NH Series

Point Autofocus Probe

3D Measuring Instrument

Mitaka

For information only.
Specifications subject to change without prior notice.

Distributor

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Mitaka

Point autofocus probe
Non-contact 3D measuring instrument

NH Series

Awards

- ***The METI Minister's Prize***
  The Fifth Monozukuri Nippon Grand Award
- ***The 10th Excellent New Technologies and Products Award for small and medium-sized enterprises***
  The Resona Foundation and Nikkan Kogyo Shimbun, Ltd.
- ***Excellent Product Award***
  JSME
- ***The Technical Achievement in Production Processing / Working Machines***
  JSME

Highest-end model with 1nm resolution
[Applications]
Shape measurement, inspection of aspherical lenses, light guide plates, molds, etc.

NH-3SPs

Measuring range (X, Y, Z) = 150 × 150 × 10 mm
Z = 130 mm (Optional)
Resolution(X, Y, Z) = 0.01 × 0.01 × 0.001 μm

Largest model with gate-type structure
[Applications]
Large and heavy precision molds

NH-5Ns

Measuring range (X, Y, Z) = 300 × 400 × 10 mm
Z = 130 mm (Optional)
Resolution (X, Y, Z) = 0.1 × 0.1 × 0.01 μm

Standard model which offers excellent functions and high-cost-performance

NH-3Ns

Measuring range (X, Y, Z) = 150 × 150 × 10 mm
Z = 110 mm (Optional)
Resolution (X, Y, Z) = 0.1 × 0.1 × 0.01 μm

Perfect solution for quality control of semiconductor products
[Applications]
8-inch wafer, lead frame, etc.

NH-4Ns

Measuring range (X, Y, Z) = 250 × 200 × 10 mm
Z = 110 mm (Optional)
Resolution (X, Y, Z) = 0.1 × 0.1 × 0.01 μm

Excellent model for measuring forms and evaluating optical characteristics

NH-3MAs

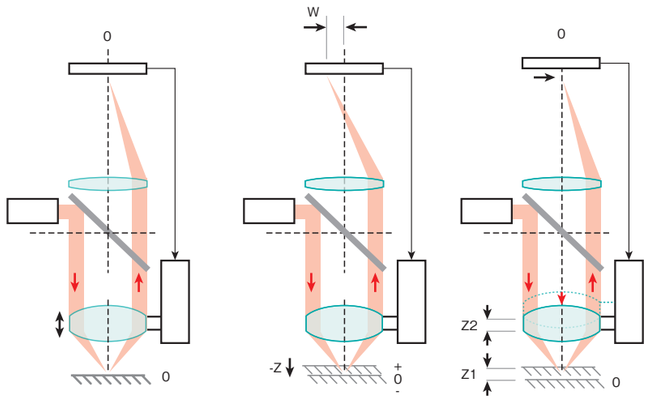
Measuring range (X, Y, Z) = 100 × 100 × 10 mm
Resolution (X, Y, Z) = 0.1 × 0.1 × 0.01 μm

ISO-approved measurement method

ISO 25178-605

Areal surface texture - non-contact 3D measuring instrument (point autofocus probe)

Measurement principle comformed to the ISO standard (ISO 25178-605) offers highly reliable data.



Principle of point autofocus instrument

The NH Series consists of an autofocus laser beam microscope (AF microscope) and a high precision XY scanning stage. In the figure above, the laser beam incorporated in the AF microscope passes through the objective (indicated by the red line) and forms a laser spot on the surface of the workpiece as a “probe”. The reflected laser beam from the workpiece surface passes through the objective again and forms an image on the autofocus sensor (AF sensor). The AF sensor detects the laser spot displacement in real time and adjusts the AF microscope back to the in-focus position. This measuring method, point autofocus profiling, is immune to the surface colors and reflectivity as the AF sensor detects the position of the laser spot.
In addition to the conventional index measurement mode, the scan autofocus measurement mode provides high speed measurement and high precision measurement.

ISO standards for areal surface texture measurement

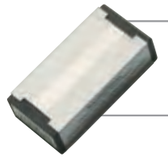
The autofocus method adopted into the NH series is based on a measurement principle that was proposed to ISO by a project team led by Mitaka Kohki in the domestic ISO committee. The method was named as “Point autofocus profiling” in 2008 and was officially standardized as ISO 25178-605 (Point autofocus probe) in February 2014.

■ Classification of areal surface texture measurement methods in ISO Standards

ISO 25178-6 : Classification of methods for measuring surface texture
- -601：Nominal characteristics of contact (stylus) instruments
- -602：Nominal characteristics of non-contact (confocal chromatic probe) instruments
- -603：Nominal characteristics of non-contact (phase-shifting interferometric microscopy) instruments
- -604：Nominal characteristics of non-contact (coherence scanning interferometry) instruments
- -605：Nominal characteristics of non-contact (point autofocus probe) instruments
- -606：Nominal characteristics of non-contact (focus variation) instruments
- -607：Nominal characteristics of non-contact (confocal microscopy) instruments

High correlation with international standards for roughness measurement

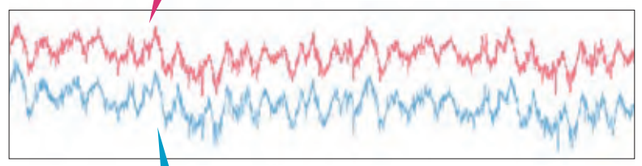
Point autofocus profiling (PAP) has a high correlation with roughness standards for stylus instruments and obtains highly reliable data.



■Roughness standard: TypeD1 (ISO5436-1)
■Calibration: PTB (Germany)
■Cutoff value (λc): 0.8 mm
■Measurement method: stylus
■Tip radius: 5 µm
■Evaluation lenght (ln): 4 mm

(Stylus: tip radius R = 5 µm)

PTB inspection sheet	Roughness parameters	PTB
	(Ra)	0.227 µm (± 3%)
	(Rz)	1.50 µm (± 4%)



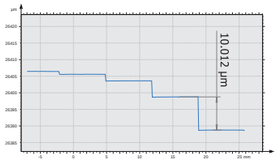
NH Series measurement result	Roughness parameters	NH-3SPs
	(Ra)	0.229 µm
	(Rz)	1.497 µm

(PAP: laser spot radius R = 0.5 µm)

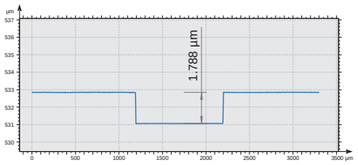
Measurement precision with different standards

Step height standards

■ Step master (Mitutoyo)
Specification: (10 ± 1.5) µm Measurement result: 10.012 µm
*Measuring instrument: NH-3SP



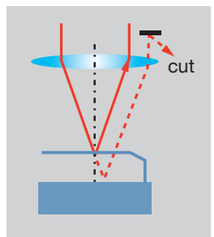
■ Step height standards (VLSI Standards)
Specification: (1.779 ± 0.011) µm Measurement result: 1.788 µm
*Measuring instrument: NH-3SP



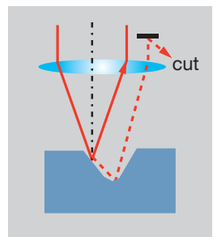
Unique optical system and measurement methods

Autofocus optical sytem cuts ghost and stray light

The autofocus optical system cuts out unnecessary light to achieve targetted measurement.



