

# UA3P

Ultrahigh Accurate 3-D Profilometer

### Safety Precautions

● Be sure to read the instruction manual carefully before using the product.

● In order to ensure the safe use of the products listed in the catalog, we ask that you thoroughly check the instruction manual attached to the equipment and the warnings of the equipment before carrying out proper operations, regardless of whether the equipment is in operation or not.

The Panasonic Group is committed to making environmentally conscious products.

<https://holdings.panasonic/global/corporate/sustainability.html>

For more information, please visit our website ▼

<https://www.panasonic.com/global/business/ua3p/>



inquiries

Panasonic  
Production Engineering Co., Ltd.

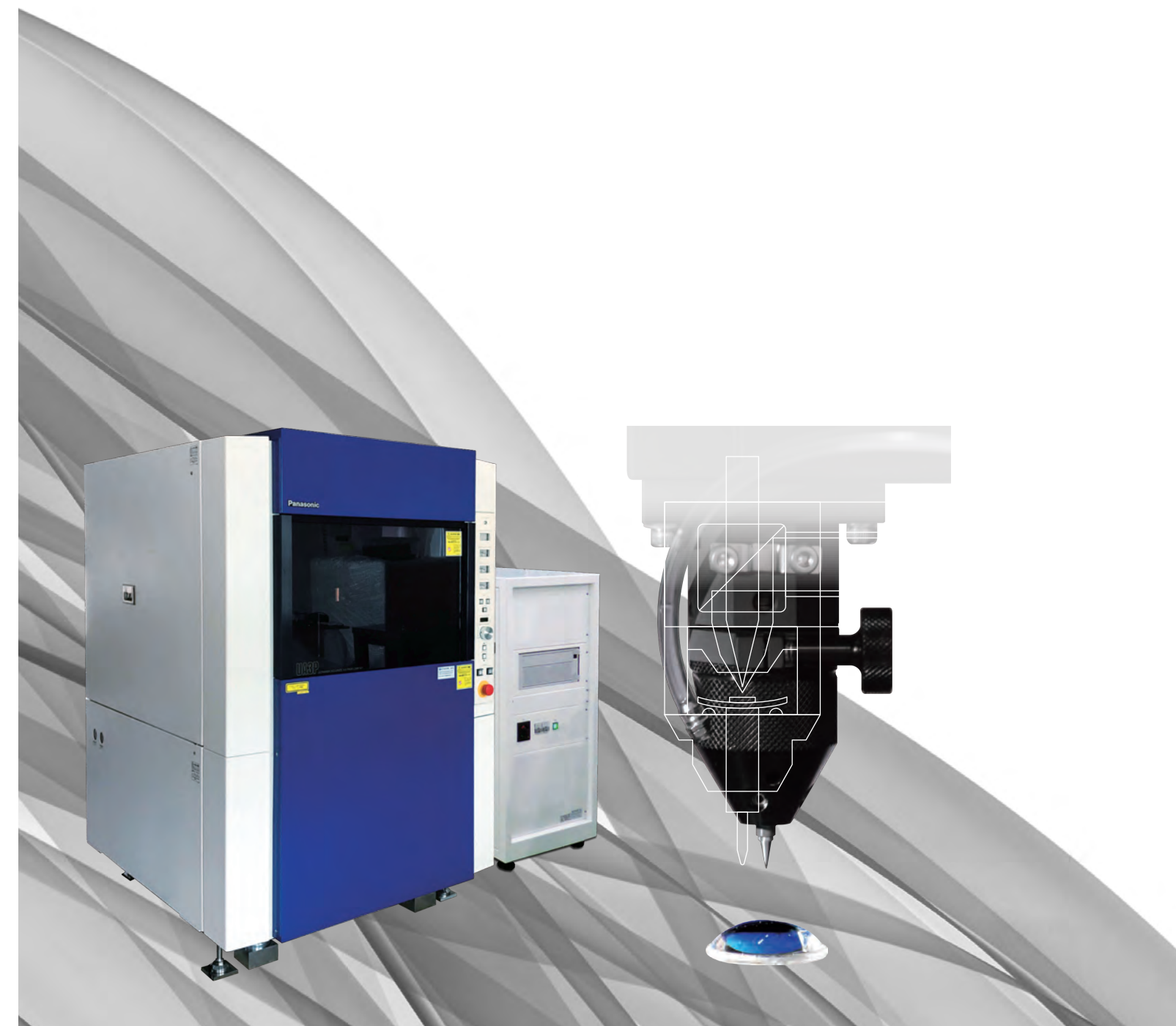
Zip code 571-8502  
2-7 Matsubacho, Kadoma, Osaka, Japan;  
TEL : (+81)6-6905-4882

The contents of this  
catalog are as of April 1, 2022.

