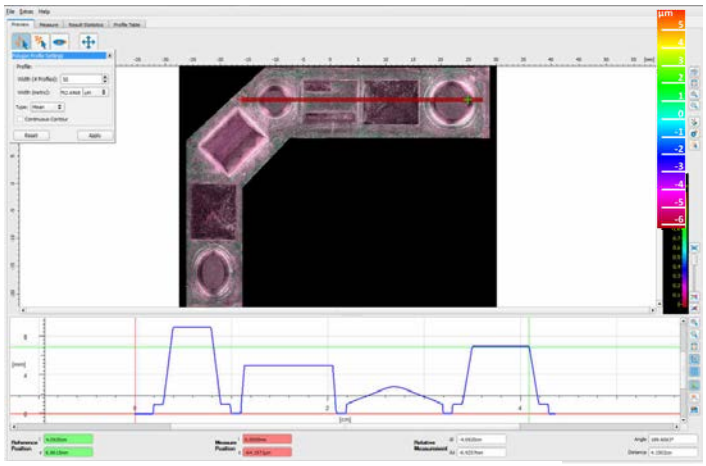
Surface texture parameters

TYPICAL SURFACE TEXTURE PARAMETERS

Sa, Sq, Sp, Sv, Sz

Profile Form Measurement:
Form measurement along a user defined profile

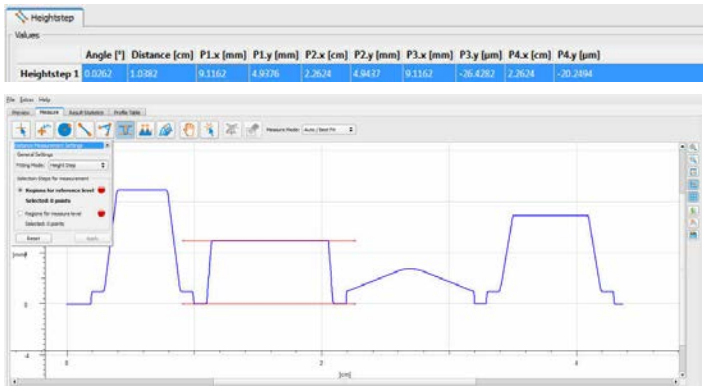
This module allows form measurement along a user defined profile according to ISO 5436. Radii, angles, height steps and normal distances are measured automatically or manually. In addition, the profile form measurement enables the verification of surface parameters such as circumcircle and incircle plus a series of further thread parameters. Users also perform cutting edge measurements and measure radii, basket arch form – both "waterfall" and "trumpet" – wedge angle and bevel lengths.



User-defined profile on a surface with calibration elements

AVAILABLE MEASUREMENTS

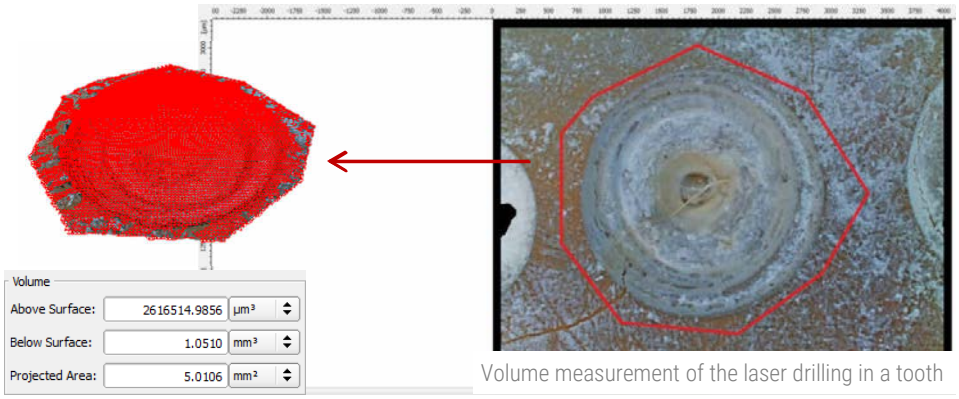
point, circle, line, angle, height step, thread information, edge, roundness



Measurement of a height step

Volume Measurement: Quantification of pits and peaks

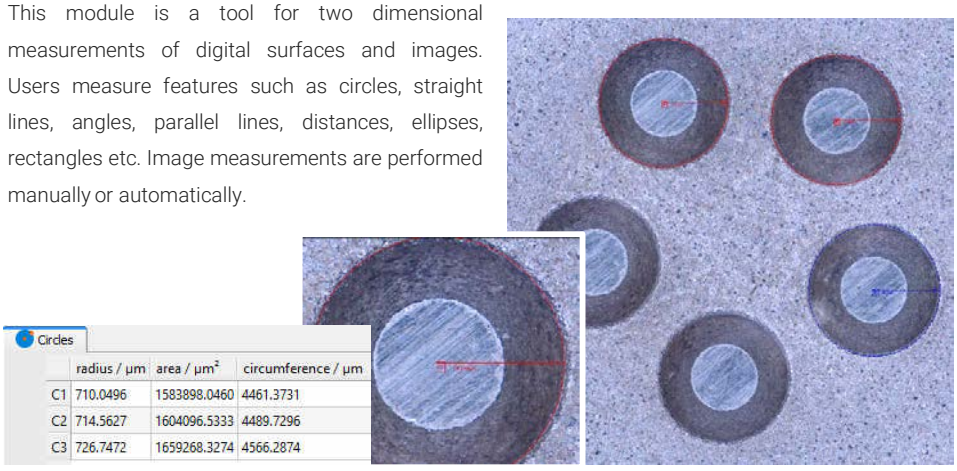
With the volume measurement module users measure the volume of a defined area or the whole object. It allows to measure the volume of voids or protrusions in an intuitive manner. The easy positioning of cutting layers or cutting surfaces provides a universal tool.



Volume measurement of the laser drilling in a tooth

2D Image Measurement: Evaluation of 2D geometries

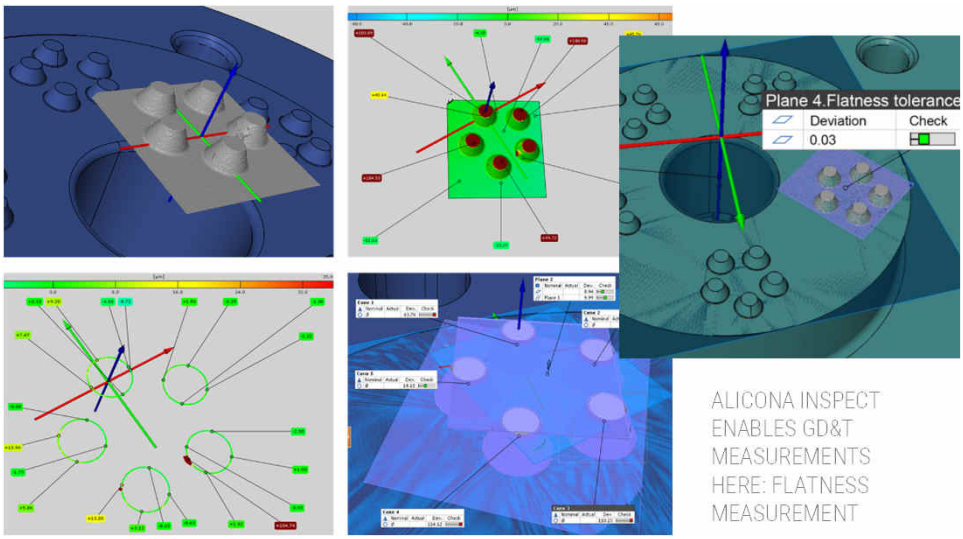
This module is a tool for two dimensional measurements of digital surfaces and images. Users measure features such as circles, straight lines, angles, parallel lines, distances, ellipses, rectangles etc. Image measurements are performed manually or automatically.



Measurement/Comparison of four radii (object: spherical calibration tool)

Alicona Inspect:
Measurement of surface geometries and GD&T

Alicona Inspect is a 3D inspection software to evaluate surface geometries and automate measurement processes. Dimensions are verified fast and easily. Users examine surfaces by using sections, surface comparisons or GD&T in accordance with ISO 1101 and ASME Y14.5. Trend analyses show how dimensions change in the course of producing several components and thus allow statistical process control. User-defined measurement reports enable an individual compilation of documentation including snapshots, images, charts and texts.



Alicona Inspect Professional
Optional module

In addition to the free version, Alicona offers a version with advanced functionalities:

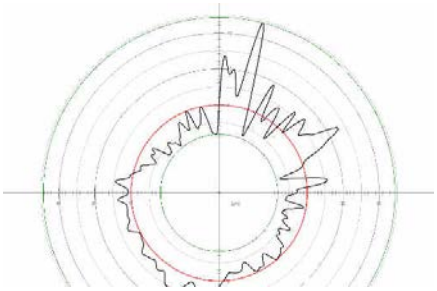
- Automated analysis via integrated macro recorder and scripting language
- Trend analysis and statistical process control
- Traceability of construction and analysis with parametric inspection
- CAD import of native formats (CATIA, UG, Pro/E)

Optional Measurement Modules

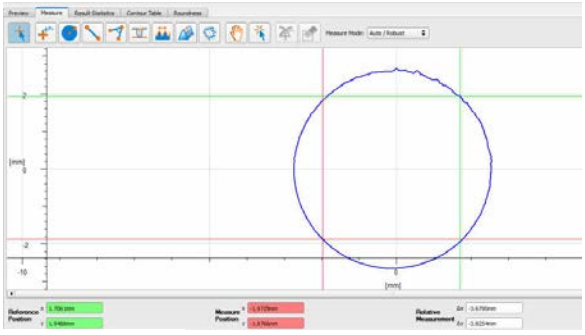
Contour Measurement: Analysis of even complex profiles

Contour measurement allows the extraction of a profile on the basis of a cutting plane, helix, and polyline. In a further measurement step users measure angles, distances, circles, incircles, circumcircles, thread pitch etc. from every position. Roundness measurement is included in the contour measurement module as well.

Automatic alignment of the cutting plane



Users select an area and measure the deviations of the shape to a circle

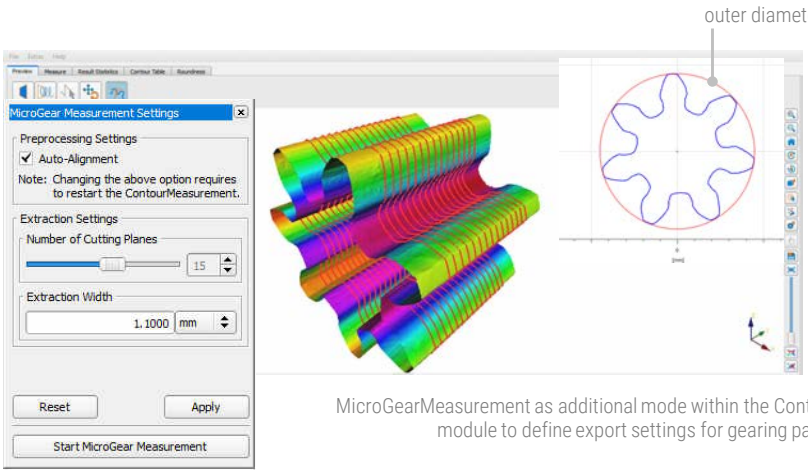


Measured contour

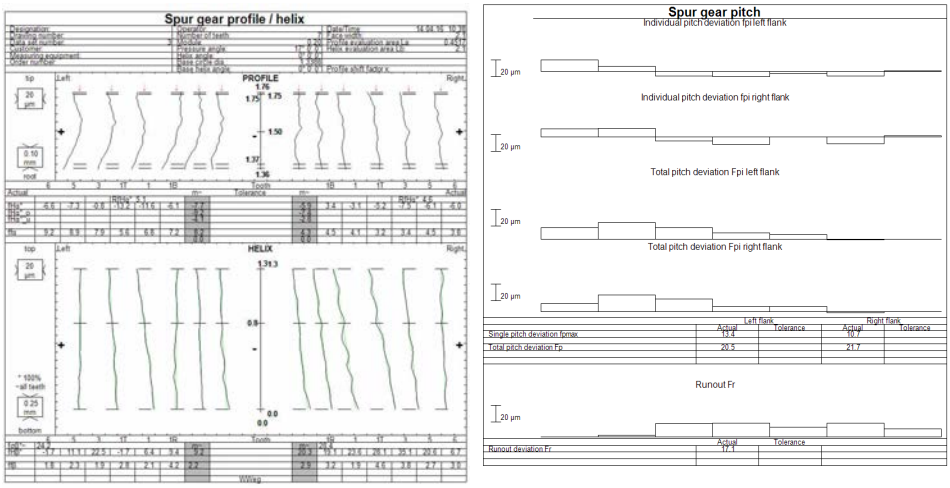
TYPICAL PARAMETERS	
RONa	mean of the absolute radial deviation to a least squares circle
RONq	root-mean-square roundness deviation
RONt	maximum peak to valley roundness deviation
RONp	maximum peak to reference roundness deviation
RONv	maximum reference to valley roundness deviation

MicroGearMeasurement:
Complete detection of every single tooth

MicroGearMeasurement combines Alicona's repeatable and high-resolution optical 3D metrology with Frenco's REANY software specialized in standardized gear inspection. It enables robust areal measurement of full teeth and thus an evaluation according to VDI/VDE, ISO as well as quality assessment according to DIN. A complete detection of every single tooth with a module of more than 0.05mm and an unlimited number of teeth is possible. MicroGearMeasurement offers fast and repeatable results as well as a great variety of parameters.



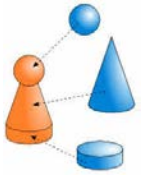
MicroGearMeasurement as additional mode within the ContourMeasurement module to define export settings for gearing parameter analysis.



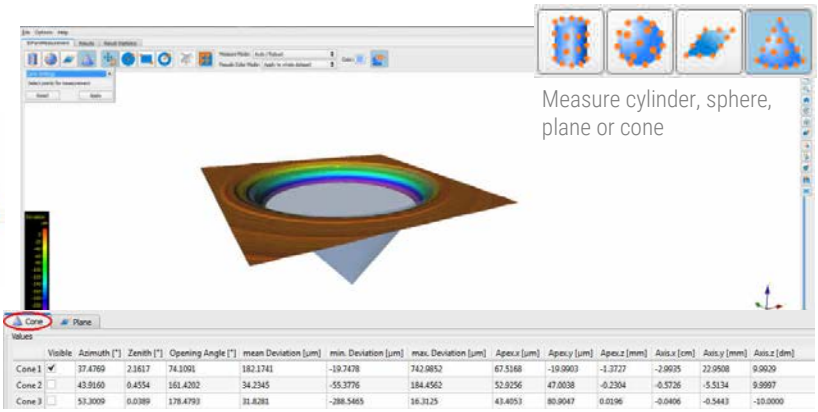
Inspection record including profile and helix deviations as well as pitch curve and runout

3D Form Measurement:
Measurement of flat and curved components

This module enables users to measure regular geometries and curved surfaces. Automatic fitting of spheres, cones and cylinders allow the visualization and form measurement of tools and other components. Deviations of a 3D dataset from a target geometry become apparent.



Allows to measure geometric forms within the dataset

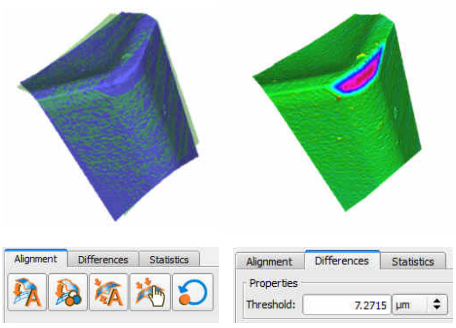


Measure cylinder, sphere, plane or cone

Difference Measurement:
Verification of form deviation

Difference measurement is used to numerically compare two different geometries. A typical application is the measurement of wear before and after use of a cutting tool. Users measure form deviations to a CAD dataset or reference geometry. Several modes visualize the differences between the two datasets. This module is also used in the field of reverse engineering.

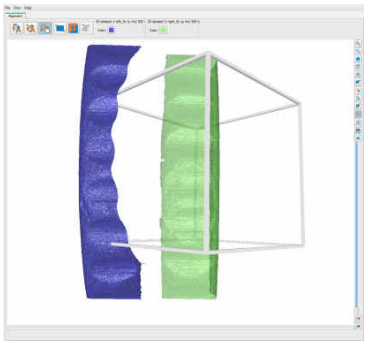
TYPICAL PARAMETERS	
Dth	set tolerance for defect detection
Dneg	max. deviation below reference surface
Dpos	max. deviation above reference surface



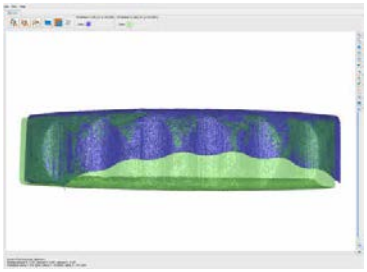
Users determine how much and where one dataset differs from another dataset (left: comparison of a new cutting tool with a worn one).

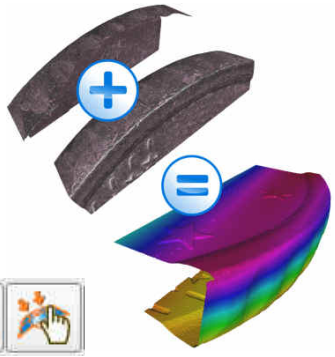
Real3DFusion:
Automatic merging of single measurements

Individual measurements from various positions are automatically merged into a 3D dataset. The Real3D technology allows the visualization of the component from different angles plus a measurement of contour, difference and form.



Alignment of datasets in order to receive significant results.





AVAILABLE ALIGNMENT OPTIONS

- Coarse Alignment
- 3(n) Point Alignment
- Automatic Alignment
- Manual Alignment

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Profile Roughness Parameters

PARAMETERS OF ROUGHNESS PROFILE	
Ra	average roughness of profile
Rq	root-mean-square roughness of profile
Rt	maximum peak to valley height of roughness profile
Rz	mean peak to valley height of roughness profile
Rmax	maximum peak to valley height of roughness profile within a sampling length
Rp	maximum peak height of roughness profile
Rv	maximum valley height of roughness profile
Rc	mean height of profile irregularities of roughness profile
Rsm	mean spacing of profile irregularities of roughness profile
Rsk	skewness of roughness profile
Rku	kurtosis of roughness profile
Rdq	root-mean-square slope of roughness profile
Rt/Rz	extreme scratch/peak value of roughness profile, (>=1), higher values represent larger scratches/peaks

PARAMETERS OF PRIMARY PROFILE	
Pa	average height of profile
Pq	root-mean-square height of profile
Pt	maximum peak to valley height of primary profile
Pz	maximum peak to valley height of primary profile
Pmax	maximum peak to valley height of primary profile within sampling length
Pp	maximum peak height of primary profile
Pv	maximum valley height of primary profile
Pc	mean height of profile irregularities of primary profile
Psm	mean spacing of profile irregularities of primary profile
Psk	skewness of primary profile
Pku	kurtosis of primary profile
Pdq	root-mean-square slope of primary profile
Pt/Pz	extreme scratch/peak value of primary profile, (>=1), higher values represent larger scratches/peaks

PARAMETERS OF WAVINESS PROFILE	
Wa	average waviness of profile
Wq	root-mean-square waviness of profile
Wt	maximum peak to valley height of waviness profile
Wz	mean peak to valley height of waviness profile
Wmax	maximum peak to valley height of waviness profile within sampling length
Wp	maximum peak height of waviness profile
Wv	maximum valley height of waviness profile
Wc	mean height of profile irregularities of waviness profile
Wsm	mean spacing of profile irregularities of waviness profile
Wsk	skewness of waviness profile
Wku	kurtosis of waviness profile
Wdq	root-mean-square slope of waviness profile
Wt/Wz	extreme scratch/peak value of primary profile, (>=1), higher values represent larger scratches/peaks

PARAMETERS: BEARING RATIO	
Rk/ Pk/ Wk	core roughness depth, height of the core material
Rpk/ Ppk/ Wpk	reduced peak height, mean height of the peaks above the core material
Rvk/ Pvk/ Wvk	reduced valley height, mean depth of the valleys below the core material
Rmr1/ Pmr1/ Wmr1	peak material component, the fraction of the surface which consists of peaks above the core material
Rmr2/ Pmr2/ Wmr2	peak material component, the fraction of the surface which will carry the load

Surface Texture Parameters

Sa	average height of selected area
Sq	root-mean-square height of selected area
Sp	maximum peak height of selected area
Sv	maximum valley depth of selected area
Sz	maximum height of selected area
Sz10	ten point height of selected area
Ssk	skewness of selected area
Sku	kurtosis of selected area
Sdq	root-mean-square gradient
Sdr	developed interfacial area ratio
FLTt	flatness using least squares reference plane

