



**Form, Contour, and Roughness  
Measurements in as Little as 1 Second**

# 3D imaging & measurement with a single device

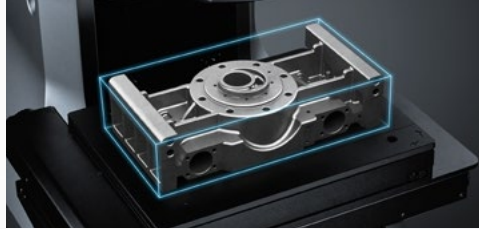


Wide-Area 3D Measurement System  
**VR Series**

5x greater scan range

## Non-contact, wide-area measurement

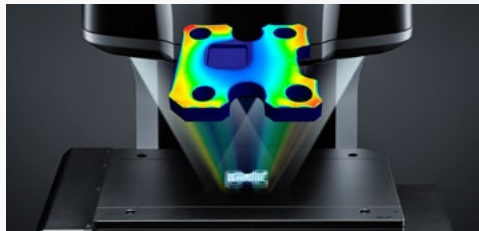
Large measurement range covers 200 (L) × 100 (W) × 50 (H) mm  
7.87"(L) × 3.94"(W) × 1.97"(H)



4x faster than conventional systems

## High-speed data acquisition and analysis

Scan and measure a surface in as little as 1 second



Industry's first

## Automatic operation with place-and-measure capability

Automatically identifies and adjusts measurement settings  
based on object size

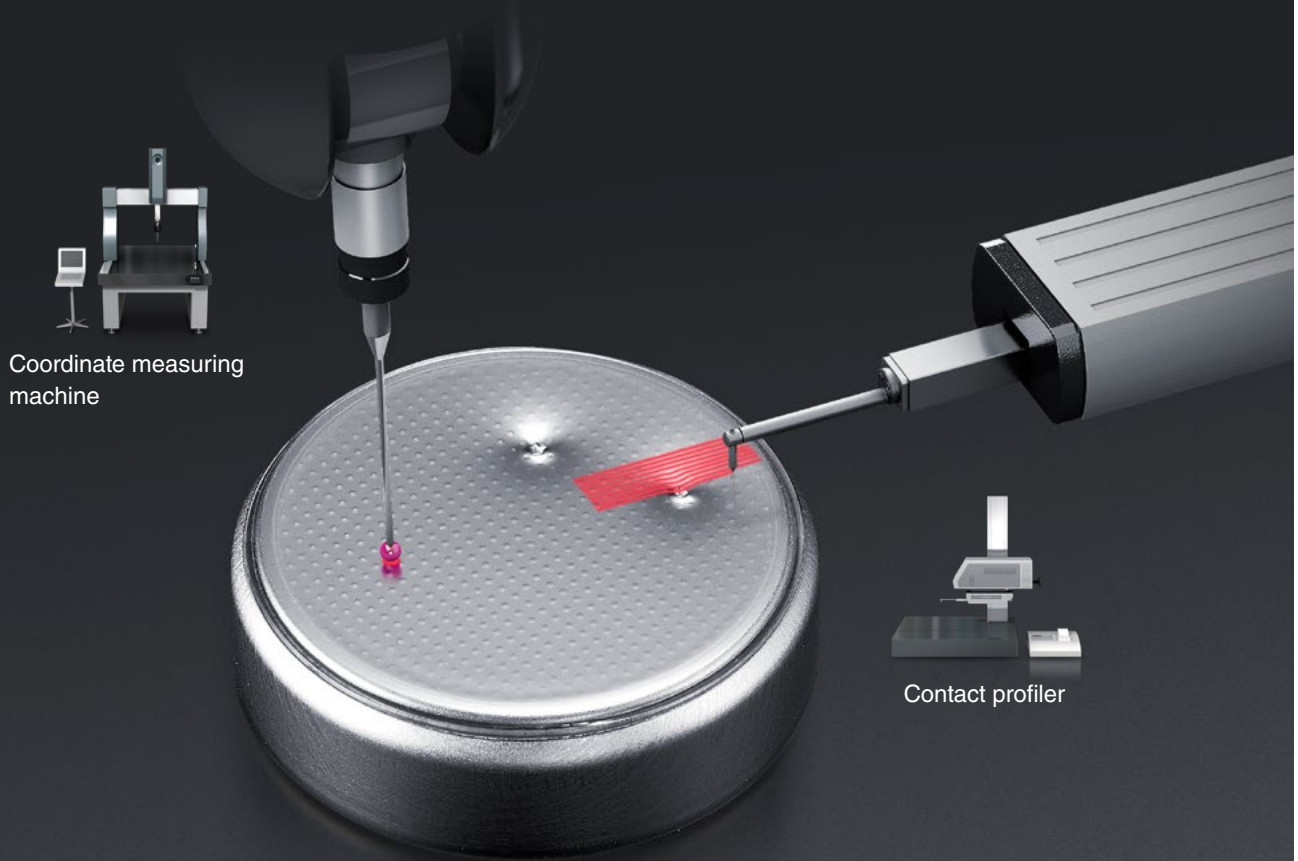


# Conventional Measurement Instruments

## Contact-based measurement

Typical measurement systems only provide measurement data on the areas that they are able to contact with a probe tip.

Measuring specific locations by simply eye-balling where to put the probe makes the results unreliable. Data is limited to points or lines.



Ex.: Depressions on a button battery

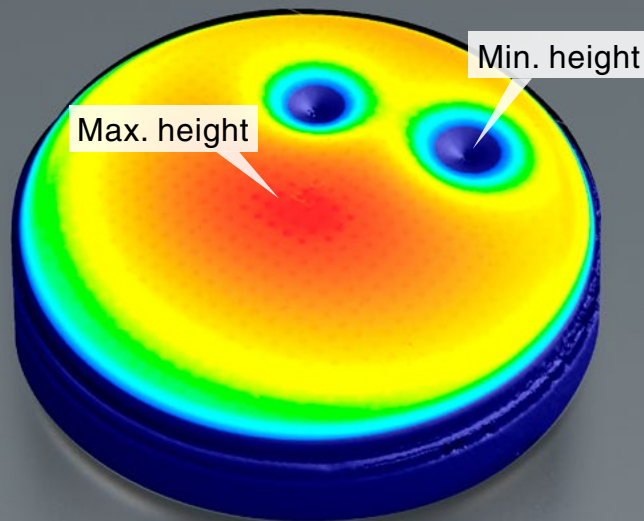
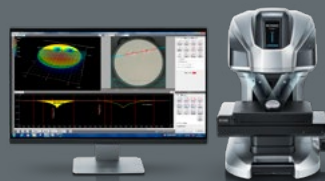
- | Measurement of specific areas is difficult
- | Measurements take a long time
- | Measurement results vary from person to person



# Wide-Area 3D Measurement System

## Non-contact surface measurement

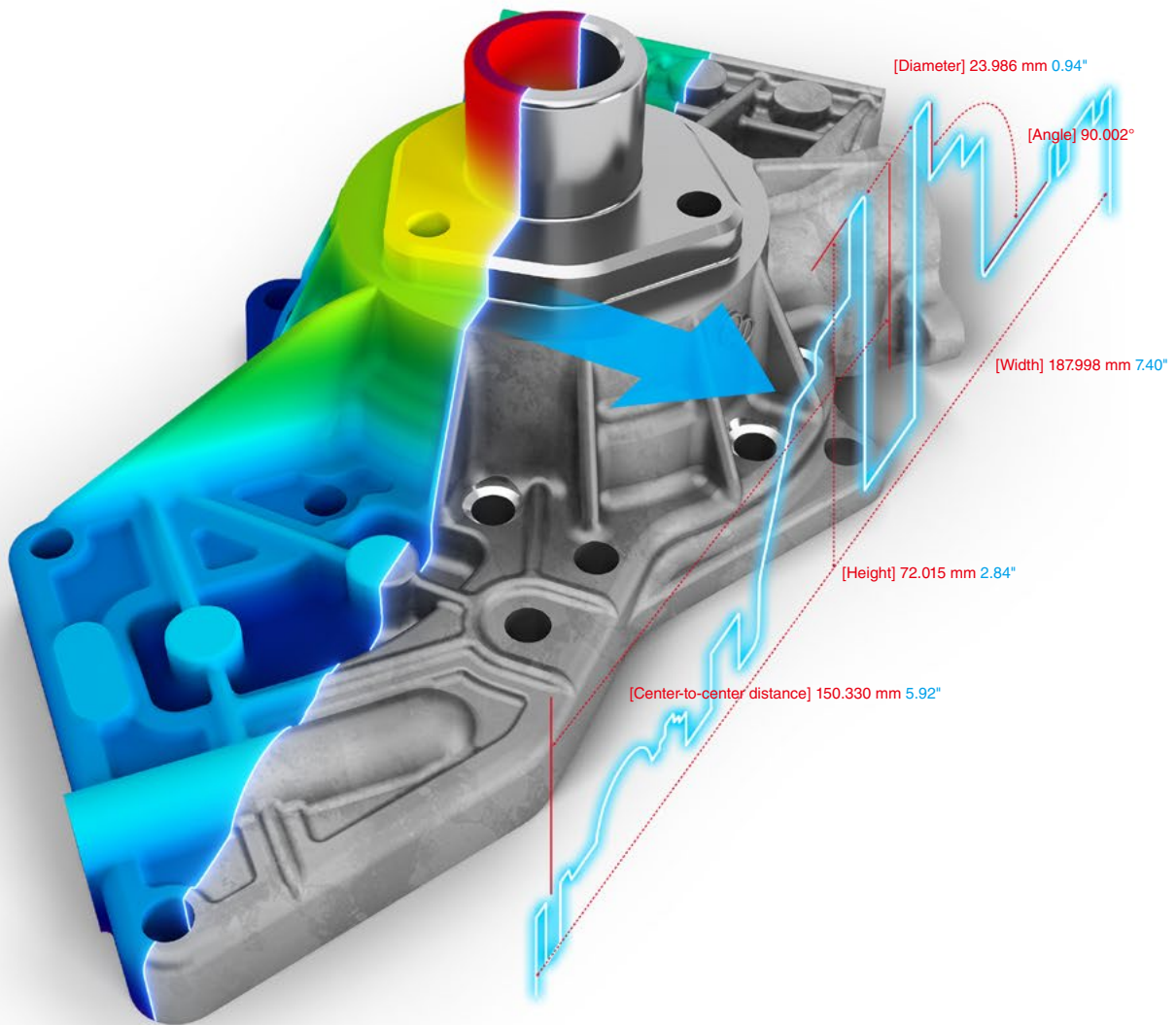
The VR Series Wide-Area 3D Measurement System quickly scans an entire surface for reliable measurement of any point on the object. A dense data set is captured over an entire area.



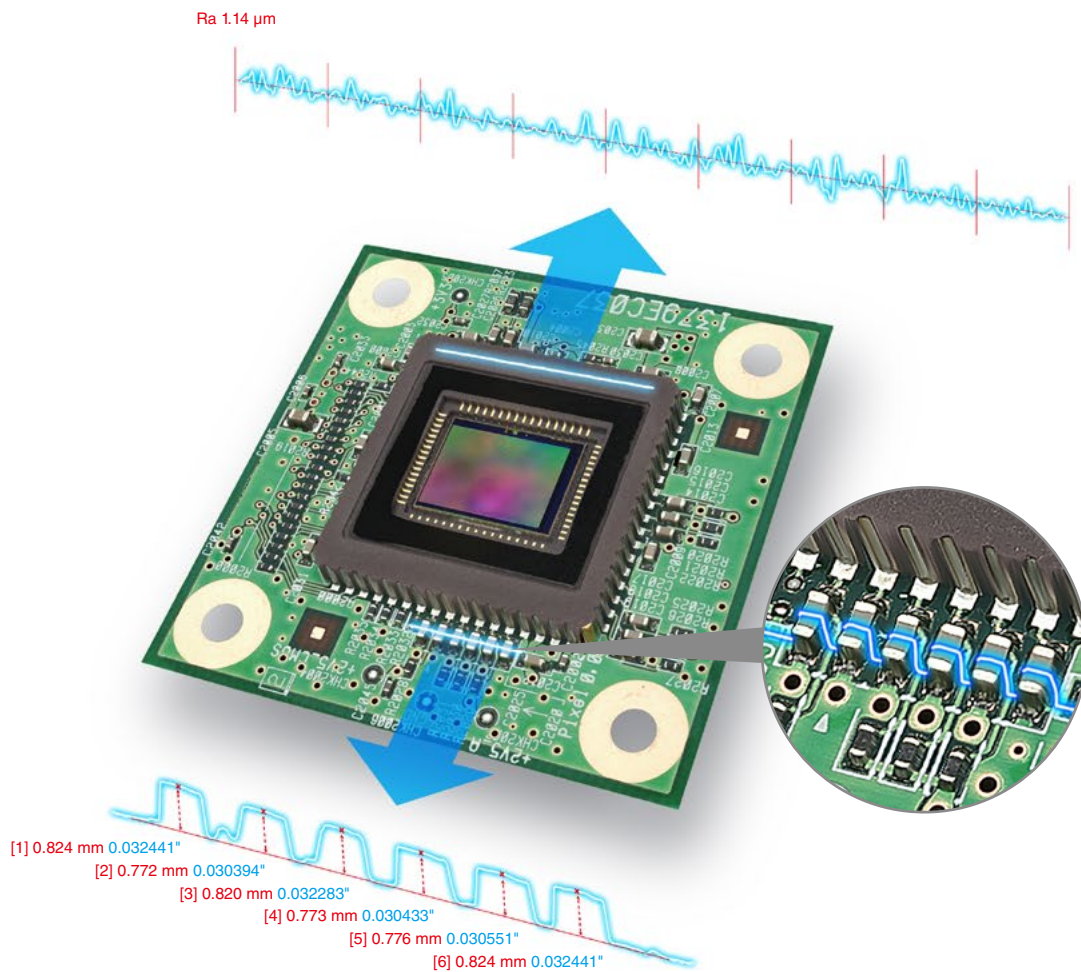
- | Max and min heights can be reliably measured
- | Scans in as little as 1 second
- | Repeatable and reproducible measurement results

Detect 1  $\mu\text{m}$  changes over a 200 mm 7.87" area

## Measure 3D surface changes over a large area



# Measure complex shapes and roughness



Non-contact, wide-area measurement

5x greater scan range

Measurement area up to 200 × 100 × 50 mm 7.87" × 3.94" × 1.97"





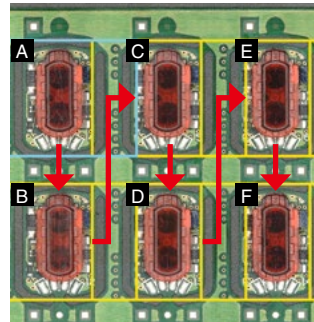
## 5x the measurable height range of conventional systems

Measurement is possible for targets up to 50 mm 1.97" tall —five times that of conventional systems. Measurement can be done on a wide range of targets including screws, electronic components, non-flat castings, and assembled products.



