KEYENCE

3D Surface Profiler

NEW VK-X3000

Nanometer, Micrometer, and Millimeter Measurements in 1 System

3D Surface Profiler
NEW VK-X3000

Triple scan approach — Surpassing conventional optical profilers

Measure targets ranging from nanometers to micrometers to millimeters

Triple scan method WORLD'S FIRST

Capitalize on three different scanning methods in a single device: laser confocal, focus variation, and white light interferometry. Selecting the best scanning method for the target material, shape, and measurement range ensures high-accuracy measurement on virtually any high-precision part.

All-in-one measurement system for in-depth analysis

292 different analysis tools

Get more than simple height and dimension measurement from conventional measurement software with a wide variety of analysis tools incorporated into an easy-to-use software interface. Perform powerful analysis using batch processing and templating.

Optical profiler basics

3D Surface Profiler

NEW VK-X3000

History of the VK Series

Since 1995

VF-7500

Laser confocal

VK-8500

Laser confocal

VK-9500

Laser confocal

VK-9700

Laser confocal

Single Measurement Principle

Observation

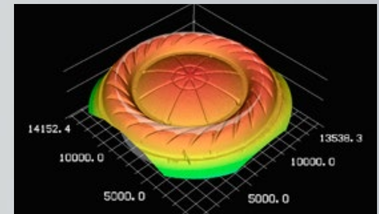
Extensive magnification coverage, ranging from optical microscopes to SEMs

- Magnification up to 28,800×
- Automatic focusing
- Observe any material

Measurement

Instant, non-contact surface scanning

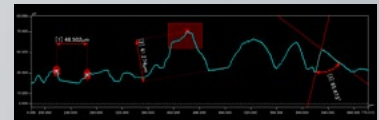
- No target damage
- Accurate nano-level measurement
- Compatible with any shape or material



Analysis

Unprecedented surface characterization

- Quantification of even the most detailed shapes
- Differentiate surfaces easily
- Roughness analysis



VK-X100

Laser confocal

VK-X250

Laser confocal

VK-X1000

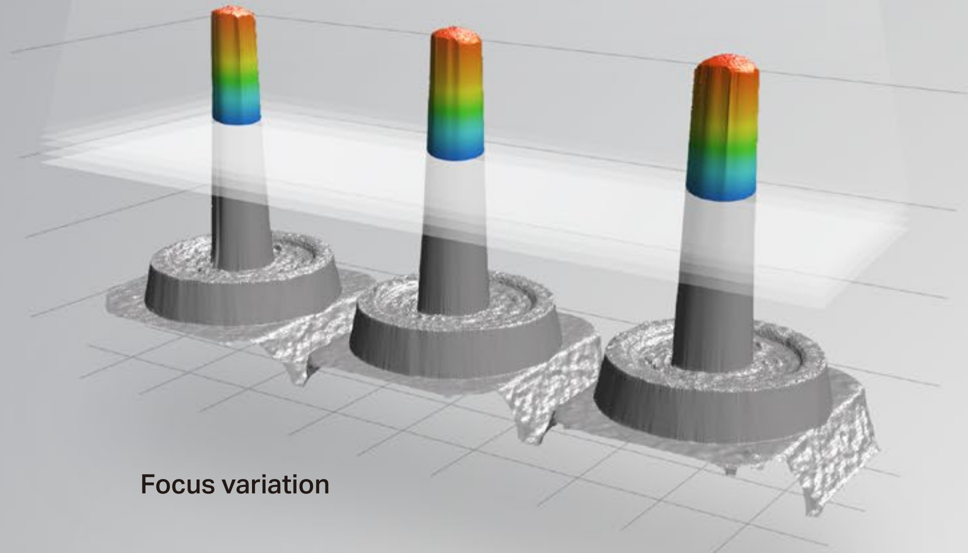
Dual

Laser confocal
Focus variation

NEW **VK-X3000**

Triple

Laser confocal
Focus variation
White light interferometry

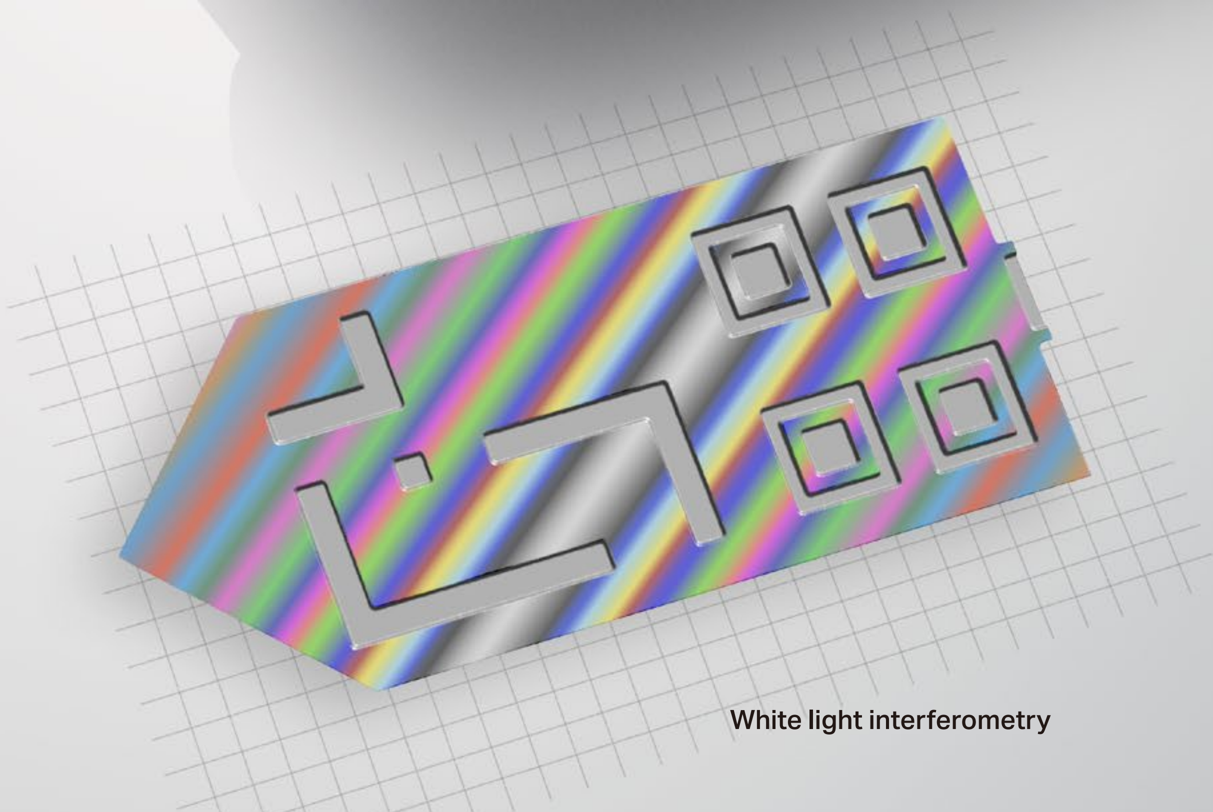


Focus variation

WORLD'S FIRST

Nanometer, micrometer, and millimeter resolutions in one unit

Laser confocal



White light interferometry

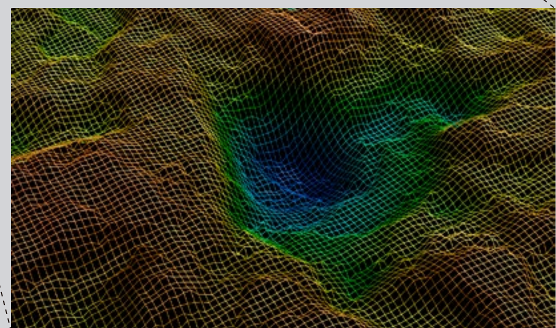
Triple scan approach for outstanding measurement performance

High-magnification, high-resolution scanning

High-accuracy observation of detailed surfaces

Accurately capture minute roughness conditions impossible to see with the naked eye in extremely high detail at magnifications up to 28,800×.

Blasted metal surface (1000×)

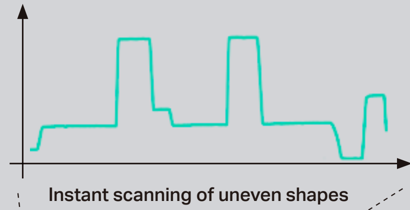


Extremely dense data set

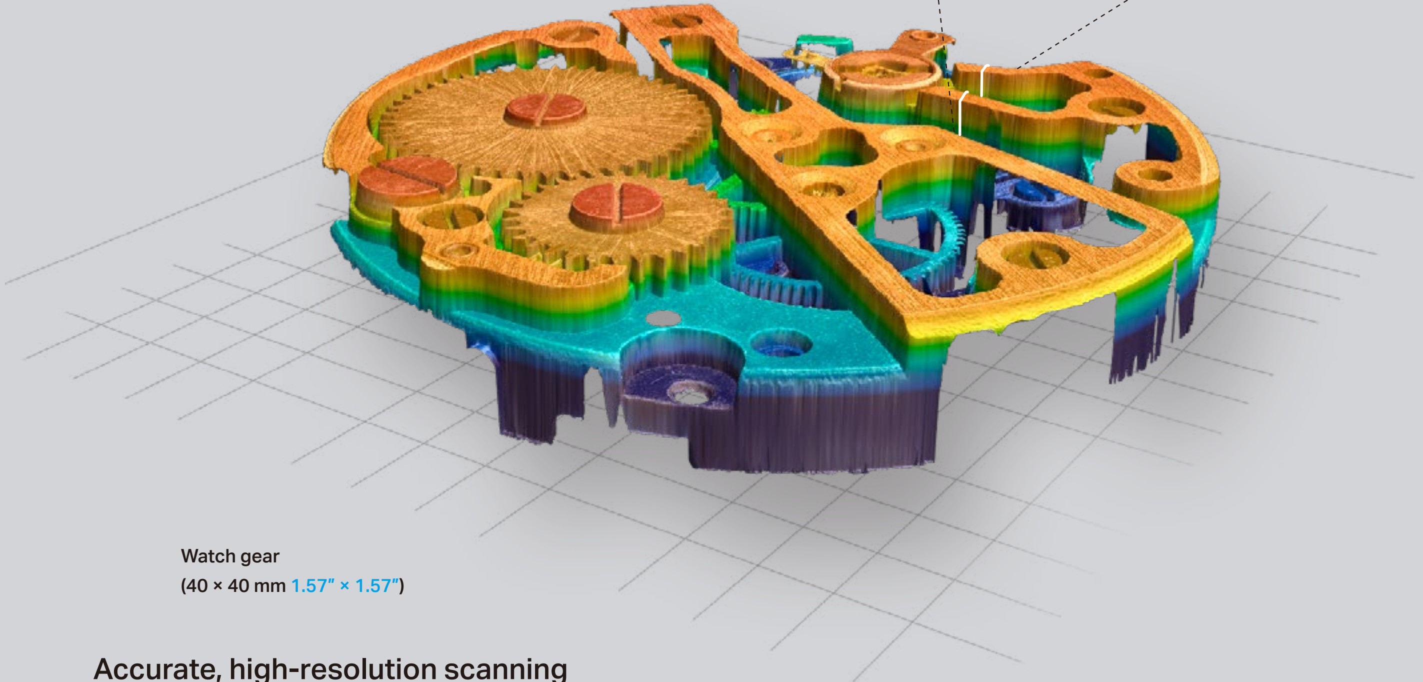
Instant measurement over large areas

Wide-area surface analysis

Instantly scan areas as large as 50 × 50 mm 1.97" × 1.97", even for targets with large height differences, for quick analysis of both the overall shape and specific areas.



