Bruker alicona

µCMM

Product Information
Document Version 3.0 // November 2024

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Document Version 3.0 //

µCMM

High accuracy over entire measurement volume

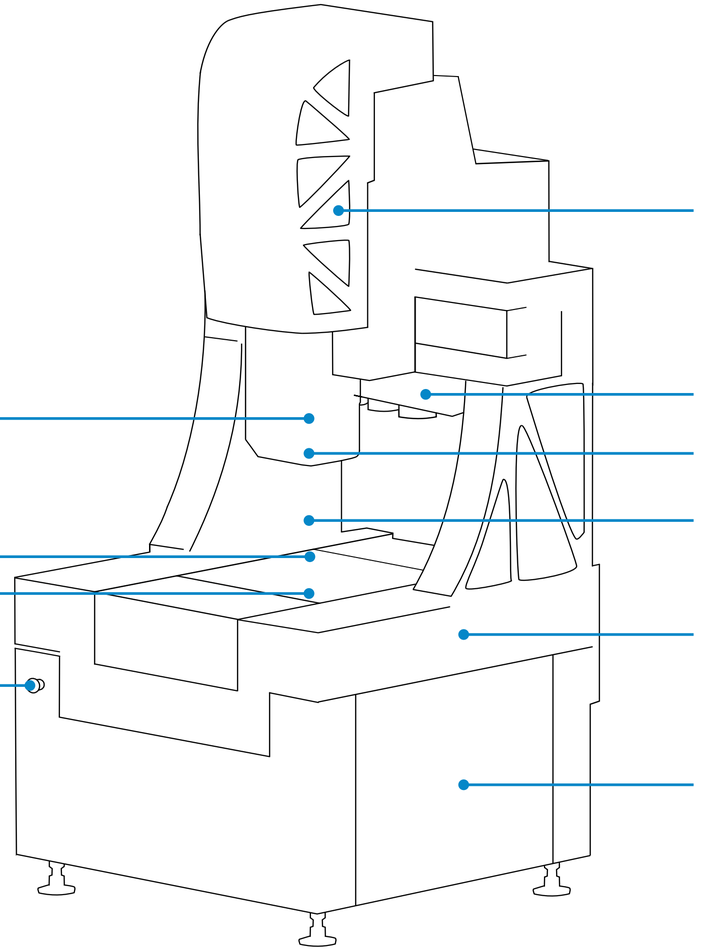
Wear-free, robust, suitable for production

Dimension, position, shape and roughness in one system

Matte to highly polished components

µCMM

System Components



Scales made of Invar with a resolution of 2nm

Automatic objective changer rack

Automatic objective changer

Optional extension to 5 axes

Focus-Variation optics with Advanced Focus-Variation

Air bearing with abrasion-free drive

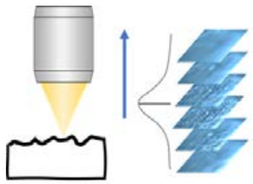
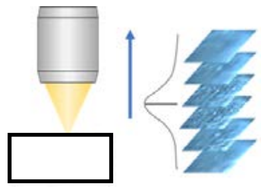
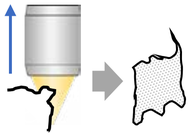
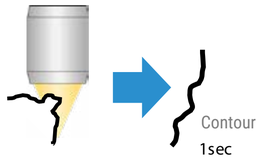
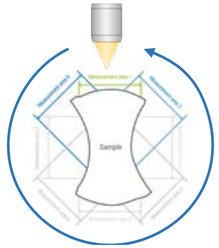
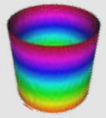
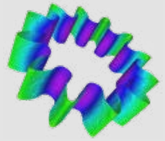
Active component temperature compensation

Solid granite construction

Comprehensive security system

Compact design with integrated, thermally decoupled control system

The Bruker Alicona
Technologies

	Focus-Variation	Adv. Focus-Variation	Vertical Focus Probing	Focus Probing	Real3D
					
Principle					
Strengths	+ Form + Roughness > 100nm 	+ All of Focus-Variation + Smooth surfaces  Ra certified nominal 22.4 nm U = 2.4 nm µCMM 28.0 nm U = 8 nm	+ Vertical walls ≥ 90° + Inner geometries & micro holes + Distance measurement  VFP of hole, 800 WD17 objective, diameter 300µm	+ Fast geometry measurement 	+ 360° measurements + Form + Complex micro-geometries  Real3D microgear measurement
Limitations	- Smooth surfaces roughness <100nm - Vertical walls ≥ 87° - Transparent surfaces	- Vertical walls ≥ 87° - Lenses	- Roughness	- Roughness	- Slower than Vertical Focus Probing - Less accurate than Vertical Focus Probing

Technical Specifications

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

Initiative Fair Data Sheet

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.

General Specifications

Measurement principle	non-contact, optical, three-dimensional Technologies: Advanced Focus-Variation (with Smart Flash 2.0), Focus Probing, Vertical Focus Probing and Real3D
Number of measurement points	single measurement: X: 1720, Y: 1720, X x Y: 2.95 million multi measurement: up to 500 million
Positioning volume (X x Y x Z)	310mm x 310mm x 310mm = 29,791,000mm³
Compressed air (*)	maintenance-free with compressed air according to specification, 7 bar consumption: 80 Nl/min (continuous)
Travel speed of axes	up to 100mm/s
Coaxial illumination	LED coaxial illumination (color), high-power, electronically controllable
3D data	monochrome; optional color data available
Objective changer	automatic pneumatic four-place objective changer rack
System monitoring	9 temperature sensors (accuracy: ± 0.1 K), internal current and voltage monitoring, incl. long-term logging, retrievable
ControlServerSF	12 Core, 32 GB DDR5, SSD 1TB, Windows 10 IoT Enterprise 64bit, 2x 27" Full HD monitor
IP code	IP20
Noise emission	≤ 70 dB(A) during normal operation

Measurement Object

Surface texture	Any surface, including polished metals
Max. mass	Up to 30 kg; more on request; 5-axes max. sample weight: 4 kg
Max. dimensions	width: 680 mm height: 375mm
Sample preparation	none

Dimensions and Environmental Conditions

Dimensions (W x D x H)	measurement instrument: 960 x 1109 x 1958 mm (up to 2288mm); ControlServerSF: 180 x 440 x 500 mm	
Mass	measurement instrument: 1250 kg (incl. steel stand); ControlServerSF: <20 kg	
Temperature requirements	setpoint temperature range: extended setpoint temperature range (on request): ControlServerSF (possible):	20 - 25 °C 19 - 29 °C 0 - 30 °C
Ambient temperature range A (high-precision measurement,VDI 2627 class 2)	permissible limit deviation of setpoint temperature: temperature change rate: permissible linear temperature difference: fluctuation range of relative humidity:	+/- 0.8 K 0.8 K/d 0.4 K/h 0.3 K/m +/- 5%
Ambient temperature range B (VDI 2627 class 3)	permissible limit deviation of setpoint temperature: temperature change rate: permissible linear temperature difference: fluctuation range of relative humidity:	+/- 2 K 2 K/d 1 K/h 0.5 K/m +/- 10%
Ambient temperature range C (reduced accuracy, VDI 2627 class 4) *(larger range possible on request)*	permissible limit deviation of setpoint temperature: temperature change rate: permissible linear temperature difference: fluctuation range of relative humidity:	+/- 3 K 3 K/d 2 K/h 1 K/m +/- 15%
Permissible relative humidity	general limits	30% - 60%
Vibrations	recommended: < 50µg (RMS values of spectrum between 3 and 100 Hz)	
Supply voltage, frequency	100 – 240 VAC; 50 - 60 Hz	
Power consumption (total)	regular operation 250-350 W, peak demand 1000 W	

(*) ISO 8573

solid particles	max. number of particles per m³	< 10,000; < 5 µm	class 4
water	max. pressure dew point	+ 3 °C	class 4
oil	max. total oil content	5 mg/m³	class 4

Objective Specific Features

Objective		1900 WD30	1500 WD130	1500 WD70	800 WD17	800 WD37	400 WD19	150 WD11	80 WD4 (3)
Numerical Aperture		0.12	0.14	0.14	0.3	0.2	0.4	0.6	0.8
Working distance	mm	30	130	69.4	17.5	37	19	11	4.5
Lateral measurement range (X,Y)	mm	3.23	2.63	2.63	1.32	1.32	0.66	0.26	0.13
Lateral measurement range (X x Y)	mm²	10.43	6.91	6.91	1.71	1.71	0.43	0.06	0.02
Measurement point distance	µm	1.88	1.53	1.53	0.76	0.76	0.38	0.15	0.08
Calculated lateral optical limiting resolution	µm	2.68	2.28	2.14	1.07	1.6	0.80	0.53	0.41
Finest lateral topographic resolution	µm	3.8	3.1	3.3	1.5	1.6	0.8	0.6	0.41
Measurement noise (1)	nm	30	180	100	4	25	2	1	1
Vertical resolution (2)	nm	85	510	500	30	71	20	10	10
Vertical measurement range	mm	29	125	65	16.5	36	18	10	4
Vertical scanning speed	µm/s	3000	3000	3000	1000-3000	1000-3000	500-3000	200-2000	
Measurement speed	≤ 1.7 million measurement points/sec.								
Accessibility (angle)	°	70	78	78	65	72	58	46	26

(1) Measurement noise N_M: Evaluation conforming to ISO 25178-700:2022 and Fair Datasheet V1.2
(2) Vertical Resolution: Defined in ‚Optical Measurement of Surface Topography' (ISBN 978-3-642-12012-1) and the Fair Datasheet V1.2 as √8 (square root of 8) x measurement noise. However, the vertical resolution values of Bruker Alicona are much more conservative.
(3) The recommended vibration limit, defined in section „Dimensions and Environmental Conditions", is the required limit for this objective

Resolution and Application Specification

Objective		1900 WD30	1500 WD130	1500 WD70	800 WD17	800 WD37	400 WD19	150 WD11	80 WD4 (3)
Min. measurable height	µm	0.1	0.51	0.5	0.03	0.07	0.02	0.01	0.01
Max. measurable height	mm	29	125	65	16.5	36	18	10	4
Min. measurable roughness (Ra)	µm	n.a.	n.a.	n.a.	0.1	0.06	0.06	0.03	0.03
Min. measurable roughness (Sa)	µm	n.a.	n.a.	n.a.	0.05	0.3	0.03	0.02	0.02
Min. measurable radius	µm	12	10	10	5	5	3	2	1
Min. measurable wedge angle	°	20							
Max. measurable slope angle, standard measurement	°	87							
Max. measurable slope angle, Vertical Focus Probing	°	>90 (depending on application)							

Measurement Parameters

Flatness deviation	1.3mm x 1.3mm with 800 WD17	U = 0.1µm
Profile roughness	Ra = 0.1µm Ra = 0.5µm	U = 0.012µm, σ = 0.001µm U = 0.02µm, σ = 0.001µm
Areal roughness	Sa = 0.1µm Sa = 0.5µm	U = 0.01µm, σ = 0.001µm U = 0.015µm, σ = 0.001µm
Wedge angle	β = 70° - 110°	U = 0.075° , σ = 0.01°
Edge radius	R = 5µm - 20µm R > 20µm	U = 1.5µm, σ = 0.15µm U = 2µm, σ = 0.3µm

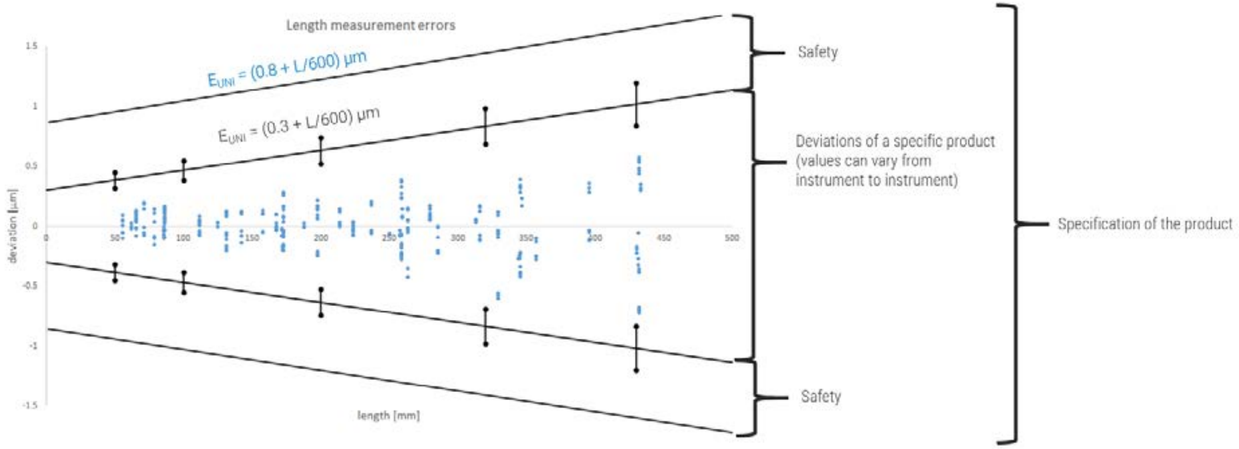
3D Accuracy 10360-8 (*)

Ambient temperature range A (VDI 2627 class 2)	$E_{Uni:Tr:ODS,MPE}$ = (0.8 + L/600) µm (L in mm) (**) $E_{UniZ:St:ODS,MPE}$ = (0.15 + L/50) µm (L in mm) (***)
Ambient temperature range B (VDI 2627 class 3)	$E_{Uni:Tr:ODS,MPE}$ = (0.8 + L/200) µm (L in mm) (**)
Ambient temperature range C (VDI 2627 class 4)	$E_{Uni:Tr:ODS,MPE}$ = (0.8 + L/100) µm (L in mm) (**)

(*) The values given are based on ISO 10360-8 and VDI 2617 sheet 12.2.
(**) Accuracy of axes based on ISO 10360-8, appendix B.4.3.4.
(***) Valid for single measurements, height step measurement.