## Measure multiple targets simultaneously

With a 200 × 100 mm 7.87" × 3.94" 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.



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"

Electronic PCB

## Proprietary sensing technology for high-accuracy measurement

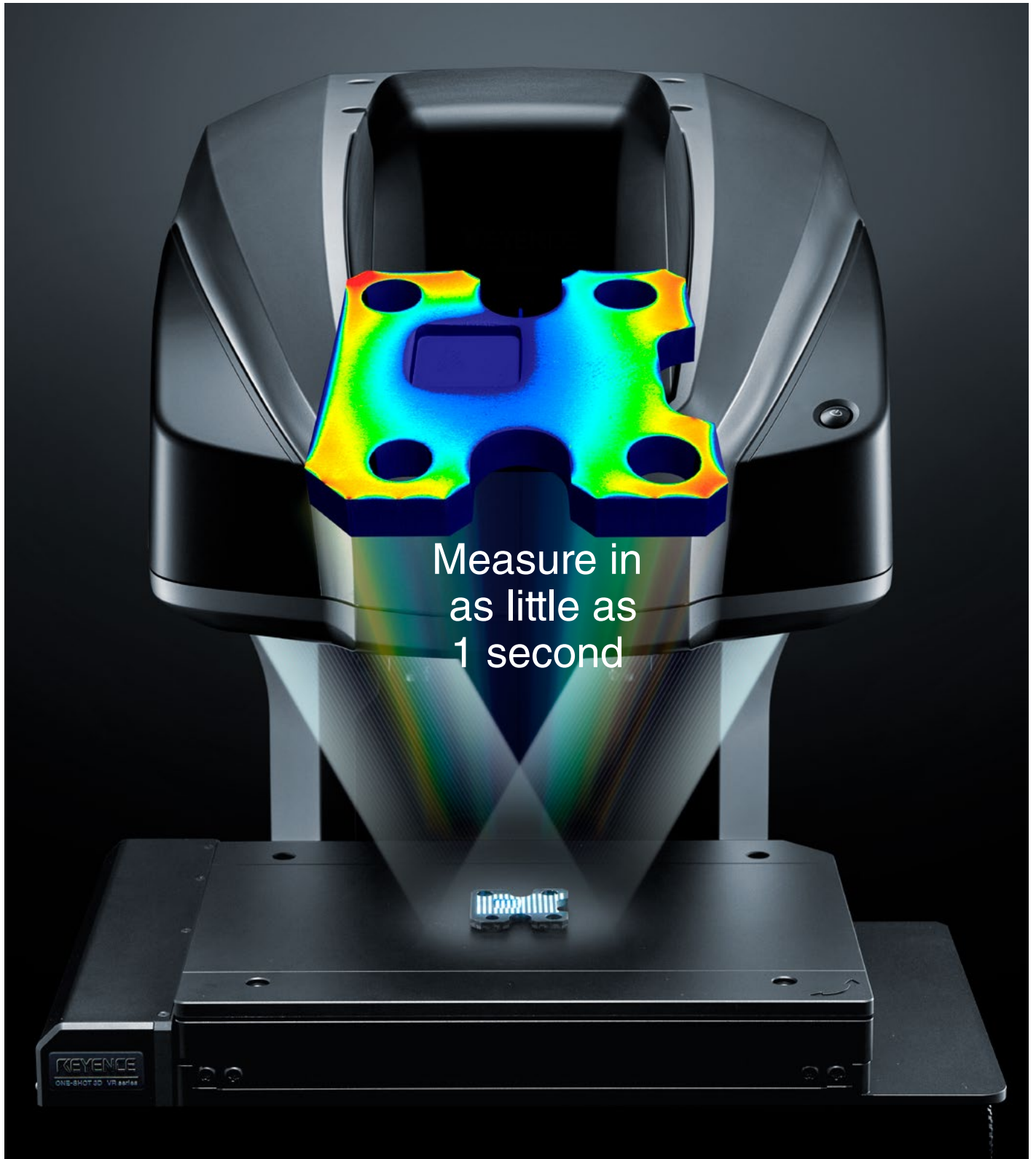
To ensure high measurement accuracy, the stage is equipped with a high-precision linear scale and a proprietary sensor. By eliminating influence from various environmental factors such as temperature changes or tilting due to load weight, the VR series ensures constant measurement quality regardless of the user.



High-speed data acquisition and analysis

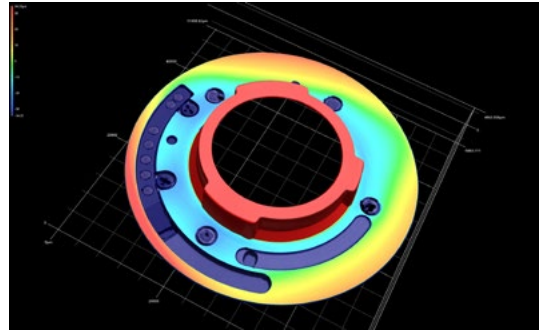
4x faster than conventional systems

**Unprecedented surface analysis in as little as 1 second**



## High-density 3D data

Each scan from the VR contains nearly 800,000 data points to help users to quickly visualize a surface in 3D, while conventional contact-based systems can easily miss small surface changes. Complex shapes can be more accurately analyzed for more thorough evaluation.



Lens mount

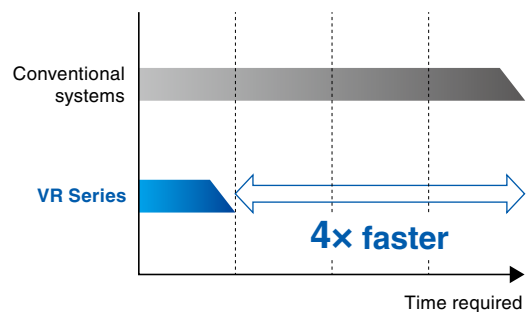
## Unprecedented speeds with measurements in as little as 1 second

With unmatched measurement speed, the VR Series can process substantially more samples, reducing work hours. This also leads to improvements in measurement quality, improved allocation of personnel and resources, and an increase in production performance. Measurement tasks can be performed faster and more efficiently, including evaluations of prototypes and inspections before shipment.



## Quick measurement for stress-free operation

When it comes to performing measurements, users want results as quickly as possible. With this in mind, KEYENCE designed the VR Series with a focus on measurement algorithms and hardware, resulting in measurements in as little as 1 second. The stage also offers improved travel speeds for a greater reduction in overall operation time.

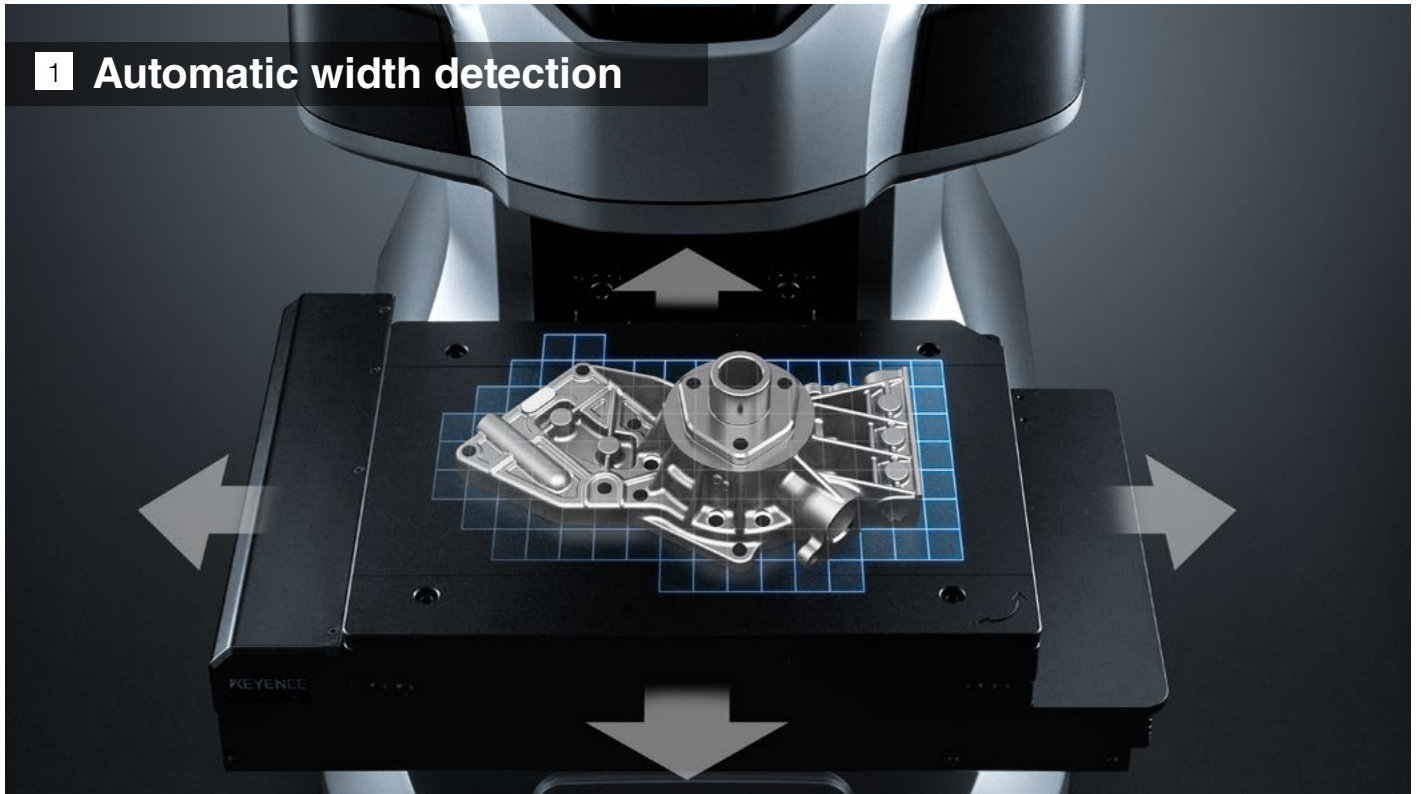


Automatic operation with place-and-measure capability

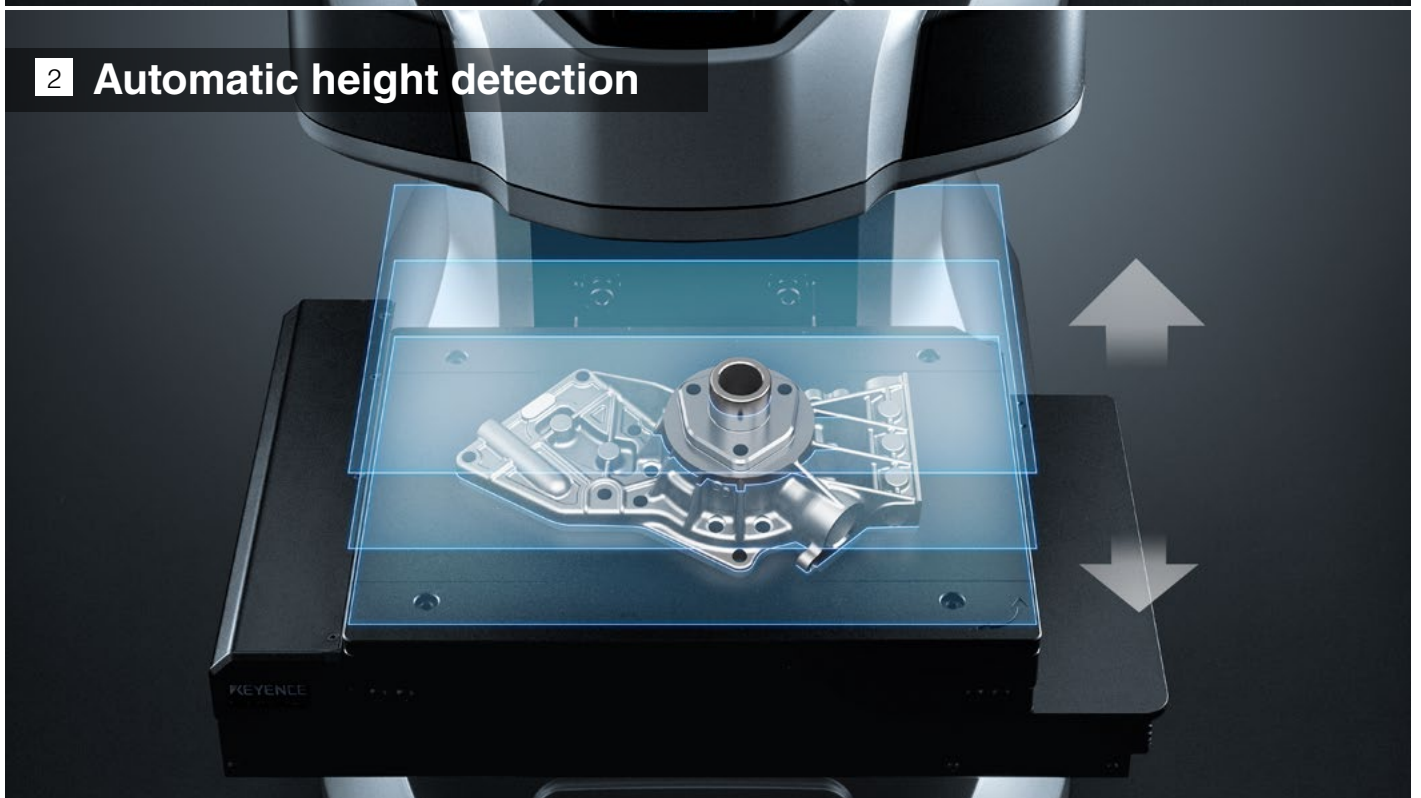
Industry's first

## User-free measurement configuration [Smart Measurement]

### 1 Automatic width detection



### 2 Automatic height detection





## Placement without the need to worry about orientation

The VR Series is able to automatically accommodate for object rotation and tilt. Users can simply place the sample on the stage and click a button to start the measurement process.



