



3D Optical Profilometer

NEW VR-6000 Series

Measure Profiles, Flatness, and Roughness
in as Little as 1 Second

[New feature]

Motorized rotational scanning for performing a wider variety of measurements



NEW

3D Optical Profilometer
VR-6000 Series



Easy-to-use, non-contact
3D measurement system

High-precision 3D measurement of an entire surface in as little as 1 second

Visualization of complex shapes and curvature with submicron resolution

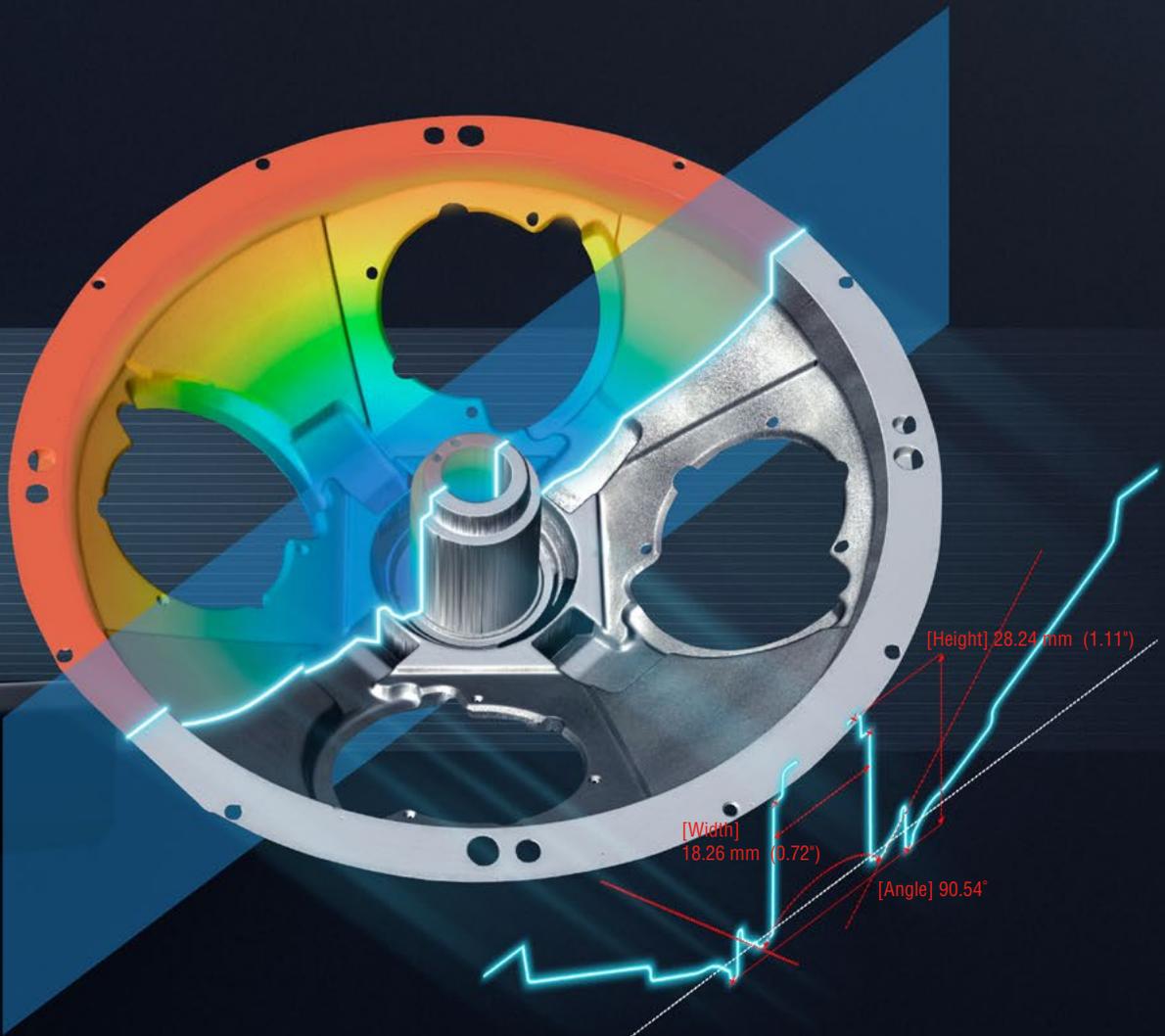
Rotational scanning on a wide variety of materials

World's first Motorized rotation unit enables measurement around the entire circumference of the part

NEW HDR scanning algorithms for measuring both matte and shiny surfaces

Measure nearly any callout with a single device

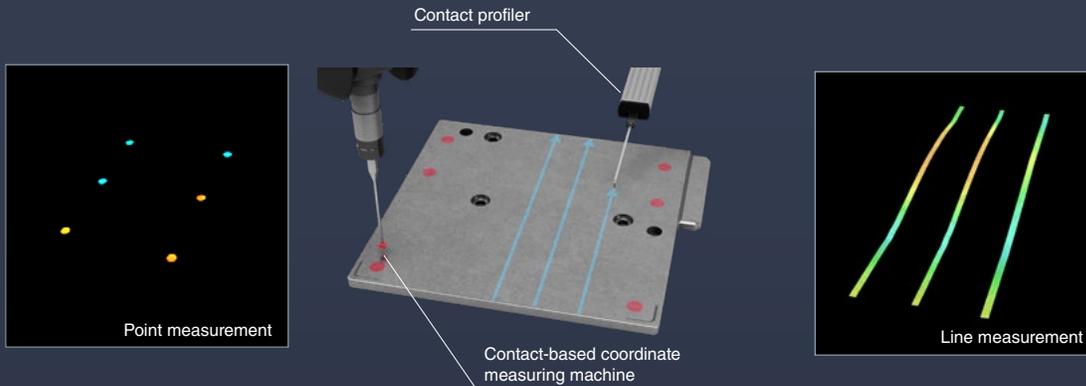
NEW Stable measurement of profiles, dimensions, roughness, and GD&T



High-Precision 3D Measurement of an Entire Surface in as Little as 1 Second

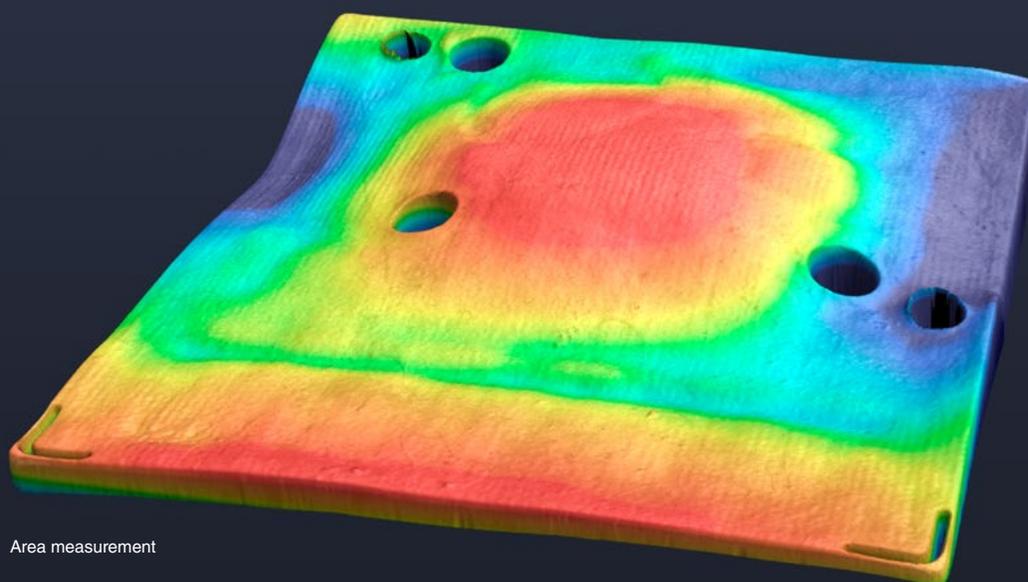
Capture full surface data with 0.1 μm resolution

Conventional measurement instruments



Some shapes cannot be analyzed with conventional measurement methods

3D Optical Profilometer



Area measurement

Measuring the entire surface reveals the true shape

Measurements in as little as 1 second

No setup or preparation required

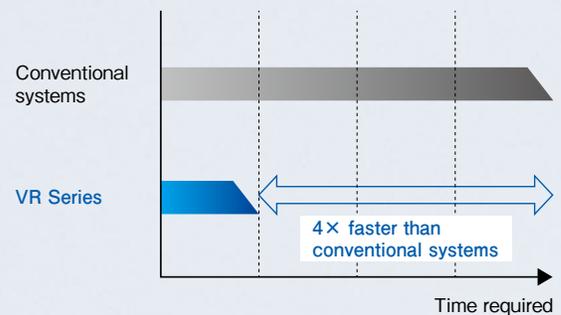
Conventional measurement systems require a lot of preparation, including fixturing, leveling, and selecting a probe. With the VR Series, you can simply place the sample on the stage and click the Measure button.

This makes the measurement process simple for anyone to perform.



Scans in as little as 1 second

KEYENCE designed the VR Series with a focus on improving measurement algorithms and hardware, resulting in measurements in as little as 1 second. As a result, substantially more samples can be processed, reducing work hours. This also leads to improvements in prototype analysis and in-process inspections.



Accurate and repeatable measurements

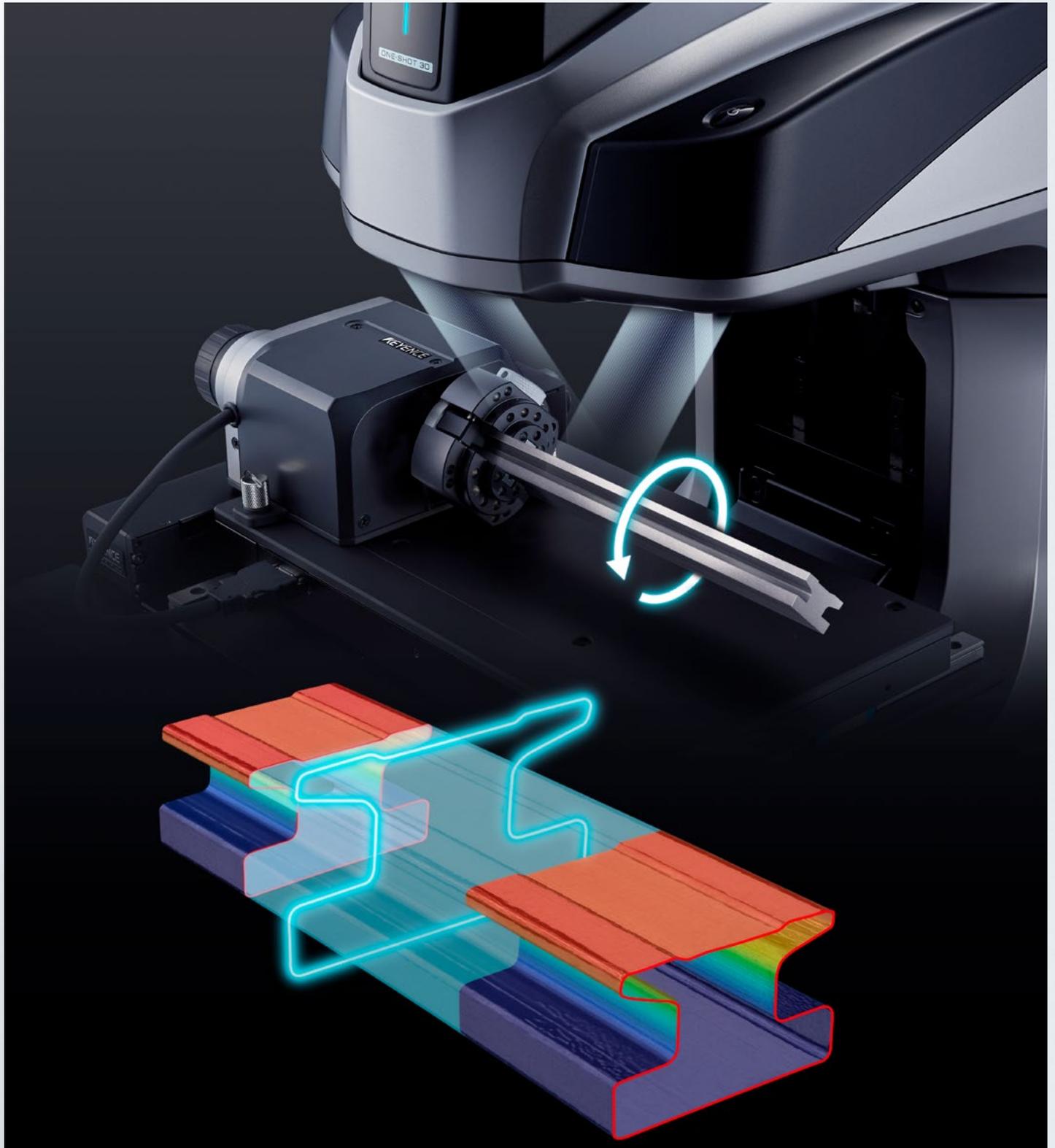
With general contact-based systems, numerical values might not be stable due to measurement location, measurement conditions, or measurement method.

The VR Series automatically sets the measurement range and measurement conditions, ensuring accurate measurements without variations between users.