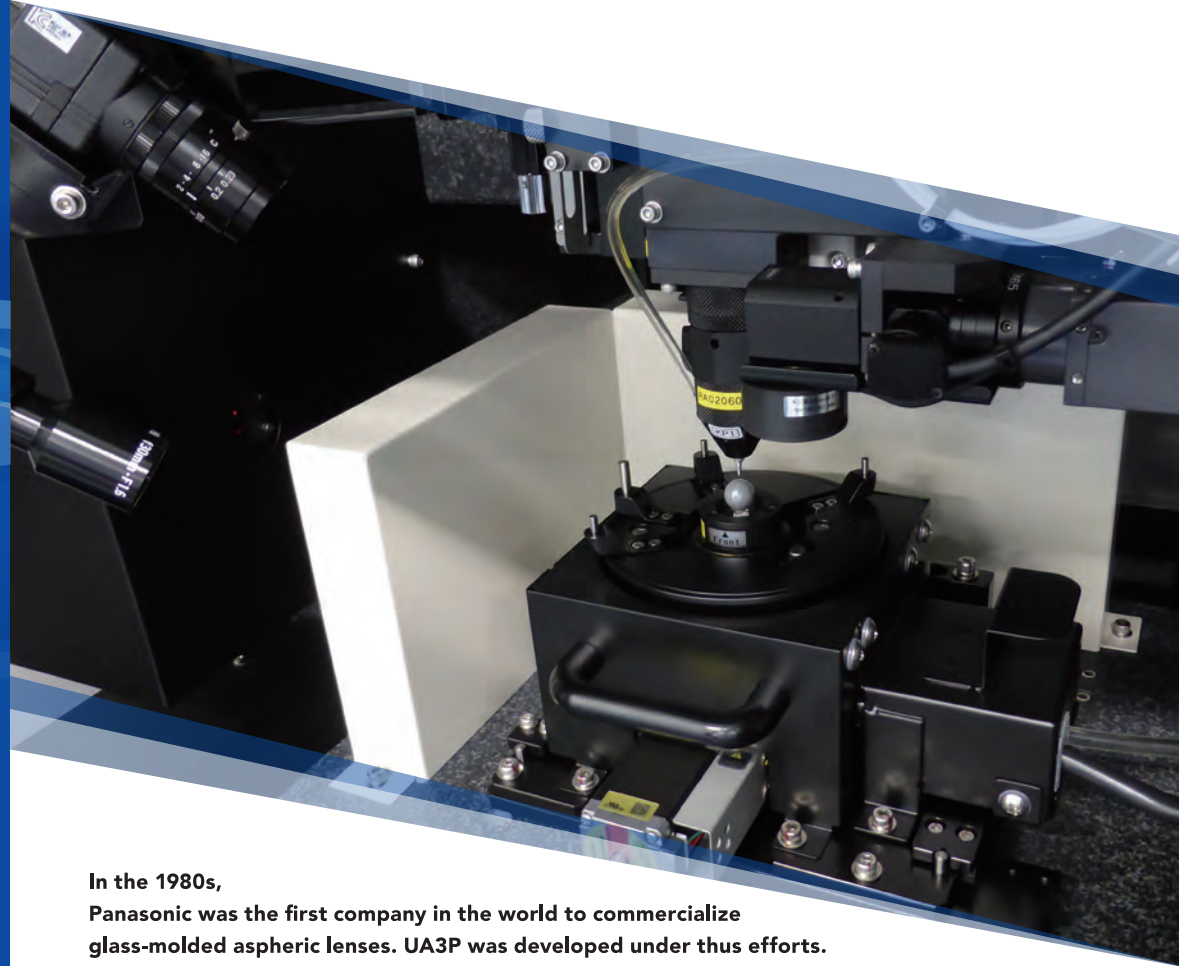
Ver.2022.4.1

©Panasonic Production Engineering Co., Ltd.2022

- The color of the product is printed matter and may differ slightly from the actual color.
- The rating and design of the product are subject to change without notice for the purpose of improvement.
- This product is designed for use in Japan. Consult your dealer for overseas use.
- Be sure to read the instruction manual carefully before using the product.