## Automatically adjusts measurement range based on object size

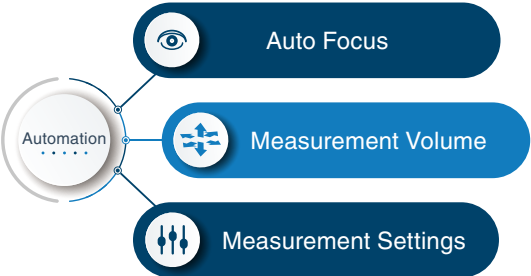
The VR Series automatically recognizes the width and height of the target in order to automatically set the optimal measurement range. By eliminating the need to set measurement length, height range, and other aspects required with general measuring instruments, the VR Series ensures mistakes, such as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



\*Stitching along the XY axes requires the VR-H3J software.

## Optimum brightness and focus positioning eliminates human error

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 the click of a button, ensuring that even new operators can measure without issue.



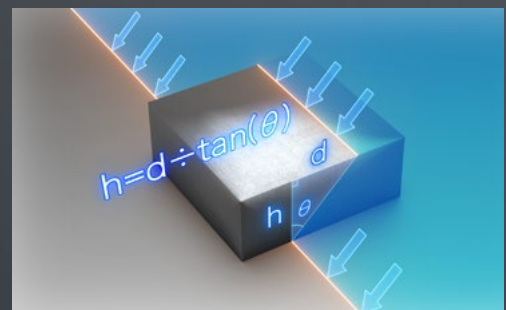
# High-accuracy 3D measurements



## Measurement principle

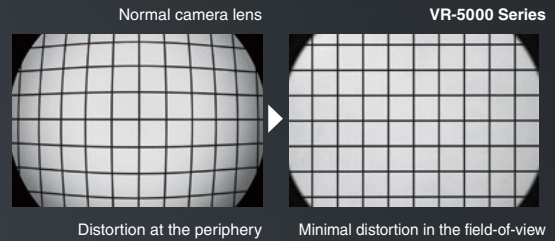
### Light-section method

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.



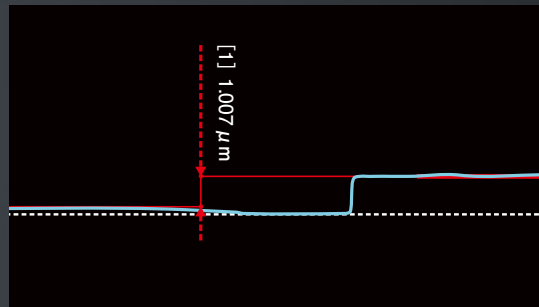
## High-precision telecentric lens

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.



## Measure height differences down to 1 μm

Based on the light-section method of measurement, the VR Series calculates data down to 1 pixel or less using proprietary light projection patterns. This results in highly accurate, ultra-precise measurement. The VR Series' ability to accurately measure height differences of only 1 μm has been confirmed through measurement of a calibrated height difference gauge.

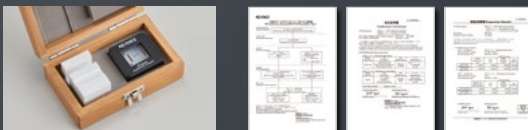


1 μm height difference gauge

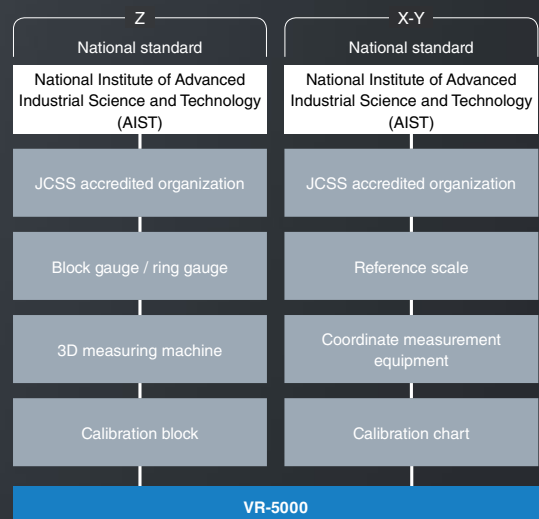
## XYZ traceability

The measurement results are traceable according to international standards, so users can obtain highly-reliable measurements.

### Calibration



The calibration gauge uses the same reference scale used by JCSS certified operators. Instead of hiring a technician to perform calibration, users can easily do it themselves on-site.

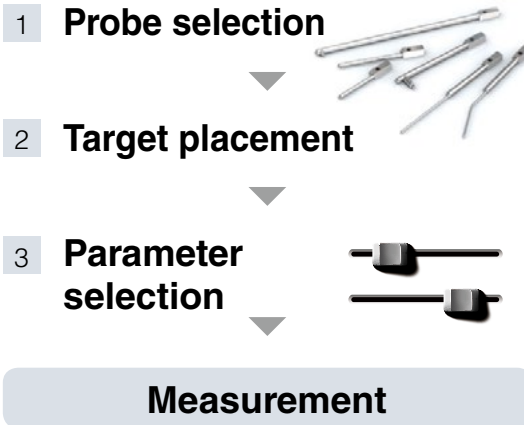


# What makes accurate and repeatable measurements possible

Contact profile measurement systems present a variety of problems



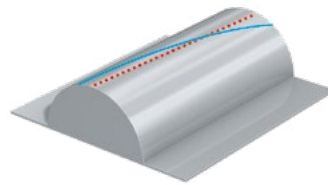
## Many pre-measurement tasks



## Low measurement reproducibility

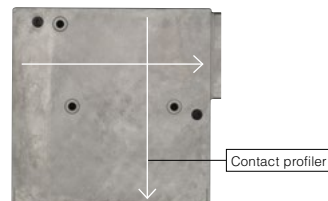
### Probes cannot always measure as intended

From straight lines along the center of a cylinder or curved surface to lines passing through the center of a circle, ensuring a probe moves as intended is often a difficult task. Such deviations in the point of measurement can result in subtle variations in measured values.



### Measurement is performed only at the point of contact

For any areas the probe doesn't pass over, knowing the actual appearance or shape is impossible. Even measuring across multiple locations would still not be representative of the true shape of the part.





## Few pre-measurement tasks

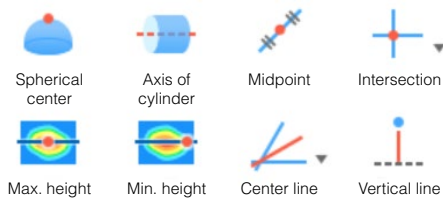
Just place the sample and press the button



## High measurement reproducibility

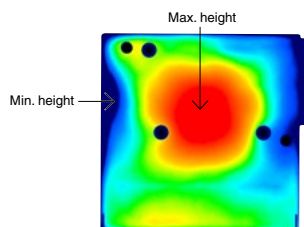
### Measure at any location

The use of assist tools makes it possible to create reference points and lines to prevent variations between users. With the VR Series, all users are able to measure the same location as intended.



## Obtain shapes from the entire field of view

The VR Series' ability to capture the shape of an entire surface ensures measurement over the entire field of view with no missing points. Averages can also be calculated from the measured values of the overall shape, resulting in greater stability.



## Wide-Area 3D Measurement System VR Series



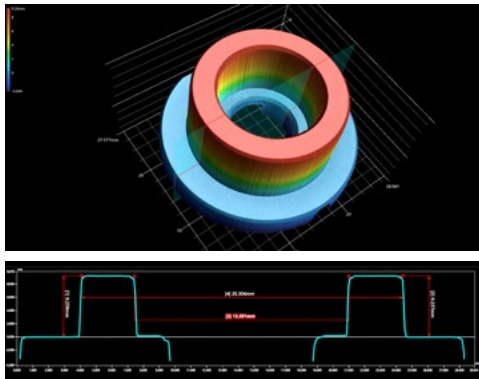
# The best features of multiple measuring systems in one device



Contact profiler

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**Profile measurement**



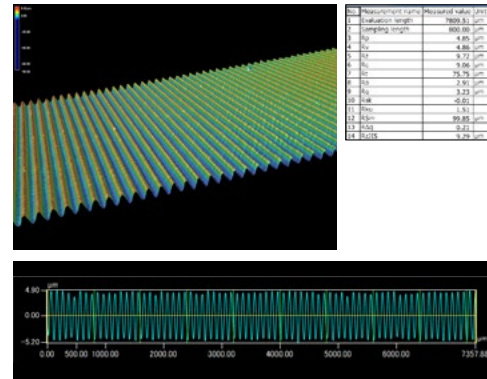
Cut metal piece

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.

Roughness meter

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**Line roughness measurement**



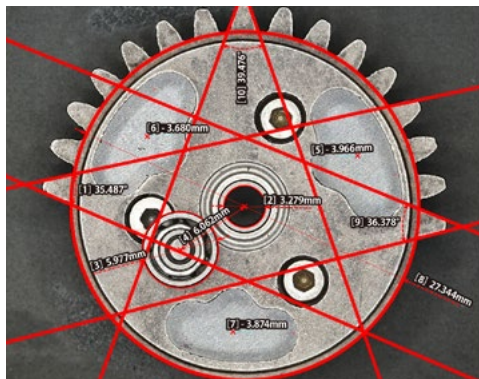
Standard roughness piece

Roughness measurement results conform to ISO 4287 requirements. Measurements along a circular profile or non-uniform surface are also possible.

Optical comparator, measuring microscope

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**2D measurement**



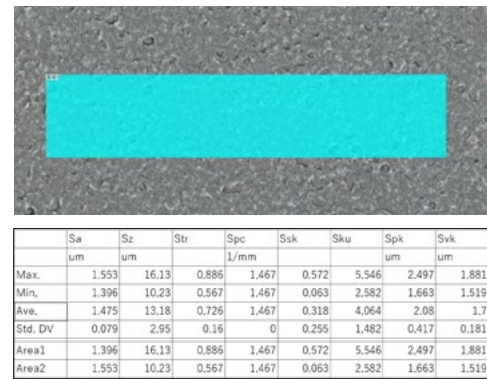
Metal gear

The VR Series measures the XY dimension while viewing the target from directly above. Height measurements can also be obtained as with a height gauge.

Laser microscope

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**Surface roughness measurement**



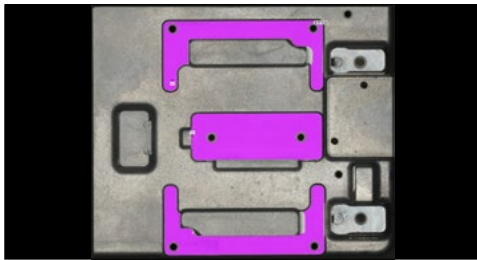
Textured surface

Measure surface roughness in accordance with ISO 25178. Because measurement is performed using a large number of data points, measurement results are more stable.



3D measuring machine

## Height difference and flatness measurement



	Max. height	Min. height	Max.-Min.
	mm	mm	mm
Area 1	0.205	-0.07	0.275

Cutting surface of casting

Height and angle differences between two surfaces can be measured in one shot using 800,000 data points. The height data from the specified surface can also be used for flatness measurements.



3D scanner

## Volume and area measurement



VOLUME	C. S. AREA	Surface area	Surface area	Area ratio	Average height	Max. height	POINTER	POZE. FRAME	VOL. FRAME	Time	CREATIVITY	
mm3	mm2	mm2	mm2	%	mm	mm	mm	mm	mm	min	min	
1	0.039	0.541	0.013	1.463	0.05	0.021	0.127	2.850	0.776	0.04	0.03	0.000
2	0.041	0.56	0.013	1.137	0.275	0.071	0.105	2.917	0.729	0.001	0.045	0.000
3	0.033	0.451	0.005	1.07	4.89	0.001	0.119	2.721	0.72	0.003	0.04	0.001
4	0.028	0.502	0.004	1.443	0.023	0.006	0.068	3.427	0.716	0.007	0.0	0.000
5	0.008	0.19	0.000	1.05	2.122	0.044	0.005	1.07	0.202	0.040	0.001	0.001
6	0.050	0.304	1.028	1.007	10.403	0.06	0.125	4.827	0.364	1.307	1.001	0.513
7	0.020	0.072	0.04	1.10	0.207	0.007	0.113	2.954	0.709	0.004	0.003	0.004
8	0.020	0.408	0.007	1.119	5.04	0.004	0.000	2.702	0.708	0.003	0.700	0.000
9	0.018	0.307	0.040	1.100	3.44	0.003	0.003	2.940	0.700	0.07	0.020	0.001
10	0.033	0.505	0.000	1.112	5.003	0.002	0.104	2.729	0.700	0.003	0.010	0.001

Resin markings

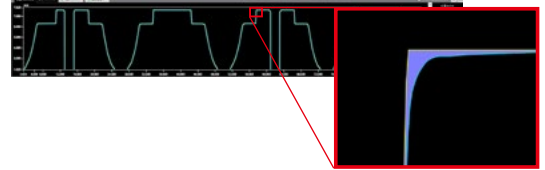
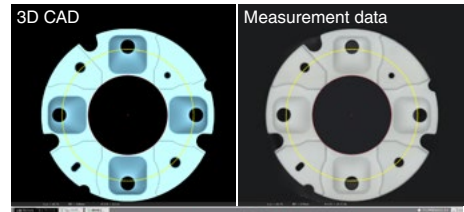
Using height data, a target's volume and area can be measured. Counting the number of uneven surfaces is also possible with a certain height specified as the threshold.



3D scanner

## Comparative measurement

\*VR-H3CA (optional)



Resin molded parts

Comparison of two different sets of 3D data is possible, such as non-defective and defective workpieces, or CAD data and prototypes. This comparison makes it easy to see height differences and overall surface displacement.



