Advanced system architecture for higher levels of CNC vision measurement performance
Quick Vision Series Evolving Toward Providing True Solutions

With sophisticated edge detection capabilities, an illumination wizard and advanced, user-friendly software the Quick Vision Series satisfies the demand for compactness, high accuracy and high throughput in the field of non-contact dimension measurement.

Continuous Evolution

Mitutoyo has marketed CNC vision measuring machines, including the Quick Vision Series, since the mid-1980s and is proud of its superb delivery record in Japan.

Today, measurement professionals are becoming more and more sophisticated, demanding higher accuracy, compactness and a smaller footprint. Mitutoyo has recently relaunched the Quick Vision Series, which already has a good reputation, to address such demands. The new Quick Vision Series highly integrates the advanced optical, sensing, software and vision measuring technologies which Mitutoyo has developed to help customers solve the challenges they face.

Traceability

Mitutoyo provides calibration services as the only domestic company accredited in three length fields (laser sources, end standards, and line standards). Also, being the manufacturer of the most comprehensive range of precision measuring instruments available, Mitutoyo provides a number of measuring instruments traceable to national standards, such as coordinate measuring machines, optical measuring instruments, and form measuring instruments, as well as vision measuring machines.

Optical

The optical system employed in the Quick Vision Series is based on optical technology that Mitutoyo has accumulated over many years. This is a practically ideal optical system where the image is flat across the entire view field with little flare.

Software

Knowledge-Based Software to Control Quick Vision

QVPAK is a constantly evolving software package. In combination with various other applications, QVPAK delivers multi-functional analysis along with high-speed processing and simple operation.

Laser Beam Safety Precautions

This machine uses a low-power Laser beam which conforms to the provisions of CLASS 2 (visible light) of JIS C6802 “Safety of laser products” for measurement. The CLASS 2 warning description label as shown at right is attached to the main unit.
Rigid Body Structure Enables High Precision
New Optical System and High-Brightness Illumination

Fixed Bridge and Table Configuration

The bridge and table guideways forming the X and Y axes are connected by a rigid body highly resistant to geometrical deformation. This means the accuracy of each axis is largely unaffected by the other’s movement, making this configuration ideal for high-precision machinery.

High Performance Multi-Auto Focus

- **Improved accuracy**
  Z-axis measuring accuracy $E_{Z}$ has been significantly improved by the image auto focus:
  - QV-APEX / QV-STREAM PLUS: $(1.5+4L/1000)$μm
  - QV-HYPER: $(1.5+2L/1000)$μm

- **Image multi-auto focus**
  The optimal focus can be selected for each surface texture and measured feature, realizing high reproducibility and reliable edge detection.

New Optical System Improves Brightness and Resolution

The optical system has been improved, realizing clearer images and higher edge detection capability.

- **Finer resolution**
  The new design has increased the numerical aperture (NA) of the standard 2.5X lens from a conventional 0.14 to an amazing 0.21, greatly improving brightness and resolution in the process. The high NA and low distortion ensures high accuracy on the screen. In addition, the working distance has increased from the conventional 34 mm to 40.6 mm, thereby improving usability as well.

- **Higher brightness**
  The LED illumination models are equipped with the latest high-brightness LED elements, not only improving the optical system but also increasing the brightness by practically doubling the illumination of the CCD.

- **Reduced flare**
  Flare has been significantly reduced by redesigning the optical system of the objective lens and the variable magnification unit (PPT).
Advanced Illumination and Wide-Range Variable Magnification Units Support Reliable Edge Detection and Automatic Measurement

RGB Color LED Illumination Increases Throughput

Changing illumination color among red, green, blue, and white (synthesized) allows detection of edges which could not be measured with conventional white light.

- Application examples
  Dimensions of resist aperture on a printed circuit board

Variable Magnification Unit Covers a Wide Range

- Programmable power turret (PPT) specifications
  PRO/PRO3/PRO5 models
  The tube lens allows provides three magnification levels with the same objective lens.
  Replacing objective lenses allows a wide range of magnification to support a variety of measurements.