PARAMETERS: BEARING AREA CURVE	
Sk	core roughness depth, height of the core material
Spk	reduced peak height, mean height of the peaks above the core material
Svk	reduced valley height, mean depth of the valleys below the core material
Srm1	peak material component, the fraction of the surface which consists of peaks above the core material
Srm2	peak material component, the fraction of the surface which will carry the load
Vmp	peak material volume of the topographic surface (ml/m²)
Vmc	core material volume of the topographic surface (ml/m²)
Vvc	core void volume of the surface (ml/m²)
Vvv	valley void volume of the surface (ml/m²)
Vvc/ Vmc	ratio of Vvc parameter to Vmc parameter

AUTO CORRELATION PARAMETERS
Sal/ Str/ Std/ Stdi/ angle

GRADIENT DISTRIBUTION PARAMETERS	
Slope of Maximum	slope of most frequent gradient
Angle X/Y of Maximum	angle in X/Y plane of most frequent gradient
Percentage of Maximum	percentage of most frequent gradient
Discretization Slope	slope range of one measure point
Discretization Angle	angle range of one measure point

Difference Measurement Parameters

Dth	set tolerance for defect detection
Dneg	max. deviation below reference surface
Dpos	max. deviation above reference surface
Dmean	mean deviation
Vp	volume of peaks above reference surface
Vv	volume of valleys below reference surface
Vdp	volume of peak defects extending above tolerance
VdV	volume of valley defects extending below tolerance

Aproj	projected area of sample
Adp	projected area of peaks above tolerance
Adv	projected area of valleys below tolerance
Pc	coverage percentage (area within tolerance)
SIMcd	greatest depth of defects (ISO 8785)
SIMch	greatest height of defects (ISO 8785)
SIMt	whole area of defects (ISO 8785)

Micro Gear Measurement Parameters

fHα*	profile slope deviation in the defined measurement plane
fHα*_t	profile slope deviation tip
fHα*_r	profile slope deviation root
ffα	profile form deviation in the defined measurement plane
RfHα*	difference between mean value of all profile slope deviations tip and mean value of all profile slope deviations root
fHβ*	helix slope deviation in the defined measurement height

ffβ	helix form deviation in the defined measurement height
foβ*~	range of helix slope deviation in the defined measurement height: difference between highest and lowest value
m~	parameter mean value (respective row)
fp	single pitch deviation in the defined measurement plane
Fp	total pitch deviation in the defined measurement plane
Fr	runout (error) in the defined measurement plane

Laboratory Measurement Module

User-defined 3D measurements

Standard

SingleField

ImageField

Automation

Optional

Remoting Interface

Real3D Measurement

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General

LiveView
Large window for magnified image of the sample and user-friendly interface

Interface to evaluation software MetMaX
Measured 3D datasets are automatically exported to MetMaX for further evaluation (e.g. roughness, form, wear, difference measurement)

Measurement Modes

SingleField
Measurement of 3D datasets within one field of view

ImageField Measurement (up to 500 million measurement points)
Measurement of large areas

Vertical Focus Probing
Measurement of flanks over 90°

Region of Interest (ROI)
Measurement of the user-defined ROI without the need to measure the entire field of view

2D Measurement
Measurement of objects in 2D

X-Large ImageField
Measurement of very large ImageFields with low resolution overview and high resolution single 3D dataset information

AutoRange Estimation
Speeds up ImageField and Real3D measurements by performing a rough measurement for automatic estimation of the ideal scan range

Automation
Scripting language for automation of 3D measurements and various analysis possibilities (e.g. roughness/ form/ wear measurement) and simple graphical user interface

Optional Measurement Modes

Real3D Measurement (up to 10 million measurement points) Full form measurement (360°) through extension of 3-axes- to 5-axes-system

Color Functionality
Provides color information of surfaces in addition to depth information

Remoting
Remote control of an Alicona measurement device with an external interface (C++, …), compatible with LabViewFramework

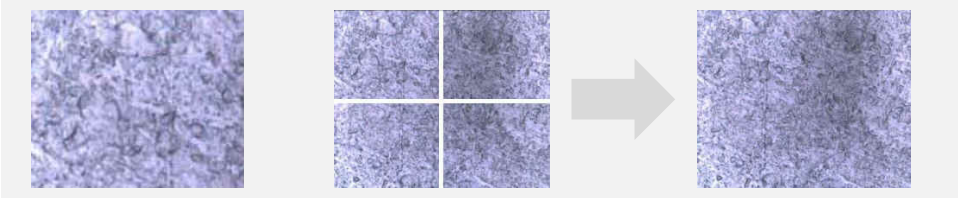
Supported Standards

ISO 25178-6:2010, ISO 25178-606:2016
VIM ISO IEC:2007
ISO 4287:2010, ISO 4288:1998,
ISO 16610-1:2015, ISO 16610-20:2015, ISO 16610-21:2013
ISO 25178-2:2012
ISO 16610-61:2016, ISO 16610-71:2014
ISO 13565-2:1998
ASME B46.1:2009

User-defined 3D measurements

SingleField

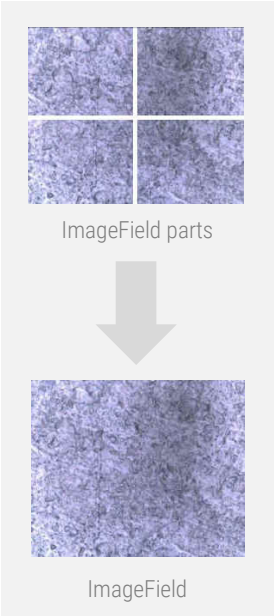
With the SingleField mode, users measure a sample or a certain position on the sample to be observed without movement in x and y direction (as displayed in the LiveView).

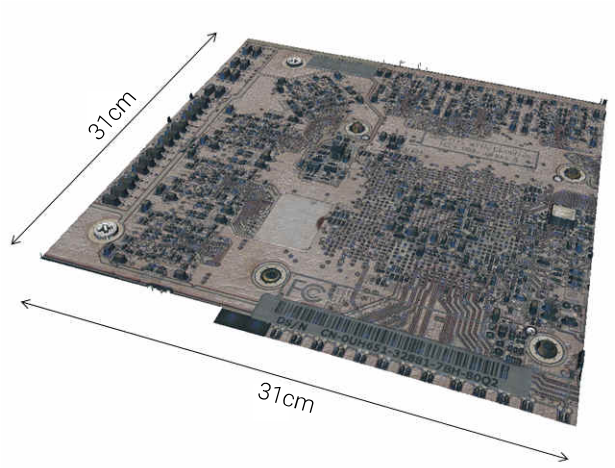


SingleField measurement versus ImageField measurement

ImageField: Large measurement areas

In order to measure areas that are larger than the actual field of view, the so-called „ImageField" functionality can be applied. It enables the measurement of areas up to 20 x 20 cm. Also, single 3D datasets of an X-Large ImageField (up to hundreds of gigabytes) can be analyzed individually. This guarantees high resolution dataset information and a low resolution overview.

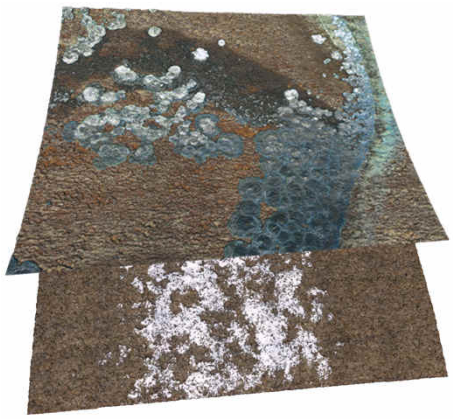




3D measurements of very large areas with "ImageField" functionality

Color Functionality

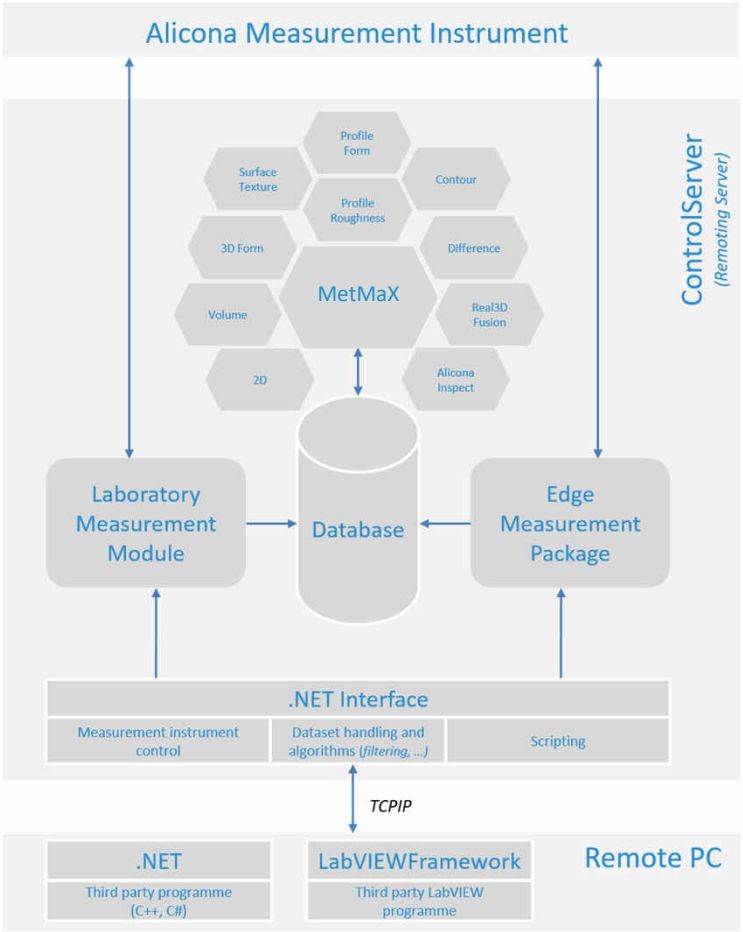
Alicona´s Focus-Variation provides true color information of surfaces in addition to depth information. Users receive a color image with full depth of field which is registered to the 3D points.



Surface textures displayed in true color

Automation

Scripting language for automation of 3D measurements and various analysis possibilities such as roughness, form and wear measurement, for example.



Remoting Interface

Remote control of the Alicona measurement device from another PC via a .NET Remoting Interface (e.g. LabVIEW, C++, ...).

RemotingInterface in connection with other parts of the software and hardware.

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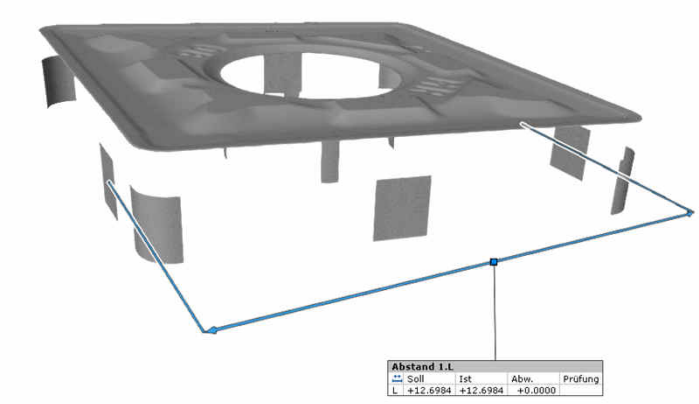
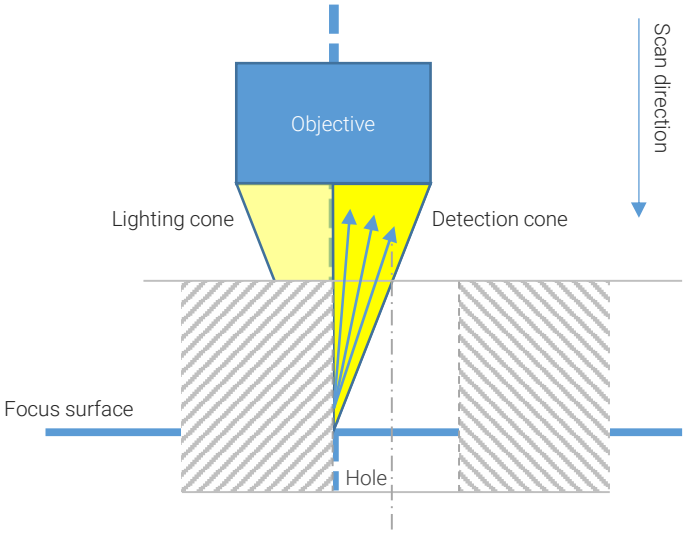
Vertical Focus Probing

Robust, accurate and non-contact measuring of flanks over 90°

So far, geometries such as the bore holes of e.g. injection valves in the automotive industry could hardly be measured optically. Lateral probing of components with vertical surfaces was limited to tactile measuring systems, CT solutions or complex special solutions. With the function of the new optical measuring system G6, vertical surfaces of more than 90° can now also be measured optically. Component features such as holes, bores, reference surfaces, contours, lengths etc. can thus be optically measured with high accuracy, high resolution and short measurement times.





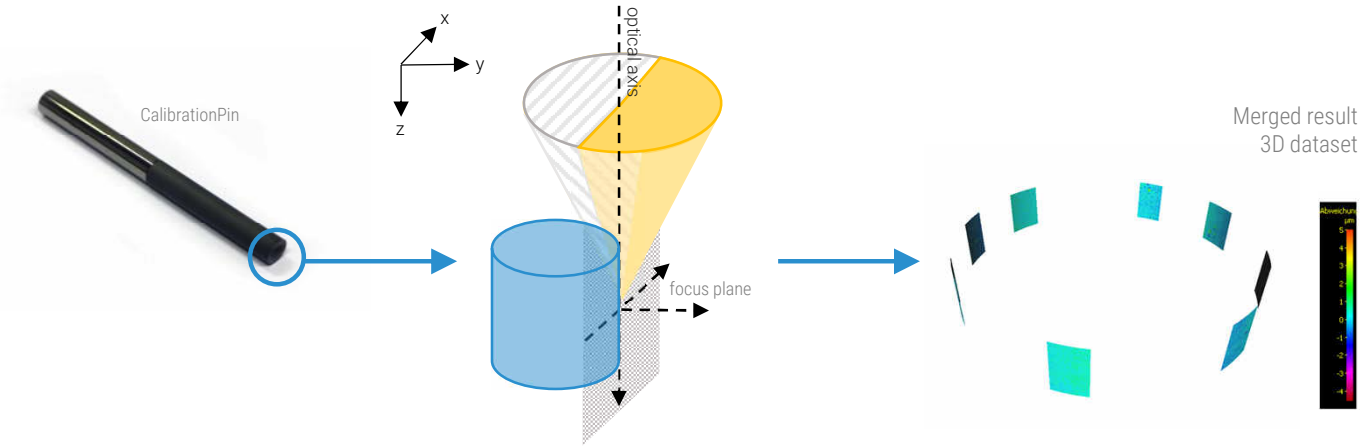
Measurement Principle

The new method 'Vertical Focus Probing' is an extension of the focus variation and is based on the use of a partial light cone. Individual light rays that are diffusely reflected from vertical surfaces get captured by the lens. Flanks with more than 90° can be measured traceably, repeatably and with high-resolution. Vertical flanks measured in this way can be used, for example, for fitting of a workpiece coordinate system.

Sample Application: CalibrationPin Measurement

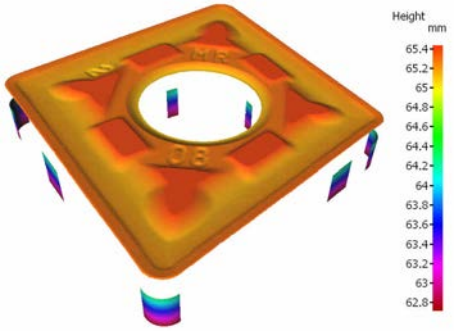
Example showing a 3D measurement of a calibrated pin. The pin was positioned at a 90° angle, which corresponds to being parallel to the optical axis. Vertical Focus Probing measures the walls by lateral, contact-less probing, and the distance between these area-based measurements. This means it allows the direct measurement of distances between two side walls without requiring any rotation of the pin.

The resulting dataset consists of 8 single measurements around the circumference of the pin, which are fused together in a 3D dataset.

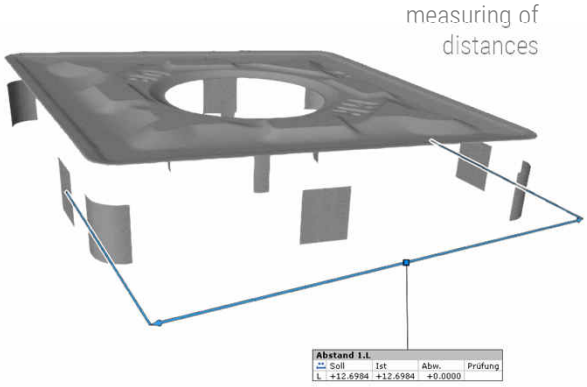


Sample Application: Distance Measurement

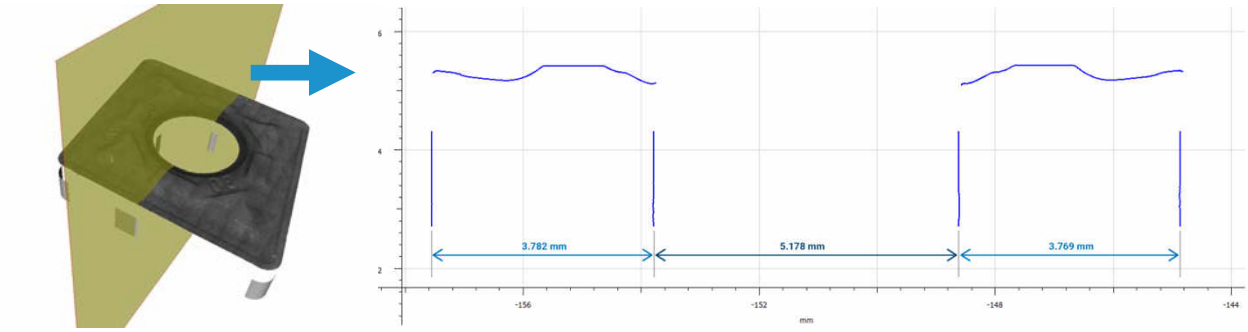
Measurement of a reference surface and adjacent flanks in a shared coordinate system



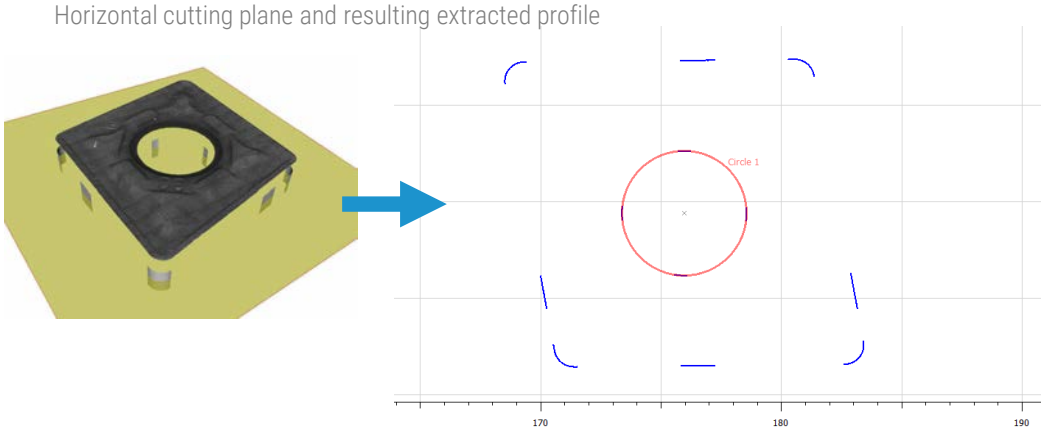
Simple and fast measuring of distances



Vertical cutting plane and resulting extracted profile



Horizontal cutting plane and resulting extracted profile

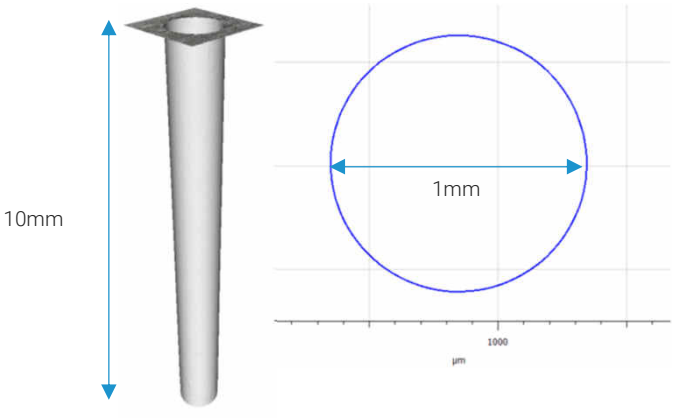


Sample Application:
Hole Measurement

Optical hole measurement becomes possible

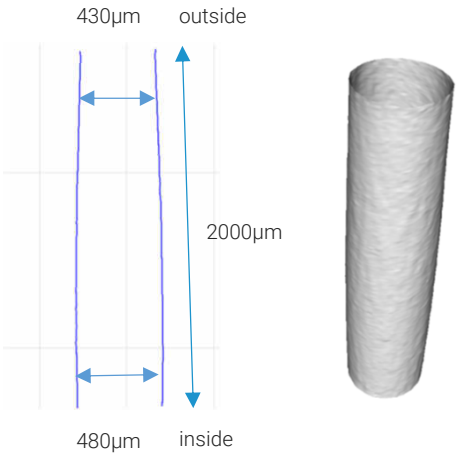
Using the new measuring method 'Vertical Focus Probing', holes can now also be measured purely optically. The diameter-depth ratio of holes ranges from 1:3 to 1:10, the measurable diameter is 0.1mm to 2mm. Users measure parameters such as outside and inside diameter and opening angle.