Microscope

## High-magnification observation



Electronic PCB

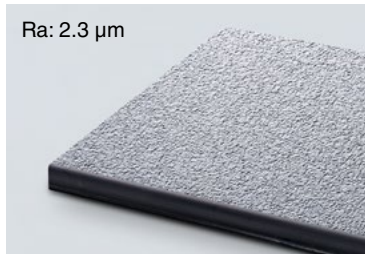
View objects at up to 160x magnification. The VR Series features an HDR function and a Depth Composition function that allows users to capture images with greater detail and focus.



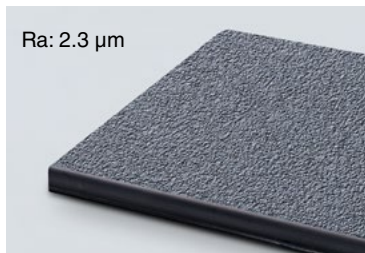
## New advanced analysis functions

# Quickly measure and compare roughness

## Parameter suggestions



The Ra is the same, but the targets look different.



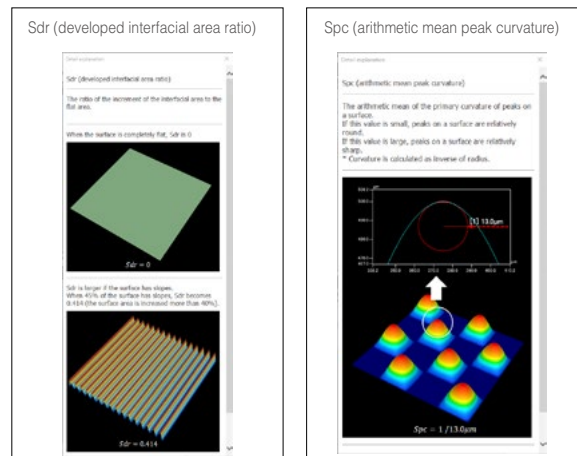
The VR Series is capable of automatically comparing and analyzing multiple data sets to determine which roughness parameters differ the most between surfaces. Data is displayed graphically and a help section for each parameter is displayed to assist users that are unfamiliar with less frequently used parameters.

## Supports 42 ISO roughness parameters

☆☆☆ Spd	Standard deviation	☆☆☆ RaJIS	ISO standard height of the surface	☆☆☆ Vvc	Valley free zone	☆☆☆☆ A1	Maximum peak-to-valley zone
☆☆☆ Vmc	Maximum mean plane	☆☆☆ Rvk	Maximum valley depth of the surface	☆☆☆ SvK	Maximum valley depth of the surface	☆☆☆☆ Rz	Maximum height of the profile
☆☆☆ Sk	Skewness of the surface	☆☆☆ Sa	Arithmetic mean height of the surface	☆☆☆☆ Rsk	Skewness of the surface	☆☆☆☆ Sma2	Area standard deviation
☆☆☆ Vvc	Valley free zone	☆☆☆ Rk	Root mean square depth of the profile	☆☆☆☆ Me2	Area standard deviation	☆☆☆☆ Spk	Maximum peak height of the surface
☆☆☆ Sgp	Maximum peak height	☆☆☆ Sdq	Root mean square gradient	☆☆☆☆ Rq	Root mean square height of the profile	☆☆☆☆ Vmap	Valley free zone
☆☆☆ Sal	Arithmetic height	☆☆☆ Sq	Root mean square height of the surface	☆☆☆☆ Mr1	Area standard deviation	☆☆☆☆ Rpk	Maximum peak height of the profile
☆☆☆ Sr	Standard height of the surface	☆☆☆ Ra	Arithmetic mean height of the surface	☆☆☆☆ Rt	Standard height of the surface	☆☆☆☆ Rkq	Maximum peak height of the profile
☆☆☆ Str	Aspect ratio of the surface texture (presence of systematic creases)	☆☆☆ A2	Surface free peak-to-valley area	☆☆☆☆ Sma1	Area standard deviation	☆☆☆☆ Rz	Maximum peak-to-valley height
☆☆☆ Spc	Arithmetic mean peak curvature (peak-to-peak)	☆☆☆ Sdr	Developed interfacial area ratio (degree of increase of surface area when compared with a flat surface)	☆☆☆☆ Rp	Maximum peak height of the profile	☆☆☆☆ Rsm	Mean width of the profile elements (average of peak and valley cycle lengths)
☆☆☆ Sak	Skewness of the surface	☆☆☆ Rku	Skewness of the surface	☆☆☆☆ Rv	Maximum valley depth of the profile		
☆☆☆ Sz	Maximum height of the surface	☆☆☆ Sku	Kurtosis of the surface	☆☆☆☆ Sp	Maximum peak height of the surface		

The VR Series supports 42 different ISO-based parameters. Knowing the differences in parameters makes discovery of the cause behind defective parts easier as well as allowing for a new quality control index to be set in place.

## Easy-to-understand explanations even for users with no detailed knowledge of roughness

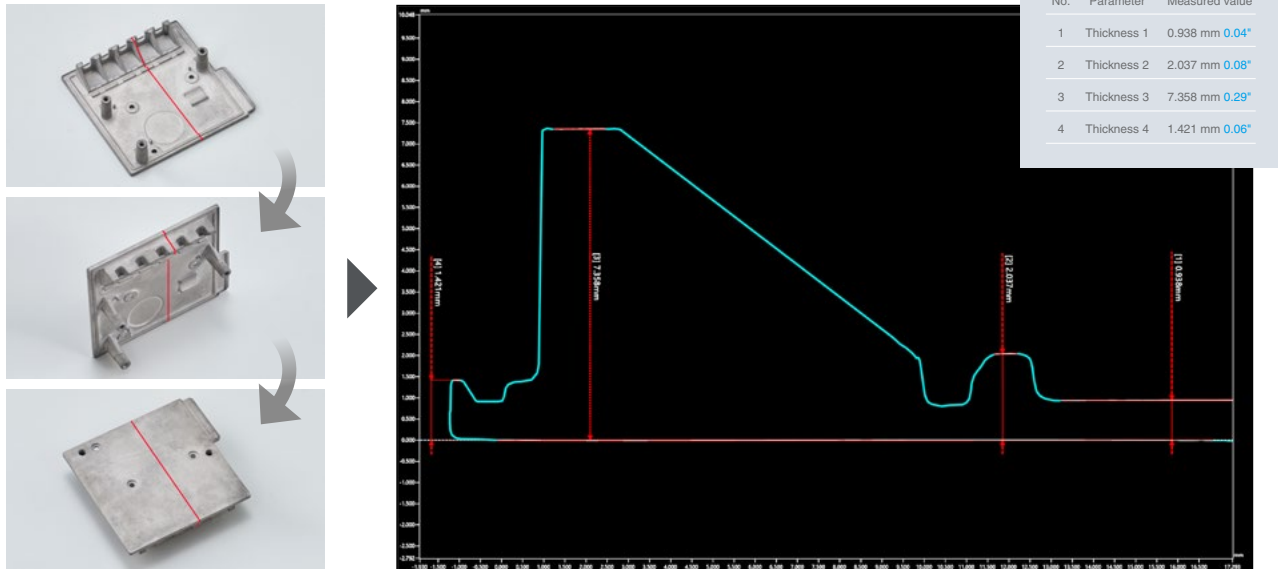


The VR Series makes it easy to work with unfamiliar roughness parameters. With just a single click, users are able to bring up an explanation for any given parameter. This ensures easy understanding of the analysis results even for those who are not familiar with roughness.



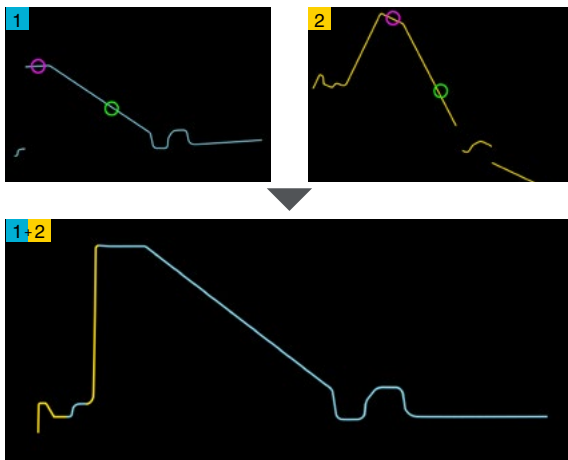
# Non-contact measurement of wall thicknesses

## Profile composition function \*VR-H3W (optional)



Profiles from different angles can be combined, allowing for measurement as a single piece of data. This makes it possible to measure the thickness of objects as well as the shape of undercuts that could otherwise not be seen when viewed from directly above.

### High-accuracy composition process with intuitive operation



The VR Series is able to generate a composite profile line simply by specifying two identical locations from each set of data. With no complicated operations, users are able to complete analysis easily.

### Specially designed jig for part rotation

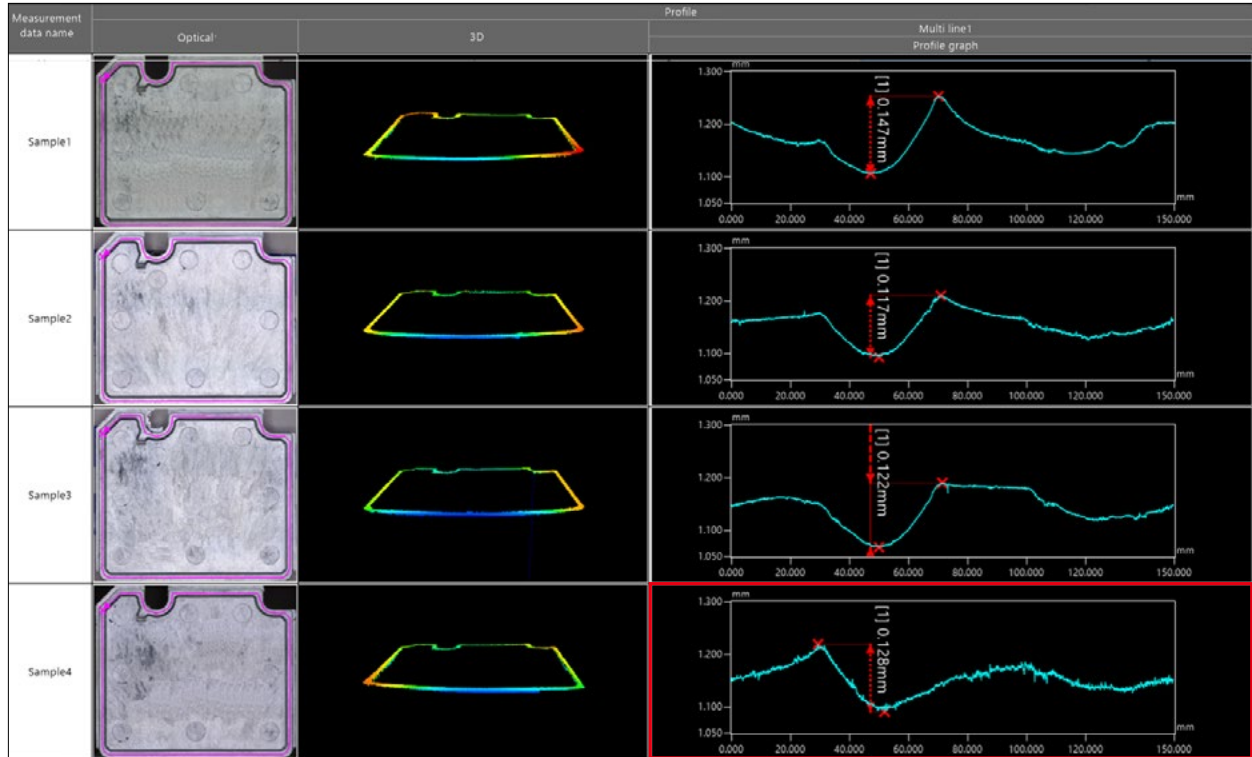


This special set of jigs can be used to secure and rotate various types of objects to assist with profile composition.

Versatile functionality for analysis and inspection

## Batch analysis of multiple data files

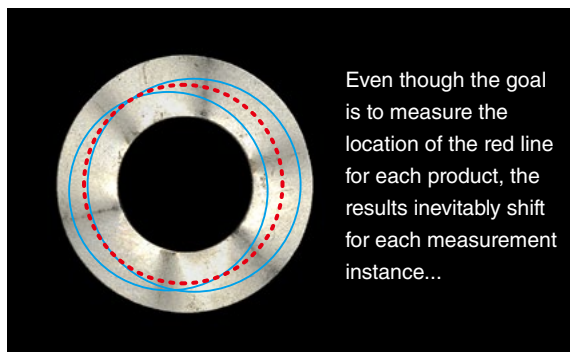
### Multi-file analysis



With the VR Series, multiple measurement data points can be displayed in a list while simultaneously applying analysis to each data set. This greatly improves work efficiency when measuring a large number of targets, allowing users to see differences between the data at a glance.

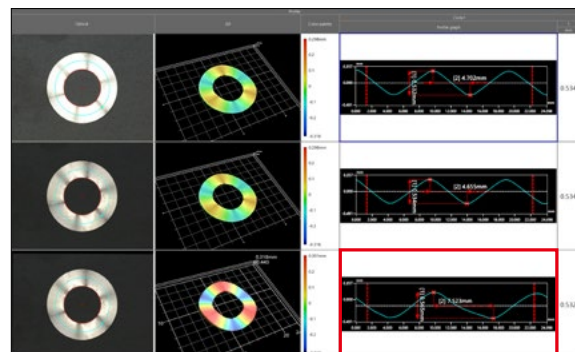
### Clear differentiation between non-defective and defective parts

Problems with conventional equipment



Production problems give rise to the need for measurement and comparison of non-defective and defective parts. However, because the measurement location varies from one person to the next, accurate comparison is not possible.