No measurement, No production.



In the 1980s, Panasonic was the first company in the world to commercialize glass-molded aspheric lenses. UA3P was developed under these efforts.

"No measurement, No production."

This slogan was born during difficult challenges that Panasonic was facing. UA3P has been used by customers around the world since its launching and has now gained their trust as the primary standard in the optical industry.

For example, lenses are produced through the processes of creating molds with a processing machine and using a molding machine to form lens products. In order to control production conditions that are changing constantly, measuring equipment with higher precision that enables us to capture "changes" is indispensable. We believe that high-quality manufacturing can only be achieved with high-precision measuring equipment.

The world's highest-level 3-D profilometer "UA3P" In the years ahead, its nanometer-level reproducibility will contribute to the realization of the dreams not only in the optical industry but in the wide range of customers in "Measurement" Evolving UA3P is our mission to society.

## Features of UA3P

2

### Absolute surface profiling through contact measurement

- Rotationally symmetric aspheric surface (pancake, gull-wing, etc.)  
- Free-form surface (polynomial, biconic, anamorphic, etc.)

4

### Achieving various analyses based on measurement data

Optimized radius calculation (Best FitR) / Zernike analysis / frequency analysis, etc.

6

### Enabling surface roughness measurement even for objects with complex shapes

8

### CAD data-based evaluation

Convert CAD to Point Cloud for Evaluation (PARASOLID, STEP, IGS)

1

### Ultra-high precision measurement

Achieving single nanometer level reproducibility

3

### Flexible NC paths capable of measuring complex shapes

5

### Evaluatable Decenter front and back/Decenter respect outline

Aspheric / free-form surface / wafer lenses, etc.

7

### Enabling measurement and evaluation without design formulas

Shape fitting function, etc.

9

### Work leveling and labor saving through automatic measurement

## Technology for ultra-precise measurement

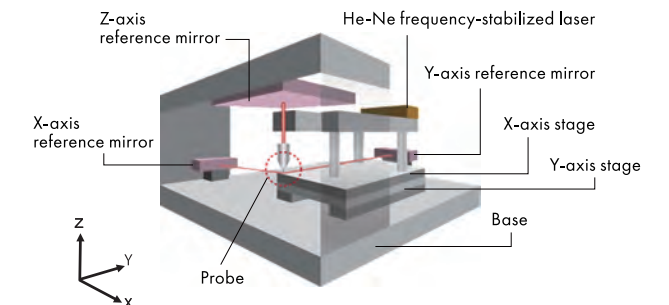
UA3P which is supporting evolution of optical components, as the primary standard in the optical industry.

He-Ne laser length measurement technology has realized absolute coordinates in nano precision.

## Coordinate measurement technology

The coordinate system of the instrument consists of 3 reference planes (mirrors) independent of the stage, and each XYZ axis is measured with 0.3 nm resolution by laser interferometry using a frequency stabilized He-Ne laser as a light source. This technology suppresses the influence of the squareness and straightness of the stage, and achieves high-precision measurement.

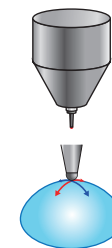
Measurement error due to coordinate axes :	0.05 $\mu\text{m}$ max. ( up to 100 mm ) 0.3 $\mu\text{m}$ max. ( up to 500 mm )
--	---



## Measuring probes



### Top surface measurement probe / AFP

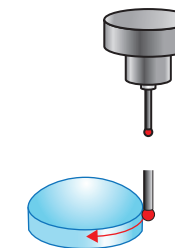


High precision scanning measurement is possible with ultra-low measuring force on an object. Stylus is held by micro-air slider, and focusing laser detects movement of the stylus and follows AFP position to the shape of the object with kept measuring force is constant.