Hole with large diameter to depth ratio



Diameter: Depth = 1:10

Hole with diameter increasing towards the inside



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Technical Specifications of Hole Measurement

GENERAL SPECIFICATIONS

Measurement of holes with

- Diameter to depth ratio of up to 1:10 (depending on objective)
- Diameters ranging from 0.1mm to 2mm (smaller diameters on request)
- Opening angles to the inside of up to ~10 degrees

Objectives	Min. diameter (*)	Max. diameter	Max. depth (**)	Diameter/ Depth-Ratio (**)
800 WD17	0.34mm	1.0mm	10mm	1:10
400 WD19	0.17mm	0.5mm	3.5mm	1:7
150 WD11	0.065mm	0.2mm	0.8mm	1:4

(*) Smaller diameters on request (**) Depending on sample

MEASURABLE PARAMETERS

Geometry of a single hole

- Hole inlet diameter
- Hole outlet diameter
- K factor
- Diameter change along the hole
- Opening angle

Geometry of holes in relation to each other

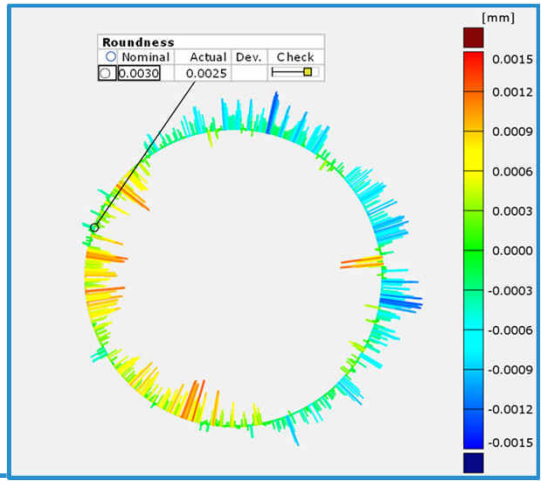
- Inclination angle (angle between hole axis and part axis)
- Orientation angle

Hole measurement is not limited to nozzle holes.

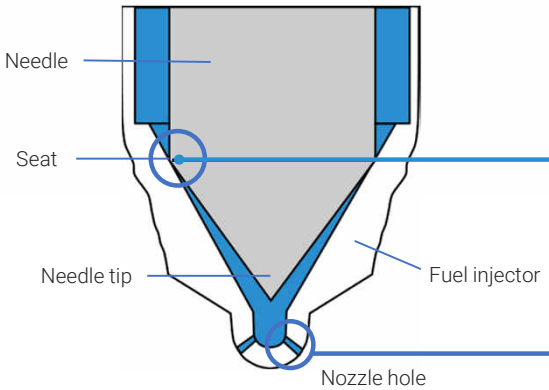
Sample Application: Valve Inspection

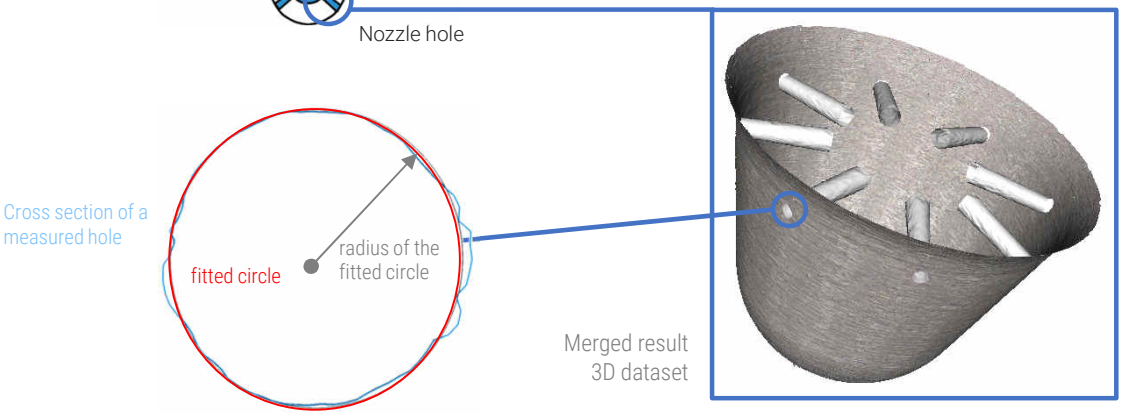
Inspecting multiple holes in a workpiece coordinate system

In combination with the highly precise, automatic rotation unit 'AdvancedReal3D', Vertical Focus Probing enables measuring of multiple holes including their orientation to each other. One application which can be achieved using the InfiniteFocus G6 in combination with Real3D is the measurement of injection nozzles including diameter, K-factor, injection angle and side angle.



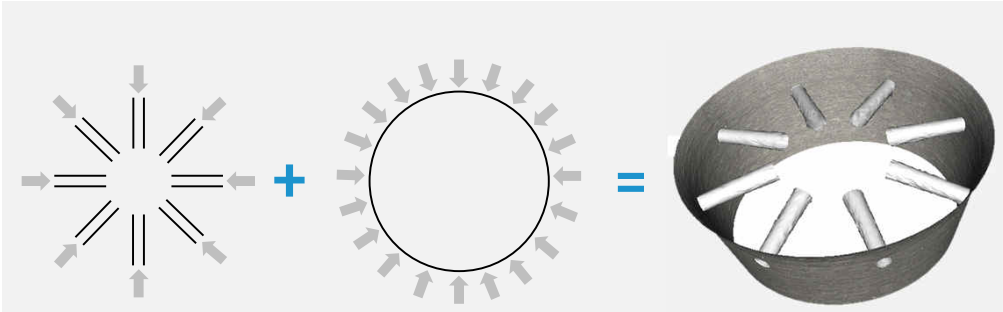
Roundness measurement of a valve seat

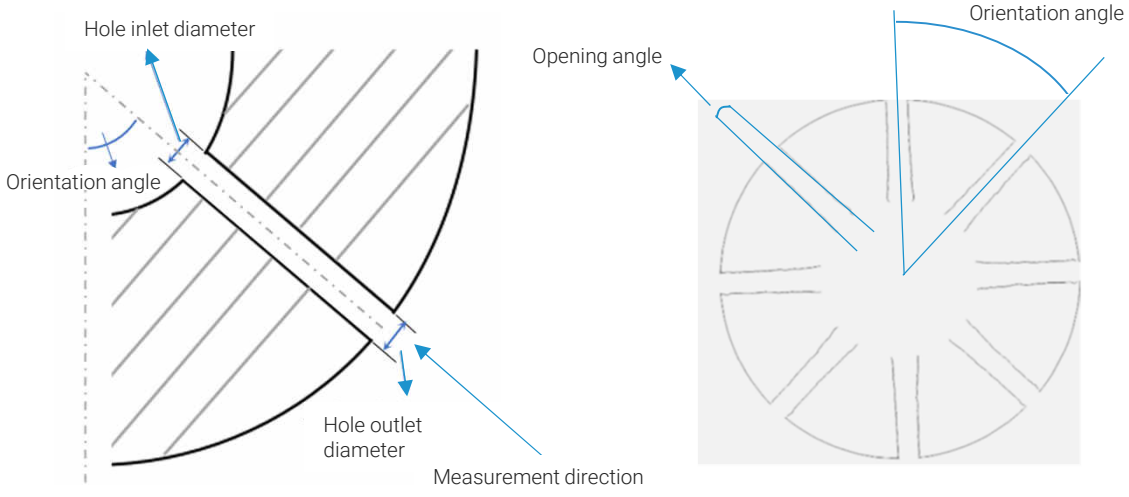




The dataset shown above was generated using a Real3D rotation unit.

Sample Application: Valve Inspection





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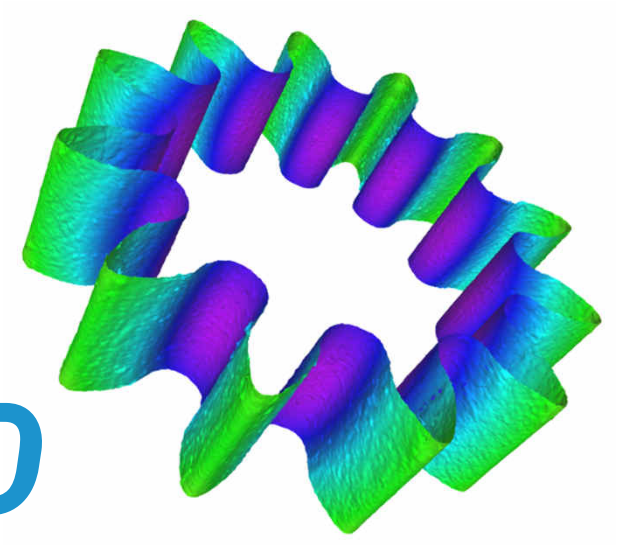


Real3D Measurement

also available separately as offline version – requires Offline MetMaX

How to measure undercuts

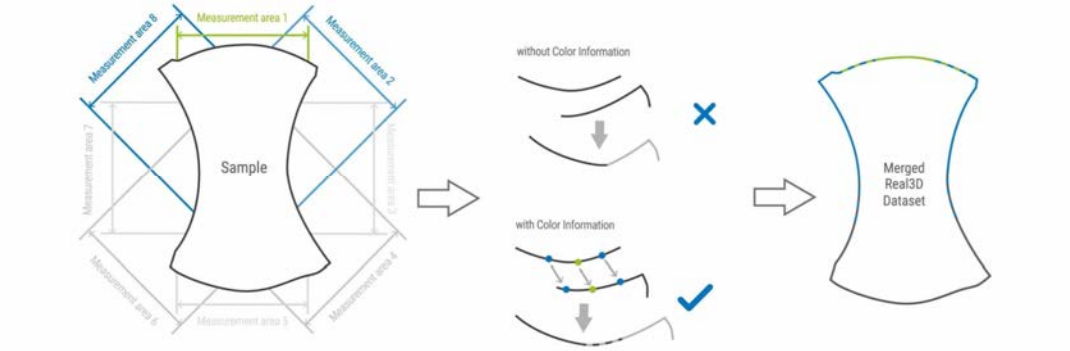
In combination with Real3D, users measure components in 3D from various perspectives which are then automatically merged into a full 3D dataset. High-precision and calibrated rotation and tilt axes ensure automated, repeatable and traceable measurement of form and roughness on the whole measurement object. Users are able to visualize and measure surface features such as diverse flank angles, thread pitch and undercuts.

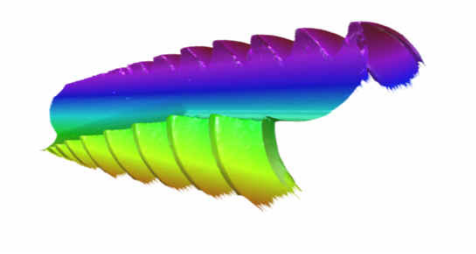
The AdvancedReal3DUnit features a motorized rotation and motorized tilt axis. It is used for full form measurement of typically round tools. It can additionally be applied for the automatic measurement of cutting dies, micro hole measurement and reverse engineering. Further, users are able to measure trail and main edges of their drill, cutting miller etc. in only one measurement circle.

The compatibility of the AdvancedReal3DUnit with a number of clamping systems allows for precise and rapid interaction between processing and measurement. In addition, various adapters enable 360° rotation and components without rotational symmetry.

Real3D Measurement

The component is measured at various rotation and tilt angles. Based on the registered true color information of each measurement point, the single measurements are transformed into a joint coordinate system. The single, overlapping measurements are then precisely merged into a complete 3D dataset.

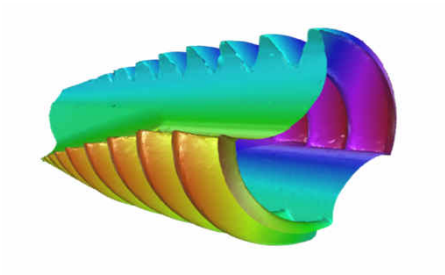




SURFACE DATASET

measurement from one perspective only

fast data handling due to small data volume



REAL3D DATASET

measurement from various perspectives, 360° inspection

measurement of undercuts, flank angles and thread pitch possible

AdvancedReal3DUnit

With the AdvancedReal3DUnit, complete 3D inspection of a tool is possible. Components are measured in 3D from various perspectives and then automatically merged into a full 3D dataset. Fully motorized rotation and tilt axes enable automatic as well as repeatable high-resolution form and roughness measurement. Three compatible clamping systems guarantee easiest tool handling and a precisely repeatable clamping process. The AdvancedReal3DUnit enables coordinate transformation and comparability of measurements to a CAD-model data.

Repeatable and traceable measurement from various perspectives with fully motorized high-precision rotation and tilt axes

AVAILABLE CLAMPING SYSTEMS

AdvancedReal3DUnit
AdvancedReal3DUnit 3R
AdvancedReal3DUnit EROWA

Technical specifications and drawings: see end of document

AdvancedReal3D Specimen Table

The AdvancedReal3D Specimen Table enables the measurement of samples that are not clamped in the AdvancedReal3DUnit while the unit is still mounted. It is a multi-functional and time saving accessory of the rotation unit that can simply be fixated on it with two screws. As the rotation unit does not need to be removed, and thus also not readjusted, it stays operational. Due to the threaded holes on its table top, samples can be securely fixated.

Dimensions (W x D x H)	180 x 118 x 117mm
Weight	480g
Material	Aluminium
Max. sample weight	5kg
Threaded holes table top	9 x M5
Product compatibility	
Rotation unit	AdvancedReal3DUnit AdvancedReal3DUnit 3R AdvancedReal3DUnit EROWA

Stable and compact table with a flat surface on which samples can be placed.

AdvancedReal3D Specimen Table mounted on AdvancedReal3DUnit.

AdvancedCalibrationPin

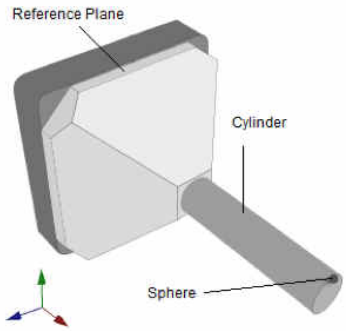
The AdvancedCalibrationPin is specifically designed to enable adjustment and calibration of the AdvancedReal3DUnit when used with an Alicona measurement system. Using this pin, a coordinate system for each tilt and rotation angle of the rotation unit can be precisely adjusted. Thus, measurement and positioning in clamping system coordinates is possible. DAkkS-calibrated.

High-precision adjustment and calibration with the AdvancedCalibrationPin.

AdvancedCalibrationPin	Pin diameter: Sphere diameter: Dimensions: Weight: Clamping system:	10mm 1mm 112.3 x 54 x 54mm 540g three-jaw chuck
AdvancedCalibrationPin3R	Pin diameter: Sphere diameter: Dimensions: Weight: Clamping system:	10mm 1mm 136 x 54 x 54mm 840g 3R
AdvancedCalibrationPinEROWA	Pin diameter: Sphere diameter: Dimensions: Weight: Clamping system:	10mm 1mm 120 x 54 x 54mm 580g EROWA

Product compatibility

AdvancedCalibrationPin	AdvancedReal3DUnit
AdvancedCalibrationPin3R	AdvancedReal3DUnit 3R
AdvancedCalibrationPinEROWA	AdvancedReal3DUnit EROWA



With the AdvancedCalibrationPin, a relation between stage coordinates and workpiece holder coordinates for all possible rotation and tilt angles is established.

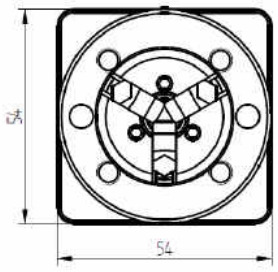
ChuckAdapter

The ChuckAdapter G2 extends the range of measurable tools: It allows inside and outside clamping of tools as well as the measurement of rotationally symmetric samples. Clamped into the rotation unit, it facilitates switching between the clamping systems without the need of having to exchange the entire grip.

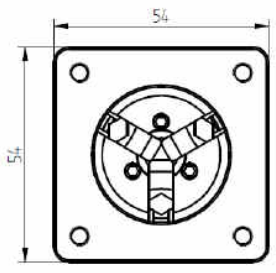
The ChuckAdapter is an accessory for the AdvancedReal3DUnit and its different versions. It offers of a three-jaw chuck, which is mounted on a 3R and EROWA pallet for the 3R and EROWA variants.

Fast switching between clamping systems with the ChuckAdapter G2.

ChuckAdapter G2	Dimensions: Weight: Compatibility:	69 x 35 x 35mm; ø 35mm 250g AdvancedReal3DUnit
ChuckAdapter3R G2	Dimensions: Weight: Compatibility:	87 x 54 x 54mm; ø 35mm 400g AdvancedReal3DUnit 3R
ChuckAdapterEROWA G2	Dimensions: Weight: Compatibility:	78 x 54 x 54mm; ø 35mm 300g AdvancedReal3DUnit EROWA
Clamping range		
Inside clamping **Outside clamping**	ø 0.5 - 16mm ø 11 - 27mm	



ChuckAdapter3R G2



ChuckAdapterEROWA G2

Edge Measurement Package

Measurement of (cutting) edges and edge verification

Applications and features

Edge Preparation Measurement
Difference Measurement
Measurement of Multiple Edges
Chamfer and Edge Break Measurement
Measurement of Angles on Round Tools
Measurement of Roughness
EdgeQuality and Chipping
Mean and Single Profile Measurement
Automated Measurement
Quality Assurance and Reporting
Customization
Remoting Interface
Integration in ERP and QM System

Bruker alicona
That's metrology!