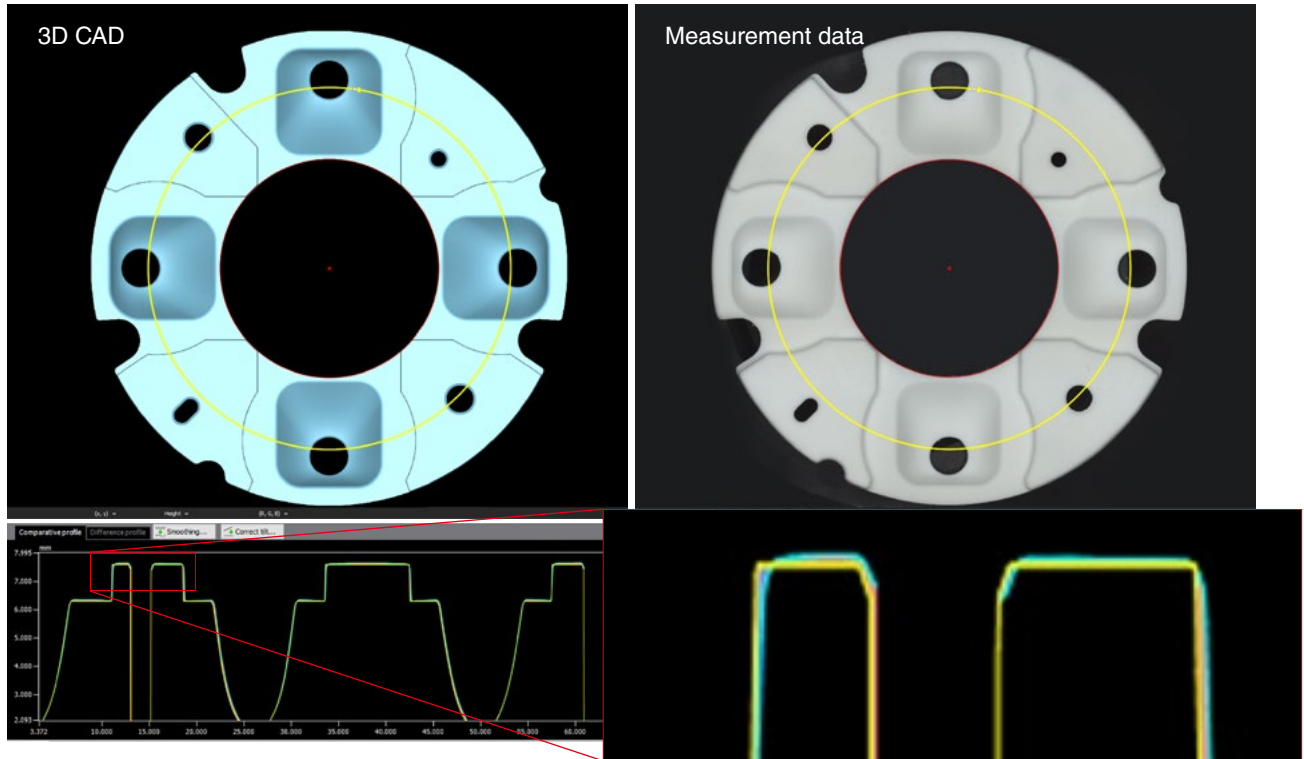
VR Series



Comparing targets in exactly the same measurement conditions with the VR Series makes it possible to see slight differences between the shape of a good and bad part.

# Verification of product design

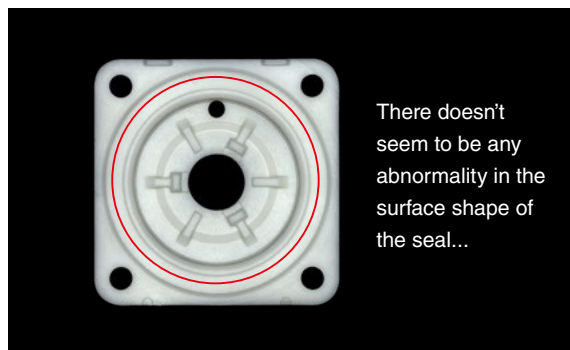
## CAD comparative measurement \*VR-H3CA (optional)



The VR Series lets users compare 3D scan and measurement data directly with a CAD file. Prototypes or other manufactured parts can be quickly evaluated to determine if the product meets design specifications.

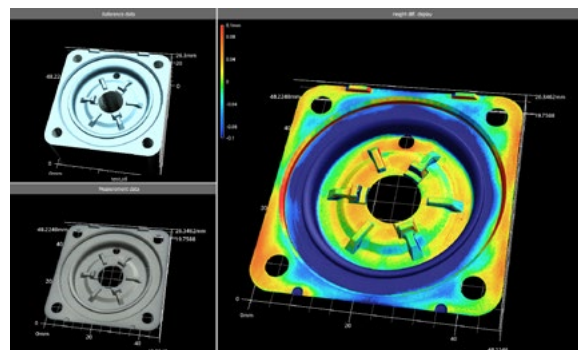
## Fast problem-solving through visual comparisons

### Problems with conventional equipment



A water leak occurred inside the product, but the cause could not be identified by examining the seal surface. The measured values seem correct...

### VR Series

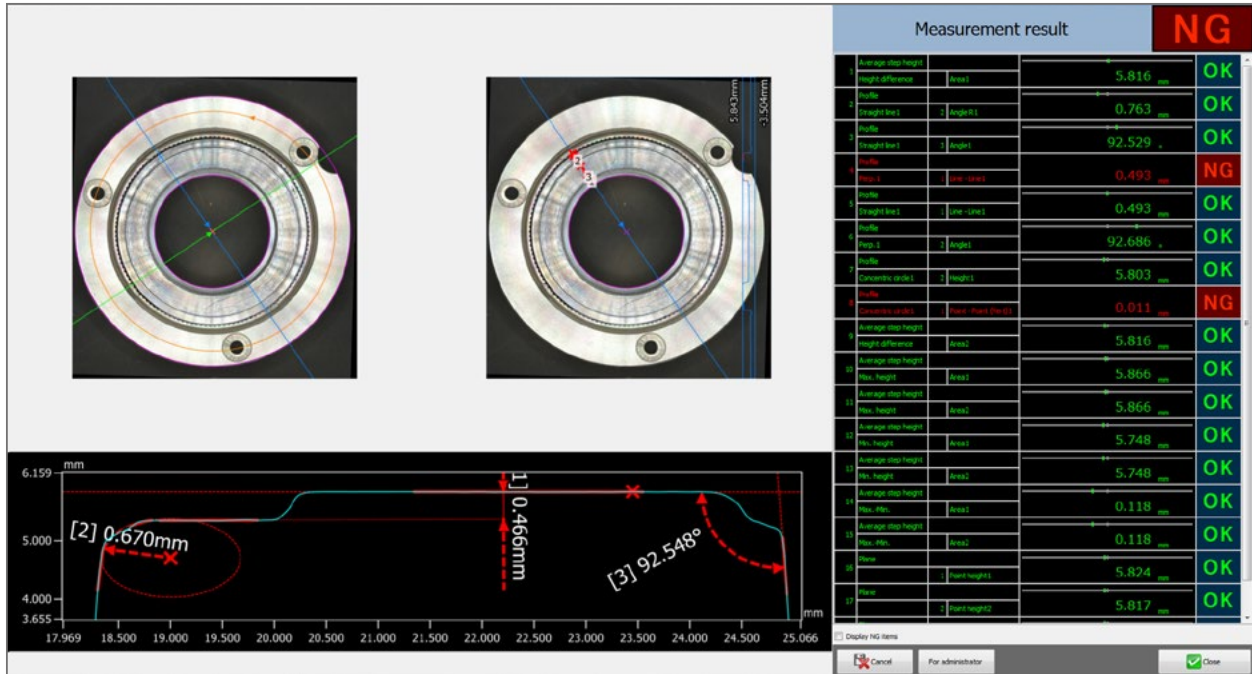


The cause of the leak was not due to the shape of the seal surface but the deviation from the overall design. Visualization of the entire product allowed for better understanding of the situation.

Versatile functionality for analysis and inspection

# Significant reduction in inspection time

## Pass/Fail judgment function



By setting the measurement items and tolerances, users can obtain pass/fail inspection based on the measurement results. All of the pre-configured measurements are performed automatically just by placing the target and pressing a button.



## Consolidate measurements into one device for major cost and time savings

Problems with conventional equipment



With conventional systems, each inspection item required a different measuring instrument, so follow-up measurements were troublesome. Moreover, because users must move back and forth between measuring instruments, inspection results had to be written on paper as they were obtained.

VR Series

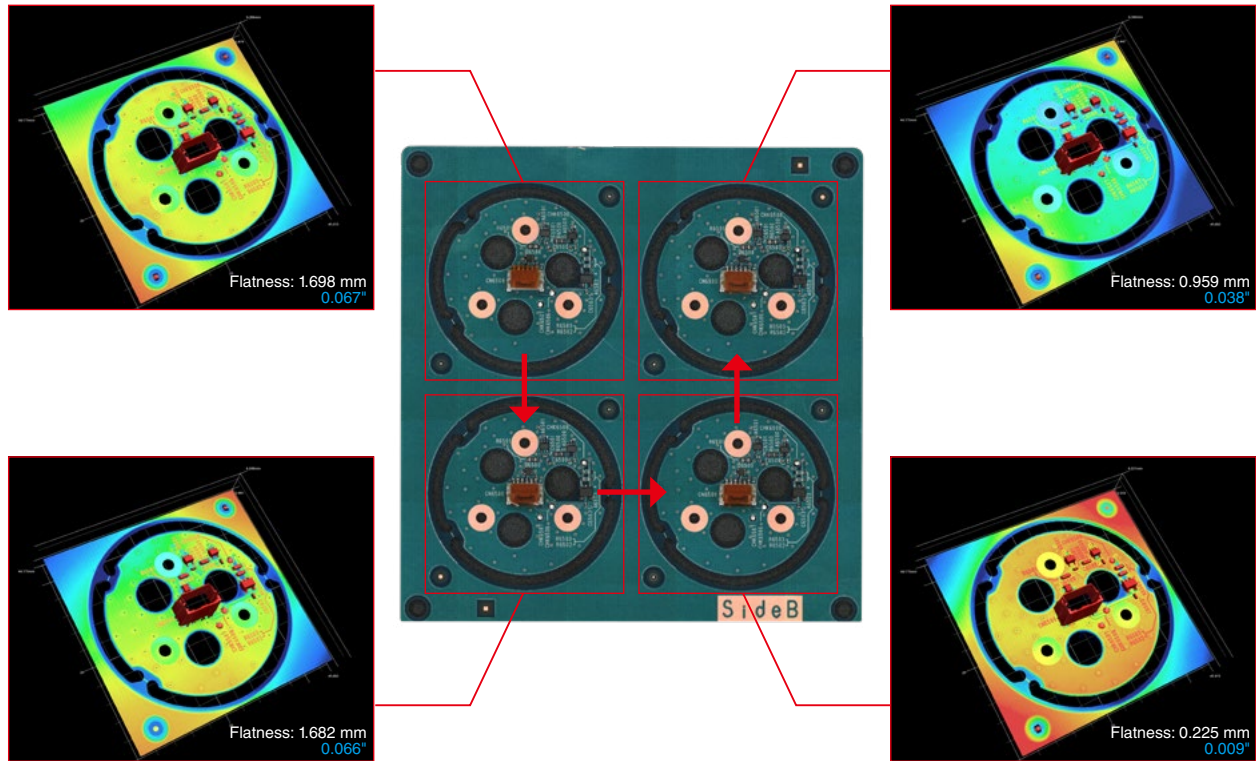


With the VR Series, all inspections can be carried out using only one device, thereby greatly reducing measurement times. Moreover, the same results can be obtained regardless of the user.



# Fully automatic inspection with no programming required

## Multi-area inspection mode



Even for products with a large number of inspection points, users can configure the order in which the points should be measured to allow for automatic measurement. This minimizes the effort required for each inspection, creating an efficient workflow without the need for experienced inspection staff.

## Reduced inspection time increases production efficiency

Problems with conventional equipment



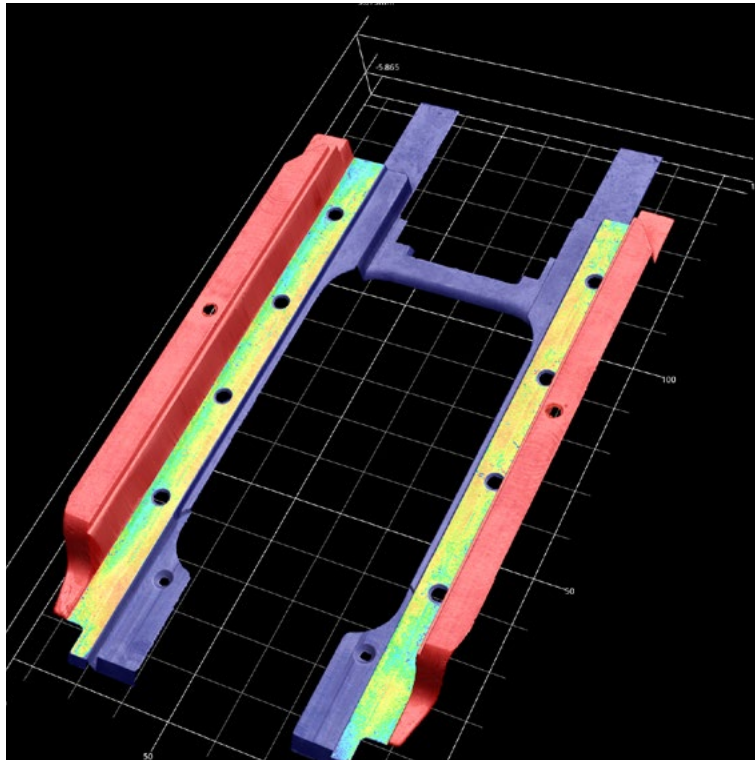
When using conventional systems, inspectors have to measure products one by one. An increase in products resulted in an increase in inspection staff. Nevertheless, inspections still take time, and mistakes are common.