Instant scanning of uneven shapes

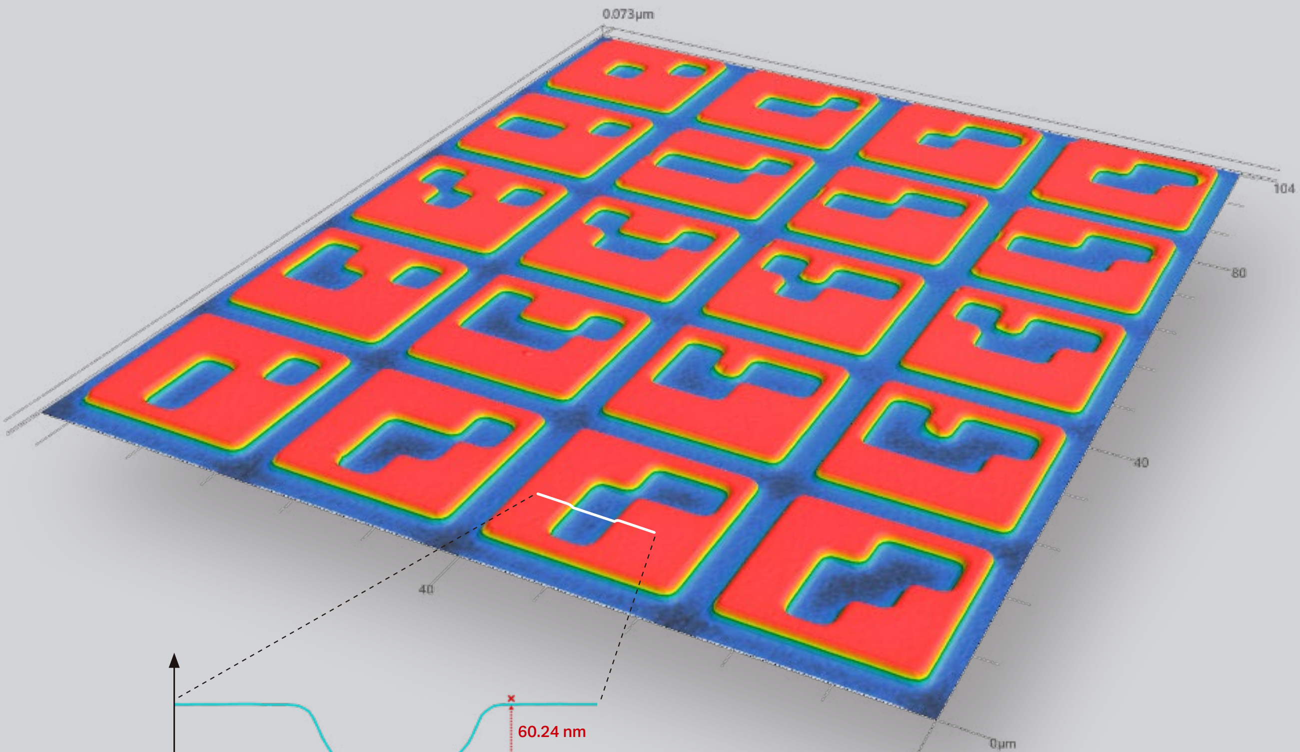


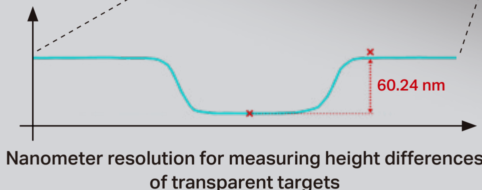
Watch gear
(40 × 40 mm 1.57" × 1.57")

Accurate, high-resolution scanning

Easy measurement of difficult materials

Capture detailed shape variation with 0.01 nm height resolution, even on transparent and mirrored surfaces.





Nanometer resolution for measuring height differences of transparent targets

Wafer micropattern (2500×)

Unmatched data integrity

Conventional system

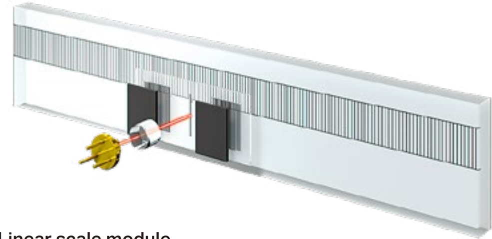
VK-X3000

Advanced technology for stable nanometer-level measurement

Assured measurement accuracy

0.1 nm linear scale NEW

The built-in ultra-high-accuracy linear scale recognizes the Z-position of the objective lens at a high resolution of 0.1 nm, making it possible to detect even minute surface projections and depressions. This ensures measurement results are based on a traceability system that complies with national standards.



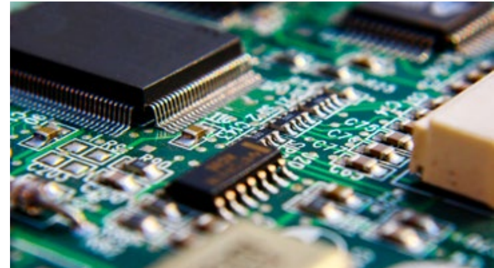
Linear scale module

This module uses two scales and a length measurement sensor to convert motion and displacement into electrical signals that can be output as dimensions.

High speed scanning

Area scanning at 125 Hz

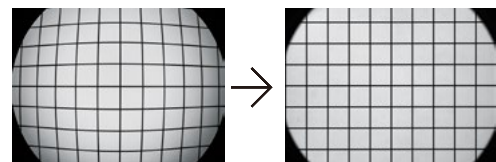
Through an increased focus on sensing technology, KEYENCE has further improved its lineup of X- and Y-axis scanners for even greater measurement performance. Take advantage of surface measurements at 125 Hz with superior accuracy or line measurements at up to 7900 Hz when only values and waveforms are needed in a hurry.



Optimized optics to eliminate aberration

Telecentric lens

The VK-X3000's telecentric lens minimizes distortion around the screen edges for high-accuracy measurement throughout the entire field of view. The ability to capture the true shape and size of a target ensures high measurement accuracy no matter where the target is placed.



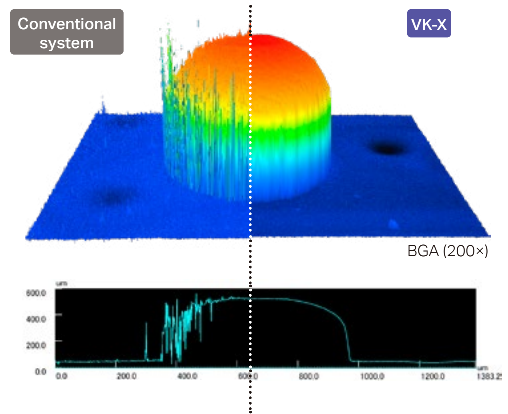
Normal lens — Edge distortion

VK-X lens — Minimal edge distortion

Capture raw data with greater reliability

16-bit sensing with ultra-sensitive photomultipliers

Laser microscopes capture and measure reflected light, so how the laser light is received is essential. The VK-X employs a photomultiplier as the laser-receiving element to achieve high-resolution 16-bit sensing.

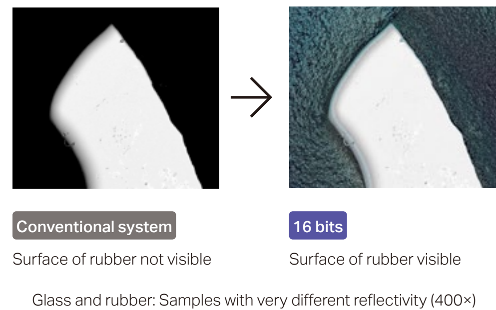


BGA (200×)

Accurate reading of composite materials with varying reflectivity

16-bit (65,536-shade) processing

Utilizing 16-bit (65,536-shade) processing, the VK-X is capable of distinguishing different colors and mixed light and dark areas that proved difficult with conventional systems.



Surface of rubber not visible

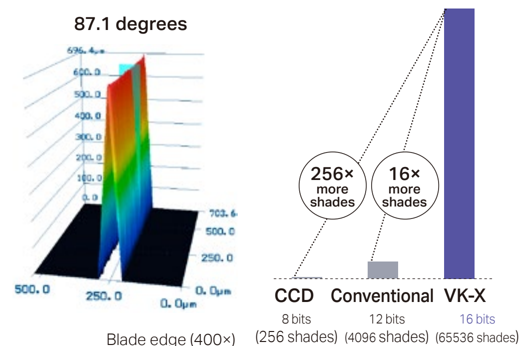
Surface of rubber visible

Glass and rubber: Samples with very different reflectivity (400×)

Measure steep angles accurately

16 times the dynamic range of conventional models

Receiving both weak laser reflections and strong laser reflections at the same time enables processing with 16 times greater sensitivity than conventional laser microscopes. The increased dynamic range makes it possible for the VK-X to provide accurate measurement for samples with steep angles or complicated shapes, as well as at low magnifications.

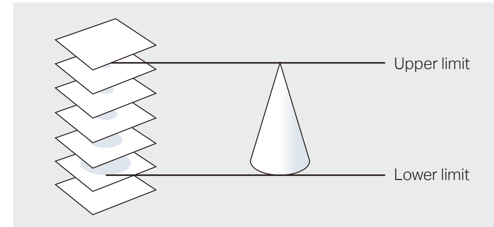


Blade edge (400×)

Automatic adjustment of scanning range

Upper/lower limit configuration

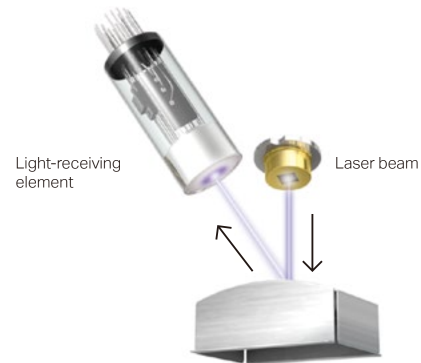
The focal point is determined by the intensity of the received light. From there, the lens moves in the lower limit direction, and the point at which the received light intensity is less than the detection limit is set as the lower limit. The lens then moves upward, and the point at which the received light intensity again becomes less than the detection limit is set as the upper limit. This method of determining and setting the upper and lower limits for a target makes it easy for anyone to set the target and prevents setting variations between users.



Instant focus adjustment with automatic focal point detection

Laser auto focus

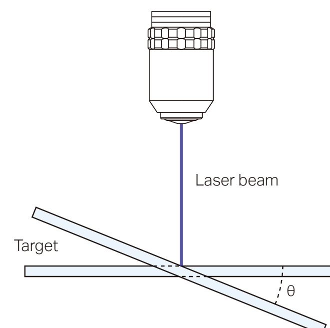
One drawback of conventional interference lenses is the difficulty in focusing using the observation screen due to the low interference signal for low-reflectivity targets. The new fast-scanning laser and high-sensitivity detector instantly determine the focal position for automatic Z-direction adjustment.



Easy tilt adjustment for interferometry

Zeroing function NEW

Adjusting the tilt of a target using a conventional interferometer requires visual checking of the stripe pattern and then readjusting as necessary until level. However, it is difficult to determine whether the target is truly level because the optimal pattern for the particular target cannot be known in advance.
The zeroing support function solves this problem by detecting the target tilt angle and automatically calculating the correction angle for interference stripe adjustment. This allows users to determine the adjustment amount before starting operation, ensuring easy, stable, and quick adjustment.