User	Measurement with conventional system	Measurement with VR Series
User A	0.34	0.35
User B	0.29	0.35
User C	0.35	0.35
...
User X	0.31	0.35

Rotational Scanning Eliminates Blind Spots

Automatic rotation to perform measurements on all sides



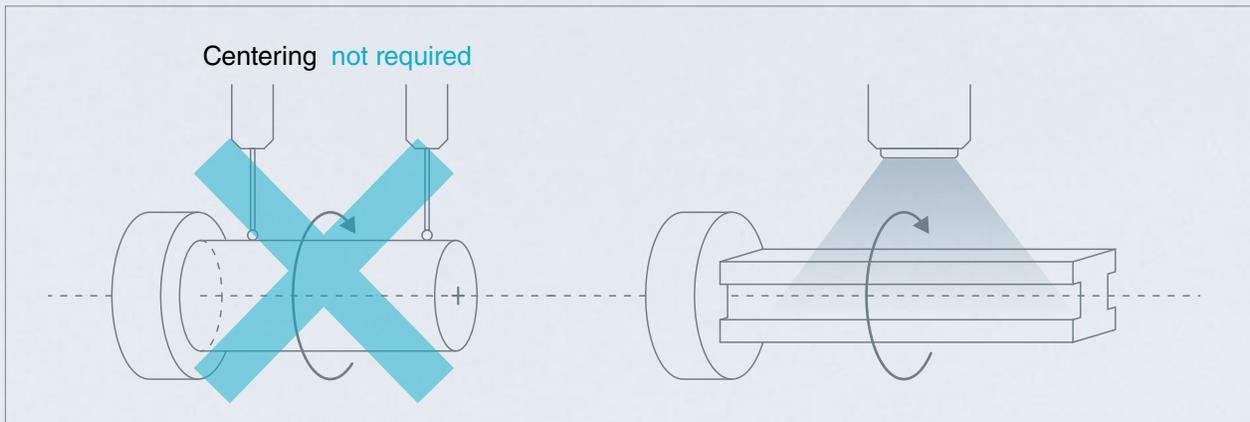
Simple Rotational Scanning

World's first

Motorized rotation unit that does not require calibration

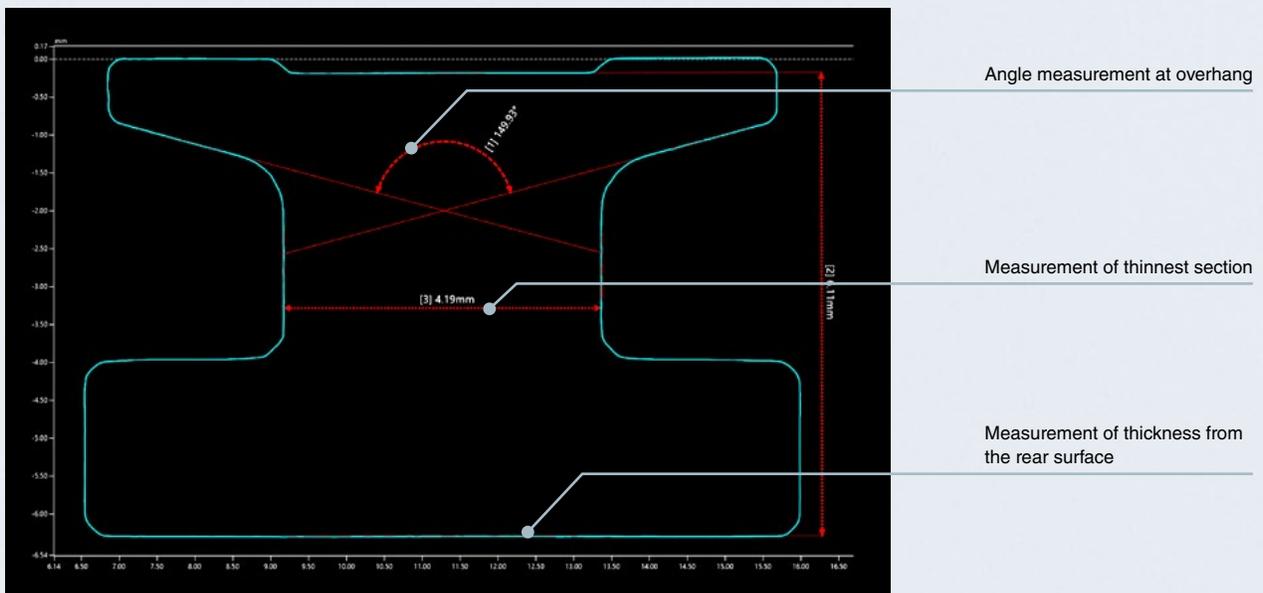
Measuring systems that rotate the target sample have always required centering and initial calibration.

However, the VR Series requires no advanced calibration, making it easy for anyone to acquire data around the target.



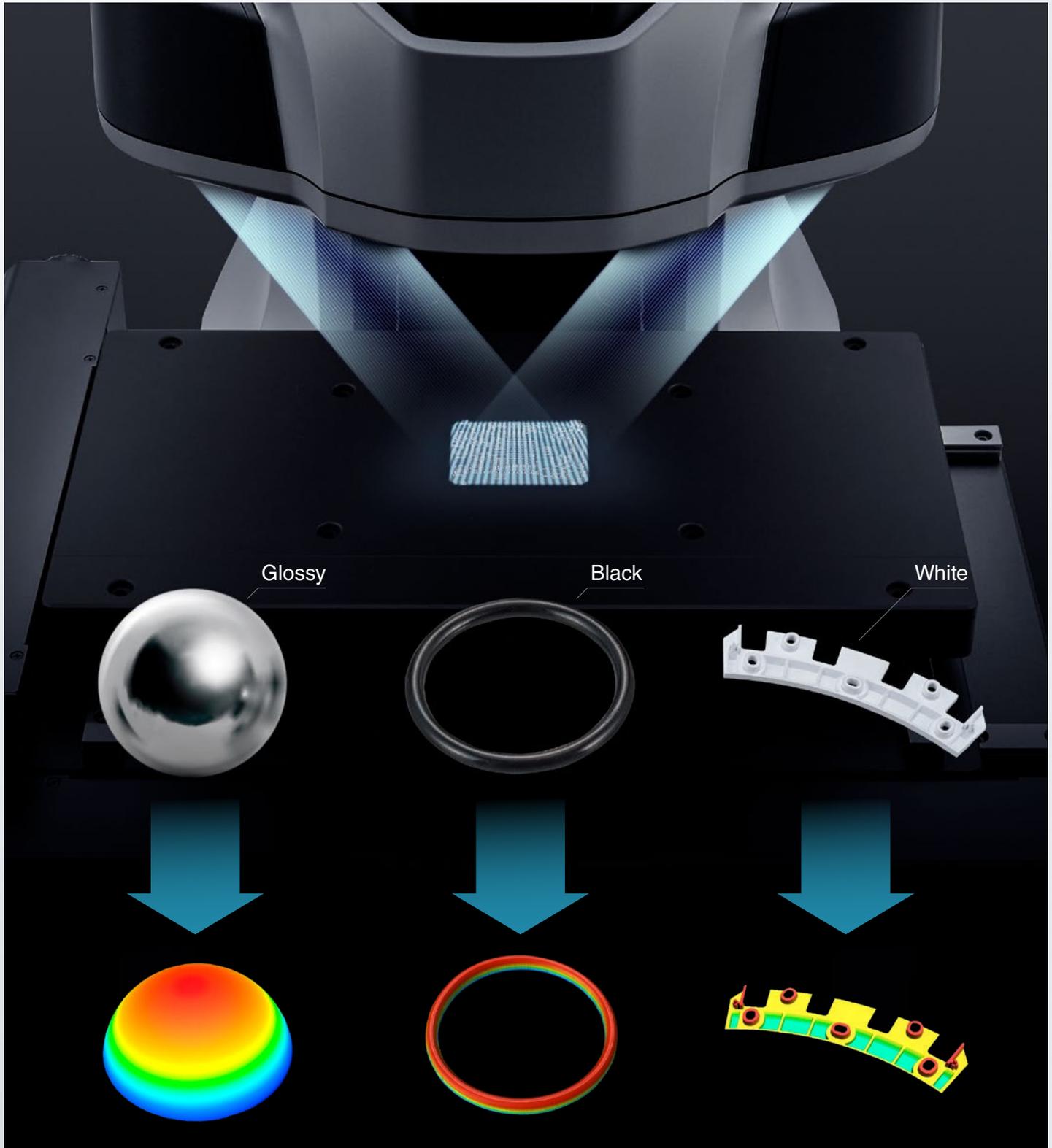
Reproduce cross-sectional shapes without cutting

By taking measurements while rotating the target sample, blind spots are eliminated and the cross-sectional shape is accurately reproduced. This allows for easy and accurate measurement of wall thickness and the dimensions of areas that are difficult to see without cutting.



Measure a Wider Variety of Materials due to an Advanced Scanning Principle

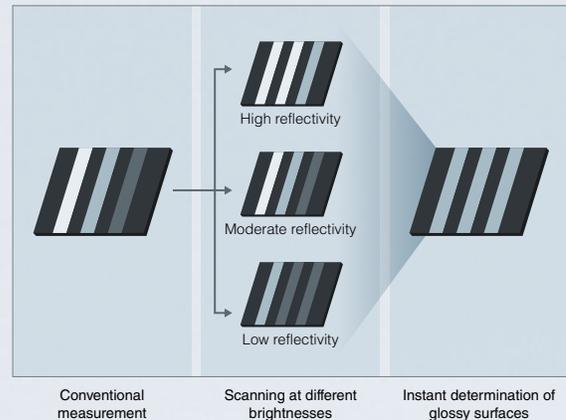
HDR scanning algorithm enables measurement of more materials



NEW

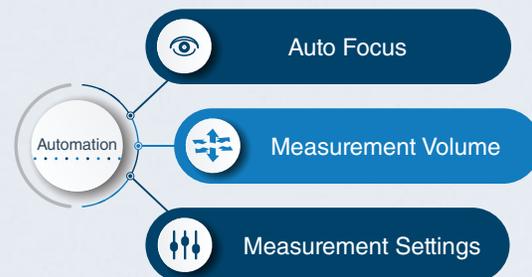
High dynamic range scanning

It is now possible to instantly determine the optimum conditions and accurately measure the forms of glossy objects and objects made of materials that do not reflect much light, which was previously impossible with optical profile measurement systems. The dynamic range of scanning is up to 1000 times greater than with conventional methods.



Optimal scan settings configured automatically

With the VR Series, everything is configured automatically to suit the target, from the selection of the optimum brightness and measurement mode to focus positioning. Measurement itself is done with just the click of a button, ensuring that even new operators can measure without issue.



Measurement range settings configured automatically

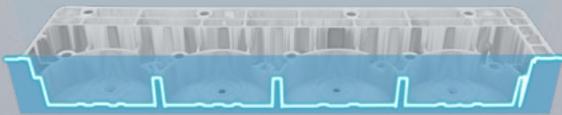
The VR Series automatically recognizes the width and height of the target in order to automatically set the optimal measurement range. By eliminating the need to set measurement length, height range, and other aspects required with general measuring instruments, the VR Series ensures mistakes, such as failing to measure a certain part of the target, do not occur. Once a target is placed, the motorized stage automatically moves in the XY direction, and rotates the sample as required.



A Single Device to Measure Nearly Any Callout

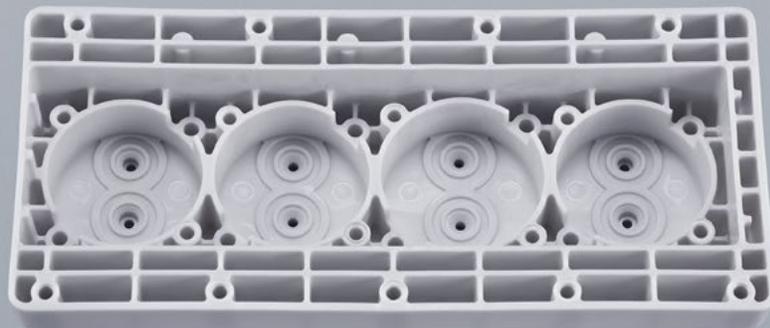
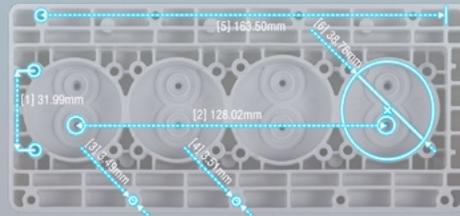
Profile measurement

