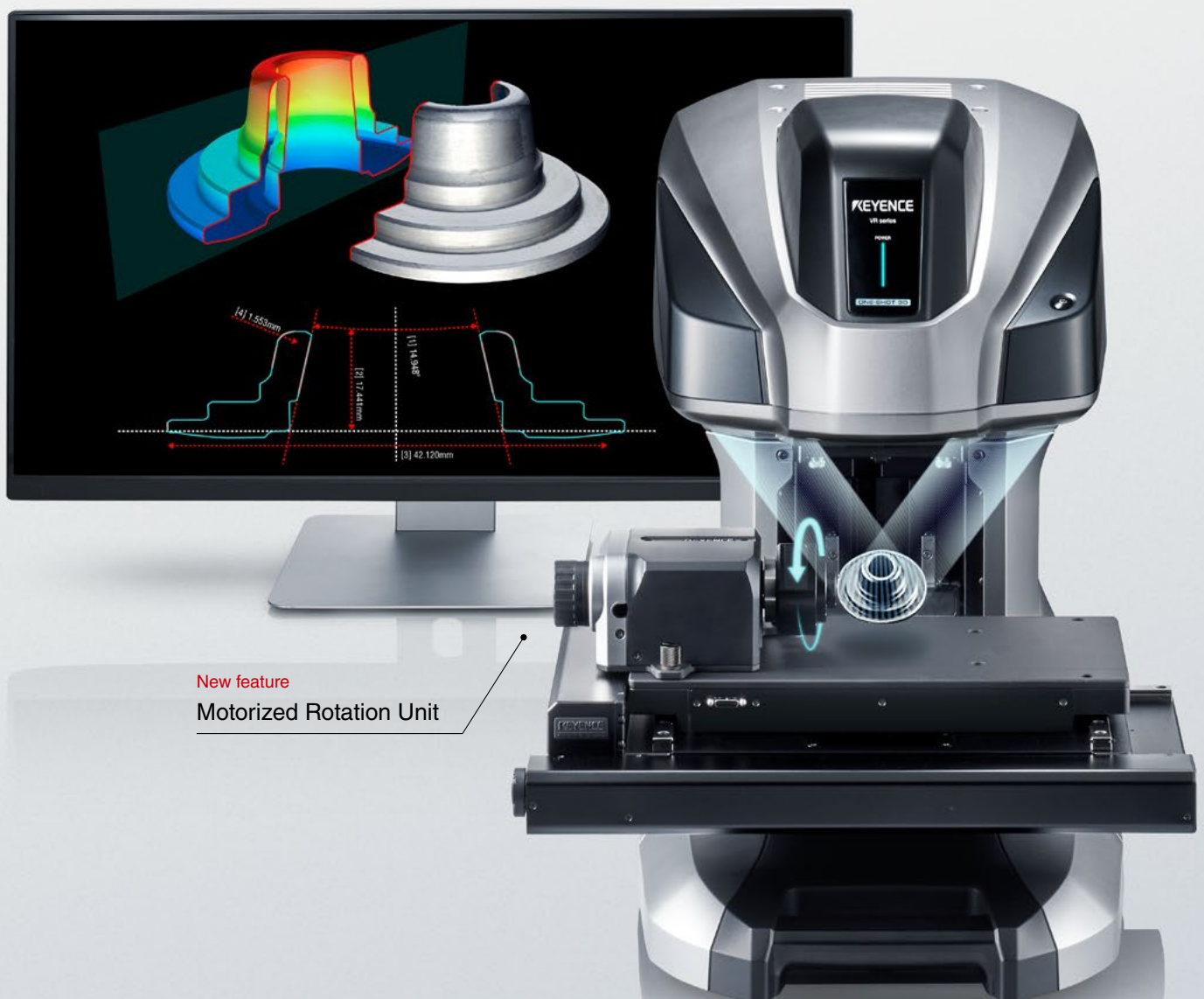# KEYENCE

3D Optical Profilometer
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 feature
Motorized Rotation Unit

3D Optical Profilometer
VR-6000 Series

Easy-to-use, non-contact

3D measurement system

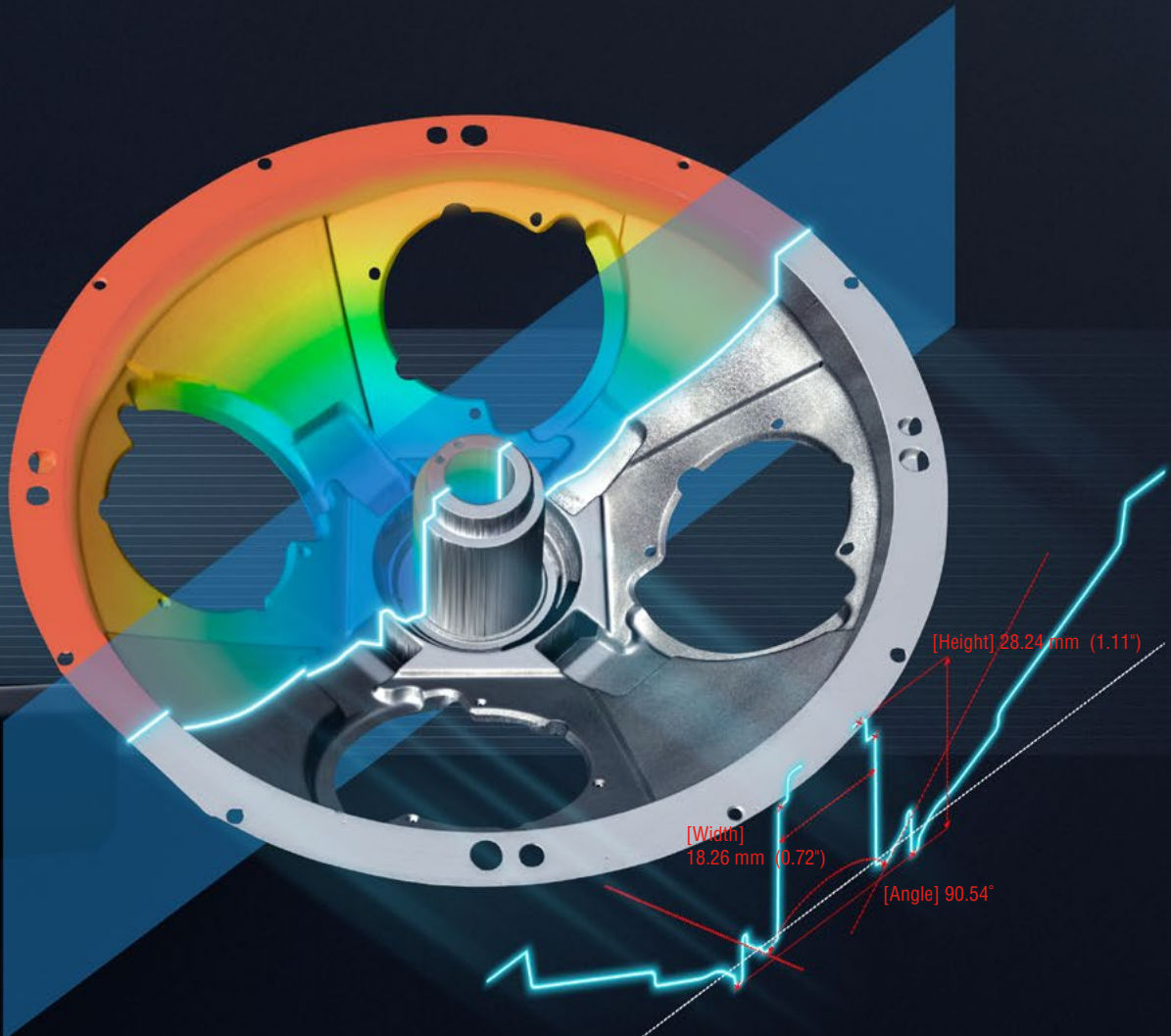# High-precision 3D measurement of an entire surface in as little as 1 second

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

[Height] 28.24 mm (1.11")

[Width] 18.26 mm (0.72")

[Angle] 90.54°

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

Contact profiler

Point measurement

Contact-based coordinate measuring machine
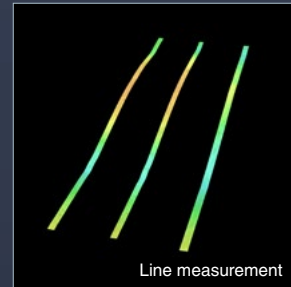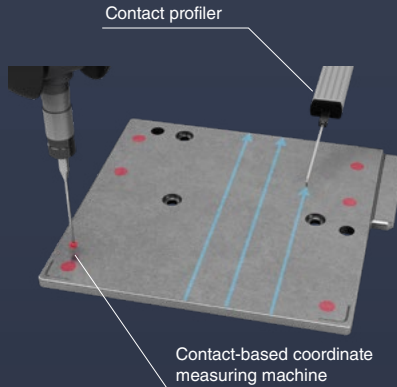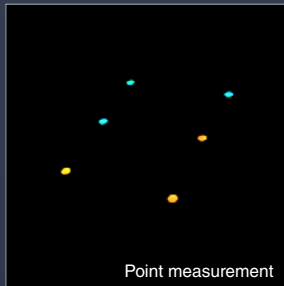
Line measurement

Some shapes cannot be analyzed with conventional measurement methods

3D Optical Profilometer
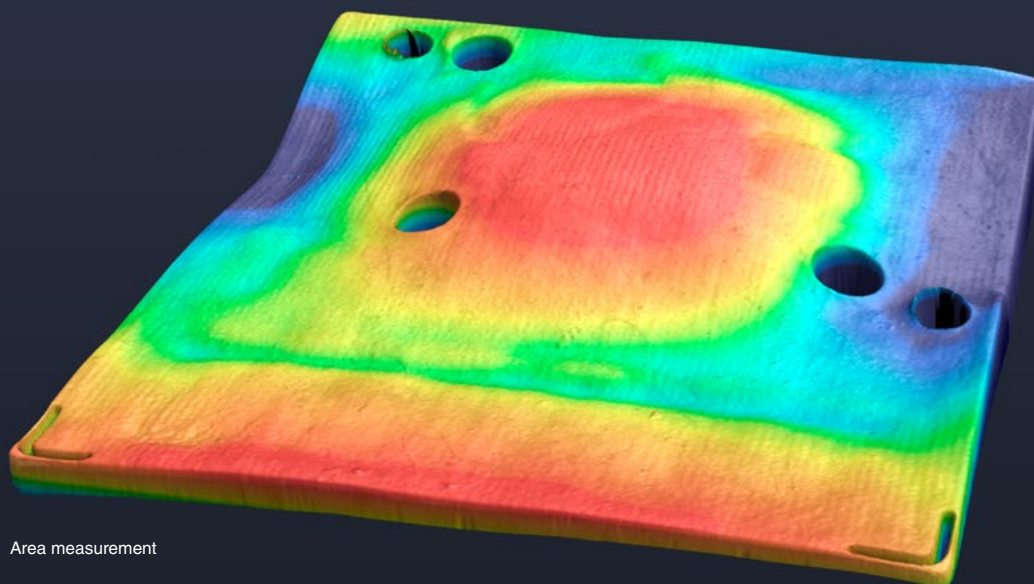
Area measurement

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.

