INSTANT MEASUREMENT

DIMENSIONAL MEASUREMENT IN A NEW LIGHT
Overview

- Limitations of other technologies
- Benefits of Keyence’s technology
- Ease of programming and software
- Technical features and benefits
- SPC integration
- System environment
- Case study
Conventional Technologies

- Optical Comparator
- Measuring Microscope
- Calipers/Micrometers
- Gauge Blocks/Pins
- Height Indicator
- CMM
- GD&T and Profile Measurement Systems
Limitations

SLOW
Measurements take a long time

INCONSISTENT
Varying measurement results depending on the operator

COMPLICATED
Limited number of people can operate the device

RESTRICTED
Complicated data management
Keyence Technology

**FAST**
Measurements performed in seconds

**CONSISTENT**
Uniform measurement results regardless of the operator

**EASY**
Intuitive interface that anyone can use

**FLEXIBLE**
Easy data management
Keyence Technology

THE EVOLUTION
OF THE OPTICAL COMPARATOR

Measurements performed in seconds
Eliminates operator subjectivity
Intuitive interface that anyone can use
Automatic data management

KEYENCE
Overview of the IM-6000E Series

The IM-6000E Series is a high-precision image dimension measuring system that measures the dimension of the target from the projected image formed by a 6.6 mega pixel monochrome CMOS camera by parallel light irradiated from the transmitter containing a high-intensity LED. By using the projected image obtained, the length, diameter, or angle of a desired part is measured instantaneously.

Basic principle (transparent illumination)

The light emitted from the transmitter containing high-intensity LED is irradiated to the target from the telecentric projection lens as parallel light. At this time, the image of the shadow produced by the target is formed by the 6.6 mega pixel monochrome CMOS camera as a projected image with clear black-and-white contrast through the telecentric light receiving lens.

By dividing the projected image of the target that is formed by the CMOS camera into 2208 x 2208 pixels, the system extracts the edge of the target. The size of the target can be obtained by counting the number of pixels within the extracted edge.

Edge extraction to achieve higher resolution

To improve the accuracy of edge extraction of the target, the IM-6000E Series performs edge extraction processing.

1. Sub-pixel processing
   The system obtains the points of greatest brightness change from the edge of the target (edge extraction point) by sub-pixelization to provide a resolution greater than the actual pixels processed.

2. Least square fitting processing
   For a group of multiple edge points obtained by sub-pixel processing, the system obtains the geometric configuration that is optimum for the edge to be detected (such as line, circle, and arc) by the least square method.

3. Outlying point removal
   There are cases where outliers are detected as edges due to burrs or dust on the target. Such edges degrade the accuracy of the fitting processing. To solve this problem, the system determines the edges that deviate from the true edge points around the target by more than a pre-set threshold, and removes them from the least square fitting.

Pattern search that correctly detects the position and angle of the target

The process of finding the same position as the pre-registered pattern image (image for reference comparison) from the current image and obtaining its position and angle is called the pattern search processing. Once a pattern image is registered, you only need to place a target having the same shape in the field of view to make the system find and recognize the position and angle of the target by using pattern search processing.

In addition, the measurement points for the target and the positional relationships within the pattern image can be stored as a set. Therefore, when a target with the same shape is placed in the field of view, the system can set the pieces of measurement automatically by recognizing the position and angle of the target.
Programming

- 3 Ways to program:
  - Live part on the system
  - Offline programming
  - Importing a .DXF File
- Exports .DXF File
- Easy to use Thread Tool! – Free