Measure height differences, chamfers, draft angles, and radii



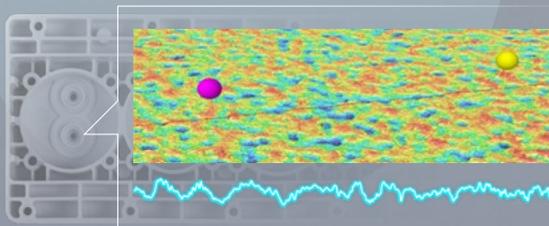
2D measurement

Measure distances and angles between circles, points, and lines



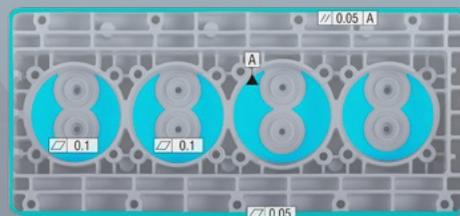
Surface roughness

Measure roughness parameters, such as Ra and Rz, to JIS and ISO standards



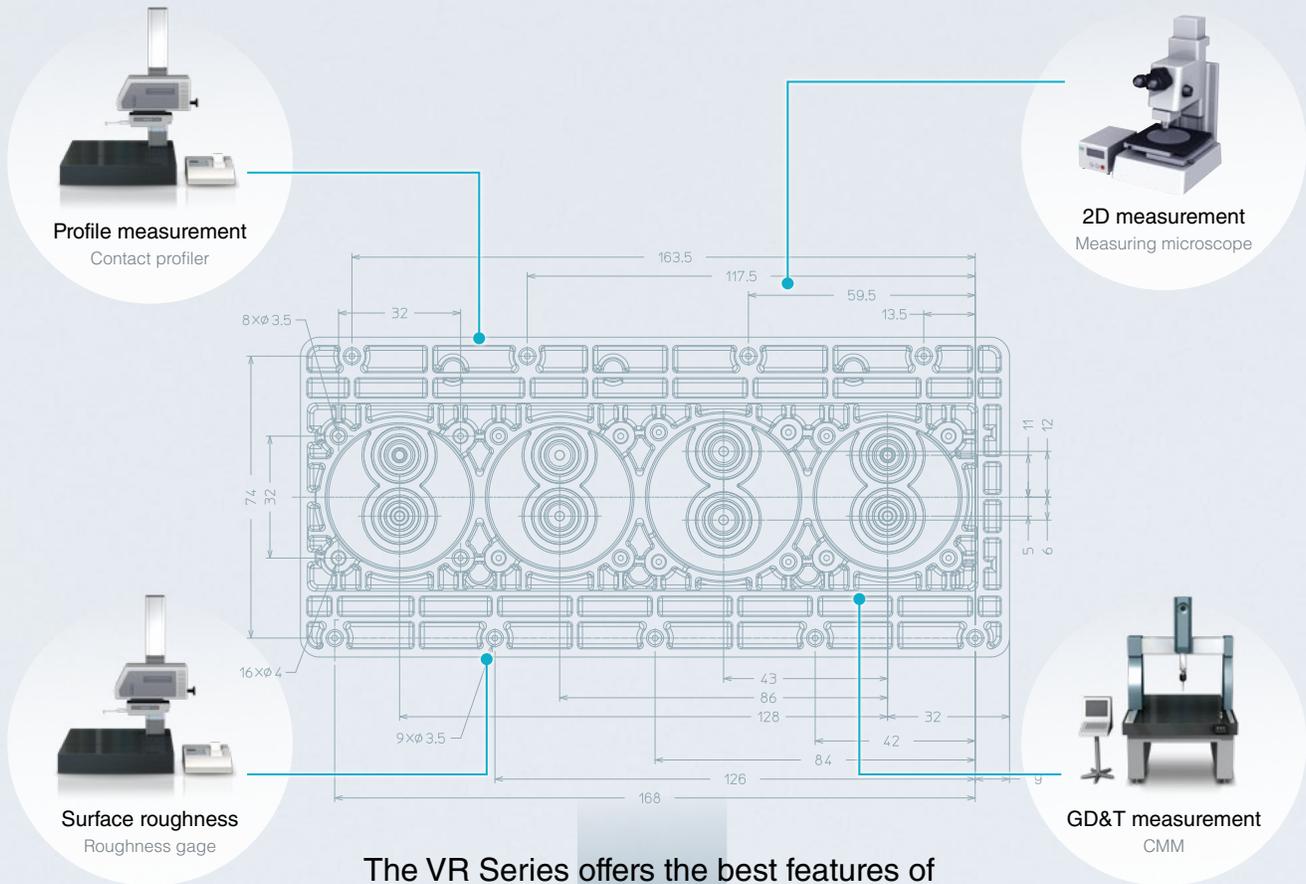
GD&T measurement

Measure flatness, parallelism, concentricity, circularity, and perpendicularity

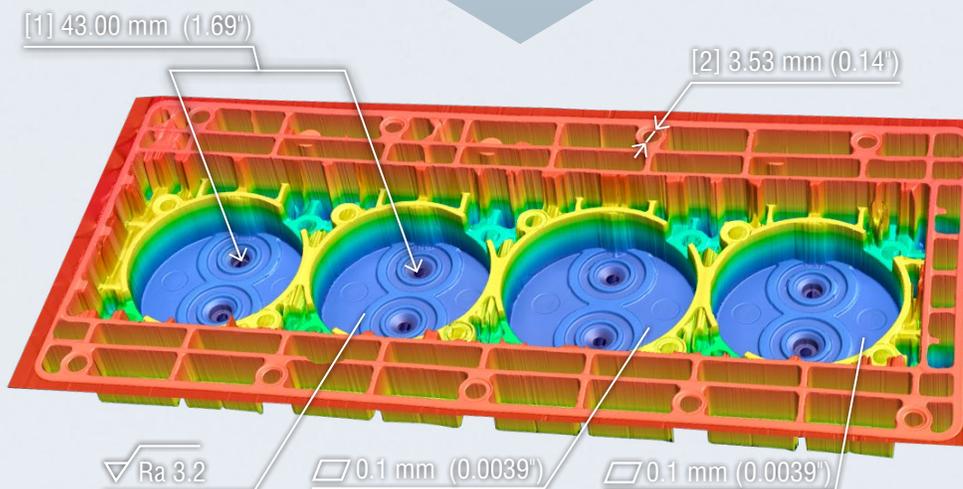


Consolidate multiple measurement systems into one device

The VR Series streamlines the inspection and analysis process by combining the measurement capabilities of multiple different systems into a single device.



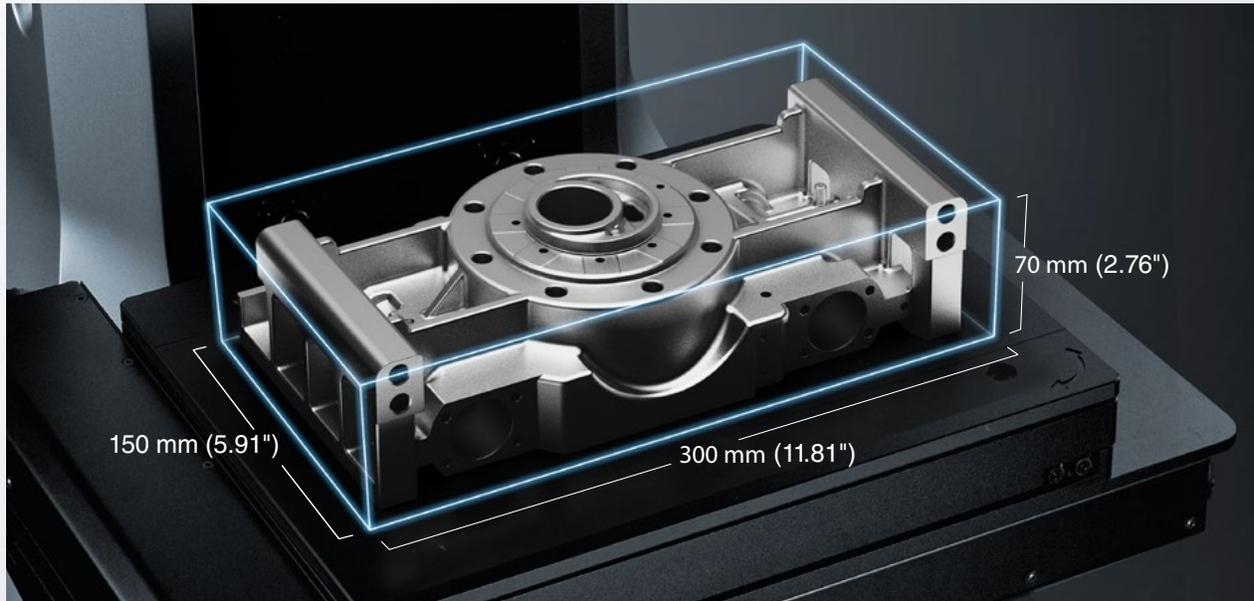
The VR Series offers the best features of multiple measurement systems in one device



Highly Accurate Wide-Area Measurement

2.6 times greater measurement range

Measurement area up to 300 × 150 × 70 mm **11.81" × 5.91" × 2.76"**



*The maximum measurement area may be limited to 300 × 125 × 70 mm **11.81" × 4.92" × 2.76"**, depending on the form of the target sample.

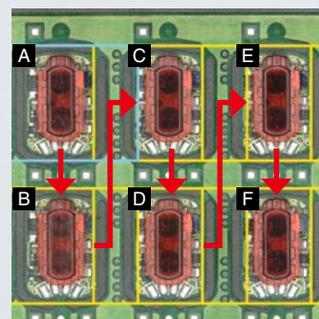
From precision parts to large products

The VR Series can measure a wide range of targets, including those with minute features such as electronic components and screws, as well as non-flat castings and assembled products. A high operating rate is achieved with a large number of measurement options.



Measure multiple targets simultaneously

With a 300 × 150 mm **11.81" × 5.91"** measurement range, multiple objects can be placed on the stage and measured at the same time. The VR Series can also be used to measure a tray of parts, as well as equidistant pins or holes. Automating both the data acquisition and analysis in this way dramatically improves productivity.



Electronic PCB

Product	Height (mm inch)
A	2.562 0.1009"
B	2.555 0.1006"
C	2.371 0.0933"
D	2.489 0.0980"
E	2.511 0.0989"
F	2.609 0.1027"

Highly accurate and precise measurement

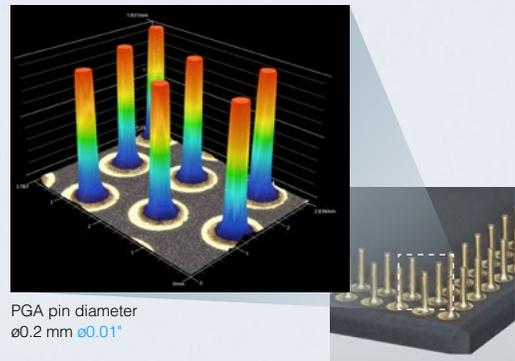
Dual camera optical measurement system

The VR Series is equipped with two cameras, one optimized for low magnification (wide field of view) and the other for high magnification (high resolution). Both large products and minute precision parts can be measured with a single device.



Capture at high magnification, scan with high definition

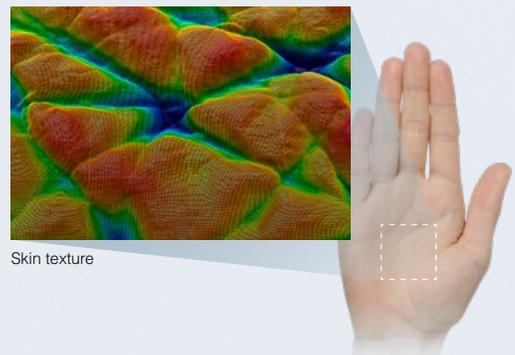
The combination of a high-resolution camera and high-definition scanning allows accurate reproduction of minute features and highly precise 3D measurements.



PGA pin diameter
 $\varnothing 0.2 \text{ mm } \varnothing 0.01''$

Acquire precise 3D data

Build precise 3D models with up to 25 million points of data. The overall shape of the target can be captured while maintaining a high resolution to measure fine surface textures.



Skin texture

User-Friendly Measurement Functions

Cross-section in any location

With the VR Series, a variety of measurements can be performed based on the scanned data. A high-degree of freedom and intuitive controls allows nearly any measurement to be taken, and measurements can be edited or changed later.

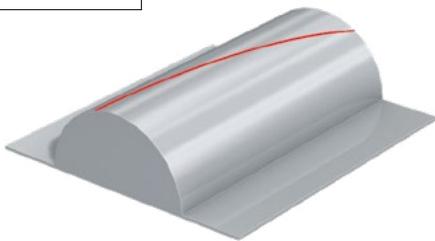


Abundant assist tools for accurate and repeatable measurements

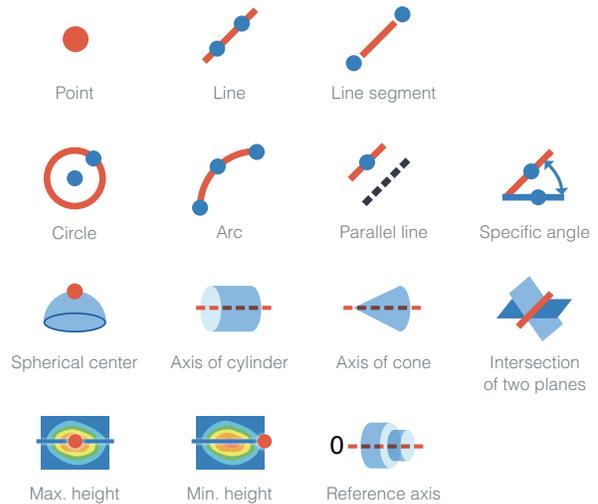
Measure difficult shapes

Both optical and height data can be used to easily place assist lines at edges, virtual intersections, and axes of cylinders, all of which are difficult with conventional systems.

Assist tools not used



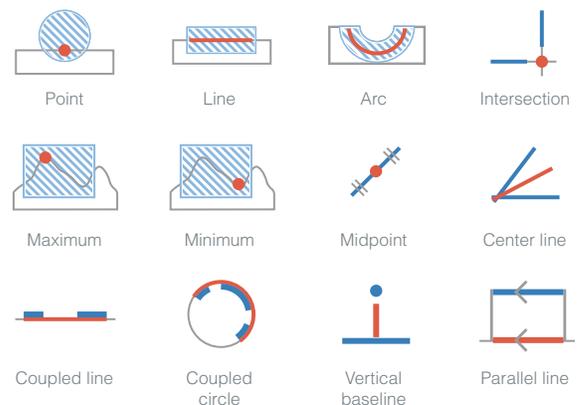
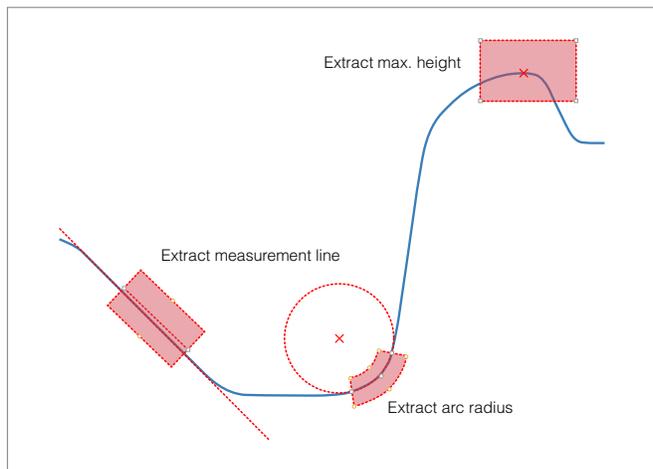
Assist tools used



Acquire the desired values

Conventional measurement systems struggle to repeatably extract features, causing measured values to change.

The VR Series uses the least squares method for cross-sectional data to extract elements such as lines and arcs, which allows stable and repeatable measurement results.