Transmissive surface



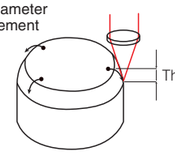
Secondary reflection of a Vee-groove

Edge detection function that measures xy coordinates of step heights

Many non-contact size measuring instruments use CCD cameras to detect edges by setting an image gradient as a threshold*. On the other hand, NH Series measures forms and detects edges of a workpiece by setting the ΔZ from the surface height as a threshold. Hence, NH Series is immune to color and reflectance ratio of a surface and capable of measuring a large area in high precision. This function is essential for measuring dimensions of high precision, high density and enlarging semiconductor products and optical devices.

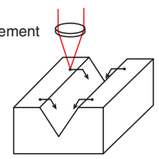
*Image processing software (Optional) offers this funciton

Outer diameter measurement



Detects more than 3 edges and measures each radius and the central coordinate

Width measurement



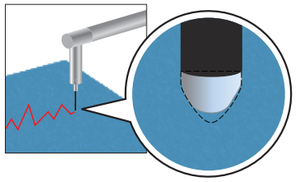
Detects more than 4 edges and measures each width and crossing angle

Perfect solution for measuring all kinds of surface topography in high precision

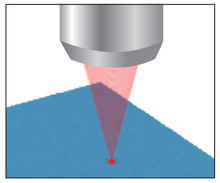
[Key features]

No damage with non-contact measurement

The laser probe (non-contact probe) offers “no stylus wear” which leads to non-destructive measurement of a workpiece surface. Repetitive form and areal surface texture measurements of a costly precision mold can be easily done.



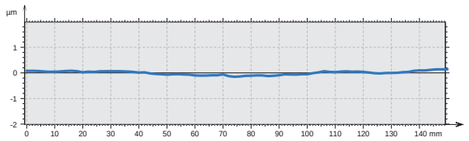
Damage to a stylus and workpieces



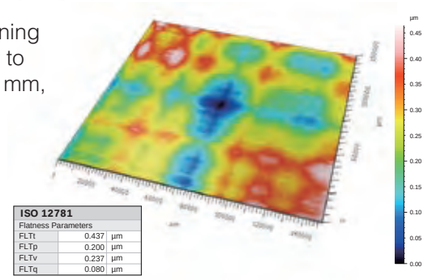
1 µm laser beam spot

Large measuring area and high precision measurement

The laser probe with a radius of 0.5 µm and the precision XY scanning stage directly measure an area of several tens of millimeters down to the sub-micrometer level (measuring range: XYZ = 150 x 150 x 10 mm, scale resolution: XY = 0.01 µm, Z = 0.001 µm (model: NH-3SPs))



Straightness of the XY scanning stage ± 0.107 µm
(Measuring length: 150 mm)

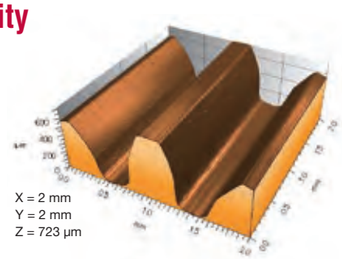


ISO 12781 Flatness Parameters		
FLTt	0.437	µm
FLTp	0.200	µm
FLTv	0.237	µm
FLTq	0.080	µm

Flatness of the XY scanning stage: 0.437 µm
(Measuring area: 150 × 150 mm)

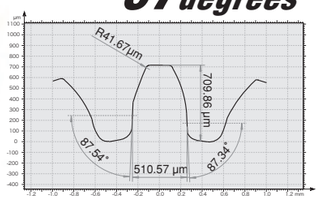
Excellent angle tracking capability

The highly sensitive autofocus sensor captures low levels of light reflected from the workpiece surface, allowing for the direct precision measurement of steep angles and step heights.



Small diameter gear (module 0.3)

Maximum measurable angle:
87 degrees



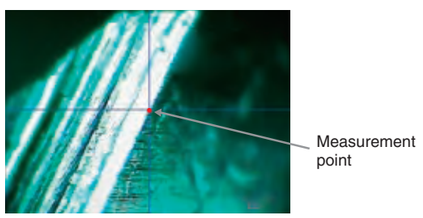
No influence of surface colors / reflectance

NH Series directly measures various types and materials of surfaces, such as coated glass with very low reflectance (approximately 0.5 %), mirror surfaces with reflectance of 90 % or greater, plastics, rubber, paper, thin films, etc.

Live camera image of the measurement point

The built-in CCD camera offers a live view of the laser beam spot. Image processing function* offers edge detection and circle measurement.

* Optional

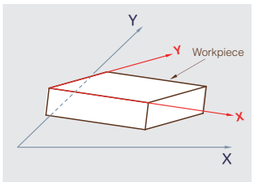


[Measurement functions]

Spatial coordinates

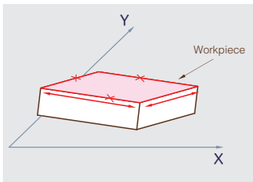
Auxiliary functions

NH Series has various spatial coordinate construction functions to assist workpiece-oriented measurement. These auxiliary functions offer pinpoint measurements for efficient quality control.



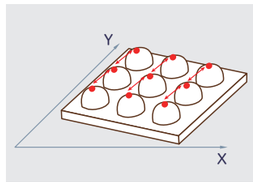
Alignment

Converts the absolute coordinate system of the instrument into the relative coordinate system of the workpice.



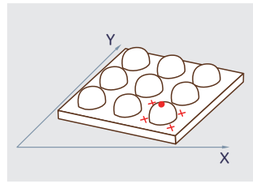
Reference plane creation

Creates a reference plane by measuring more than 3 heights (max. 300 points). Flatness can be calculated by measuring more than 10 heights.



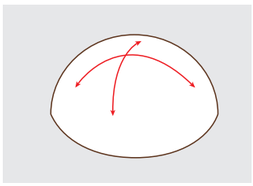
Point measurement

Measures heights of any line in an equal pitch.
[Application] Waviness and warpage measurements of a lead frame.



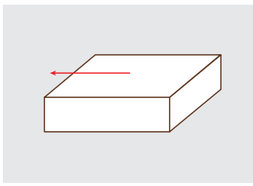
Height measurement

Obtains multi-points around the specified height position for a height measurement and calculates the average, max. and min. values.
[Application] Max. height measurement of BGA.



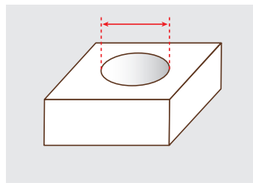
Curve

Measures the curvature either by measuring heights on two specified circles or cross measurement.



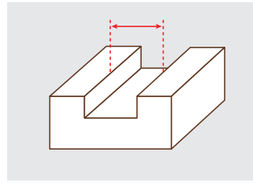
Edge

Detects an edge by setting a threshold value.



Circle

Detects the center point and the radius of a circle, a circular cylinder or a hole.



Width

Measures a width of a groove or a rectangular parallelepiped by defining two lines for specifying the width.

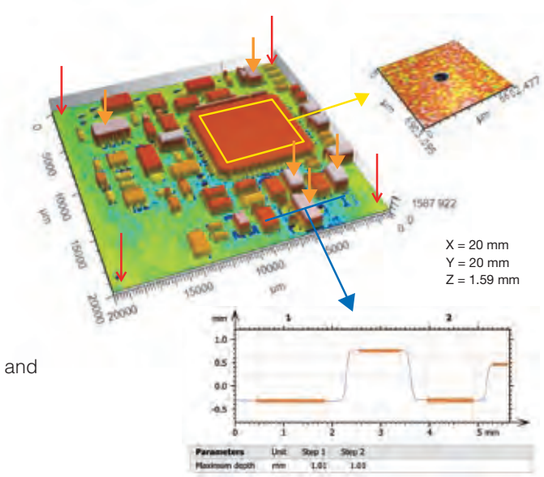
Application example

Macro measurement

Macro measurement offers automatic measurement and evaluation by linking image processing function*, spacial coordinate function and specified point measurment function of the point autofocus probe.