Appendix: Accuracy

µCMM ACCURACY OF AXES: $E_{Uni:Tr:ODS,MPE}$



- Each point represents a distance measurement of a specific length
- 5 lengths, 3 times, 7 directions, according to ISO 10360-8
- Test uncertainty according to ISO 23165: U(k=2) = 0.05µm + 0.3 µm/m (laser interferometer)

Relation between E_{UniZ} and uncertainty of profile roughness

Since the Rz value is typically 6 times as high as the Ra value, the uncertainty of the Rz value is also 6 times as high as the uncertainty of the Ra value. If the influence of the λ_c filter is considered as well, the result is E_{UniZ}.

Relation between E_{Bi} and E_{Uni}

ISO 10360 deals with the acceptance and reverification tests for coordinate measuring systems (CMS). In part 8, CMMs with optical distance sensors are discussed*, using the length measurement errors E_{Bi} and E_{Uni} for verification. In case of optical measuring instruments, the relevant parameter for real measurement application is E_{Uni} due to the measuring direction. Using method B (see ISO 10360-8, section 6.3.5.3), E_{Bi} can be calculated from the measured and the calibrated length measurement errors as well as the probing form and size errors P_{Form} and P_{Size}.

Assuming:
- E_{Uni} = (0.3 + L/600) µm
- $P_{Form.Sph.1x25:St:ODS}$ = 0.405 µm
- $P_{Size.Sph.All:St:ODS}$ = 0.12 µm

Using method B, $E_{Bi:j:ODS}$ can be calculated based on the 105 measured and calibrated values $L_{Uni.meas}$ and $L_{Uni.cal}$:

- $L_{Uni.meas} - L_{Uni.cal} + P_{Size.Sph.1x25:j:ODS} > 0 \rightarrow E_{Bi:j:ODS} < L_{Uni.meas} - L_{Uni.cal} + P_{Size.Sph.1x25:j:ODS} + P_{Form.Sph.1x25:j:ODS}$
- $L_{Uni.meas} - L_{Uni.cal} + P_{Size.Sph.1x25:j:ODS} < 0 \rightarrow E_{Bi:j:ODS} > L_{Uni.meas} - L_{Uni.cal} + P_{Size.Sph.1x25:j:ODS} - P_{Form.Sph.1x25:j:ODS}$

Plot all errors → results in $E_{Bi:j:ODS}$ = (0.65 + L/600)µm

**Note that ISO 10360-8 has limited applicability to an optical micro-coordinate measuring machine such as the µCMM. Reasons for this are:*

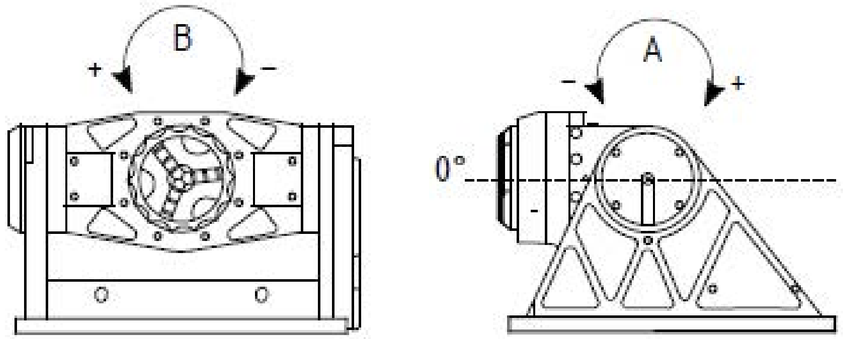
- *The standard specifies that the spheres to be measured have a diameter of 10-51mm. This is not possible with a single field measurement on a microcoordinate measuring machine like the µCMM. It requires an image field measurement, which necessitates moving the sensor head and the stitching of several single field measurements. This is not covered by ISO 10360-8. The spheres on the calibration standards used by Bruker Alicona therefore have a diameter of 1mm.*
- *A bidirectional length measurement (E_{Bi}) is stipulated in the standard for historical reasons, as it was established when using tactile measuring methods. Optical measuring instruments typically measure unidirectional, which means that a requirement for bidirectional evaluation is far from practice.*
- *The standard is designed for point measurements as known from tactile measuring devices. The extension to point clouds is only marginally provided for in ISO 10360-8. However, due to the small tolerances, optical measuring devices for microcoordinate metrology measure small dimensions using geometry elements based on point clouds. This means that a requirement for point measurements is neither viable nor suitable for application.*

The guideline VDI/VDE 2617 Sheet 12.2 was developed according to ISO 10360-8 by the VDI/VDE Technical Committee 4.31 and published in Feb. 2023. It deals in detail with the topic of acceptance and reverification testing for coordinate measuring machines for the optical measurement of micro-geometries.

Technical Specifications AdvancedReal3DUnit

	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. torque rotation axis (B)	0.25 Nm powered / 2 Nm unpowered
Max. torque tilt axis (A)	1.2 Nm powered / 5 Nm unpowered
Squared roundness measurement error (using a ø 6mm calibration pin)	
Max. speed rotation axis (B)	50°/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 length	360mm
Max. sample diameter	100 mm
Material	solid surfaces
Sample preparation	none
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 EROWA

Max. sample weight	4 kg
Max. sample length	220mm
Max. sample diameter	100 mm
Material	solid surfaces
Sample preparation	none
Clamping repeatability	2µm

AdvancedReal3DUnit with EROWA pallet system

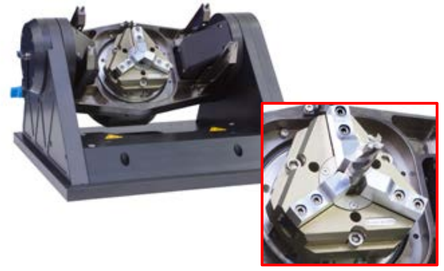
AdvancedReal3DUnit 3R

Max. sample weight	4 kg
Max. sample length	220mm
Max. sample diameter	100 mm
Material	solid surfaces
Sample preparation	none
Clamping repeatability	2µm

AdvancedReal3DUnit with 3R pallet system

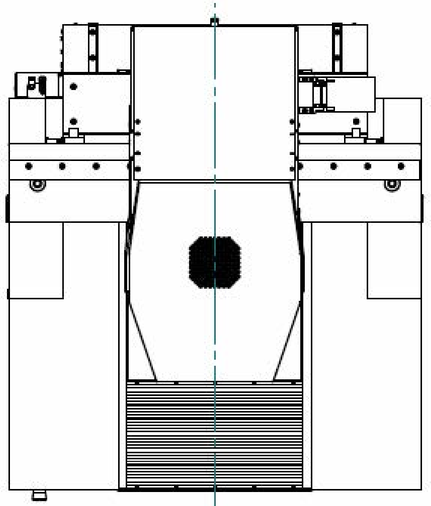
AdvancedReal3DUnit with pneumatic chuck

Max. sample weight	4 kg
Max. sample length	235mm
Material	solid surfaces
Sample preparation	none
CLAMPING RANGE	
Outer clamping range	ø 0,5mm to 40mm
Clear aperture	ø 14.5mm