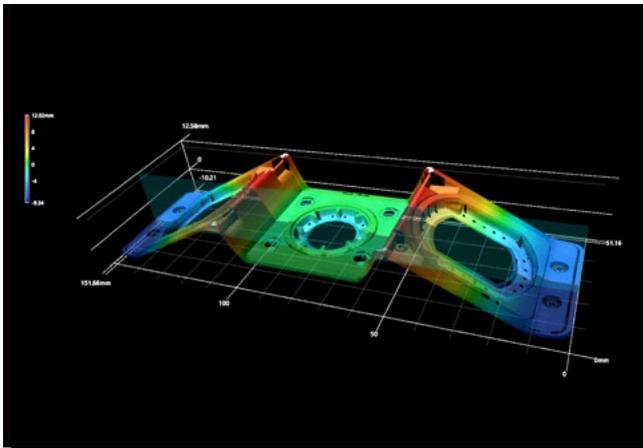


User-Friendly Measurement Functions

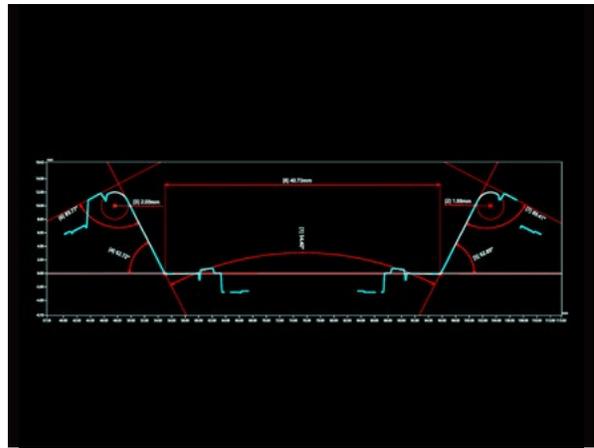
Profile measurement

Faithfully reproduce contact profiles

By measuring the 3D shape of a target, the VR Series is able to measure the height, width, angle, and radius from the cross-sectional shape. In addition, the non-contact design enables measurement of soft objects such as rubber and cloth products. The measurement of steep slopes and the surface measurement of hollow parts in which there is separation between surfaces can be performed without any need to worry about a stylus getting stuck.



Sensor head



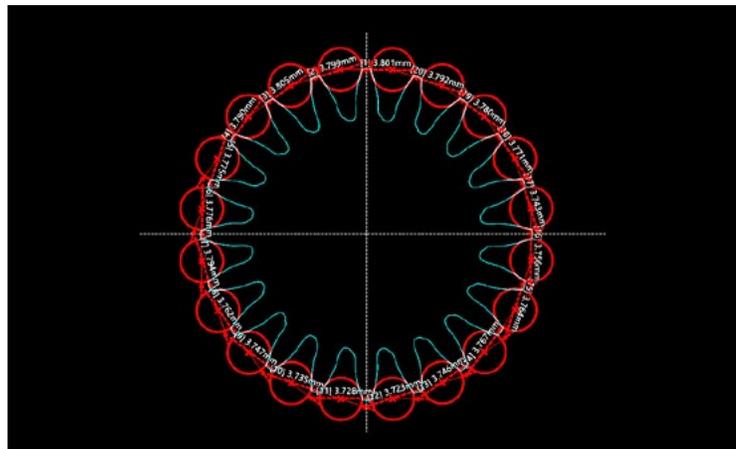
Cross-section measurement

Use data from the back and sides for measurement

Data can be acquired around the surface of the part, including on the sides and backside. Non-destructive cross sectional measurements can be performed around the entire circumference of the part, and thickness measurements of thin, stamped products can be accurately measured.



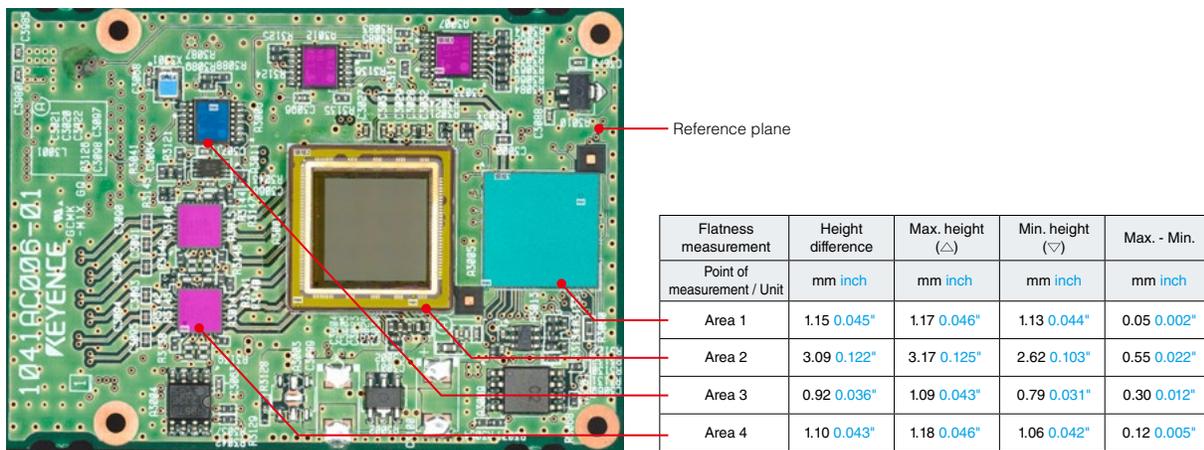
Straight bevel gear



Flatness measurement

Accurate measurement based on data from the entire surface

Height differences and parallelism between two surfaces can be easily measured, using hundreds of thousands to millions of data points to perform the calculation. Maximum and minimum points can be automatically calculated, and flatness across the entire surface of the sample can be measured.

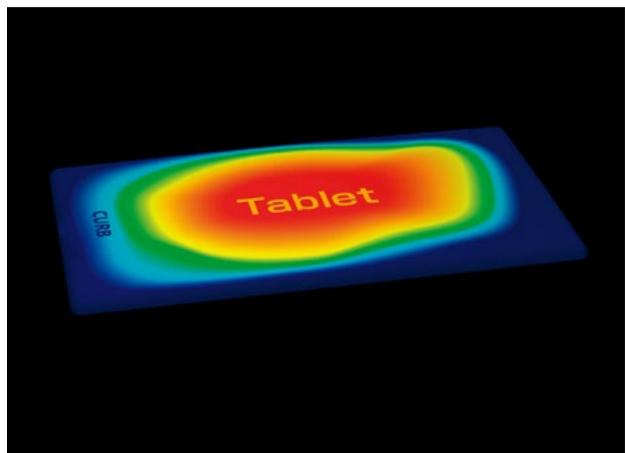
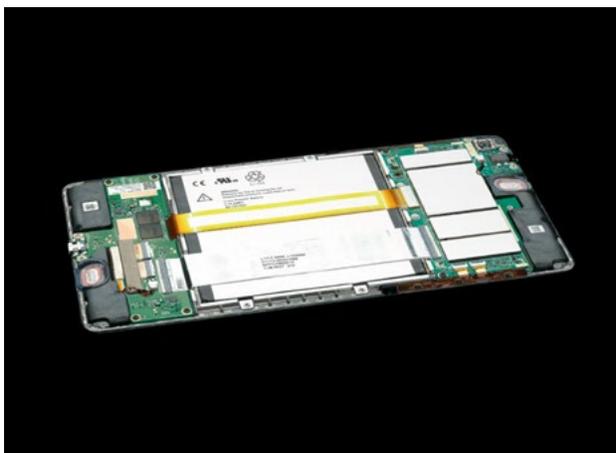


Electronic PCB

Warpage visualization

Visualize subtle differences in height

After acquiring height data, users can change the color in which height is displayed. This makes it easy to visualize differences across the surface. 10 different height-color patterns can be selected for indicating height, enabling quick judgement with just a single glance.



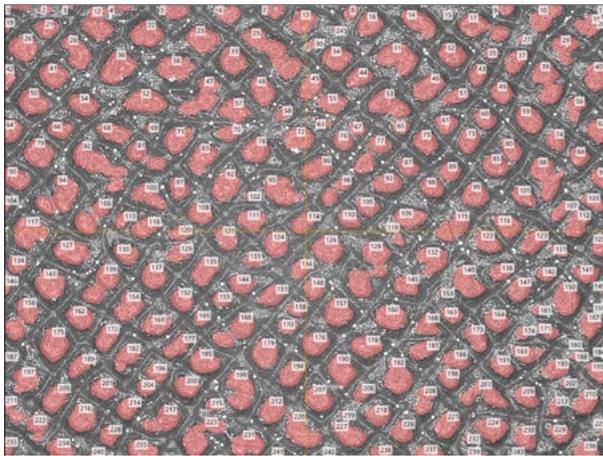
Curvature measurement of tablet case

User-Friendly Measurement Functions

Volume and area measurement

Analysis made possible with a non-contact measurement system

Using height data, a target's volume and area can be measured. Counting the number of protrusions or depressions is also possible with a certain height specified as the threshold. Data can be identified from up to 3000 locations, making it possible to instantly quantify scratches and foreign matter.



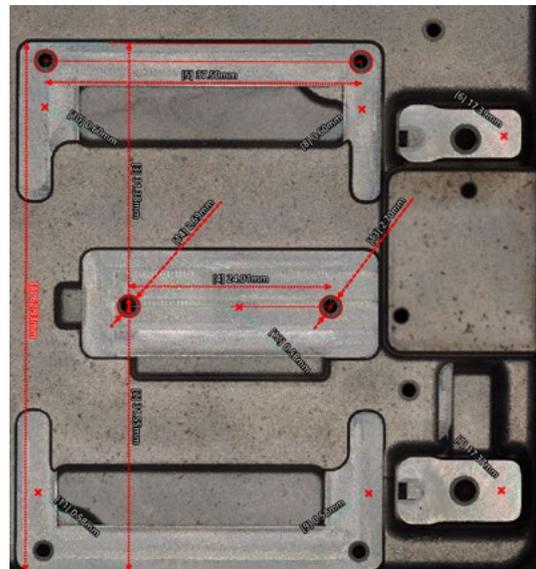
Measurement of number of grains/volume of topography

	Volume	Cross sectional area	Surface area	Average height	Max. height
	mm ³ in ³	mm ² in ²	mm ² in ²	mm inch	mm inch
Total	4.86 0.00029 ⁺³	154.163 0.23895 ⁺²	153.485 0.23790 ⁺²	6.92 0.272 ⁺	13.956 0.549 ⁺
Maximum	0.058 3.53937 ⁻³	1.909 0.00295 ⁺²	1.934 0.00299 ⁺²	0.046 0.002 ⁺	0.177 0.007 ⁺
Minimum	0	0.001 1.55000 ⁻²	0	0	0
Average	0.02 1.22047 ⁻³	0.634 0.00098 ⁺²	0.632 0.00097 ⁺²	0.028 0.001 ⁺	0.057 0.002 ⁺

Dimensional measurements

Extract accurate edges from height and image data

The VR Series measures the XY dimension while viewing the target from directly above. In addition, since height data is also acquired, you can accurately measure objects that have sagging surfaces or edges that are difficult to ascertain.

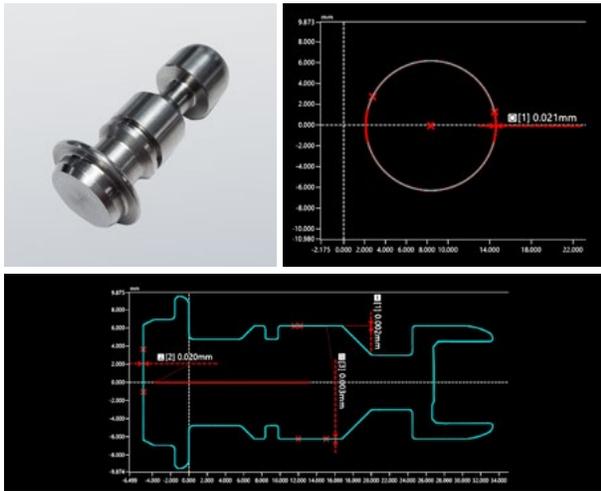


Cutting surface of casting

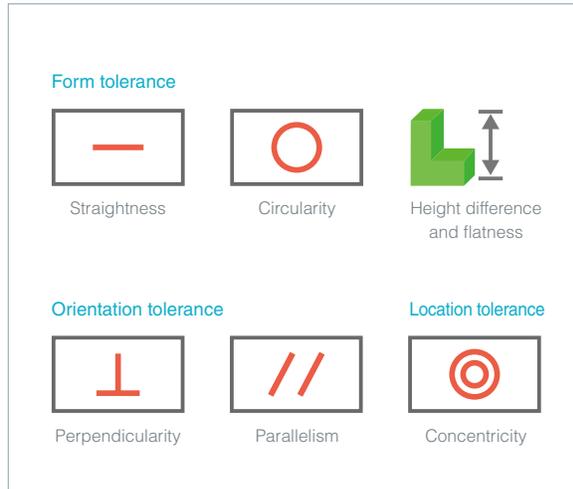
GD&T measurement

Support for a wide range of drawing callouts

GD&T measurements such as straightness, circularity, and perpendicularity can be performed using various orientation and position tolerance tools. Even flatness measurements that traditionally were time consuming to measure can be captured in an instant.



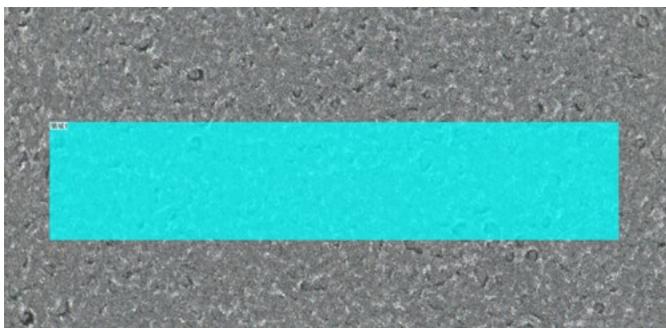
Profile measurement of bolt



Roughness measurement

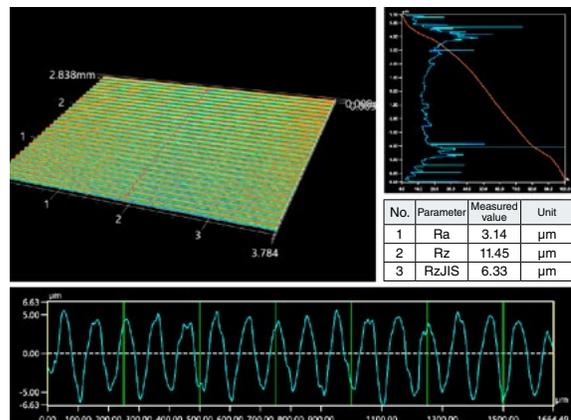
Non-contact roughness measurement

A total of 42 roughness parameters can be measured, including Ra, Rz, Sa, and Sz. Measurement results are compliant with ISO 4287 (1994, 2001) and ISO 25178.



