VISION METROLOGY SYSTEMS
HDV
HDV300 AND HDV400
HDV300 CNC AND HDV400 CNC

The HDV horizontal digital video comparators combine the best features of a horizontal optical comparator and a vision metrology system. With a rigid steel design, they are configured like a traditional horizontal comparator. The workstage is the same as the Starrett field-proven HB400 and HD400 comparators, with a 110lb (50kg) load capacity. The heart of the system centers on a uniquely designed interchangeable lens mounting system coupled to a hi-resolution color digital video camera (patent pending). The system is available with a choice of seven telecentric lenses for micron-level resolution and optical distortion as low as 0.001% for accurate field-of-view (FOV) measurements. Lenses provide a maximum FOV of up to 2.44" x 1.85" (62mm x 47mm). Stage movement can be related to the imported file allowing part comparison up to 16" (400mm) long.

The HDV systems house a powerful 64-bit PC, which runs MetLogix M3 Metrology software. With this software, DXF CAD files can be imported and 2D Go/No-Go gages can be developed directly from the CAD files. Video edge detection (VED), allows real-time interaction of the imported file with the video image of the part being inspected. Productivity, speed and accuracy are all enhanced. Systems are available in manual or CNC control.

Features
- Steel construction with hard anodized X Y stage
- 12" x 6" (300mm x 150mm) of stage travel for HDV300
- 16" x 6" (400mm x 150mm) of stage travel for HDV400
- 21.3" x 5.1" (540mm x 130mm) workstage
- 110lb (50kg) maximum load capacity
- 2" (51mm) of focus travel
- Helix angle adjustment with ±15° Vernier scale
- Manual X-Y and focus positioning via hand wheels or CNC with joystick and trackball positioning
- Heidenhain glass scales for 0.5μm (.00002") X and Y resolution
- LED illumination for surface and profile lighting
- 5 megapixel color camera (2448 x 2058 pixels
- Ultra-low distortion to 0.001% for telecentric FOV measurements
- 64-bit Intel® Processor
- Windows® 7 Professional operating system
- MetLogix M3 software with DXF/FOV option pack
- Parts displayed on 24" (60cm) touch-screen color monitor (1920 x 1080 pixels)

Options
- 7 interchangeable telecentric lenses for fields of view from 2.36" x 1.77" to 0.09" x 0.07" (patent pending)
- 6.5:1 zoom optics
- 23" or 32" high cabinet stands
- Calibration standards optional
The MVR manual vision metrology systems are ideal for individual measurements or short runs. They are available with dedicated 6.5:1 zoom optics or a quick-change bayonet lens mount which accepts zoom optics or telecentric lenses for micron-level resolution and optical distortion down to 0.001% for accurate field-of-view (FOV) measurements. These can encompass an entire small part up to 2.00” x 1.50” or a feature of a larger part and be seamlessly integrated with stage motion to measure parts with a length up to 8” (MVR200) or 12” (MVR300). The operator interface is a 21.5” all-in-one touch screen PC which runs MetLogix M3 FOV software under Windows® 7 Professional. The screen displays a live video image of the part plus geometry tools and digital readings. The image of the part can be resized using zoom, and measurements can be taken by simply tapping a feature on the screen.

MVR hardware features include a granite base for maximum stability, recirculating ball linear guides for smooth and precise stage motion, and a motorized Z-axis with variable speed control.

### Features
- X-Y travel for MVR200: 8” x 4” (200 x 100 mm)
- X-Y travel for MVR300: 12” x 8” (300 x 200 mm)
- Z travel: 8” (200 mm) with 2.0x auxiliary lens
- Manual X-Y positioning via hand wheels
- Motorized Z-axis positioning with variable speed control
- Windows® 7 Professional operating system for network connectivity
- MetLogix M3 metrology software with DXF/FOV option pack
- Video edge detection (VED)
- Field-of-view (FOV) measurements integrated with stage motion
- Renishaw scales for .00002” (0.5 µm) of X and Y resolution
- Accuracy: 2.5µm + 5L/1000 for X and Y, 2.5µm + 5L/1000 for Z
- Color digital video camera
- Collimated LED sub-stage illumination
- Ring light LED surface illumination
- Granite base