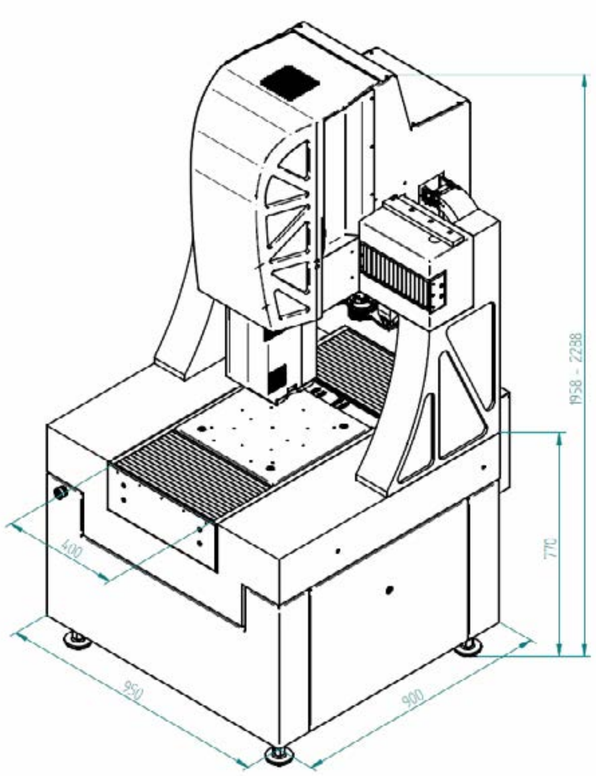


AdvancedReal3DUnit with three-jaw pneumatic chuck

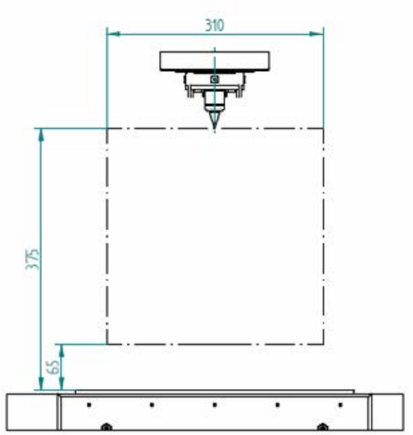
Technical Drawings



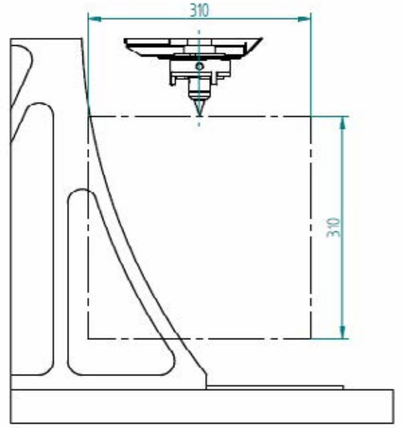
Top View



Isometric View

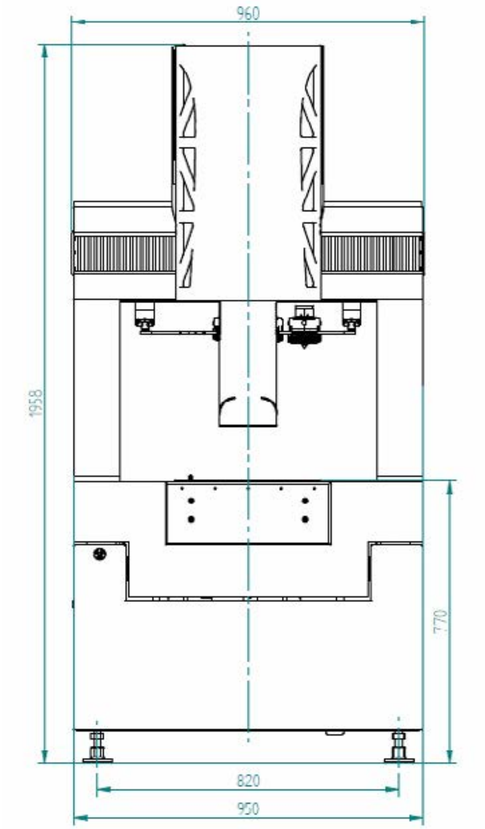


Positioning Volume, Front View

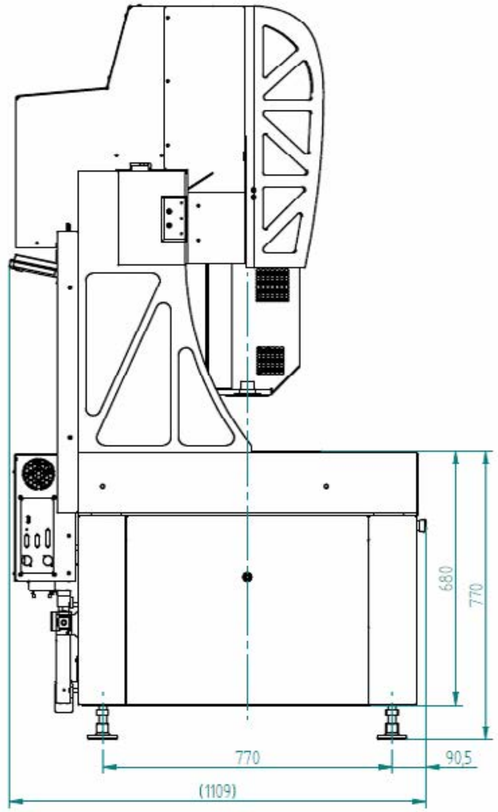


Positioning Volume, Side View

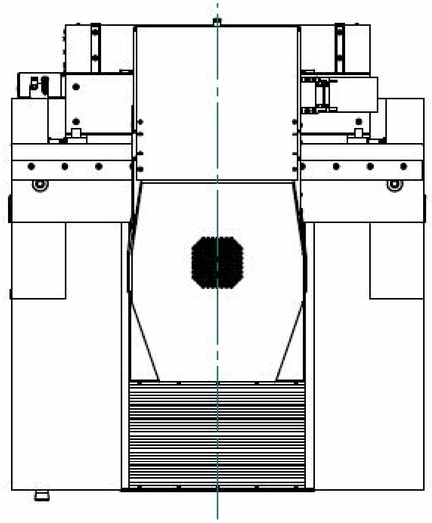
Technical Drawings



Front View
(sensor in lowest position)



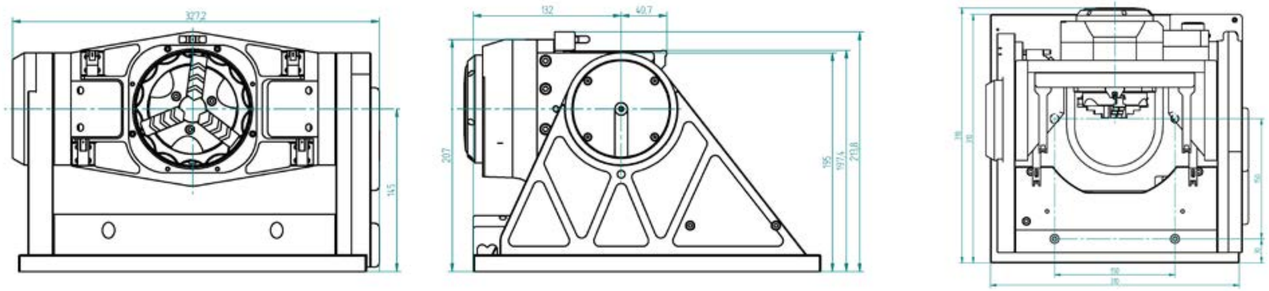
Side View



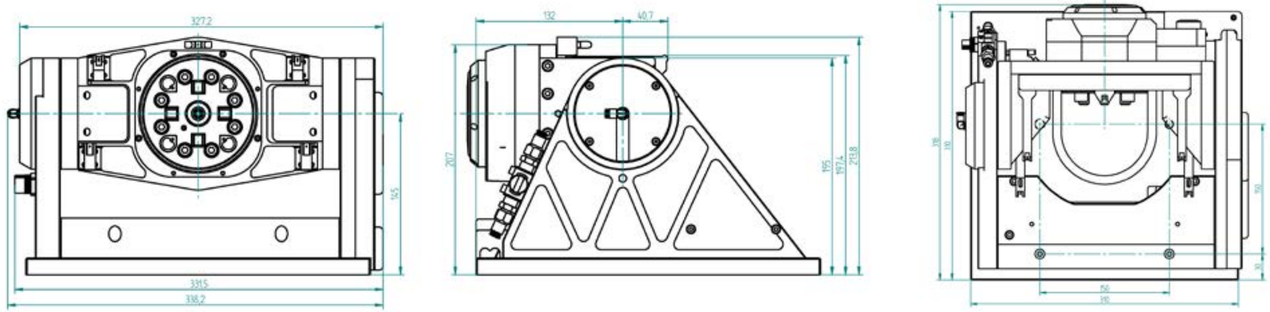
Top View

AdvancedReal3DUnit: Technical Drawings

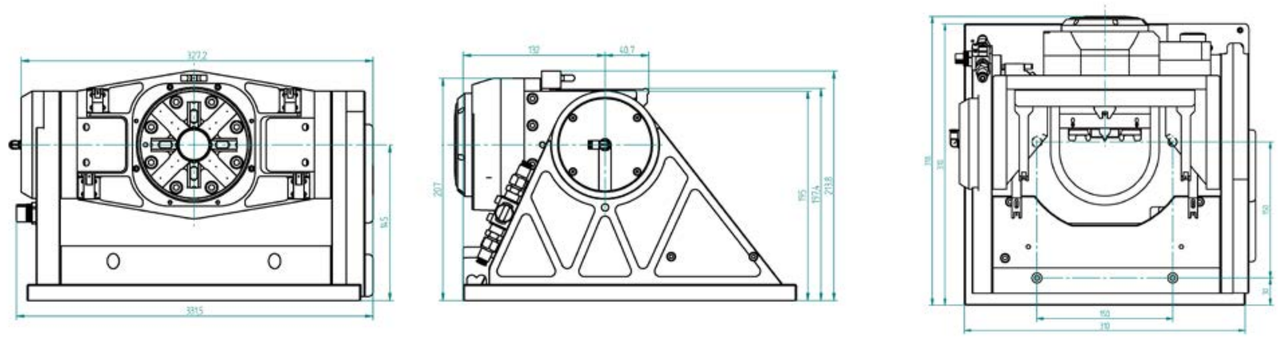
AdvancedReal3DUnit G3



AdvancedReal3DUnit 3R G3



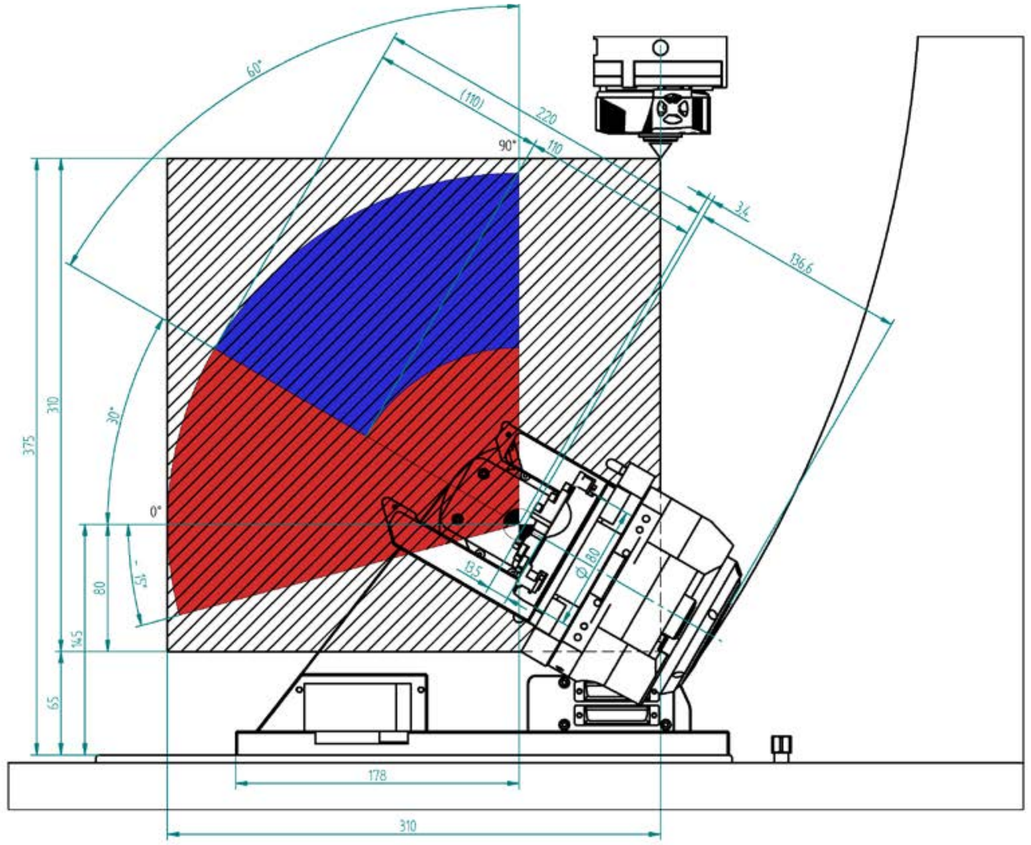
AdvancedReal3DUnit EROWA G3



AdvancedReal3DUnit: Working Area and Sample Length

AdvancedReal3DUnit

Shaded: Working area of µCMM (without SpacerPlate)



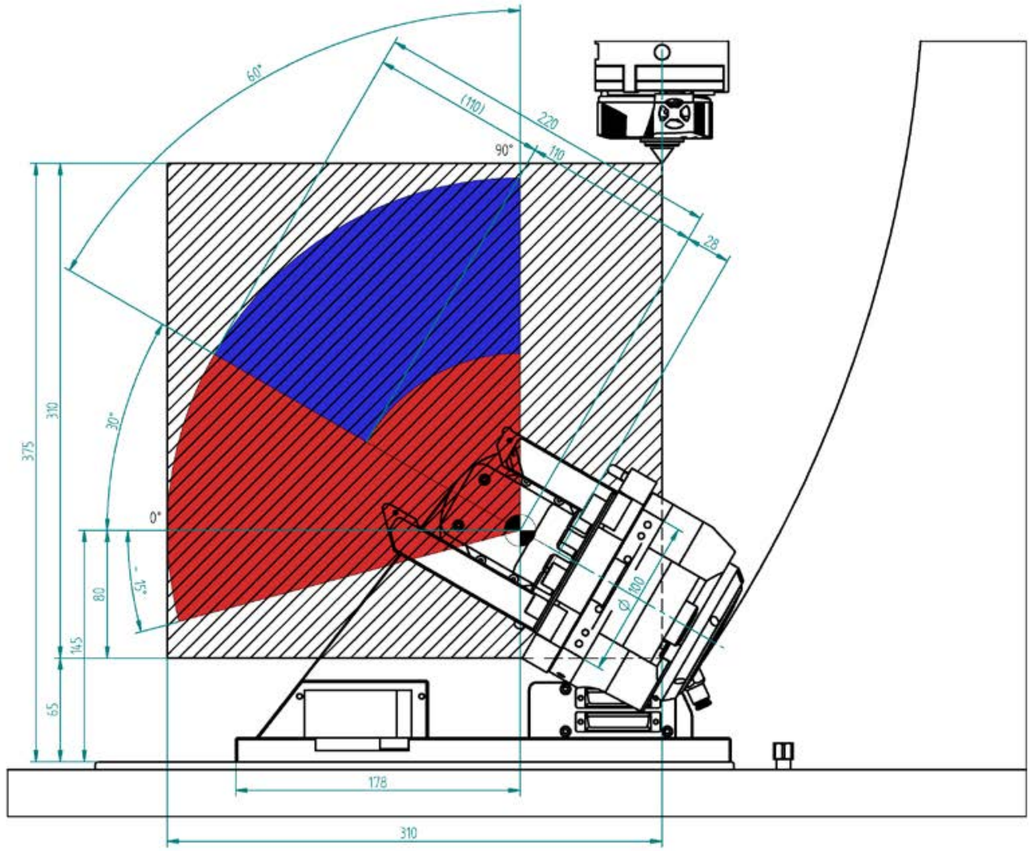
Maximum Sample Dimensions

Tilt Angle		Without RingLight		With RingLight	
		Max. diameter	Max. length[1]	Max. diameter	Max. length[1]
-15° to 30°	mm	100	220	96	220
30° to 90°	mm	100	110	96	110
30° to 90°	mm	13	360	13	360

(1) If the sample diameter is smaller than the clear aperture (23.5 mm), the sample can protrude through it and thus be significantly longer.

