

Next Generation 3D Digital Microscope  
***Fast, Easy and High Quality***  
Total Imaging Solutions

# KH-8700



**HIROX**  
http://www.hirox.com



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## HIROX-USA, Inc.

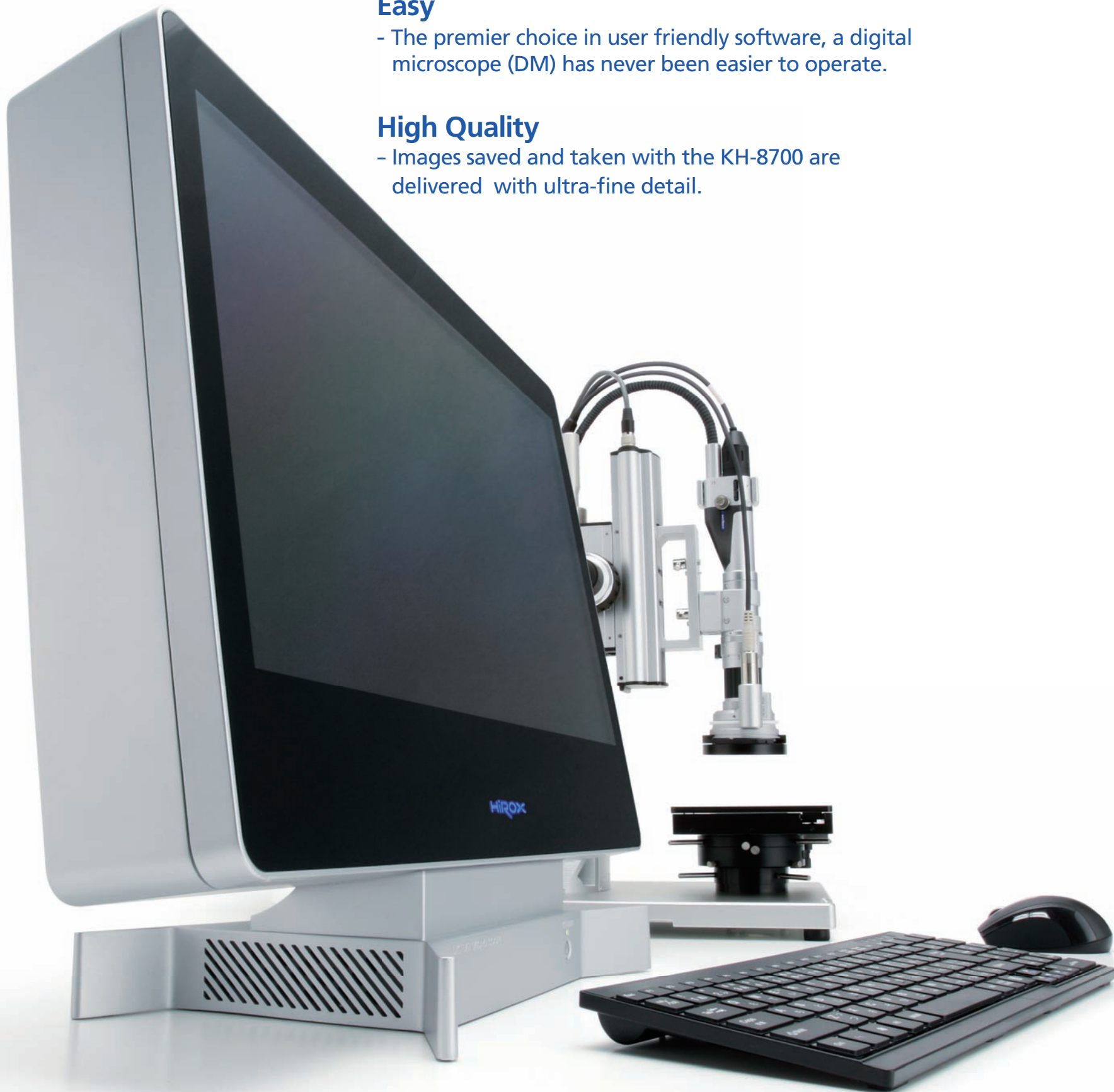
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1 - 8 6 6 - 4 4 7 6 9 8 7



### Fast

- The all new Hirox platform delivers fast operation and faster processing speeds.

### Easy

- The premier choice in user friendly software, a digital microscope (DM) has never been easier to operate.

### High Quality

- Images saved and taken with the KH-8700 are delivered with ultra-fine detail.

### Observation

P.04

Obtain high quality images and utilize multiple angles of observation.

### Measurement

P.08

Achieve quick and accurate 2D/3D results eliminating human error.

### Capture and Record

P.12

Create analytical data of the smallest details in the highest resolution.