- Measuring force : 0.15 ~ 0.30 mN ( 15 ~ 30 mgf )
- \*0.05 ~ 0.30 mN for UA3P - 3100 / 4000
- 0.10 ~ 0.30 mN for UA3P - 5000 H
- Stylus : 30 degree tip angle, r = 2  $\mu\text{m}$  diamond stylus usable



### Side surface measurement probe / S-AFP



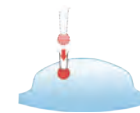
The tilt of a probe mirror detected with high precision is fed back to the XY stages to enable scanning measurement with low contact force (0.3 mN). Enabling to measure plastic product such as a lens holder (barrel), without deforming.

- Measuring force : 0.3 mN (30 mgf)
- Measurement accuracy :  $\pm 0.15 \mu\text{m}$  (on 90° inclination measurement)
- Maximum measurement angle :  
Horizontal measurement : 45° to 90° (angle relative to horizontal surface) ;  
Vertical measurement : 80° to 90° (angle relative to horizontal surface)

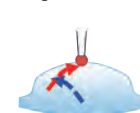
## Evaluation Procedure using UA3P

Achieving accurate measurement with simple operation. It can deal with any kinds of design equations, and accurate shape measurement is possible by correcting installation error of a measuring object by three-dimensionally.

1. Focus on (contact onto measuring object)



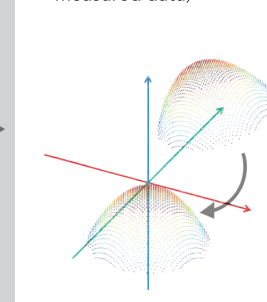
2. Centering (move to vertex)



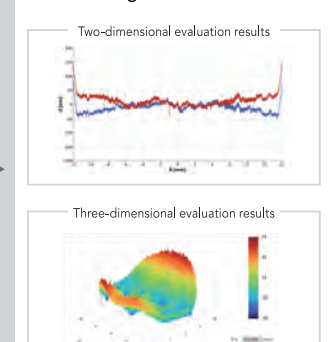
3. Measurement



4. Alignment (Coordinate transformation of measured data)



5. Visualizing result



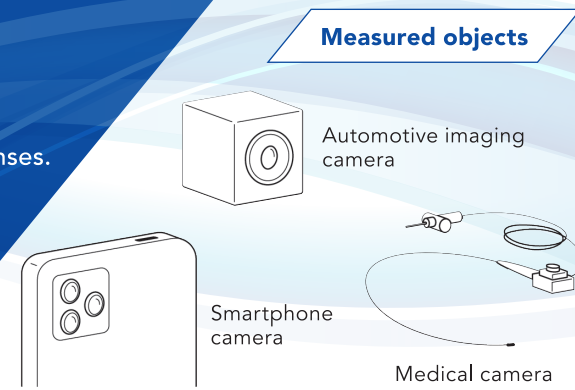
Automatically positioning the measurement center, and measuring on the measurement object.

Quantifying the difference between the measurement data and design formula.



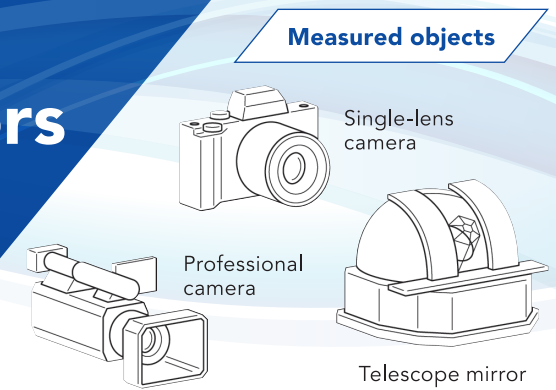
# Small plastic lens

Continuous and automatic measurement of high-precision small lenses. Achieving leveling work and labor saving on standard work, as well as reducing work load for operator.



# Medium and large size aspheric lenses and mirrors

Supported various of measurement paths and analysis methods. It can handle various processes from measurement to correction processing for photographic lenses or high-precision mirrors.