AI-Scan for reliable, fully automated measurement

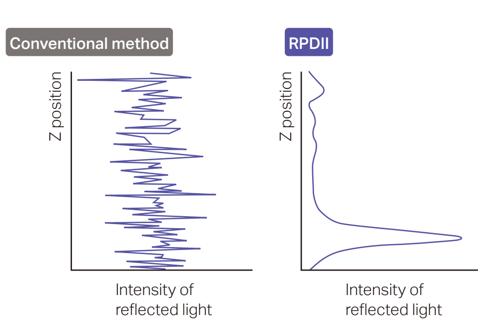
Place-and-click measurement

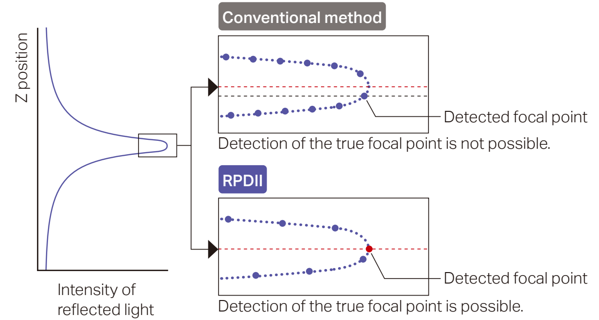
Start Measurement

Accurate results regardless of user, every time

Reliable detection of reflected light

RPDII algorithm



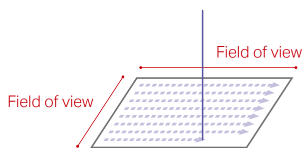


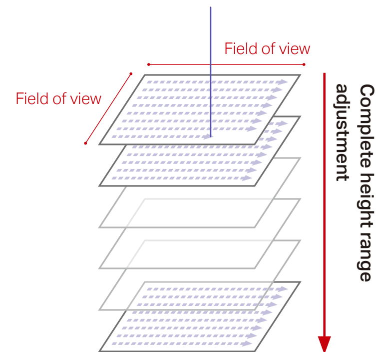
The updated light-receiving element and algorithm help reduce noise while also producing accurate profile curve calculations even in areas that poorly reflect light or with low-magnification lenses.

The peak position—the point of strongest reflected light intensity along the Z-I profile curve—can be accurately determined using the RPDII algorithm, so users always get correct data.

Automatic light intensity adjustment

AAGII algorithm (AAG = Advanced Auto Gain)



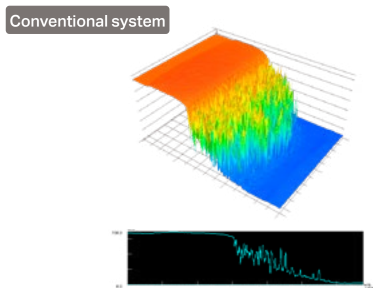


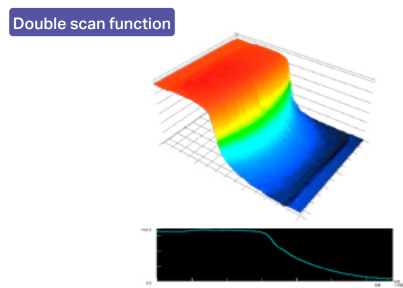
With conventional models, laser sensitivity adjustment is performed at a defined height, making it impossible to determine the ideal contrast settings and thereby making accurate scanning impossible. Quickly and accurately setting the received-light sensitivity is also difficult due to variations in the reflection intensity between focal points and field-of-view positions of different materials and shapes.

AAGII quickly detects laser reflections at the specified height range and sets the sensitivity to the ideal level for the entire range. The algorithm lowers the laser intensity to avoid glare within the range and then increases the intensity again to the received light intensity limit. This makes it possible to obtain an accurate 3D scan with minimal noise.

Two different scanning conditions for complex shape measurements

Double scan



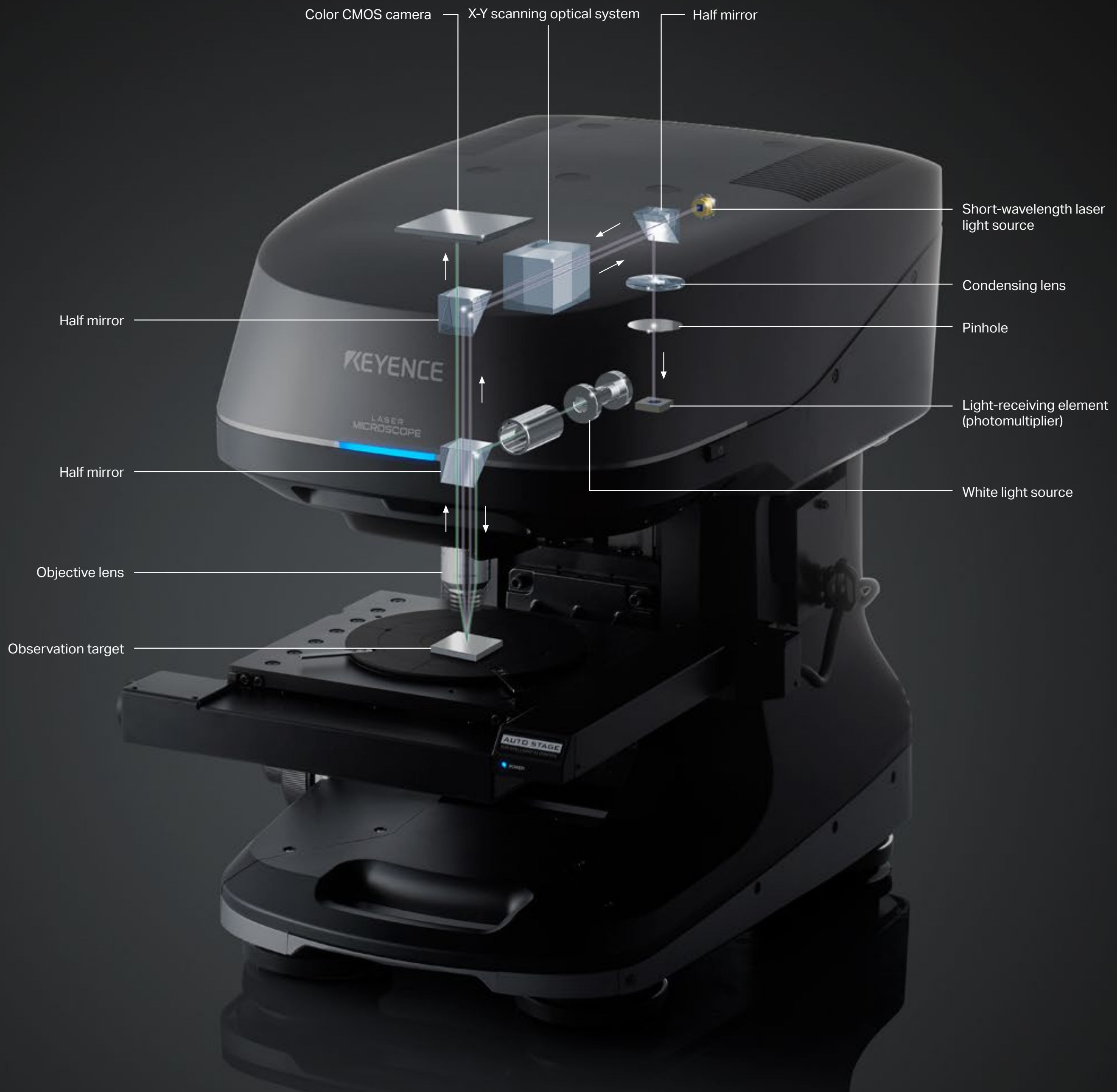


Solder (100×)

With a single scan, targets with significantly different shapes or materials with different reflectivity make it difficult to optimize the settings for the overall target, preventing successful measurement in some instances.

The double scan function reconfigures the conditions and performs another scan if the reflected light intensity is unstable. If the surface cannot be measured accurately with a single scan, the target is automatically scanned again to generate accurate results.

Triple scan measurement principle



Laser-based detection of reflected light intensity and height

A laser provides a single-point light source that can scan the field of view using the X-Y scanning optical system to detect the reflected light of each pixel with the light-receiving element. The objective lens is moved along the Z-axis, and the reflected light intensity at each Z-axis position is obtained for each pixel through repeated scans. The Z-axis position with the highest reflected light intensity is set as the focal point for detecting the height information and reflected light intensity. This allows the capture of completely focused, ultra-depth light intensity images and height information images.

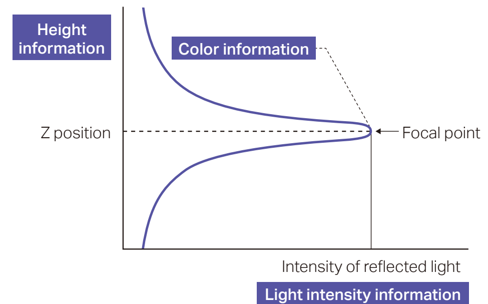
CMOS camera for obtaining color information

The reflected light from the white light source is detected by the color CMOS camera. The system acquires color information for each pixel at the focal point detected by the laser light source, enabling true-to-life color observation that is impossible with SEM systems.

Laser confocal

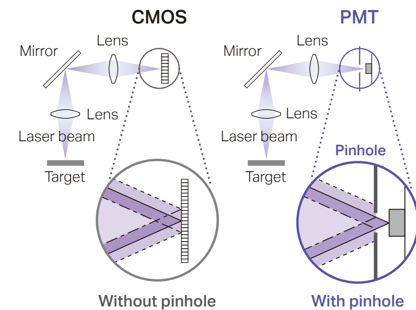
Z-position detection based on reflected light intensity

For each pixel within the area (1024 × 768 pixels), the Z-axis position with the highest reflected light intensity (the focal point, as shown to the right) is determined, and the reflected light intensity and color information for that point is obtained. This information is used to create three types of image data: color, light intensity, and height.



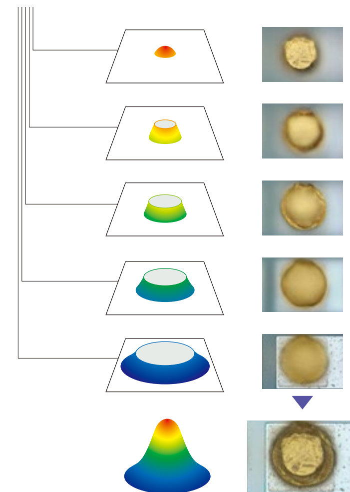
Pinhole for eliminating ambient light

Due to the influence of out-of-focus light and ambient light from neighboring pixels, high-accuracy measurement and high-resolution observation are difficult with a quasi-confocal optical system using CMOS light-receiving elements and other similar systems. A laser confocal optical system, however, eliminates out-of-focus light to achieve high-accuracy measurement and high-resolution observation.