*Optional

1. Align the workpiece at the specified position
2. Measure the specified area for warpage evaluation
3. Measure the specified length for step height evaluation and carry out PASS / FAIL tests
4. Measure the heights of the specified positions

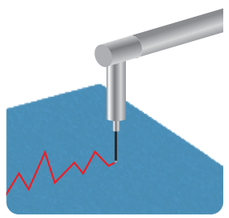


NH Series solves various measurement problems

[Comparison with other measurement methods]

Problem with contact probe

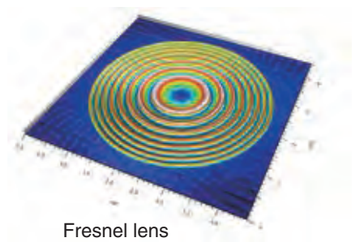
The stylus scratches the workpiece surface



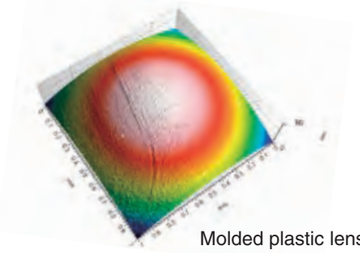
- △ Cannot measure soft and sticky workpiece
- △ Cannot accurately set the measurement position
- △ Stylus wears out

NH Series solution

Non-contact measurement preserves the workpiece surface



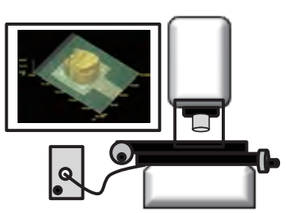
Fresnel lens



Molded plastic lens

Problem with laser microscope

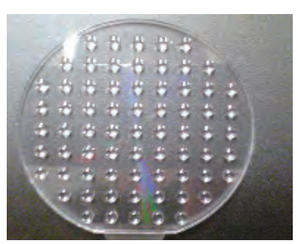
The measurement range is its filed of view



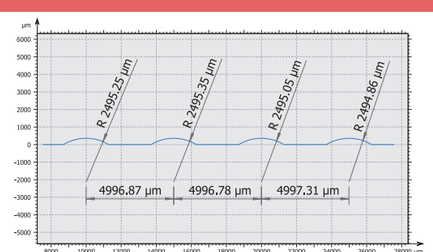
- △ Patching is necessary for large area measurement
- △ Cannot program automatic measurement

NH Series solution

Stage movable range is the measuring range which directly measures a large area



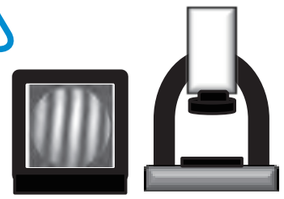
Array lens: pitch 5 mm



Pitch evaluation in the large area

Problem with interferometry

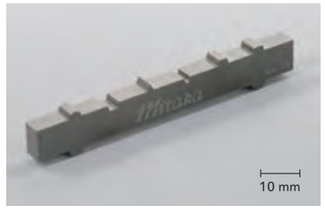
Unable to measure large form changes



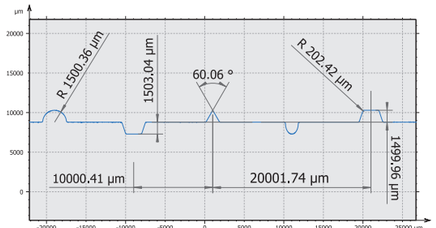
- △ Cannot measure slopes
- △ Only measures within the field of view
- △ Cannot measure warpage in the order of several millimeters

NH Series solution

Easily measures steep slopes and rough surfaces

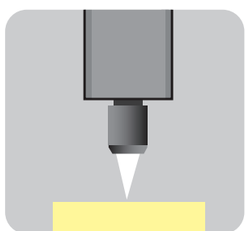


Contour reference material (EDM)



Problem with focus variation

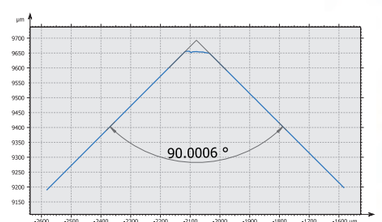
Unable to measure mirror surface



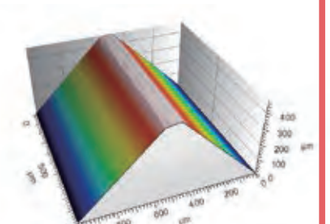
- △ Cannot meausre surface roughness of mirror-finished surfaces
- △ Surface treatments are necessary for transparant workpiece

NH Series solution

Directly measures mirror surfaces and transparant materials without surface treatments



Apex angle of a prism

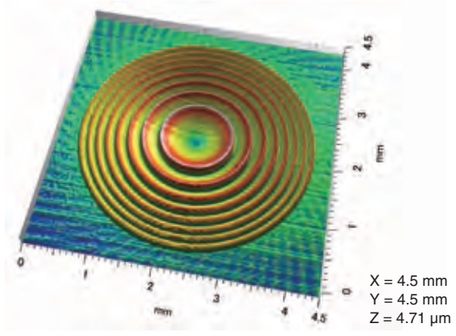


Perfect solution for measuring all kinds of surface topography

[Measurement examples]

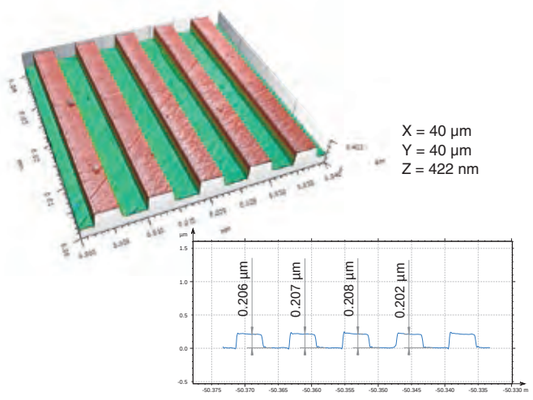
Fresnel lens

Precision measurment of transparant steep slopes



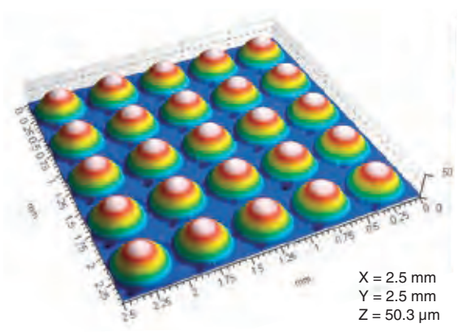
Grating

High speed measurement of sub-micrometer grooves in high precision



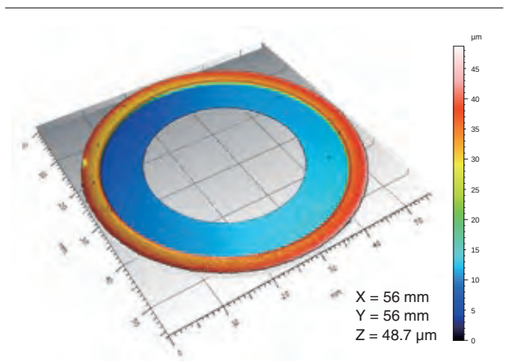
Microlens arrays

Precisely tracks irregular lens surface



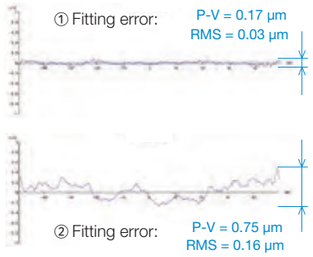
Dicing blade warpage

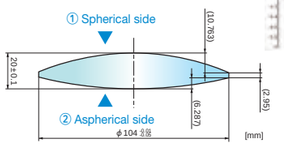
Doughnut measurement (mask measurement) offers automatic high-speed measurement