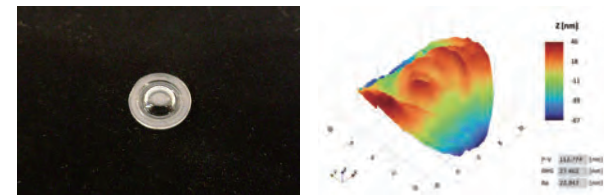


## Measurement examples

### Shape measurement

#### High-precision surface shape measurement

Detecting shape errors at the 10 nm level and contributing to mold processing correction and molding product quality control



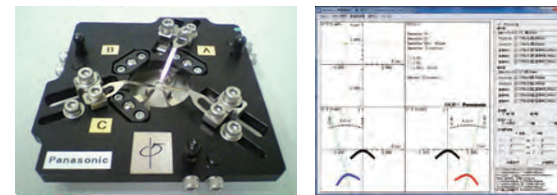
Plastic lens / mold

Lens shape evaluation

### Decenter Measurement

#### Jig for lens decenter and tilt measurement jig

Synthesizing lens front back by using 3 balls, and evaluating decenter and tilt of optical axis at the 0.1μm level.



Decenter Measurement Jig

### Multiple objects automatic measurement

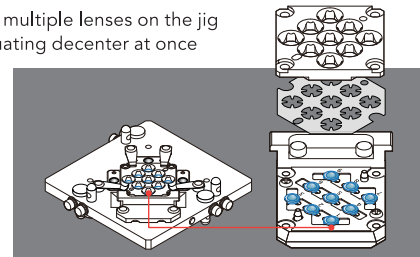
#### Automatic measurement function

Automatic measurement and evaluation by creating and executing an automatic program for the measurement procedure



#### Jig for multiple-lens decenter measurement

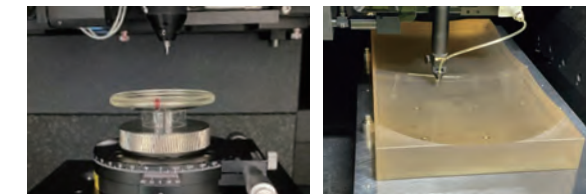
Installing multiple lenses on the jig and evaluating decenter at once



## Measurement examples

### Measuring path

Various measurement paths for various shapes



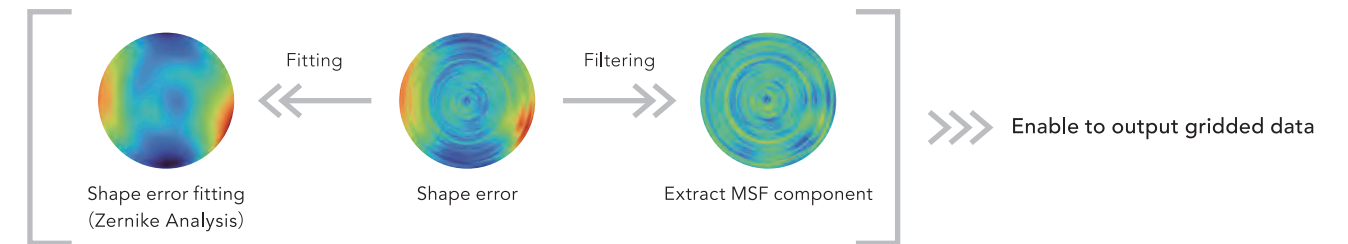
Rotational symmetric aspherical

Freeform surface

Type	On axis path	Pizza cutting path	Spiral path	Raster path
Measurement Path Image				
Application	Detection of Onion ring tool mark	Short-time whole surface measurement detecting Onion ring tool mark	High-speed and high-density slope evaluation	Generating raster path to fill in unformed outline