AdvancedReal3DUnit 3R

Shaded: Working area of µCMM (without SpacerPlate)

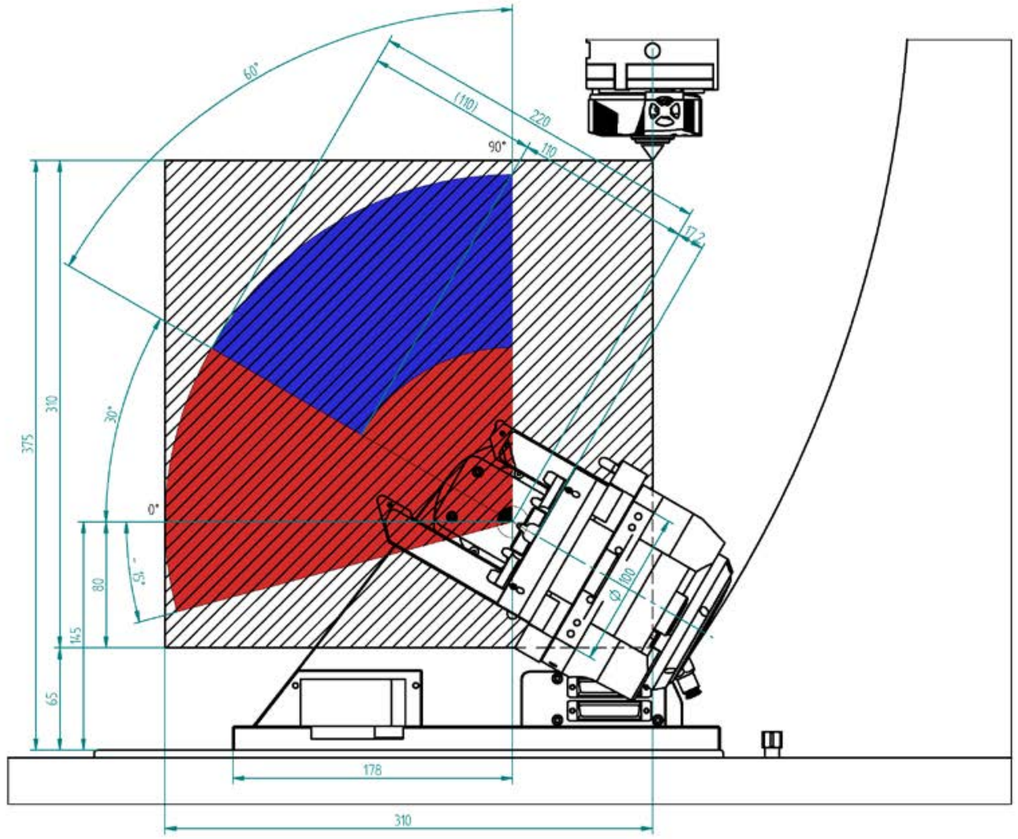


Maximum Sample Dimensions

Tilt Angle		Without RingLight		With RingLight	
		Max. diameter	Max. length	Max. diameter	Max. length
-15° to 30°	mm	100	220	96	220
30° to 90°	mm	100	110	96	110
30° to 90°	mm	13	220	13	220

AdvancedReal3DUnit EROWA

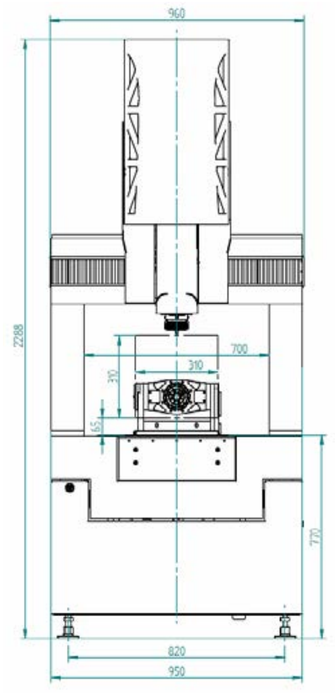
Shaded: Working area of µCMM (without SpacerPlate)



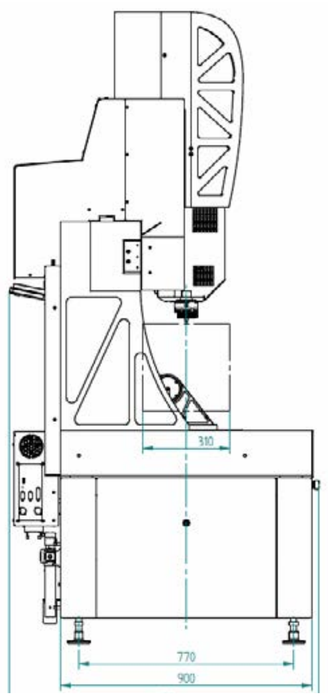
Maximum Sample Dimensions

Tilt Angle		Without RingLight		With RingLight	
		Max. diameter	Max. length	Max. diameter	Max. length
-15° to 30°	mm	100	220	96	220
30° to 90°	mm	100	110	96	110
30° to 90°	mm	13	220	13	220

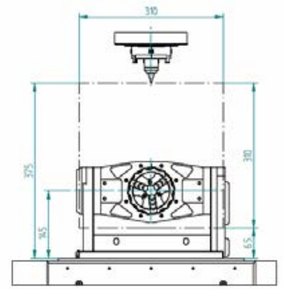
Technical Drawings with AdvancedReal3DUnit



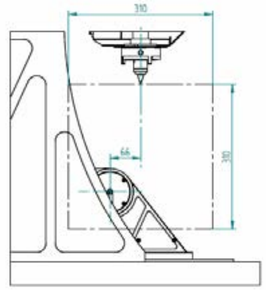
µCMM – front view with AdvancedReal3DUnit



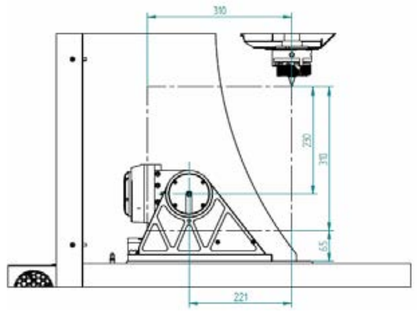
µCMM – side view with AdvancedReal3DUnit



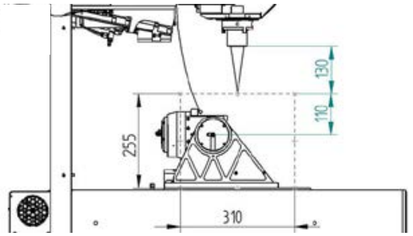
µCMM – positioning volume with AdvancedReal3DUnit, front view



µCMM – positioning volume with AdvancedReal3DUnit, side view, Y axis in middle position



µCMM – positioning volume with AdvancedReal3DUnit, side view, Y axis in rearmost position



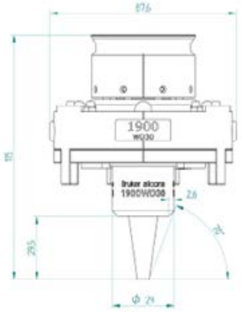
µCMM – positioning volume with AdvancedReal3DUnit and µCMMObjective 1500 WD130, side view, Y axis in middle position

Objectives Accessibility and Dimensions

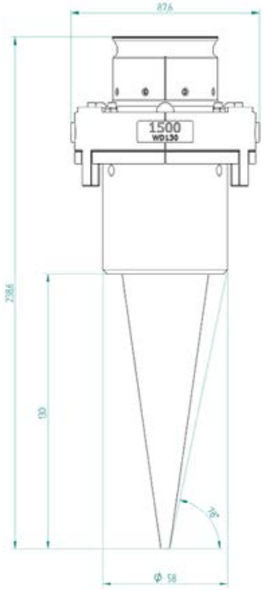
Notice About Objective Names

To enable a more precise differentiation, objective names have been expanded to include the working distance in their name.

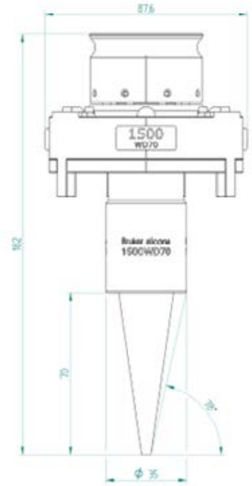
Formerly	New name	Formerly	New name
1500B	1500 WD70	400A	400 WD19
800A	800 WD17	150A	150 WD11



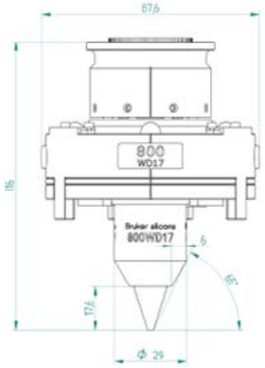
Objective 1900 WD30, accessibility: 70°



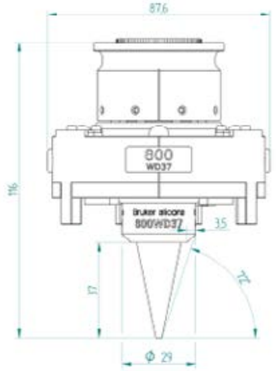
Objective 1500 WD130, accessibility: 78°



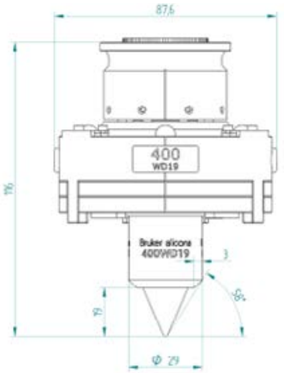
Objective1500 WD70, accessibility: 78°



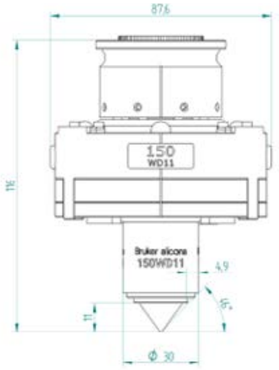
Objective 800 WD17, accessibility: 65°



Objective 800 WD37, accessibility: 72°

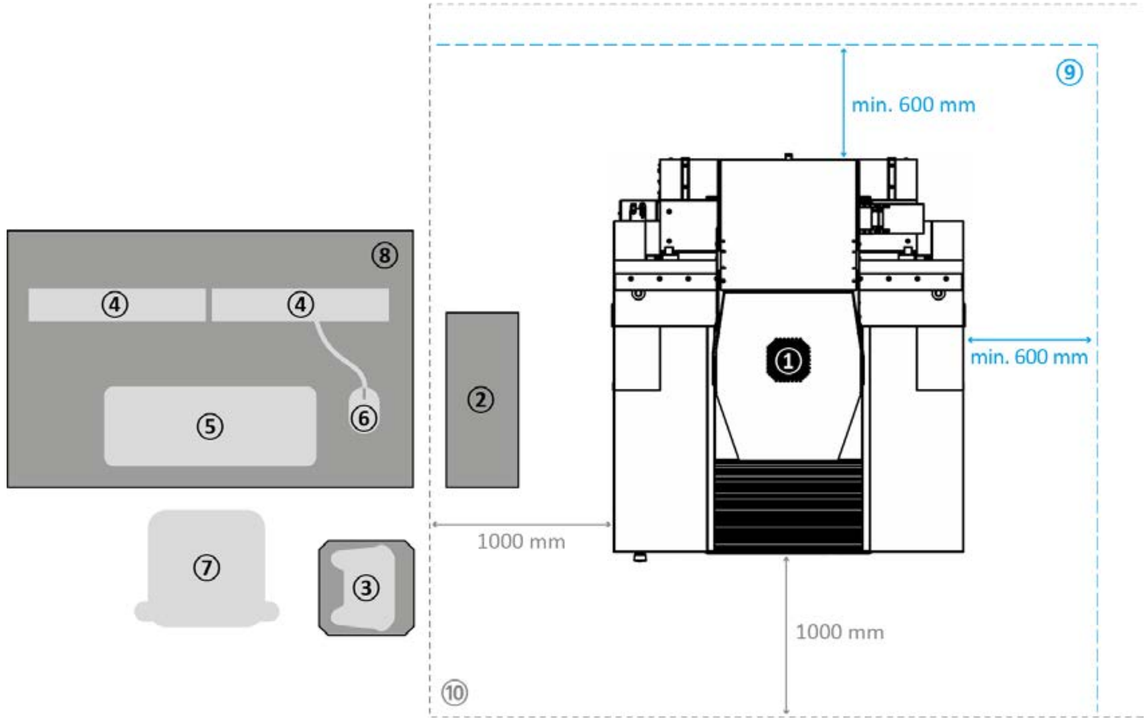


Objective 400 WD19, accessibility: 58°



Objective 150 WD11, accessibility: 46°

Recommended System Layout



1. µCMMInstrument
2. ControlServerSF
3. µCMMController on µCMMControllerStand
4. monitors
5. keyboard
6. mouse
7. chair
8. table (1500mm)
9. minimum distance to wall (600 mm)
10. recommended distance to persons (1000 mm) during operation

(*) Depending on the position of the compressed air maintenance unit, a minimum distance of 600mm to the rear or to the right (wall) as well as to bulky objects should be maintained to ensure accessibility when replacing the filter.