### Options
- Dedicated 6.5:1 zoom optics
- Quick-change bayonet lens mount
- Quadrant LED Ring Light
- Bayonet-mountable 6.5:1 zoom optics
- Bayonet mountable 0.30x, 0.50x, 0.80x, 1.0x, 2.0x, and 4.0x telecentric optics
- 0.5x, 1.5x, and 2.0x auxiliary lenses for zoom optics
- Calibration standards
- Coaxial LED surface illumination for zoom optics
- DXF/FOV option pack for automatic comparison to CAD designs
- Modular system workstation

### Weight and Dimensions

<table>
<thead>
<tr>
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<th>MVR200</th>
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Manual Vision Metrology Systems

MV

MV300 AND MV350

MV metrology systems are easy-to-use, general purpose, and video-based with position control via hand wheels. Available with zoom optics, X and Y dimensions are measured by moving the stage horizontally. Z height is measured by moving an optical video probe vertically to maintain focus. A highly stable mechanical design and precision linear bearings achieve superb performance. The MV machines are ideal for QA, parts inspection, and short runs.

The operator interface is an M3-equipped PC. The part image, measuring marks, and readings are displayed on a color touch-screen. Video edge detection (VED), single and multi-point measurements of 2D geometries, and report generation are standard.

Features

- Zoom optics 6.5:1
- MetLogix M3 control system software
- Video edge detection
- Easy manual X-Y-Z positioning
- Fiber Optic or LED illumination
- All in-one-PC with 21.5" (55cm) color touch-screen
- Windows® 7 Professional operating system
- Sub-stage bottom illumination and ring light surface illumination
- X-Y-Z travel for MV300: 12" x 6" x 5.5" (300 x 150 x 135 mm)
- X-Y-Z travel for MV350: 14" x 14" x 8" (350 x 350 x 200 mm)
- Machine stand and control cart is standard with MV350

Options

- Workstation
- 0.5x, 1.5x, and 2.0x auxiliary lenses for zoom optics
- Coaxial LED surface illumination
- Calibration standards
- DXF/FOV option pack for automatic comparison to CAD designs
- Modular workstation for MV300

Weight and Dimensions

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**Automatic Vision Metrology Systems**

**AV**

**AV300 AND AV350**

The AV automatic vision (or video-based) metrology systems provide accurate 3-axis measurement capability (X-Y-Z) with hi-resolution video zoom optics. The systems can be pre-programmed (CNC) for repetitive part inspection, or driven manually via a joystick and trackball for individual measurements. Superb performance is achieved by a highly stable mechanical design, with precision linear bearings. Throughput is maximized with either QC5000 or Metlogix M3 software controlling all aspects of Video Edge Detection (VED) and multiple channel Fiber Optic or LED illumination.

These automatic vision systems are ideal for quality assurance, inspection, and production runs. Flexible and powerful, the AV series allows users to cost effectively achieve maximum throughput of their inspection process. Measured data is effectively archived or networked to other devices.

Also see our AV+ multi-sensor metrology systems, which can provide vision metrology operation with travel up to 50” x 36” x 8” (1270 x 915 x 200mm).

### Features

- CNC operation or manual operation via joystick and trackball
- **AV300** 12” x 6” x 5.5” (300mm x 150mm x 140mm)
- **AV350** 14” x 14” x 8” (350mm x 350mm x 200mm)
- **AV300**, E2 = 1.9 µm + 5L/1000 accuracy for X and Y, E1 = 2.5 µm + 5L/1000 for Z
- **AV350**, E2 = 2.5 µm + 5L/1000 accuracy for X and Y, E1 = 2.5 µm + 5L/1000 for Z
- Reading resolution 4µin (0.1µm)
- Magnification on 24” monitor, 1:1 pixel setting: 37x to 240x with 6.5:1 zoom, 25x to 240x with 12:1 zoom
- Multiple channel Fiber Optic or LED Illumination
- Cast aluminum base for AV300. Granite base on AV350
- 1.3 megapixel color camera

### Lens Options

- 6.5:1 or 12:1 zoom optics
- Optional 0.5x, 1.5x and 2.0x auxiliary lenses

### Options

- Ergonomic workstation (standard with AV350)
- Calibration standards
- 0.5x, 1.5x and 2.0x auxiliary lenses for zoom optics
- LED darkfield quadrant illuminator

### Weight and Dimensions

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AV AUTOMATIC VISION SYSTEM
Automatic Vision Metrology Systems

AVR

AVR200 AND AVR300

The AVR CNC automatic vision metrology systems are ideal for repetitive measurements and automatic comparison to CAD files. They are available with dedicated zoom optics or a quick-change bayonet lens mount which accepts a choice of telecentric lenses for micron-level resolution and optical distortion down to 0.001% for accurate field-of-view (FOV) measurements. These can encompass an entire small part up to 2.00” x 1.50” or a feature of a larger part and be seamlessly integrated with stage motion to measure parts with a length up to 8” (AVR200) or 12” (AVR300).