Images observed with the objective lens QV-HR2.5 and PRO

- 1X tube lens
  View field: .10"x .07" (2.5 x 1.88 mm)

- 2X tube lens
  View field: .05"x .04" (1.25 x 0.94 mm)

- 6X tube lens
  View field: .02"x .01" (0.41 x 0.31 mm)
Programmable Ring Light (PRL)

Fine control of obliquity and direction provides illumination optimal for measurement. Obliquity* can be arbitrarily set in the range from 30° to 80°. This type of illumination is effective for enhancing the edge of inclined surfaces or very small steps.

Illumination can be controlled independently in every direction, front and back, right and left. Measurement with edge enhancement is possible by forming a shadow by lighting from only one direction.

*35° to 80° in the case of QV-STREAM PLUS

Multi-function Control Box (Standard accessory)

This multi-function control box has been developed for maximum ease of use.
Compact Vision Measuring Machine  
Quick Vision ELF  
QV-ELF

- Controller-integrated compact design. Light and small-footprint characteristics allow installation in an office.

- The edge detection capability as well as the functions and performance of measurement software QVPAK are as powerful as the higher model QV-APX, surpassing the conventional image of a compact model.

- Many functions in a small body. The PT machine equipped with a programmable power turret (PPT) and the PRO machine equipped with the programmable ring light (PRL) are also available. The laser auto focus (LAF) option can also be selected.

### Specifications

<table>
<thead>
<tr>
<th>Model No.</th>
<th>QV-ELF202</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical system</td>
<td>PT machine</td>
</tr>
<tr>
<td>LAF model</td>
<td>363-103</td>
</tr>
<tr>
<td>Measuring range (X × Y × Z)</td>
<td>7.87&quot;×9.84&quot;×3.94&quot; (200 × 250 × 100mm)</td>
</tr>
<tr>
<td>Variable magnification unit</td>
<td>PPT 6X</td>
</tr>
<tr>
<td>Resolution / scale unit</td>
<td>0.1μm / reflective-type linear encoder</td>
</tr>
<tr>
<td>CCD camera</td>
<td>B &amp; W</td>
</tr>
<tr>
<td>Illumination unit</td>
<td>Vertical reflected / contour</td>
</tr>
<tr>
<td></td>
<td>Halogen</td>
</tr>
<tr>
<td></td>
<td>Ring</td>
</tr>
<tr>
<td></td>
<td>Halogen</td>
</tr>
<tr>
<td></td>
<td>PRL</td>
</tr>
<tr>
<td></td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>White LED</td>
</tr>
<tr>
<td>Measuring accuracy</td>
<td>E/X / Y axes</td>
</tr>
<tr>
<td></td>
<td>E/Z axis</td>
</tr>
<tr>
<td>LAF repeatability*1</td>
<td>σ: 0.4μm</td>
</tr>
<tr>
<td>Stage glass size</td>
<td>10.59&quot;×12.24&quot; (269 × 311mm)</td>
</tr>
<tr>
<td>Maximum stage loading</td>
<td>22lbs. (10kg)</td>
</tr>
<tr>
<td>Dimensions of main unit</td>
<td>22.68&quot;×37.16&quot; [39.09] *2×57.05&quot; (576 × 944 [993] *2 × 1449mm)</td>
</tr>
<tr>
<td>Mass of main unit (including mounting stand)</td>
<td>430lbs. (195kg)</td>
</tr>
</tbody>
</table>

*1: Applicable to the LAF model only.  
*2: The dimensions in [brackets] are for the LAF model.

**Notes:**
- The measuring accuracy is evaluated according to a Mitutoyo inspection method. "L" indicates an arbitrary measuring length (unit: mm).
- The accuracy is guaranteed under the following optical conditions: (QV-HR2.5X or QV-SL2.5X) + tube lens 1X.
- The machine incorporates a startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated.