NOTE: Depending on the location – production environment or precision measurement room –, different distances may apply.

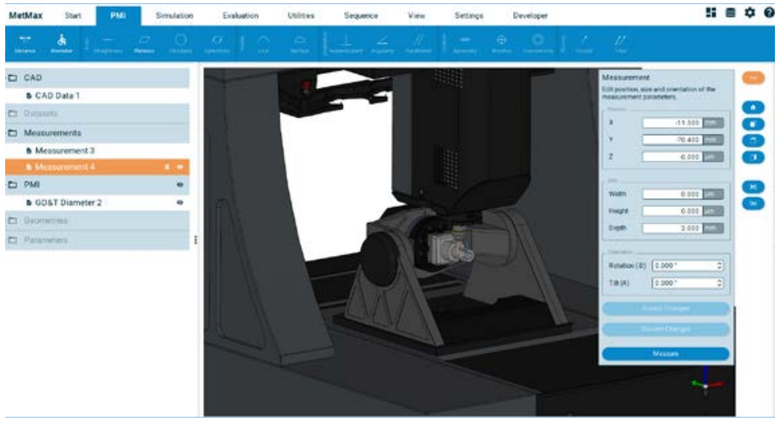
MetMaX

Association algorithm certified by PTB

Planning, automation and evaluation of measurements

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

MetMax incl. all features and modules is also available as offline version.



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

Importing Functions

CAD data
STEP, STL

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

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 Standard

ISO 25178-6:2010, ISO 25178-606:2016
VIM ISO IEC:2007
ISO 4287:2010, ISO 4288:1998 and ISO 21920-2:2021, ISO 21920-3:2021 resp.
ISO 16610-1:2015, ISO 16610-20:2015, ISO 16610-21:2013
ISO 25178-2:2020, ISO 25178-3:2012
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

Profile Roughness Parameters

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

Parameters of Roughness Profile

Ra	average rougness 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	mean peak to valley height of primary profile
Pmax	maximum peak to valley height of primary profile within a 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 a sampling length
Wp	maximum peak height of waviness profile
Wv	maximum valley height of waviness profile
Wc	mean height of profile irregularities of wavniess 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 waviness profile, (>=1), higher values represent larger scratches/peaks

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

ffβ	helix form deviation in the defined measurement height
fσβ*~	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

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

Laboratory Measurement Module

User-defined
3D measurement

General

Live View
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

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

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

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

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

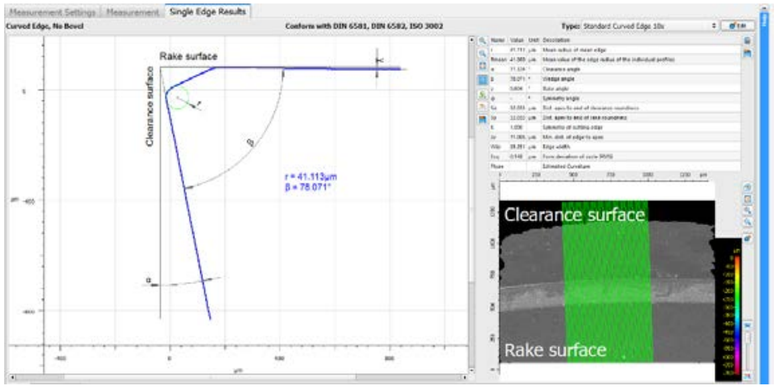
Vertical Focus Probing
Measurement of flanks over 90°

Supported Standard

ISO 25178-6:2010, ISO 25178-606:2016
VIM ISO IEC:2007
ISO 4287:2010, ISO 4288:1998 and ISO 21920-2:2021, ISO 21920-3:2021 resp.
ISO 16610-1:2015, ISO 16610-20:2015, ISO 16610-21:2013
ISO 25178-2:2020, ISO 25178-3:2012
ISO 16610-61:2016, ISO 16610-71:2014
ISO 13565-2:1998
ASME B46.1:2009

Edge Measurement Package

Measurement of (cutting) edges and edge verification



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

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

Importing Functions

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

Exporting Functions

Datasets
AL3D

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

Depth Images
PNG, BMP, TIF

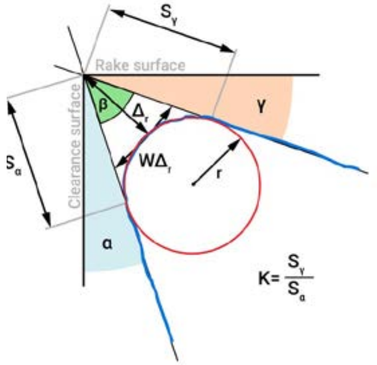
3D-Data points
Plain text, VRML2.0, SUR, STL, OpenGPS X3P, G3D

Object Properties
TXT

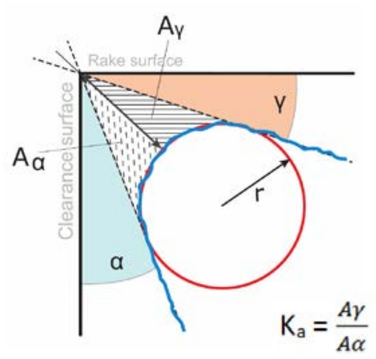
Supported Standard

ISO 25178-6:2010, ISO 25178-606:2016
VIM ISO IEC:2007
ISO 4287:2010, ISO 4288:1998 and ISO 21920-2:2021, ISO 21920-3:2021 resp.
ISO 16610-1:2015, ISO 16610-20:2015, ISO 16610-21:2013
ISO 25178-2:2020, ISO 25178-3:2012
ISO 16610-61:2016, ISO 16610-71:2014
ISO 13565-2:1998
ASME B46.1:2009
VDI 2654 Sheet 2

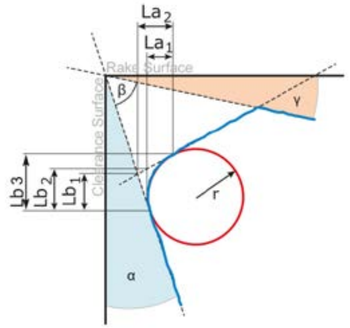
Edge Parameters



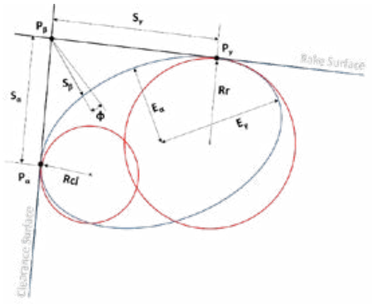
Sα, Sγ	distance between the apex (intersection of both dashed lines) and the end of the clearance or rake roundness, respectively
Δr	shortest distance from the intersection of the dashed lines to the fitted circle
WΔr	edge width
r	radius of the cutting edge
Ecq	from deviation of circle
Ebq	form deviation 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	clerance angle
β	wedge angle
K	edge symmetry



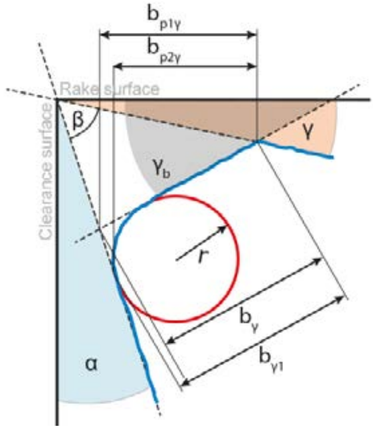
K_a	edge system based on areas
L_{a1}, L_{b2}, L_{a2}, L_{b2}, L_{b3}	length of honing width projected to rake/clearance surface
K_{ea}	ratio of the ellipse half axis length along the rake surface to the half axis length along the clearance surface
K_{er}	ratio of the fitted circle's radius on the rake 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))
Eγ	ellipse half axis length along the rake surface
Eα	ellipse half axis length along the clearance surface
Rcl	ellipse-radius clearance face
Rr	ellipse-radius rake face
Rcalc	calculated radius based on Δr

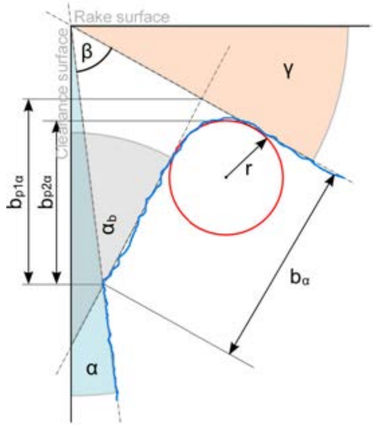
Edge Parameters for Negative Bevel

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



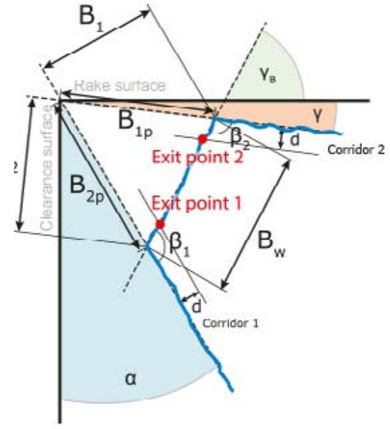
Edge Parameters for Supporting Bevel

$b_{p1\alpha}$, $b_{p2\alpha}$	projected bevel length
b_a	ture bevel lenght
a_b	angle of supporting bevel



Parameters for Edge Break

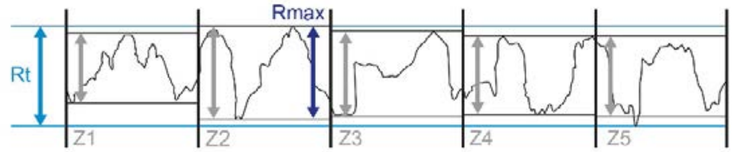
Bw	width of edge break
β1, β2	edge break angles
B1, B2	lenghts between fitted lines and edge break points (ISO 13715)
B1p, B2p	projected lenght
x1 neg, x2 neg	normal distancs between corridors and exit points
Bd, Bda	(absolute) mean deviation of edge break
Bf	indicates the form of the edge
Bg	indicates 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



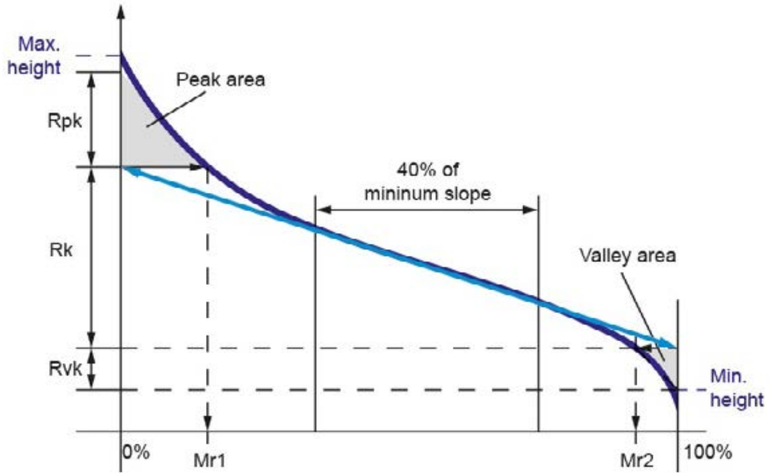
Profile Parameters

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

Surface Texture Parameters

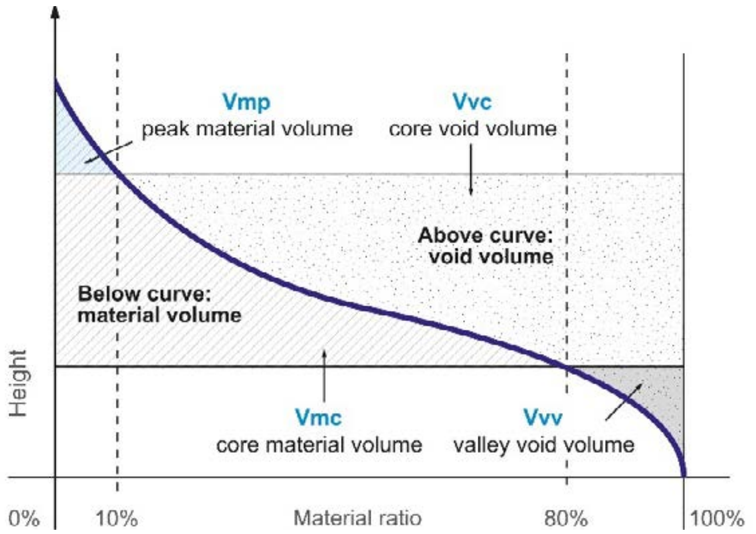
Sa	average height of selected area
Sq	root-mean-square height of selected area
Sp	maximum peak height of selected area
Sv	maximum valley depth of selected area
Sz	maximum height of selected area
Sz10	ten point height of selected area
Ssk	skewness of selected area
Sku	kurtosis of selected area
Sdq	root-mean-square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

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)

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)

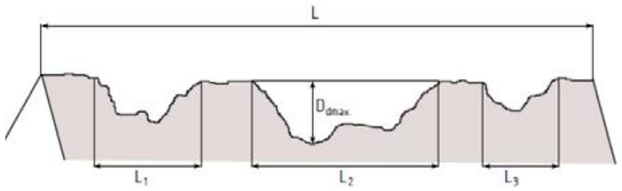


Volume parameters can distinguish differences between surfaces better than others.