AVR hardware features a granite base for maximum stability, recirculating ball linear guides for smooth and precise stage motion, and full CNC control for high throughput. The AVR line is built around a 21” all-in-one touch screen PC which runs MetLogix M3-CNC software under Windows® 7. M3 software capabilities include 3-axis measurements and 2D geometrical constructs (points, lines, angles, rectangles).

For more information please see the Options and Specifications table at the end of this section.

Weight and Dimensions

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<tr>
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<th>AVR200</th>
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AVR Automatic Vision System
AV+ AV300+ AND AV350+

AV300+
An enhanced version of the popular AV300 CNC video-based measurement system. The AV300+ system improves measuring performance by utilizing a precision granite base along with an extended travel Z column, delivering 12” x 6” x 8” (300 x 150 x 200mm) X-Y-Z measuring range. The system is a servo driven motion platform for enhanced performance and includes a 12:1 zoom lens, hi-resolution digital color camera and your choice of fiber optic or LED Illumination. Complete with vibration isolation and integrated machine stand, the AV300+ delivers more capability for multi-sensor requirements. The AV300+ is powered by QC5300 software to handle a variety of measuring applications.

AV350+
Offering similar attributes and performance to the AV300+ with an expanded measurement envelope of 14” x 14” x 8” (350 x 350 x 200mm) X-Y-Z measuring range for those larger part and payload measurement requirements.

Features
- 12:1 Zoom Optics with co-axial illumination
- Precision Granite base construction
- System stand and control cart standard
- Windows® 7 Professional operating system for network connectivity
- Touch probe and laser compatible
- Touch probe change rack compatible

MICROSCOPE-BASED OPTICS AV300+ MICRO
The AV300+ Micro is a CNC system that offers a granite base and column, 12” x 6” x 4” (300 x 150 x 100mm) travel, microscope optics, a lens turret which accepts up to Five Olympus M plan objectives, a choice of powerful QC5300 or PAXIT software control systems, video edge detection (VED), LED or fiber optic illumination options, standard machine pedestal and computer cart. With PAX-it imaging software, an operator can measure, annotate, and analyze the images, and then create a written report that includes the images. Processing options include image stitching, fusion, blending, and background subtraction. These systems are ideal for automated measurements of microscopic features, such as semiconductors, microelectronic and biomedical components.

Features
- QC5000 or PAXIT software
- X travel of 12” (300mm), Y 6” (150mm), Z 4” (100mm)
- Turret holds up to 5 Olympus lenses
- Scale resolution up to 5nm
- Adaptable to your applications

Weight and Dimensions

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<th>AV350+</th>
<th>AV300+ MICRO</th>
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</table>

For more information please see the Options and Specifications table at the end of this section.
1. **User Programmability.** Over-movement, focus, magnification, lighting, data acquisition tools, and reporting. Automating these tasks eliminates operator error and speeds throughput.

2. **Accurate Positioning** of samples obtained from high acceleration, linear motors, and high accuracy scales to determine position. Path optimization may improve throughput.

3. **Non-Linear Error Correction (NLEC)** software feature allows any errors detected in the measurement system to be corrected automatically. The entire measurement area is mapped and compensated for inherent mechanical errors.

4. **Video Edge Detection (VED)** is user programmable feature, which allows the choice of how the software sees a feature. Setting the threshold strength and the VED method provides great flexibility in the types of features that can be measured.

5. **Powerful software choices.** QC5300 provides a flexible solution that allows a user to run up to 3 sensors on the system; video, touch probe and laser. MetLogix M3 software offers powerful simplicity with a touchscreen operator interface and a wide range of software measuring functionality.

These five concepts, combined with other principles, make the LF Vision Line a teachable, automatic, and accurate measuring device.

### Weight and Dimensions

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<th>LF713</th>
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<td>3500lb (1588kg)</td>
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LARGE FORMAT PREMIER
**M3**

FOR VISION SYSTEMS (VIDEO)

Multi-touch software control that can pan and zoom with pinch, swipe, or touch. Works with active part views and live video feeds (or use the conventional mouse interface). Custom "Eye Measure" probe captures complex edges generated by a finger path drawn on the touch screen. Measure Logic probe intelligence provides instant feature determination and measurement with a single touch.

