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Actual product colors may differ slightly from those in the printed matter.
Ratings and design of the product may subject to upgrading or improvement without prior notice.
The product is specified for use in Japan. For use abroad, consult with a dealer.
Carefully read the operating manual before use, and operate the product as instructed.
It is impossible to manufacture parts without making measurements - the UA3P series supports nanometer-accuracy manufacturing by making precise measurements of fine shapes.

The UA3P series can measure aspherical lenses and free-form mirrors and their molds, which are essential for digital consumer electronics such as mobile phones, DSCs, DVDs, and Blu-ray recorders, as well as in home security, optical communications, and vehicle HUDs, to an accuracy of up to 0.01 μm.

Easy operation supports rapid feedback to machining.

Full lineup from ultrahigh accuracy measurement of ±0.10 μm at an inclination angle of 70° to measurement of large components of D500 mm

**Hardware**

**Stylus**

- **New diamond stylus for top-surface measurement**
  - Supports precise shape measurement, such as of mobile lenses and ultrathin glass sheets.
  - R2D45 (new diamond stylus) is provided for measuring up to an inclination angle of 60°.

- **Ruby stylus for top-surface measurement**
  - Uses a high-sphericity ruby ball for general-purpose measurements.

- **Stylist for side-surface measurement**
  - Shares a highly-sphericity ruby ball for general-purpose measurements.

**Decenter and Tilt measurement jig**

- **Decenter/Tilt measurement between lens faces**
  - The lens is fixed on a jig provided with three reference balls for combination. Any decentering between the lens faces is evaluated by measuring both faces of the lens.

**Observation camera**

A measuring point is magnified for display to enable easy positioning.

**Wafer level lens (WLL)**

Applicable model: UA3P-500H/650H/700H

<table>
<thead>
<tr>
<th>Option code</th>
<th>SB/500H</th>
<th>SB/650H</th>
<th>SB/750H</th>
<th>250H</th>
<th>450H</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>R2D45</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>For measuring up to an inclination angle up to 60°.</td>
</tr>
<tr>
<td>2</td>
<td>R2D30</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>For measuring inclination angles up to 70°.</td>
</tr>
<tr>
<td>3</td>
<td>R2D25</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>The long-radius tip has high wear resistance.</td>
</tr>
<tr>
<td>4</td>
<td>Ruby ball for calibrating diamond stylus</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>For calibrating tip of diamond stylus.</td>
</tr>
<tr>
<td>5</td>
<td>R250 μm ruby stylus</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>For measuring outlines of nozzles and detailed shapes.</td>
</tr>
<tr>
<td>6</td>
<td>Stylus for measuring R30 μm side surface</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>For measuring outlines of nozzles and detailed shapes.</td>
</tr>
<tr>
<td>7</td>
<td>Style for measuring R250 μm side surface</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>For measuring the outlines of lenses and molds.</td>
</tr>
<tr>
<td>8</td>
<td>Standard ball for calibrating small-diameter stylus</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>For calibrating tip of stylus for top-surface measurement.</td>
</tr>
<tr>
<td>9</td>
<td>Decenter and Tilt measurement jig</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>Needs decenter and tilt evaluation software.</td>
</tr>
<tr>
<td>10</td>
<td>Decenter and Tilt measurement jig</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>Needs decenter and tilt evaluation software.</td>
</tr>
<tr>
<td>11</td>
<td>Decenter and Tilt measurement jig</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>Needs decenter and tilt evaluation software.</td>
</tr>
<tr>
<td>12</td>
<td>Decenter and Tilt measurement jig</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>Needs decenter and tilt evaluation software.</td>
</tr>
<tr>
<td>13</td>
<td>Observation camera unit (Dedicated number for each model)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>For measuring wafer level lenses, evaluation software is needed.</td>
</tr>
<tr>
<td>14</td>
<td>Wafer chuck and camera unit</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>For measuring wafer level lenses, evaluation software is needed.</td>
</tr>
</tbody>
</table>

* Reference

**Precautions**

* Note that the ruby stylus is at risk of breaking due to its large coefficient of friction while measuring aluminum lenses or surface-coated lenses.