Be sure to contact your nearest Mitutoyo prior to relocating this machine after initial installation.
QV-APEX

• QV series standard model ranging in size from compact to large.
• The PRO machine is equipped with RGB color LED illumination, a programmable power turret (PPT) and a programmable ring light (PRL) as standard. The laser auto focus (LAF) option is also available.

Images observed with the PRO model

Pressed part

Printed circuit board

Vision observed with the PRO3 model equipped with the color CCD

Printed circuit board

Lead of QFP package

Specifications

<table>
<thead>
<tr>
<th>Model No.</th>
<th>QV-APEX302</th>
<th>QV-APEX404</th>
<th>QV-APEX606</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical system</td>
<td>PRO</td>
<td>PRO2</td>
<td>PRO3</td>
</tr>
<tr>
<td>LAF model</td>
<td>363-117</td>
<td>363-117*1</td>
<td>363-117*1</td>
</tr>
<tr>
<td>Measuring range (X × Y × Z)</td>
<td>11.81”×7.87”×7.87” (300 × 200 × 200mm)</td>
<td>15.75”×15.75”×9.84” (400 × 400 × 250mm)</td>
<td>23.62”×25.59”×9.84” (600 × 650 × 250mm)</td>
</tr>
<tr>
<td>Variable magnification unit</td>
<td>PPT 6X</td>
<td>Zoom</td>
<td>PPT 6X</td>
</tr>
<tr>
<td>Resolution / scale unit</td>
<td>0.1μm / reflective-type linear encoder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCD camera</td>
<td>B &amp; W</td>
<td>3CCD color</td>
<td>B &amp; W</td>
</tr>
<tr>
<td>Illumination unit</td>
<td>Vertical reflected</td>
<td>Color LED</td>
<td>Halogen</td>
</tr>
<tr>
<td>Contour</td>
<td>White LED</td>
<td>Halogen</td>
<td>White LED</td>
</tr>
<tr>
<td>Ring</td>
<td>—</td>
<td>—*1</td>
<td>—</td>
</tr>
<tr>
<td>PRL</td>
<td>Color LED</td>
<td>Halogen</td>
<td>Color LED</td>
</tr>
<tr>
<td>Measuring accuracy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X/Y axes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E/Z axis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E/X-Y plane</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LAF repeatability*2</td>
<td>σ: 0.4μm</td>
<td>—</td>
<td>—*1</td>
</tr>
<tr>
<td>Stage glass size</td>
<td>15.71”×10.67” (399 × 271mm)</td>
<td>12.41”×21.69” (319 × 551mm)</td>
<td>27.44”×29.84” (697 × 758mm)</td>
</tr>
<tr>
<td>Maximum stage loading</td>
<td>44lbs (20kg)</td>
<td>88lbs (40kg)</td>
<td>110lbs (50kg)</td>
</tr>
<tr>
<td>Dimensions of main unit</td>
<td>33.82”×37.44”×36.35” (859 × 951 × 1609mm)</td>
<td>40.43”×55.39”×70.08” (1027 × 1407 × 1778mm)</td>
<td>51.54”×78.15”×70.63” (1309 × 1985 × 1794mm)</td>
</tr>
<tr>
<td>Mass of main unit (including mounting stand)</td>
<td>794lbs (360kg)</td>
<td>1,276lbs (579kg)</td>
<td>3,197lbs (1450kg)</td>
</tr>
</tbody>
</table>

*1: On special order *2: Applicable to the LAF model only.

Remark: Halogen illumination is available for the PRO machine, on special order. The measuring accuracy is evaluated according to a Mitutoyo inspection method. “L” indicates an arbitrary measuring length (Unit: mm). Accuracy is guaranteed under the following optical conditions: (QV-HR2.5X or QV-SL2.5X) + tube lens 1X for PRO and PRO3 and 3X for PRO2.