Conventional systems

VR Series

4× faster than conventional systems

Time required
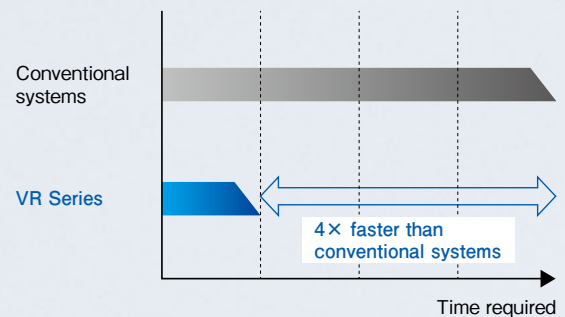
Accurate and repeatable measurements

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
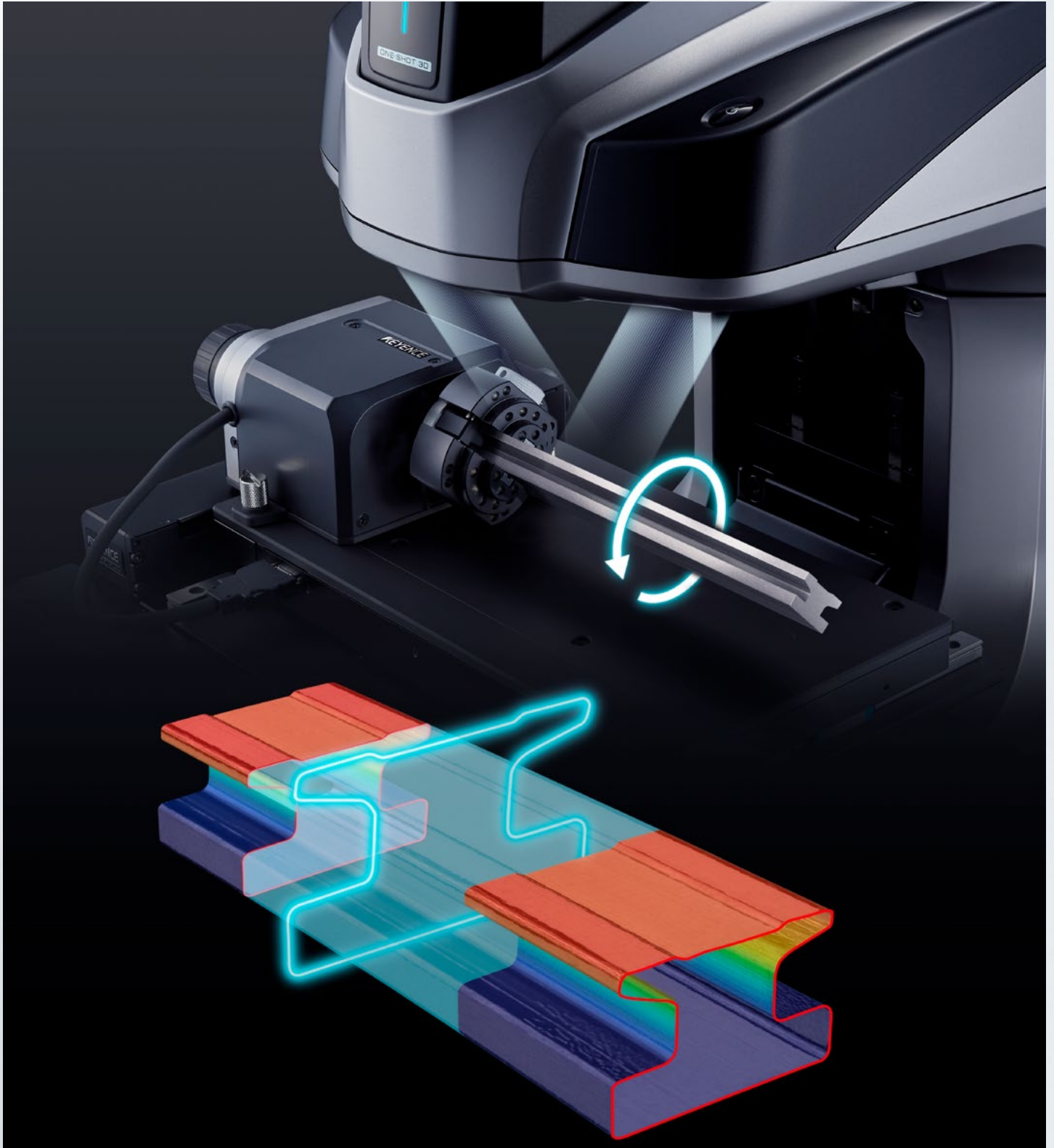
Simple Rotational Scanning

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.

Centering not required
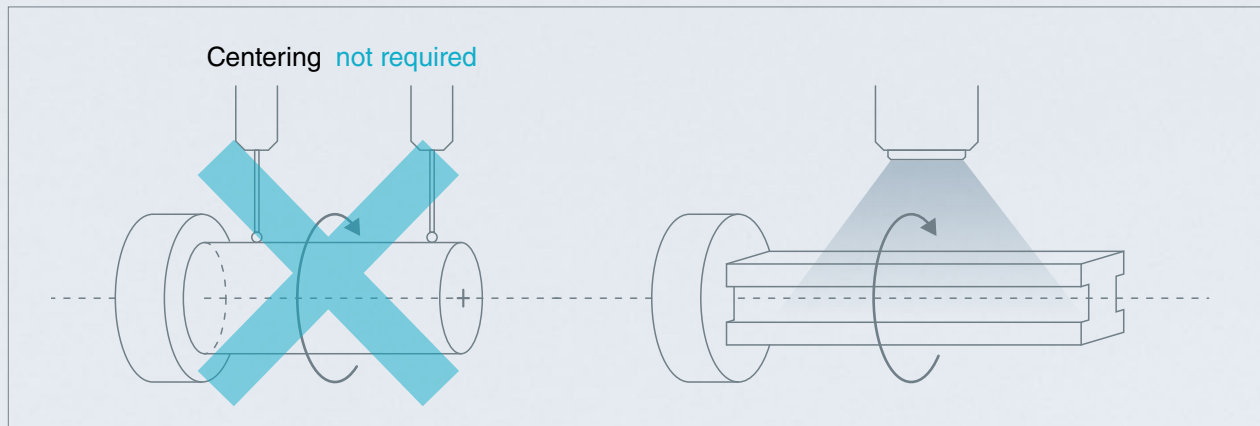
Reproduce cross-sectional shapes without cutting

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.

Angle measurement at overhang

Measurement of thinnest section

Measurement of thickness from the rear surface
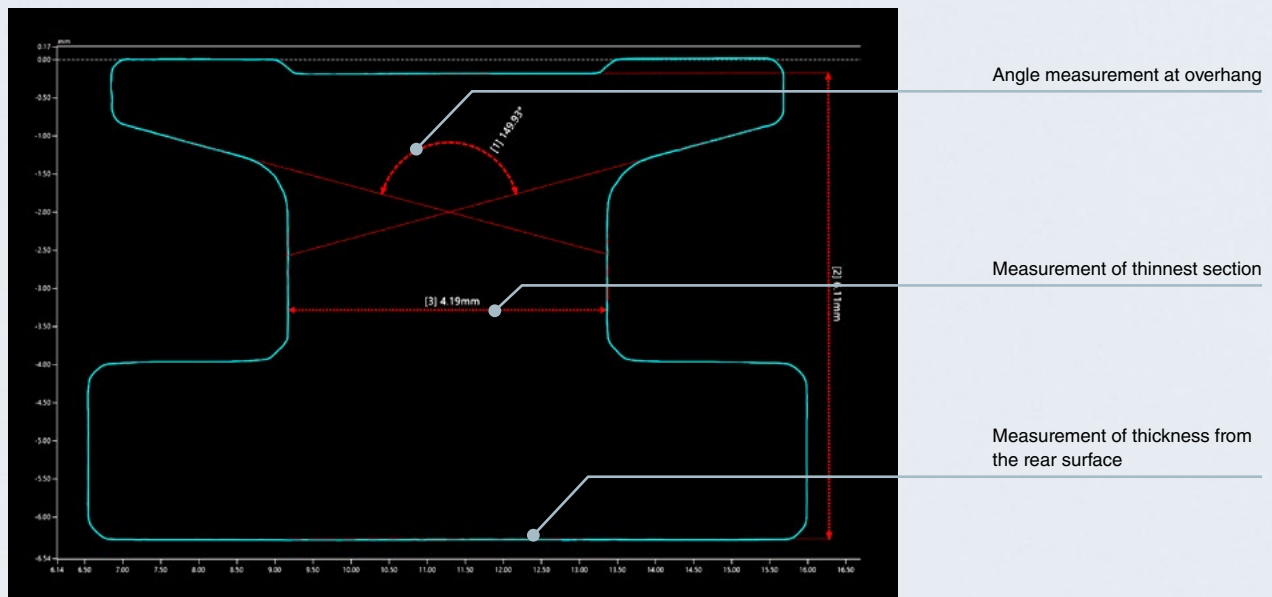
Measure a Wider Variety of Materials due to an Advanced Scanning Principle

HDR scanning algorithm enables measurement of more materials

Glossy   Black   White
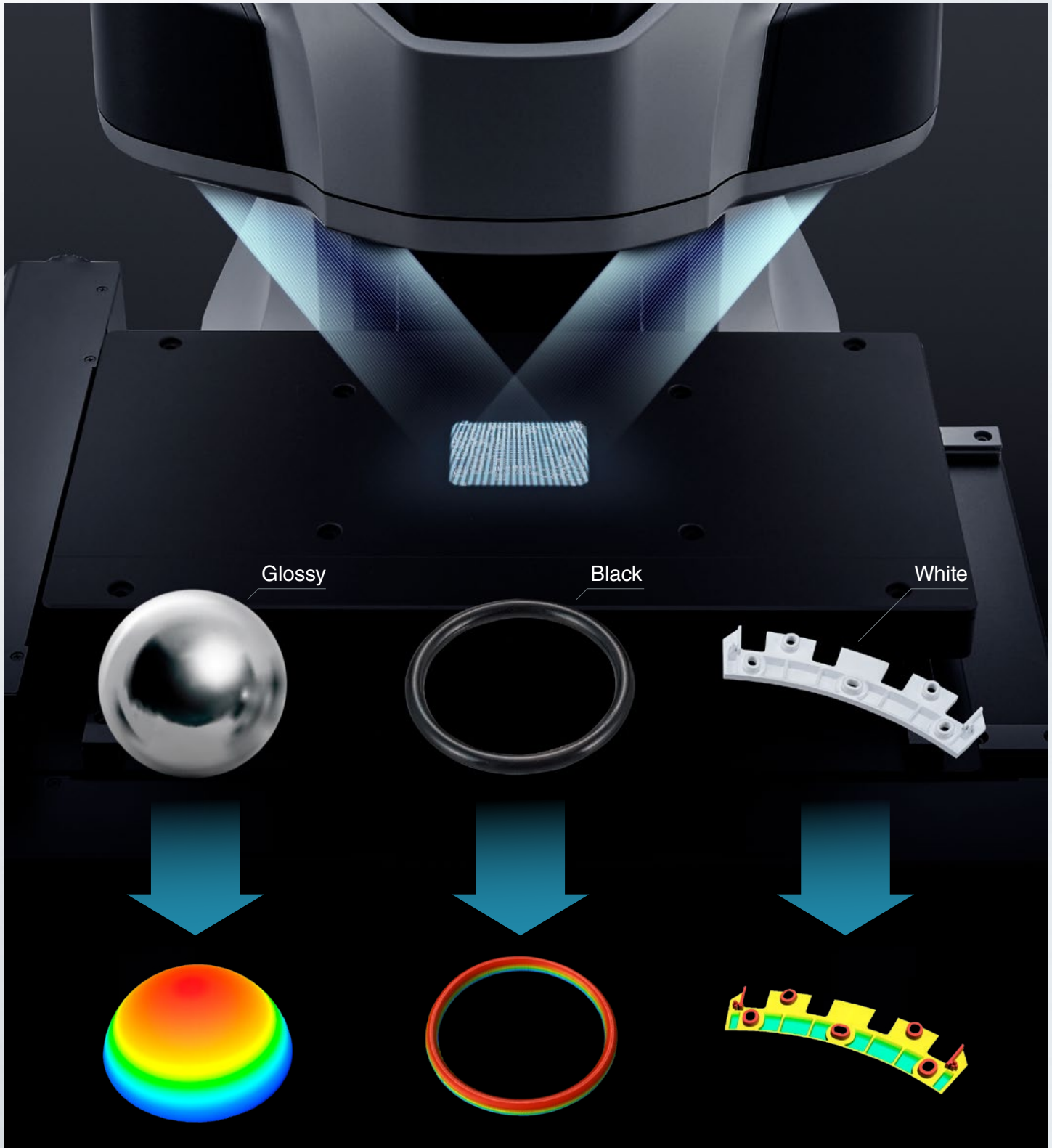
High dynamic range scanning