VR Series



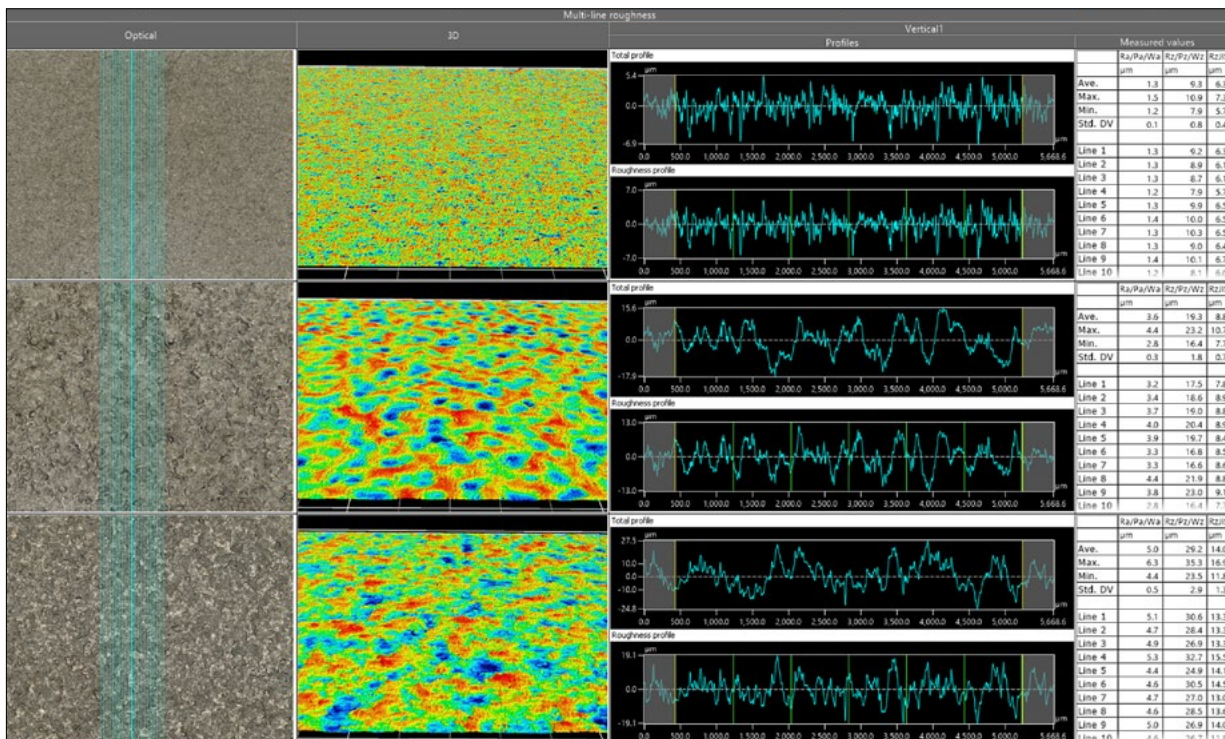
Thanks to the VR Series' ability to measure products automatically on a tray or pallet, almost no manual labor is required. The shorter inspection times allow for increased production.

# Automotive and Metal Industries



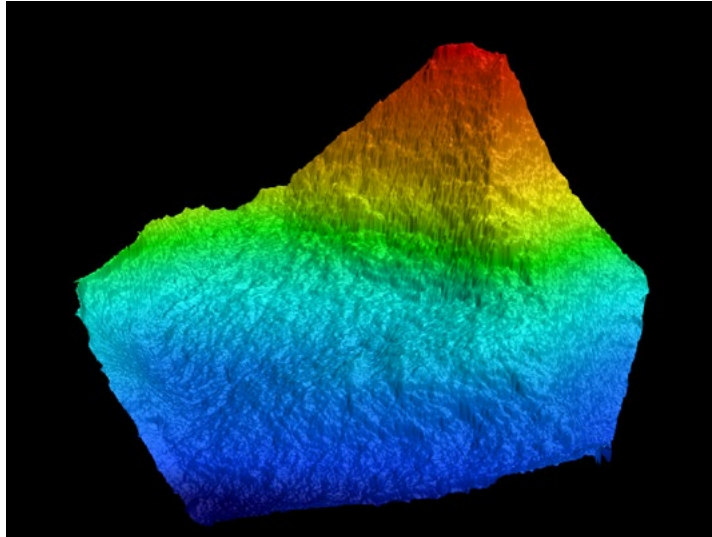
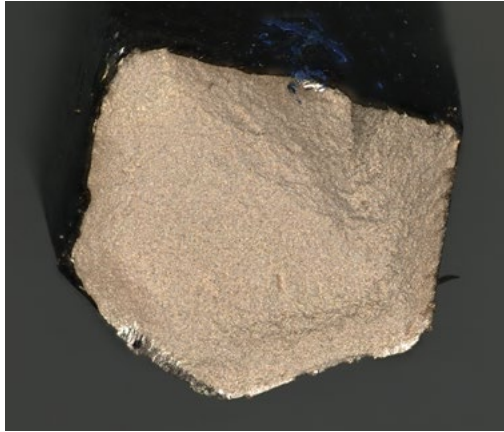
	Measured value		
Max. height ( $\Delta$ )	0.028	0.0011*	mm inch
Min. height ( $\nabla$ )	-0.023	-0.0009*	mm inch
Max. - Min.	0.052	0.0020*	mm inch

Cut metal surface (flatness of mating surface)



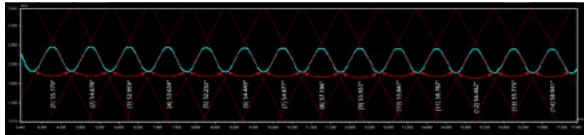
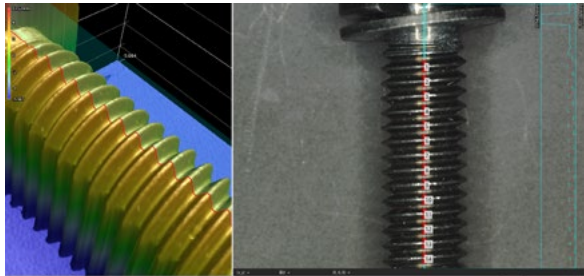
Shot blasted surface (roughness evaluation)



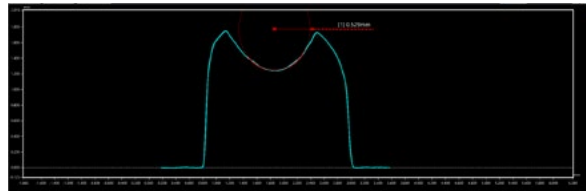
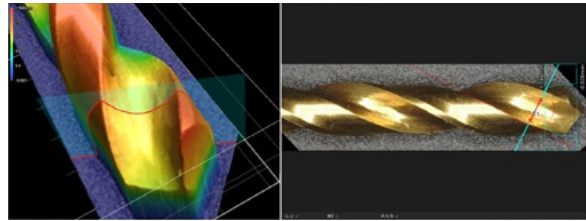


	Volume	Cross sectional area	Surface area
	mm <sup>3</sup>	mm <sup>2</sup>	mm <sup>2</sup>
Total	32.9645	21.0559	34.4040

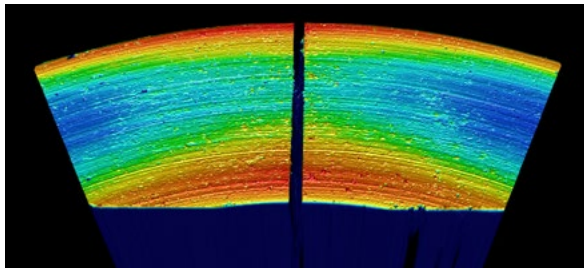
Metal fracture surface (surface area and volume analysis)



Threads (thread angle)

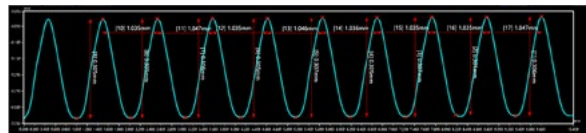
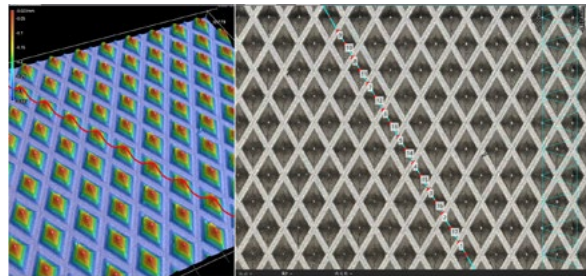


Drill (rake surface shape)



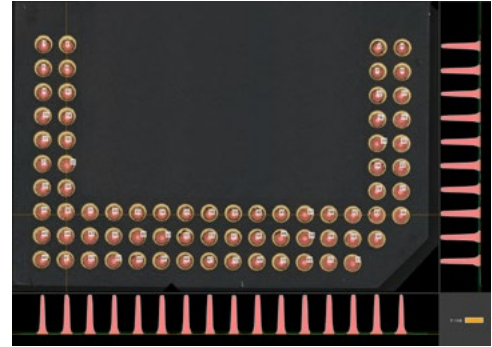
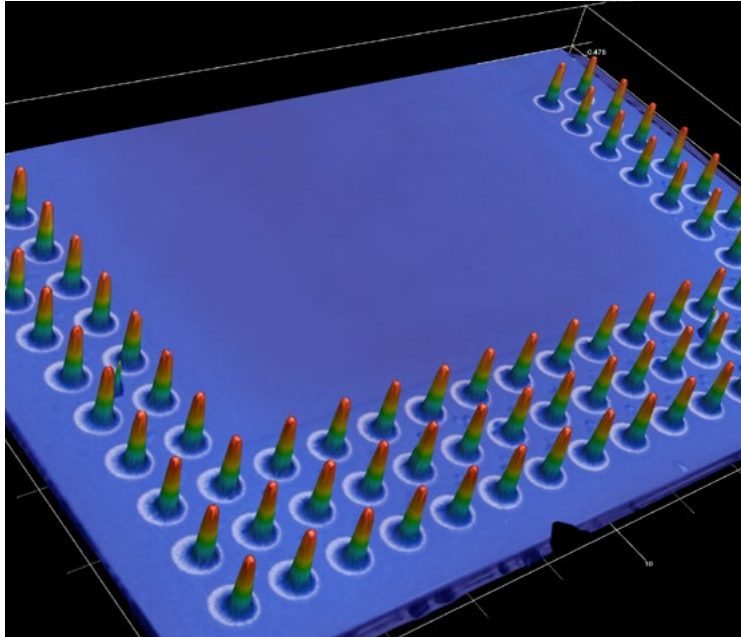
Area name	Average height	Max. height	Min. height	Max. - Min.
Unit	mm inch	mm inch	mm inch	mm inch
Brake surface	-0.234 -0.009"	0.085 0.003"	-5.478 -0.216"	5.563 0.219"

Brake pads (flatness)



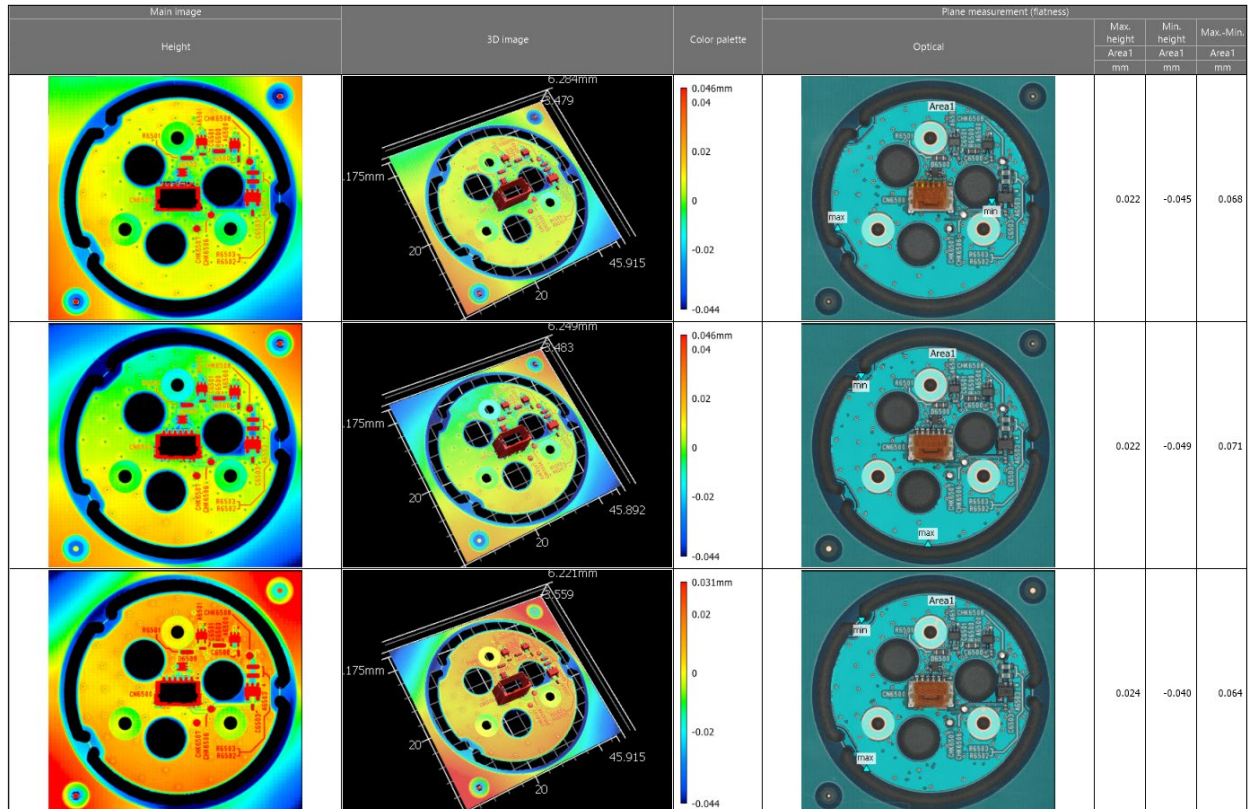
Knurled surface (peak height and pitch measurement)

# Electrical Devices and Electronics Industries



	Volume	Cross sectional area	Surface area	Area ratio	Max. height
	mm <sup>3</sup>	mm <sup>2</sup>	mm <sup>2</sup>	%	mm inch
Total	10.022	21.786	114.813	6.206	102.885 4.0506"
Maximum	0.151	0.4	1.737	0.114	1.431 0.0563"
Minimum	0.127	0.232	1.479	0.066	1.39 0.0547"
Average	0.137	0.298	1.573	0.085	1.409 0.0555"
3σ	0.019	0.111	0.163	0.032	0.029 0.0011"
1	0.144	0.273	1.62	0.078	1.414 0.0557"
2	0.134	0.258	1.536	0.074	1.397 0.0550"