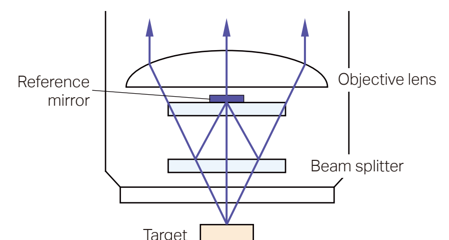
Focus variation

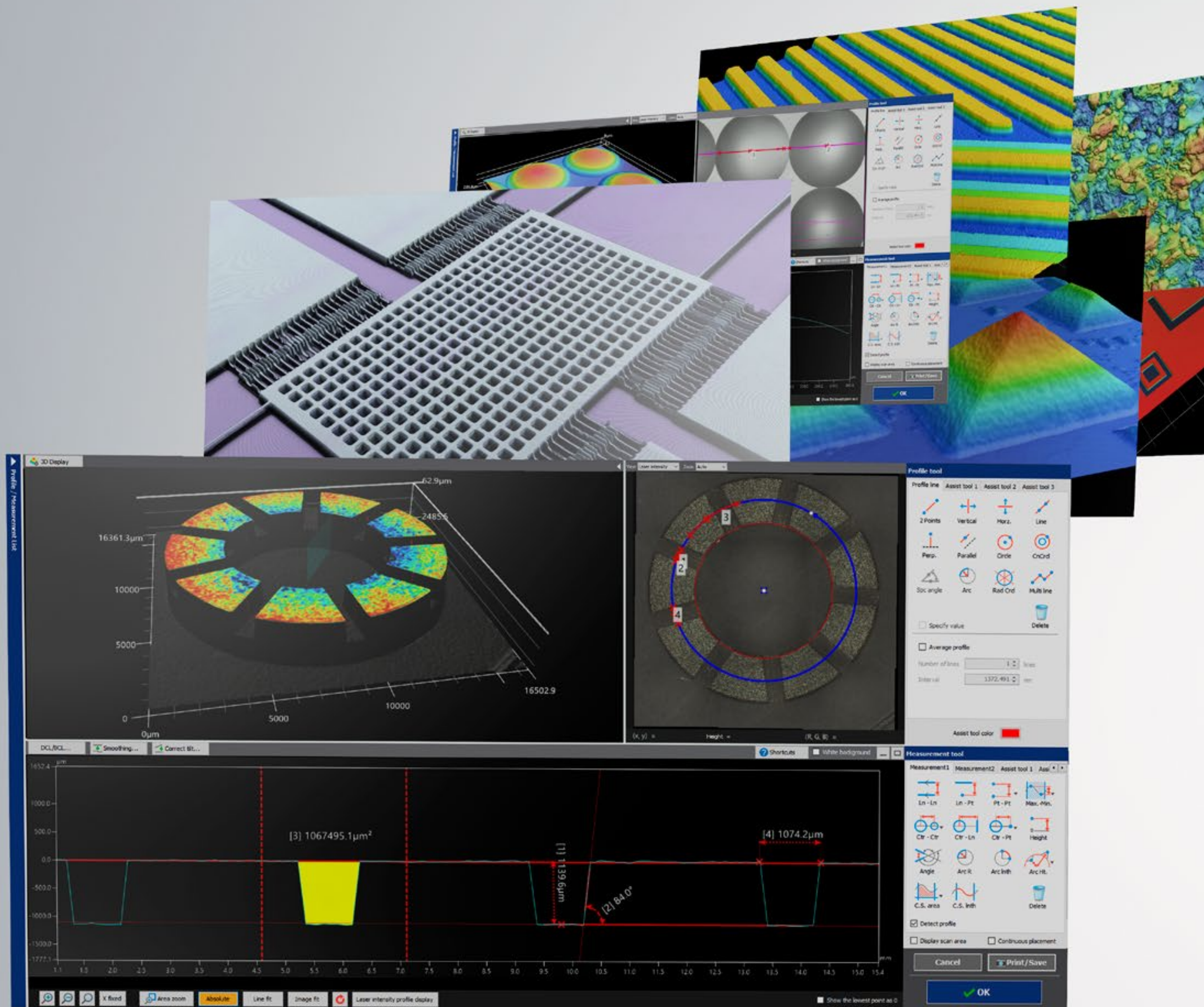
This 3D measurement system uses the high-resolution 5.6-megapixel color CMOS camera to determine the focal point by detecting focal changes (i.e., the degree of blur in an image) between high-quality images captured by moving the objective lens from bottom to top at an ideal pitch for the depth of field. For in-focus images, the difference in brightness between adjacent pixels increases proportionally to the image brightness. However, if the image is not in focus, the difference in brightness between adjacent pixels becomes small. This makes it possible to obtain the height information of a target by recording the lens position at the point with the greatest difference in brightness. The position of the objective lens is also monitored using the built-in linear scale (length measurement system) to provide target height information with even greater accuracy. In addition to obtaining 3D measurements of a target, images with in-focus areas are superimposed to create a fully-focused composite observation image.



White light interferometry

This measurement method provides a 3D shape through observation of the light interference pattern using an image sensor such as a CMOS sensor. Using an interference objective lens with a built-in reference plane mirror (reference surface), a white light from a white LED or other light source is used to illuminate the reference plane mirror (reference surface) and the target (measurement surface). The light reflected from each object interferes with each other, and the interference stripe appears as contour lines representing the height of each half wavelength. This corresponds to the shape of the target surface with respect to the reference plane mirror. The interference stripe is captured by the high-resolution 5.6-megapixel color CMOS camera, and computer processing is used to determine the point of maximum intensity of the interference stripe for measuring surface conditions.





Unprecedented surface analysis with 292 measurement tools

Extensive array of analysis tools

Intuitive measurement of any feature

Profile measurement (dynamic cross-section)

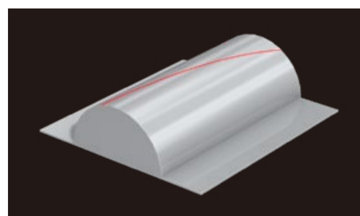
Wire bonding (1000×)

Accurate detection at the desired location

The system is able to detect the axis of a cylinder, the center of a sphere, the highest point of a surface, and other aspects not visible to the naked eye. This ensures consistent measurement results, even if the position clicked differs between users.

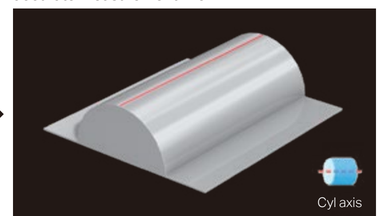
Conventional system

Drawing lines as intended is difficult.



VK-X

The shape is recognized automatically to draw an accurate measurement line.



Assistance tools ensure accurate measurement

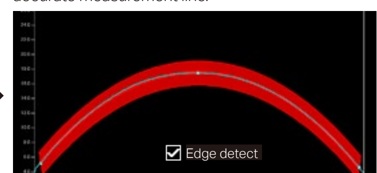
Even if the user does not click directly on the cross-section measurement line, the measurement line can be drawn as intended by automatically recognizing the edge of the target, ensuring accurate measurement results.

Conventional system

Drawing lines as intended is difficult.

VK-X

The shape is recognized automatically to draw an accurate measurement line.



Non-contact 3D quantification

Volume/area measurement

Measure up to 3000 points—including volume, surface area, area ratio, particle size, and particle count—and calculate average, maximum, and minimum values from the results.

Facets on GaAs due to liquid phase growth (3000×)

3D measurement across entire surface

Surface measurement (Flatness/warpage)

Detect the maximum and minimum heights within an area, and measure flatness and average step height.

	Step	Max. height (△)	Min. height (▽)	Flatness (Max. - Min.)	Surface angle 1	Surface angle 2
Unit	μm	μm	μm	μm	°	°
Area 1	-0.016	0.4	-0.1	0.5	179.977	0.023
Area 2	0	0.38	-0.05	0.43	179.99	0.01
Total	-0.016	0.78	-0.15	0.93	359.967	0.033
Maximum	0	0.4	-0.05	0.5	179.99	0.023
Minimum	-0.016	0.38	-0.1	0.43	179.977	0.01

Wafer chipping (1000×)

Easy dimensioning

Planar measurement

Various XY measurements are possible including distance, circular diameter, and angle. The wide selection of functions helps to reduce variation through automatic extraction of target edges and the creation of auxiliary lines and intersections.

Gear dimension measurement (50×)

Measure complex features with ease

Point-height measurement

Measuring the height from the reference surface can be done with pinpoint accuracy simply by looking at the screen. This makes measurement that is difficult to perform with contact-type devices easy for any user.

Camera contact terminal (30 × 10 mm 1.18" × 0.39")

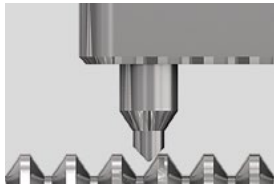
Non-contact roughness measurement

Measure roughness with great detail

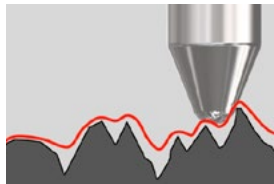
Surface roughness measurement

With conventional contact-type roughness meters, the stylus frequently cannot be used with microscopic shapes or can damage samples. The VK-X3000 provides a detailed picture of surface conditions not possible with stylus-based systems, allowing ultra-high-accuracy measurement even of microscopic shapes. In addition to JIS-compliant line roughness measurement capabilities, it can also carry out ISO-compliant surface roughness measurements.

Problems with stylus profilometers



1. Difficult to position stylus as desired



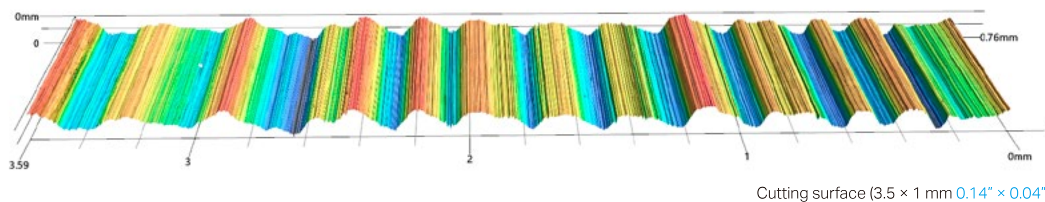
2. Impossible to measure areas smaller than the stylus diameter

3. Damage to target

4. Not usable with soft/sticky targets

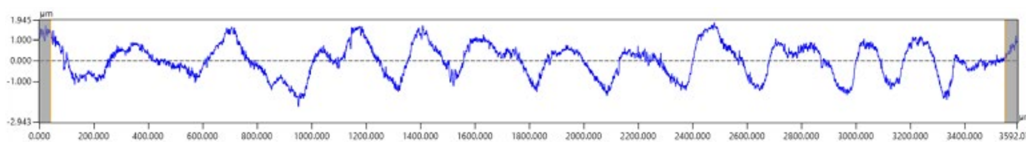
Non-contact surface scanning: Microscopic shape measurement that is impossible with a stylus

Roughness measurements can be taken that are compliant with both new and old JIS requirements. Accurate detection can be performed even for ultra-fine shapes that cannot be detected using a contact-type system. Surface roughness measurement can also be done using complete surface data. Instead of using just a line, which can result in areas being overlooked, roughness can be calculated over an entire area for more accurate and stable measurement.

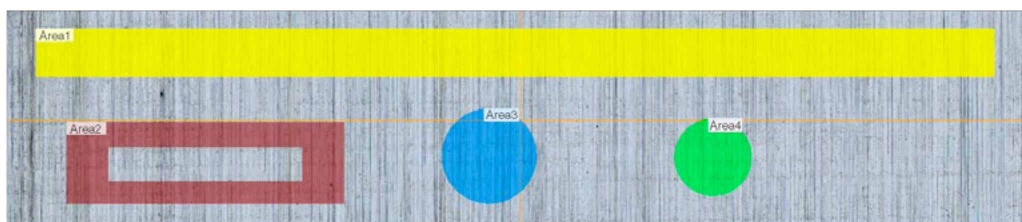


Cutting surface (3.5 × 1 mm 0.14" × 0.04")

Line roughness measurement



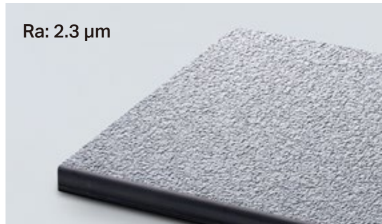
Surface roughness measurement



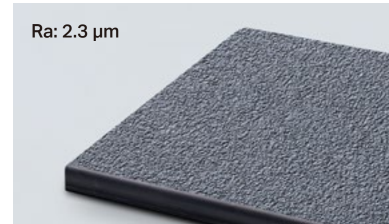
Automatic roughness analysis

AI-ANALYZER

Surface roughness has been widely used as a method of quantifying surface conditions, but sometimes differences in values can not be obtained. The VK-X3000 makes it easy to determine which parameters to use when first beginning analysis. This greatly reduces the amount of time required for analysis.



The Ra value is the same, but the surfaces look different.