### Analysis technique

Supports evaluation and correction of shape errors with various analysis methods



## Specifications

Type	Standard equipment				Large-scale equipment		Twin probe (top-surface and side-surface profilometer)	High-accuracy equipment		
	Model name	UA3P-300	UA3P-4	UA3P-400	UA3P-500H / 550H	UA3P-650H	UA3P-700H	UA3P-400T *2	UA3P-3100	UA3P-4000
Appearance										
Outer dimensions (W×D×H) mm	700×800×1510	1010×1110×1450		1260×1510×1580	2100×1830×2110	2100×1830×2200	1070×1230×1530	760×860×1580	1060×1200×1610	1300×1560×1900
Mass of main body	700kg (Others : 150kg)	1200kg (Others : 150kg)		2400kg (Others : 300kg)	8500kg (Others : 300kg)	9000kg (Others : 300kg)	750kg	900kg (Others : 200kg)	1500kg (Others : 300kg)	3200kg (Others : 300kg)
Measuring range (X,Y,Z axes) mm	30×30×20	100×100×35		200×200×45 UA3P-550H (+260×90×45)	400×400×120 +φ500×120	500×500×120	100×100×50	3100-A30 : 30×30×20 3100-A50 : 50×50×20	4000-A100 : 100×100×35 4000-A120 : 120×120×35	200×200×50
Measured object placement area (X,Y,Z axes) mm	100×100×120	220×220×132		300×270×252.5	600×600×330	600×600×330	200×200×140	130×130×120	210×210×127.5	300×300×255
Resolution	0.3nm									
Maximum inclination angle for top-surface measurement	75°	60°		75°	75°		75°	75°		
Angle for side-surface measurement	Horizontal : 45~90° / Vertical : 80~90°									
Measurement accuracy with top-surface probe	30° or less : ±0.05μm (round trip) 45° or less : ±0.08μm (round trip) 60° or less : ±0.15μm (round trip) 70° or less : ±0.15μm (downward)	30° or less : ±0.05μm (round trip) 45° or less : ±0.10μm (round trip) 60° or less : ±0.30μm (round trip)	30° or less : ±0.05μm (round trip) 45° or less : ±0.08μm (round trip) 60° or less : ±0.15μm (round trip) 70° or less : ±0.15μm (downward)	100mm or less : 0.05μm / 200mm or less : 0.1μm (Repeatability within 0.05μm)	30° or less : ±0.05μm (round trip) 45° or less : ±0.08μm (round trip) 60° or less : ±0.10μm (round trip) 70° or less : ±0.15μm (downward)	30° or less : ±0.05μm (round trip) 45° or less : ±0.08μm (round trip) 60° or less : ±0.10μm (round trip) 70° or less : ±0.15μm (downward)	30° or less : ±0.05μm (round trip) 45° or less : ±0.08μm (round trip) 60° or less : ±0.15μm (round trip) 70° or less : ±0.15μm (downward)	30° or less : ±0.04μm (round trip) 45° or less : ±0.05μm (round trip) 60° or less : ±0.06μm (round trip) 70° or less : ±0.08μm (round trip) (Reference) Case of normal direction display (Nd) 0~70° : ±0.05μm	30° or less : ±0.05μm (round trip) 45° or less : ±0.06μm (round trip) 60° or less : ±0.07μm (round trip) 70° or less : ±0.10μm (round trip)	30° or less : ±0.05μm (round trip) 45° or less : ±0.06μm (round trip) 60° or less : ±0.07μm (round trip) 70° or less : ±0.10μm (round trip)
Measurement accuracy by coordinate axis (XY axis measurement accuracy)	100mm or less : 0.05μm (Repeatability within 0.05μm)									
Measurement speed	0.005~5mm/sec	0.01~10mm/sec		0.02~20mm/sec	0.032~32mm/sec		Top0.01~10mm/sec, Side0.01~5mm/sec	0.005~5mm/sec	0.01~10mm/sec	0.02~20mm/sec
Operating environment Temperature / Humidity / Vibration *1	20~23°C (Variation ±1°C) / 20~60% / Allowance 2.0cm/s² (=2.0gal) Recommended 0.5cm/s²									
Required power source	AC100V±5% / 14A									
Air : Pressure 0.5MPa~1.0MPa Flow rate	100 L/min(ANR)	150 L/min(ANR)		250 L/min(ANR)	450 L/min(ANR)		100 L/min(ANR)	150 L/min(ANR)	200 L/min(ANR)	350 L/min(ANR)
Standard accessories	Top ceramic stylus R500μm, Top diamond stylus R2D60, Probe, Standard sphere for calibration, Printer			Top ceramic stylus R500μm, Top diamond stylus R2D60,	Probe, Standard sphere for calibration, Printer		Top ceramic stylus R500μm, Top diamond stylus R2D60, Side ruby stylus φ2 mm, Probe, Standard sphere for calibration, Printer	Top ceramic stylus R500μm, Top diamond stylus R2D60, Probe, Standard sphere for calibration, Printer		