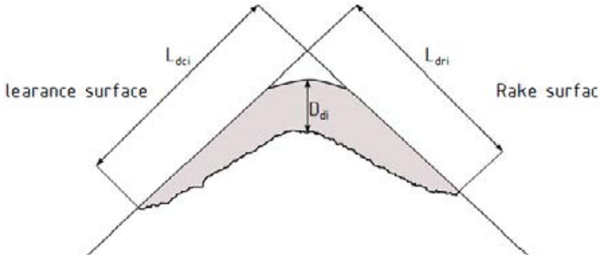
Volume parameters are calculated for entire surfaces.

Parameters for chipping measurement along the profile

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



Example of an edge with three defects



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

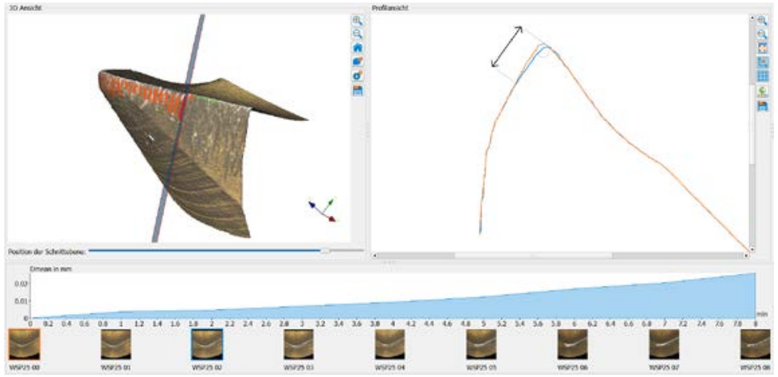
Parameters for edge quality measurement

L	evaluated length
Pd	percentage of edge lenght 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

Wear Measurement Module

In collaboration with: SANDVIK Coromant

Automatic wear measurement on cutting tools



Over a defined period of time, the wear process is represented by animated 3D data sets and profiles.

Features

- Automatic measurement of various wear parameters (e.g. flank wear, notch wear, plastic deformation)
- Visualization and animation of wear process (morphing)
- Visualization of original and several worn surface profiles and 3D data sets
- Export of results to .csv

Exporting Functions

Result
CSV

Supported Standard

ISO 8688

Flank wear and notch wear:
ISO 3685
ISO 8688-1

Wear 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
Lbmax	maximum value of flank wear
Lbmean	average value of flank wear
VB	flank wear at current position
Vbmaxq	Mean value of the 10% largest flank wear values

Pick & Place

Automated placing and measurement of components

Features

- Easy teach-in in 3 steps
- Option for closed loop process and ERP integration
- Pays for itself within few months
- Administrator/Worker mode for teach-in or just starting a project
- Teach-in in 3 simple steps:
  a.Define project
  b.Define pallets (First pallet, OK pallet, NOK pallet)
  c.Define procedure

Technical Specifications

Robot Type	UR3e
Safety	15 advanced adjustable safety functions. TÜV NORD Approved Safety Function Tested in accordance with: EN ISO 13849:2008 PL d
Axis	6 joints
Repeatability	+/- 0.1mm
Payload	2 kg
Interfaces	TCP/IP, Profinet Customized available

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

CalibrationTool

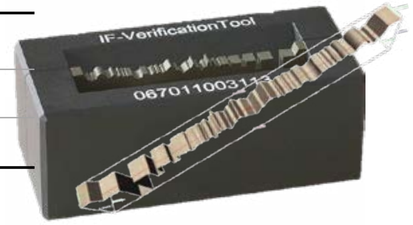
3D dataset of the measured height step

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.

Circle diameters	100µm, 250µm, 500µm, 1000µm
Grid spacings	90°, 60°, 20°
Height step	500µm, 1000µm, 2000µm, 5000µm

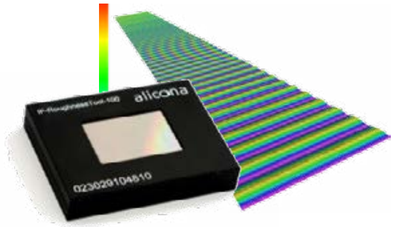


VerificationTool to verify form measurements.

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, 4288 and 21920, respectively. DAkkS calibrated.

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



RoughnessTool verification of optical 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 64 x 14 mm
Temperature range	20 °C +/- 2 °C

Humidity rage	40 - 65 %
Recalibration interval	3 years
Calibration laboratory	NPL
Calibration according to	ISO 25178

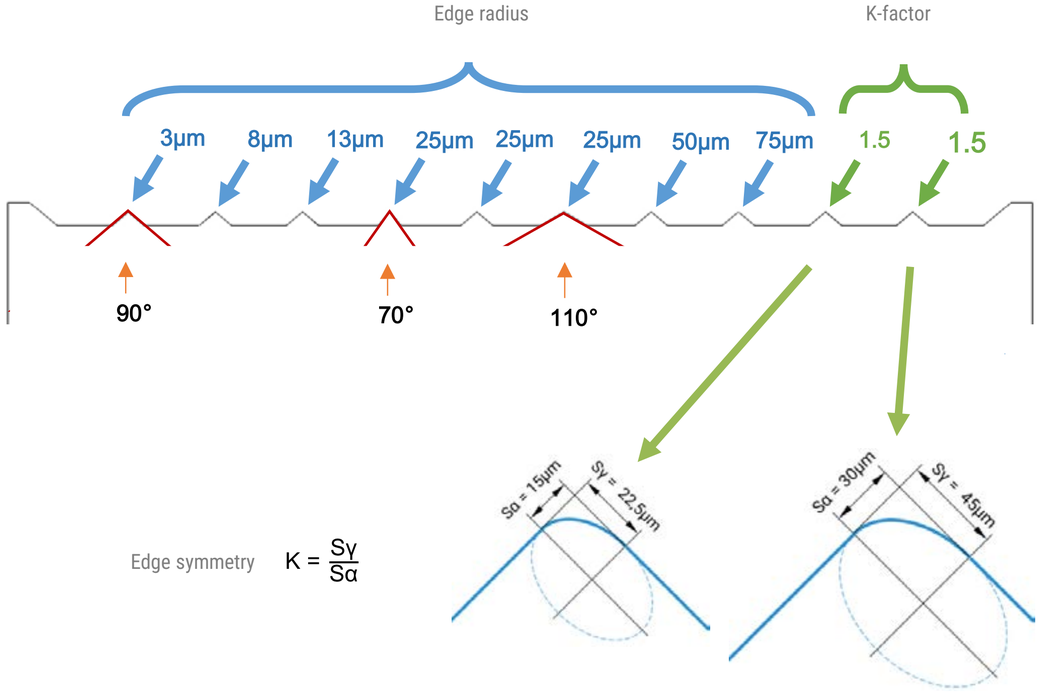
ArealRoughnessTool to verify roughness measurements.

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 rage	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.

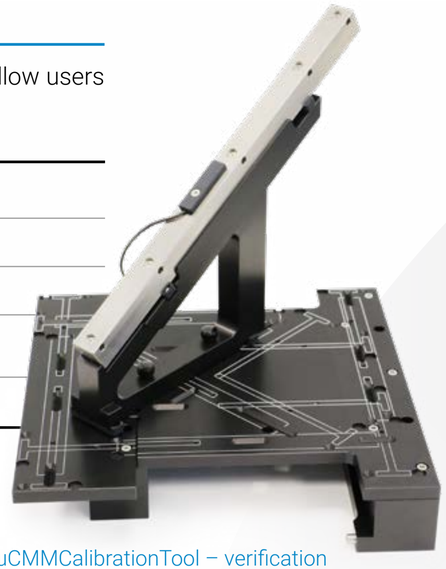


Edge symmetry $K = \frac{S\gamma}{S\alpha}$

µCMMCalibrationTool

The calibrated sphere distances of the µCMMCalibrationTool allow users to measure and verify larger distances based on ISO 10360-8.

Spheres	5x ø 1mm
Sphere positions	0, 80, 200, 300, 360mm
Material	Invar bar with stainless steel spheres
Coefficient of thermal expansion	approx. 1µm/K/m
Calibration laboratory	DAkkS



µCMMCalibrationTool – verification of larger distances based on ISO 10360-8

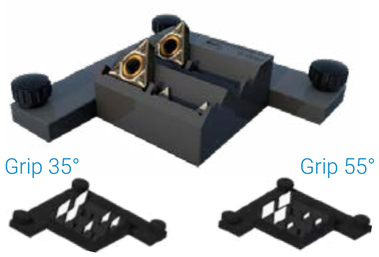
Grips

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.



Grip 35° Grip 55°

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 (W x D x H)	70 x 52.5 x 79 mm
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 151.1 mm
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	10^2-5Ω

Accessories

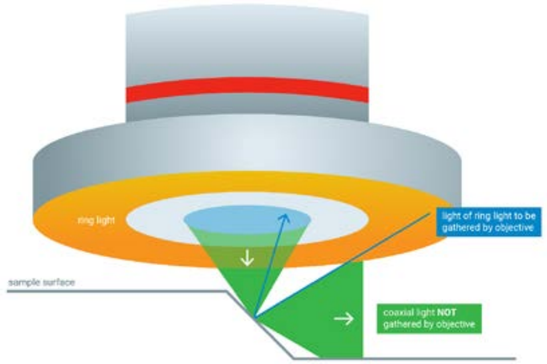
RingLightHP

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)

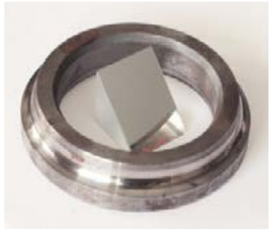


45DegreeMirror

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 aluminum



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 and 35 mm.