Dozens of roughness parameters are compared to instantly determine the most significant difference

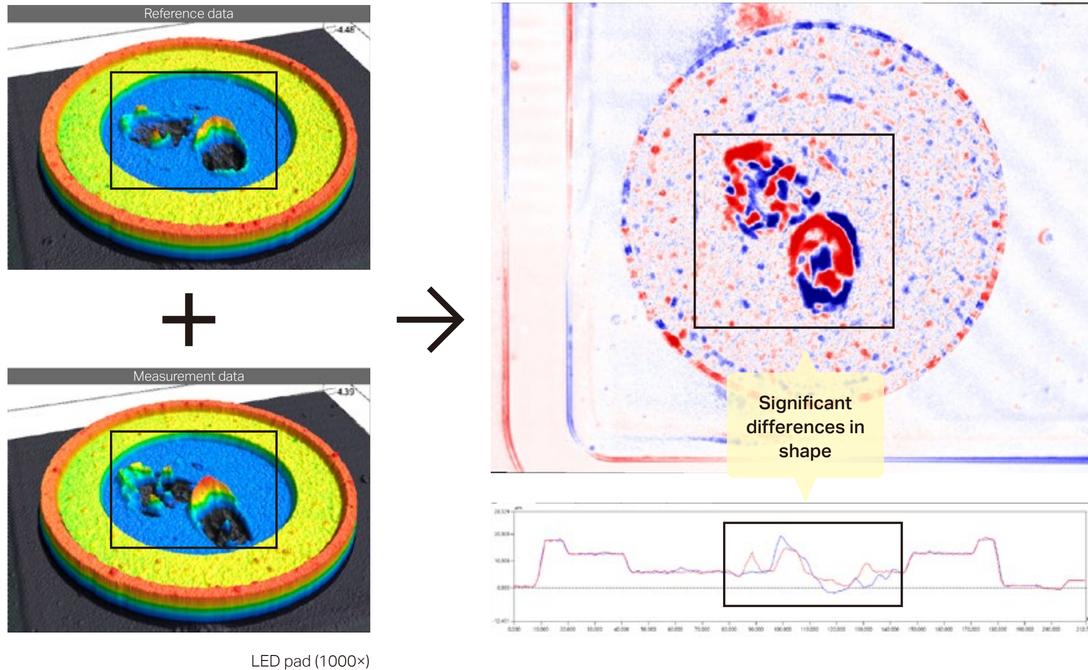
Ra and Rz are two of the most common roughness parameters, but there are numerous other parameters as well. AI-ANALYZER makes it easy to quickly determine which roughness parameter is best for a specific target. Manage and evaluate advanced roughness parameters even without an in-depth knowledge of roughness. Additional roughness parameters also let you instantly visualize the surface conditions of multiple targets.

Compare, count, discover

Superimpose samples to visualize differences

Comparative measurement

Small differences in shape can be hard to notice and are often overlooked. The VK-X3000 aligns two different data sets and superimposes them on top of each other for a cross-section profile comparison of a specific location. This enables visualization and quantification of height, roundness, and other differences, ensuring even the smallest differences are not overlooked. Specific measurement data can also be compared between separate locations.

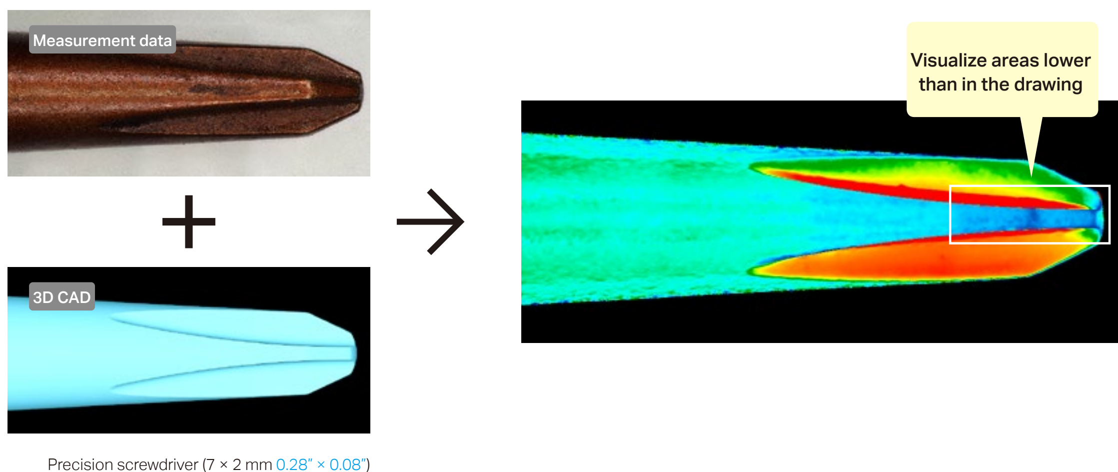


LED pad (1000×)

Design verification

CAD comparative measurement NEW

Superimposing CAD data and scanned data lets users compare and examine whether a shape matches the design specifications. The finish of products can be checked using a variety of methods, including cross-section shape comparisons at specified locations, and using color to highlight variations in overall shape.

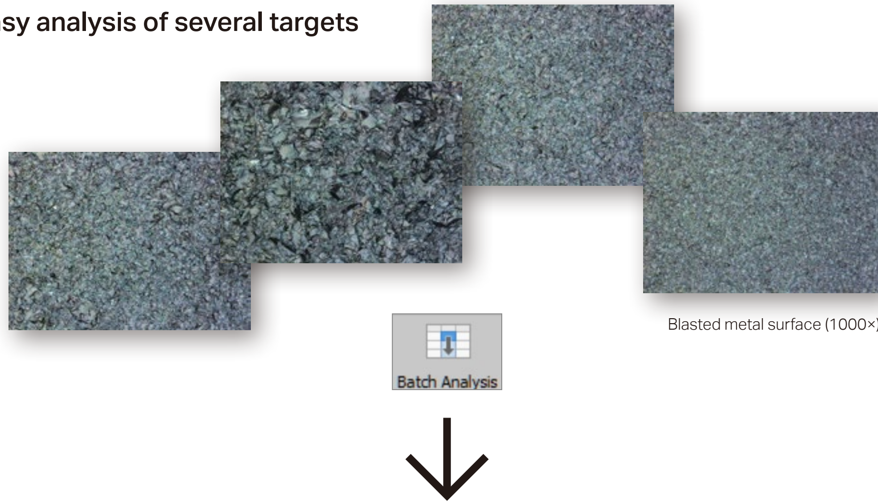


Precision screwdriver (7 × 2 mm 0.28" × 0.08")

Batch measurement and analysis of large data sets

Batch analysis function

Repeated image processing and measurement operations can be performed all at once by configuring the settings only one time. This simplifies measurement of numerous targets and allows the user to see differences at a glance while also eliminating wasted time and setting errors, significantly improving overall work efficiency. Different samples can be measured under the same conditions, so it is possible to view and compare multiple analysis results at once to understand the differences at a glance.



Blasted metal surface (1000×)

Dedicated batch analysis function for repeated image processing and measurement operations

Differences due to changes in manufacturing conditions or wear over time can be instantly recognized for drastically reduced analysis time. Unlike other macro processing and batch processing functions, the batch analysis function also allows users to apply additional analysis and image processing to other data with increased samples at the press of a button.

Multi-line R Laser + Optical	Multi-line R 3D	Multi-line R Horizon1 Profiles	Multi-line R Horizon1 Ra Ave. µm	Multi-line R Horizon1 Rz Ave. µm	Multi-line R Horizon1 RSm Ave. µm
			0.624	3.755	8.430
			0.422	2.408	8.254
			0.612	4.709	#####
			0.261	1.530	6.983

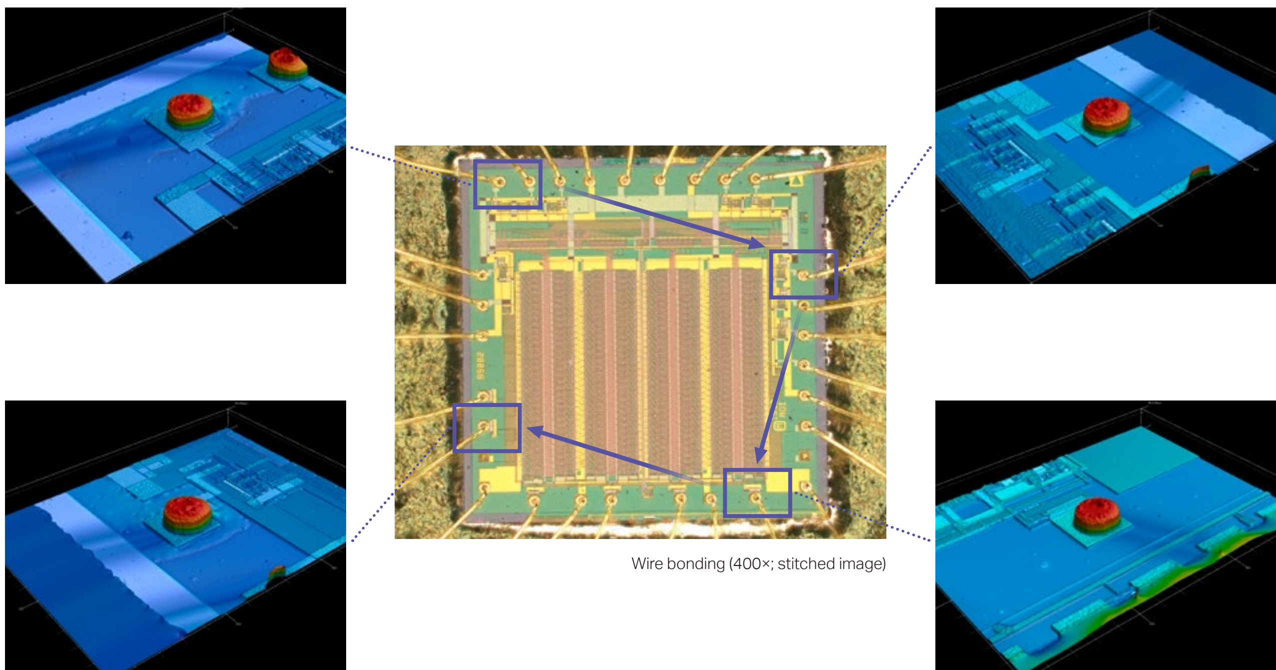
Reducing inspection time through automation

Significantly reduced measurement time

Inspection mode NEW

In addition to measurement repetition, the VK-X3000 is able to automatically scan multiple locations of a target by registering the scanning conditions in advance. This means users do not need to be present during scanning, so they can use that time to perform other tasks. Pass/fail judgments can be made by using a template file indicating design values and tolerance.

Using an advanced motorized stage, images and measurements can be taken at programmed locations, increasing the number of test samples that can be evaluated and completely automating the inspection process.



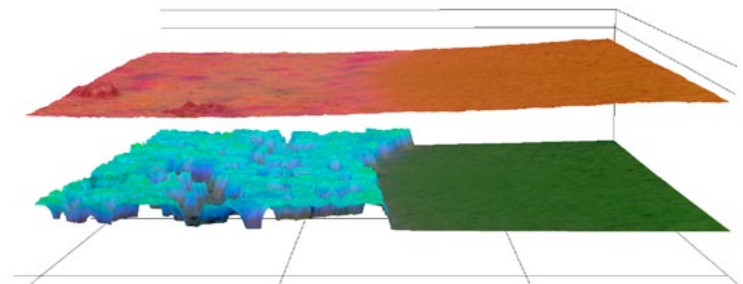
Wire bonding (400×; stitched image)

Film measurement

3D measurement of both coating and substrate

Laser transmission film thickness measurement

The VK-X3000 measures thickness by analyzing the light reflected from two locations of a transparent object—the top surface and the bottom surface. The topmost and bottommost layers of the film are converted to a 3D image, and the thickness is measured from the image's cross-sectional shape.

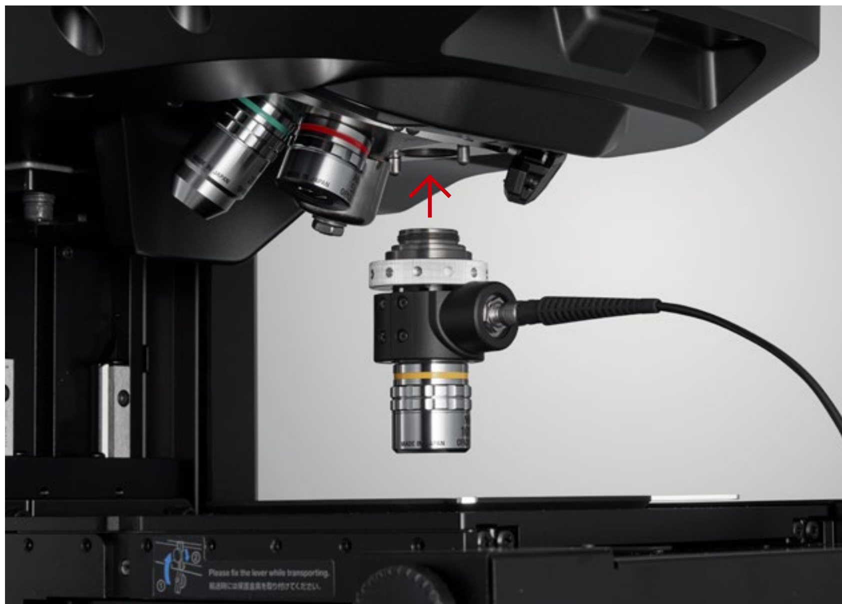


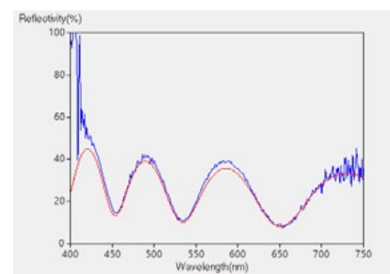
Clear painted film (1000×)

New measurement principle for thin films

Spectral interference film thickness measurement NEW

Analyzing the interference between light reflected on the surface of a film and the light reflected from the substrate allows measurement of the thickness of film as thin as 0.1 μm. A refractive index database for some 70 typical materials is also included, enabling analysis of various types of films.