**The stylus for side-surface measurement (R200 μm − 250 μm) may require an observation camera for measurement.**
Software

- **Circumferential scanning measurement software**
  - The measured object is circumferentially scanned and measured.
  - Options: Coordinate measurement technology
    - He-Ne frequency-stabilized laser
    - Circumferential scanning measurement software
      - Angular accuracy: ±0.003°
      - Measurement accuracy: ±0.003°
      - Measurement range: 360°
      - Measuring angle: 360°
      - Measurement data: 1 million points
    - Results: Surface measurement data
      - Surface measurement data
      - Surface measurement data
      - Surface measurement data
    - Results: Surface measurement data
      - Surface measurement data
      - Surface measurement data
      - Surface measurement data
    - Results: Surface measurement data
      - Surface measurement data
      - Surface measurement data
      - Surface measurement data
    - Results: Surface measurement data
      - Surface measurement data
      - Surface measurement data
      - Surface measurement data

  - User-defined software (free-form curved surfaces, etc.)
    - Other formulas are supported in addition to the lens design formula that is registered as a standard feature.
    - The use of the C language for creating the design formula and the calculation part of a partial differential equation allows all of ISO10110-12 to be covered.

  - Fitting software (rotation symmetry)
    - A previously unknown design formula of a measured object can be obtained from the measurement data.
    - The aspherical factor (A - Aa) of a rotationally symmetrical aspherical surface can be obtained using the least squares method.

  - Auto-measurement
    - Fully automated, including probe movement and focus ON/OFF
    - Supporting various errors

Technology for realizing ultrahigh accurate measurement

- Coordinate measurement technology
  - The profilometer’s coordinate system is configured with three reference flat surfaces (mirrors) independent of the stages. The length of each X, Y, and Z axis is measured to a resolving power of 0.3 nm with the laser interference method using a He-Ne frequency-stabilized laser as a light source. This suppresses the influence of squariness and straightness of the stages to achieve high-precision measurement.
  - Measurement error due to coordinate axis: 0.05 µm max. (up to 100 mm)
  - 0.3 µm max. (up to 500 mm)

- Top-surface measuring probe/AFP (atomic force probe)
  - High-precision scanning and measurement of a measured object is feasible due to the use of ultra-low measuring forces.
  - The stylus is held by the micro-air slider, and the focus laser detects the movement of the stylus. The position of the AFP is tracked in line with the shape of the measured object to keep the measuring force constant.
  - Measuring force: 0.15-0.30 mN (15-30 mgf)
  - USP-3000 requires 0.10-0.20 mN.
  - Stylus: A diamond stylus with a tip angle of 30° and a radius of 2 µm can be used.

- Side-surface measuring probe/S-AFP
  - The inclination of a probe mirror detected at high precision is fed back to the XY stages to enable scanning measurement with low-contact force (0.3 mN).
  - This enables measurement without deforming resin products, such as a lens barrel.
  - Measuring force: 0.3 mN (30 mgf)
  - Measurement accuracy: ±0.15 µm (when measuring 90° inclination)
  - Maximum measuring angle:
    - Horizontal measurement: 45° - 90° (angle relative to horizontal surface)
    - Vertical measurement: 80° - 90° (angle relative to horizontal surface)

Software

- Optional software
  - Software for creating point group data design formula
    - A rectangular curved surface is created using the spline function with respect to given 3D point group data.
  - Auto-measurement
    - Applicable model: All models except for USP-40T

Achieving high-speed and high-precision measurement with easy operation

- Supporting various design information. An installation error in the measured object is three-dimensionally corrected to enable accurate profile measurement.
  - Supporting any design information
  - Optical design formula
  - 3D point group data
  - The center of the measured object is found to scan and measure on its axis and plane.
  - Numerically identifying a difference between the measurement data and design formula

By synthesizing the top-surface data and side-surface data of a measured object, decentering and inclination of the optical axis of a lens or a mold can be evaluated with reference to the side surface.

Software

- Options
  - Notes
    - 1: Circumferential scanning measurement software
    - 2: User-defined software
    - 3: Base alignment software
    - 4: Coordinate axis conversion software
    - 5: Rotation symmetry fitting software
    - 6: New diamond stylus correction software (on axis)
    - 7: Function for creating point group data design formula
    - 8: Function for creating measurement data curve
      - Number of measuring points: 1 million
      - Capture speed: 2000 points/sec
    - 9: V-groove measuring software
    - 10: Inclination and decentering evaluation software
    - 11: High-inclination measuring software
    - 12: Auto-measuring software
    - 13: TopFlat centering software
    - 14: Notes

- Notes
  - Available
  - Standard feature
  - Not available
## Measurement area/accuracy by model