Function for top-surface profilometer

Function for side-surface profilometer

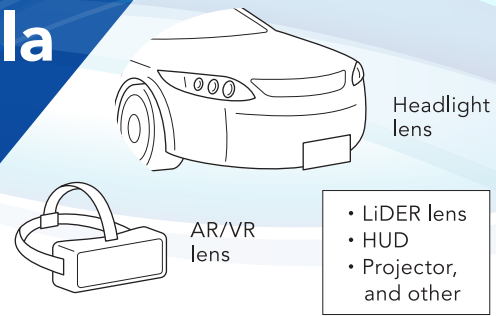
\* 1 : Wind from air conditioners should not directly blow onto the equipment

\* 2 : This product is categorized as a product (or technology) that qualifies as a regulated cargo as specified by the Foreign Exchange and Foreign Trade Act. To export or transfer abroad applicable products (or technology), you must gain permission for export in advance from the Japanese government.

# Freeform / Multiple segments formula

Supports CAD based design formula  
Supports future manufacturing with Nano-precision for automotive parts and complex shaped parts.

## Measured objects



## UA3P-400T

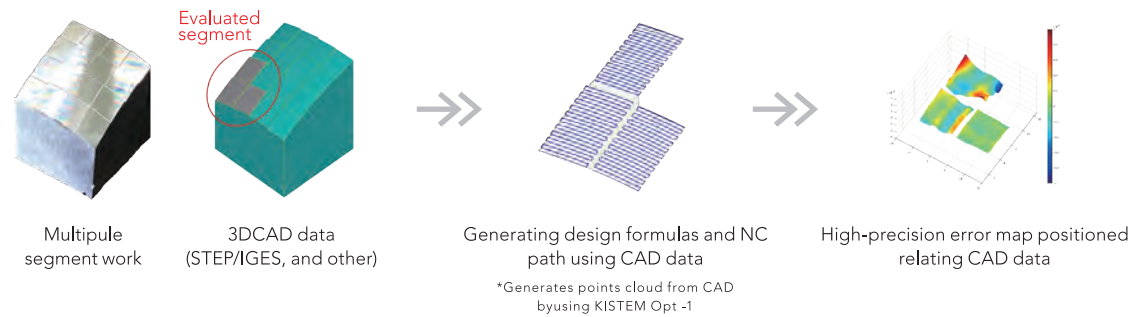
# Top and side surface measurement

Achieved the scanning measurement of the vertical sides of a lens or a lens barrel with an accuracy of 50 nm.  
Positional deviation on the order of 100 nm can be measured in combination with optical surface data.



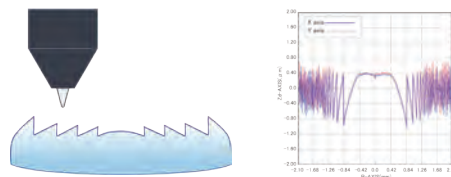
## Measurement examples

### CAD data linkage using CAD/CAM software



### Diffractive lens measurement

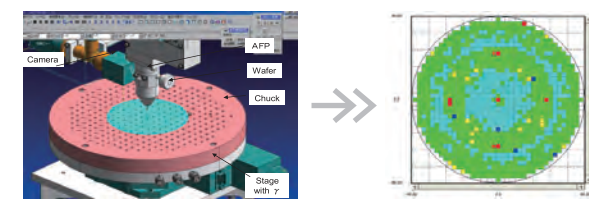
#### Enabling diffractive lens measurement and evaluation