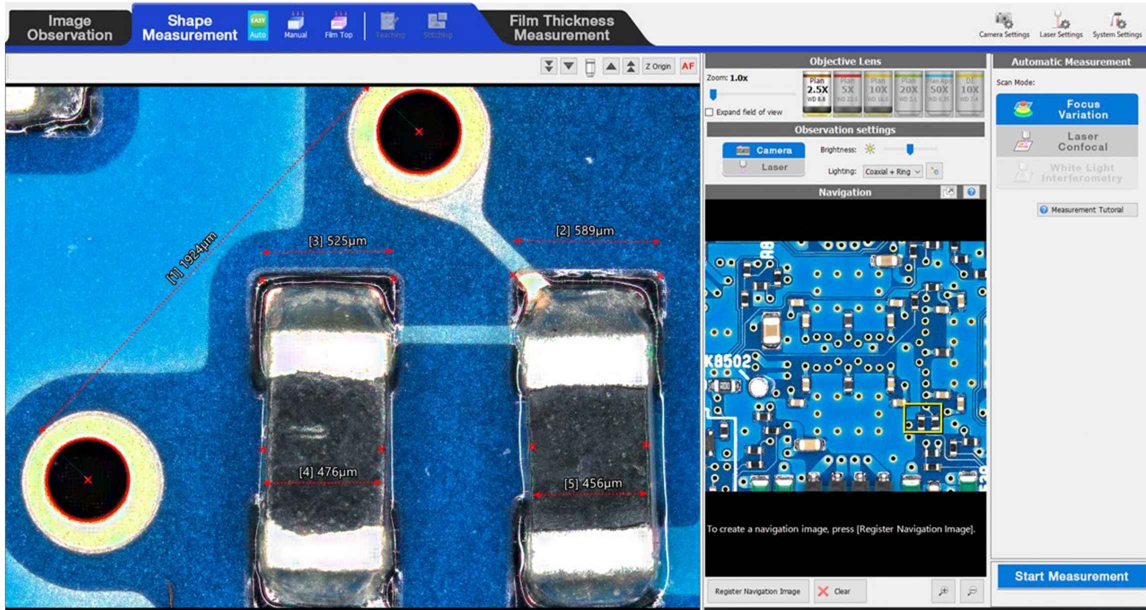


Advanced observation

Versatile functionality

Measurement functions

Combining the ease of use of KEYENCE digital microscopes and the superior observation capabilities of laser microscopes opens the door to a wide range of microscope applications.



Improved image detail and contrast

HDR observation

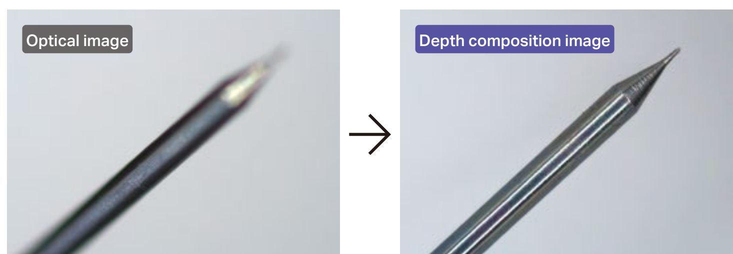
A single image with high-level detail is generated by capturing several images at different brightness levels. This allows for clear observation of otherwise invisible defects as well as improvements in color and contrast.

Ink toner (400×)

Fully focused images for accurate judgment

Depth composition function

Fully focused images are possible even of objects that can only be partially observed in focus with an optical microscope. This means users can see entire areas at a glance for efficient analysis.



Microdrill (100×)

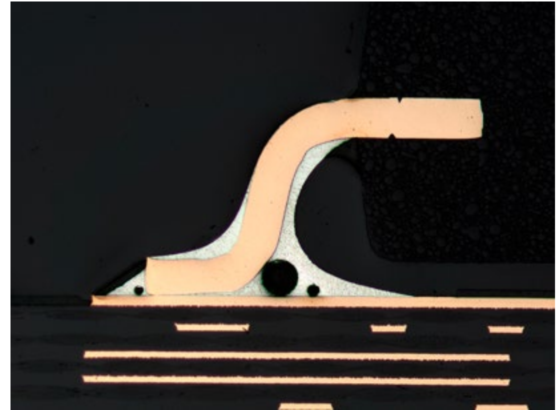
Optimal lighting with no additional equipment

Ring illumination, coaxial illumination, and mixed illumination

Terminal crimping (50×)

Ring illumination for superior clarity

Ring illumination allows true-to-life observation of targets. Even targets with significant surface differences can be seen brightly and clearly.



Voids in solder (100×)

Coaxial lighting for detailed observation

Coaxial lighting highlights surface textures, illuminating minute variations such as scratches.

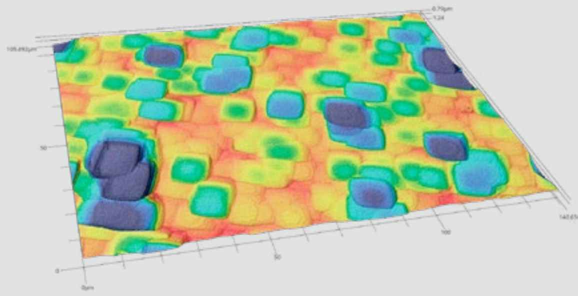
Images comparable to an SEM

High-magnification color images

High-resolution laser scanning allows the creation of images with magnification and resolution comparable to SEM images. The color camera also captures color information for each pixel at the true focal point determined by laser confocal, ensuring in-focus and true-to-life color information. This makes capturing full-color laser images that are easy to understand incredibly simple.

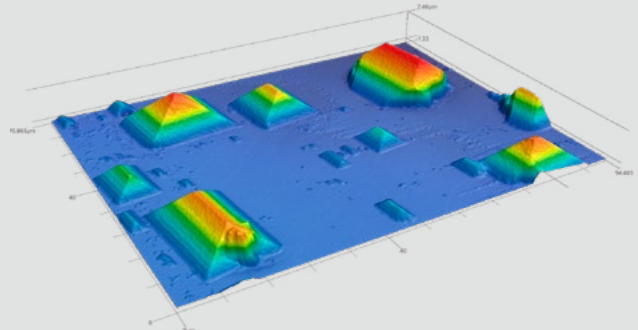
Abrasive (400×)

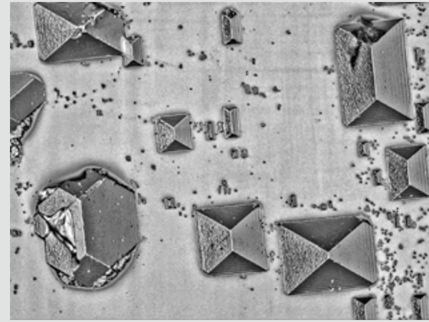
Application Examples



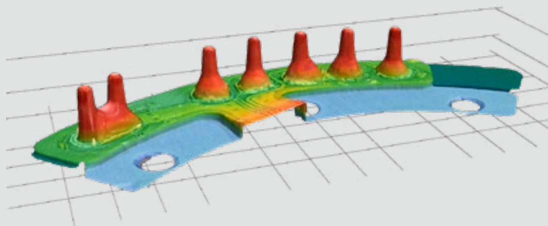
Sa	µm	0.234
Sz	µm	2.030
Str		0.442
Spc	1/mm	3802.583
Sdr		0.03774
Sq	µm	0.311
Ssk		-1.209
Sku		4.822
Sp	µm	0.792
Sv	µm	1.238
Sal	µm	8.200
Std	°	89.700
Sdq		0.279

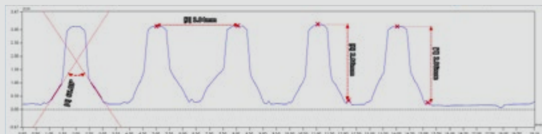
Silicon wafer backside (3000×)
Surface roughness measurement



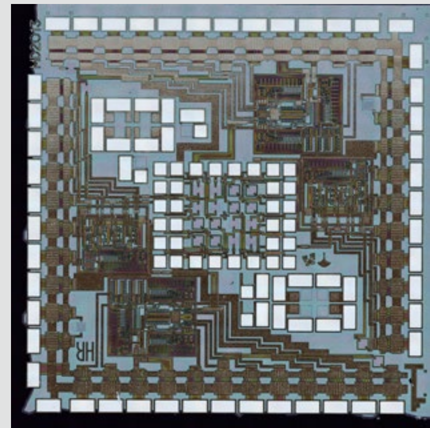


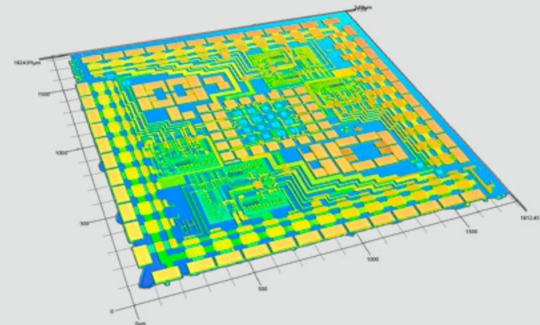
Facets on GaAs due to liquid phase growth (3000×)
Non-vacuum high-magnification imaging
Provided by Prof. Tadaaki Kaneko, Department of Chemistry, School of Science and Technology, Kwansei Gakuin University



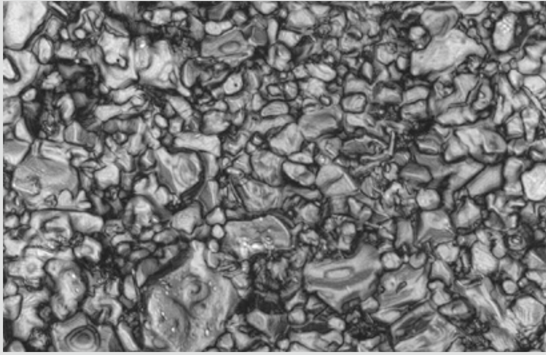


Camera mount terminal (30 × 12 mm 1.18" × 0.47")
Terminal shape measurement



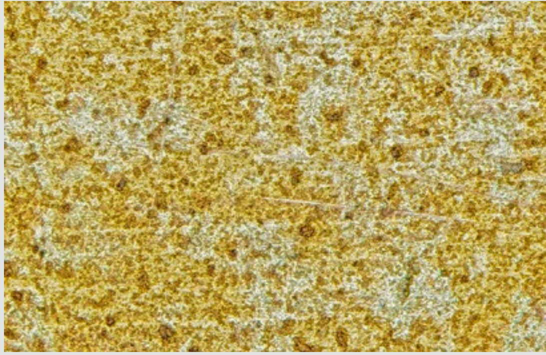


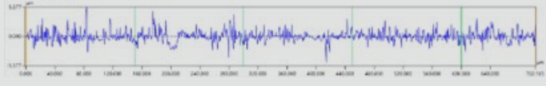
MEMS (2 × 2 mm 0.08" × 0.08")
Provided by Dr. Matthieu Denoual (GREYC/CNRS, ENSI de Caen, France) and Mita Laboratory, Graduate School of Engineering, University of Tokyo