Applications and Features

Edge Preparation Measurement
Difference Measurement
Measurement of Multiple Edges (*MultiEdgeMeasurement*)
Chamfer and Edge Break Measurement (*EdgeBreakMeasurement*)
Measurement of Angles on Round Tools (*RoundToolMeasurement*)
Measurement of Roughness (*ToolRoughness*)
EdgeQuality and Chipping (*EdgeQuality*)
Mean and Single Profile Measurement
Automated Measurement
Quality Assurance and Reporting
Customization
Remoting Interface
Integration in ERP and QM System

Exporting Functions

Datasets
AL3D

Optical Images/ 3D View
PNG, BMP, TIF, TIFF, ICO, JPG, JPEG, PPM, XPM, XBM

Depth Images
PNG, BMP, TIF

3D Data Points
Plain text, VRML2.0, SUR, STL, OpenGPS X3P, G3D

Object Properties
TXT

Importing Functions

Dataset
STL, AL3D, AFM, D2, DAT, TXT LEI, PLU PNG, SDF, SMD, SUR, DFR, TIF, TFR, TRR, ZFR, ZRR, PTB XYZ, UB3, X3P, G3D

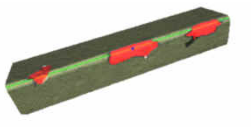
Optical Image
PNG, BMP, TIF, TIFF, ICO, JPG, JPEG, PPM, XPM, XBM

Supported Standards

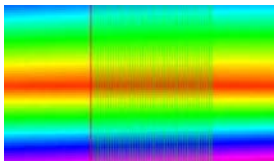
ISO 25178-6:2010, ISO 25178-606:2016
VIM ISO IEC:2007
ISO 4287:2010, ISO 4288:1998,
ISO 16610-1:2015, ISO 16610-20:2015, ISO 16610-21:2013
ISO 25178-2:2012
ISO 16610-61:2016, ISO 16610-71:2014
ISO 13565-2:1998
ASME B46.1:2009

Applications on Round Tools

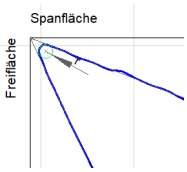
ToolRoughness
Roughness measurement on rake and clearance surface



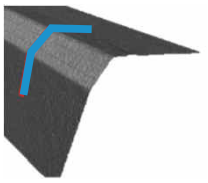
EdgeQuality
Automatic chipping measurement



Mean and single profile measurement

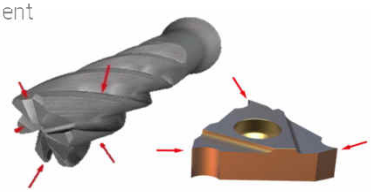


Edge Measurement

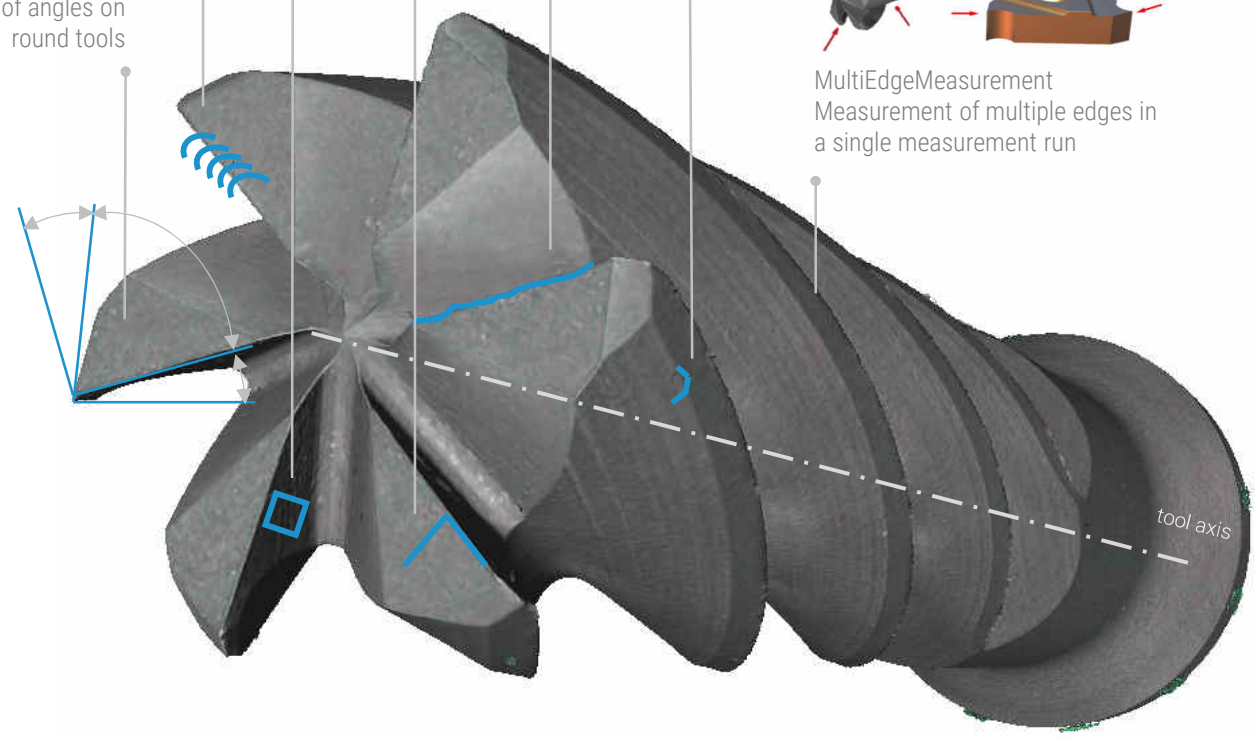


EdgeBreakMeasurement
Chamfer and edge break measurement

RoundToolMeasurement
Measurement of angles on round tools



MultiEdgeMeasurement
Measurement of multiple edges in a single measurement run



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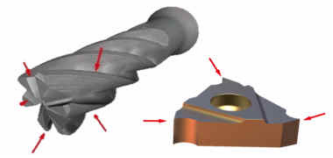
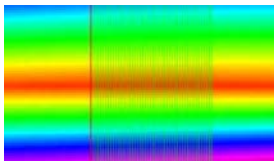
Applications on Inserts

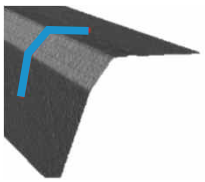


MultiEdgeMeasurement
Measurement of multiple edges in a single measurement run

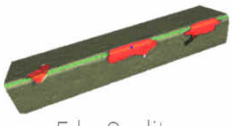
ToolRoughness
Roughness measurement on rake and clearance surface



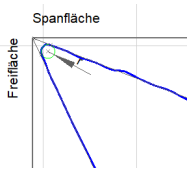
Mean and single profile measurement



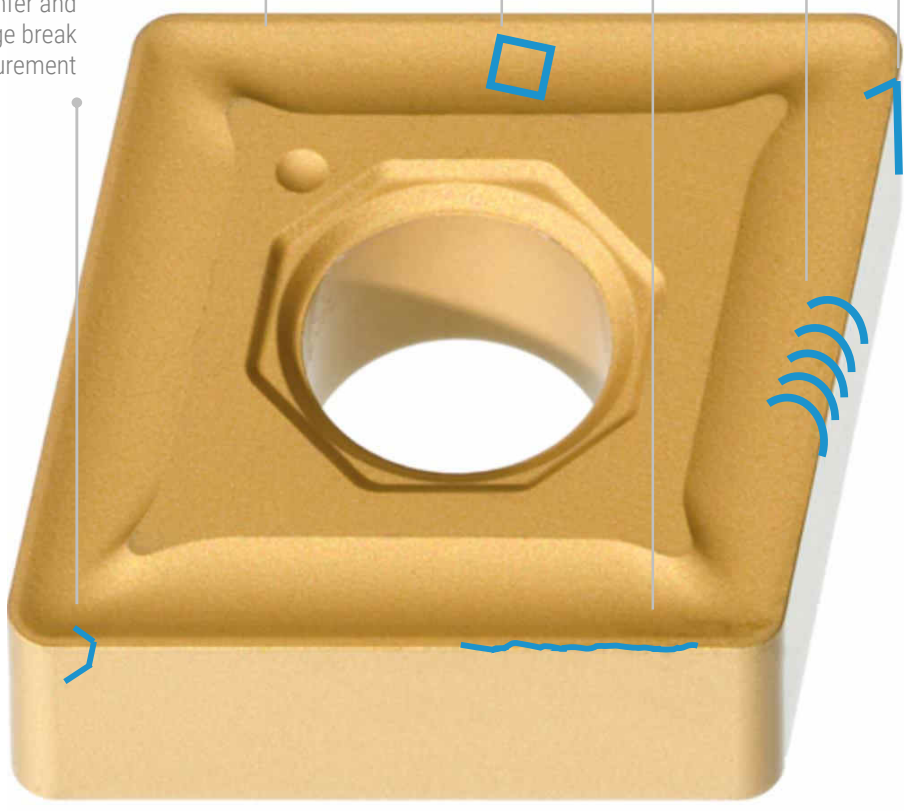
EdgeBreakMeasurement
Chamfer and edge break measurement



EdgeQuality
Automatic chipping measurement



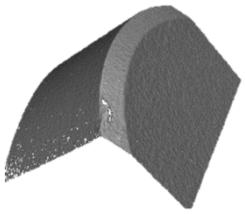
Edge Measurement

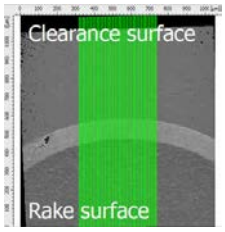


Edge Preparation Measurement

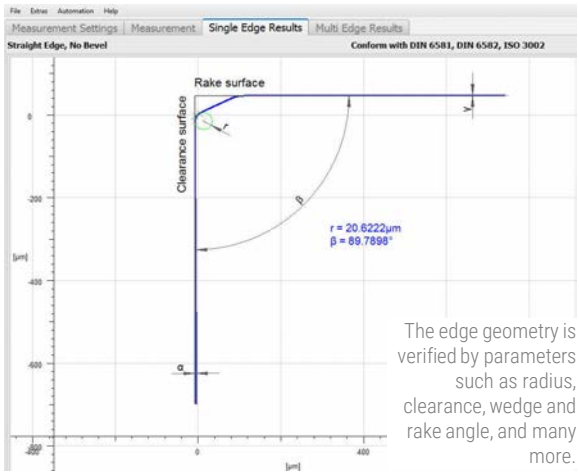
With the Edge Measurement Package users measure complex geometries of deburred, ground, smoothed and polished cutting edges. It enables the measurement of straight and curved edges, as well as edges with or without bevel. Users measure, among others, radius, clearance (α), wedge angle (β), rake angle (γ), edge symmetry as well as negative and positive bevel lengths. Measurements include projected bevel length, true bevel length and bevel angles. Also basket arches with both waterfall and trumpet shape are traceably measured in high repeatability.

A fit of elliptic shapes into the edge region describes the shape with many additional radial parameters. Additionally, the edge can be compared to user-defined basket arch files of arbitrary shape. Defined tolerances in terms of cutting edge preparation are verified.



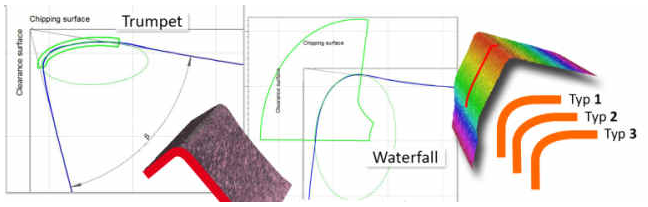


Name	Value	[u]	Description
r	20.6222	µm	Mean radius of mean edge
α	0.2791	°	Clearance angle
β	89.7898	°	Wedge angle
γ	-0.0689	°	Rake angle
Sα	11.4767	µm	Dist. apex to end of clearance roundness
Sγ	14.7852	µm	Dist. apex to end of chipping roundness
K	1.2883		Symmetry of cutting edge
Δr	3.6556	µm	Min. dist. of edge to apex
WΔr	11.7685	µm	Edge width
Ecq	0.0665	µm	Form deviation of circle (RMS)
Ftype	Trumpet		Estimated Curvature



The edge geometry is verified by parameters such as radius, clearance, wedge and rake angle, and many more.

Both, waterfall and trumpet shape are traceably measurable in high repeatability.



Measurement of Multiple Edges (MultiEdgeMeasurement)

MultiEdgeMeasurement offers fully automatic measurement of user-defined parameters at various tool positions in a single measurement run. Metrology expertise is not needed to verify the quality of inserts, cutters, drills or other round tools. The administrator simply defines the necessary parameters and measurement positions in the software, and then the sequence can be started and carried out at any time without further user influence. Upon completion, all results are clearly summarized in a single chart with a traffic light system reporting immediately if the work pieces comply with the tool specifications. For additional details on the parameters, users click on the result of interest. This automation decreases the inspection time for both single tools as well as entire batches. In addition, personnel resources are set free as the measured tools do not require repositioning or modification in the software settings.

Three typical application areas are:

Verification of edge geometries through the measurement of various edge positions

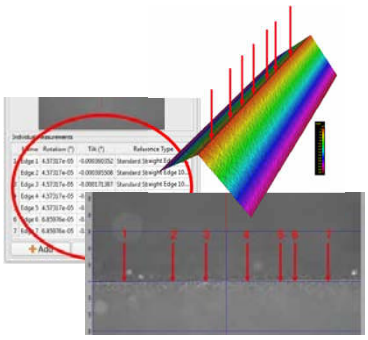
The user defines the measurement parameters for various tool positions. All parameters are then measured automatically and users receive results for each selected position.

Automatic inspection of drill, cutting miller or insert

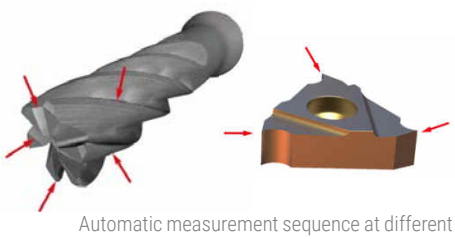
In combination with a rotation unit users measure multiple edges of tools. This even includes chamfered edges of e.g. drills, cutters and other round tools.

Rapid quality assurance of an entire batch

Users can measure a number of parameters across multiple tools. This enables, for example, quality assurance of an entire batch.



Several measurements on one edge by a single command to verify the homogenity of an edge preparation process.



Automatic measurement sequence at different positions on a tool

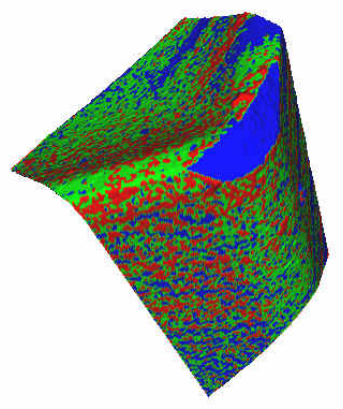
Automatic measurements on various tools to assure the quality of an entire batch

Difference Measurement

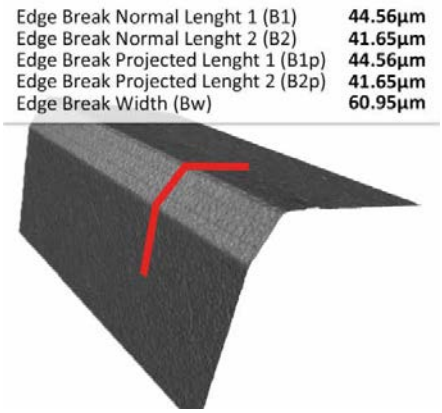
Difference Measurement automatically compares the measured cutting tool to a previously imported CAD dataset or reference geometry. Differences to a measured "golden standard" are clearly visible. This is achieved through advanced pseudo colour visualization: all points that lie within the tolerance remain green whereas all others are shown in red and blue.

Chamfer and Edge Break Measurement (EdgeBreakMeasurement)

Users measure the shape and length of a chamfer. Measurements include chamfer width, various angles, width of edge break, normal distances and other ISO 13715 conform parameters. Just like edge measurement, chamfer measurement is designed as a one-button solution that can be applied in production.



Difference Measurement:
3D measurements are automatically compared to a reference geometry or CAD data.



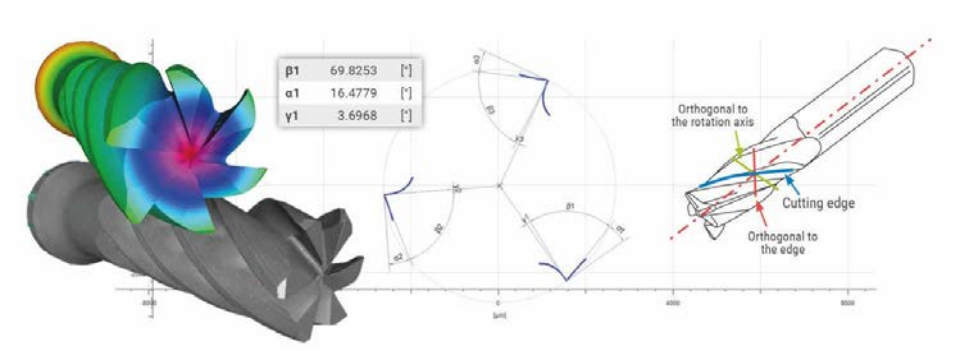
Measurable parameters of an edge break include chamfer width, various angles and other ISO 13715 conform parameters.

Measurement of Angles on Round Tools (RoundToolMeasurement)

In combination with the AdvancedReal3DUnit, users measure additional important parameters such as rake angle, wedge angle and clearance angle with respect to the tool axis.

In addition to the result table, users receive a graphical visualization, more precisely a profile, of the measured round tool with the measured parameters included.

AdvancedReal3DUnit



Measurement of parameters such as rake angle, wedge angle and clearance angle with respect to the tool axis

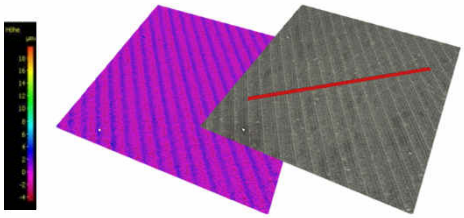
Measurement of Roughness (ToolRoughness)

ToolRoughness allows to automatically calculate the roughness of a tool with both profile and area based parameters on the rake and clearance surface as well as in the flute of a tool. Typical measurable parameters are Ra, Rq, Rz, Sa, Sq, Sz.

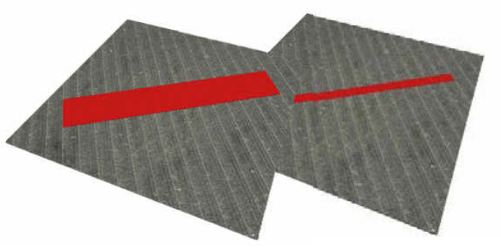
Roughness measurement on rake and clearance surface or in the flute of a tool

FEATURES

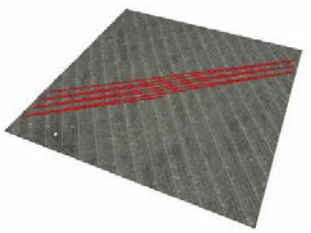
- Automatic alignment of profiles orthogonal to the dominant structure.
- Option to choose between calculating parameters from a mean profile or calculating mean parameters from multiple profiles.
- Form removal of cylinders and spheres.
- Warning if repeatability of a measured dataset is not good enough, or if Ra value is smaller than the min. measurable Ra stated in the technical specifications.
- Automatic choice of lambdaC according to ISO 4288.
- Automatic choice of the profile length according to ISO 4288.
- Definition of number of sampling lengths.
- Automatic extraction of the profile in a zigzag path if the profile length is larger than the field of view.
- Predefined profile lengths.
- Adjustment of reference types to individual needs.
- Add tolerances to certain parameters



Profile extraction orthogonal to the dominant structure of the surface

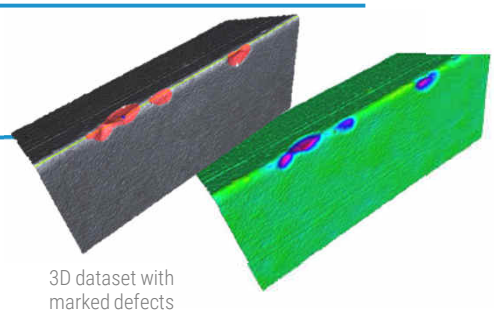


Mean parameters calculated from multiple profiles vs. roughness parameters calculated from a mean profile



Automatic profile extraction along zigzag path if profile lengths larger than field of view

EdgeQuality and Chipping

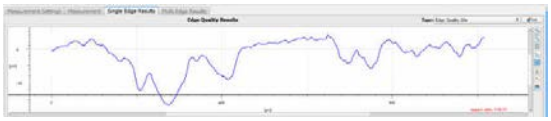


3D dataset with marked defects (true and pseudo color)

EdgeQuality offers fully automatic chipping measurement: depth, length and volume for edge quality verification.

Users measure

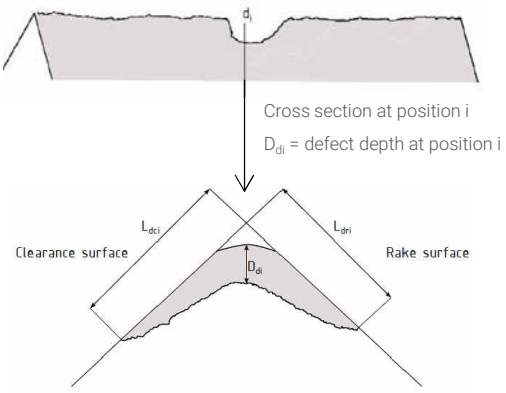
- the quality of cutting edges
- edges with or without edge radius
- the defect depth along the clearance and rake surface as well as along the edge profile
- the roughness on the edge

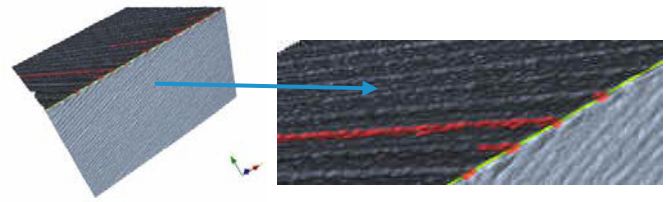


Extracted surface profile along the edge

Other features

- High resolution enables the measurement of ISO 4287 conforming parameters (Ra, Rq, Rz, Rp, Rv …) along the edge.
- Possibility to calculate defects with respect to a previously measured golden standard or an imported CAD dataset.
- Warning if repeatability of a measured dataset is not good enough, or if Ra value is smaller than the min. measurable Ra stated in the technical specifications.
- Warning if roughness on rake/clearance surface is too high for desired detection parameters.





Warning options: If roughness on rake/clearance surface is higher than specified average Rv value, a warning can be displayed.

TYPICAL PARAMETERS
percentage of edge length with defects
max. defect depth along the profile
max. defect length along the clearance/rake surface
(robust) radius in areas without defect

Mean and Single Profile Measurement

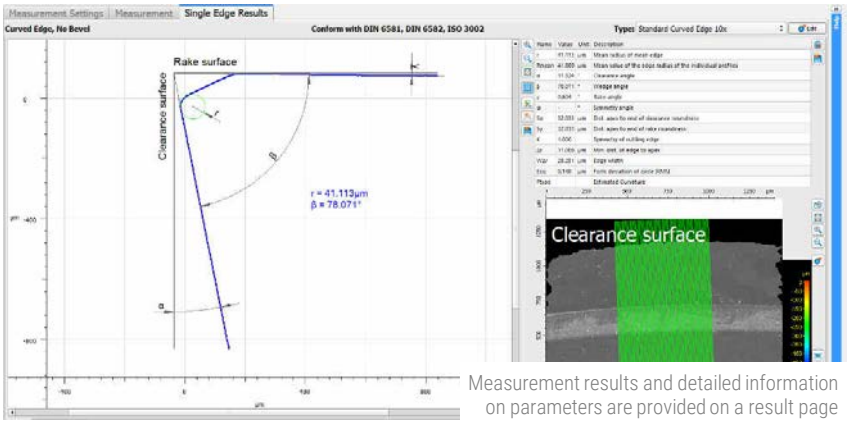
Cutting edges are usually verified throughout the measurement of the mean profile. The Edge Measurement Package additionally offers the measurement of up to 100 edge profiles within the measurement area. This enables detailed analysis of the selected measurement area. Users easily detect variances along the edge to deeply analyze its homogeneity.