Video Here of programming
## MSA Study

### Repeatability

<table>
<thead>
<tr>
<th>Feature #</th>
<th>Characteristic</th>
<th>Gage R&amp;R 11/01</th>
<th>Gage R&amp;R 11/20</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>20°±2°(22°18')</td>
<td>197.1</td>
<td>3.66</td>
</tr>
<tr>
<td>11</td>
<td>0.5 ±0.1 (0.6/0.4)</td>
<td>52.9</td>
<td>3.25</td>
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<tr>
<td>12</td>
<td>20°±2°(22°18')</td>
<td>211</td>
<td>7.32</td>
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<tr>
<td>14</td>
<td>23°±1°(24°22')</td>
<td>102.9</td>
<td>9.76</td>
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<tr>
<td>15</td>
<td>3.70 ±0.05 (3.75/3.65)</td>
<td>110.6</td>
<td>2.84</td>
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<tr>
<td>16</td>
<td>4.90 ±0.02 (4.92/4.68)</td>
<td>24</td>
<td>4.57</td>
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<tr>
<td>17</td>
<td>0.70 ±0.05 (0.75/0.65)</td>
<td>74.2</td>
<td>5.03</td>
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<tr>
<td>18</td>
<td>7.90 ±0.05 (7.95/7.85)</td>
<td>60.3</td>
<td>2.1</td>
</tr>
<tr>
<td>19</td>
<td>9.95 ±0.05 (9.90/10.00)</td>
<td>63</td>
<td>1.19</td>
</tr>
<tr>
<td>73</td>
<td>2.30 ±0.05 (2.35/2.25)</td>
<td>17</td>
<td>1.71</td>
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<td>70</td>
<td>R 0.2 ±0.1 (0.3/0.1)</td>
<td>34.8</td>
<td>6.79</td>
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<tr>
<td>71</td>
<td>R 0.2 ±0.1 (0.3/0.1)</td>
<td>32.3</td>
<td>1.74</td>
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<tr>
<td>73</td>
<td>2.30 ±0.05 (2.35/2.25)</td>
<td>17.6</td>
<td>9.81</td>
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<tr>
<td>76</td>
<td>R 0.2 ±0.1 (0.3/0.1)</td>
<td>24.4</td>
<td>1.74</td>
</tr>
</tbody>
</table>

### Keyence Gage R&R Summary

#### Quality Assurance Department

- **Study Date:** 2/24/2012
- **Company Part No.:** CM901
- **Gage Type:** Keyence IM-5000
- **Study Type:** Gage R&R
- **Operators:** 1
- **Trials:** 3
- **Specifications:** Min 1.134 Max 1.181
- **95% Confidence Interval:** [1.134, 1.181]

**Notes:**
- The % tolerance method is used to determine gage R&R acceptance.
- Gage R&R values indicate the percentage of variation due to the gage itself, not the process variation.
- Gage R&R values less than 10% are considered acceptable.
SPC Integrations

Keyence on-board SPC software
Unlimited Licenses!

We also integrate with:

- Minitab
- WinSPC
- QcCalc
- ASI Data
- Micronite
- IQMS
- DataLyzer
- SPC-PC IV
- SQCpack
- QI Macros
- GainSeeker
- CAQ
- DataMetrics
- Easy Acquisition
- GSQA
- Hydra Mes
- IntraStage
- Isolocity
- KurtSPC Premium
- Predisys
- Shopfloor-Online
- SigmaXL
- SPC Express
- SPC1+ Navigator
- WinStat
- Wonderware QI
- XLStat
Justification – Time Study

Optical Comparator
• 5 minutes per part
• 100 parts a day for in-process inspection
• 8.33 hours/day
• 167 hours/month

The IM Series
• 5 seconds per part
• 100 parts a day for in-process inspection
• 4.2 minutes/day
• 1.4 hours/month

Yearly Cost: $50,100
Yearly Cost: $420

That’s 0.008% of current costs!

*An average operator wage is $25/hour
A complete package includes:

- The IM system (we’ll use the IM-6225 in this case)
- Scratch-resistant sapphire glass stage
- Off-line (remote) programming software
- CAD import software
- Orientation and mounting tools
- Training materials/keyboard/mouse

= The system will pay for itself in 1 year
Four Models to Match Your Needs

**Wide-field and Adjustable Illumination Model**
IM-8226
- Newly developed, built-in adjustable illumination unit
- Measurement field: 200 mm x 159 mm
- Auto focus and image stitching functions

**Wide-field Model**
IM-8126
- Measurement field: 200 mm x 181 mm
- ø100 x 200 mm ø3.94" x 7.87" measurement field
- Auto focus and image stitching functions

**General-purpose Model**
IM-8015-IM-6025
- Dimension measurement of up to 100 objects at a top speed of 2 seconds
- Large diameter double telecentric lens

**High-precision Model**
IM-8145
- Measurement repeatability: ±0.1 µm ±0.004 Mil
- Repeatability: ±0.1 µm ±0.004 Mil
- Motorized XYZ stage eliminates need for positioning / focus adjustment
Benefits Summary

- Production
  - Increase machine up time
  - Decrease scrap and re-work

- Quality
  - Increase capacity
  - Increase quality of delivered product

- Sales/Company Growth
  - Aggressively quote new jobs
IM Series Instant Measurement

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