Note: This machine incorporates a startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo prior to relocating this machine after initial installation.
High Accuracy Vision Measuring Machine
Quick Vision
QV-HYPER

- A choice of measuring range similar to the QV-APEX combined with high accuracy means that a machine ideally suited to the workpiece can be selected.
- QV-HYPER is equipped with RGB color LED illumination, a programmable power turret (PPT), and a programmable ring light (PRL) as standard. The laser auto focus (LAF) option is also available.
- A low-expansion glass scale with a linear thermal expansion coefficient of only \((0 \pm 0.02) \times 10^{-6}/K\) helps provide the exceptional accuracy specification. Errors due to temperature fluctuation have been minimized. The ultra-precise vision measuring machine ULTRA QV and ultra-high accuracy coordinate measuring machine LEGEX are also equipped with this low-expansion glass scale.

Conventional glass scale

Ultra-high accuracy crystallized glass scale

Specifications

<table>
<thead>
<tr>
<th>Model No.</th>
<th>QV-HYPER302</th>
<th>QV-HYPER404</th>
<th>QV-HYPER606</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical system</td>
<td>PRO</td>
<td>PRO</td>
<td>PRO</td>
</tr>
<tr>
<td>Code No.</td>
<td>Standard model</td>
<td>363-114</td>
<td>363-134</td>
</tr>
<tr>
<td>LAF model</td>
<td>363-118</td>
<td>363-138</td>
<td>363-158</td>
</tr>
<tr>
<td>Measuring range (X × Y × Z)</td>
<td>11.81&quot;x7.87&quot;x7.87&quot; (300 x 200 x 200mm)</td>
<td>15.75&quot;x15.75&quot;x9.84&quot; (400 x 400 x 250mm)</td>
<td>23.62&quot;x25.59&quot;x9.84&quot; (600 x 650 x 250mm)</td>
</tr>
<tr>
<td>Variable magnification unit</td>
<td>PPT 6X</td>
<td>PPT 6X</td>
<td>PPT 6X</td>
</tr>
<tr>
<td>Resolution / scale unit</td>
<td>0.02μm / reflective-type linear encoder*1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCD camera</td>
<td>B &amp; W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring accuracy</td>
<td>E-X axis : (0.8+2L / 1000) μm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>E-Z axis : (1.5+2L / 1000) μm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>E-X-Y plane : (1.4+3L / 1000) μm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LAF repeatability*2</td>
<td>(\sigma : 0.4)μm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass of main unit (including mounting stand)</td>
<td>33ibs.(15kg)</td>
<td>66lbs.(30kg)</td>
<td>88lbs.(40kg)</td>
</tr>
</tbody>
</table>

*1: Low-expansion glass scale: \((0 \pm 0.02) \times 10^{-6}/K\)
*2: Applicable to the LAF model only.

Remark: Halogen illumination is available for the PRO machine, on special order. The measuring accuracy is evaluated according to a Mitutoyo inspection method. For other specifications, refer to the QV-APEX specifications.
The accuracy is guaranteed under the following optical conditions: (QV-HR2.5X or QV-SL2.5X) + tube lens 1X.

Note: This machine incorporates a startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo prior to relocating this machine after initial installation.

Unit: inch/(metric)
A choice of measuring range similar to the QV-APEX means that a machine suited to the workpiece can be selected.

An innovative method of acquiring images without stopping the stage has tremendously improved throughput. Conventional vision measuring machines repeat the displacement, stop, measurement and displacement cycle, which is a fundamental limitation on productivity. In contrast, the QV-STREAM PLUS realizes non-stop vision measurement (stream mode) by eliminating acceleration/deceleration and stop time, consequently reducing the overall measurement time needed.

Mitutoyo has developed a strobe illumination method using high-brightness LEDs to realize non-stop vision measurement. The LED-strobe is turned on for such a short time when the target area reaches the measurement point that the image does not blur. This highly efficient method also uses the lens array to enhance the directional characteristics of the illumination.

Note: This machine incorporates a startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo prior to relocating this machine after initial installation.