Automated Measurement

Measurements are performed fully automatic as a „single-button" solution. The user only chooses a reference type from either a selection of pre-defined edge types or by using a bar-code reader. Parameter settings only have to be defined once by an administrator.

Quality Assurance and Reporting

All measurements are automatically saved and can be imported into Microsoft Excel for statistical evaluation. Detailed reports can be generated and printed for each measurement. All measurements are archived in a database for quality assurance.



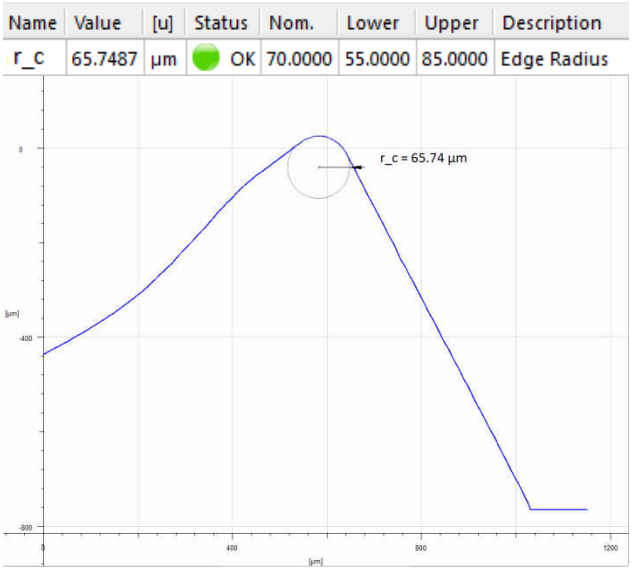
Measurement results and detailed information on parameters are provided on a result page

Customization

The Edge Measurement Package is individually adaptable to the user's needs: Via customized scripts new measurement parameters can be quickly and easily implemented in order to meet new requirements, or customized routines can be defined. Additionally, the graphical user interface can be adapted to the customer's needs and customer-specific parameter names can be assigned.

Remoting Interface

The Remoting Interface can be used to automate edge measurement sequences via a .NET interface. It allows to control the system by utilizing an external robot or another external stage.



Users define customized parameters which are measured by customized scripts. These parameters are shown on the result page.

Order Management Module

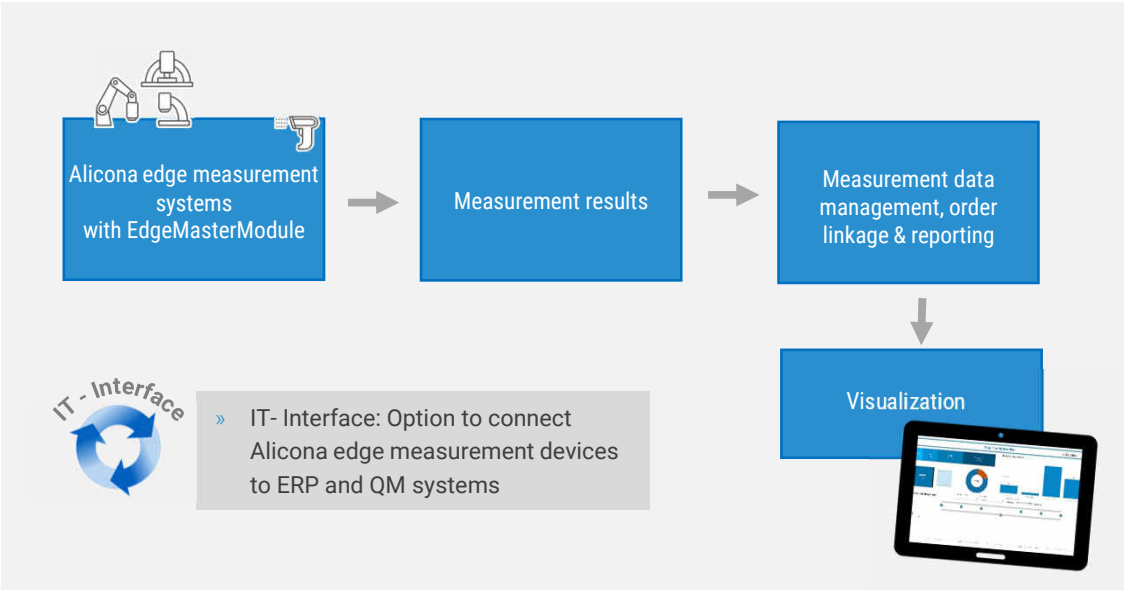
Intuitive, customizable Order Management with user-specific Reporting

The Alicona OrderManagementModule enables **order processing and management with a customizable interface and user-specific reporting.**

- Order-related and database-supported measurement data management with **adjustable fields according to individual requirements**.
- **Fast allocation of the measurement to the order,** optionally supported by a barcode scanner.
- **Automatic selection of the correct measurement settings** for the selected order, for **efficient processes and significant time savings**.

Production-near Interface and transparent Order Processing

- **User-specific reports** to monitor the constant quality of production, e. g. by comparing different measurement runs or operators.
- **Intuitive and production-oriented user interface with different user levels,** from basic to administrative system privileges.
- Overview of all orders, including the fulfillment status, makes order processing transparent and allows for **early detection and correction of deviations in order processes.**

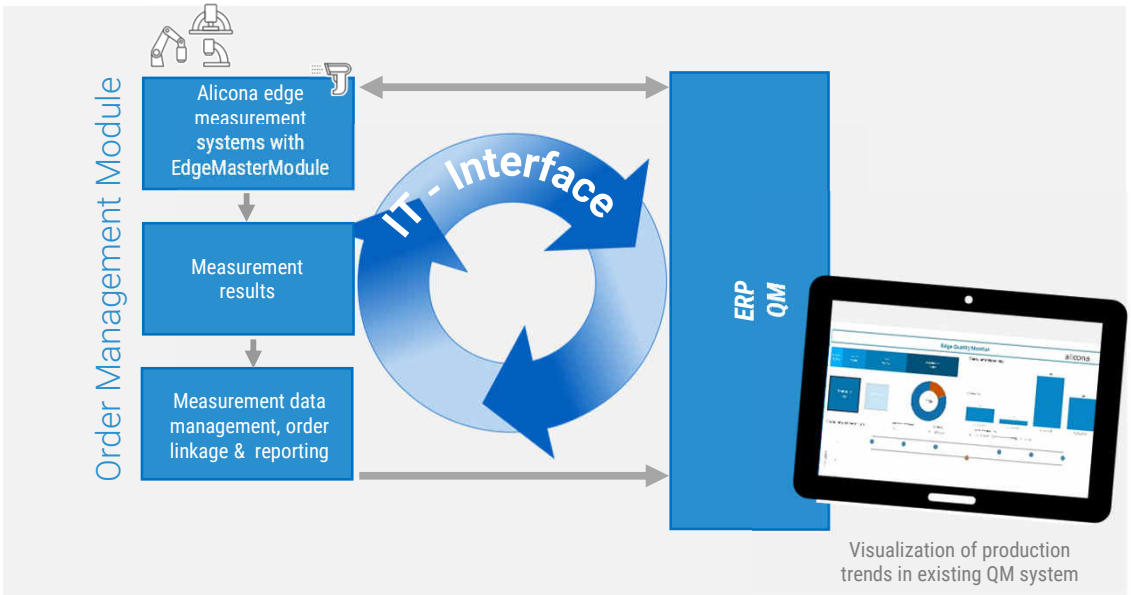


IT-Interface

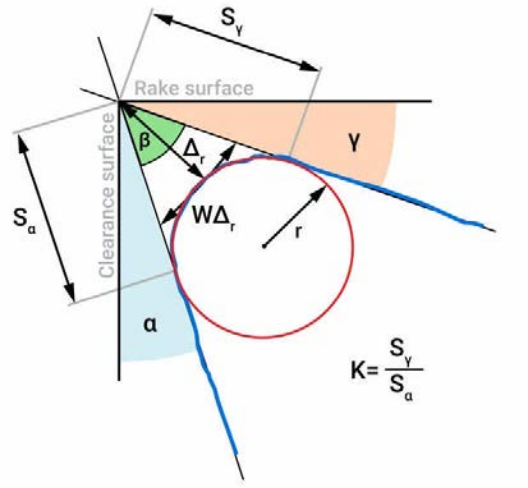
Integration of Measurement Technology in ERP and QM-Systems

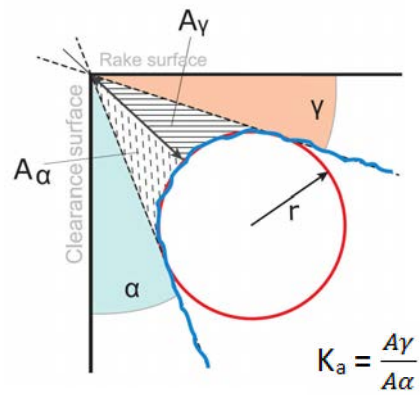
The IT-Interface enables the **integration of Alicona measurement technology** into the IT environment of your production. Measurement data is fed into your company's ERP and QM systems. This facilitates intelligent networking and **communication between measurement technology and production systems**.

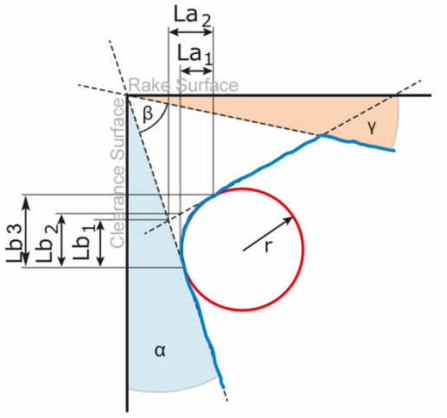
- Alicona edge measuring systems are connected to the ERP system, **hence access nominal values, tolerances and measuring strategies** of all tools. Measurements are achieved fully automatically, at the same time measurement results are fed into the QM system.
- The **networking of measurement data, ERP and QM systems** enables self-sufficient, user independent generation of measurement programs.
- Production managers **have access to all production data** and can react immediately to negative and positive trends. This supports global manufacturing **at several production sites in uniform quality**.

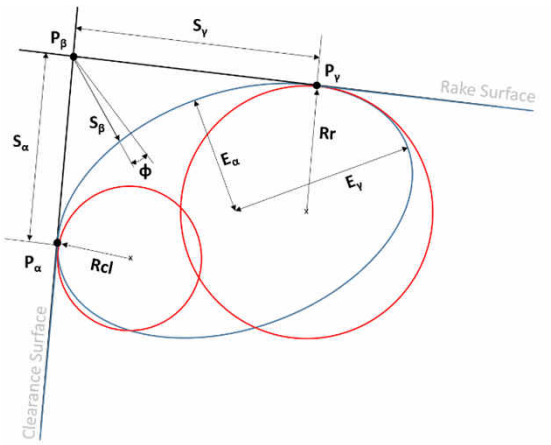


Visualization of production trends in existing QM system









Edge parameters

S_α, S_γ	distance between the apex (intersection of both dashed lines) and the end of the clearance or rake roundness, respectively
Δr	shortest distance from the intersection of the dashed lines to the fitted circle
WΔr	edge width
r	radius of the cutting edge
Ecq	form deviation of circle
Ebq	form deviation of basket arch
Ftype	form deviation parameter (indicates whether the form of the cutting edge is waterfall, trumpet or not defined)
R_{mean}	mean value of the radii of all single profiles
γ	rake angle
α	clearance angle
β	wedge angle
K	edge symmetry
K_a	edge symmetry based on areas
L_{a1}, L_{b2}, L_{a2}, L_{b2}, L_{b3}	length of honing width projected to rake/clearance surface
K_{ea}	ratio of the ellipse half axis length along the rake surface to the half axis length along the clearance surface
K_{er}	ratio of the fitted circle's radius on the rake surface to the radius of the circle on the clearance surface
rE	measure of the mean radius of the cutting edge
ψE	tilt angle between the rake surface and the half axis of the ellipse whose angle to the rake surface is smaller
Φ	symmetry angle (angle between the bisector of the wedge angle β and Sβ (= Δr))
E_γ	ellipse half axis length along the rake surface
E_α	ellipse half axis length along the clearance surface
R_{cl}	ellipse-radius clearance face
R_r	ellipse-radius rake face
R_{calc}	calculated radius based on Δr

EDGE PARAMETERS FOR NEGATIVE BEVEL

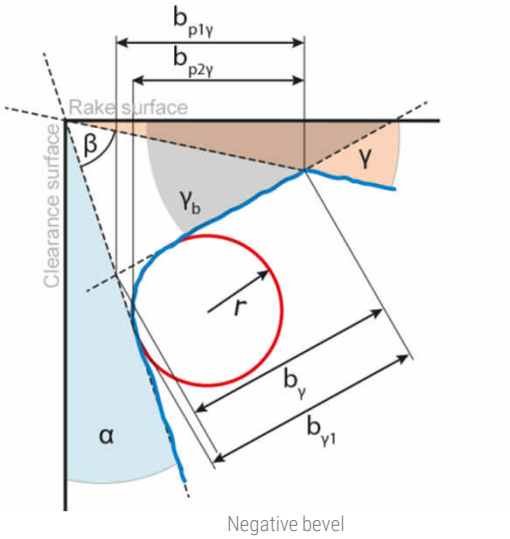
$b_{p1\gamma}$, $b_{p2\gamma}$, $b_{p3\gamma}$	projected bevel length
b_{γ}, $b_{\gamma1}$	true bevel lengths
$b_{\gamma mean}$	mean value of the bγ values of all single profiles
γ_b	angle of negative bevel

EDGE PARAMETERS FOR SUPPORTING BEVEL

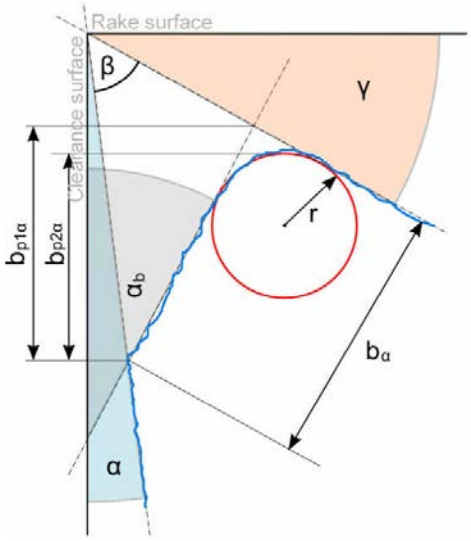
$b_{p1\alpha}$, $b_{p2\alpha}$	projected bevel length
b_{α}	true bevel length
α_b	angle of supporting bevel

PARAMETERS FOR EDGE BREAK

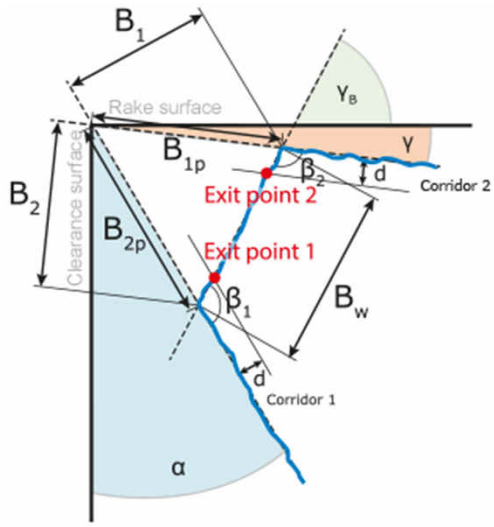
Bw	width of edge break
β1, β2	edge break angles
B1, B2	lengths between fitted lines and edge break points (ISO 13715)
B1p, B2p	projected lengths
x1 neg, x2 neg	normal distances between corridors and exit points
Bd, Bda	(absolute) mean deviation of edge break
Bf	indicates the form of the edge
Bg	indicates the form of the edge
Fc	indicates whether the shape of the edge is more like a circle or a line
γB	angle of cutting edge removal



Negative bevel



Supporting bevel

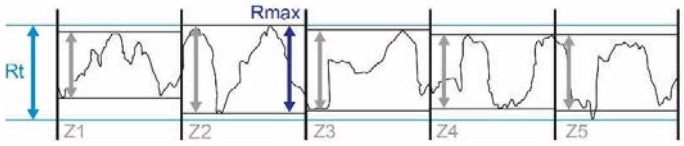


Edge break parameters

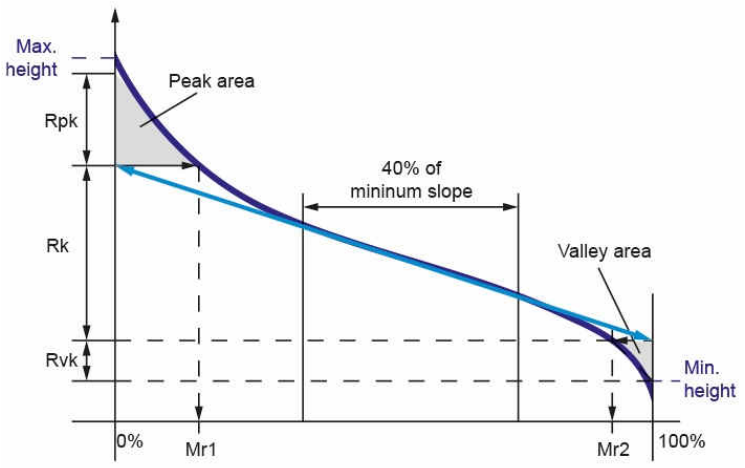
Profile parameters

Ra	average roughness of profile
Rq	root-mean-square roughness of profile
Rz	mean peak to valley height of roughness profile
Rt	maximum peak to valley height of roughness profile
Pt	maximum peak to valley height of primary profile
Rmax	maximum peak to valley height of roughness profile within a sampling length
Rp	maximum peak height of roughness profile
Rv	maximum valley height of roughness profile
Rc	mean height of profile irregularities of roughness profile

Rsm	mean spacing of profile irregularities of roughness profile
Rsk	skewness of roughness profile
Rku	kurtosis of roughness profile
Rdq	root-mean-square slope of roughness profile
Rk	core roughness depth, height of the core material
Rpk	reduced peak height, mean height of the peaks above the core material
Rvk	reduced valley height, mean depth of the valleys below the core material
Rmr1	peak material component, the fraction of the surface which consists of peaks above the core material
Rmr2	peak material component, the fraction of the surface which carries the load



Rz = mean value of Z1, Z2, Z3, Z4, Z5



Material ratio parameters

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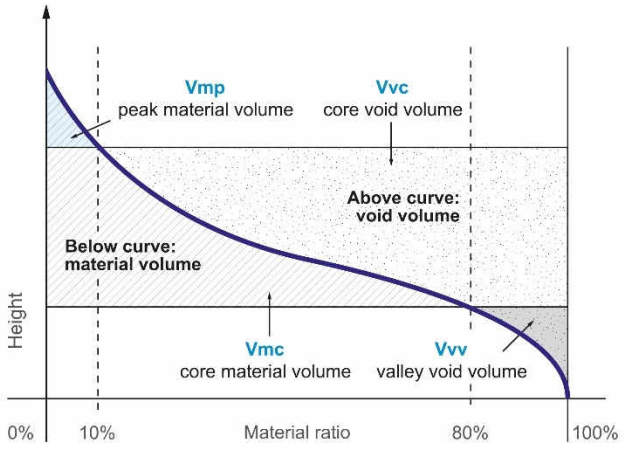
Surface texture parameters

Sa	average height of selected area
Sq	root-mean-square height of selected area
Sz	maximum height of selected area
Sp	maximum peak height of selected area
Sv	maximum valley depth of selected area
S10z	ten point height of selected area
Ssk	skewness of selected area
Sku	kurtosis of selected area
Sdq	root-mean-square gradient
Sdr	developed interfacial area ratio
Sk	core roughness depth, height of the core material
Spk	reduced peak height, mean height of the peaks above the core material
Svk	reduced valley height, mean depth of the valleys below the core material
Smr1	peak material component, the fraction of the surface which consists of peaks above the core material
Smr2	peak material component, the fraction of the surface which carries the load
Vmp	peak material volume of the topographic surface
Vmc	core material volume of the topographic surface
Vvc	core void volume of the surface
Vvv	valley void volume of the surface

Volume parameters can distinguish differences between surfaces better than others. Volume parameters are calculated for entire surfaces.