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.
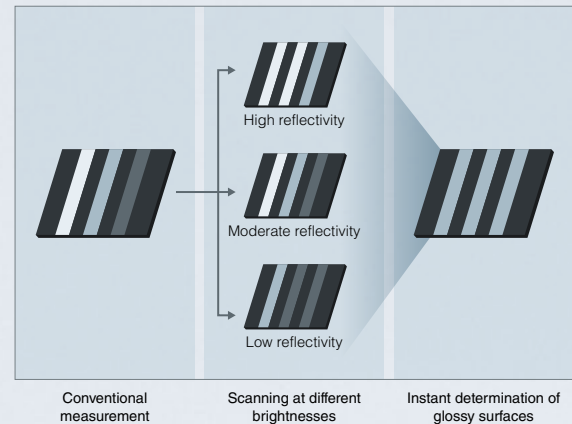
High reflectivity

Moderate reflectivity

Low reflectivity

| Conventional measurement | Scanning at different brightnesses | Instant determination of glossy surfaces |

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.

Automation

Auto Focus

Measurement Volume

Measurement Settings
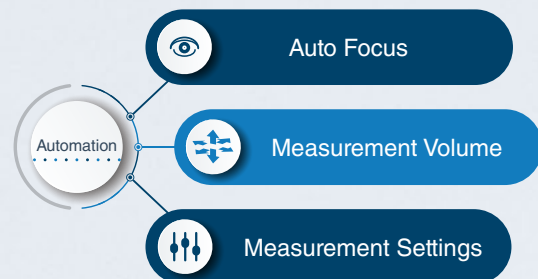
Measurement range settings configured automatically

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
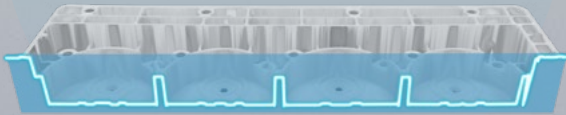
2D measurement

Measure distances and angles between circles, points, and lines
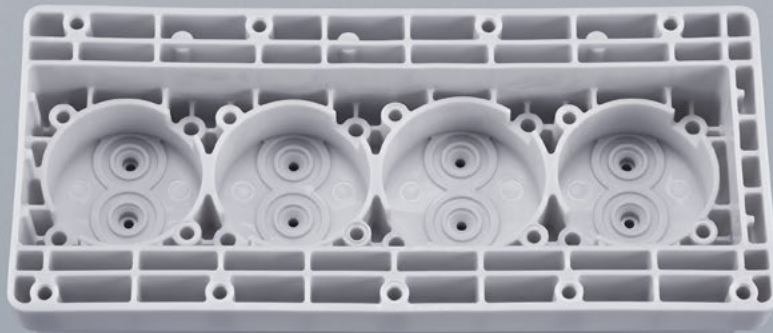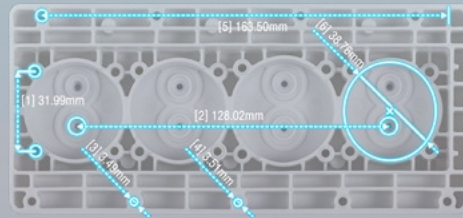
Surface roughness

Measure roughness parameters, such as Ra and Rz, to JIS and ISO standards
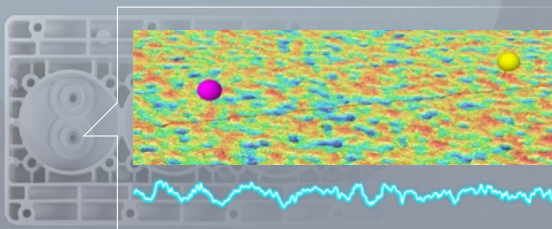
GD&T measurement

Measure flatness, parallelism, concentricity, circularity, and perpendicularity
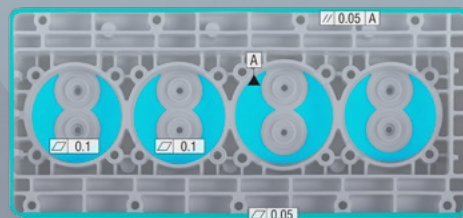
Consolidate multiple measurement systems into one device

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

Profile measurement
Contact profiler

2D measurement
Measuring microscope

Surface roughness
Roughness gage

GD&T measurement
CMM
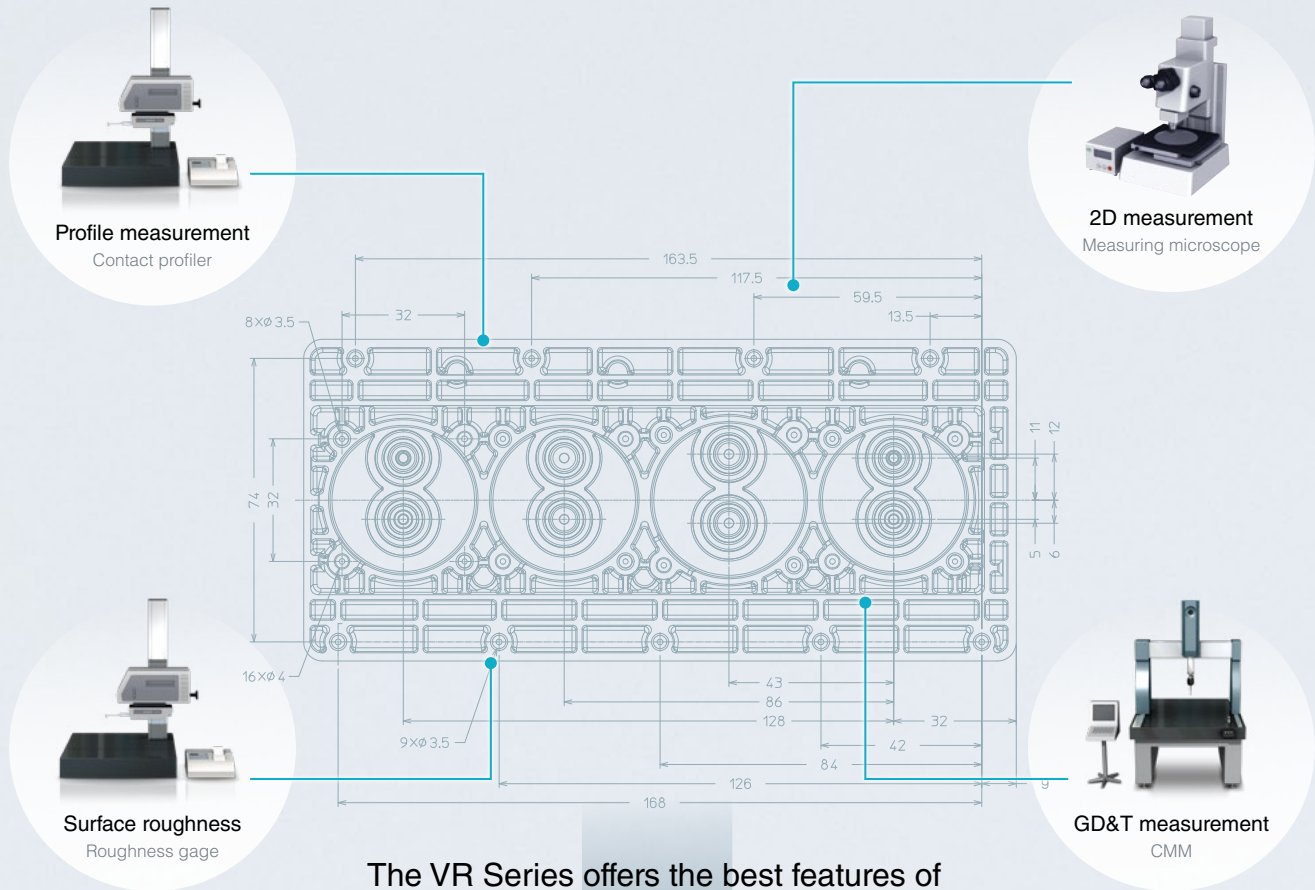
The VR Series offers the best features of multiple measurement systems in one device

[1] 43.00 mm (1.69")

[2] 3.53 mm (0.14")

Ra 3.2   0.1 mm (0.0039")   0.1 mm (0.0039")
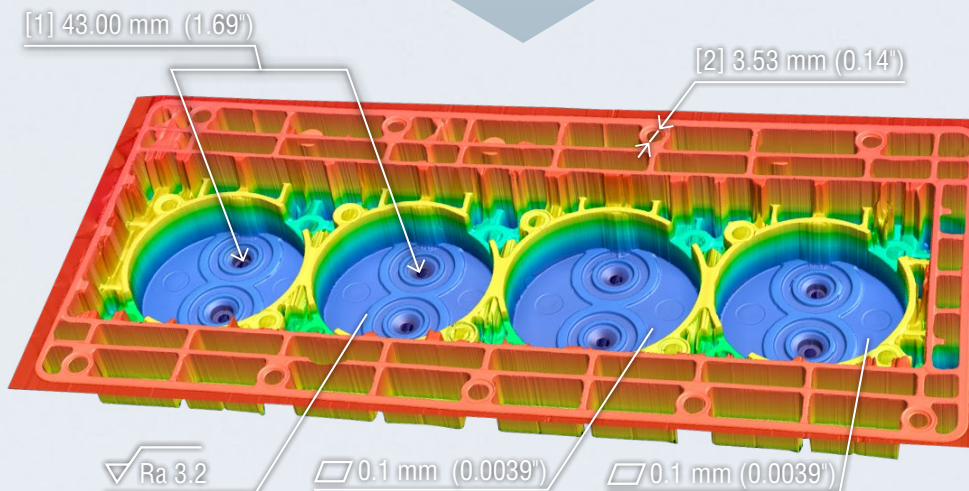
Highly Accurate Wide-Area Measurement