Large aspherical lens

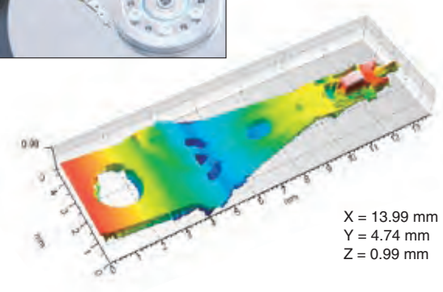
Direct measurement of a large area





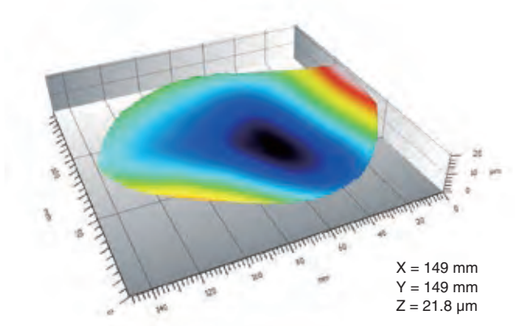
HDD head suspension

Waviness and warpage of delicate parts



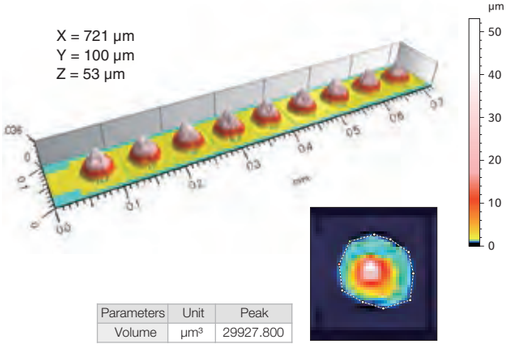
Warpage and waviness of wafer

High speed measurement of the entire warpage and waviness



BGA volume

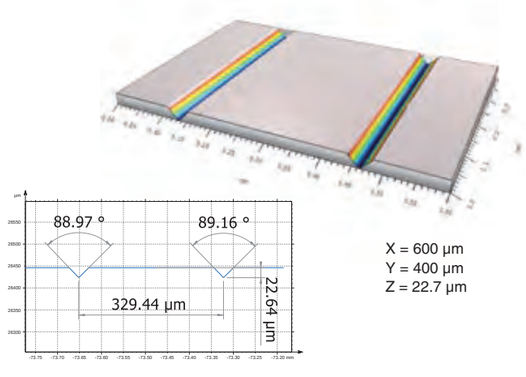
Volume evaluation from areal surface measurement result



Parameters	Unit	Peak
Volume	µm³	29927.800

Light guide panel

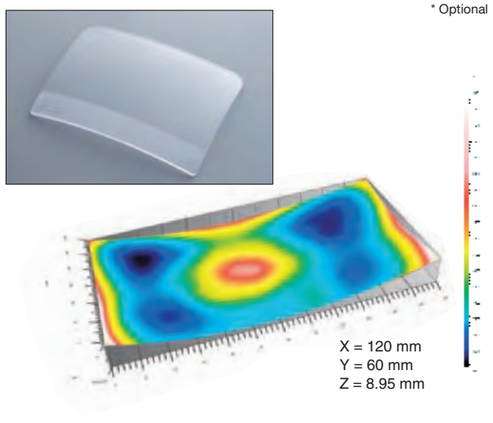
Vee-groove measurement of an optical component



HUD glass

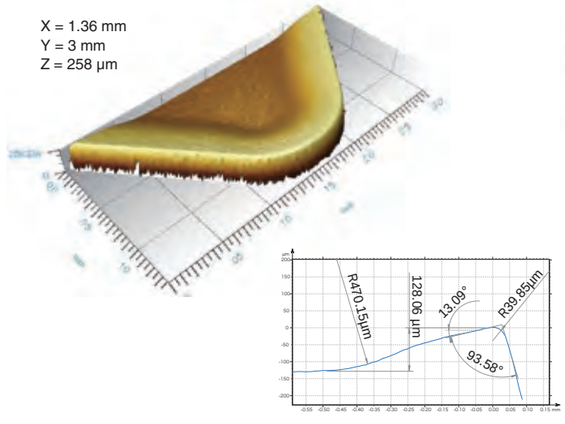
Free form grass surface measurement and CAD comparison*

* Optional



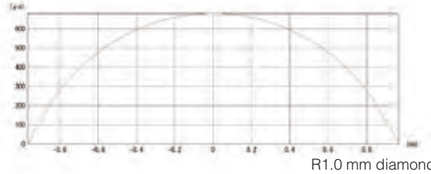
Tip of turning tool

High precision measurment of the entire form and fine area



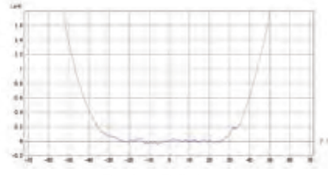
Diamond round cuttin tool

High precision measurement and comparison with the design values



R1.0 mm diamond turning tool

Form measuremet result



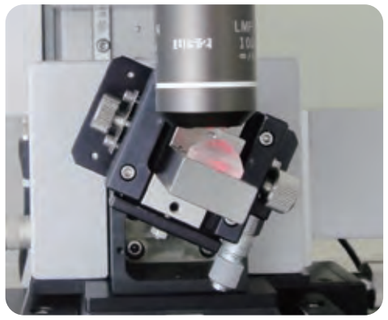
Design R fitting

Rotation stage mechanisms

High NA aspheric surface measuring device (SE stage)

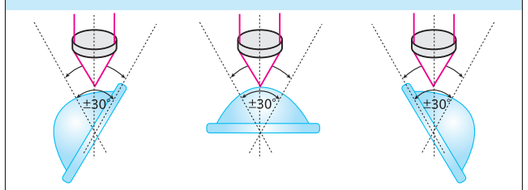
Stitching measurement techology enables sub-micrometer measurement of aspherical lens with the inclination angle greater than 60 degrees

NH series offers precision measurements with absolute accuracy of less than ± 0.1 µm at the inclination angle within ± 30°. For any high NA aspherical lens with the inclination angle greater than ± 30°, stitching measurement technology described in the figure below offers high-precision measurements up to ± 90°.