No.	Sa	Sz	Str	Spc	Sdr	Sp	Ssk	Sku
	μm	μm		1/mm		μm		
Area shape 1	0.51	6.33	0.61	34.1	0.01	2.99	-0.02	3.02

Blasted sample

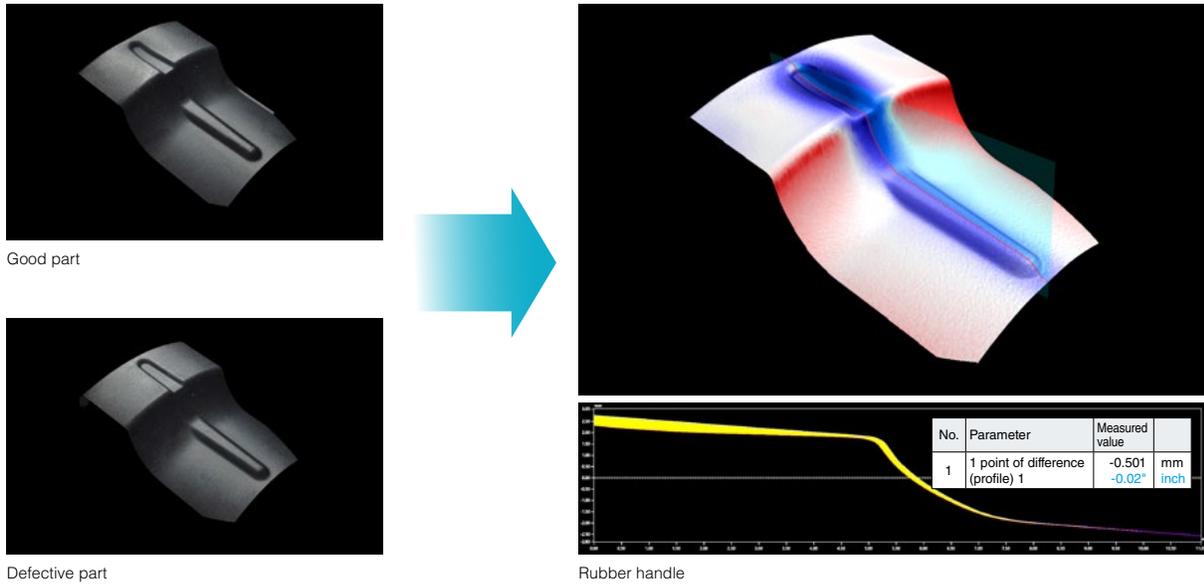


Roughness reference sample

Wide-Variety of Analysis Tools

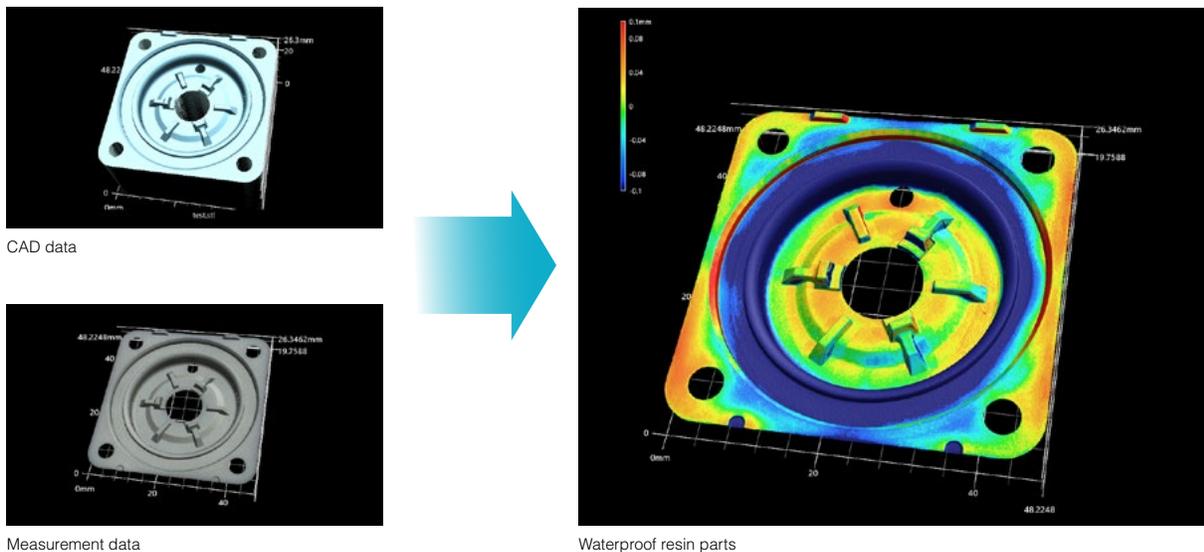
Compare data between products

Scan data acquired from two different parts can be overlaid, and differences can be visualized with a height color display. Instant analysis can be performed, instead of painstakingly trying to identify differences through trial and error.



Compare CAD data to measurement data

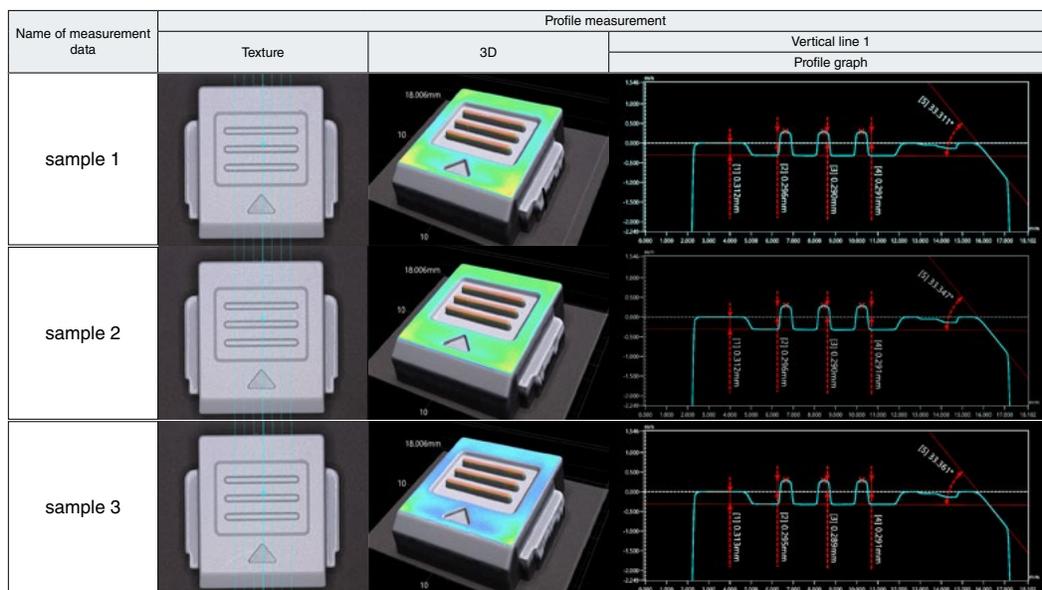
CAD data can be superimposed on measurement data to determine whether the shape is as intended. Prototypes or other manufactured parts can be quickly evaluated to determine if the product meets design specifications.



Immediate analysis of multiple data files

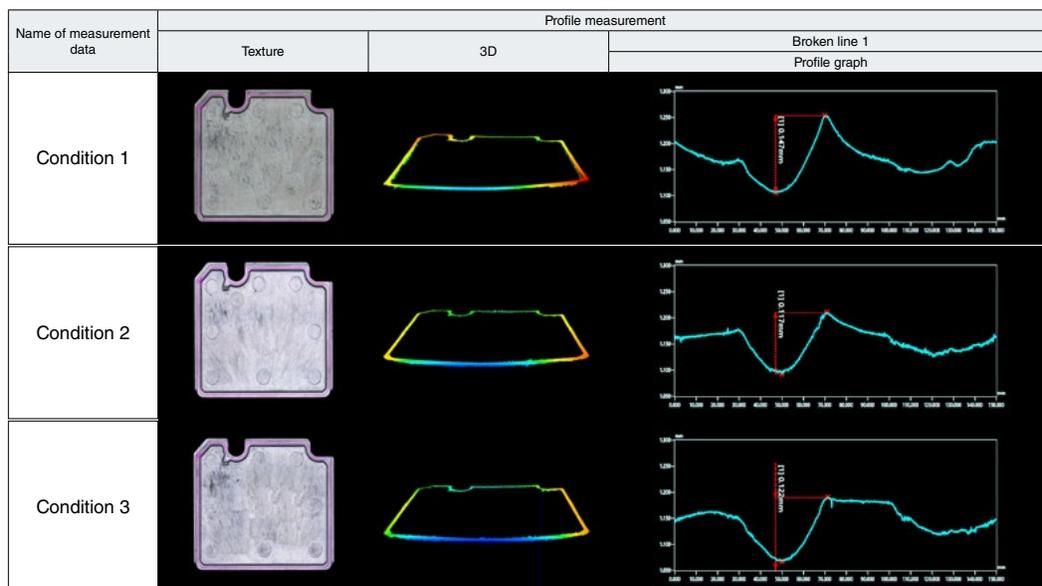
Repeated image processing and measurement operations can be automatically performed across multiple parts. This simplifies measurement of numerous targets and allows the user to see differences at a glance while also eliminating wasted time and setting errors, significantly improving overall work efficiency.

Apply measurements from one sample to other samples



Profile measurement of plastic molded part

Ascertain differences by displaying analysis results of multiple samples and 3D data side by side



Distortion analysis of die-cast parts with different manufacturing conditions

Versatile Functionality

Automatic differentiation of surface conditions

Surface roughness has been widely used as a method of quantifying surface conditions, but sometimes commonly used parameters do not differ in value. The VR-6000 makes it easy to determine which parameters to use when first beginning analysis.

Roughness parameter suggestions



Ra and Rz are two of the most common roughness parameters, but there are numerous other parameters as well. The Parameter Recommendation function makes it easy to quickly determine which roughness parameter is best for evaluating a specific target. Even novice users are able to quickly visualize and quantify differences in appearance and texture.

Result

Measurement data

Measurement data name	Image	Area settings
VR-20XX0220_134421		All Areas
VR-20XX0220_161032		All Areas
VR-20XX0220_161118		All Areas

Group2

Measurement data name	Image	Area settings
VR-20XX0220_134533		All Areas
VR-20XX0220_160406		All Areas
VR-20XX0220_160946		All Areas

Back

Analysis result

Parameters are ordered by degree of separation.
Select parameters to be added to a report.

Separation	Parameter	Name	Desc.	Distribution
★★★★	Sp	Arithmetic mean peak curvature (peakedness)	* The larger the value, the higher the peakedness.	
★★★★	Sa	Arithmetic mean height of the surface		
★★★★	RSm	Mean width of the profile elements (average of peak and valley cycle lengths)		
★★★	Ra	Arithmetic mean height of the profile		
★★★	Sdr	Developed interfacial area ratio (degree of increase of surface area when compared with a flat surface)	* This value is 0.1 when the surface area increases by 10%.	
★★★	Str	Aspect ratio of the surface texture (presence of systematic creases)	* This is a value from 0 to 1. The smaller the value, the more clear are the creases.	
★★★	Sz	Maximum height of the surface		

Show all parameters

★★★★

Degree of separation
2 or more

★★★★

Degree of separation
1 or more

★★★

Degree of separation
0.5 or more

★★★

Degree of separation
Less than 0.5

Close

Roughness is calculated from multiple measurement data, and the degree of separation for each roughness parameter value is calculated.

22

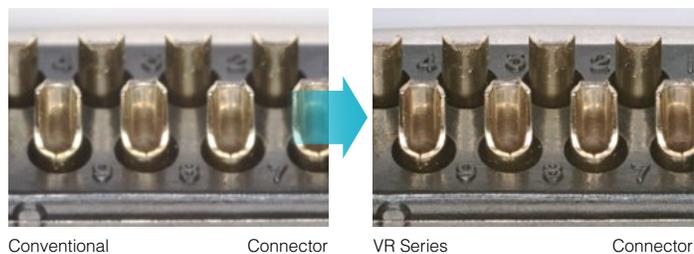
Visual observation

Samples can be observed and imaged under magnifications ranging from 12x - 160x. High-magnification, high-resolution images can be captured and saved with just a single click.



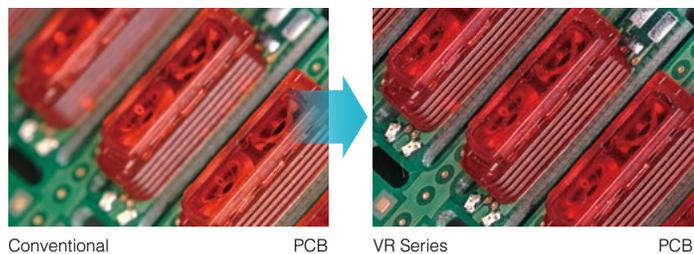
Deep depth-of-field with a telecentric lens

The VR Series features a unique telecentric lens based on advanced optical technology that KEYENCE has developed over 20 years. Observation in high resolution, low distortion, and with a deep depth of field have been achieved.



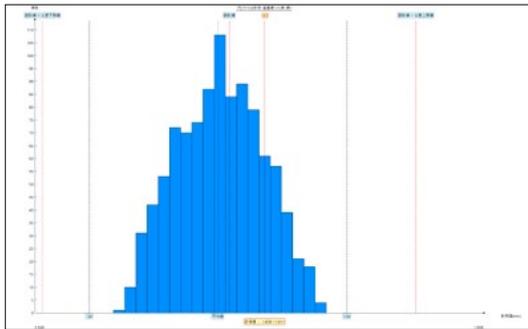
Equipped with a depth composition function

If the depth-of-field is insufficient when a sample has a large height change or when the magnification is increased, the depth composition function can be used to capture multiple images of the sample across different focal planes, creating a fully-focused image.