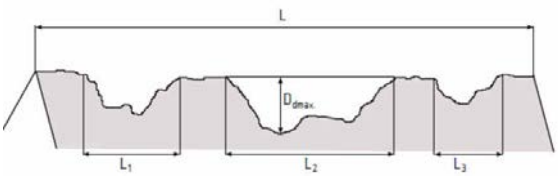
Difference measurement parameters

Dmin	max. deviation below reference surface
Dmax	max. deviation above reference surface
Dmean	mean deviation
Vp	volume of peaks above reference surface
Vv	volume of valleys below reference surface
Vdp	volume of peak defects extending above tolerance
Vdv	volume of valley defects extending below tolerance
AProj	projected area of sample
Adp	projected area of peaks above tolerance
Adv	projected area of valleys below tolerance
Pc	coverage percentage (area within tolerance)
SIMcd	greatest depth of defects (ISO 8785)
SIMch	greatest height of defects (ISO 8785)
SIMt	whole area of defects (ISO 8785)

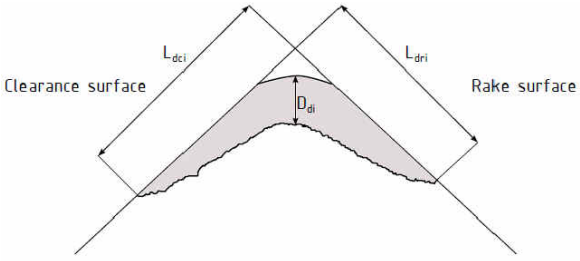


Parameters for chipping measurement along the profile

Ra	average roughness of profile
Rq	root-mean-square roughness of profile
Rz	mean peak to valley height of profile
Rp	maximum peak height of profile
Rv	maximum valley depth of profile



Example of an edge with three defects



Depth of defect at a certain position (here: position i)

Parameters for edge quality measurement

L	evaluated length
Pd	percentage of edge length that has defects
Vdrel	relative defect volume per length
Ddmax	max. defect depth along the profile
Ddmean	mean defect depth along the profile
Vdmax	max. defect volume
Vdmean	mean defect volume
Ldmax	max. defect length along the profile
Ldmean	mean defect length along the profile
Ldcmax	max. defect length along the clearance surface
Ldcmean	mean defect length along the clearance surface
Ldrmax	max. defect length along the rake surface
Ldrmean	mean defect length along the rake surface
Rmean_ robust	radius in areas without defects

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Automation Manager

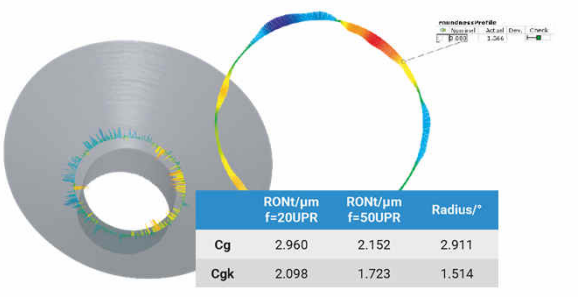
Automated measurement and evaluation

The AutomationManager is a software platform that makes the automated and user-independent measurements and evaluation of micro-precision components or micro-structured surfaces on large components possible. The process is based on the interplay between an administrator, who defines the measurement program, and operators in the production area. The operator starts the pre-programmed measurements at the touch of a button, the selection of the components to be measured is done by means of a drop-down menu or barcode scanner. The measurement and evaluation of surface and roughness parameters runs automatically, the worker has no influence on the measurement result.

Available add ons and software

Add-On: Alicona Inspect Form Measurement

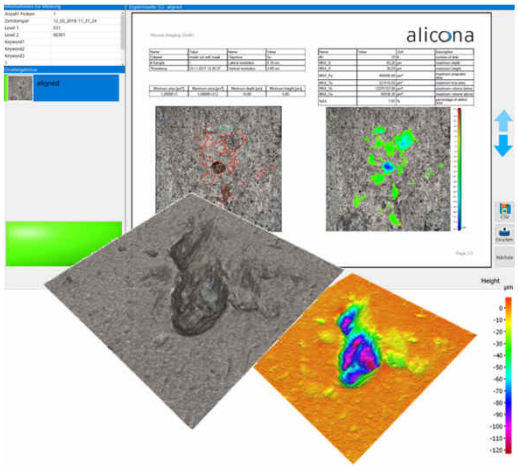
Using Alicona Inspect, the automated measurements can be applied on the dimensional inspection of components. Parameters and positions to be measured are individually defined by an administrator beforehand and include, among others, angle, distances, roundness, shape deviations and positional relationships.



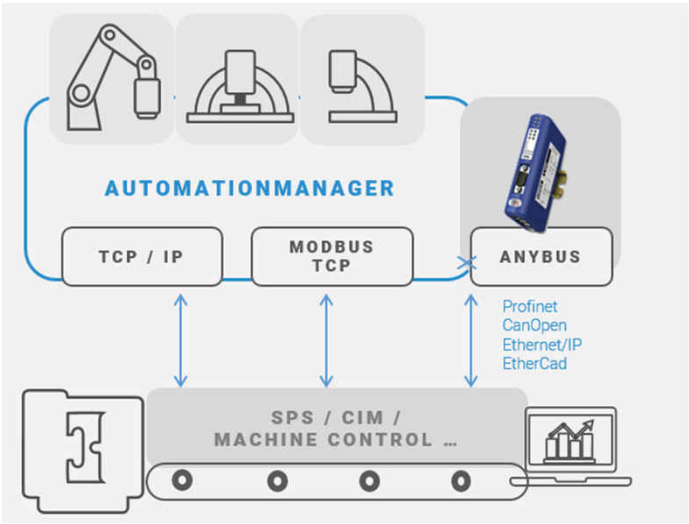
	RONt/µm f=20UPR	RONt/µm f=50UPR	Radius/°
Cg	2.960	2.152	2.911
Cgk	2.098	1.723	1.514

Add-On: Defect Measurement

The Defect Measurement software automatically detects and quantifies defects on component surfaces and edges. The area-based 3D measurement technology makes it possible to measure and visualize defects and scratches over large areas. In addition to other parameters, users can evaluate the number, length, depth, volume and height of the defects. Applications include corrosion measurement on metal plates, determination of defects and breakage on turbine components as well as measurement of burrs on pressed blanks of indexable inserts.



Compatibility and integration into production



Using the AutomationManager, Alicona's optical 3D metrology is easily integrated into production. For the integration of high-resolution optical measuring sensors, communication and interconnection of production system, machines and measurement systems are crucial.

With the Modbus protocol interface, Alicona offers the possibility to flexibly use its measuring systems for comprehensive process control. Using this well-known public industry standard, manufacturers can integrate Alicona metrology in combination with the AutomationManager into their productions process without any programming effort.

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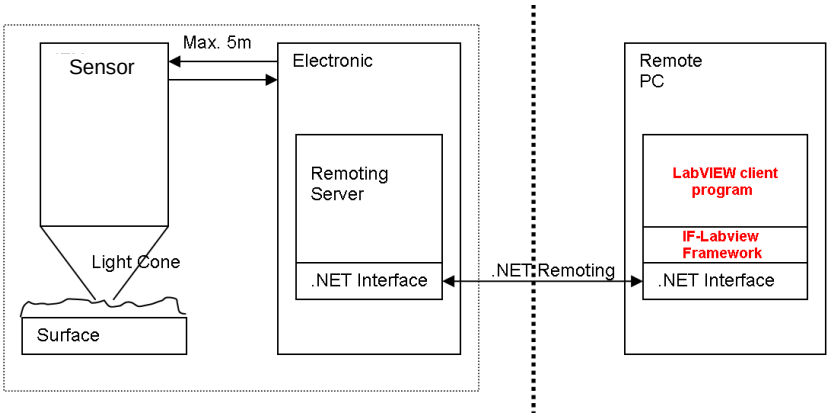
LabVIEW Framework

Programming interface

The LabVIEWFramework provides a LabVIEW programming interface for InfiniteFocus systems which enables users to design fully automated measurements and allows to control one or more Alicona measurement device. An easy-to-use alternative to scripting, users easily write programs tailored to their needs or produce prototypes very quickly. Typically, the LabVIEWFramework is used for measurement procedures conducted on a regular basis or for specific measurement tasks that would require add-ons of the measurement software.



Service Software

Adjustment and Calibration

Automatic adjustment and calibration

The software allows the automatic adjustment and calibration of the InfiniteFocus G6. The adjustment methods include those for optical axis, sensor rotation, sampling distance, flatness error and grey balance. The calibration methods include lateral calibration, vertical calibration, flatness error calibration and roughness calibration.

Applications: Adjustment and calibration

Users check the functionality of the measurement device with automatic calibration routines. In production, the software is used to adjust and calibrate Alicona measurement devices. Service technicians check and assure the functionality of a measurement device at the customer's site.

CALIBRATION

Lateral calibration
Vertical calibration
Roughness calibration
Flatness error calibration

ADJUSTMENT

Grey balance adjustment

ADDITIONAL FEATURES

Single Measurement
Automatic update of the calibration state
Report generation

SERVICES PERFORMED BY SERVICE TECHNICIANS ONLY

Adjustment of the optical axis
Adjustment of the sensor rotation
Lateral adjustment
Adjustment of the flatness error
Orthogonality adjustment

Calibration of the optical axis
Calibration of the sensor rotation

SUPPORTED STANDARDS

ISO 25178-606, ISO 25178-6

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Pick & Place

Automated placing and measurement of components

- Easy teach-in in 3 steps
- Option for closed-loop process and ERP integration
- Pays for itself within 10 months

Alicona InfiniteFocus G5
with Pick & Place

Automated placing and measurement

Alicona Pick & Place is an automation solution that makes it possible to set up a complete automation process within ten minutes. Therefore an optical measurement system is extended with a robot arm to automatically pick, place, measure and sort components. Pick & Place can also be used in smaller production environments and pays for itself within ten months.

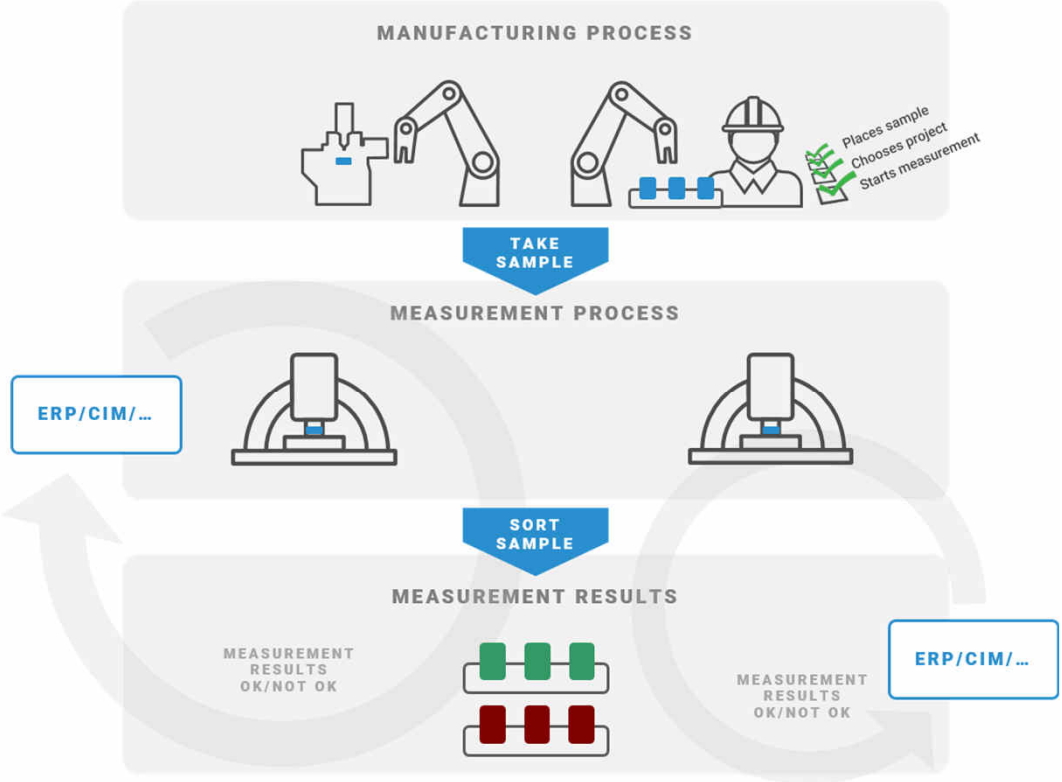
The system is based on the interaction between an administrator who pre-defines automation processes, the collaborative robot for the manipulation and placing of components as well as high-resolution optical 3D measurement technology. The possible connection to existing production systems including ERP facilitates adaptive production planning.

High-resolution optical 3D measurement technology in combination with a collaborative robot arm enables automated placing, measuring and OK/NOT OK sorting in production.

Teach-in of measurement series is carried out in only three steps and does not require any programming knowledge.

Automated placement and measurement with turbine blades

Automated placement and measurement with drills



Interacting with machine
Adaptive closed-loop production

The machined component is removed from the machine by the robot, clamped on the measuring system and measured automatically. Depending on the manufacturing strategy, there are different options of continuing the production process afterwards. Either the measurement result is fed back into the tool machine following a closed-loop strategy, where machine parameters are corrected automatically and manufacturing continues in a self-controlling manner. Alternatively, an automatic sorting into OK/NOT OK pallets follows after the 3D measurement for further processing.

Interacting with worker
Easy teach-in in only 3 steps

The user teaches-in an automated procedure in only three steps with no programming knowledge required. The robot handles component manipulation including the positioning on the measuring system and further sorting in OK/NO OK pallets. Regardless of the number of components, only four parts per pallet have to be pre-defined. At the push of a button the operator starts the entire process in production. After the measurement is finished, the component is sorted by measurement results OK/NOK and put in the respective pallet by the robot.

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Calibration Standards

CalibrationTool

The Alicona CalibrationTool is particularly designed for verifying the vertical and lateral accuracy of all Alicona 3D measurement devices. It provides a height step (1000µm) for the vertical check and various chess patterns for the verification of lateral results. DAkkS-calibrated (*optional*).

Circle diameters	2000µm, 1000µm, 500µm, 250µm, 100µm, 50µm
Grid spacings	120µm, 50µm, 24µm, 12µm, 5µm
Height step	1000µm

3D dataset of the measured height step

CalibrationTool

Chess pattern for the verification of lateral measurements

VerificationTool

The VerificationTool is a standard particularly designed to verify the accuracy of form measurements achieved by Alicona measurement systems. It shows various form artefacts such as height steps, angles and cylindrical shapes. Traceable to the PTB.

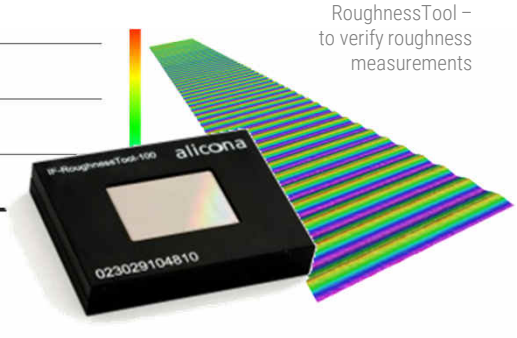
Cylinder diameter	100µm, 250µm, 500µm, 1000µm
Angles	90°, 60°, 20°
Height steps	500µm, 1000µm, 2000µm, 5000µm

VerificationTool – to verify form measurements

RoughnessTool

The roughness standard can be applied for both tactile and optical measurement systems. Its traceability provides comparison with other measured values, certified standards or target values. Users can measure and verify surface geometry and roughness according to ISO 4287/88. DAkkS- or NPL-calibrated.

Sinusoidal Roughness Standard	
RoughnessTool-100	Ra = 0.1µm
RoughnessTool-500	Ra = 0.5µm
RoughnessTool-3000	Ra = 3µm



RoughnessTool – to verify roughness measurements

ArealRoughnessTool

Areal roughness standard for optical measurements traceable to NPL. With this tool, users verify the accuracy of optical roughness measurements.

Roughness standard	Sa = 0.75µm Sq = 1µm
Calibrated area	1.4 x 1.4 mm
Dimensions (W x D x H)	82 x 63 x 14 mm
Temperature range	20 °C +/- 2 °C
Humidity range	40 - 65 %
Recalibration interval	3 years
Calibration laboratory	NPL
Calibration according to	ISO 25178

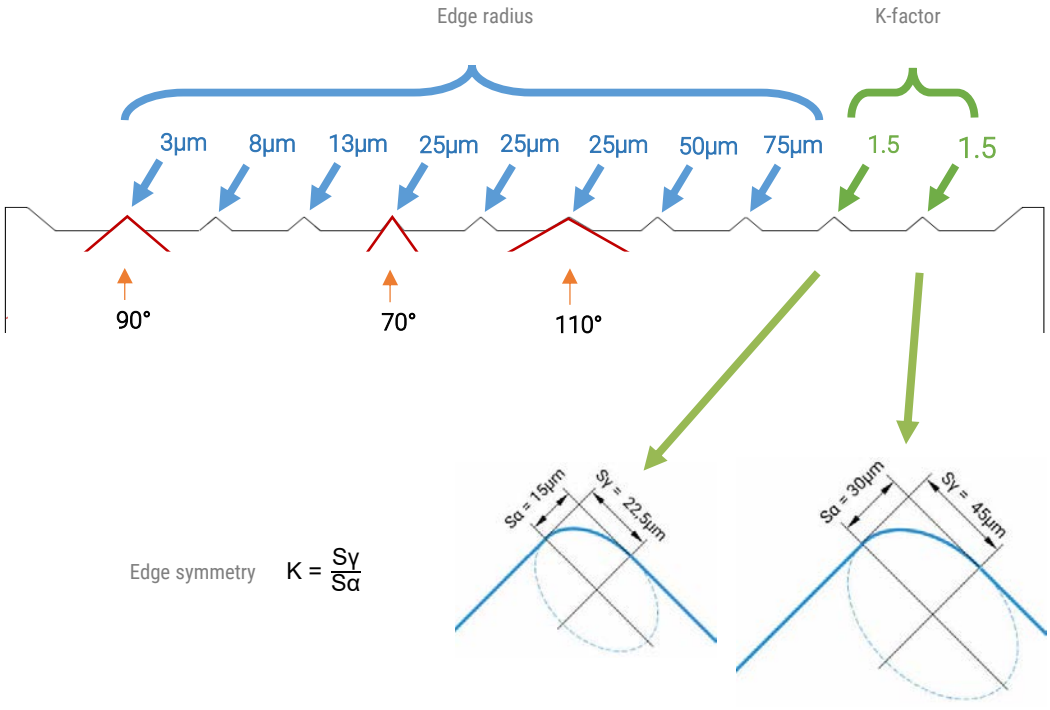
ArealRoughnessTool – verification of optical roughness measurements

EdgeCalibrationTool G2

The EdgeCalibrationTool is particularly designed for the verification of optical edge measurements. Users verify high resolution measurements performed in both research and production. Based on the technology of Focus-Variation, also complex components with steep flanks and varying material properties are traceably measured. METAS (Federal Institute of Metrology, Berne/Switzerland) calibration certificate included.

Radii	3µm, 8µm, 13µm, 25µm (3x), 50µm, 75µm
Angles	70°, 90°, 110°
Edge shape	radius, elliptical K = 1.5
Dimensions (W x D x H)	65 x 30 x 25 mm
Temperature range	20 °C +/- 2 °C
Humidity range	40 - 65 %
Recalibration interval	5 years
Certification	**Option 1:** Two edges with METAS certificate as well as factory certificate for all edges. **Option 2:** All edges with METAS certificate.

EdgeCalibrationTool – traceable verification of radius, K-factor and angle



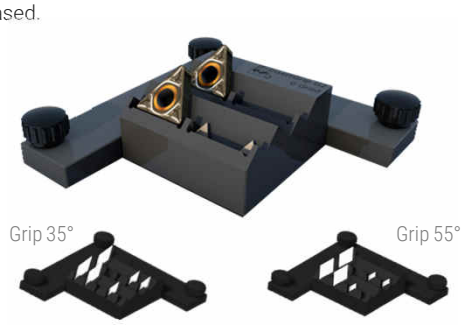
Edge symmetry $K = \frac{Sy}{Sa}$

Grips

InsertGrip G2

Predefined slots at six different angles ensure precise positioning of up to 10 inserts and enable automated single as well as MultiEdgeMeasurement of cutting edges, while at the same time supporting the automation process and reducing time and labor to a minimum. As the tools do not need to be repositioned measurement accuracy is increased.

Dimensions (W x D x H)	116 x 116 x 28 mm
Angles	0°, 35°, 55°, 60°, 80°, 90° (other angles available on request)
Both the mechanical stop and the grips have magnets.	



Measurement of multiple inserts at predefined angles without repositioning

AdvancedInsertGrip

The AdvancedInsertGrip is an adjustable sample holder for a multitude of cutting inserts. Cutting tools can be put into the same position more then once, which guarantees repeatable measurement results.

Dimensions at tilt angle 0° (W x D x H)	70 x 52.5 x 7 9mm
Tilt range	-25° to +25°
Opening angle	60° and 90°
Slope angle at 0° tilt angle	45°

ToolGrip

The ToolGrip enhances the range of measurable tool sizes and types. It enables the measurement of drills, milling cutters and other round tools with larger diameters and lengths. Tiltable from 0 up to 90°, tools can additionally be rotated inside the v-shaped socket. An adjustable axial and radial stop allows for repeatable insertion of samples. The ToolGrip is well-suited for production environments due to easy and fast sample exchange.