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

70 mm (2.76")

150 mm (5.91")
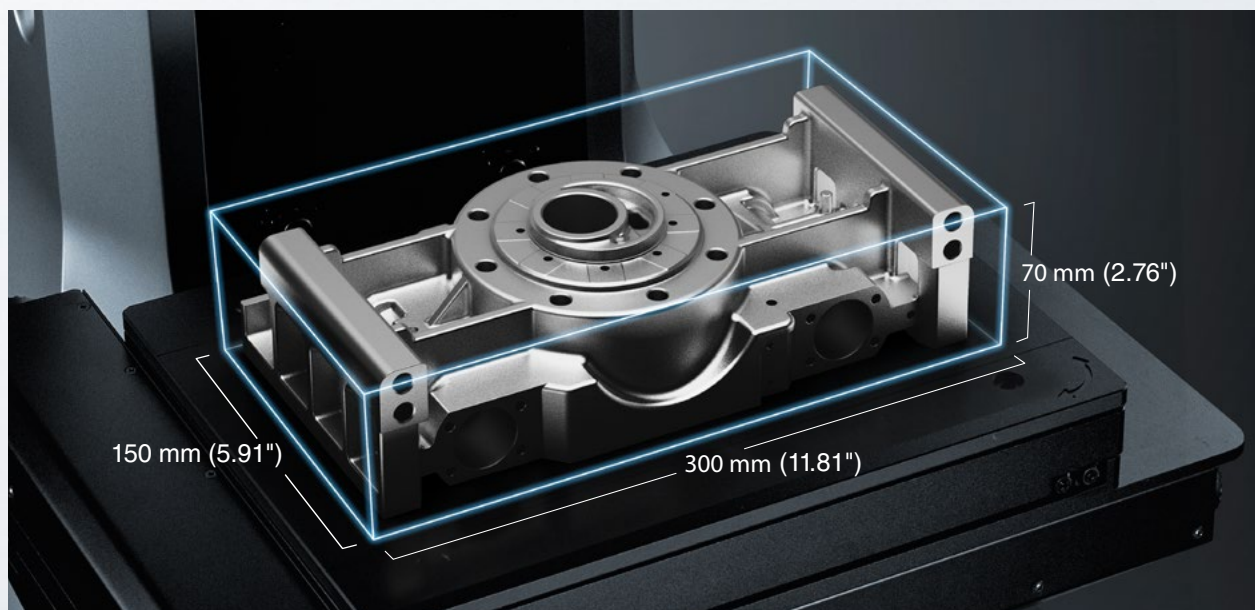
300 mm (11.81")

*The maximum measurement area may be limited to 300 x 125 x 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.
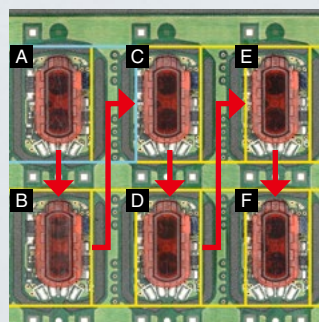
Electronic PCB

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
ø0.2 mm ø0.01"
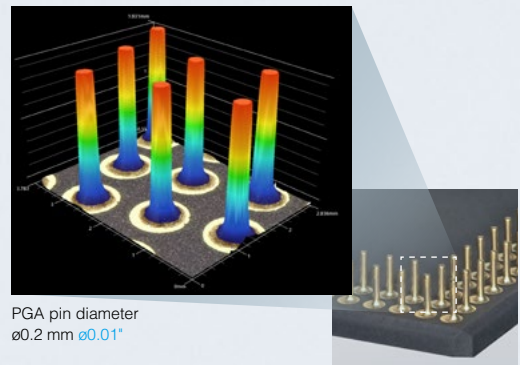
Acquire precise 3D data

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.
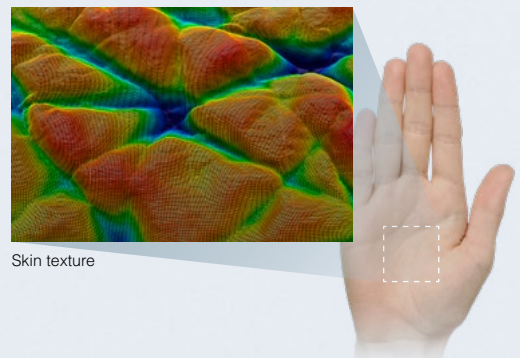
Abundant assist tools for accurate and repeatable measurements

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

Point	Line	Line segment
Circle	Arc	Parallel line	Specific angle
Spherical center	Axis of cylinder	Axis of cone	Intersection of two planes
Max. height	Min. height	Reference axis
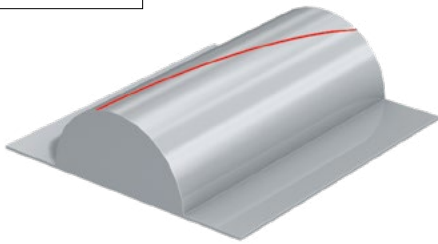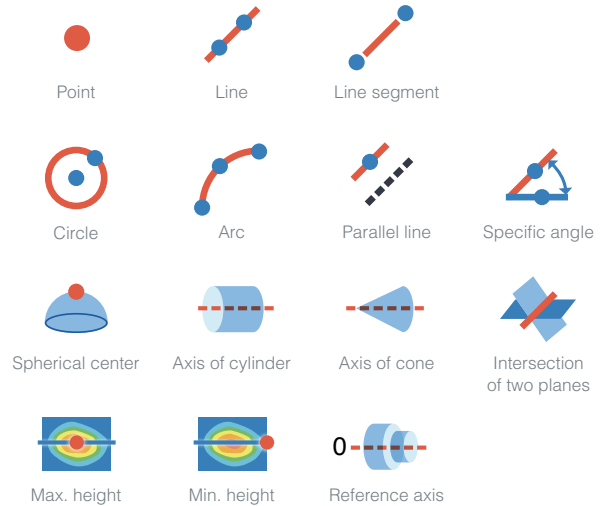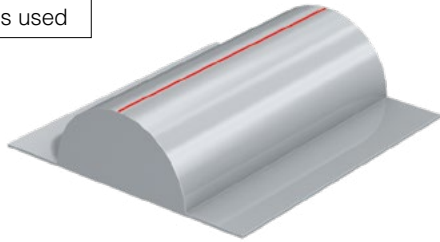
Acquire the desired values

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.

Extract max. height

Extract measurement line

Extract arc radius

Point	Line	Arc	Intersection
Maximum	Minimum	Midpoint	Center line
Coupled line	Coupled circle	Vertical baseline	Parallel line

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.

Reference plane

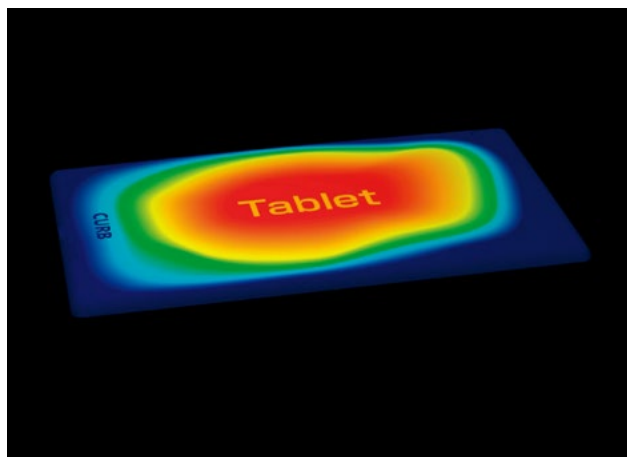| Flatness measurement	Height difference	Max. height (△)	Min. height (▽)	Max. - Min.
Point of measurement / Unit	mm inch	mm inch	mm inch	mm inch
Area 1	1.15 0.045"	1.17 0.046"	1.13 0.044"	0.05 0.002"
Area 2	3.09 0.122"	3.17 0.125"	2.62 0.103"	0.55 0.022"
Area 3	0.92 0.036"	1.09 0.043"	0.79 0.031"	0.30 0.012"
Area 4	1.10 0.043"	1.18 0.046"	1.06 0.042"	0.12 0.005"
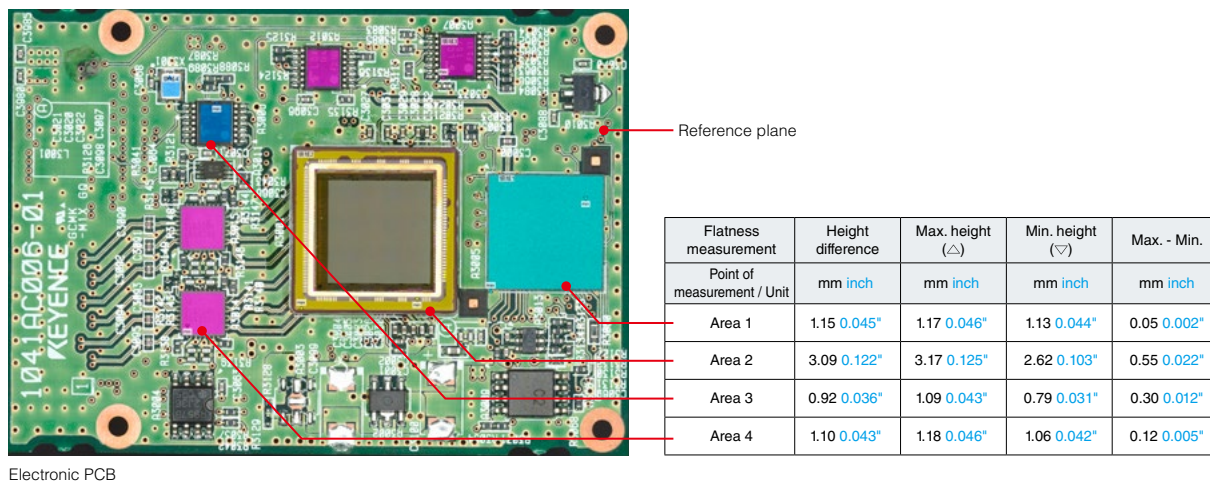
Electronic PCB

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.
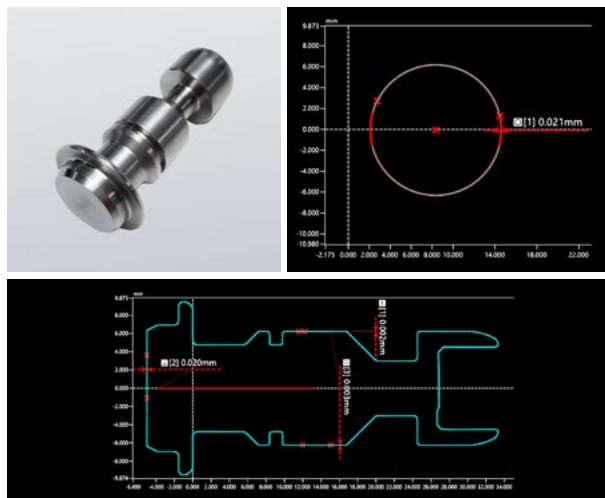