PGA (simultaneous height and count measurement)

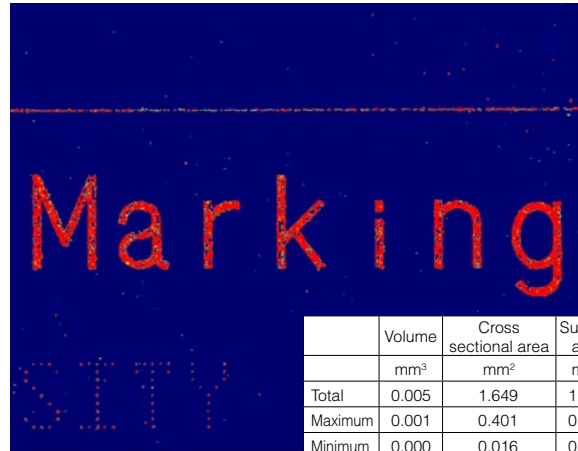


Electronic PCB (curvature/flatness measurement)

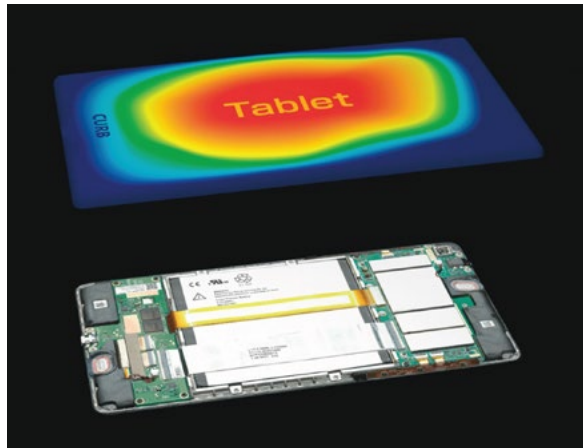




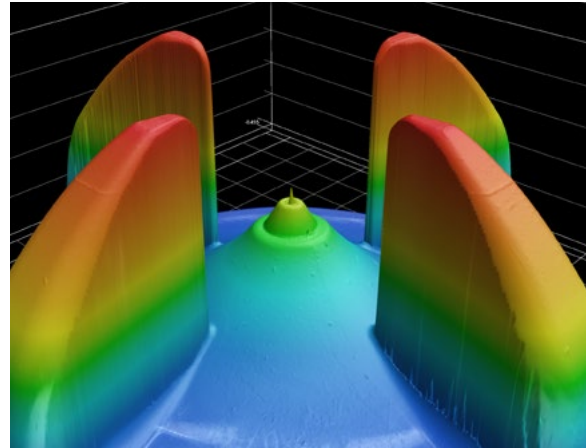
Laser marking (volume and area measurement)



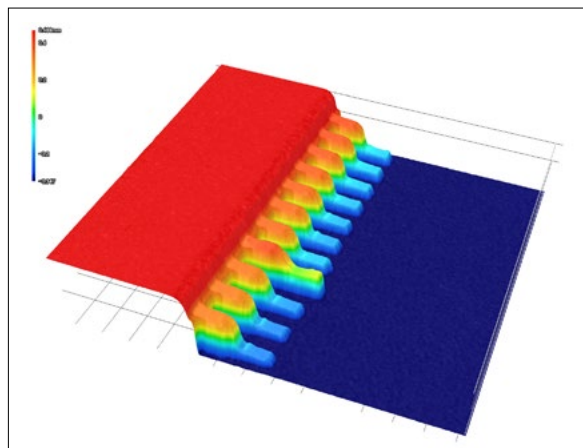
	Volume	Cross sectional area	Surface area
	mm <sup>3</sup>	mm <sup>2</sup>	mm <sup>2</sup>
Total	0.005	1.649	1.664
Maximum	0.001	0.401	0.405
Minimum	0.000	0.016	0.016
Average	0.001	0.206	0.208
3σ	0.001	0.366	0.369



7-inch tablet (case curvature)



Needle on static eliminator



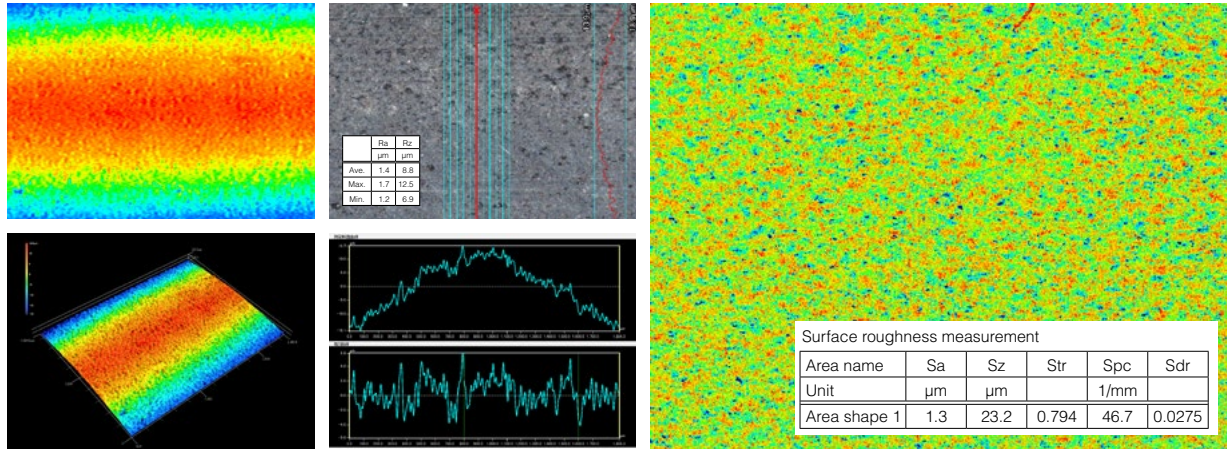
IC (lead float)



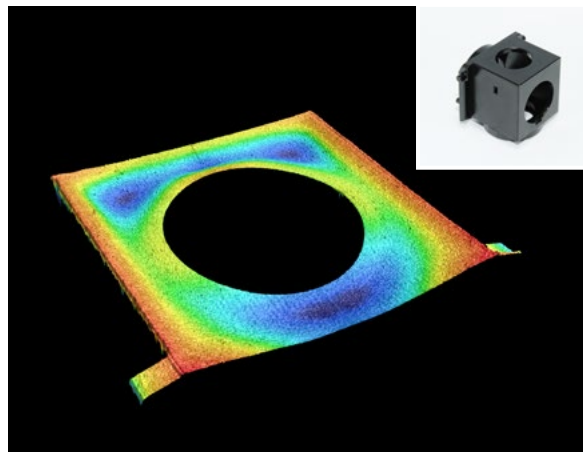
Metal components (curvature, 2D measurements)

# Application Examples

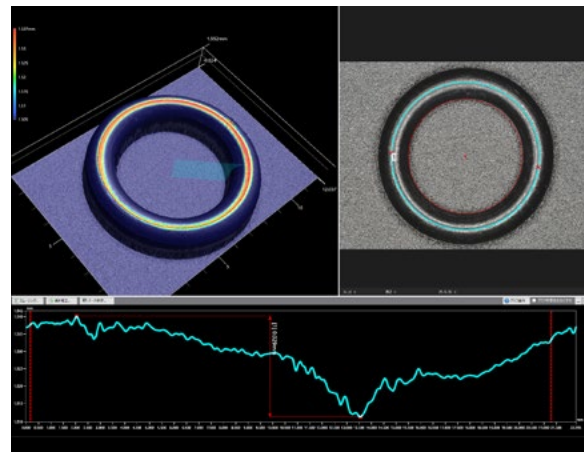
## Rubber and Plastic Materials



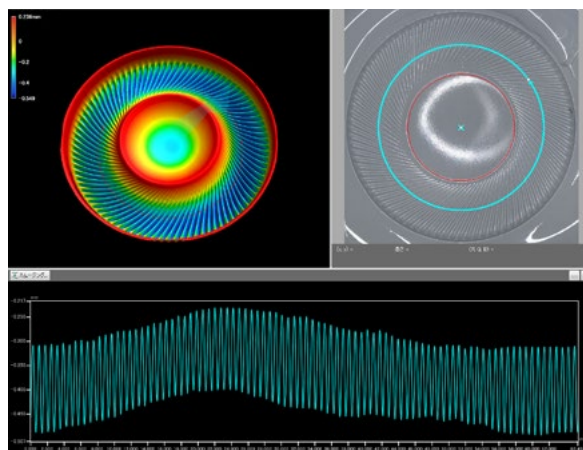
Weather-stripping (line roughness, surface roughness)



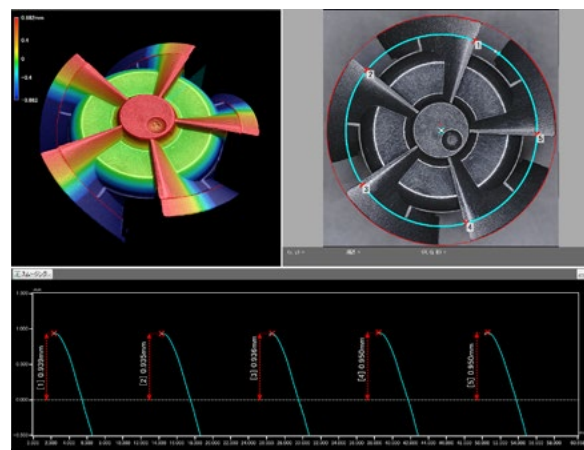
Optical filter case (resin mold sink marks)



O-ring (Curvature after molding)



Diaphragm (shape, distortion)

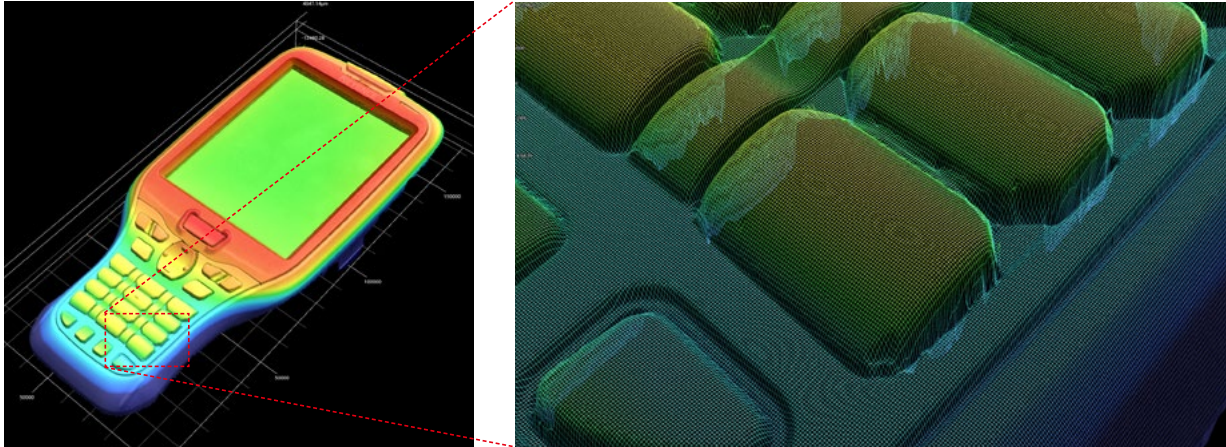


Fan (height from reference)

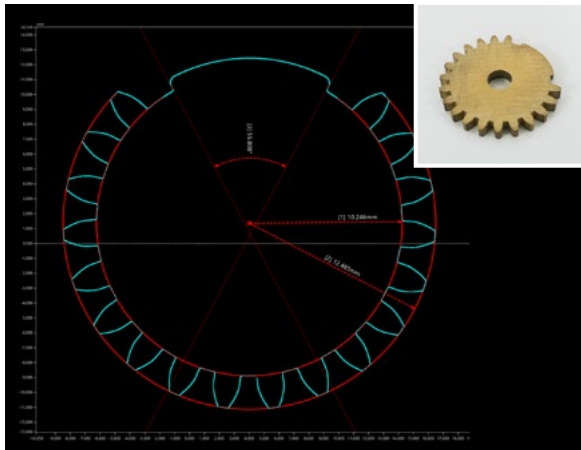


# Application Examples

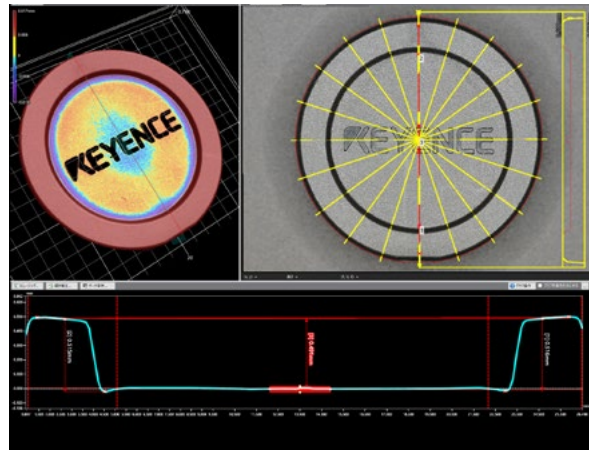
## Other Industries



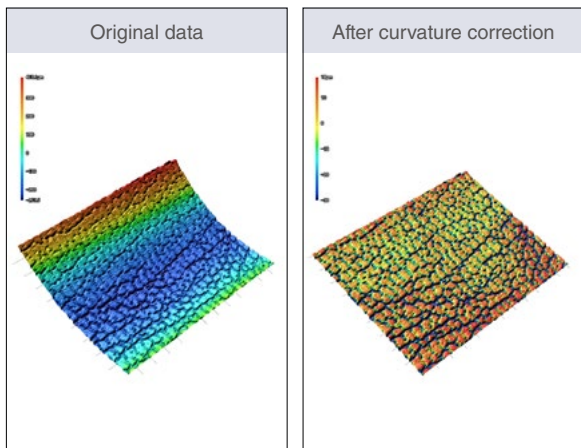
Handheld terminal (creation of a precise 3D model using height data of about 800,000 points per field of view)