Dimensions (W x D x H)	103.7 x 45.5 x 151.1mm
Tilt angles	0 - 90°
Sample diameter	2 - 30 mm
Sample length	40 - 250 mm
Max. sample weight	1 kg

The ToolGrip enables repeatable measurements of complex cutting edge geometries.

RotationGrip

The RotationGrip is a clamping device with a three-jaw scroll chuck and manual tilt and rotation axis. It enables precise positioning of tools at various tilt and rotation angles.

Dimensions (W x D x H)	108 x 96 x 80 mm
Max. sample weight	1.5 kg
Max. sample length	150 mm
Aperture	11 mm
Tilt range	approx. 0 - 60°
Rotation range	0 - 360°
Clamping range	
Inner gripping range **Outer gripping range**	ø 0.5 - 16 mm ø 10 - 50 mm

NanoGrip

The NanoGrip is a sample holder with an adhesive microstructure for fixing components with a smooth contact surface. Users achieve highly repeatable measurements by fixing the sample holder with four knurled screws to the measurement system.

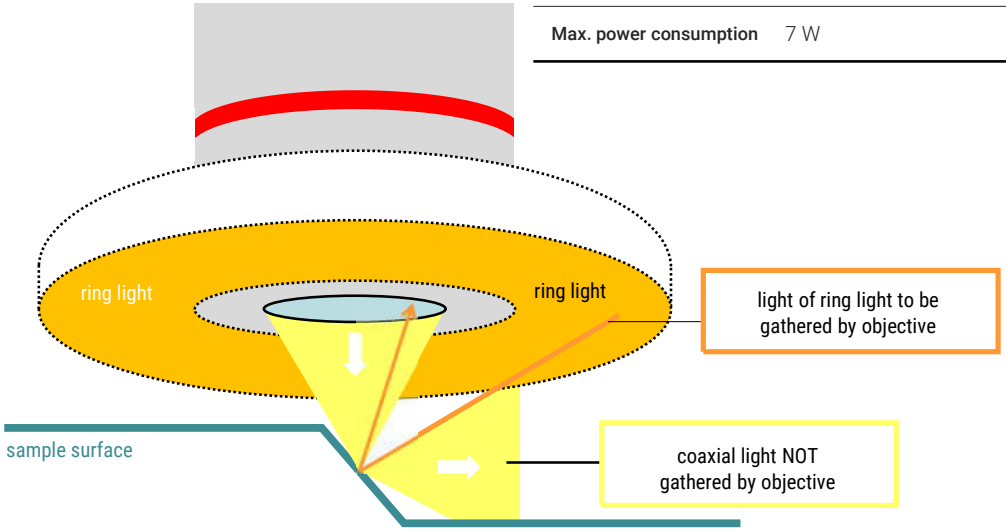
Dimensions (W x D x H)	180 x 7.5 x 150 mm
Sample area with microstructure	75.4 x 75.4 mm
Electrical resistance of the structure	$10^{2\text{-}5}\Omega$

Accessories

RingLightHP

Designed for computer-controlled use, the RingLightHP features 56 high-power LEDs to brightly illuminate reflective surfaces, reduce shadows, detect edges and highlight surface roughness. Due to the LEDs' alignment in two concentric rings, the RingLightHP is ideal for measuring samples that have to be uniformly illuminated. At the same time the 24 independently controllable LED segments with adjustable dimming enable focusing on specific areas of the sample. The innovative magnetic snap-on system ensures easy and secure attaching to the objective. The spring connectors allow cable-less power supply and controlling with Alicona software.

Dimensions (W x D x H)	88 x 30 x 71.6 mm
Weight	160 g
Light source	56 white LEDs
Cooling	3 miniature fans
Operating type	S1 (continuous operation)
Supply voltage	7.5-12 VDC
Max. power consumption	7 W



45DegreeMirror

Optical 45° mirror to enhance and facilitate the measurement of complex forms such as undercuts and/or negative flanks as well as inside measurements. Its reflective surface ensures ideal sample illumination.

Due to weak illumination, the measurement of negative flanks and undercuts usually poses a problem. With this product the light is redirected to hit the steep flank. Thus, the flank is adequately illuminated and can be measured.

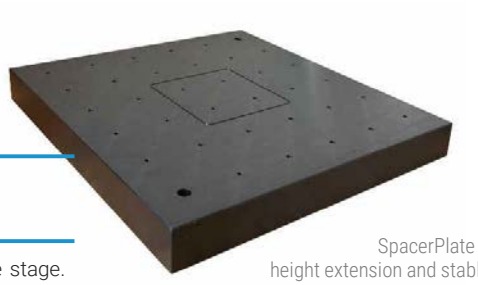
Length of the hypotenuse	28.30 mm
Length of the cathetus	20 mm
Surface accuracy	λ/8
Coating	enhanced aluminium

Even difficult samples can be easily measured with the 45DegreeMirror.

SpacerPlate

The SpacerPlate is an accessory for extending the height of the stage. Especially for roughness measurement a stable positioning can be ensured. It is available in two different heights:

» 17.5 mm (weight: ~1.8 kg) and 35 mm (weight: ~2.5 kg).

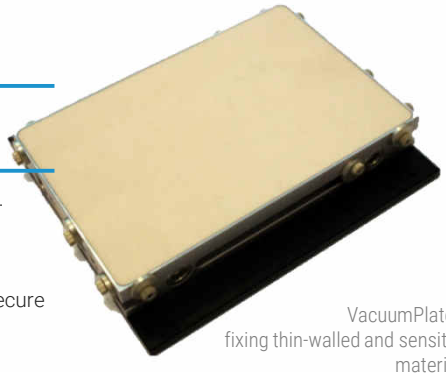


SpacerPlate –
height extension and stable positioning

VacuumPlate

The VacuumPlate is used for fixing samples on the InfiniteFocus G6. Especially thin-walled and sensitive materials, e. g. sheets, paper or rubber can be easily fixed. The plate consists of a porous base plate which distributes the vacuum evenly on the surface. Lateral stops secure samples in a certain position.

» Dimension of the surface area:
38 mm x 200 mm x 300 mm (weight: 8.7 kg).



VacuumPlate –
fixing thin-walled and sensitive materials

RotationTable

The RotationTable is used for aligning components along the X or Y axis of the system. It is ideal for the measurement of horizontal or vertical grooves.

» Dimensions: 310 mm x 310 mm x 14.5 mm (weight: ~3 kg).

» Max. sample weight: 32 kg (heavy samples must be positioned in the center of the RotationTable).

RotationTable –
easy alignment of hardware components

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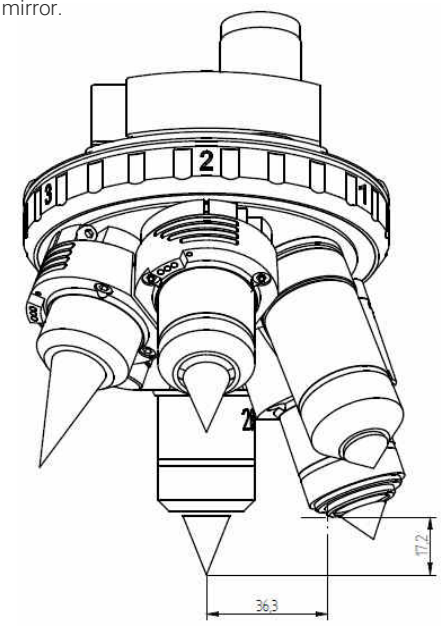
Long Working Distance Objectives

Easily access complex geometries

The objectives of this series are specifically designed for the measurement of complex geometries such as turbine blades and gears as well as samples with deep holes and bores. Due to their extended working distance, they are also highly suitable for customized measurements requiring a mirror.

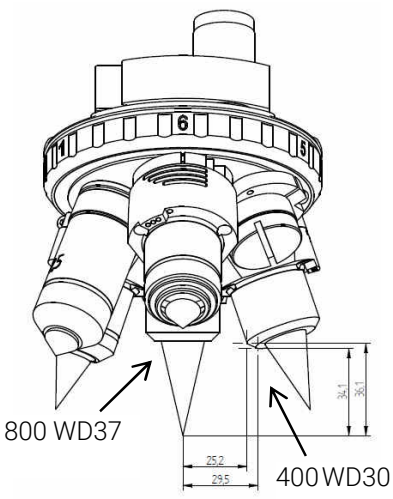
BENEFITS

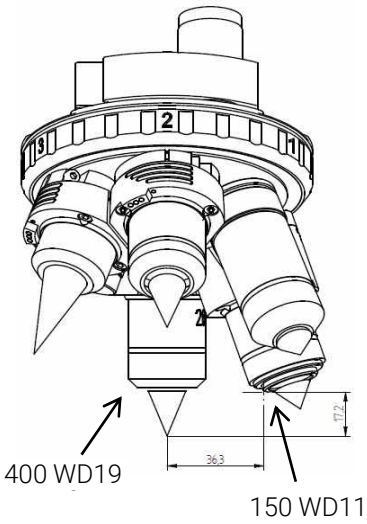
- Longer working distance than standard series
- Suitable for samples with hard-to-access measurement positions
- Enable the measurement of complex geometries
- Facilitate customized measurements requiring a mirror
- Easy handling

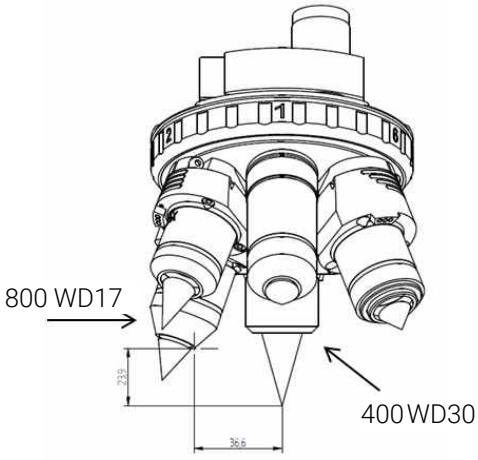


Configurations with long WD objectives

Depending on the objective configuration which is customized for your application, the use of long working distance objectives may limit the number of objectives and working distance of adjacent objectives. The figures below show some examples of possible configurations, showing the limitations of the working distance of standard objectives caused by their adjacent long working distance objectives.

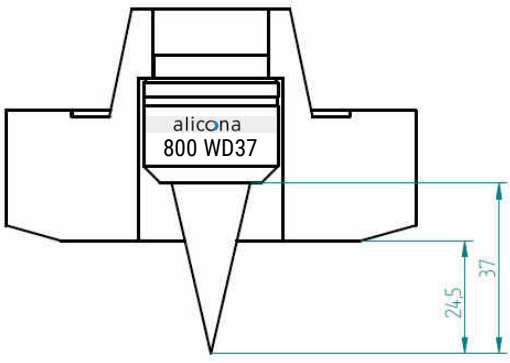




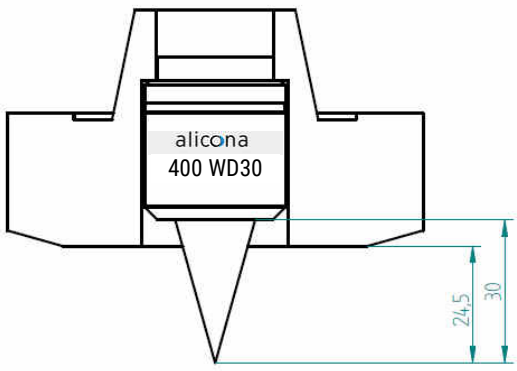


Ring light usage

The white high-power LED ring light with its 24 independently controllable segments enables the measurement of nearly any surface, including highly-reflective surfaces and steep flanks. However, the working distance of the long WD objectives is limited when used with the ring light.



Working distance of
800 WD37 with ring light



Working distance of
400 WD30 with ring light

Technical Specifications

The following specifications conform to the guidelines of the Initiative Fair Datasheet. Specifications in blue mark Alicona specific values.

INITIATIVE FAIR DATASHEET

The “Fair Datasheet” considers itself a quality label to encourage manufacturers of measurement instruments to provide practice-oriented and comparable specifications. The initiative is supported by various manufacturers of measurement instruments, users such as Audi, Bosch and Daimler as well as by the Kaiserslautern University of Technology, with PTB, ZVEI and VDI considerably contributing to its operation.

Initiative Fair Data Sheet

Specifications in blue mark Alicona specific values.

Technical Specifications

GENERAL SPECIFICATIONS

Measurement principle	Non-contact, optical, three-dimensional Technologies: • Advanced Focus-Variation (Smart Flash 2.0) • Vertical Focus Probing • Real3D
Number of measurement points	Single measurement: X: 2160, Y: 2160, X x Y: 4.6 million ImageField: up to 500 million
Positioning volume (X x Y x Z)	200 mm x 200 mm x 180 mm = 7 200 000 mm^3
Positioning volume (R x T)	AdvancedReal3DUnit (optional): Motorized rotation: 360° / Motorized tilt: - 15° to + 90°
Maintenance	Yearly service and recalibration recommended
Coaxial illumination	LED coaxial illumination (color), high-power, electronically controllable
Ring light illumination (optional)	White LED high-power ring light, 24 segments, wireless, snap-on system
System monitoring	Automatic self-diagnosis due to temperature sensors, internal current and voltage monitoring
ControlServerSF	6 Core, 32 GB DDR4, SSD 512GB, Windows 10 IoT Enterprise 64bit, 2x 27" Full HD LED Monitor
IP code	IP20
Noise emission	≤ 70 dB(A) during normal operation

DIMENSIONS AND ENVIRONMENTAL CONDITIONS

Dimensions (W x D x H)	Measurement instrument: 910 mm x 690 mm x 1100 mm; ControlServerSF: 180 mm x 440 mm x 500 mm
Mass	Measurement instrument only: 160 kg; ControlServerSF: <20 kg; AdvancedReal3DUnit <20kg
Ambient temperature range	Measurement instrument: possible: 19° C - 28° C; calibrated for: 20° C - 24° C (can be calibrated for other temperature ranges); ControlServerSF: possible: 0° C - 30° C
Permissible temperature gradient	Less than 1° C/h
Permissible relative humidity	Recommended: 45 % (+/-5 %); possible: 45 % (+/-15 %)
Supply voltage and current electric power	1000 W; 100 - 240 VAC; 50 - 60 Hz

MEASUREMENT OBJECT

Surface texture	Any surface, including polished metals
Max. height	Up to 315 mm; more on request
Max. weight	Up to 30 kg; more on request; 5-axes max. sample weight: 4 kg
Max. measurable slope angle	Advanced Focus-Variation: 87° / Vertical Focus Probing: > 90°
Preparation	none

OBJECTIVE SPECIFIC FEATURES

Objective name (1)		***3000 WD8***	***1900 WD30***	***800 WD37 (2)***	***800 WD17***	***400 WD30 (2)***	***400 WD19***	***150 WD11***	***80 WD4***
Working distance	mm	8.8	30	37	17.5	30	19	11	4.5
Lateral measurement range (X,Y)	mm	5.3	3.8	1.6	1.6	0.8	0.8	0.3	0.16
Measurement point distance	µm	2.88	1.77	0.72	0.72	0.36	0.36	0.14	0.07
Measurement noise	nm	800	80	40	15	20	5	2	1
Vertical resolution	nm	2300	250	130	50	80	30	15	10

(1) Objectives with longer working distance available upon request.

(2) Objective available in special objective configuration.

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RESOLUTION AND APPLICATION SPECIFICATIONS

Objective name		*3000 WD8*	*1900 WD30*	*800 WD37 (2)*	*800 WD17*	*400 WD30 (2)*	*400 WD19*	*150 WD11*	*80 WD4*
Min. measurable roughness (Ra)	µm	n.a.	n.a.	0.7	0.18	0.24	0.12	0.05	0.03
Min. measurable roughness (Sa)	µm	n.a.	n.a.	0.35	0.09	0.12	0.06	0.025	0.015
Min. measurable radius	µm	20	12	5	5	3	3	2	1

ACCURACY (3)

Flatness deviation	1.5 mm x 1.5 mm with 800 WD17 objective	U = 0.1 µm
Max. deviation of a height step measurement	Height step 10000 µm Height step 1000 µm Height step 100 µm Height step 10 µm Height step 1 µm	$E_{UniZ:\ St:\ ODS,\ MPE}$ = 0.8 µm, σ = 0.4 µm $E_{UniZ:\ St:\ ODS,\ MPE}$ = 0.5 µm, σ = 0.1 µm $E_{UniZ:\ St:\ ODS,\ MPE}$ = 0.4 µm, σ = 0.05 µm $E_{UniZ:\ St:\ ODS,\ MPE}$ = 0.3 µm, σ = 0.025 µm $E_{UniZ:\ St:\ ODS,\ MPE}$ = 0.15 µm, σ = 0.01 µm
Profile roughness	Ra = 0.1 µm Ra = 0.5 µm	U = 0.025 µm, σ = 0.002 µm U = 0.04 µm, σ = 0.002 µm
Area roughness	Sa = 0.1 µm Sa = 0.5 µm	U = 0.02 µm, σ = 0.002 µm U = 0.03 µm, σ = 0.002 µm
Distance measurement	XY up to 1 mm XY up to 10 mm XY up to 20 mm MultiMeasurement XY	$E_{UniXY:\ Tr:\ ODS,\ MPE}$ = 0.7 µm $E_{UniXY:\ Tr:\ ODS,\ MPE}$ = 1.0 µm $E_{UniXY:\ Tr:\ ODS,\ MPE}$ = 2.0 µm $E_{UniXY:\ Tr:\ ODS,\ MPE}$ = 3.2 µm + L/100 (4)
Wedge angle	β = 70 ° - 110 °	U = 0.15° , σ = 0.02°
Edge radius	R = 5 µm - 20 µm R > 20 µm	U = 1.5 µm, σ = 0.15 µm U = 2 µm, σ = 0.3 µm

(3) E_{Uni} and E_{Bi} based on ISO 10360-8.

(4) Measurement at reference temperature of 22°C +/- 0.5K and with reference weight of 15kg +/- 5kg.