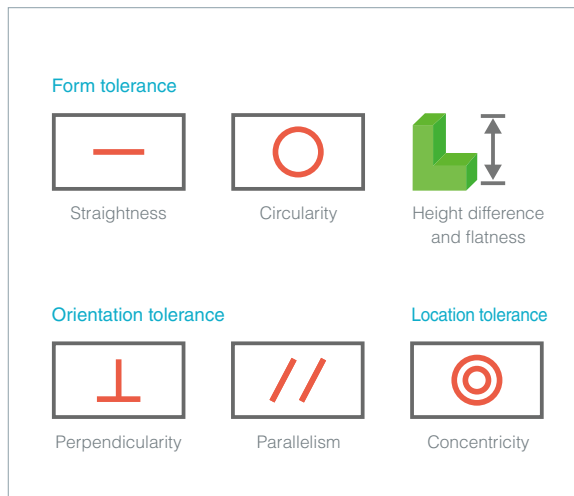
Curvature measurement of tablet case

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

Form tolerance

Straightness   Circularity   Height difference and flatness

Orientation tolerance   Location tolerance

Perpendicularity   Parallelism   Concentricity

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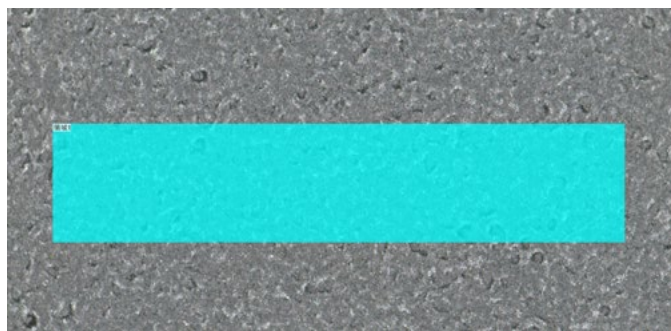
No.	Sa	Sz	Str	Spc	Sdr	Sp	Ssk	Sku
	µm	µm		1/mm		µm		
Area shape 1	0.51	6.33	0.61	34.1	0.01	2.99	-0.02	3.02

Blasted sample

| No.	Parameter	Measured value	Unit
1	Ra	3.14	µm
2	Rz	11.45	µm
3	RzJIS	6.33	µm
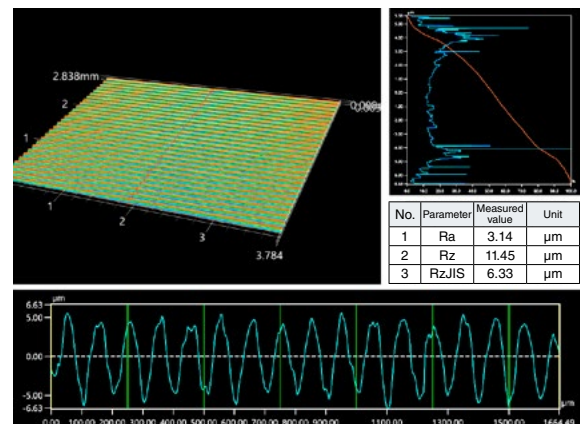
Roughness reference sample

# 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.
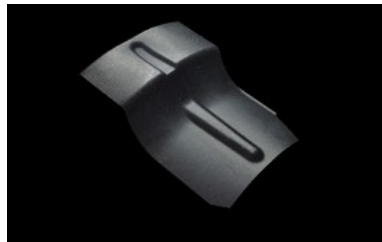

Good part

Defective part

No.	Parameter	Measured value	
1	1 point of difference (profile) 1	-0.501 -0.02"	mm inch
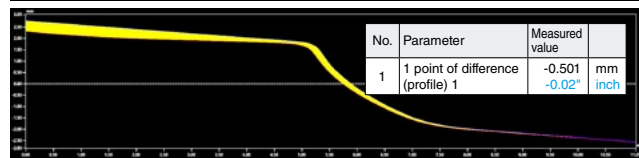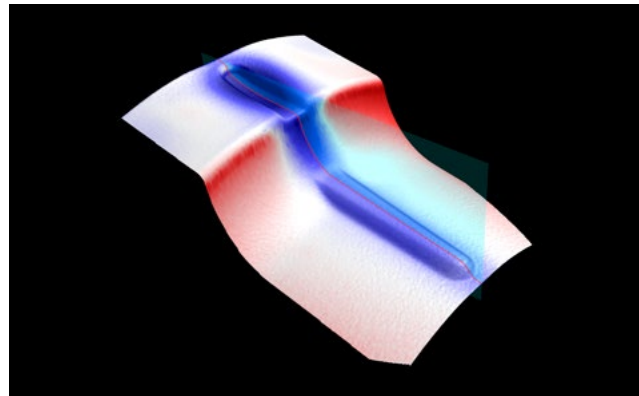
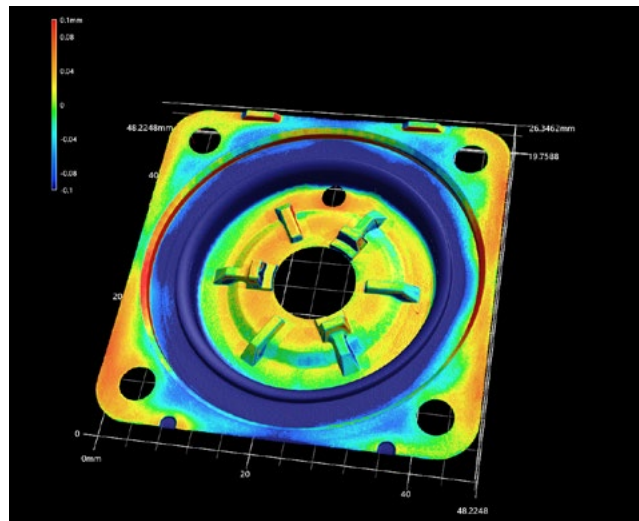Rubber handle

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.
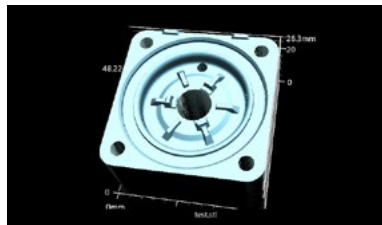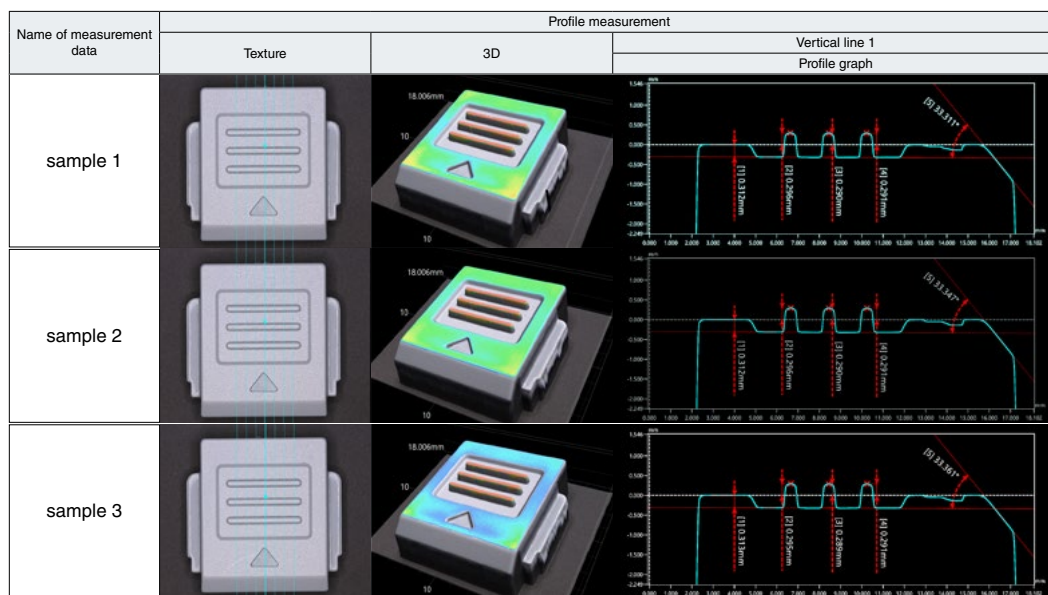

CAD data
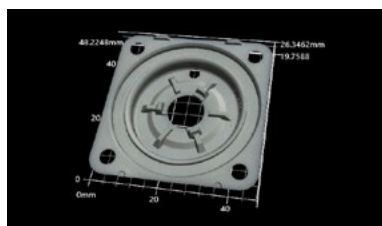
Measurement data

Waterproof resin parts

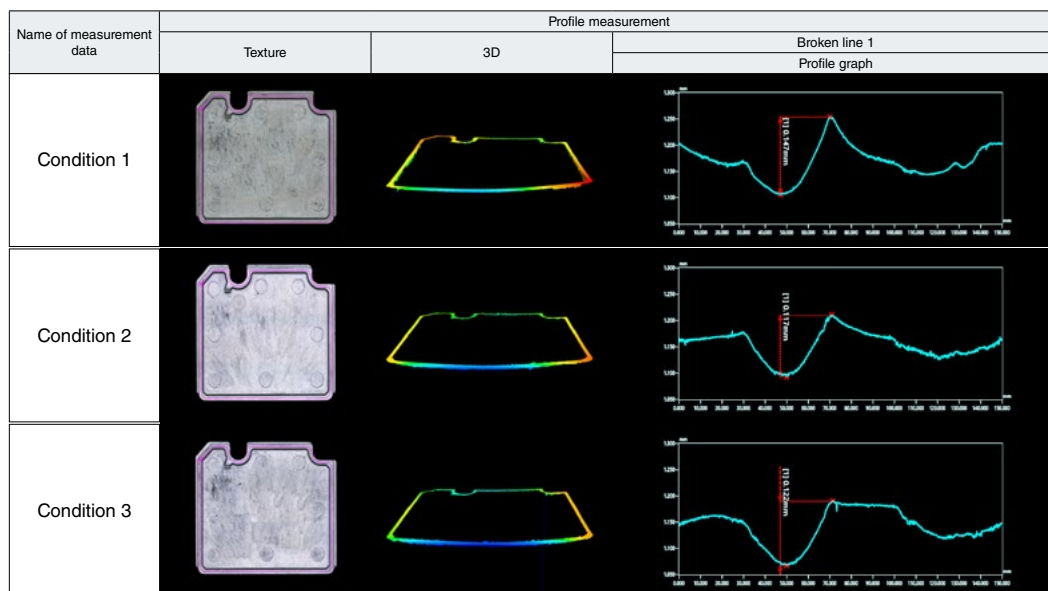# Immediate analysis of multiple data files

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

Name of measurement data	Profile measurement		
	Texture	3D	Vertical line 1
			Profile graph
sample 1			
sample 2			
sample 3			

Profile measurement of plastic molded part

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

Name of measurement data	Profile measurement		
	Texture	3D	Broken line 1
			Profile graph
Condition 1			
Condition 2			
Condition 3			

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: 2.3 µm

The Ra is the same, but the targets look different

Ra: 2.3 µm

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.