Components/Features

Components			Description	Compatibility	Article number
µCMM		✓	Calibrated, optical 3D micro-coordinate measuring machine based on Focus-Variation including VerticalFocusProbing to measure dimensions, position, shape and roughness. - Positioning volume (X x Y x Z) 310x310x310 mm³ - Automatic pneumatic four-place objective charger Hardware includes: - 64 bit high-speed control server - 2 x 27-inch screen - µCMM Controller - Mouse and keyboard - Reflecting block - µCMM Objective 800 WD17 Software includes: - LaboratoryMeasurementModule 3D data acquisition - MetMaX Software Graphical user interface and measurement database Collision detection, reporting Standard measurement modules (profile form measurement, profile roughness measurement, surface texture measurement, volume measurement, 2D image measurement) - MultiMeasurement Module - Alicona Inspect - Real3DFusion Geometric difference and tolerance measurement module - Drivers Price includes: - 1 year software support and software updates - Packaging		
ControlServerSF		✓			
µCMMController		✓			
µCMMControllerStand		✓			
Monitors		✓			
Keyboard		✓			
Mouse		✓			
Dongle		✓			
Objectives					
	µCMMObjective1900 WD30	optional	Objective with integrated high precision hardware interface to the sensor. Working distance 30 mm and max. vertical measurement range 28,5 mm. Compatible with RinglightHP.		BA-OPO-0136
	µCMMObjective1500 WD23	Product discontinued, availability not guaranteed.			
	µCMMObjective1500 WD70	optional	Ultra high working distance objective (Wd = 70mm) mainly for form measurement.	Not compatible with RinghlightHP	BA-14408
	µCMMObjective1500 WD130	optional	Objective with integrated high precision hardware interface to the sensor. Working distance 130 mm and maximum vertical measurement range 125 mm.	Not compatible with RinghlightHP	BA-OPO-0141
	µCMMObjective800 WD17	✓	Objective with integrated high precision hardware interface to the sensor. Working distance 17,5 mm and maximum vertical measurement range 16,5 mm. Compatible with RinglightHP.		BA-OPO-0130
	µCMMObjective800 WD37	optional	Objective with integrated high precision hardware interface to the sensor. Working distance 37 mm and maximum vertical measurement range 36 mm.		BA-OPO-0139
	µCMMObjective400 WD19	optional	Objective with integrated high precision hardware interface to the sensor. Working distance 19 mm and maximum vertical measurement range 18 mm. Compatible with RinglightHP.		BA-OPO-0131
	µCMMObjective150 WD11	optional	Objective with integrated high precision hardware interface to the sensor. Working distance 11 mm and maximum vertical measurement range 10 mm. Compatible with RinglightHP.		BA-OPO-0132
	µCMMObjective 80WD4	optional	Objective with integrated high precision hardware interface to the sensor. working distance 4,5 mm and maximum vertical measurement range 4 mm.		BA-OPO-0133

Software Products			Description	Compatibility	Article number
LaboratoryMeasurementModule					
	SingleField	✓			
	ImageField	✓			
	Automation	✓			

Components/Features

	RemotingInterface	✓	Interface for remote control of the Alicona measurement device.		
	Color Functionality	optional	µCMM 3D Color is an additional software function for the LaboratoryMeasurementModule. This function stores not only the depth information but also the color information in each individual measuring point.		BA-SWO-0174
MetMaX (incl. Alicona Inspect and standard measurement modules)					
	ProfileFormMeasurement	✓			
	ProfileRoughnessMeasurement	✓			
	SurfaceTextureMeasurement	✓			
	VolumeMeasurement	✓			
	2DImageMeasurement	✓			
Contour Scanning		✓			
One Click Roughness		optional	This is a module in the MetMaX software that allows the user to quickly perform profile roughness measurements without CAD dataset.		BA-SWO-0191
Offline MetMaX		optional	MetMaX offline licence For usage on an external workstation. With this option, database operations can be done and evaluations on existing data sets can be performed. If the CAD of a sample is prepared properly, first steps for measurement programs can be prepared. Requirements: Offline Dongle and system specifications met Includes standard measurement modules (profile form measurement, profile roughness measurement, surface texture measurement, volume measurement, 2D image measurement), 3DFormMeasurement, ContourMeasurement, DifferenceMeasurement, Real3DMeasurement and Real3DFusion. Minimum computer requirement: RAM16GB, recommend RAM32GB. Graphic card Nvidia, Monitor resolution 1.920x1.080p with full HD, scaling setting 100%, Operating system Win 10.	Not compatible with AMD, Intel graphic card.	BA-SWO-0153
Real3DMeasurement		optional	Measurement module for automatic evaluation of Real3D data including following measurements: - DifferenceMeasurement to numerically compare two different geometries, including form deviation to a CAD dataset or reference geometry - 3DFormMeasurement to fit sphere, cone and cylinder - ContourMeasurement to measure angles, distances, circles, incircles, circumcircles, thread pitch etc. from every position; roundness measurement included		BA-SWO-0165
ContourMeasurement		optional	Measurement module for the measurement of angles, distances, circles, incircles, circumcircles, thread pitch etc. from every position. Roundness measurement included.	included in Real3DMeasurement	BA-SWO-0164
3DFormMeasurement		optional	Measurement module to fit geometric primitives such as sphere, cone and cylinder.	included in Real3DMeasurement	BA-SWO-0163
DifferenceMeasurement		optional	Measurement module to numerically compare two different geometries. Applied for wear analysis and measurement of form deviation to a CAD dataset or reference geometry.	included in Real3DMeasurement	BA-SWO-0162
Real3DFusion		✓			
Micro Gear Measurement		optional	Software module for standardized gear inspection. Enables robust areal measurement of full teeth. Available views: Inspection Record Total Geometry Topo 3D		BA-SWO-0138

Components/Features

Micro Gear Measurement Professional	optional	Software module for standardized gear inspection. Enables robust areal measurement of full teeth. Available Views: Inspection Record Total geometry Topo 3D Rating Iceberg Single flank Amplitude Position analysis Tooth analysis Form analysis		BA-SWO-0141
Micro Gear Measurement Test License	✓	Software module for standardized gear inspection. Enables robust areal measurement of full teeth. Limited for 30 days. Available views: Inspection record Total geometry Topo 3D Rating Iceberg Single flank Amplitude Position analysis Tooth analysis Form analysis		BA-SWO-0142
ServiceSoftware	✓			
Edge Measurement Package	optional	Software package for traceable cutting edge measurement of various tool types and sizes. Measurements include: - radius and form - Chipping & EdgeQuality (fully automatic chipping measurement - depth, length and volume for edge quality verification) and roughness measurement along the edge) - edge break (chamfer) - edge contour through elliptic fit - form deviation - MultiEdgeMeasurement (measurement of multiple edges in one measurement cycle) - RoundToolMeasurement (measurement of angles on round tools with respect to the tool axis, in combination with µCMM Real3D) - ToolRoughness (roughness measurment on rake and clearance surface) - Order Management Module Lite (up to 10 customizable fields to create user-specific reports)		BA-SWO-0172
Offline Edge Measurement Package	optional	Offline version of software package for traceable cutting edge measurement of various tool types and sizes . Measurements include: - radius and form - Chipping & EdgeQuality (fully automatic chipping measurement - depth, length and volume for edge quality verification) and roughness measurement along the edge) - edge break (chamfer) - edge contour through elliptic fit - form deviation - MultiEdgeMeasurement (measurement of multiple edges in one measurement cycle) - RoundToolMeasurement (measurement of angles on round tools with respect to the tool axis, in combination with µCMM Real3D) - ToolRoughness (roughness measurment on rake and clearance surface) - Order Management Module Lite (up to 10 customizable fields to create user-specific reports) - Standard Measurement Modules (profile form measurement,profile roughness measurement, surface texture measurement, volume measurement, 2D image measuremnt and automation)		BA-SWO-0146
Order Management Module	optional	OrderManagementModule is a software for order processing and management with a user-specific reporting.	Requires EdgeMeasurementPackage	BA-SWO-0125
Order Management Module Interface	optional	OrderManagementModule Interface is an extension to the OrderManagementModule which allows the integration of Bruker Alicona measurement technology into the customer's IT environment.	Requires EdgeMeasurementPackage	BA-SWO-0171
Wear Measurement Module	optional	Software module for automatic wear measurement on cutting tools.		BA-SWO-0169
Automation Package (incl. AutomationManager and MetMaX Automation)	optional	Automation Package containing the following products: AutomationManager - Automation software for automatic measurement and evaluation of components, also applicable for quality assurance in production. Expandable with optional add-ons such as automatic defect detection. MetMaX Automation - Software functionality in MetMaX which allows automation of the measurement workflow.		BA-SWO-0176
MetMaX Automation	optional	Software functionality in MetMaX which allows automation of the measurement workflow.		BA-SWO-0177
Defect Measurement	optional			in development for MetMaX
Alicona Inspect Professional	optional	3D inspection software to evaluate surface geometries and automate measurement processes including GD&T.		BA-SWO-0180
Burr Measurement	optional	BurrMeasurement detects and measures different parameters of a burr on the edge. Goal is to measure the largest burr height and get an overview of regions which are out of a defined tolerance zone.	Requires EdgeMeasurementPackage	BA-SWO-0140

Components/Features

SurfaceAI Package					In development

Calibration Standards			Description	Compatibility	Article number
CalibrationTool		optional	Certified and traceable calibration tool to verify the vertical and lateral accuracy. Recalibration is recommended every 5th year.		BA-HWO-0109
VerificationTool		optional	Certified and traceable verification tool for verification of form measurements, e.g. height steps, angles and cylindrical shapes. It is delivered with a IPK certificate. Recalibration is recommended every 5th year.		BA-HWO-0110
RoughnessTool					
	RoughnessTool-100	optional	Certified and traceable roughness standard (Ra 100nm) to verify optical and tactile roughness measurements, establishing comparability to tactile measurements. It is delivered with a DAkkS certificate. Recalibration is recommended every 3rd year.	Requires 150 WD11	BA-HWO-0116
	RoughnessTool-500	optional	Certified and traceable roughness standard (Ra 500nm) to verify optical and tactile roughness measurements, establishing comparability to tactile measurements. It is delivered with a DAkkS certificate. Recalibration is recommended every 3rd year.	Requires 150 WD11	BA-HWO-0114
	RoughnessTool-3000	optional	Certified and traceable roughness standard (Ra 3000nm) to verify optical and tactile roughness measurements, establishing comparability to tactile measurements. It is delivered with a DAkkS certificate. Recalibration is recommended every 3rd year.	Requires 400 WD19	BA-HWO-0115
ArealRoughnessTool		optional	The ArealRoughnessTool is designed specifically for optical measurement systems. It is delivered with a certificate from the NPL. It allows to calibrate the areal roughness parameters Sa in compliance with ISO-25178. The nominal Sa is 750nm. Recalibration is recommended every 3rd year.		BA-HWO-0142
EdgeCalibrationTool					
	2 edges with certificate	optional	The EdgeCalibrationTool is a standard for the verification of edge measurements. This standard provides different edge shapes as well as different edge angles. Furthermore, edges with elliptical shapes are included. A METAS (Federal Institute of Metrology, Berne/Switzerland) calibration certificate for the 8µm and 25µm radii is included in the delivery. Recalibration is recommended every 5th year.		BA-HWO-0143
	all edges with certificate	optional	The EdgeCalibrationTool is a standard for the verification of edge measurements. This standard provides different edge shapes as well as different edge angles. Furthermore, edges with elliptical shapes are included. A METAS (Federal Institute of Metrology, Berne/Switzerland) calibration certificate for all radii is included in the delivery. Recalibration is recommended every 5th year.		BA-HWO-0144
µCMMCalibrationTool		optional	Calibration Tool with calibrated sphere distances to verify larger distances (ISO 10360-8). Recalibration is recommended every 5th year.		BA-HWO-0145
AdvancedCalibrationPin		applicable version delivered with AdvancedReal3DUnit G3	High-precision calibration pin. Enables calibration of the AdvancedReal3DUnit to ensure the reliability and accuracy of the rotation unit. In the adjustment procedure, every tilt angle of the rotation unit is precisely adjusted. Tolerance Table DIN EN ISO 10360-2:2010	included in AdvancedReal3DUnit G3	BA-HWO-0132
AdvancedCalibrationPin3R		applicable version delivered with AdvancedReal3DUnit 3R G3	High-precision calibration pin. Enables calibration of the AdvancedReal3DUnit to ensure the reliability and accuracy of the rotation unit. In the adjustment procedure, every tilt angle of the rotation unit is precisely adjusted. Suitable for all pallets which are used for the 3R-SP26771 system. Tolerance Table DIN EN ISO 10360-2:2010	included in AdvancedReal3DUnit 3R G3	BA-HWO-0128
AdvancedCalibrationPinEROWA		applicable version delivered with AdvancedReal3DUnit EROWA G3	High-precision calibration pin. Enables calibration of the AdvancedReal3DUnit to ensure the reliablility and accuracy of the rotation units. In the adjustment procedure, every tilt angle of the rotation unit is precisely adjusted. Suitable for all pallets which are used for the ITS100 system. Tolerance Table DIN EN ISO 10360-2:2010	included in AdvancedReal3DUnit EROWA G3	BA-HWO-0129