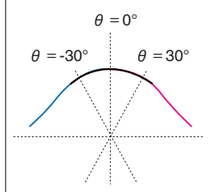
How to measure an inclination angle greater than ± 30°

① Individually measure effective measurable angles (± 30°)



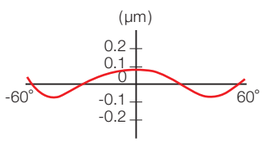
Rotating angle θ = 30° Rotating angle θ = 0° Rotating angle θ = -30°

② Data composition

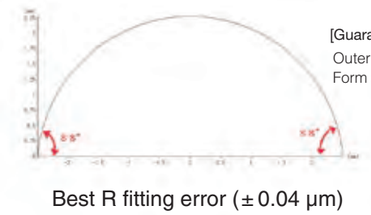


③ Aspheric surface fitting process

$$Z(X)=\frac{C\times X^2}{1+\sqrt{1-(K+1)\times C^2\times X^2}}+\sum_{i=1}^{20}Ai\times X^i$$



Evaluation result of a glass reference sphere



[Guaranteed accuracy]
Outer diameter: φ 5 mm ± 1 µm
Form deviation: ± 0.1 µm

Best R fitting error (± 0.04 µm)

Stitched data
(20° pitch with 9 data)

[Result]
Diameter: 5.0001 mm
Form deviation: ± 0.0415 µm

[Applications]

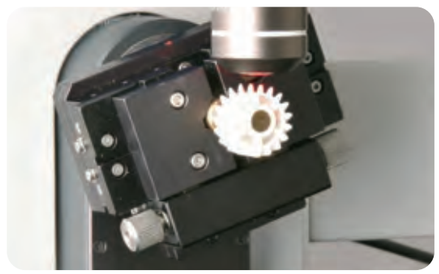
- Cell phone camera lens
- Digital camera lens
- DVD pickup lens
- Condenser lens
- Ball lens
- Microlens arrays
- Nose profile (tip) measurement of diamond cutting tool
- Optical fiber tip radius measurement
- Endoscope lens
- Aspherical lens molding dies

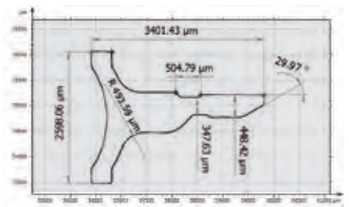
Entire circumference measuring device (EL stage)
Non-destructive, 360-degree contour and roughness measurements

The precision elevation stage (EL stage) does not requre centering of a workpiece for 360-degree entire circumference measurements. EL stage is a powerful tool for contour measurements of precision gears, punches for precision press dies, roundness measurements of ball lenses, surface roughness measurements of specific parts and quality control of precision parts.

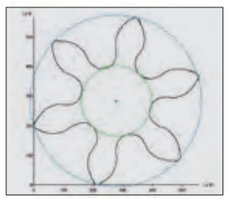
Measurement examples

- Precision gears
- Polished shafts
- Contour measurement of punches for precision press dies
- Roundness measurement of ball lenses





Micro punch



Precision gear

Image processing software

MitakaImager

Clear image with good repeatability

The high speed and high precision laser autofocus quickly obtains clear images with good repeatability. Precision size measurements can be done simultaneously.
(repeatability of line width measurement 3σ = 0.01 µm)*

Precision measurement

By linking the linear scale values of the XY scanning stage with the image coordinate values via Mitaka Imager, NH Series offers precision measurement in the entire movable range.

Applications of detected and evaluated data

Every image processing measurement data can be saved in CSV file format. Commercially available spread sheet software (MS Excel) easily loads the measurement data for statistical processing, generating reports, etc.

Enhanced automatic measurement

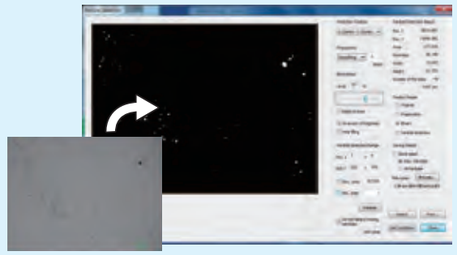
Mitaka Imager enhances teaching macro function of NH software:

1. Apply the gravity center positions of circle patterns obtained through particle detection function and / or the pattern position obtained through pattern maching function for reference points in alignment function
2. Quickly move the XY scanning stage to these detected positions

Mitaka Imager is equipped with various dynamic link functions.

Particle detection

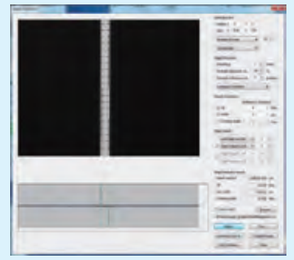
Particle detection measures positions, areas, widths, heights, circumferences and numbers of particles. The obtained data can be used for moving the XY scanning stage to the detected particles and for creating the alignment.



Edge detection

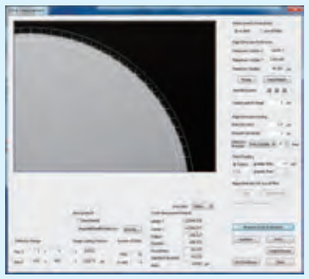
Edge detection measures line widths, groove widths, central coordinate, inclination, etc.

[Applications] Widths and heights of optical waveguide, gap measurement of various magnetic heads, width and depth measurements of vee-grooves, pattern widths of LCD and PDP, etc.



Circle measurement

Circle measurement offers inside and outside diameter at any Z positions in high precision and calculates position of center, radius, roundness and area. Also, by linking with the XY linear scalve values, a workpiece with a large diameter (out of field-of-view measurement) can be measured in high precision without lowering the magnification.



Pattern matching

Pattern matching registers and detects alignment markers, various patterns as model images. Also, it measures the inclination of the workpiece from the center of gravity of the detected patterns and automatically detects measurement position. This function is effective for extracting the target patterns from images with low gradation and irregular luminance.

[Application] Position displacement measurement of an optical element package.

*with scale marks of the standard scale

Microlens array form measuring and optical characteristic evaluation instrument

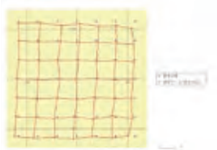
NH-3MAs

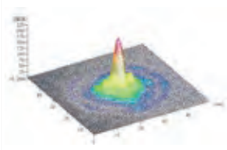
High precision image processing offers optical characteristics evaluations

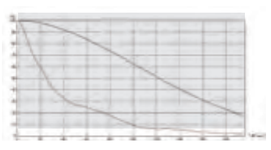
Functions

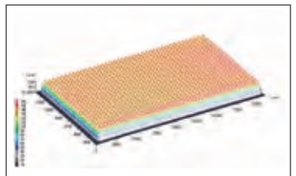
- Effective focal length
- Back focus
- Transmittance
- Focal position
- Focal depth
- MTF

Automatically measures microlens arrays (MLA)


Distortion aberration

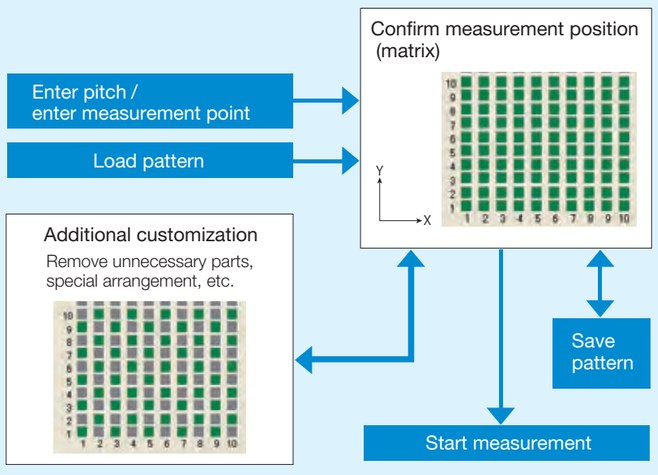

Spot profile


MTF

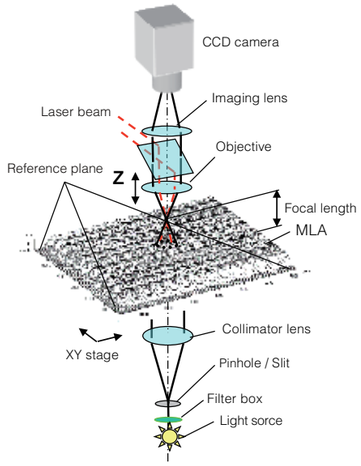

MLA in 3D

The right figure shows the measurement optical system. The focused image (the pinhole slit image) of the paralle laser beam is enlarged by the microscope lens and is captured by the CCD camera. The image processing evaluates this captured image on its optical characteristics. The specialized matrix measurement sofware offers automatic measurement of MLA by registering the array patterns.