Ra	Rz	Rp	Rv	Rt	Rq	Rsk	Rku	RΔq	Rmr(c)	Rdc	Rmr	RzJIS
µm	µm	µm	µm	µm	µm				%	µm	%	µm
0.160	0.882	0.413	0.469	1.428	0.209	-0.422	3.344	0.923	0.000	0.267	50.000	0.387

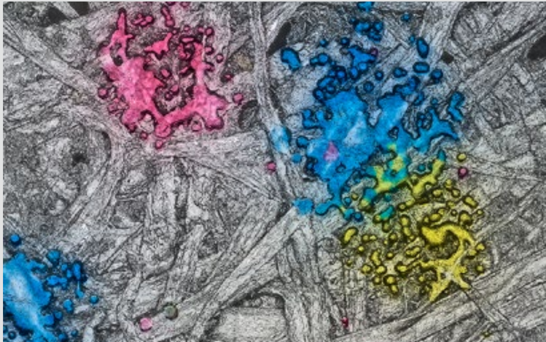
Ceramic (6000×)
Line roughness measurement

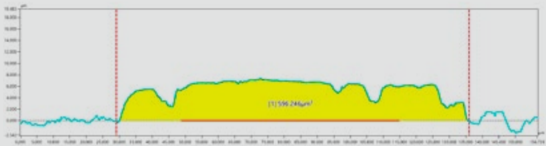




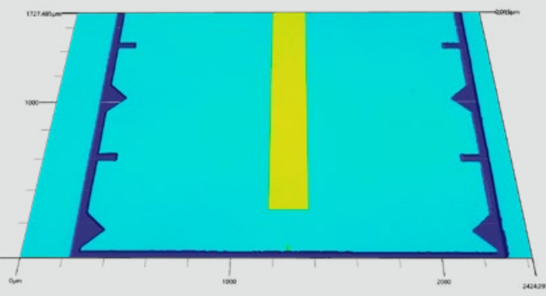
Ra	Rz	Rp	Rv	Rt	Rq	Rsk	Rku	RΔq	Rmr(c)	Rdc	Rmr	RzJIS
µm	µm	µm	µm	µm	µm				%	µm	%	µm
0.745	7.697	4.175	3.522	10.478	1.032	0.413	5.882	1.672	0.000	0.898	50.000	5.411

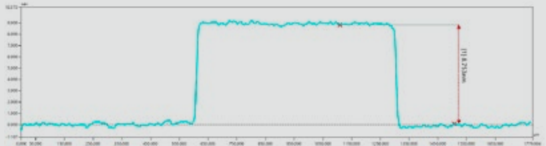
Gold plating surface (400×)
Line roughness measurement



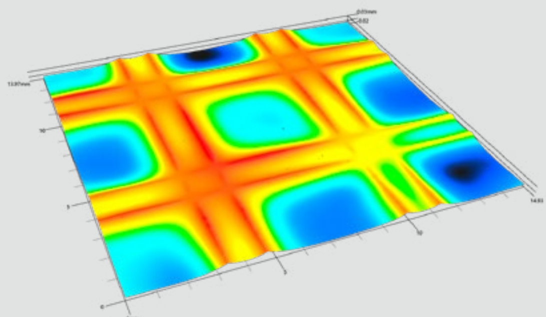


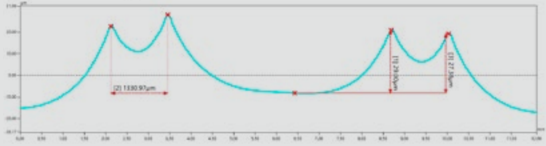
Paper fibrous toner (1000×)
Toner cross-section measurement



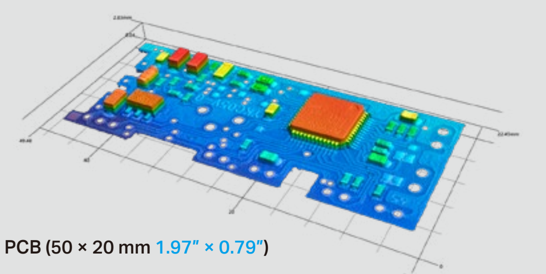


Step gauge (8 nm) (200×)
Micro-step shape measurement





Functional film (15 × 15 mm 0.59" × 0.59")
3D modeling/shape measurement of overall shape

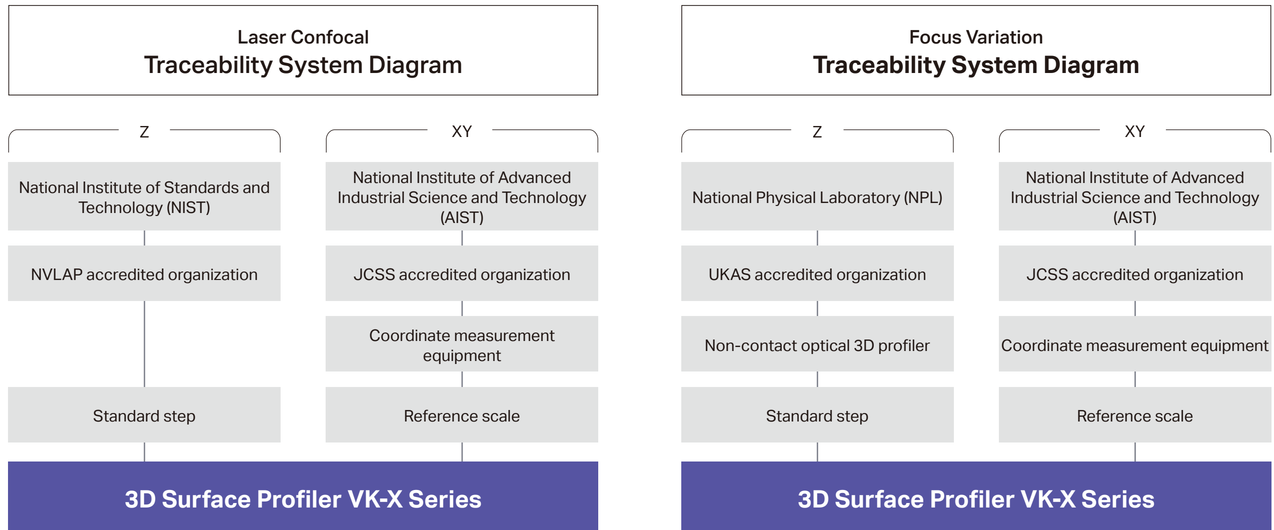


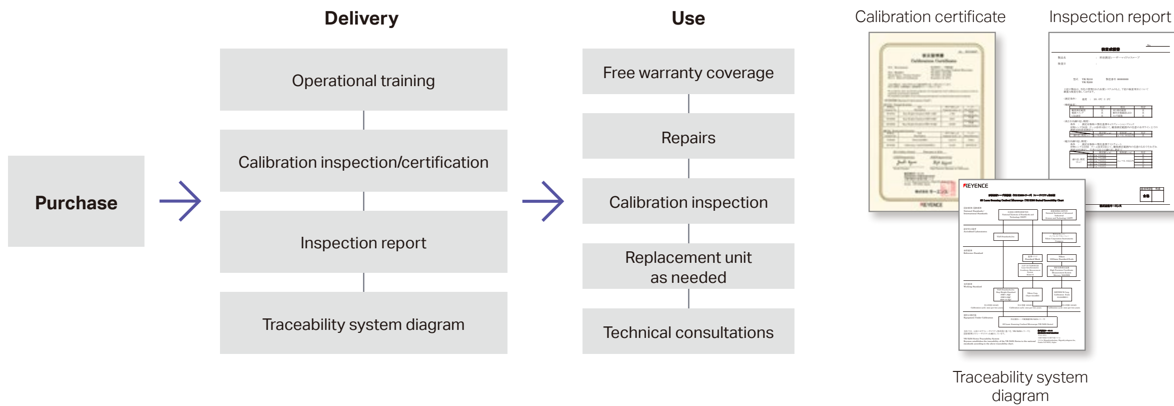
PCB (50 × 20 mm 1.97" × 0.79")

Guaranteed accuracy in compliance with national standards

Traceable measurement results

Measurement results are based on a traceability system compliant with national standards, guaranteeing both accuracy and repeatability and ensuring highly reliable measurement results.





Simple calibration and verification

Reference gauges can be used to ensure accurate calibration after equipment delivery, eliminating the need to send the unit out for calibration. KEYENCE also provides adjustment jigs for each measurement principle, making equipment management and maintenance easy.

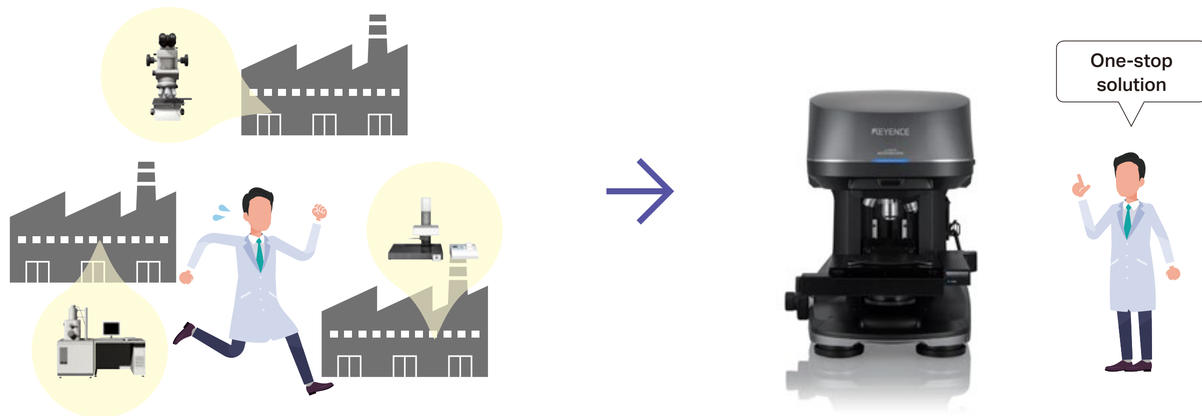
Remote and local operations

Company licenses for multiple PCs NEW

The VK-X Series can be used with a company license, meaning the software can be installed on any computer within an office. This lets all measurement staff share data and perform other activities quickly to accelerate projects. The license also enables remote usability, allowing users to work not only from home but also from other sites or hotel rooms while on business trips.

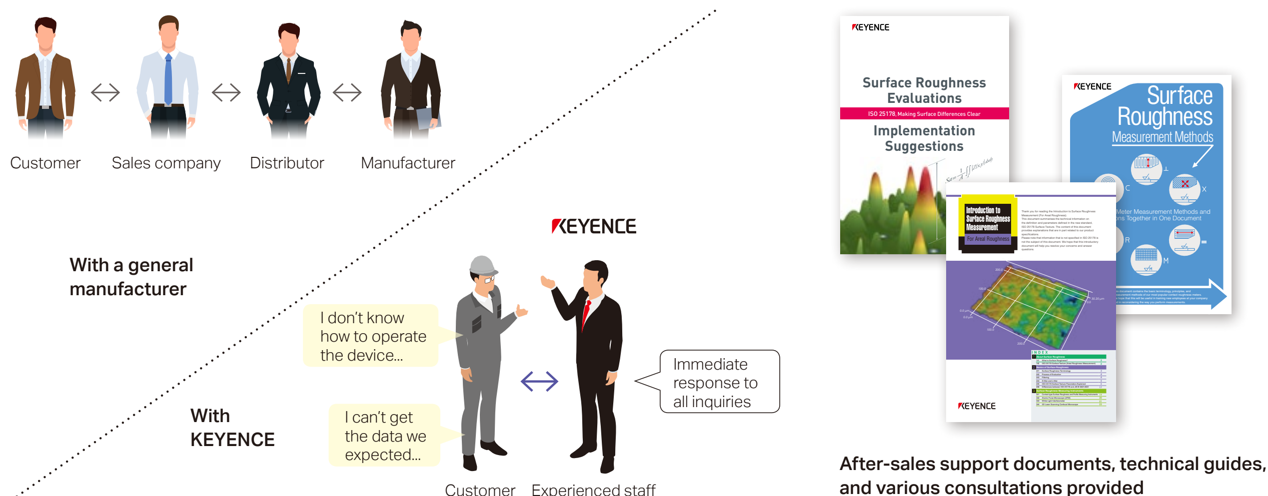
Observation and measurement in one device

By combining various equipment into one device, this system can help reduce operations and laboratory hours by providing a one-stop solution to various problems.