Portable



Handheld

# Observation

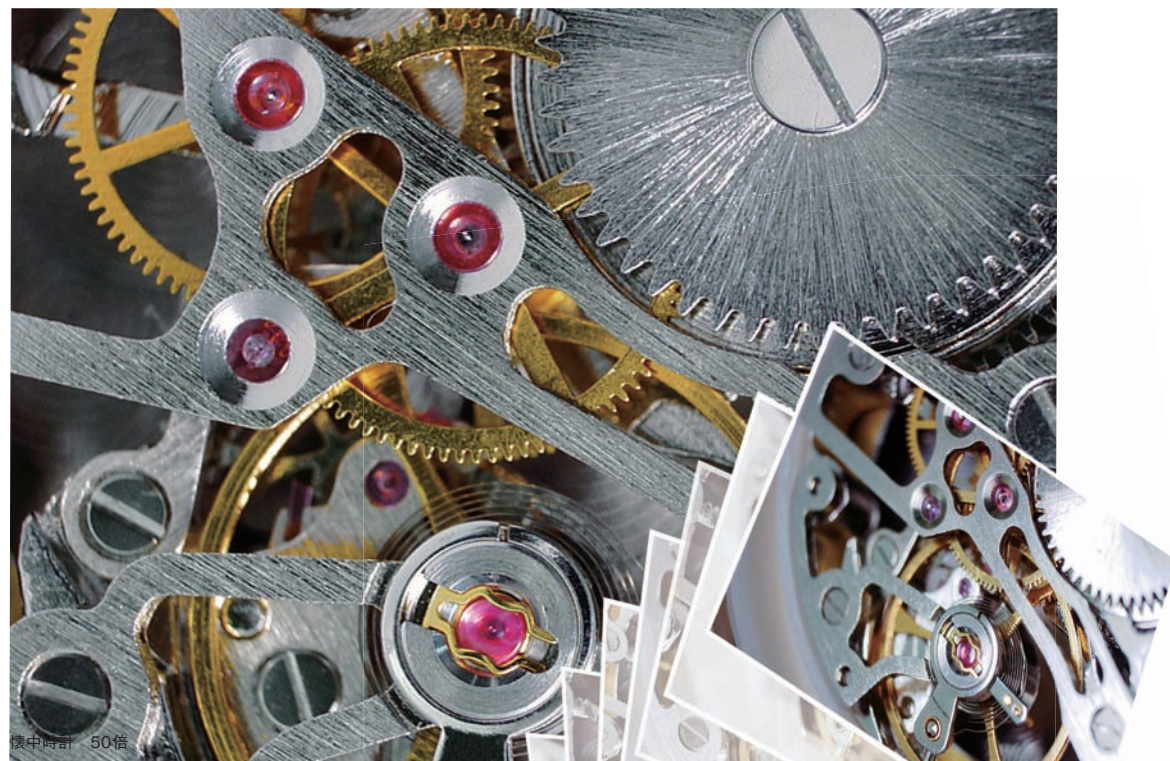
## Obtain High Quality Images and Utilize Multiple Angles of Observation.

Noticing small but significant details is now a more efficient process than ever. Smooth functionality and fast performance is attained by combining our 24 frames/second output and the all new GENEX engine. By utilizing high intensity LED optics with a full HD monitor, the KH-8700 obtains optimal picture quality.

**New**

### 24 Frame /Second (First and Fastest for a DM)

The new high-speed Genex Graphics Processor allows Hirox's CCD camera to capture 24 fps with the continuous high-quality resolution of 1200 x 1600 pixels. This provides a great on-screen performance and live image operation is as smooth as the naked eye. Here, it is not necessary to change to a lower resolution setup, all of the functions work with 1200 x 1600 pixel resolution (UXGA).



懐中時計 50倍

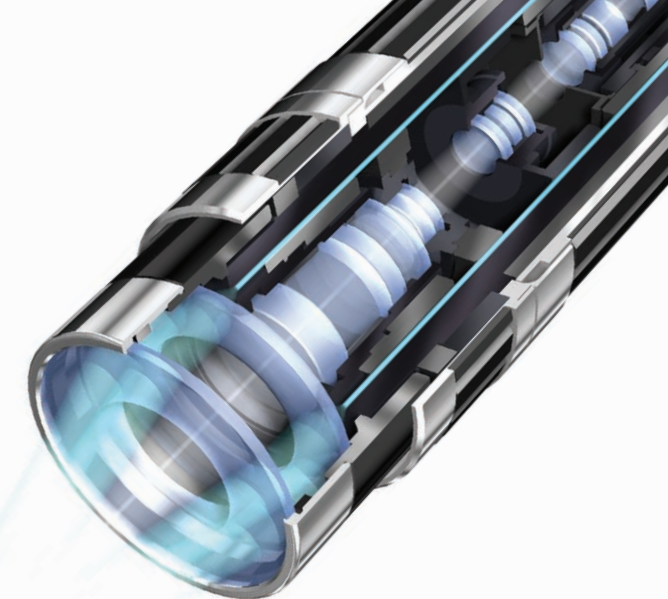
**24** Frame  
1600 x 1200

**New**

### High Intensity LED Light Source

The new high intensity LED light source provides 5700K temperature, which closely portrays daylight color temperature (5500K) to re-produce true sample color images as well as full illumination immediately with no warm up time. The light source has an average lifetime of 30,000 hours, equivalent to over 10 years of usage (Note: 8 hours/day x 30 days x 12 months x 10 years).