How to creat Matrix measurement



Automatically measure and evaluate optical characteristics



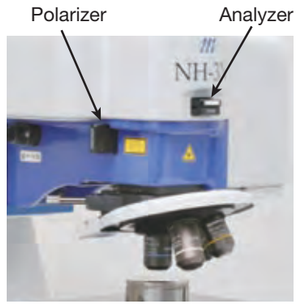
Measurement optical system

Measurement example

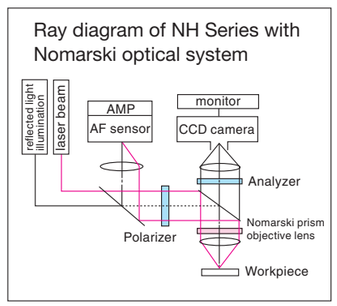
- MLA for LCD projector
- MLA and molds for optical communication systems
- Fly eye lens and molds
- Rod lens arrays
- CCD on chip lens
- Planar microlens for optical integrated circuit

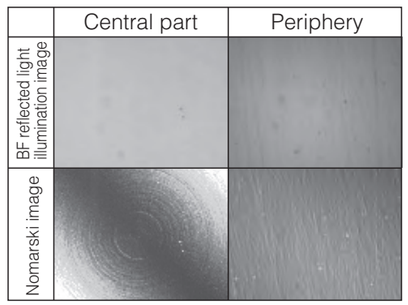
Nomarski interference contrast observation

NH microscope can load Nomarski interference contrast optical system. Nomarski optical system visualizes angstrom-level surface roughness and scratches that normal bright-field optical systems cannot visualize, and offers immediate quantitative measurements of roughness and step heights.



NH-3Ns loaded with Nomarski optical system



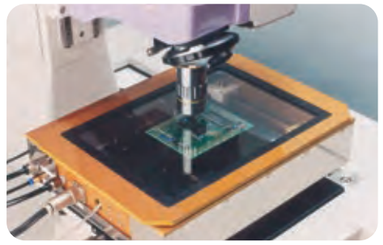


Custom-made modules Mitaka offers perfect solutions for special needs

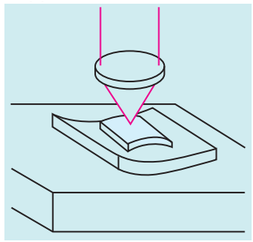
Thermostatic chamber

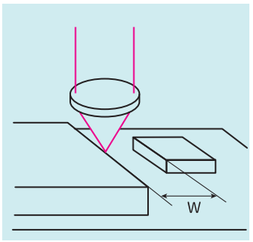
High precision measurement of a workpiece surface deformed by temperature change

NH Series offers quantitative analysis of thermal deformation of a workpiece surface in micrometer level by simply adding the precision thermostatic chamber (ceramic heater type / air heater type) on to its base plate. The thermostatic chamber continues to be active and well accepted in heat distortion measurement of precision pressed parts, environmental test of electronic componets and various research fields.


Thermostatic chamber (ceramic heater type)

● Applications


Warpage of a semiconductor device due to thermal stress



Size measurement of a surface mounting component under high temeprature environment

Custom-made stages

Wafer holder

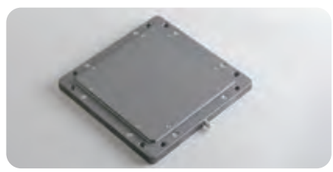
Precision wafer holder (air chuck type) specially designed for NH Series

Automatic θ stage

Enhances the operability of measurement and offers easy setup of workpieces

Porous vacuum stage

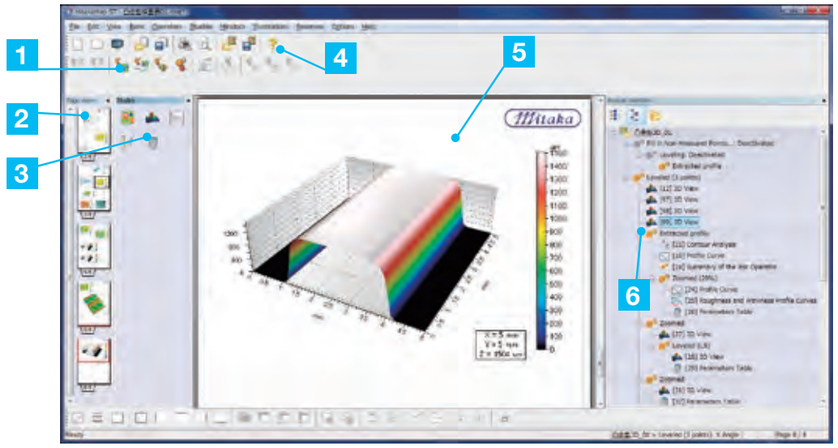
Snugly holds thin and delicate workpieces (i.e. thin film)



3D Surface Texture Analysis Software

MitakaMap

Interactive and user-friendly software complete with powerful online help. Advanced analysis is carried out by applying straightforward operations to measurement data.



1 Minidocs
Automatic analysis by insertion of pre-defined sequences of analysis steps

2 Page viewer
Fast navigation to every page in the analysis report

3 Studies
Icons for analytical studies applicable to the selected data set

4 Online help
Detailed descriptions of all studies and operators

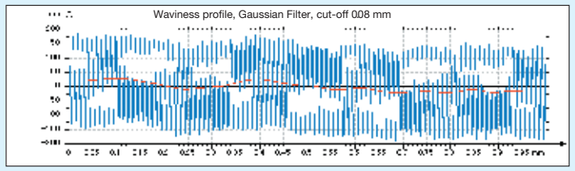
5 Document page
Current page in the analysis report

6 Analysis workflow
Tree view of all analysis steps in the report

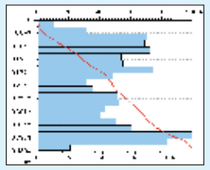
2D surface texture analysis

■ Primary profile (*P*-parameter) ■ Roughness (*R*-parameter) ■ Waviness (*W*-parameter)

Waviness profile, Gaussian Filter, cut-off 008 mm



Abbott-Firestone curve



Result: Roughness: *Ra* = 0.102, *Rz* = 0.331, *Rsm* = 10.0 (µm) Waviness: *Wz* = 0.041 (µm)

Standard parameter

(ISO 4278/JIS B 0601, ASME B46.1)

- Height (peak and valley) *Rz, Ra, Rp, Rv, Rc, Rq, Rsk, Rsq*
- Spacing: *Rsm, Rdq*
- Material ratio: *Rmr, Rdc*
- Peak: *Ppc*

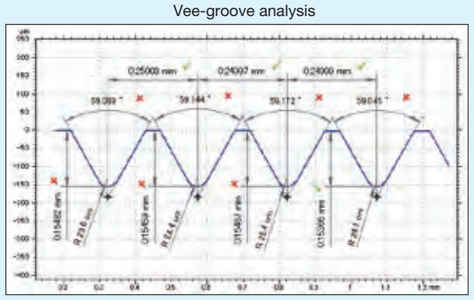
Extensive filter types ■ Gaussian filter ■ Double Gaussian filter ■ Spline filter ■ Robust Gaussian filter ■ 2RC-ISO ■ 2RC-PC

Profile analysis

Contour analysis

Automatic calculation of width, height, curvature and distance.
The tolerance limit function is a perfect solution for quality control of precision parts.