### Wafer lens measurement

#### Enabling wafer lens measurement and evaluation

Measured on an alignment mark basis using a recognition camera



## Measurement examples

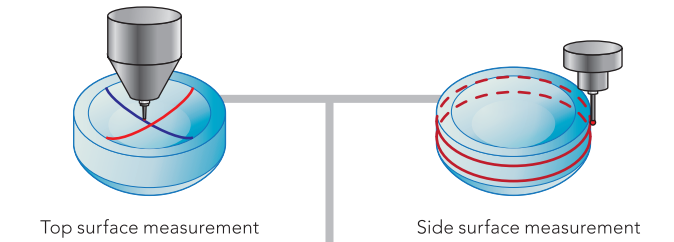
### Top surface measurement

#### Mold measurement



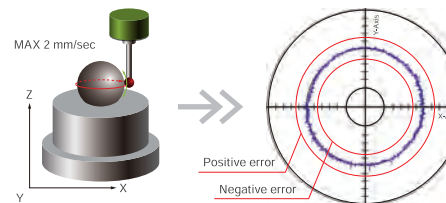
### Top + Side surface

#### Decenter respected lens outline

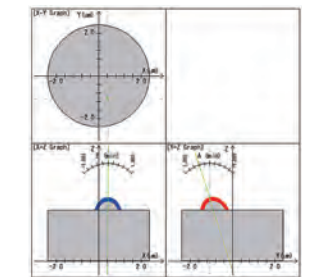
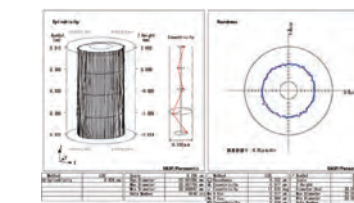


### Side surface measurement

#### Sphere measurement



#### Pin gauge measurement



\* UA3P-400T corresponds to product related to weapons of mass destruction.

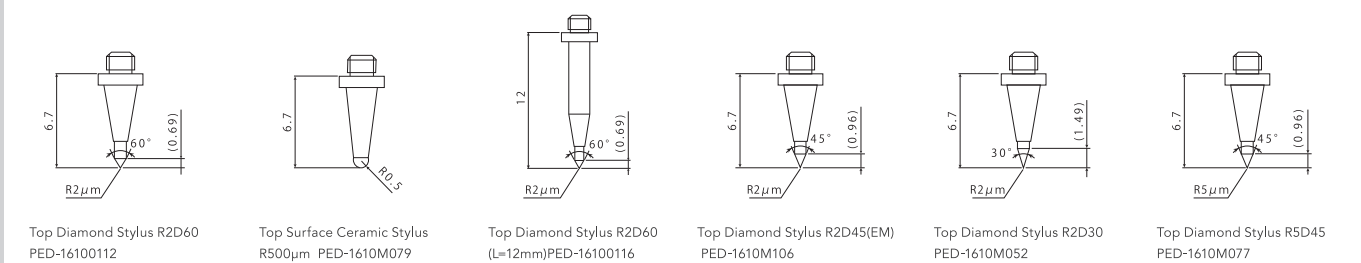
## Specifications

	Software Option	Details
1	Circular scanning measurement function	Adds circumferential scanning NC paths for measured objects with a hole in the center.
2	Top Flat centering function	Function that enables centering of a measuring object whose center is nearly flat.
3	User-defined formula function	Function to be evaluated by user created formula.
4	Aspherical coefficients fitting function	Function to fit aspherical coefficients based on measured data.
5	Diamond stylus correction function	Function to correct stylus tip shape based on standard sphere measured data.
6	Point cloud data design formula creation function	Function to generate a spline curved formula based on points cloud converted from CAD data (provided by the customer)
7	One million data points sampling, capturing 2000 points per second function	Function to expand the number of measurement points and to increase the speed of capturing data points
8	Waveguide software (offline)	Function to evaluate the dimensions of the shape of an object based on the measured data
9	Decenter and tilt evaluation software (offline)	Function to evaluate decenter and tilt of lens front and back using the jig installed 3 sphere.
10	Automatic Measurement Software	Function to create measurement procedure program and to execute procedures automatically.
11	Wafer lens measurement software	Function to measure and evaluate wafer lenses in combination with mechanical option [2]

	Mechanics Option	Details
1	Auto Tilt Stage (2 Axis, 3 Axis)	Mechanism that automatically corrects the tilt of a measuring object based on its measured data.
2	Wafer Chuck & Stage	Adding an air chucking stage and recognition camera for wafer lens measurement
3	Decenter and Tilt measuring Jig (various types)	Jig used for decenter and tilt measurement (used in combination with option software [9])

## Stylus

### Stylus for top surface



### Stylus for side surface