**Features**

- DXF CAD file import for comparing parts being inspected to the actual design file; no need for cumbersome Mylar overlays
- "Vtouch" Probe has video touch probe functionality – just click for simple acquisition of points on a feature’s edge
- Part View can generate distance and tangent lines from within the graphical part view. The "Gesture Menu" can be used for feature creation and manipulation tools.

- “Quick Annotate” allows data on several features to be displayed simultaneously with smart marquee feature selection
- Application of universal tolerance value entry according to feature resolution groupings
- Feature Detail Graphics: Individual feature views display point cloud distributions, nominal deviations, and tolerance results. Scroll through Actual, Nominal, Tolerance, Deviation and Data Fit Type information.
- Simple machine/camera calibration with popular machine and video correction methods
- Windows® 7 Professional-based, globally recognized OS for flexible data exporting and interface with Windows applications
**QC5200**

Metrology software is a Windows® 7 Professional 32-bit based PC inspection system for video measuring machines.

The QC5200 supports a wide range of industries that require precise measurement and inspection of 2D parts using a single sensor. This product features an intuitive user interface and simple, meaningful visual displays. The design reflects a deep understanding of the user's needs along with a process model that supports the operator at every stage in the measurement process.

- Powerful yet intuitive video edge detection tools
- Auto-Focus
- “XY” 2D measurements with optional “Z” axis for height measurements
- Image capture with drag and drop data reporting
- Image processing tools
- Continuous edge mode
- Patented Measure Magic
- Alternative algorithms
- Auto program from CAD files
- Pattern recognition
- Integrated runs database
- Geometric tolerancing
- Advanced calculation
- Data cloud analysis

**QC5300**

Metrology software picks up where the QC5200 leaves off. This product offers multi-axis dimensional measurement of 2D and 3D parts. The QC5300 integrates an innovative user interface, state of the art ergonomics, powerful data import, export and data analysis tools.

- 3D measurement set
- 3D offset alignments
- Customizable screen layouts
- Multiple reference frames
- 3D part view
- Renishaw touch probe interface
- Optional laser sensor
- Vector probing
- Multiple language support
- 3D Measure Magic
- Advanced calculations
- 3D data clouds
- Alternate algorithms
- Drag and drop report generator
- Data export to a wide variety of applications

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Data Cloud Alternate fits

Measure Magic

Image View

Tolerance

Integrated Database

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Options

Motion control system

Video edge detection (color or b/w)

Programmable light control

Auto-focus (Z-axis only)

Programmable zoom

Non-linear error correction

2D Measurement

3D Measurement
### Specifications and Options

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<td><strong>X-Y Accuracy (μm)</strong></td>
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<td>E2 = 2.5μm + 5L/1000</td>
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<td>6.5:1 – 2 LED 12:1 – 3 LED</td>
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- **Vertical**: Vertical
- **Part View Orientation**: Vertical
- **X-Y-Z Travel (in)**:
  - 12” x 6” x 8”
  - 14” x 14” x 8”
  - 12” x 6” x 4”
  - 12” x 12” x 8”
  - 16” x 12” x 8”
  - 28” x 24” x 8”
  - 38” x 30” x 8”
  - 50” x 36” x 8”

- **X-Y-Z Travel (mm)**:
  - 300 x 150 x 135mm
  - 350 x 350 x 200mm
  - 200 x 100 x 200mm
  - 300 x 150 x 135mm
  - 350 x 350 x 200mm
  - 200 x 100 x 200mm

- **Z Axis Measuring**:
  - Optional
  - Optional
  - Optional
  - Standard
  - Standard
  - Standard
  - Standard

- **CNC**:
  - Standard
  - Standard
  - Standard
  - Standard
  - Standard
  - Standard
  - Standard

- **X-Y Accuracy (μm)**:
  - $E_2 = 2.5 \mu m + \frac{5L}{1000}$
  - $E_2 = 2.5 \mu m + \frac{5L}{1000}$
  - $E_2 = 2.5 \mu m + \frac{5L}{1000}$
  - $E_2 = 2.5 \mu m + \frac{5L}{1000}$
  - $E_2 = 1.9 \mu m + \frac{5L}{1000}$
  - $E_2 = 1.9 \mu m + \frac{5L}{1000}$
  - $E_2 = 1.9 + \frac{5L}{1000}$