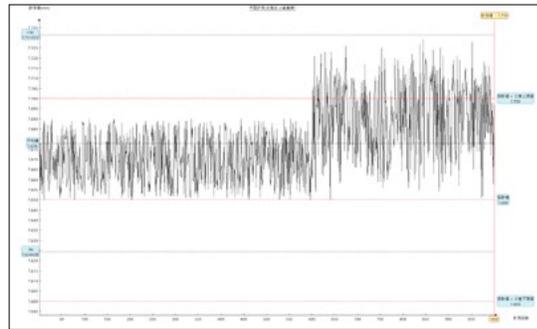


Statistical analysis function

Statistical analysis software is included as a standard feature. Major statistical values such as average, σ , 3σ , 6σ , and Cpk can be automatically calculated and displayed from the inspection results. Information such as the measured date/time and lot number is also automatically saved, so users can easily search for the results of previous measurements. Graphs and histograms are automatically created for quick visualization of trends.



Histogram



Trend graph

Output	Item name	Result
<input checked="" type="checkbox"/>	Data-entire(s)	1000
<input checked="" type="checkbox"/>	Valid measurement(s)	1000
<input type="checkbox"/>	Invalid measurement(s)	0
<input checked="" type="checkbox"/>	OK number(s)	862
<input checked="" type="checkbox"/>	NG number(s)	138
<input checked="" type="checkbox"/>	NG rate	13.800%
<input checked="" type="checkbox"/>	Design value	7.650
<input checked="" type="checkbox"/>	Upper tolerance	0.050
<input checked="" type="checkbox"/>	Lower tolerance	-0.050
<input checked="" type="checkbox"/>	Maximum value	7.729
<input checked="" type="checkbox"/>	Minimum value	7.650
<input checked="" type="checkbox"/>	Average value	7.678
<input checked="" type="checkbox"/>	Range (Max. - Min.)	0.079
<input checked="" type="checkbox"/>	6σ	0.107144
<input checked="" type="checkbox"/>	4σ	0.071429
<input checked="" type="checkbox"/>	3σ	0.053571
<input checked="" type="checkbox"/>	σ	0.017857
<input checked="" type="checkbox"/>	CP	0.933326
<input checked="" type="checkbox"/>	CPK	0.407005

Order No.	Order Date	Order Qty	Lot No.	Lot Qty	Lot Date	Lot Status	Lot Size	Lot Date	Lot Status	Lot Size	Lot Date	Lot Status
01	2023/01/01	10000	001	1000	2023/01/01	OK	1000	10.152	17.884	7.679	0.079	0.012
02	2023/01/01	10000	002	1000	2023/01/01	OK	1000	10.204	17.884	7.679	0.079	0.012
03	2023/01/01	10000	003	1000	2023/01/01	OK	1000	10.256	17.884	7.679	0.079	0.012
04	2023/01/01	10000	004	1000	2023/01/01	OK	1000	10.307	17.884	7.679	0.079	0.012
05	2023/01/01	10000	005	1000	2023/01/01	OK	1000	10.359	17.884	7.679	0.079	0.012
06	2023/01/01	10000	006	1000	2023/01/01	OK	1000	10.411	17.884	7.679	0.079	0.012
07	2023/01/01	10000	007	1000	2023/01/01	OK	1000	10.463	17.884	7.679	0.079	0.012
08	2023/01/01	10000	008	1000	2023/01/01	OK	1000	10.515	17.884	7.679	0.079	0.012
09	2023/01/01	10000	009	1000	2023/01/01	OK	1000	10.567	17.884	7.679	0.079	0.012
10	2023/01/01	10000	010	1000	2023/01/01	OK	1000	10.619	17.884	7.679	0.079	0.012
11	2023/01/01	10000	011	1000	2023/01/01	OK	1000	10.671	17.884	7.679	0.079	0.012
12	2023/01/01	10000	012	1000	2023/01/01	OK	1000	10.723	17.884	7.679	0.079	0.012
13	2023/01/01	10000	013	1000	2023/01/01	OK	1000	10.775	17.884	7.679	0.079	0.012
14	2023/01/01	10000	014	1000	2023/01/01	OK	1000	10.827	17.884	7.679	0.079	0.012
15	2023/01/01	10000	015	1000	2023/01/01	OK	1000	10.879	17.884	7.679	0.079	0.012
16	2023/01/01	10000	016	1000	2023/01/01	OK	1000	10.931	17.884	7.679	0.079	0.012
17	2023/01/01	10000	017	1000	2023/01/01	OK	1000	10.983	17.884	7.679	0.079	0.012
18	2023/01/01	10000	018	1000	2023/01/01	OK	1000	11.035	17.884	7.679	0.079	0.012
19	2023/01/01	10000	019	1000	2023/01/01	OK	1000	11.087	17.884	7.679	0.079	0.012
20	2023/01/01	10000	020	1000	2023/01/01	OK	1000	11.139	17.884	7.679	0.079	0.012
21	2023/01/01	10000	021	1000	2023/01/01	OK	1000	11.191	17.884	7.679	0.079	0.012
22	2023/01/01	10000	022	1000	2023/01/01	OK	1000	11.243	17.884	7.679	0.079	0.012
23	2023/01/01	10000	023	1000	2023/01/01	OK	1000	11.295	17.884	7.679	0.079	0.012
24	2023/01/01	10000	024	1000	2023/01/01	OK	1000	11.347	17.884	7.679	0.079	0.012
25	2023/01/01	10000	025	1000	2023/01/01	OK	1000	11.399	17.884	7.679	0.079	0.012
26	2023/01/01	10000	026	1000	2023/01/01	OK	1000	11.451	17.884	7.679	0.079	0.012
27	2023/01/01	10000	027	1000	2023/01/01	OK	1000	11.503	17.884	7.679	0.079	0.012
28	2023/01/01	10000	028	1000	2023/01/01	OK	1000	11.555	17.884	7.679	0.079	0.012
29	2023/01/01	10000	029	1000	2023/01/01	OK	1000	11.607	17.884	7.679	0.079	0.012
30	2023/01/01	10000	030	1000	2023/01/01	OK	1000	11.659	17.884	7.679	0.079	0.012
31	2023/01/01	10000	031	1000	2023/01/01	OK	1000	11.711	17.884	7.679	0.079	0.012
32	2023/01/01	10000	032	1000	2023/01/01	OK	1000	11.763	17.884	7.679	0.079	0.012
33	2023/01/01	10000	033	1000	2023/01/01	OK	1000	11.815	17.884	7.679	0.079	0.012
34	2023/01/01	10000	034	1000	2023/01/01	OK	1000	11.867	17.884	7.679	0.079	0.012
35	2023/01/01	10000	035	1000	2023/01/01	OK	1000	11.919	17.884	7.679	0.079	0.012
36	2023/01/01	10000	036	1000	2023/01/01	OK	1000	11.971	17.884	7.679	0.079	0.012
37	2023/01/01	10000	037	1000	2023/01/01	OK	1000	12.023	17.884	7.679	0.079	0.012
38	2023/01/01	10000	038	1000	2023/01/01	OK	1000	12.075	17.884	7.679	0.079	0.012
39	2023/01/01	10000	039	1000	2023/01/01	OK	1000	12.127	17.884	7.679	0.079	0.012
40	2023/01/01	10000	040	1000	2023/01/01	OK	1000	12.179	17.884	7.679	0.079	0.012
41	2023/01/01	10000	041	1000	2023/01/01	OK	1000	12.231	17.884	7.679	0.079	0.012
42	2023/01/01	10000	042	1000	2023/01/01	OK	1000	12.283	17.884	7.679	0.079	0.012
43	2023/01/01	10000	043	1000	2023/01/01	OK	1000	12.335	17.884	7.679	0.079	0.012
44	2023/01/01	10000	044	1000	2023/01/01	OK	1000	12.387	17.884	7.679	0.079	0.012
45	2023/01/01	10000	045	1000	2023/01/01	OK	1000	12.439	17.884	7.679	0.079	0.012

Statistical analysis

NEW Customized Excel report output function

When a measurement is complete, you can automatically output the results to a specified cell in a specified Excel spreadsheet. There is no need to change your current reporting, as the VR Series can adapt to your processes.

*Excel is a registered trademark of Microsoft Corporation in the United States and/or other countries.

Just place the sample and press the button



Inspection report							KK-0001-01 Made on XX/XX/20XX	
Customer name			XXXXX Corporation			Keyence Corporation		
Item number		1234AB001		Number of items #		10		
Item name		Base plate						
Inspection Items	Equipment	Inspection criteria	1	2	3	4	5	judgment
1	Bending height	VR 25±0.05 mm	25.002	25.015				OK / NG
2	Angle	VR 35±0.2 mm	35.15	35.11				OK / NG
3	Radius	VR 15±0.3 mm	14.95	14.81				OK / NG
4	Roughness	VR 3.2 μm	2.8	2.6				OK / NG

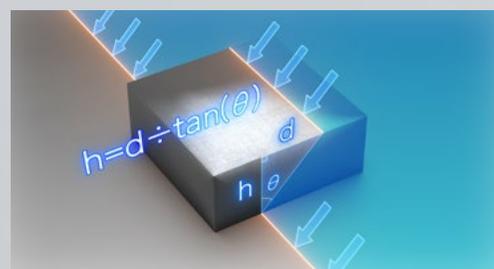
Technology for High-Precision Applications



[Measurement principle]

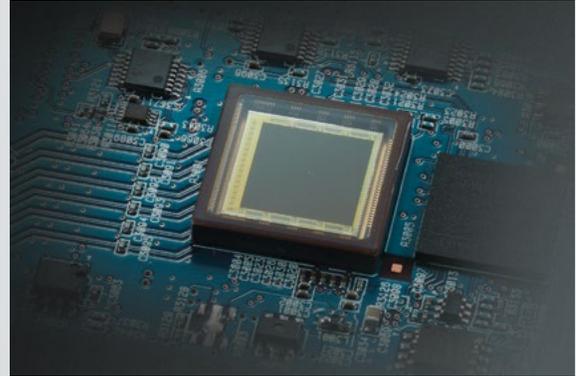
Light-section method

Structured light is emitted from the transmitter lens and projected onto the surface of the object. The reflected light is then detected by the receiver lens and will appear banded and bent based on changes in the topography of the surface. Triangulation is then used to calculate and measure the height of the surface.



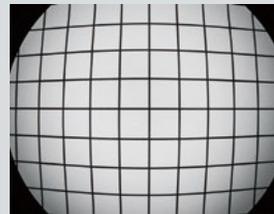
High-definition CMOS sensor

By adopting a large format, high-definition CMOS, low noise data is acquired across the entire field-of-view. RGB data is acquired for each pixel, providing excellent color imaging for surface inspection.

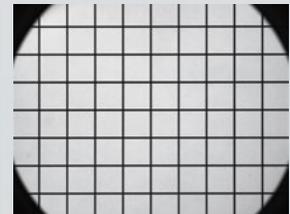


High-precision telecentric lens

To enable high-accuracy measurements throughout the field of view, the VR Series uses a telecentric lens with extremely low lens aberration. Objects can be captured as they actually appear and at their actual size, ensuring high measurement accuracy anywhere on the screen.



Normal camera lens
Distortion at the periphery



VR Series
Minimal distortion in the field of view

Large-aperture, high-resolution lens

A total of three large-aperture high-resolution lenses are mounted on the transmitter and receiver parts. With the advanced optical design, it is possible to acquire high-precision and high-definition measurement data at both low and high magnifications.

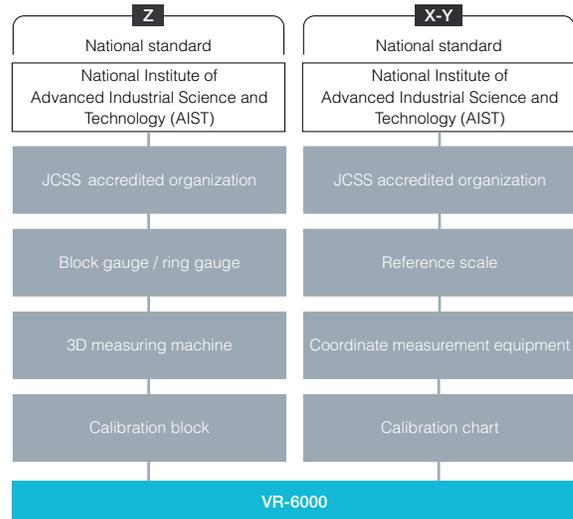


Guaranteed Accuracy in Compliance with National Standards

Traceable measurement results

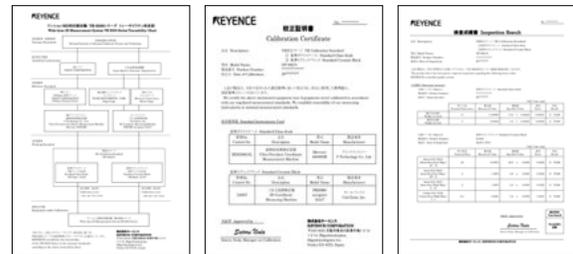
Accuracy guarantee

In order to perform highly reliable measurements as a non-contact measuring machine, traceability to national standards is ensured. A calibration certificate, inspection report, and traceability diagram are included with the product as standard.



Inspection reports/calibration certificates

Even after the VR Series has been installed, KEYENCE can carry out calibration and adjustment work and re-issue the calibration certificate.



Complete calibration with the touch of a button

Using the VR Series calibration gauge, which provides traceability to national standards, calibration work can be performed accurately in the customer's own environment. A calibration certificate, inspection report, and traceability diagram are also included with the calibration gauge.



Calibration gauge OP-88275 (optional)

Remote and local operations

Company licenses for multiple PCs NEW

The VR-6000 Series can be used with a company license, meaning the software can be installed on any computer within an office. This lets all 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.