Unique direct sales system support

KEYENCE employs a direct sales system that eliminates intermediaries such as distributors and dealers. Technical sales and field engineers are armed with a wealth of specialized knowledge that allows them to quickly respond to various inquiries. This means that KEYENCE can support customers through extensive after-sales services. KEYENCE also offers on-site inspection and calibration services in addition to free equipment replacement in the event of a malfunction, providing users with peace of mind even after purchasing.



After-sales support documents, technical guides, and various consultations provided

Other accessories

VK spacer

An optional spacer extends the working distance of the VK by an additional 100 mm 3.94" so that taller objects can be accommodated directly on the stage.

Motorized stage

The high-accuracy, motorized XY stage offers more precise navigation, programmable measurements, and image stitching capabilities.

300 mm 11.81" wafer stage

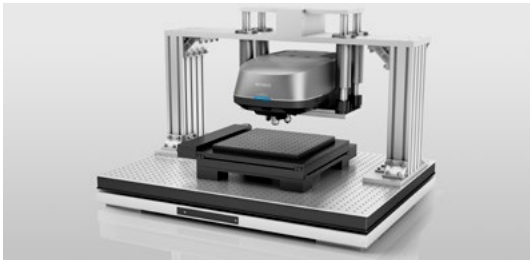
Observe and analyze across an entire 300 mm 11.81" wafer. The stage itself can be attached directly with no alterations. Please contact KEYENCE for other sizes.

Tilting stage

The tilting stage allows for detailed adjustment of the tilt angle when using white light interferometry.

Large-format stages

Upon request, KEYENCE can propose customized stages that can measure larger samples (e.g. solar panel substrates).



Spectral film thickness unit

This unit allows for thin film measurement using spectral response. Simply attach the unit to the revolver for use.

Extensive lens lineup

An extensive lineup of VK-X lenses is available, from 2.5× to 150×. All lenses undergo special tuning and inspection before being shipped with each system. The lineup includes lenses with long working distances and those for targets with a high aspect ratio.

Fluorite, which has low refraction and color aberration, is used as the lens material.

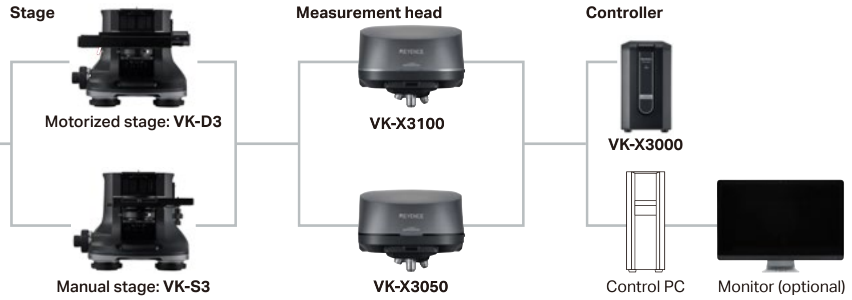
Examples of lenses with long working distances	Monitor magnification	Working distance
Standard 5× lens	120×	22.5 mm 0.89"
Ultra-long range 20× lens	480×	20.5 mm 0.81"
Ultra-long range 50× lens	1200×	13.8 mm 0.54"
Ultra-long range 100× lens	2400×	4.7 mm 0.19"

System configuration diagram

Optional accessories

- Motorized XY stage: **VK-S2100**
- Spectral film thickness unit: **VK-T300**
- Stage for 300 mm 11.81" wafers: **OP-88231**
- Extended height spacer: **OP-88232**
- Tilting stage: **OP-88549**
- Ring illumination for 2.5× lens: **OP-88230**
- VK reference gauge: **OP-88248**
- Extension cable set: **OP-88249**

* Contact KEYENCE for advice on a stage suitable for large samples.



- Observation/analysis software set: **VK-A3**
- Image stitching module: **VK-H3J** (optional)
- White light interferometry module: **VK-H3I** (optional)
- CAD comparison module: **VK-H3CA** (optional)

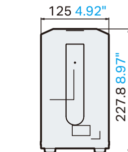
Measuring lenses

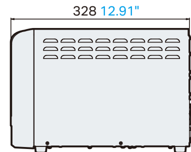
Objective lens	W/D (mm inch)	Field of view	VK-X3100	VK-X3050
2.5×	8.8 0.35"	675 × 506 µm to 7398 × 5545 µm	Optional	Optional
5×	22.5 0.89"	337 × 253 µm to 3699 × 2773 µm	✓	✓
10×	16.5 0.65"	168 × 126 µm to 1849 × 1386 µm	✓	✓
20×	3.1 0.12"	84 × 63 µm to 924 × 693 µm	✓	✓
50×	0.54 0.02"	33.7 × 25.2 µm to 370 × 277 µm	N/A	✓
100×	0.35 0.0138"	16.8 × 12.6 µm to 185 × 138 µm	N/A	Optional
APO, 50×	0.35 0.0138"	33.7 × 25.2 µm to 370 × 277 µm	✓	Optional
APO, 100×	0.3 0.0118"	16.8 × 12.6 µm to 185 × 138 µm	Optional	Optional
APO, 150×	0.2 0.0079"	11 × 8.3 µm to 123 × 92 µm	Optional	Optional
Long range, 20×	11.0 0.43"	84 × 63 µm to 924 × 693 µm	Optional	Optional
Long range, 50×	8.7 0.34"	33.7 × 25.2 µm to 370 × 277 µm	Optional	Optional
Long range, 100×	2 0.08"	16.8 × 12.6 µm to 185 × 138 µm	Optional	Optional
Ultra-long range, 20×	20.5 0.81"	84 × 63 µm to 924 × 693 µm	Optional	Optional
Ultra-long range, 50×	13.8 0.54"	33.7 × 25.2 µm to 370 × 277 µm	Optional	Optional
Ultra-long range, 100×	4.7 0.19"	16.8 × 12.6 µm to 185 × 138 µm	Optional	Optional
Interference, 10×	7.4 0.29"	168 × 126 µm to 1350 × 1012 µm	Optional	Optional
Interference, 20×	4.7 0.19"	84 × 63 µm to 675 × 506 µm	Optional	Optional
Interference, 50×	3.4 0.13"	33.7 × 25.2 µm to 270 × 202 µm	Optional	Optional

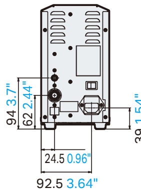
Dimensions

Unit: mm inch

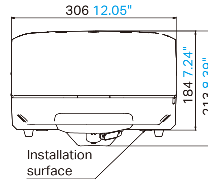
Controller: **VK-X3000**

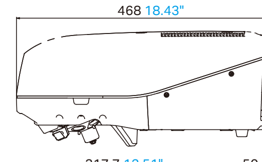


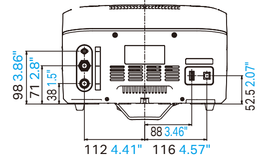


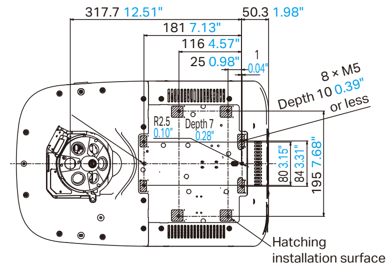


Measurement head: **VK-X3100/X3050**

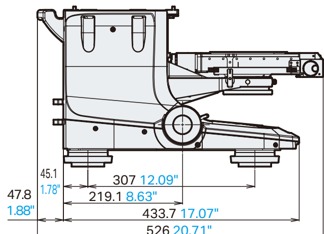


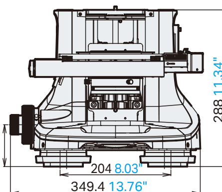




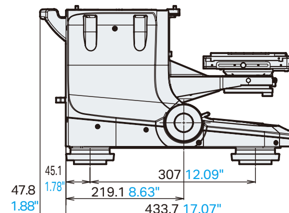


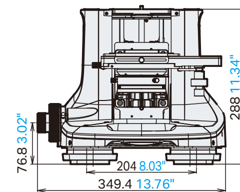
Stage: **VK-D3**





Stage: **VK-S3**



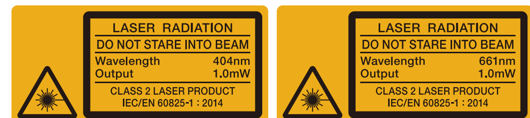


Specifications

■ Basic functions

Model		VK-X3000/X3100	VK-X3000/X3050
Total magnification*1		42 to 28800×	
Field of view		11 to 7398 μm	
Measurement principle		Laser confocal, Focus variation, White light interferometry, Spectral interference	
Laser wavelength		Semiconductor laser, 404 nm	Semiconductor laser, 661 nm
Max. laser measurement speed*2		Surface: 125 Hz, Line: 7900 Hz	
Max. laser output		0.9 mW	
Laser class		Class 2 (JIS C6802)	
Laser light-receiving element		16-bit photomultiplier	
White light source		White LED	
White-light-receiving element		High-definition color CMOS	
Laser confocal	Height display resolution	0.1 nm	1 nm
	Height repeatability σ	10×: 100 nm, 20×: 40 nm, 50×: 12 nm	10×: 100 nm, 20×: 40 nm, 50×: 20 nm
	Height accuracy*3	0.2+L/ 100 μm or less	
	Width display resolution	0.1 nm	1 nm
	Width repeatability 3σ	10×: 200 nm, 20×: 100 nm, 50×: 40 nm	10×: 400 nm, 20×: 100 nm, 50×: 50 nm
	Width accuracy*3	Measured value ±2% or less	
Focus variation	Height display resolution	0.1 nm	1 nm
	Height repeatability σ	5×: 500 nm, 10×: 100 nm, 20×: 50 nm, 50×: 20 nm	5×: 500 nm, 10×: 100 nm, 20×: 50 nm, 50×: 30 nm
	Height accuracy*3	0.2+L/ 100 μm or less	
	Width display resolution	0.1 nm	1 nm
	Width repeatability 3σ	5×: 400 nm, 10×: 400 nm, 20×: 120 nm, 50×: 50 nm	5×: 400 nm, 10×: 400 nm, 20×: 120 nm, 50×: 65 nm
	Width accuracy*3	Measured value ±2% or less	
White light interferometry	Height display resolution	0.01 nm	
	Width display resolution	0.1 nm	
	Surface topography repeatability*4	0.08 nm	
	Repeatability of RMS*4	0.008 nm	
Spectral interference film thickness measurement	Repeatability σ*4	0.1 nm	
	Accuracy*4	±0.6%	
Optical observation	Number of pixels	5.6 million	
	Revolver	6-hole electric revolver	
	Ring illumination lens	2.5×, 5×, 10×	
	Optical zoom	1 to 8×	
XY stage configuration	Manual operation range	70 × 70 mm 2.76" × 2.76"	
	Motorized operation range	100 × 100 mm 3.94" × 3.94"	
Weight	Measurement head	Approx. 13 kg	
	Stage	Approx. 17 kg (+2.5 kg with motorized stage attached)	
	Controller	Approx. 3 kg	
Environmental resistance	Ambient operating temperature	+15 to 28°C 59 to 82.4°F	
	Ambient operating humidity	20 to 80% RH (No condensation)	
Power supply	Power voltage	100 to 240 VAC, 50/60 Hz	
	Power consumption	150 VA	

*1 When using a 23-inch full-screen display.
*2 At top speed when using a combination of measurement mode/measurement quality/lens magnification.
When the line scan measurement pitch is within 0.1 μm.
*3 When measuring a standard sample with a 20× or greater lens.
*4 Typical values under the default measurement environment.



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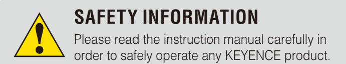

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