In addition, the new light source is environment friendly with ¼ electronic consumption, less heat and UV.



**New**

### Full High Definition LCD Monitor (First for a DM)

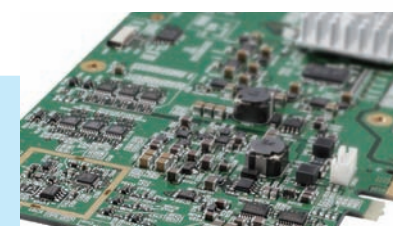
21.5" Full HD LCD monitor (1920 x 1080) is integrated into the KH-8700. It is one of the top grade high intensity pixel reproduction monitors displaying 16.77 million colors, a contrast ratio of 1000:1, and brightness of 300 cd/m<sup>2</sup>. Monitor size has increased 80%, with a new aspect ratio of 9:16 instead of 3:4. The new aspect ratio allows our new software platform main menu and other function keys not to overlap with live images.



## GENEX

### What is Genex?

The new graphics processor called, "Genex Engine," creates the fastest sample to on-screen ratio (24fps). For the first time ever in digital microscopy, the CCU (Genex) combines a high sensitivity compact CCD camera operating in a 32 bit image with high resolution at 1200 x 1600 pixels on the "Live Image."

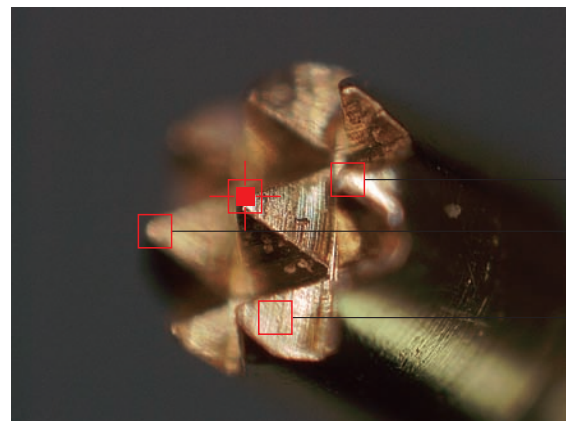




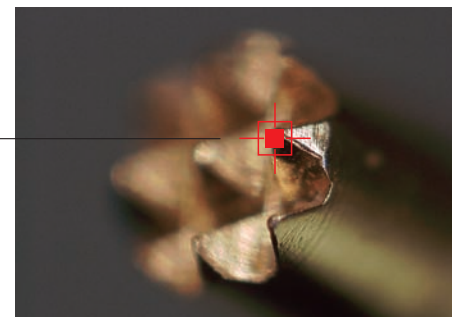
**New**

## Point Focus (Auto Focus)

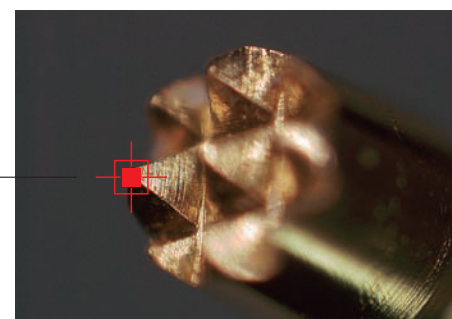
A key advantage in the line of Hirox digital microscopy is the ability to easily and quickly auto focus an image. Auto focusing an image at a rapid rate is due to our 0.05 micron pulse motorized z axis. All one has to do is double click the desired location on the monitor and the high speed software does the rest by automatically selecting the optimal focus point.



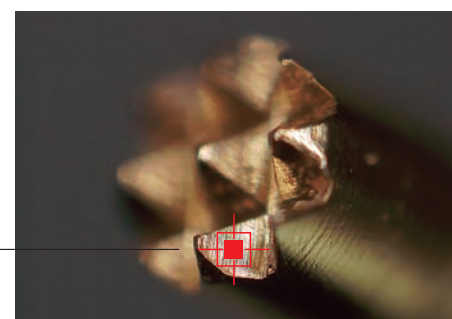
By obtaining focus information on the entire image, you can instantaneously focus on an arbitrary point simply by a mouse operation.