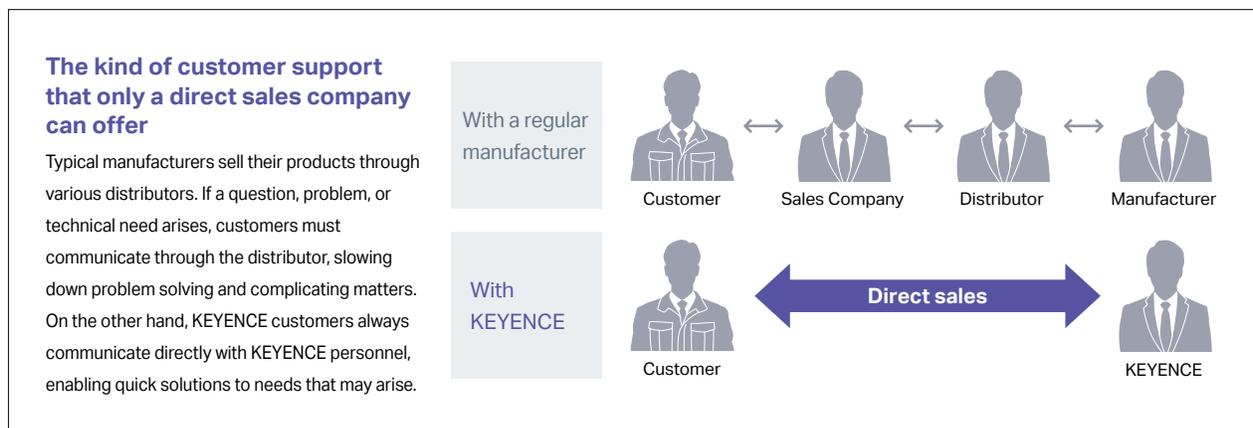
Observation and measurement in one device

By combining various equipment into one device, this system can help reduce operation and engineering 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.



Examples of Applications by Department

Development and design



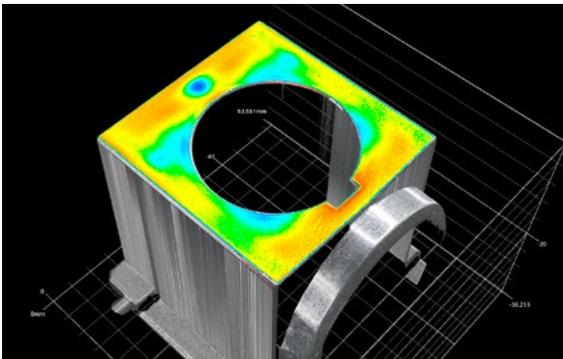
Intuitive operation enables quick qualitative and quantitative evaluation. In addition, parts can be compared directly against their CAD model to determine manufacturing differences.

Prototyping and evaluation

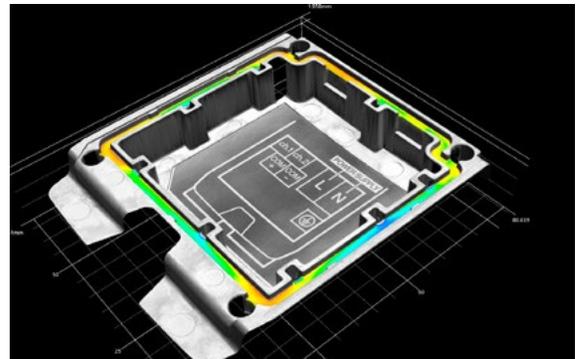


Use of the batch processing and comparison function makes it possible to greatly improve the efficiency of prototyping and evaluation work. Parts produced with different materials and processes can be compared to see how their surface conditions differ.

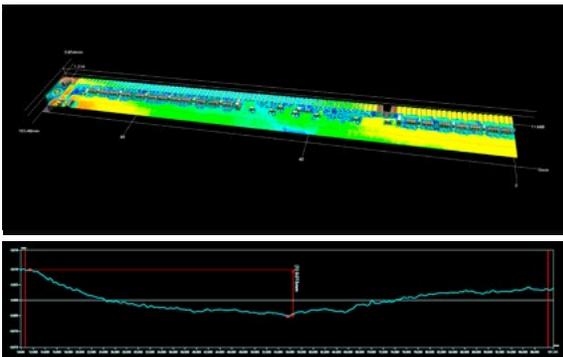
Confirmation of sink marks due to differences in plastic materials



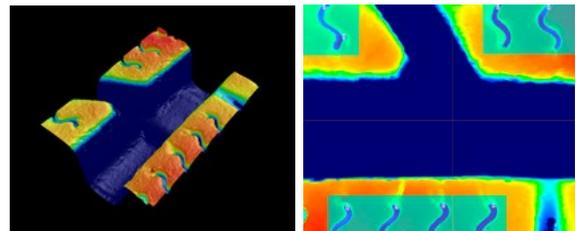
Leak evaluation of seals on sensor cases



Evaluation of changes in PCB warpage due to heating



Quantification of groove depth in tire wear testing



	Volume	Cross sectional area	Surface area	Avg. depth	Max. depth
	mm ³ in ³	mm ² in ²	mm ² in ²	mm inch	mm inch
Max.	2.639 0.00016 ⁱⁿ³	1.737 0.0027 ⁱⁿ²	6.362 0.0098 ⁱⁿ²	-1.183 -0.047 ⁱⁿ	-1.365 -0.054 ⁱⁿ
Min.	0.094 5.73623 ⁱⁿ³	0.077 0.0001 ⁱⁿ²	0.384 0.0006 ⁱⁿ²	-1.741 -0.069 ⁱⁿ	-2.095 -0.082 ⁱⁿ
Average	1.825 0.00011 ⁱⁿ³	1.311 0.0020 ⁱⁿ²	3.75 0.0058 ⁱⁿ²	-1.372 -0.054 ⁱⁿ	-1.614 -0.064 ⁱⁿ

Production technology and manufacturing



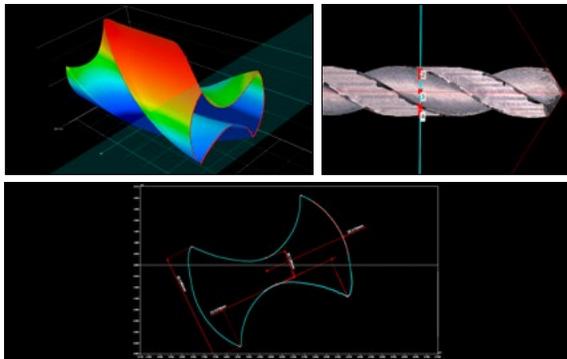
Downtime is reduced and yield is improved by installing the VR Series near production lines so that analysis can be performed immediately if a problem occurs. Tooling wear and part deviation can be instantly identified so processes can be adjusted.

Quality assurance and quality control

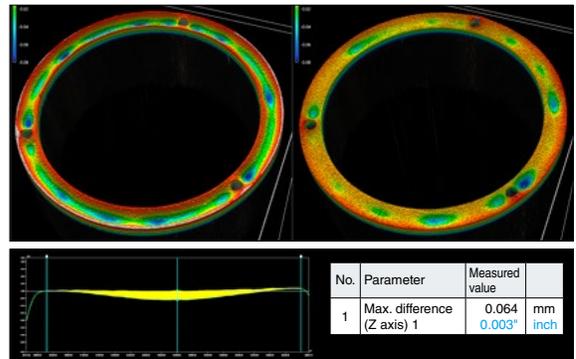


Use of the inspection mode allows anyone to easily and accurately carry out pass/fail incoming and outgoing inspections. Statistical values are automatically tracked for trend analysis, and results can be exported for integration with existing databases.

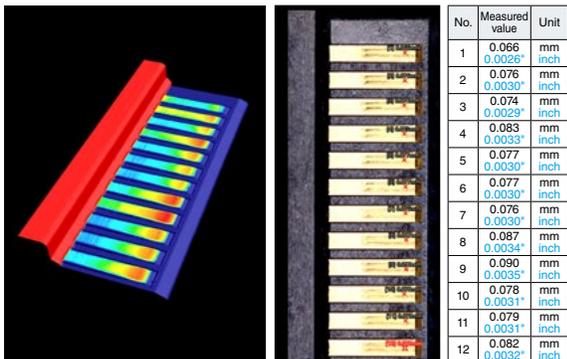
Drill contour/dimension measurements



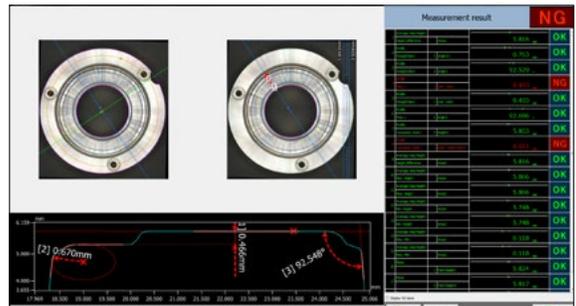
Evaluation of differences in good vs. defective parts



Warpage verification of connector electrodes



Outgoing inspection

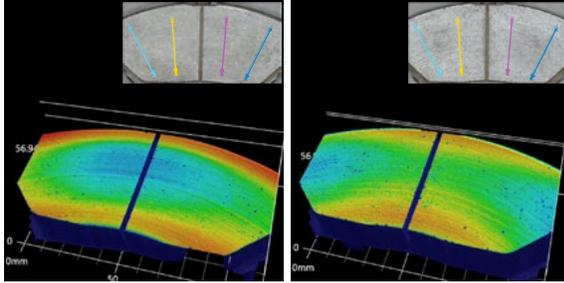


Examples of Applications by Industry

Automotive and aerospace

Wear evaluation of brake pads

Development and design departments

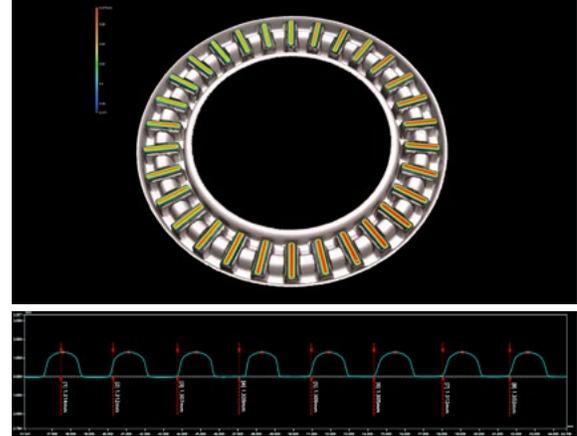


Name of measurement	Measurement line 1		Measurement line 2		Measurement line 3		Measurement line 4	
Content	Ra	Rz	Ra	Rz	Ra	Rz	Ra	Rz
Unit	μm	μm	μm	μm	μm	μm	μm	μm
sample1	8.85	59.80	10.50	57.84	12.02	135.27	0.79	3.32
sample2	8.89	58.10	8.37	63.10	8.07	65.99	0.95	4.37

Visualize wear with a height-color display and quantify surface conditions via roughness parameters.

Durability testing of bearings

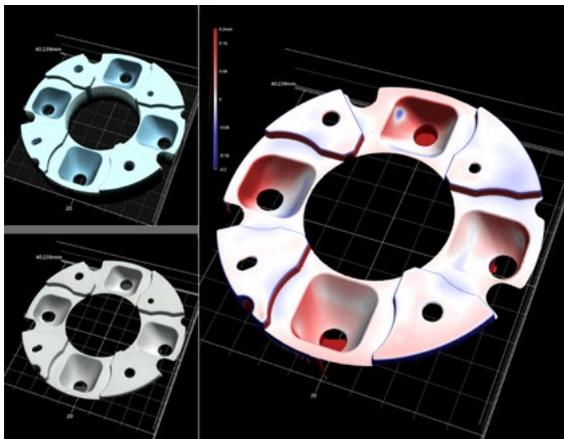
Development and design departments



Virtual cross-sections can be drawn across the entire surface of the part to instantly understand how shape and contour changes.

Identify defective components

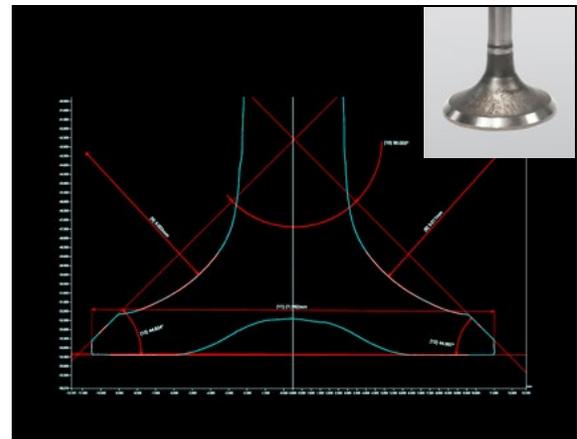
Quality assurance and quality control departments



Defective products can be compared against their CAD model for quick failure analysis.

Profile measurement of valve train components

Production technology and manufacturing departments

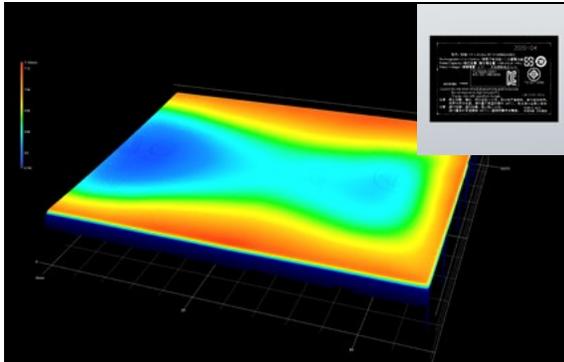


Parts that would be impossible to measure with conventional equipment can be easily measured with the VR Series.