Vee-groove analysis



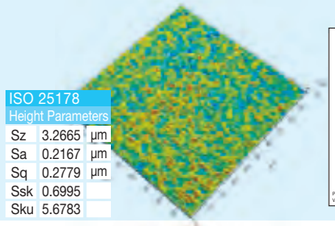
Areal surface texture analysis

Parameters defined in ISO 25178 are pre-installed.

Standard parameters

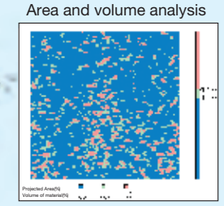
- Height: *Sz*, *Sa*, *Sp*, *SV*, *Sq*, *Ssk*, *Sku*, ISO 4278-2, ASME B46.1, EUR15178N
- Flatness: *FLT*t, *FLT*p, *FLT*v, *FLT*q (ISO 12781)

Surface after electrical discharge machining (laser spot radius R=0.5µm)



ISO 25178 Height Parameters		
Sz	3.2665	µm
Sa	0.2167	µm
Sq	0.2779	µm
Ssk	0.6995	
Sku	5.6783	

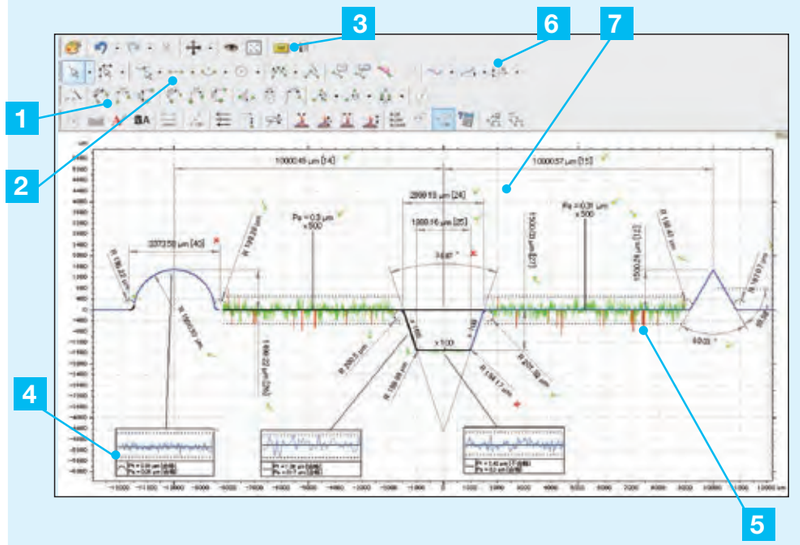
Area and volume analysis



Advanced Contour Module

Additional operators and studies for Contour Analysis (standard) and Advanced Contour Analysis (optional module) provide powerful dimensional and form deviation analysis

Example of form deviation analysis



1 Analysis tools
Tools for width, distance, height, radius, diameter, angle of intersection, horizontal angle, angle of an arc, etc.

2 Creating segments
Associating segments (lines and arcs) with a measured profile for dimensional analysis

3 DXF input
Loading CAD data (DXF) in order to compare the measured profile with design specifications

4 Residue tool
Graphical study of form deviations of straight lines and arcs (Pz,Pa,Pq, etc.,)

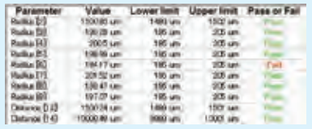
5 Deviation tool
Viewing magnified form deviation graphics and highlighting out of tolerance data points in red

6 Coordinate conversion tools
Changing leveling position and the origin

7 Analysis window
Analysis space for scaling a profile, positioning dimension lines and numeric results

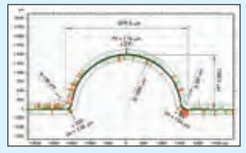
Batch processing of data

Tabulating the analysis results and automatically displaying deviations from pre-defined tolerances



CAD data comparison

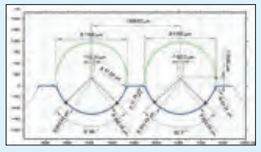
Loading CAD data in order to compare measured profiles with design specifications



Dimensional analysis of osculating circle

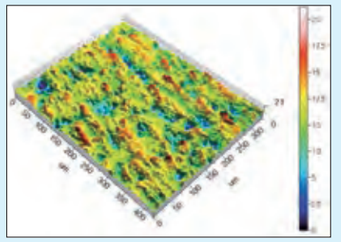
Analyzing contact points and center coordinates with respect to virtual circles

Circle creation menu



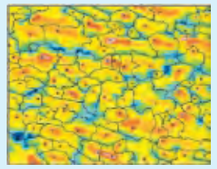
Motifs Analysis

Dividing surface asperity into ridge and course lines in order to extract local peaks and pits for detailed surface observations



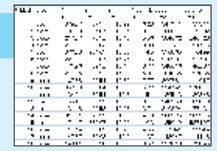
Visualization of motifs

Dividing peaks by course lines



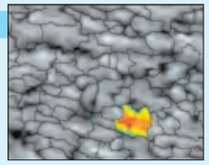
Batch output of analysis result

Numbering all motifs and exporting the full set of numerical results to a text file



Individual analysis

Visualizing an individual motif and generating its specific parameters



[Motif Parameters (Typical parameters)]

■ Number of motifs ■ Type of Motif ■ Height ■ Area ■ Volume ■ Extremum of XYZ
■ Nb of neighbors ■ Pitch (max/min/mean) ■ Coflatness ■ Perimeter ■ Mean diameter (max/min/mean)
■ Form factor ■ Aspect ratio ■ Roundness ■ Compactness ■ Orientation ■ Sphere radius

Height: 2.02 µm
Area: 0.004 mm^2
Volume: 867.8 $µm^3$

Specifications

[Standard]