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

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

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.
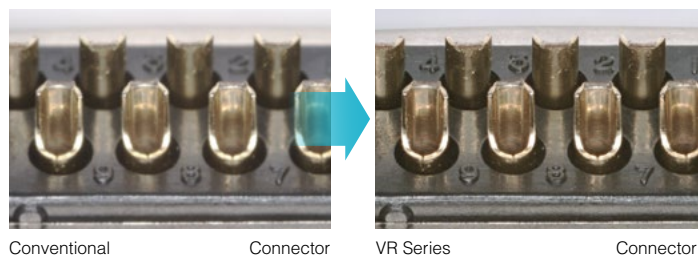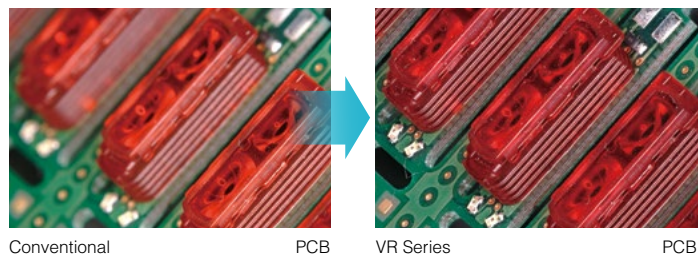

Conventional   Connector   VR Series   Connector

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.

Conventional   PCB   VR Series   PCB

23

Inspection and Quality Control Functions

Pass/fail inspection and reporting

Pass/Fail judgment function

By setting the measurements and tolerances, users can obtain pass/fail inspection judgements based on the measurement results. All of the pre-configured measurements are performed automatically with the click of a button.
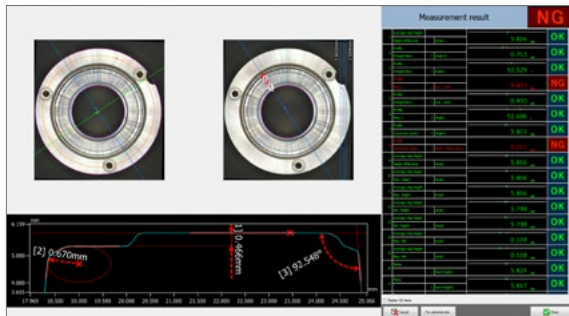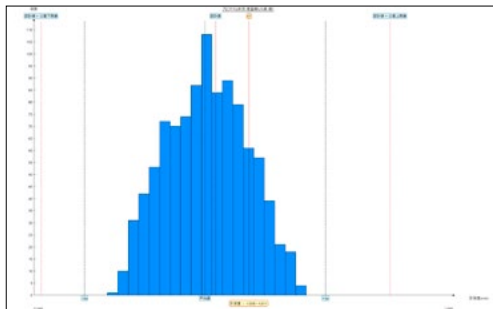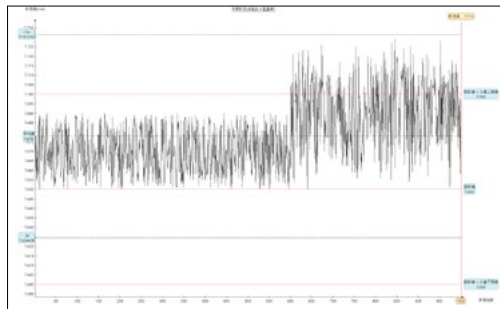

Pass/Fail judgment function

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

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	criterion	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

Combining multiple 3D data sets for extended data analysis
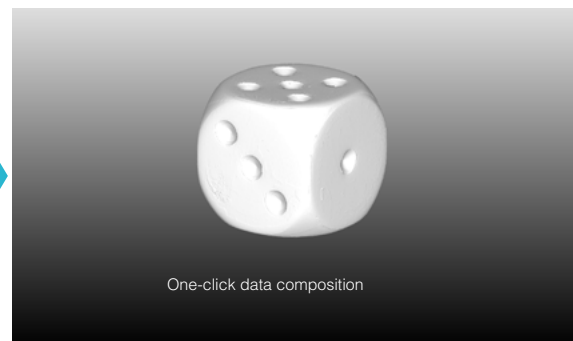
NEW VR-VL conversion module (VR-H4L)

High accuracy 3D data obtained with the VR-6000 can be used for a wide variety of 3D analyses.

3D analysis function

Data composition

Pre-composition image 1

Pre-composition image 2
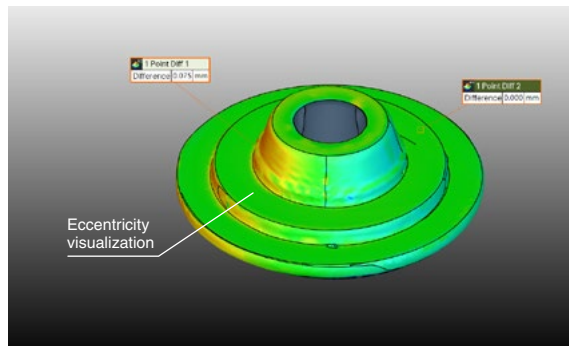
Precise alignment

One-click data composition
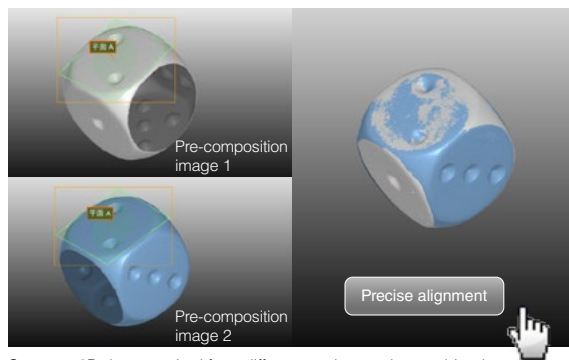
Separate 3D data acquired from different angles can be combined into a single data set.

Full-surface data composition of dice
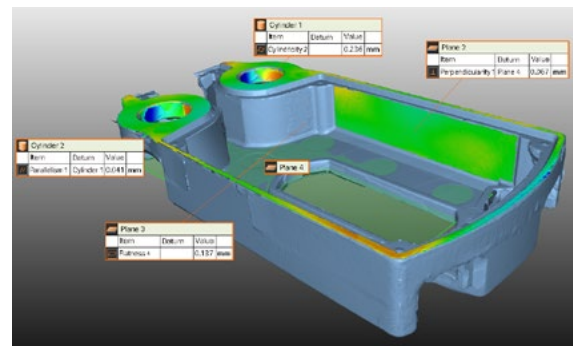
CAD comparison measurement

Eccentricity visualization

Comparing a retainer valve with CAD data makes it possible to determine the degree of eccentricity at just a glance.

GD&T

Evaluation of the shape, orientation, and location tolerance is possible even for high-precision parts as small as a fingertip. ***Requires VL-H3G GD&T software**

CAD data conversion (Reverse engineering)

3D-CAD data from tool tip shape
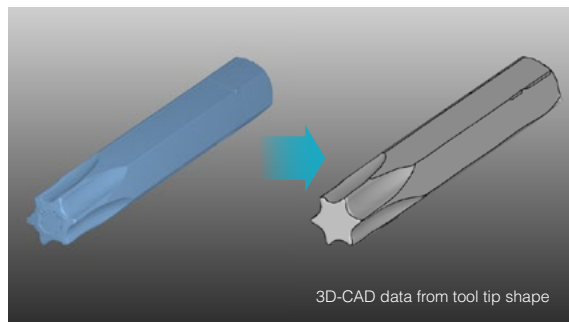
By scanning the actual product, the shape can be converted directly into STEP data. ***Requires VL-H3R CAD conversion module**

VR-VL data binding

No binding   With VR data binding
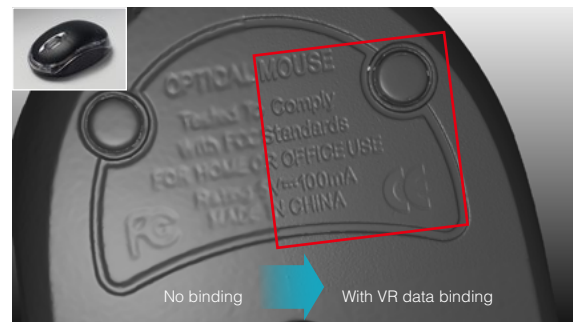
Data acquired with the VR-6000 Series can be combined with data acquired with the VL-700 Series. ***Requires VL-H3G software**

25

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.

$$h = d \div \tan(\theta)$$
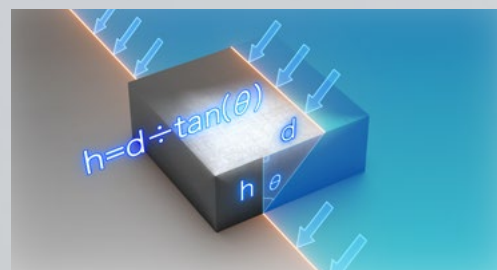
High-definition CMOS sensor

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.
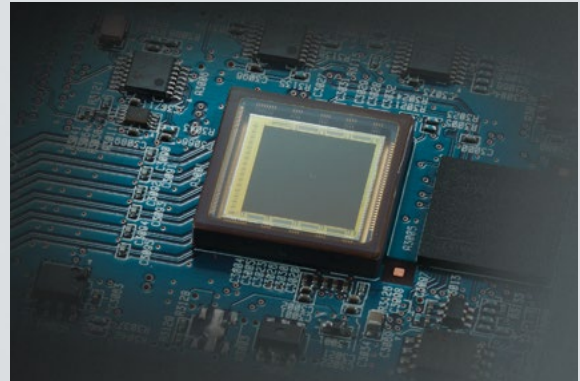
High-precision telecentric lens

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.
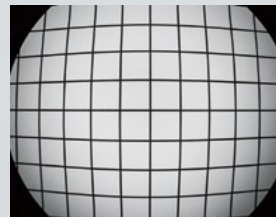
Normal camera lens
Distortion at the periphery
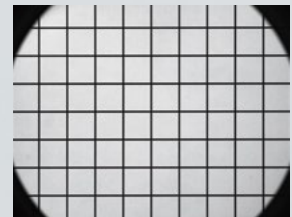
VR Series
Minimal distortion in the field of view

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
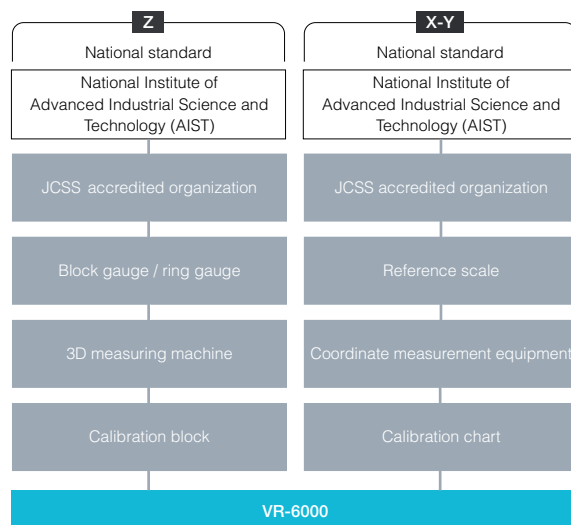
Traceable measurement results

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.