Semiconductors and electronic devices

Checking battery curvature

Quality assurance and quality control departments



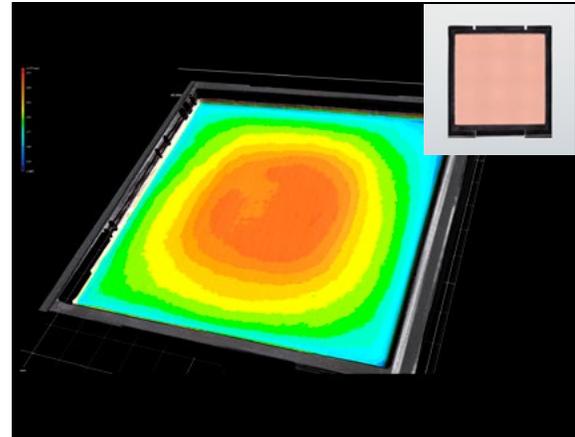
	Height difference	Max. height (△)	Min. height (▽)	Max. - Min.
	mm inch	mm inch	mm inch	mm inch
Area shape 1	6.936 0.273"	7.119 0.280"	6.764 0.266"	0.355 0.014"

By using height color displays to visualize the condition of deformities, you can clearly see the difference between the center and the edges of a part. This allows for quick implementation of countermeasures to alleviate the issue.

Chemicals, pharmaceuticals, and food products

Checking foundation filling

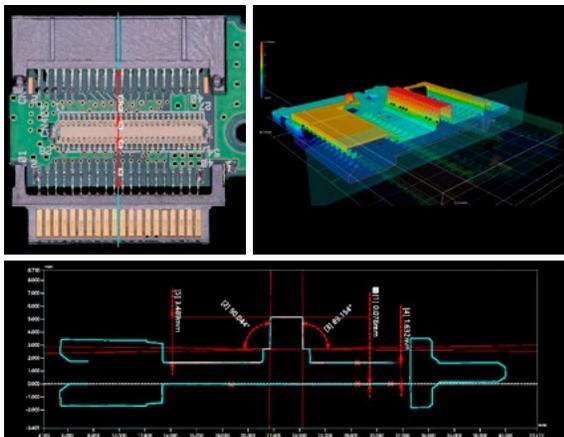
Production technology and manufacturing departments



You can measure flatness to check if a product is evenly filled, which leads to optimization of the mold and the pressure conditions. Since the VR Series is a non-contact system, manufacturing conditions can be adjusted quickly and accurately to improve yield.

Defect analysis, PCB connectors, parallelism measurements

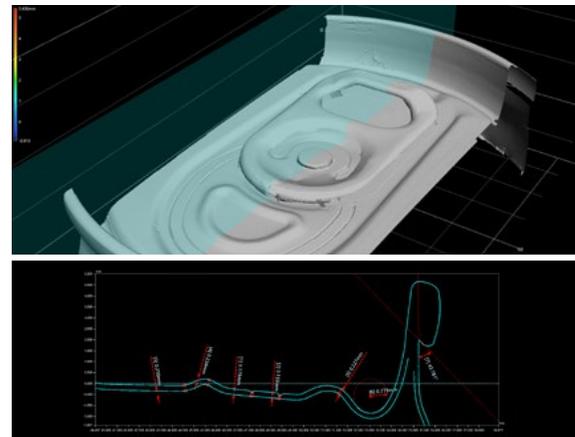
Quality assurance and quality control departments



As a method of analyzing connector insertion defects, you can measure parallelism and dimensions based on the back side, which was difficult to implement in the past. Improvements in analysis capabilities will also lead to improvements in reliability from your suppliers.

First article inspection of stamped parts

Production technology and manufacturing departments



There is no need to cut products or grab them with hand tools. You can improve productivity by shortening the time required for first article and random sampling inspections.

List of Product Specifications

Fully-automated model

VR-6200

XYZ-axis motorized control



100 mm 3.94" height spacer

OP-88630

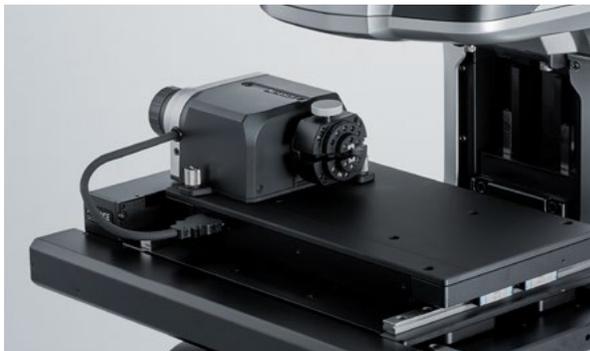
Inserting this 100 mm 3.94" high spacer between the measurement unit and the base allows you to measure objects up to 167 mm 6.57" in height. This extra space can be also used for use of a heating stage or special fixture.



Motorized rotation unit

VR-RU2

This motorized unit is used to secure, tilt, and rotate the target object, to eliminate blind spots when taking measurements. This makes it possible to evaluate vertical wall contours and make evaluations based on the back side without cutting the target object.



*Optional accessory for VR-6200 only

Standard model

VR-6100

XY-axis manual control

Z-axis motorized control



Motorized stage

VR-S400

The manual stage model can be upgraded to a motorized stage later on. This enables quick and accurate stitching, as well as easier navigation around a sample.



Large sample stage

A variety of large-sized or special stages are available to meet your needs. Measurement can be performed for various products, including large PCBs and housings that cannot be placed on the stage. Contact us for more details.

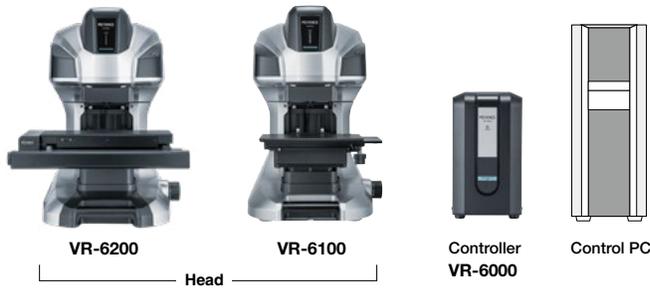


Rotational fixturing kit

OP-88677

Fixturing tool for performing rotational stitching on objects such as shafts or rods.





Motorized rotation unit VR-RU2 (optional)
*Optional accessory for VR-6200 only



Motorized stage VR-S400 (optional)
*Optional accessory for VR-6100 only



Monitor



Standard software set
VR-A2¹
Measurement expansion module
VR-H4J (optional)
Comparative measurement module
VR-H4CA (optional)

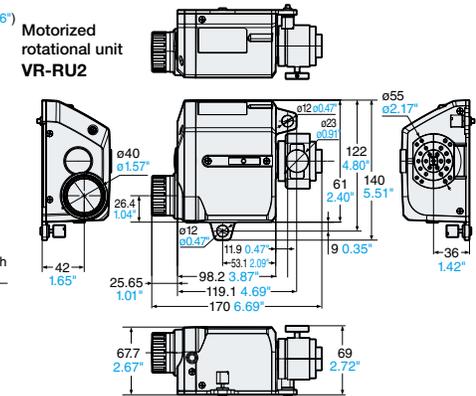
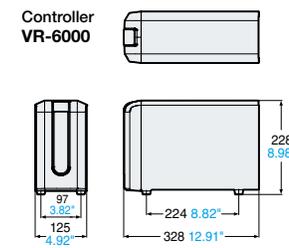
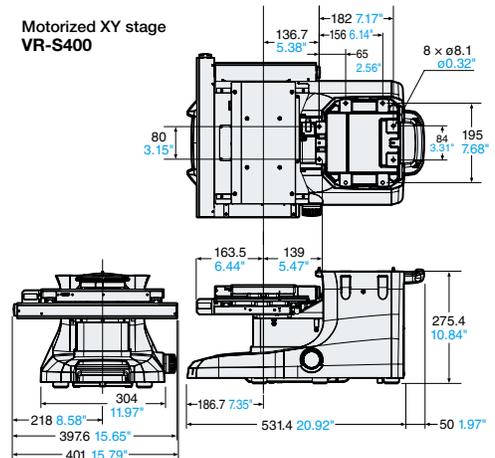
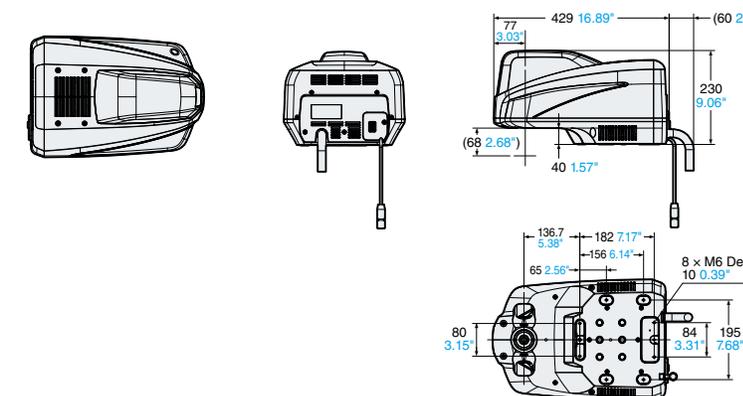
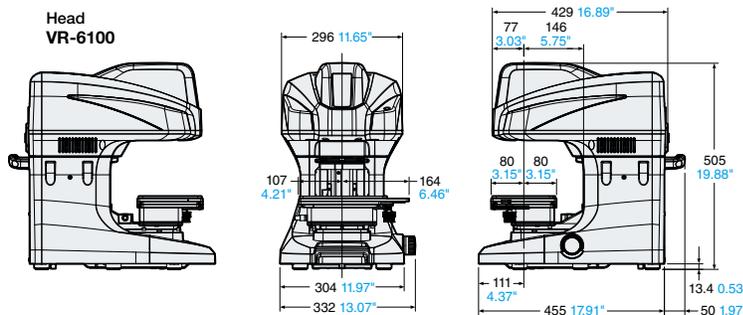
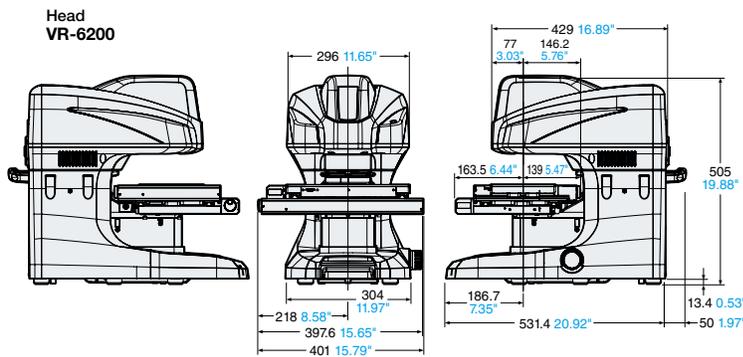
¹ Models may vary according to the instrument language.



Calibration gauge OP-88275 (optional)



Tilt stage OP-87709



Unit: mm inch

Specifications

VR Head/Controller

Model	Controller	VR-6000																
	Head	VR-6200 Fully motorized model								VR-6100 Standard model								
Camera		Low magnification (wide field of view)				High magnification (high resolution)				Low magnification (wide field of view)				High magnification (high resolution)				
Magnification on a 15" monitor		12x	25x	38x	50x	40x	80x	120x	160x	12x	25x	38x	50x	40x	80x	120x	160x	
Field of view	Horizontal: mm inch	24.0 0.94"	12.0 0.47"	8.0 0.31"	6.0 0.24"	7.6 0.30"	3.8 0.15"	2.5 0.10"	1.9 0.07"	24.0 0.94"	12.0 0.47"	8.0 0.31"	6.0 0.24"	7.6 0.30"	3.8 0.15"	2.5 0.10"	1.9 0.07"	
	Vertical: mm inch	18.0 0.71"	9.0 0.35"	6.0 0.24"	4.5 0.18"	5.7 0.22"	2.9 0.11"	1.9 0.07"	1.4 0.06"	18.0 0.71"	9.0 0.35"	6.0 0.24"	4.5 0.18"	5.7 0.22"	2.9 0.11"	1.9 0.07"	1.4 0.06"	
Zoom		1x to 4x																
Height measurement	Display resolution	0.1 μm																
	Height measurement range	Without Z stitching	10 mm 0.39"				1 mm 0.04"				10 mm 0.39"				1 mm 0.04"			
		With Z stitching	50 mm 1.97"				30 mm 1.18"				50 mm 1.97"				30 mm 1.18"			
	Repeatability (σ) ¹	Without Z stitching	0.4 μm															
		With Z stitching	1.0 μm															
Measurement accuracy ¹	Without Z stitching	±2.5 μm																
	With Z stitching	±4.0 μm																
Width measurement	Repeatability (σ) ¹	1 μm				0.5 μm				1 μm				0.5 μm				
	Measurement accuracy ¹	±5 μm				±2 μm				±5 μm				±2 μm				
Stitching function ²		Fully-automated measurement (XY automatic control + Z automatic control, θ automatic control)								Manual measurement (XY manual operation + Z automatic control)								
		Automatic mapping creation, Automatic area setting																
	Motorized rotational unit	Supported								Not supported								
XY measurable range ²		300 × 150 mm 11.81" × 5.91"								92 × 86 mm 3.62" × 3.39"								
Stage	XY stroke	278 × 134 mm 10.94" × 5.28" (motorized)								70 × 70 mm 2.76" × 2.76" (manual)								
	Z stroke	69 mm 2.72" (motorized)																
	Load capacity	4.5 kg 9.92 lb																
Working distance		75 mm 2.95"																
Image receiving element		4 megapixel monochrome CMOS																
Transmitter lens		Double-telecentric lens × 2																
Receiver lens		Double-telecentric lens																
Light sources	Observation light source	LED ring light (red, blue, green)																
	Measurement light source	White LED																
Power supply	Power voltage	100 to 240 VAC ±10%, 50/60 Hz																
	Power consumption	200 VA max.																
Environmental resistance	Ambient temperature	+15 to 30°C +59 to 86°F																
	Ambient humidity	20 to 80% RH (no condensation)																
Weight	Controller	Approx. 4 kg 8.82 lb																
	Head ³	Approx. 28 kg 61.73 lb								Approx. 25 kg 55.12 lb								
Data processing		Dedicated PC specified by KEYENCE (OS: Windows 10 Pro)																

¹ Value obtained using KEYENCE's specified standard gauge with measurement in KEYENCE's specified measurement mode (ambient temperature: 23±1°C 73.4±1.8°F)

² Measurement expansion module (VR-H4J) required ³ Weight of only measurement unit: Approx. 11 kg 24.25 lb



CALL TOLL FREE TO CONTACT YOUR LOCAL OFFICE
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