Specifications

<table>
<thead>
<tr>
<th>Model No.</th>
<th>QV-STREAM PLUS302</th>
<th>QV-STREAM PLUS404</th>
<th>QV-STREAM PLUS606</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical system</td>
<td>PROS</td>
<td>PRO</td>
<td>PRO</td>
</tr>
<tr>
<td>LAF model 363-119</td>
<td>363-120</td>
<td>363-139</td>
<td>363-140</td>
</tr>
<tr>
<td>Measuring range (X × Y × Z)</td>
<td>11.81”×7.87”×7.87” (300 × 200 × 200mm)</td>
<td>15.75”×15.75”×9.84” (400 × 400 × 250mm)</td>
<td>23.62”×25.59”×9.84” (600 × 650 × 250mm)</td>
</tr>
<tr>
<td>Variable magnification unit</td>
<td>PPT 4X</td>
<td>PPT 6X</td>
<td>PPT 4X</td>
</tr>
<tr>
<td>Resolution / scale unit</td>
<td>0.1μm / reflective-type linear encoder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCD camera</td>
<td>B &amp; W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illumination unit*1</td>
<td>Vertical reflected High-brightness LEDs (RGB and white during constant illumination and Cyan during strobe illumination)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contour*2</td>
<td>High-brightness LED blue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRL</td>
<td>High-brightness LEDs (RGB and white during constant illumination and Cyan during strobe illumination)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring accuracy</td>
<td>E1X / Y axes (1.5+3L/1000) μm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E2Z axis (1.5+4L/1000) μm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E2X-Y plane (2+4L/10000) μm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LAF repeatability*3</td>
<td>σ = 0.4μm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1: Only one of the illumination functions (vertical reflected, contour or PRL) can be set in the STREAM mode. If the PRL illumination is selected, either all lights (four directions) or one direction can be used.

*2: The ±Z-axis measuring range is 50 mm when the contour illumination is used in the STREAM mode.

*3: Applicable to the LAF model only.

Remark: The measurement accuracy is evaluated according to a Mitutoyo inspection method. For other specifications, refer to the QV-APEX specifications. Accuracy is guaranteed under the following optical conditions: (QV-HR2.5X or QV-SL2.5X) + tube lens 1X.

Note: This machine incorporates a startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo prior to relocating this machine after initial installation.
External Dimensions and Dimensions of Measuring Tables

QV-302

The dimensions in [brackets] are for PRO2, PRO3, and QV-STREAM PLUS machines.

QV-404

The dimensions in [brackets] are for PRO2, PRO3, and QV-STREAM PLUS machines.

QV-606

The dimensions in [brackets] are for PRO2, PRO3, and QV-STREAM PLUS machines.
Optional Hardware