Z	X-Y
National standard	National standard
National Institute of Advanced Industrial Science and Technology (AIST)	National Institute of Advanced Industrial Science and Technology (AIST)
JCSS accredited organization	JCSS accredited organization
Block gauge / ring gauge	Reference scale
3D measuring machine	Coordinate measurement equipment
Calibration block	Calibration chart
VR-6000	

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.
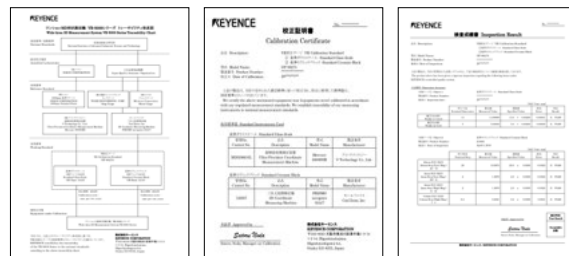
Complete calibration with the touch of a button

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.

The kind of customer support that only a direct sales company can offer

Typical manufacturers sell their products through various distributors. If a question, problem, or technical need arises, customers must communicate through the distributor, slowing down problem solving and complicating matters. On the other hand, KEYENCE customers always communicate directly with KEYENCE personnel, enabling quick solutions to needs that may arise.

With a regular manufacturer

Customer ↔ Sales Company ↔ Distributor ↔ Manufacturer

With KEYENCE
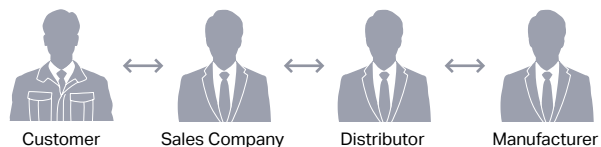
Customer — Direct sales → KEYENCE

Examples of Applications by Department
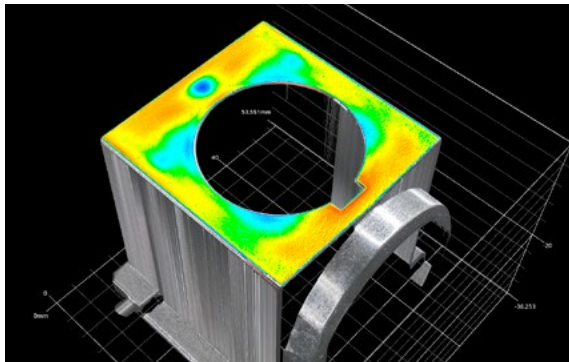
Development and design

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

Confirmation of sink marks due to differences in plastic materials

Evaluation of changes in PCB warpage due to heating

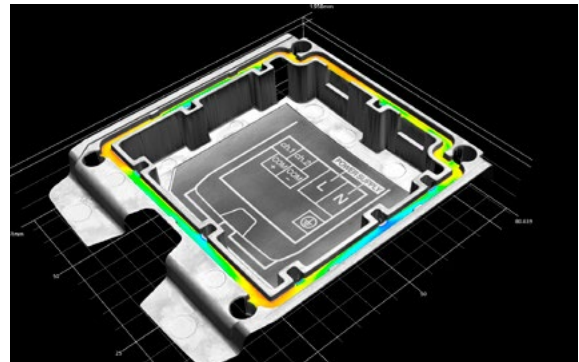## Prototyping and evaluation

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.

Leak evaluation of seals on sensor cases
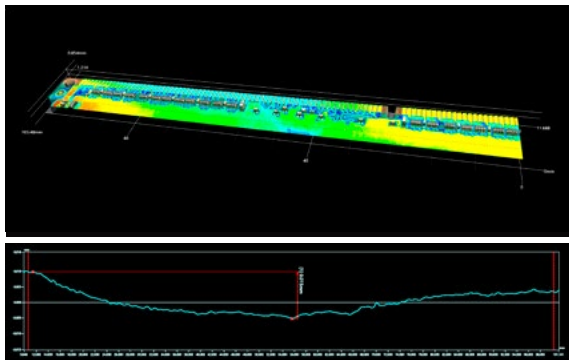
Quantification of groove depth in tire wear testing

	Volume	Cross sectional area	Surface area	Avg. depth	Max. depth
	mm³ in³	mm² in²	mm² in²	mm inch	mm inch
Max.	2.639 0.00016*³	1.737 0.0027*²	6.362 0.0098*²	-1.183 -0.047"	-1.365 -0.054"
Min.	0.094 5.73623*³	0.077 0.0001*²	0.384 0.0006*²	-1.741 -0.069"	-2.095 -0.082"
Average	1.825 0.00011*³	1.311 0.0020*²	3.75 0.0058*²	-1.372 -0.054"	-1.614 -0.064"
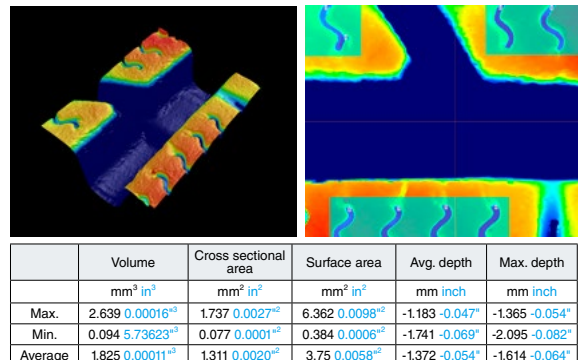
Production technology and manufacturing

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.
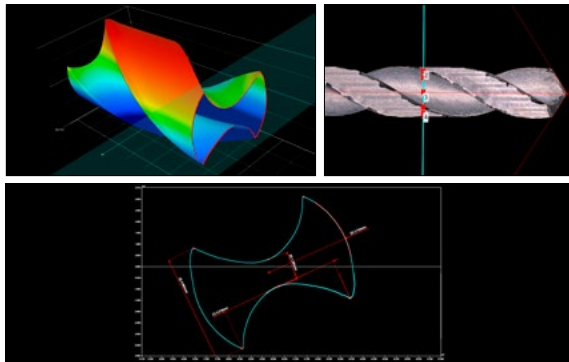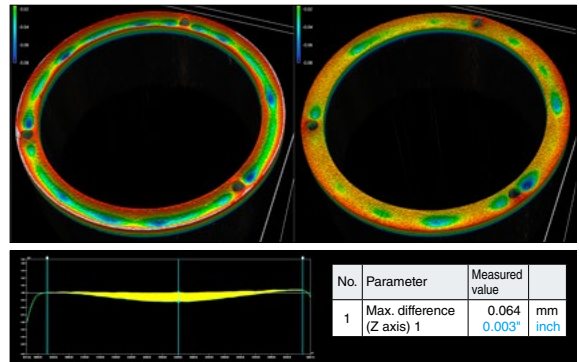
Quality assurance and quality control

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

No.	Parameter	Measured value	
1	Max. difference (Z axis) 1	0.064 0.003"	mm inch

Warpage verification of connector electrodes

No.	Measured value	Unit
1	0.066 0.0026"	mm inch
2	0.076 0.0030"	mm inch
3	0.074 0.0029"	mm inch
4	0.083 0.0033"	mm inch
5	0.077 0.0030"	mm inch
6	0.077 0.0030"	mm inch
7	0.076 0.0030"	mm inch
8	0.087 0.0034"	mm inch
9	0.090 0.0035"	mm inch
10	0.078 0.0031"	mm inch
11	0.079 0.0031"	mm inch
12	0.082 0.0032"	mm inch
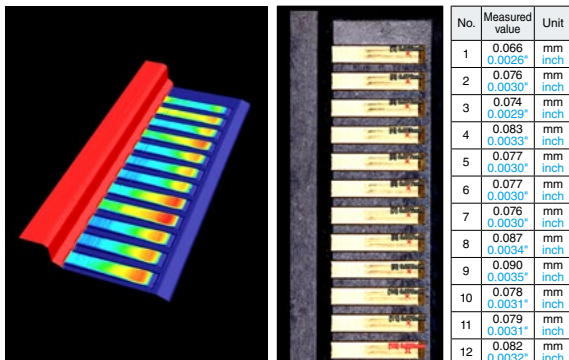
Outgoing inspection
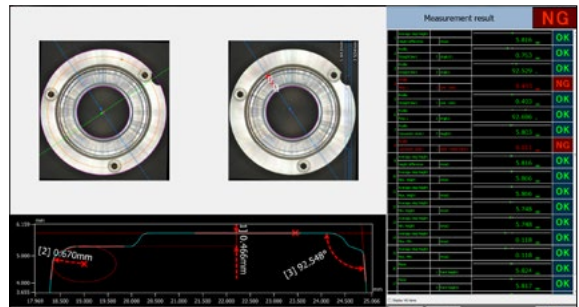
Examples of Applications by Industry

Automotive and aerospace

Wear evaluation of brake pads
Development and design departments

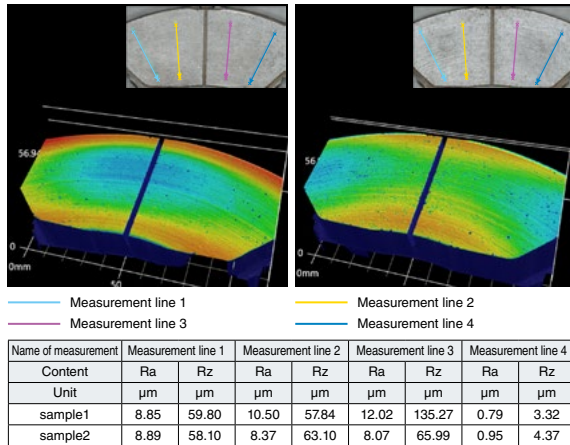|	Measurement line 1		Measurement line 2		Measurement line 3		Measurement line 4	
Name of measurement	Measurement line 1		Measurement line 2		Measurement line 3		Measurement line 4	
Content	Ra	Rz	Ra	Rz	Ra	Rz	Ra	Rz
Unit	µm	µm	µm	µm	µm	µm	µm	µm
sample1	8.85	59.80	10.50	57.84	12.02	135.27	0.79	3.32
sample2	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.