Technical Specifications AdvancedReal3DUnit G3

Rotation axis (B-axis)	360° rotation; motorized
Tilt axis (A-axis)	-15° to +90°; motorized
Accuracy rotation axis (B)	+/- 0.2 Arc sec/° (max.10 Arc sec)
Accuracy tilt axis (A)	+/- 0.04 Arc sec/° (max. 20 Arc sec)
Resolution rotation axis (B)	0.1 Arc sec
Resolution tilt axis (A)	0.02 Arc sec
Max. speed rotation axis (B)	> 30°/sec
Max. speed tilt axis (A)	> 10°/sec
Dimensions (W x D x H)	327 mm x 318 mm x 207 mm
Weight	< 20 kg
Clamping system variants*	AdvancedReal3DUnit with three-jaw lever scroll chuck; AdvancedReal3DUnit 3R** with 3R-SP26771 MacroHP; AdvancedReal3DUnitEROWA** with EROWA ITS Chuck 100P

**Other clamping systems available upon request.*
***These systems require a compressed air pressure of 6 - 10 bar.*

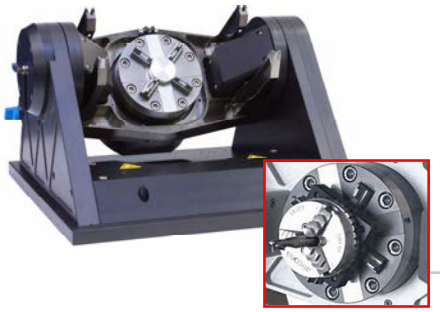
AdvancedReal3DUnit	
Max. sample weight	4 kg
Max. sample diameter	100 mm
CLAMPING RANGE	
Outer clamping range	ø 2 mm to 71 mm
Inner clamping range	ø 22 mm to 69 mm
Clear aperture	ø 23.5 mm

AdvancedReal3DUnit with three-jaw lever scroll chuck

AdvancedReal3DUnit 3R	
Max. sample weight	4 kg
Max. sample diameter	100 mm
Clamping repeatability	2µm

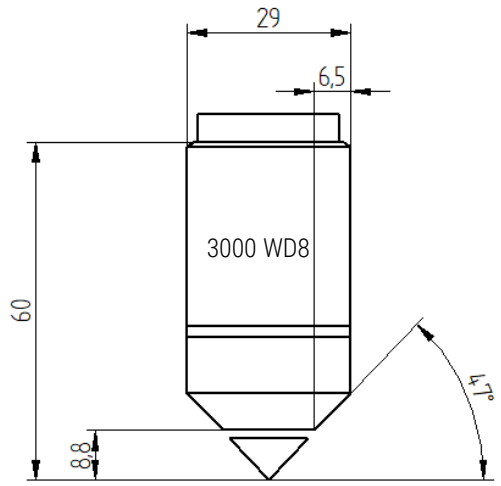
AdvancedReal3DUnit with 3R pallet system

AdvancedReal3DUnit EROWA	
Max. sample weight	4 kg
Max. sample diameter	100 mm
Clamping repeatability	2µm

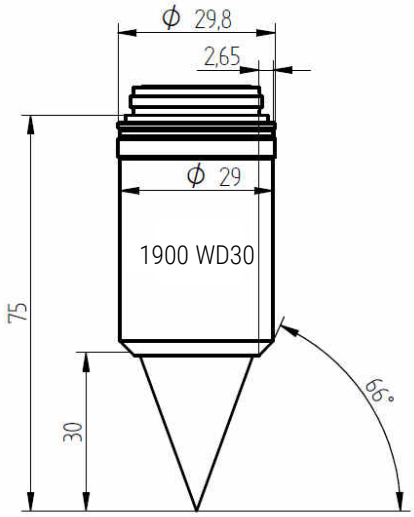


AdvancedReal3DUnit with EROWA pallet system

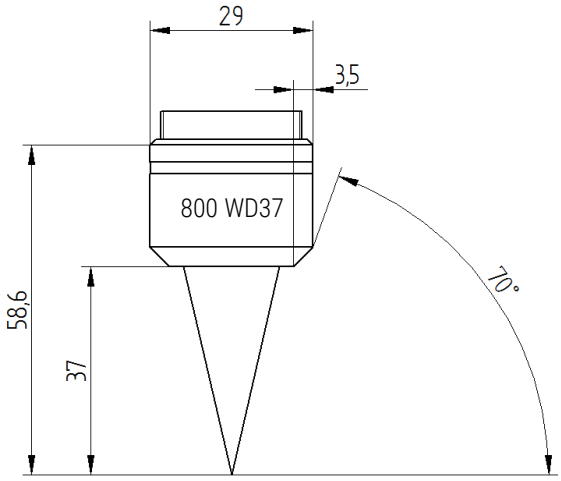
Objectives: Accessibility and Dimensions



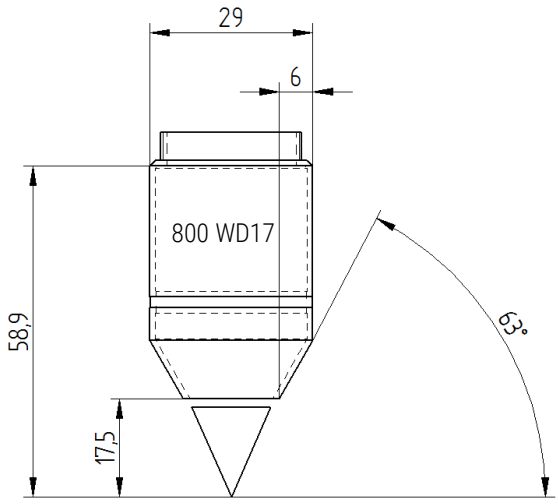
Objective 3000 WD8, accessibility: 47°



Objective 1900 WD30, accessibility: 66°

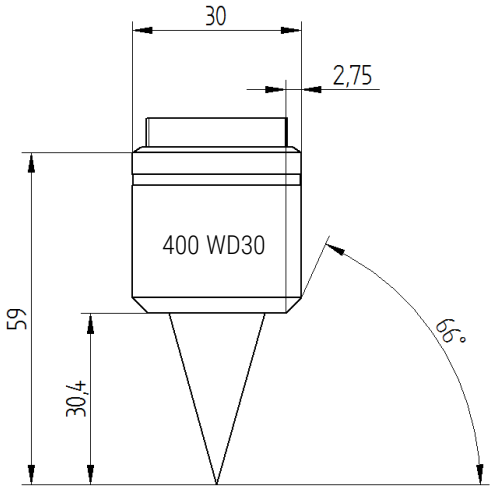


Objective 800 WD37, accessibility: 70°

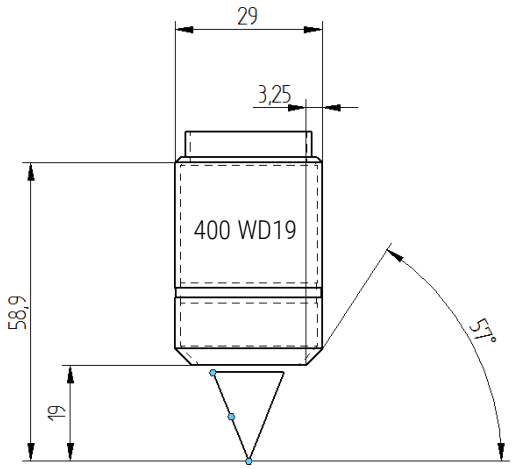


Objective 800 WD17, accessibility: 63°

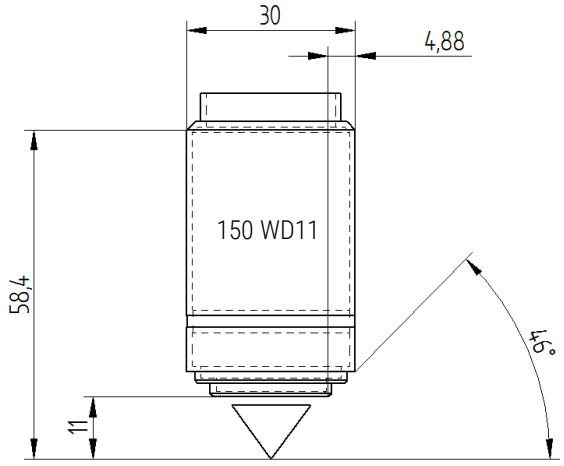
Objectives: Accessibility and Dimensions



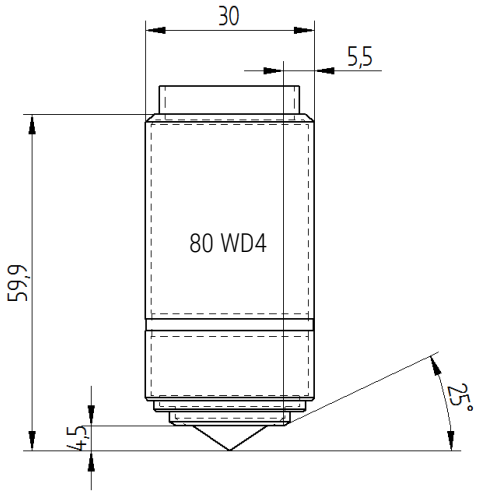
Objective 400 WD30, accessibility: 66°



Objective 400 WD19, accessibility: 57°

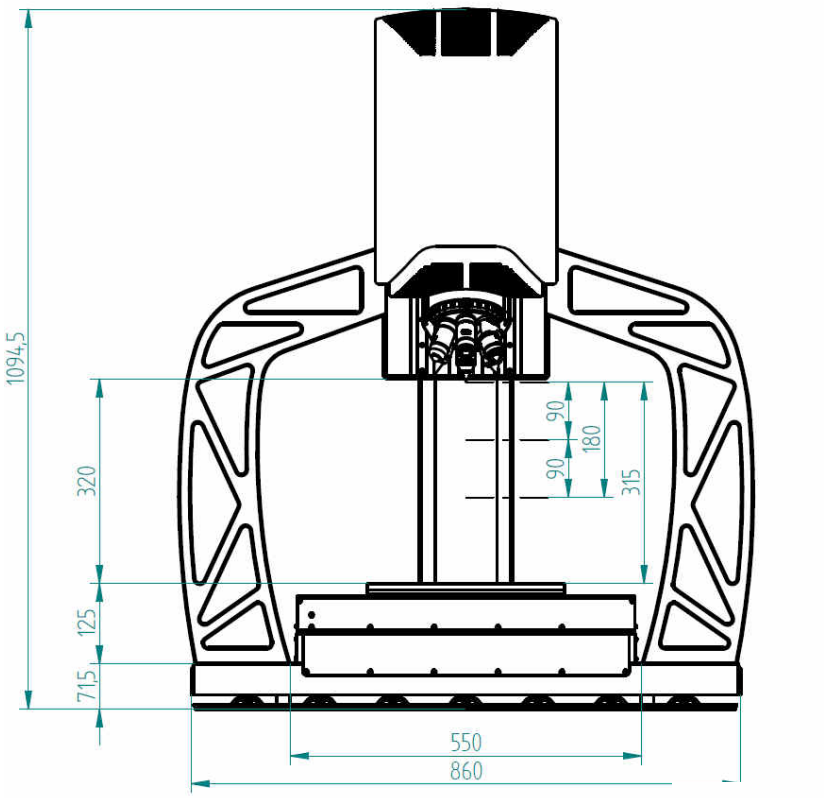


Objective 150 WD11, accessibility: 46°

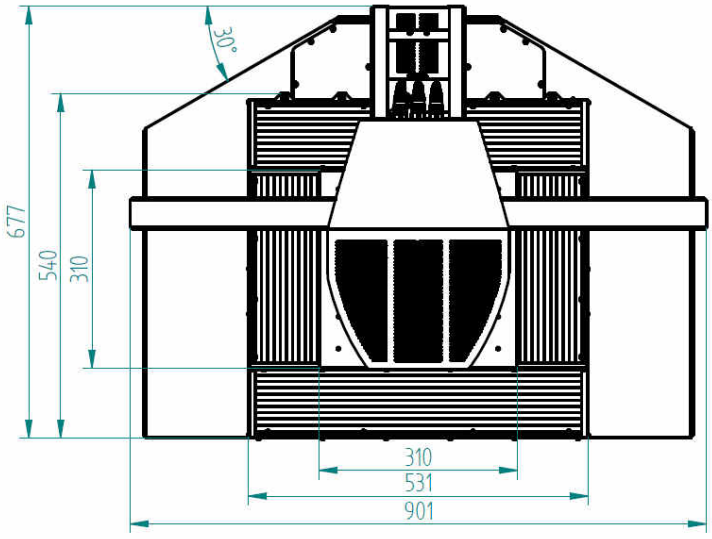


Objective 80 WD4, accessibility: 25°

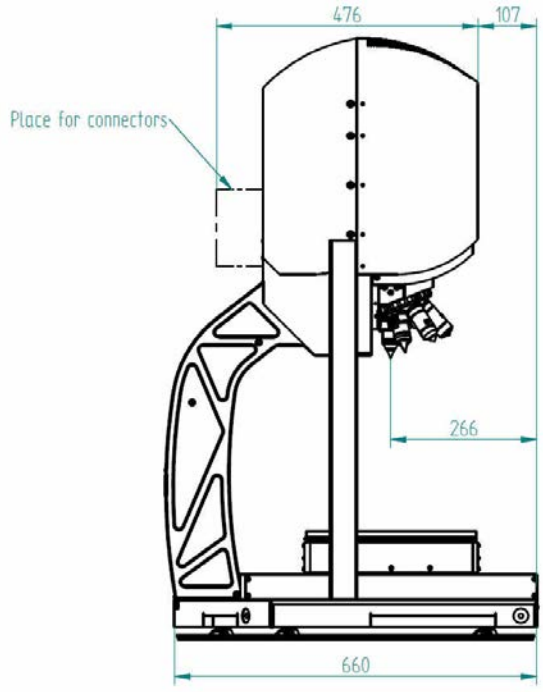
Technical Drawings



Front view



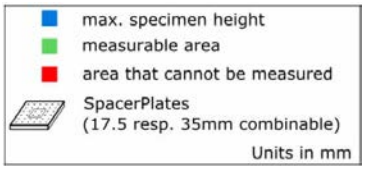
Top view

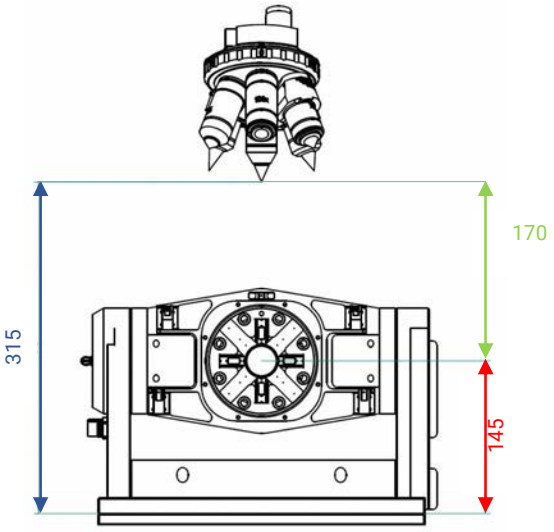


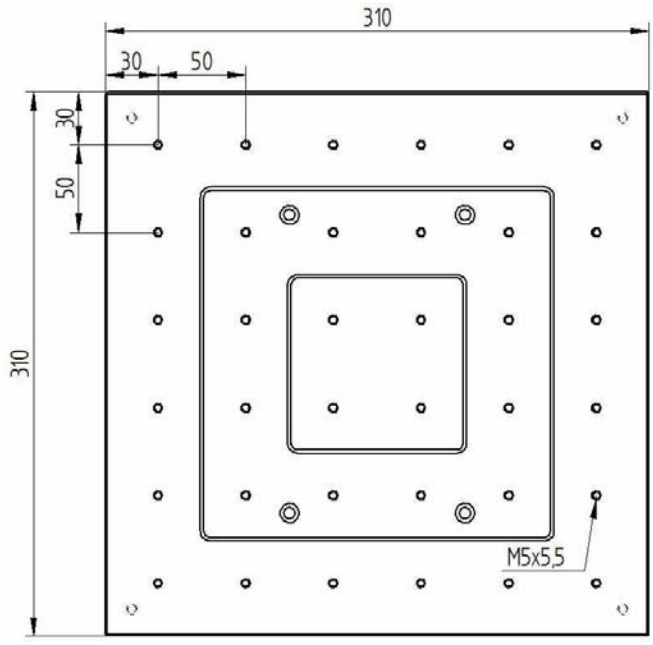
Side view

Technical Drawings

The **system height** indicates the distance between the table top of the X/Y-stage and the focus point of the objective when the Z-axis is in its highest position.



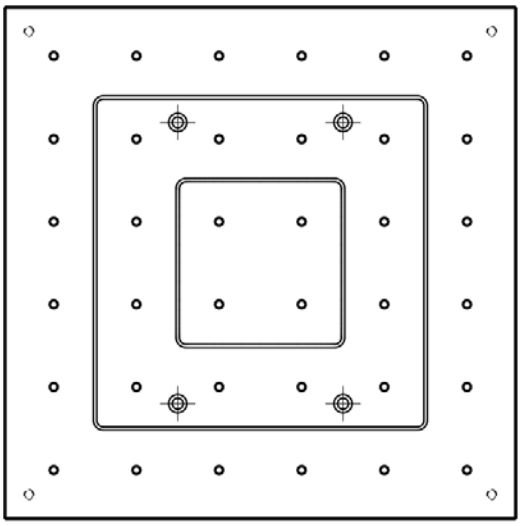




X/Y-stage
Mounting screws: M5 x 5, knurled

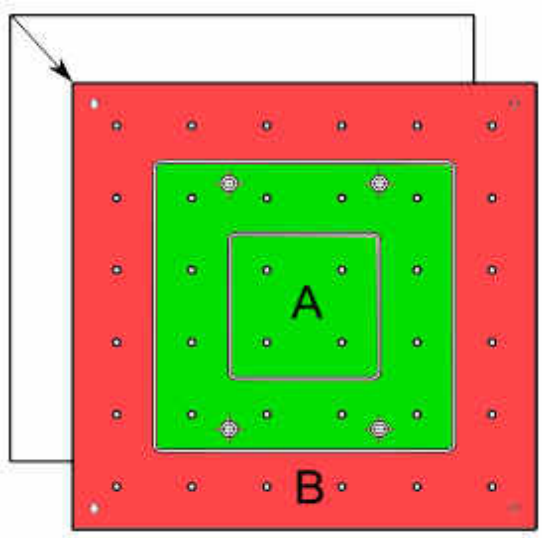
Maximum sample weight

Alternative 1: Stage in middle position



When the X/Y-stage is in the middle position, it is possible to place a sample with a max. weight of **30kg** at any position on the stage top.

Alternative 2: Stage at outside corner

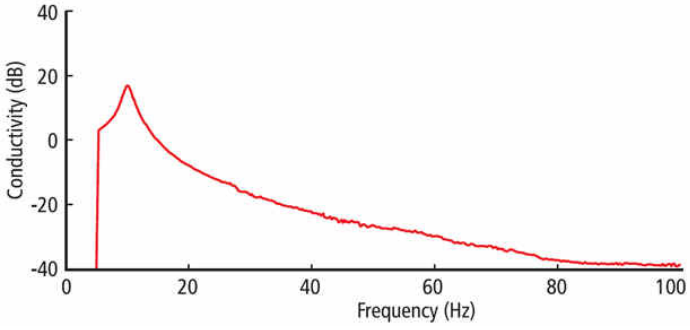


Weight limits	
Area A	30kg
Border B	24kg

In order to avoid damage to the stage, pay attention to the following instructions if the sample weighs more than **24kg**:

- The sample's center of gravity needs to be positioned inside area A.
- Do not position the sample's center of gravity outside area A.
- Border B refers to the area 55mm off the stage's outer edge.

Passive vibration absorption system



Damping characteristics of the integrated vibration absorption system.

Included and Optional Components/Features

Components	
InfiniteFocus G6	
Advanced Focus-Variation	✓
Vertical Focus Probing	✓
Real3D	optional
ControlServerSF	✓
Joystick	✓
EmergencyStop	✓
CableSet	✓
2x Monitors	✓
Keyboard	✓
Mouse	✓
Dongle	✓
Objectives	
3000 WD8	optional
1900 WD30	optional
800 WD17	✓
800 WD37	optional
400 WD19	optional
400 WD30	optional
150 WD11	optional
80 WD4	optional

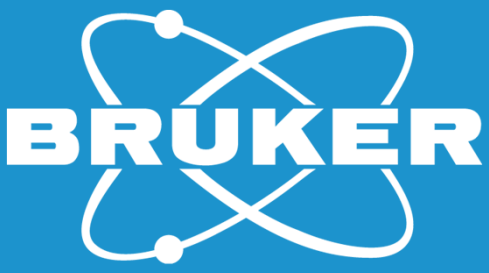
Software Products	
LaboratoryMeasurementModule	
SingleField	✓
ImageField	✓
Automation	✓
RemotingInterface	optional
Color Functionality	optional
MetMaX (incl. Alicona Inspect and standard measurement modules)	
ProfileFormMeasurement	✓
ProfileRoughnessMeasurement	✓
SurfaceTextureMeasurement	✓
VolumeMeasurement	✓
2DImageMeasurement	✓
Offline MetMaX (incl. Alicona Inspect and standard measurement modules, see above)	optional

Software Products	
Real3DMeasurement (incl. ContourMeasurement, 3DFormMeasurement and DifferenceMeasurement)	optional
ContourMeasurement	optional
3DFormMeasurement	optional
DifferenceMeasurement	optional
Real3DFusion	optional
Micro Gear Measurement	optional
Micro Gear Measurement Professional	optional
Micro Gear Measurement Test License	optional
ServiceSoftware	✓
Edge Measurement Package	optional
Offline Edge Measurement Package	optional
Order Management Module	optional
IT Interface	optional
Alicona Inspect Professional	optional
Wear Measurement Module	optional
Automation Package (incl. AutomationManager and MetMaX Automation)	optional
Automatic Defect Measurement	optional
Grinding Grain Analysis	optional
Laser Treatment Analysis	optional
Burr Measurement	optional
Cam Inspection	optional
Valve Inspection	optional
Pick&Place	optional

Included and Optional Components/Features

Calibration Standards	
CalibrationTool	optional
EdgeCalibrationTool	
2 edges with certificate	optional
all edges with certificate	optional
ArealRoughnessTool	optional
RoughnessTool	
RoughnessTool-100	optional
RoughnessTool-500	optional
RoughnessTool-3000	optional
VerificationTool	optional
AdvancedCalibrationPin AdvancedCalibrationPin3R AdvancedCalibrationPinEROWA	*applicable version delivered with AdvancedReal3DUnit*
Grips	
AdvancedReal3DUnit (incl. AdvancedCalibrationPin and AdvancedReal3D Specimen Table)	optional
AdvancedReal3DUnit 3R (incl. AdvancedCalibrationPin3R and AdvancedReal3D Specimen Table)	optional
AdvancedReal3DUnit EROWA (incl. AdvancedCalibrationPinEROWA and AdvancedReal3D Specimen Table)	optional
AdvancedReal3DUnit Pneumatic (incl. AdvancedCalibrationPin and AdvancedReal3D Specimen Table)	optional
InsertGrip	optional
AdvancedInsertGrip	optional
ToolGrip	optional
RotationGrip	optional
NanoGrip	optional
ChuckAdapter ChuckAdapter3R ChuckAdapterEROWA	optional

Accessories	
AdvancedReal3D Specimen Table	optional *(delivered with AdvancedReal3DUnit)*
RinglightHP	optional
Reflecting Block	✓
45DegreeMirror	optional
SpacerPlate	
SpacerPlate-17	optional
SpacerPlate-35	optional
Robust system tables	
TableRight	optional
TableLeft	optional
RotationTable	optional
VacuumTable	optional
Extended Hardware Guarantee	optional



For more information
please get in contact with us:
+43 316 403010 700
or sales.alicona@bruker.com

Alicona Imaging GmbH
Dr.-Auner-Strasse 19
8074 Raaba/Graz, Austria

www.alicona.com