- **Z Accuracy (μm)**:
  - $E_1 = 2.5 \mu m + \frac{5L}{1000}$
  - $E_1 = 2.5 \mu m + \frac{5L}{1000}$
  - $E_1 = 2.5 \mu m + \frac{5L}{1000}$
  - $E_1 = 2.5 \mu m + \frac{5L}{1000}$
  - $E_1 = 2.0 \mu m + \frac{5L}{1000}$
  - $E_1 = 1.9 + \frac{5L}{1000}$
  - No

- **Scale Resolution**:
  - 0.5μm
  - 0.5μm
  - 0.5μm
  - 0.5μm
  - 0.1μm
  - 0.1μm
  - 0.1μm

- **Multi-Sensor Compatible**:
  - No
  - No
  - No
  - No
  - Yes
  - Yes
  - Yes

- **Base**:
  - Cast Aluminum
  - Granite
  - Granite
  - Granite
  - Cast Aluminum
  - Granite
  - Granite

- **Control System/Software**:
  - M3 or QC5300
  - M3 or QC5300
  - QC5300 or PAX-it
  - QC5300 or M3
  - QC5300 or M3

- **Display**:
  - 21” Touchscreen
  - 21” Touchscreen
  - 21” Touchscreen
  - 21” Touchscreen
  - 24” Monitor
  - 24” Monitor

- **Zoom Optics - Standard**:
  - 6.5:1
  - 6.5:1
  - 6.5:1
  - 6.5:1
  - 12:1
  - 12:1

- **Zoom Optics - Optional**:
  - –
  - –
  - –
  - –
  - –
  - –

- **Optics**:
  - Choice of 4.0x, 2.0x, 1.0x, 0.80x, 0.50x and 0.30x interchangeable
  - Choice of 4.0x, 2.0x, 1.0x, 0.80x, 0.50x and 0.30x interchangeable

- **Microscope Optics**:
  - Standard
  - Optional

- **Digital Video Camera**:
  - 1.3 MP Color
  - 1.3 or 2.0 MP Color
  - 1.3 MP Color
  - 1.3 MP Color
  - 1.3 MP Color
  - 1.3 MP Color

- **Surface Ring Illumination**:
  - LED or FO
  - LED or FO
  - LED or FO
  - LED or FO
  - LED or FO

- **Transmitted Illumination**:
  - LED or FO
  - LED or FO
  - LED or FO
  - LED or FO
  - LED or FO

- **Coaxial Illumination**:
  - Optional
  - Optional
  - Optional
  - Optional
  - Optional

- **Digital Video Camera**:
  - Choice of 4.0x, 2.0x, 1.0x, 0.80x, 0.50x and 0.30x interchangeable
  - Choice of 4.0x, 2.0x, 1.0x, 0.80x, 0.50x and 0.30x interchangeable
  - Choice of 4.0x, 2.0x, 1.0x, 0.80x, 0.50x and 0.30x interchangeable

- **Digital Video Camera**:
  - Standard; 2 MP with Telecentric
  - Standard; 2 MP with Telecentric
  - Standard; 2 MP with Telecentric

- **Digital Video Camera**:
  - LED or FO
  - LED or FO
  - LED or FO

- **Digital Video Camera**:
  - LED or FO
  - LED or FO
  - LED or FO

- **Digital Video Camera**:
  - LED or FO
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- **Digital Video Camera**:
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## Specifications and Options (continued)

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* Includes additional 200mm dovetail slide for increased Z working distance.

### Accessories

- **Fiber Optic Lighting**
- **Rotary Head with choice of collet kit**
- **Calibration Standards**
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<tr>
<th>Accessory</th>
<th>AVR300</th>
<th>AV300+</th>
<th>AV350+</th>
<th>AV300+ MICRO</th>
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</table>
With the unbeatable combination of precision mechanics, powerful and intuitive software, and support from the most respected name in measurement, Starrett Metrology Systems take video-based and multi-sensor measuring systems to the next level.

Our broad range of metrology systems are ideal for use in QC labs, research, engineering, and manufacturing environments where small to large scale high-precision measurement is critical.

Many systems are available in either manual or CNC configurations.

The "Plus" and "LF" systems are multi-sensor instruments combining larger capacity with CNC and the capability to measure 2D or 3D geometry with powerful metrology software utilizing optional touch probes and laser sensors in addition to standard zoom optics.

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Starrett Metrology Systems provide quick Return-On-Investment through increased product quality, user time savings and alternative equipment reduction. Whether you are looking to solve a specific application or for a general purpose measurement tool, consider a system from Starrett!