Specificaitons \ Model		NH-3SPs	NH-3Ns	NH-4Ns	NH-5Ns	NH-3MAs
Microscope	Observation optical system	Infinity-corrected (f = 180 mm)	Infinity-corrected (f = 100 mm)	Infinity-corrected (f = 100 mm)	Infinity-corrected (f = 180 mm)	Infinity-corrected (f = 180 mm)
	Objective lens	10 × (NA = 0.3, WD = 11 mm) 20 × (NA = 0.4, WD = 12 mm) 50 × (NA = 0.5, WD = 10.6 mm) 100 × (NA = 0.8, WD = 3.4 mm)				
	Revolving nosepiece	Motorized quintuple				
	CCD camera	380,000-pixel color CCD camera (optional: 1,450,000-pixel color CCD camera, black/white CCD camera, etc.)				
	Illumination	BF Reflected light illumination device				
Measuring range	X	150 mm	150 mm	250 mm	300 mm	100 mm
	Y	150 mm	150 mm	200 mm	400 mm	100 mm
	Z	120 mm	100 mm	100 mm	120 mm	100 mm
	AF*1	10 mm (optional: 15 mm, 20 mm)				
Positioning resolution	X	0.01 µm	0.1 µm			
	Y	0.01 µm	0.1 µm			
	Z1 (AF)	0.001 µm	0.01 µm			
	Z2 (Positioning)	0.1 µm				
Accuracy (L=length(mm))	X, Y scales	(0.5 + 2.5L / 1000) µm	(2 + 4L / 1000) µm			
	Z1 (AF) scale	(0.1 + 0.3L / 10) µm	(0.3 + 0.5L / 10) µm			
	Z2 (Positioning) no scale	(3 + L / 10) µm				
	Z2 (Positioning) with scale	(1 + 2L / 120) µm	(2 + 3L / 100) µm	(2 + 3L / 100) µm	(2 + 3L / 120) µm	(2 + 3L / 100) µm
Measurement repeatability (AF)		σ = 0.01 µm	σ =0.03µm			
Autofocus	Laser spot diameter	100×: approx. 1 µm 50×: approx. 2 µm 20×: approx. 4 µm 10×: approx. 15 µm				
	Laser	Semiconductor laser O/P:1 mW (MAX) Wavelength: 635 nm Class 2 IEC 60825-1:2014				
Other	Base plate size (W × D)	284 × 240 mm	244 × 240 mm	364 × 244 mm	400 × 480 mm	244 × 240 mm
	Max. workpiece height	125 mm	105 mm	105 mm	120 mm	105 mm
	Max. workpiece weight	12 kg			100 kg	12 kg
	Instrument size (W × D × H)*2	1550 × 920 × 1610 mm	1550 × 900 × 1400 mm	1660 × 970 × 1400 mm	2100 × 1420 × 1720 mm	1550 × 900 × 1400 mm
	Instrument weight	320 kg	210 kg	250 kg	1500 kg	220 kg
	Power consumption	700W(100V7A)			1 kW (100V10A)	700 W (100V7A)
Special vibration isolator		Air spring (pressure supply: 5 kgf / cm²)				
Control unit		XY scanning stage control unit, control computer, PC rack				
Standard software		Alignment function, reference plane creation function, height measurement, 2D / 3D measurements and evaluation, roughness measurement, point measurement, 2D size evaluation, teaching macro funciton (creation and execution), image capture (380,000-pixel)				

[Options] Separate concultations are required

● ···· Standard ○ ···· Optional

Specificaitons \ Model		NH-3Ns	NH-3MAs	NH-3SP	NH-4Ns	NH-5Ns
Hardware	Transmission stage and light device	○	●	○	○	—
	Rotation stage	○	○	○	○	○
Safety measures	Thermostatic cover	○	○	●	○	○
	Emergency stop button	○	○	●	○	●
	Interlock mechanism	○	○	○	○	○
Software	Aspherical form evaluation	○	○	○	○	○
	Optical flat correction	○	○	●	○	○
	Optical characteristic evaluation	○*3	●	○ *3	○ *3	—
	Image processing (Mitaka Imager)*4	○	●380,000 pixel	○	○	○
Special software	Vector evaluation, 3D dividing evaluation, matrix measurement, flyeye lens measurement, 3D mask measurement, drawing print-out, BAR creation, form deviation evatluation, coplanarity evaluation, image evaluation (SurgtopEye / WinROOF / DynamicEye), MitakaMap, focus depth measurement*5 MTF evaluation*5					
Other	Objective lenses (5×, 50×: NA = 0.35, W.D. = 18 mm, 100×: NA = 0.95 W.D. = 0.35 mm, etc.), wafer holder, 6-inch automatic θ stage, magnification optical system (f = 180 mm), Nomarski optics, thermostatic chamber, infrared transmission observation, printer					

*1 AF in the above table refers to "autofocus" axis. AF axis has a linear scale.

*2 Instrument size includes the PC rack.

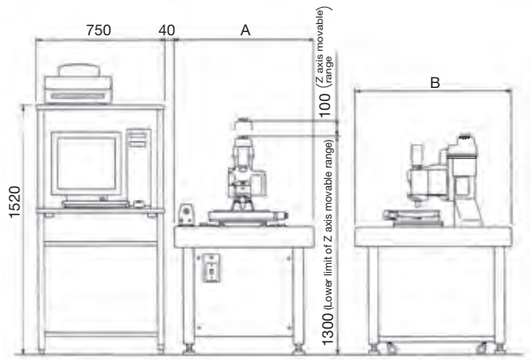
*3 Transmission stage and light device / 380,000-pixel image processing software are necessary.

*4 Either 380,000-pixel / 1,450,000-pixcel must be selected for Mitaka Imager (Imaging processing software). (Different CCD camera for different pixels) (Image capture software is included as standard software)

*5 The special software for NH-3MAs and optical characteristic evaluation.

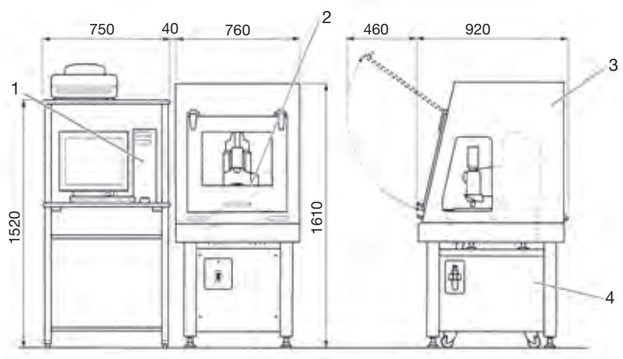
Outline drawing Unit: mm

NH-3Ns, NH-4Ns, NH-3MAs



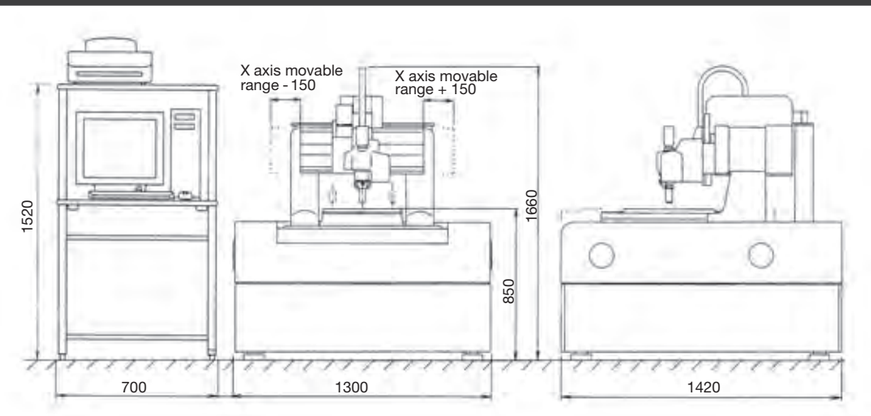
	A	B
NH-3Ns	760	900
NH-4Ns	820	970
NH-3MAs	760	900

NH-3SPs

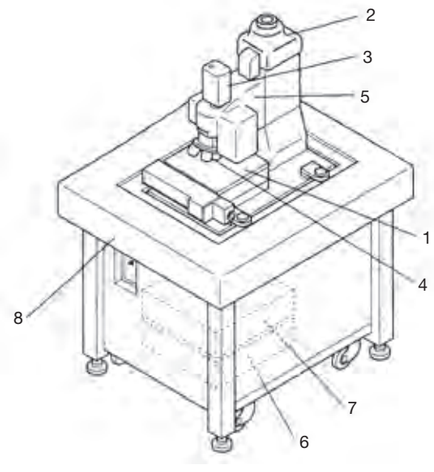


1	Control computer
2	Main body
3	Thermostatic cover
4	Air spring vibration isolator

NH-5Ns



NH-3Ns・System diagram



1	Motorized XY scanning stage
2	Z axis stage
3	CCD camera
4	Objective lenses
5	AF microscope
6	XYZ stage driver
7	AF controller
8	Special vibration isolator