<table>
<thead>
<tr>
<th>Model</th>
<th>Top-surface measurement</th>
<th>High-accuracy equipment</th>
<th>Large-scale equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>UA3P-300</td>
<td>700 x 700 x 1500</td>
<td>700 kg (C: 150 kg)</td>
<td>150 kg (C: 50 kg, Others: 150 kg)</td>
</tr>
<tr>
<td>UA3P-4</td>
<td>1000 x 1100 x 1450</td>
<td>1000 kg (C: 150 kg)</td>
<td>150 kg (C: 50 kg, Others: 150 kg)</td>
</tr>
<tr>
<td>UA3P-5</td>
<td>1200 x 1250 x 1500</td>
<td>1200 kg (C: 150 kg)</td>
<td>150 kg (C: 50 kg, Others: 150 kg)</td>
</tr>
<tr>
<td>UA3P-500H</td>
<td>1300 x 1350 x 1500</td>
<td>1300 kg (C: 300 kg)</td>
<td>300 kg (C: 150 kg)</td>
</tr>
<tr>
<td>UA3P-550H</td>
<td>2100 x 1820 x 2110</td>
<td>2100 kg (C: 300 kg)</td>
<td>300 kg (C: 150 kg)</td>
</tr>
<tr>
<td>UA3P-650H</td>
<td>2100 x 1820 x 2110</td>
<td>2100 kg (C: 300 kg)</td>
<td>300 kg (C: 150 kg)</td>
</tr>
<tr>
<td>UA3P-700H</td>
<td>3100 x 2000 x 2300</td>
<td>3100 kg (C: 300 kg)</td>
<td>300 kg (C: 150 kg)</td>
</tr>
<tr>
<td>UA3P-400T</td>
<td>330 x 330 x 230</td>
<td>330 x 330 x 230</td>
<td>230 x 115 x 150</td>
</tr>
<tr>
<td>UA3P-3000</td>
<td>600 x 600 x 330</td>
<td>600 x 600 x 330</td>
<td>330 x 115 x 150</td>
</tr>
</tbody>
</table>

### Specifications

**Type**

- Standard equipment
- Large-scale equipment
- High-accuracy equipment

**Model name**

- UA3P-300
- UA3P-4
- UA3P-5
- UA3P-500H / 550H
- UA3P-650H
- UA3P-700H
- UA3P-400T
- UA3P-3000

### Measurement accuracy by coordinate axis

- **XY axis measurement accuracy**
  - UA3P-300: 100 mm max.: 0.05 µm (Repeatability 0.05 µm max.)
  - UA3P-4: 100 mm max.: 0.05 µm (Repeatability 0.05 µm max.)
  - UA3P-5: 100 mm max.: 0.05 µm (Repeatability 0.05 µm max.)
  - UA3P-500H: 100 mm max.: 0.05 µm (Repeatability 0.05 µm max.)
  - UA3P-550H: 100 mm max.: 0.05 µm (Repeatability 0.05 µm max.)
  - UA3P-650H: 100 mm max.: 0.05 µm (Repeatability 0.05 µm max.)
  - UA3P-700H: 100 mm max.: 0.05 µm (Repeatability 0.05 µm max.)
  - UA3P-400T: 100 mm max.: 0.05 µm (Repeatability 0.05 µm max.)
  - UA3P-3000: 100 mm max.: 0.05 µm (Repeatability 0.05 µm max.)

### Operating environment

- Temperature/humidity/description: 20-25°C (10°C variation) / 10-90% RH (no condensation)
- Required pressure source: 0.5 MPa - 1.0 MPa
- Air pressure source: 0.5 MPa - 1.0 MPa

### Standard accessories

- Standard ruby stylus, standard diamond stylus, AFP (Model 100: 1 pc., Models 4 and 5: 2 pcs. each), standard ball for calibration, printer
- Ceramic stylus, standard diamond stylus, AFP (Model 300: 1 pc., Models 4 and 5: 2 pcs. each), standard ball for calibration, printer
- Standard ruby stylus, standard diamond stylus, AFP (Model 400: 1 pc., Models 4 and 5: 2 pcs. each), ceramic stylus, standard diamond stylus, AFP-H (2 pcs), standard ball for calibration, printer

### Design formula

\[ Z = k \times \left( X - X_1 \right)^2 + \left( Y - Y_1 \right)^2 + Z_1 \]