QV Objective Lenses

<table>
<thead>
<tr>
<th>Objective lens</th>
<th>Code No.</th>
<th>PPT magnification</th>
<th>Monitor magnification</th>
<th>View field (inch/mm)</th>
<th>Working distance*1 (inch/mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>QV-SL0.5X*2</td>
<td>02AKT199</td>
<td>1X 6X (4X)</td>
<td>16X 96X (64X)</td>
<td>.493&quot;×3.70&quot;(12.54×9.4)</td>
<td>1.20&quot;(30.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2X</td>
<td>32X</td>
<td>.246&quot;×1.85&quot;(6.27×4.7)</td>
<td>1.34&quot;(34)</td>
</tr>
<tr>
<td>QV-1X</td>
<td>02ALA400</td>
<td>1X</td>
<td>16X</td>
<td>.082&quot;×.061&quot;(.213×.156)</td>
<td>2.09×1.56(3.13×2.35)</td>
</tr>
<tr>
<td>QV-SL1X</td>
<td>02ALA150</td>
<td>6X (4X)</td>
<td>64X</td>
<td>.123&quot;×.092&quot;(3.13×.235)</td>
<td>2.07&quot;(52.5)</td>
</tr>
<tr>
<td>QV-HR2.5X</td>
<td>02AKT300</td>
<td>1X 8X</td>
<td>80X</td>
<td>.08&quot;×.074&quot;(2.03×1.88)</td>
<td>1.60&quot;(40.6)</td>
</tr>
<tr>
<td>QV-SL2.5X</td>
<td>02ALA170</td>
<td>6X (4X)</td>
<td>480X (320X)</td>
<td>.016&quot;×.012&quot;(.41×.31)</td>
<td>2.36&quot;(60)</td>
</tr>
<tr>
<td>QV-5X</td>
<td>02ALA420</td>
<td>1X 6X (4X)</td>
<td>16X 96X (64X)</td>
<td>.098&quot;×.074&quot;(2.5×1.88)</td>
<td>1.62&quot;(41)</td>
</tr>
<tr>
<td>QV-10X*3</td>
<td>02ALG010</td>
<td>2X</td>
<td>320X</td>
<td>.024&quot;×.018&quot;(.62×.47)</td>
<td>1.20&quot;(30.5)</td>
</tr>
<tr>
<td>QV-25X<em>2</em>3</td>
<td>02ALG020</td>
<td>6X (4X)</td>
<td>1920X (1280X)</td>
<td>.0015&quot;×.001&quot;(.04×.03)</td>
<td>.51&quot;(13)</td>
</tr>
</tbody>
</table>

The list on the left is for PRO machines. The monitor magnification assumes 15-inch LCD specifications. The values in [brackets] are for the QV-STREAM PLUS model.

*1: The PRL illumination area is a function of the working distance, depending on the position of the PRL.
*2: Insufficient illumination and other restrictions may apply to some workpieces.
*3: The usable position for PRL is restricted.

Clear high-performance QV objective lenses

RGB Color Filtering Unit

The color filtering function can be added to the vertical reflected illumination or programmable ring light in Quick Vision models that use a halogen light source. This function enhances the visibility of low-reflection surfaces on colored workpieces, facilitating edge detection. This function can also be retrofitted to a conventional Quick Vision. In addition, a yellow filter enables vision measurement in the yellow light region, which provides high sensitivity.

Temperature Compensation

QV-APEX/QV-HYPER/QV-STREAM PLUS

Even if measurements are made at a non-standard ambient temperature, 23°C say, the output data is fully compensated to give the same result as if measurements were made at the standard reference temperature of 20°C. Compensation is enabled by inputting the linear thermal expansion coefficient of the workpiece and by taking readings from temperature sensors located on each axis scale and on the workpiece itself.

Calibration Chart

A calibration chart is used to compensate for the pixel size of the CCD chip, autofocus accuracy and the optical axis offset at each magnification of the variable magnification unit (PPT).
One-Click Point Tool
This is a basic tool for capturing one point.

One-Click Circle Tool
This tool is appropriate for capturing a circle.

One-Click Line Tool
This tool is appropriate for capturing a line.

One-Click Arc Tool
This tool is appropriate for capturing an arc and the radius of a corner.

Maximum/Minimum Tool
This tool evaluates the maximum or minimum point within the range.

Pattern Search
This tool captures the position of a pattern that has been registered beforehand. It is optimal for positioning the alignment mark.

Area Centroid Tool
This tool evaluates the position of a feature’s centroid. It is appropriate for positioning a different feature.

Auto Trace Tool
This is a form measuring tool that can autonomously track an unknown feature.

Surface Focus Tool
This is a general vision focusing tool.

Pattern Focus Tool
This focusing tool is optimal for transparent or low-contrast surfaces.

Edge Focus Tool
This is a tool for focusing on a beveled edge.

Standard Software
More Powerful, Friendly Software: QVPAK Version 7 (Compatible with Windows XP)
**Calculation Functions**

<table>
<thead>
<tr>
<th>Point</th>
<th>Circle</th>
<th>Sphere</th>
<th>Cylinder</th>
<th>Buffer</th>
<th>Distance</th>
<th>Intersection</th>
<th>Angle</th>
<th>Point of intersection</th>
<th>Midpoint</th>
<th>Step line</th>
<th>End face</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line</td>
<td>Plane</td>
<td>Stepped Cylinder</td>
<td>Cone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Seating plane measurement**

![Generation image on seating surface](image1)

**Surface measurement**

A seating surface (three-point combined surface) can be selected as a datum surface. The result of flatness based on three-point combination is regarded as a coplanarity value.