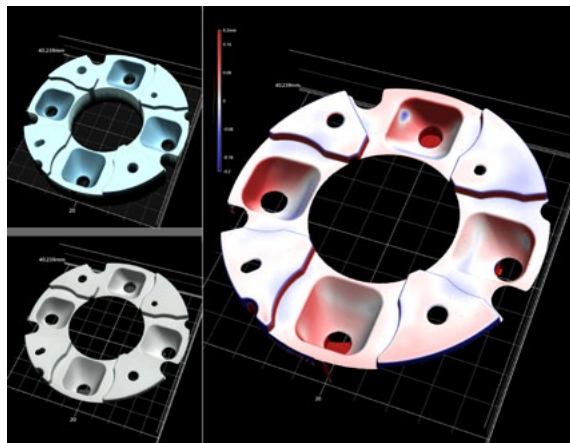### Durability testing of bearings
Development and design departments
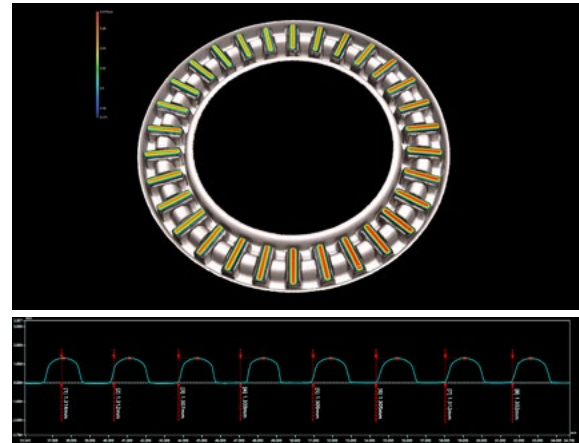
Virtual cross-sections can be drawn across the entire surface of the part to instantly understand how shape and contour changes.
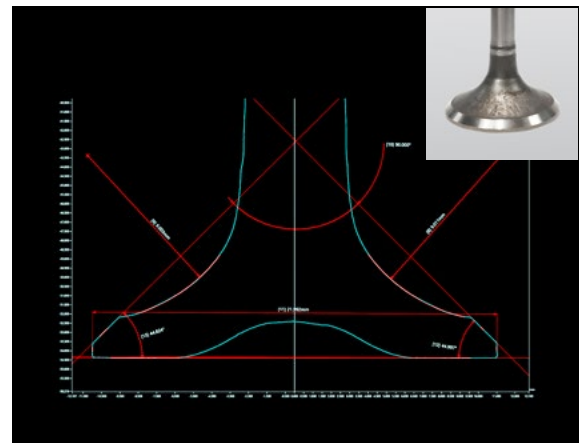
Identify defective components
Quality assurance and quality control departments

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

Profile measurement of valve train components
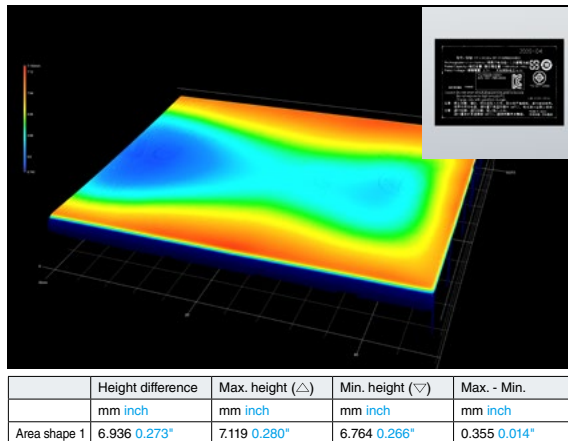Production technology and manufacturing departments

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

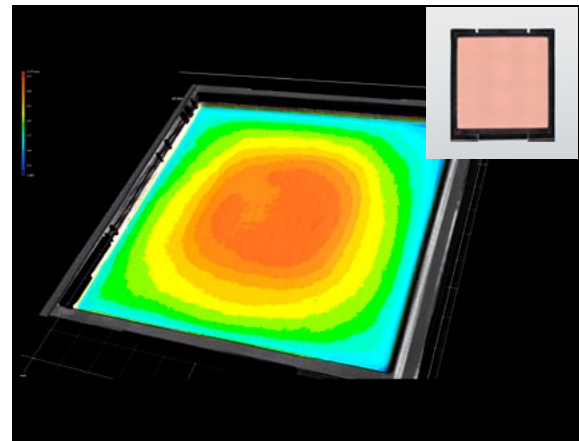|	Height difference	Max. height (△)	Min. height (▽)	Max. - Min.
	mm inch	mm inch	mm inch	mm inch
Area shape 1	6.936 0.273"	7.119 0.280"	6.764 0.266"	0.355 0.014"

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.

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.

Chemicals, pharmaceuticals, and food products
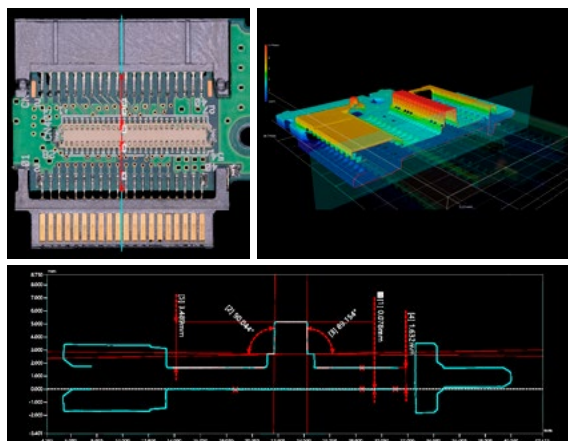
Checking foundation filling
Production technology and manufacturing departments

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.

First article inspection of stamped parts
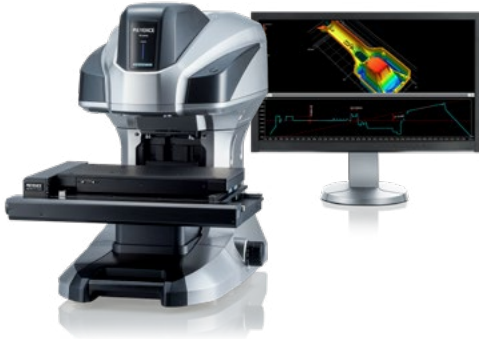Production technology and manufacturing departments
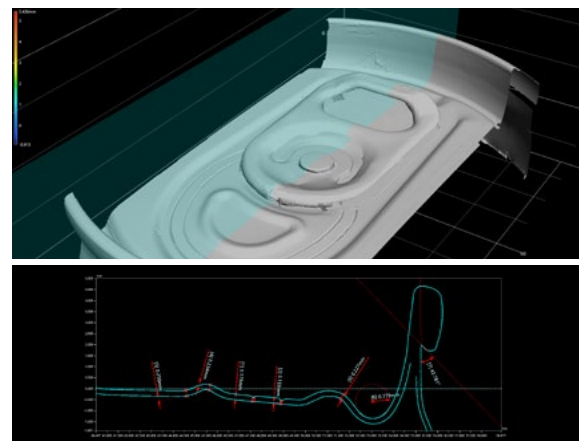
There is no need to cut products or grab them with hand tools. You can improve productivity by shortening the time required for first article and random sampling inspections.

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.
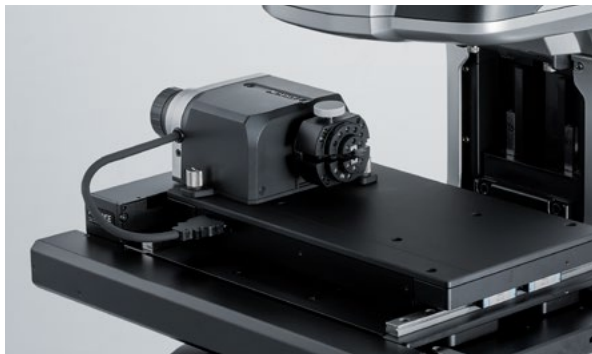
*Optional accessory for VR-6200 only

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.
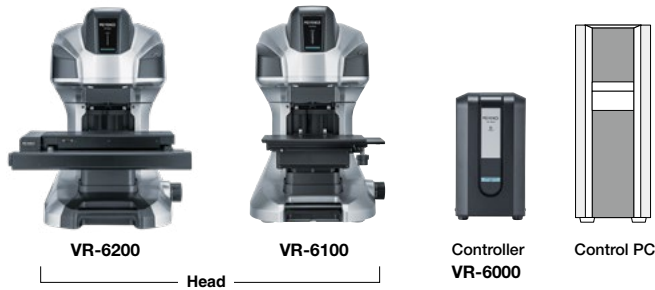

Rotational fixturing kit
OP-88677

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

VR-6200

VR-6100

Head

Controller
VR-6000

Control PC

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-A2 [*1]

Measurement expansion module
VR-H4J (optional)

Comparative measurement module
VR-H4CA (optional)

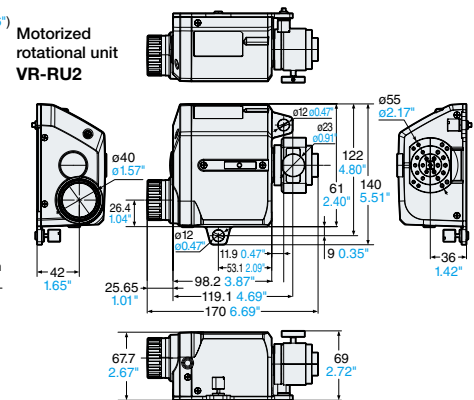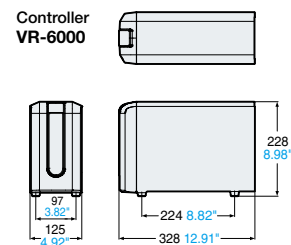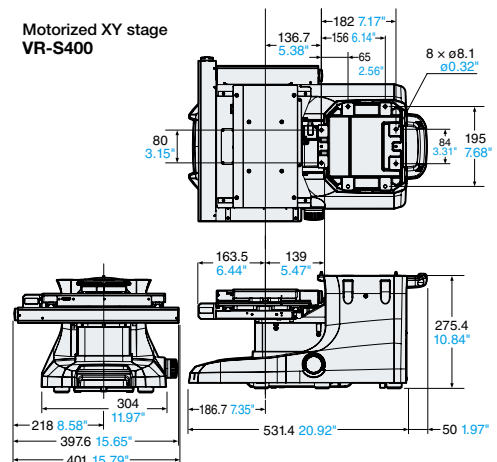VR-VL data-link software
VR-H4L (optional)

*1 Models may vary according to the instrument language.

Calibration gauge
OP-88275 (optional)

Tilt stage
OP-87709

Head
VR-6200

296 11.65"
429 16.89"
77 3.03"
146.2 5.76"
163.5 6.44"
139 5.47"
505 19.88"
304 11.97"
218 8.58"
397.6 15.65"
401 15.79"
186.7 7.35"
531.4 20.92"
13.4 0.53"
50 1.97"

Motorized XY stage
VR-S400

182 7.17"
156 6.14"
136.7 5.38"
65 2.56"
8 × ø8.1 ø0.32"
80 3.15"
84 3.31"
195 7.68"
163.5 6.44"
139 5.47"
275.4 10.84"
218 8.58"
304 11.97"
397.6 15.65"
401 15.79"
186.7 7.35"
531.4 20.92"
50 1.97"

Head
VR-6100

296 11.65"
429 16.89"
77 3.03"
146 5.75"
107 4.21"
164 6.46"
80 3.15"
80 3.15"
505 19.88"
304 11.97"
332 13.07"
111 4.37"
455 17.91"
13.4 0.53"
50 1.97"

Controller
VR-6000

228 8.98"
97 3.82"
125 4.92"
224 8.82"
328 12.91"

429 16.89"
(60 2.36")
77 3.03"
230 9.06"
(68 2.68")
40 1.57"

Motorized
rotational unit
VR-RU2

ø55 ø2.17"
ø12 ø0.47"
ø23 ø0.91"
ø40 ø1.57"
122 4.80"
61 2.40"
140 5.51"
26.4 1.04"
ø12 ø0.47"
11.9 0.47"
53.1 2.09"
9 0.35"
36 1.42"
42 1.65"
25.65 1.01"
98.2 3.87"
119.1 4.69"
170 6.69"
67.7 2.67"
69 2.72"

136.7 5.38"
182 7.17"
156 6.14"
65 2.56"
8 × M6 Depth 10 0.39"
80 3.15"
84 3.31"
195 7.68"

Unit: mm inch

35

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			12×	25×	38×	50×	40×	80×	120×	160×	12×	25×	38×	50×	40×	80×	120×	160×
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			1× to 4×															
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															
Compatible OS			Windows 10 Professional / Windows 11 Professional															

*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
1-888-539-3623
1-888-KEYENCE
TO CONTACT YOUR LOCAL OFFICE

KEYENCE CORPORATION OF AMERICA

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