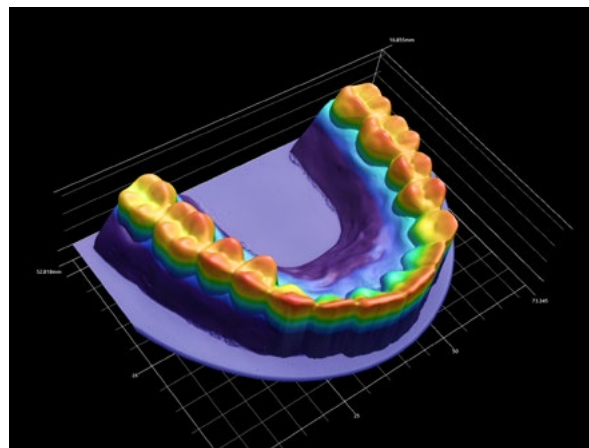
Gear (profile measurement of entire circumference cross-section)



Plastic cap (measurement of sink mark due to height difference)



Grain (overall grain depth)

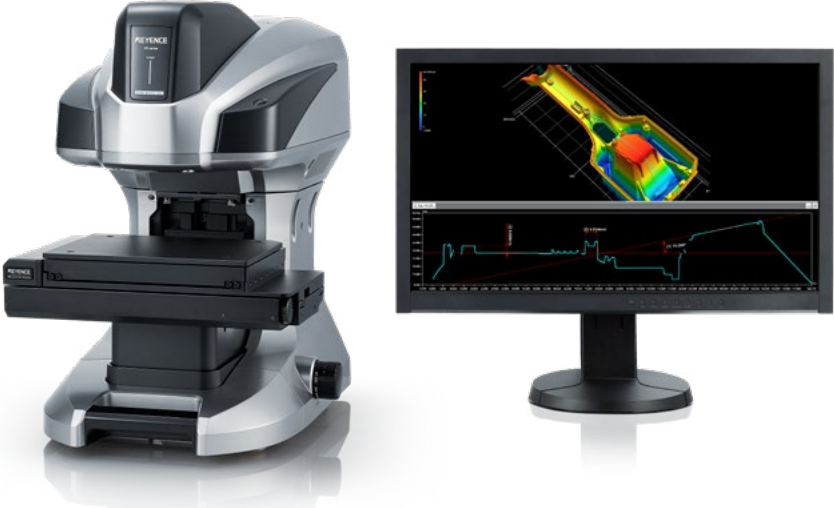


Dentures (overall shape)

Product Lineup

Fully-automated Model  
**VR-5200**

XYZ-axis  
motorized control



Standard Model  
**VR-5100**

XY-axis  
manual control

Z-axis  
motorized control



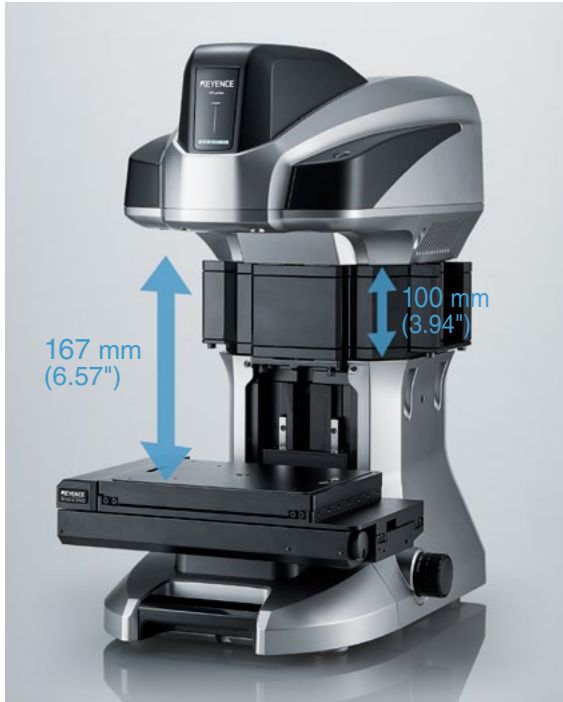


## Optional Accessories

### 100 mm 3.94" height spacer

#### OP-88274

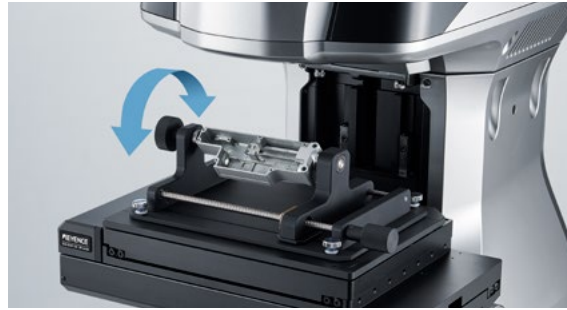
Inserting this 100 mm 3.94" high spacer between the measurement unit and the base allows you to measure objects up to 167 mm 6.57" in height. This extra space can be also used for setting a heating stage or special jig.



### Rotating stage

Standard item with VR-H3W

Securing the target and rotating it in one direction allows for measurement from any angle. Combining the profile data makes it possible to measure the wall thickness of the target.



### Large sample stage

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



\*Large sample stages are not available from KEYENCE.

### Motorized stage

#### VR-S300

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.



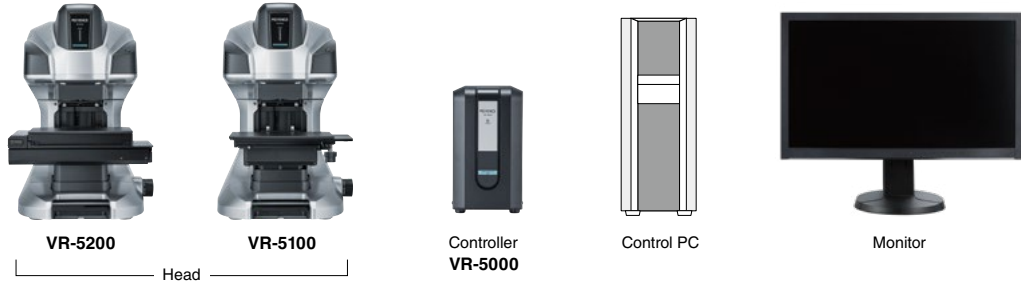
### Tilt stage

#### OP-87709

This stage allows users to observe and measure objects from an angle without having to manipulate the object by hand. The OP-87709 is convenient for measurement of vertical walls and areas otherwise not visible from a top-down view.



# System Configuration / Dimensions



100 mm 3.94" height spacer  
**OP-88274** (optional)



Motorized stage  
**VR-S300** (optional)  
\* Optional accessory for VR-5100 only



Calibration gauge  
**OP-88275** (optional)

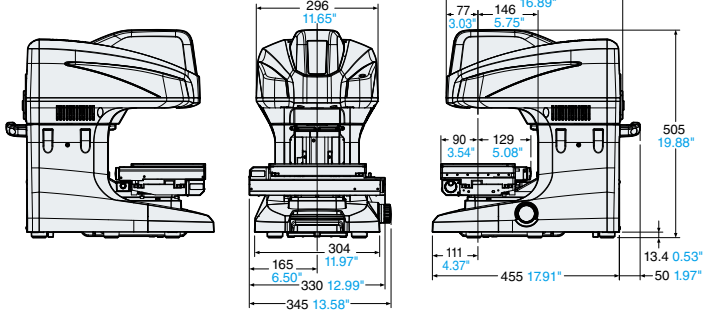


- Standard software set **VR-A1**\*1
- Measurement expansion module **VR-H3J** (optional)
- Comparative measurement module **VR-H3CA** (optional)
- Profile composition module **VR-H3W** (optional)

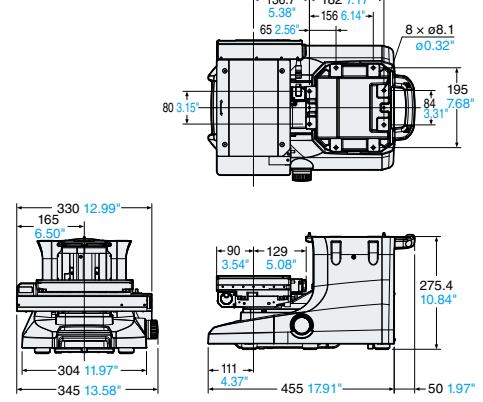
\*1 Models may vary according to the instrument language.  
VR-A1 (Japanese) / VR-A1E (English) / VR-A1D (German) / VR-A1C (Simplified Chinese) / VR-A1W (Traditional Chinese) / VR-A1K (Korean) / VR-A1T (Thai)

Unit: mm inch

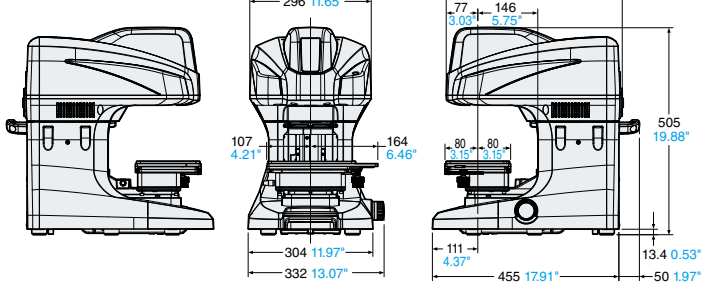
Head  
**VR-5200**



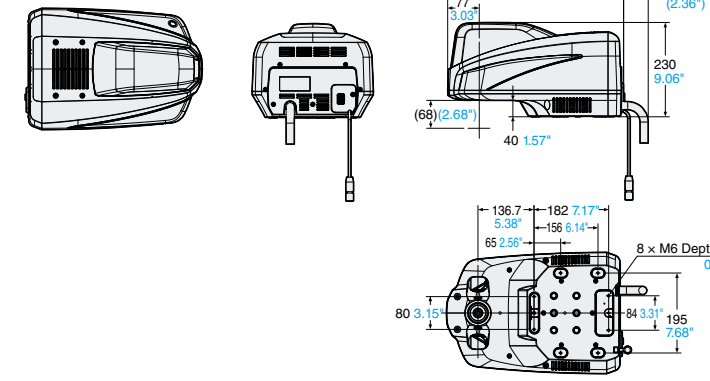
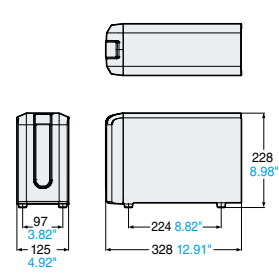
Motorized XY stage  
**VR-S300**



Head  
**VR-5100**



Controller  
**VR-5000**



# Specifications

## VR Head/Controller

Model	Controller		VR-5000															
	Head		VR-5200								VR-5100							
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 <i>inch</i>		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 <i>inch</i>		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) <sup>*1</sup>	Without Z stitching	0.4 μm															
		With Z stitching	1.0 μm															
	Measurement accuracy <sup>*1</sup>	Without Z stitching	±2.5 μm															
With Z stitching		±4.0 μm																
Width measurement	Repeatability (σ) <sup>*1</sup>	1 μm				0.5 μm				1 μm				0.5 μm				
	Measurement accuracy <sup>*1</sup>	±5 μm				±2 μm				±5 μm				±2 μm				
Stitching function <sup>*2</sup>			Fully-automated measurement (XY automatic control + Z automatic control)								Manual measurement (XY manual operation + Z automatic control)							
			Automatic mapping creation, Automatic area setting															
XY measurable range <sup>*2</sup>			206 × 104 mm 8.11" × 4.09"								92 × 86 mm 3.62" × 3.39"							
Stage	XY stroke	184 × 88 mm 7.24" × 3.46" (motorized)								70 × 70 mm 2.76" × 2.76" (manual)								
	Z stroke	73 mm 2.87" (motorized)																
	Load capacity	4.5 kg																
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, 50/60 Hz																
	Power consumption	200 VA max.																
Environmental resistance	Ambient temperature	+15 to 30°C 59 to 86°F																
	Ambient humidity	35 to 80% RH (no condensation)																
Weight	Controller	Approx. 4 kg																
	Head <sup>*3</sup>	Approx. 28 kg								Approx. 25 kg								
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)

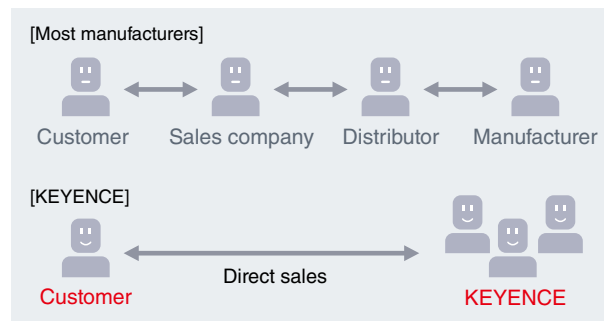
\*2 Measurement expansion module (VR-H3J) required

\*3 Weight of only measurement unit: Approx. 11 kg

\* Windows is either registered trademark or trademark of Microsoft Corporation in the United States and/or other countries.

## First-class customer support that only a direct service company can provide

KEYENCE employs a direct sales system that eliminates intermediaries such as distributors and dealers. Our experienced, highly-skilled sales engineers respond quickly to customers' inquiries, providing them with exceptional after-sales service and support. KEYENCE also offers free on-site inspection services and provides equipment loans free of charge in the event of a failure. With this level of service, KEYENCE provides post-sales support you can rely on.



## In-Depth Analysis of Roughness



Introduction to roughness



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**SAFETY INFORMATION**  
 Please read the instruction manual carefully in order to safely operate any KEYENCE product.

CONTACT YOUR NEAREST OFFICE FOR RELEASE STATUS

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<b>AZ</b> Phoenix	<b>CA</b> Los Angeles	<b>GA</b> Atlanta	<b>KY</b> Louisville	<b>MN</b> Minneapolis	<b>NY</b> Rochester	<b>OH</b> Cleveland	<b>SC</b> Greenville	<b>TX</b> Dallas	
<b>CA</b> San Francisco	<b>CA</b> Irvine	<b>IA</b> Iowa	<b>MA</b> Boston	<b>MO</b> Kansas City	<b>NC</b> Charlotte	<b>OR</b> Portland	<b>TN</b> Knoxville	<b>UT</b> Salt Lake City	

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