![MSHAPE-QV output display](image2)

**High-speed Processing**

**Application**

**Increase in Edge Detection Capability**

The capability of detecting a noisy edge has increased by analyzing modest changes in brightness and differences in texture on the target surface.

![Noisy edge](image3)

![Brightness analysis](image4)

![Noisy edge](image5)

![Texture analysis](image6)

**One-click Measuring Tool Set-up**

The tool size, orientation, and threshold value of a measuring tool are automatically set with one click of the mouse.

![AI Illumination Tool](image7)

**Removal of Abnormal Points**

Abnormal points such as dust, burrs, and cracks are removed. The removal threshold detection level can be set arbitrarily.

**AI Illumination Tool**

This tool can automatically set the optimal light intensity adjustment and light intensity correction at procedure creation time, thereby increasing detection repeatability.

**Reinforced filter function**

Stable edge detection is possible by reducing image noise. Median, average, Gaussian and morphologic settings are available.
QV Graphics
QVPAK is capable of 3D graphic display of measurement results, relationship of features (e.g. circle-to-circle distance calculation) from captured points and also the geometrical accuracy of circles, lines, planes and cylinders.

![3-D graphic display](image1)
![Geometrical accuracy: Line](image2)
![Geometrical accuracy: Circle](image3)

Image Composition and Color Viewer
This function combines multiple images of surfaces at different heights to create a composite image in focus over a wide range. It is also possible to create a pseudo color image with a B&W camera using the RGB color illumination.

![Image data after composition with the color viewer](image4)

QV Navigator 2
This function provides a navigated display of point capture and calculation procedure between features and a coordinate system setup pattern. It allows you to customize even a complicated pattern at will. Also, a Part Program can be created and stored along with workpiece images, thus making Repeat measurements easier.

![User macro creation function](image5)
![Part Program creation example](image6)
Ease of Operation

QV Smart Editor Function
This function displays a part program created by QVPAK in a tree structure using icons and titles. It has improved the ease of editing programs for factors such as illumination and edge detection settings.

Multi-point auto focus
Targeting the auto-focus tool (surface and pattern) on separate areas allows multiple heights to be measured. Maximum and minimum heights as well as the average height can be found.

Help Function
The Help function has been enhanced by greater use of graphics. Searches can be easily made to give a quick solution to a user’s query.

Illumination Wizard
The AI Illumination tool has been further upgraded. This tool automatically sets the optimal illumination conditions from among multiple combinations of illumination types such as contour illumination, surface illumination, and the illumination direction and angle of PRL illumination.

Multi-point auto focus

Help Function

Illumination Wizard

Saving Images in a File
Video images can be saved in TIFF format. Also, the images can be recalled and re-measured.
Note: All information regarding our products, and in particular the illustrations, drawings, dimensional and performance data contained in this printed matter as well as other technical data are to be regarded as approximate average values. We therefore reserve the right to make changes to the corresponding designs. The stated standards, similar technical regulations, descriptions and illustrations of the products were valid at the time of printing. In addition, the latest applicable version of our General Trading Conditions will apply. Only quotations submitted by ourselves may be regarded as definitive.

Mitutoyo products are subject to US Export Administration Regulations (EAR). Re-export or relocation of Mitutoyo products may require prior approval by an appropriate governing authority.

Trademark and Registrations
Designations used by companies to distinguish their products are often claimed as trademarks. In all instances where Mitutoyo America Corporation is aware of a claim, the product names appear in initial capital or all capital letters. The appropriate companies should be contacted for more complete trademark and registration information.

We reserve the right to change specifications and prices without notice.