Grips			Description	Compatibility	Article number
AdvancedReal3DUnit G3	3 Jaw Chuck	optional	Bruker Alicona measurement system extension with motorized, high-precision rotation- and tilt axis to automatically measure full form and roughness of the complete sample. Fast and easy clamping of the sample via integrated three-jaw-chuck system. Includes: - Motorized rotation- and tilt axis - AdvancedReal3D Specimen Table - AdvancedCalibrationPin		BA-HWO-0161
AdvancedReal3DUnit 3R G3	3R	optional	Bruker Alicona measurement system extension with motorized, high-precision rotation- and tilt axis to automatically measure full form and roughness of the complete sample. Fast and easy clamping of the sample via integrated 3R system. Includes: - Motorized rotation- and tilt axis - AdvancedReal3D Specimen Table - AdvancedCalibrationPin		BA-HWO-0152

Components/Features

AdvancedReal3DUnit EROWA G3	EROWA	optional	Bruker Alicona measurement system extension with motorized, high-precision rotation- and tilt axis to automatically measure full form and roughness of the complete sample. Fast and easy clamping of the sample via integrated EROWA system. Includes: - Motorized rotation- and tilt axis - AdvancedReal3D Specimen Table - AdvancedCalibrationPin		BA-HWO-0153
AdvancedReal3DUnit Pneumatic G3		optional	µCMM extension with motorized, high-precision rotation- and tilt axis to automatically measure full form and roughness of the complete sample. Fast and easy clamping of the sample via integrated, pneumatically operated three-jaw chuck. Product Includes: - Motorized rotation- and tilt axis - 5 jaw sets to cover clamping diameters from 0.5 mm to 40 mm - AdvancedReal3D Specimen Table - AdvancedCalibrationPin		BA-HWO-0157
InsertGrip G2		optional	Grip for higher automated and repeatable measurement of small objects, especially inserts, in variable oblique positions (90°, 80°, 60°, 55°, 35°, 0°). Measurement comfort is increased. Depending on the size of the objects and the degree of the oblique position, different numbers of inserts are applicable. The measurement of all inserts can be performed in only one single measurement cycle.		BA-GHO-0121
AdvancedInsertGrip		optional	Grip for measurement of small objects in various positions. This grip can be adjusted to most specimens and also locked in the desired position. Measurement comfort and repeatability are increased. The grip enables repeatable measurement results.		BA-GHO-0102
ToolGrip		optional	Grip for user-friendly and repeatable clamping of shaft tools with complex cutting edge geometries. The clamping system is tiltable from 0 up to 90 degree. An adjustable axial and radial stop collar allows the repeatable clamping of the tool. Tools with diameters of up to 30 mm and lengths up to 250 mm are measurable.		BA-GHO-0110
RotationGrip		optional	Compact clamping device for horizontal mounting of round tools. Tools are manually rotated or tilted up to 60° into the desired measurement position. An intergrated three-jaw-chuck system enables easy clamping of samples with different diameters.		BA-GHO-0103
Clamping Set		optional	Four large and four small clamping bridges are used to fix components in a certain position. The sample holder is a flexible solution for flat, steep and round components.		BA-GHO-0105
Real3DAdapter		optional	Adapter for mounting of customized sample holders (accessory for Real3DRotationUnit).		BA-GHO-0108
Guide		optional	Fixture for InfiniteFocus, InfiniteFocus X-Large and µCMM systems. Components are continuously equally positioned and aligned to simplify automated measurements.		BA-HWO-0107
NanoGrip		optional	Sample holder with a non-slippery micro-structure to fix components with a smooth contact surface in XY. Users achieve highly repeatable measurements by fixing the sample holder with four knurled screws on the measurement system. Additionally, four tapped holes can be used to mount other specific adapter plates. The dimension of the surface area is 75.4 mm x 75.4 mm.		BA-GHO-0114
ChuckAdapter G2	Three-jaw-chuck	optional	Three-jaw-chuck for fixing rotationally-symmetric samples, which can't be fixed in the AdvancedReal3DUnit or µCMMReal3D. Outer gripping range: 11-27 mm (standard position), up to Ø 40 mm (reversed jaws); inner gripping range: 0,5-16 mm (standard position), up to Ø 30 mm (reversed jaws).		BA-GHO-0122
ChuckAdapter3R G2	3R	optional	Three-jaw-chuck mounted on a 3R pallett. Fixing rotationally-symmetric samples, which can't be fixed in the AdvancedReal3DUnit 3R or µCMMReal3D 3R. Outer gripping range: 11-27 mm (standard position), up to Ø 40 mm (reversed jaws); inner gripping range: 0,5-16 mm (standard position), up to Ø 30 mm (reversed jaws).		BA-GHO-0118
ChuckAdapterEROWA G2	EROWA	optional	Three-jaw-chuck mounted on a EROWA pallett. Fixing rotationally-symmetric samples, which can't be fixed in the AdvancedReal-3DUnit EROWA or µCMMReal3D EROWA. Outer gripping range: 11-27 mm (standard position), up to Ø 40 mm (reversed jaws); inner gripping range: 0,5-16 mm (standard position), up to Ø 30 mm (reversed jaws).		BA-GHO-0117
ColletChuckER11		optional	The ColletChuckER11 is a package consisting of a collet chuck, a turnbuckle and four collets with different diameters (1mm, 1.5mm, 2mm, 2.5mm). Including transport box.		BA-GHO-0109

Components/Features

µCMM Pick&Place 3R	optional	Automatic sample handling and loading of Alicona measurement equipment. This product is an add-on solution for Bruker Alicona´s µCMM to turn it into full automated measurement solution. Hardware includes: - 6-axis robot type UR-3e - Gripper with special fingers to pick up 3R MacroStandard pallets - System table, which gets directly mounted with the µCMM base - Plate holder for 24 specimens (3R MacroStandard pallets) Software includes: - Process management Software with easy worker GUI for running tough processes and teaching in	Requires AdvancedReal3DUnit 3R G3	BA-HWO-0182
µCMM Pick&Place EROWA	optional	Automatic sample handling and loading of Alicona measurement equipment. This product is an add-on solution for Bruker Alicona´s µCMM to turn it into full automated measurement solution. Included hardware: - 6-axis robot type UR-3e - Gripper with special fingers to pick up EROWA pallets - System table, which gets directly mounted with the µCMM base - Plate holder for 24 specimens (EROWA centering plate 50) Included software: - Process management SW with easy worker GUI for running tought processes and teaching in	Requires AdvancedReal3DUnit EROWA G3	BA-HWO-0156
2nd Air µCMMReal3D	optional	For automation with the µCMMReal3D Rotation Unit. To clean the clamping and to check if there is something clamped (further automation needed).	Requires AdvancedReal3DUnit 3R G3	BA-HWO-0149

Accessories		Description	Compatibility	Article number
AdvancedReal3D Specimen Table	optional	Multi-functional and compact specimen table which enables measurement of specimen which are not clamped into the AdvancedReal3DUnit , without removing, e.g. specimen with flat surfaces.	included in AdvancedReal3DUnit	BA-12657
RinglightHP	optional	Digital controllable, cable-free and white LED ring light for easy measurement of diverse interfaces and geometries. The ringlight is directly clamped on the objective of the measurement system via magnets. The wide illumination angle produces a bright and homogeneous object illumination. For compatibility with objectives please check the objective description.		BA-HWO-0106
Reflecting Block	✓			
45DegreeMirror	optional	45° mirror to measure the inner geometry of components.		BA-HWO-0112
SpacerPlate				
SpacerPlate-17	optional	Attachment for mounting on the x/y-stage of the Alicona measurement system for the higher positioning of samples. Height: 17.5mm		BA-HWO-0130
SpacerPlate-35	optional	Attachment for mounting on the x/y-stage of the Alicona measurement system for the higher positioning of samples. Height: 35mm		BA-HWO-0131
ReplicaIntroKit	optional	Dispensing gun, 2 cartridges brown á 75ml, 40 mixing tips		BA-HWO-0164
ReplicaMixingTips	optional	Mixing tips pink: 40 pieces.		BA-HWO-0165
Bar Code Scanner	optional	The scanner allows to select the type of component, reduces the complexity and the possibility of errors.		BA-HWO-0102

Software Components/Features

	FocusX	InfiniteFocus G6	µCMM	
MetMaX				**Additional Information**
MetMaX Including: Standard measurement modules (ProfileRoughness, SurfaceTexture, ProfileForm, VolumeMeasurement) Utilities (3D Editor, FormRemoval, .:) Notifications, Synthetic Dataset Generation) Alicona Inspect Free	✓	✓	✓	
MetMaX Xplore	✓	✓	✓	
MetMaX Remoting	✓	✓	✓	
PMI Profile Roughness (CAD)	✓	✓	✓	
One Click Roughness	✓	BA-SWO-0191	BA-SWO-0191	
CAD Deviation	BA-SWO-0190	✓	✓	In CAD Deviation Package
PMI Profile of a Surface	BA-SWO-0190	✓	✓	In CAD Deviation Package
Focus Probing	BA-SWO-0189	✓	✓	In Probing Package
Vertical Focus Probing	BA-SWO-0189	✓	✓	In Probing Package
Hole&Pin Functionality	BA-SWO-0189	✓	✓	In Probing Package
Contour Scanning		✓	✓	
MetMaX Automation	BA-SWO-0177	BA-SWO-0176 BA-SWO-0177	BA-SWO-0176 BA-SWO-0177	BA-SWO-0176: AutomationPackage BA-SWO-0177: MetMaX Automation
MetMaX Offline	BA-SWO-0153	BA-SWO-0153	BA-SWO-0153	
Alicona Inspect Professional	BA-SWO-0180	BA-SWO-0180	BA-SWO-0180	
DifferenceMeasurement	BA-SWO-0162 BA-SWO-0165	BA-SWO-0162 BA-SWO-0165	BA-SWO-0162 BA-SWO-0165	BA-SWO-0165: Real3DMeasurement
3DFormMeasurement	BA-SWO-0163 BA-SWO-0165	BA-SWO-0163 BA-SWO-0165	BA-SWO-0163 BA-SWO-0165	BA-SWO-0165: Real3DMeasurement
ContourMeasurement	BA-SWO-0164 BA-SWO-0165	BA-SWO-0164 BA-SWO-0165	BA-SWO-0164 BA-SWO-0165	BA-SWO-0165: Real3DMeasurement
Real3D Fusion	✓	✓	✓	
PMI Diameter			✓	
PMI Distance			✓	
PMI Datum		✓	✓	
PMI Edge	BA-SWO-0188	BA-SWO-0178	BA-SWO-0172	In EdgeMeasurementPackage
Automatic RoundToolAlignment	BA-SWO-0188	BA-SWO-0178		In EdgeMeasurementPackage
MicroGearMeasurement	BA-SWO-0138	BA-SWO-0138	BA-SWO-0138	

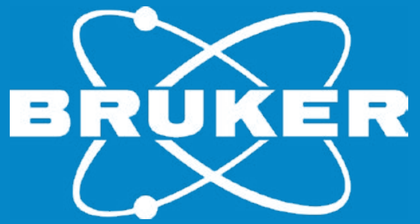
Software Components/Features

MicroGearMeasurement Professional	BA-SWO-0141	BA-SWO-0141	BA-SWO-0141	
MicroGearMeasurement Test License	BA-SWO-0142	BA-SWO-0142	BA-SWO-0142	

LaboratoryMeasurementModule ServiceSoftware				**Additional Information**
LaboratoryMeasurementModule including SingleField, ImageField, Automation, Remoting	✓	✓	✓	
Color Functionality	BA-SWO-0175	BA-SWO-0175	BA-SWO-0175	
Cooling Hole			As Customized Solution	
Real3D	With RotationUnit	With RotationUnit	With RotationUnit	
ServiceSoftware	✓	✓	✓	

EdgeMasterModule OrderManagementModule WearMeasurementModule				**Additional Information**
EdgeMeasurementPackage, including EdgeQuality, ToolRoughness, OrderManagementModule LITE	BA-SWO-0188	BA-SWO-0178	BA-SWO-0172	
OrderManagementModule	BA-SWO-0125	BA-SWO-0125	BA-SWO-0125	
OrderManagementModule Interface	BA-SWO-0171	BA-SWO-0171	BA-SWO-0171	
WearMeasurementModule	BA-SWO-0169	BA-SWO-0169	BA-SWO-0169	
Offline Edge Measurement Package	BA-SWO-0188	BA-SWO-0113	BA-SWO-0148	

Others				**Additional Information**
Automation Manager		BA-SWO-0176	BA-SWO-0176	In Automation Package Unlimited
Burr Measurement	BA-SWO-0140	BA-SWO-0140	BA-SWO-0140	Requires EdgeMeasurementPackage
Defect Measurement	In Development	In Development	In Development	
Surface AI Package	In Development	In Development	In Development	



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