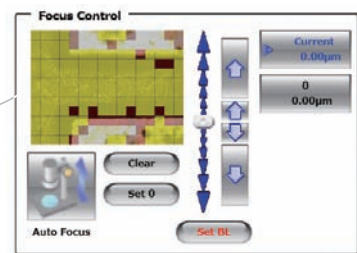
Contact Probe (200x)



Focusing on the Clicked Point



Focusing on the Clicked Point

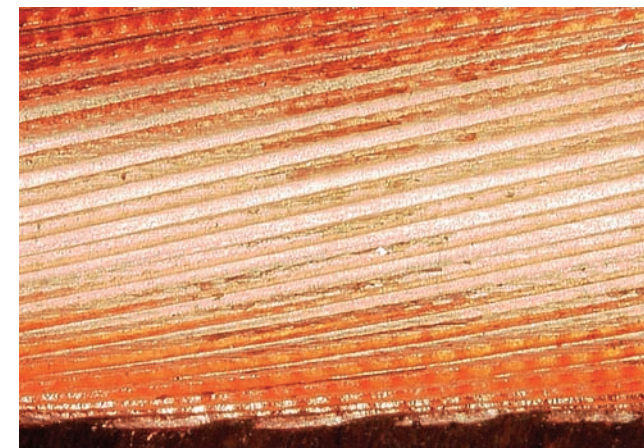


Focus information is always searchable with the focus indicator.

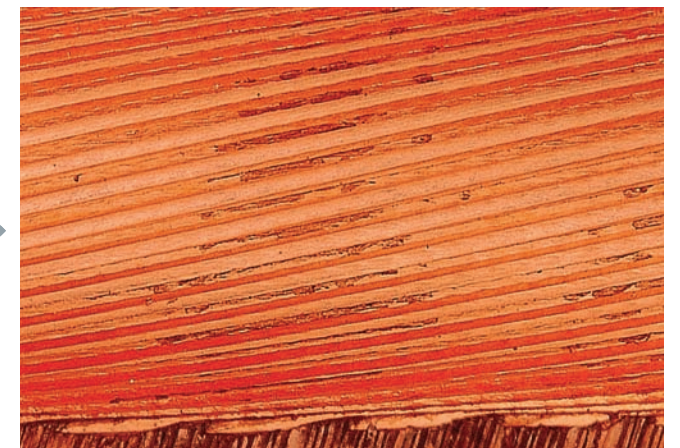
## High Dynamic Range (HDR) - Real Time

High Dynamic Range, an essential observation technology based on a Hirox original algorithm, reproduces a dynamic shutter range as a visual image. This function provides results through blending both the low and high boundaries of an image to give a clear and balanced result.

High Reflection Sample (Metal Tube) (40x)



Before



After

Transparent + Highly Reflective Sample (Connector) (120x)

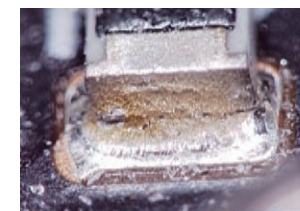


Before

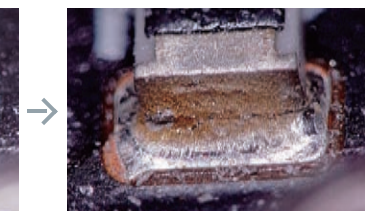


After

High + Low Reflection Surface Sample (Composite) (200x)



Before



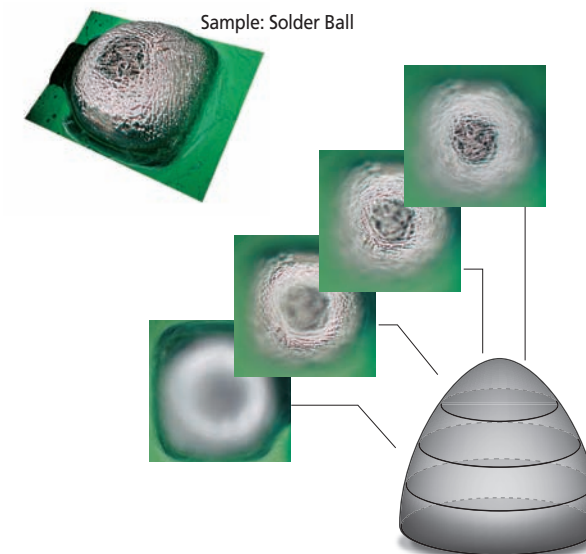
After

**New**

## Quick 3D - One Push Operation (Fastest for a DM)

Just tapping on the touch screen scans from the bottom to top and creates 3D. Intuitive software provides the end user the ability to automatically detect focal planes, eliminating time in the procedure. Indicate the bottom most focal plane, and let the system do the rest.

Sample: Solder Ball



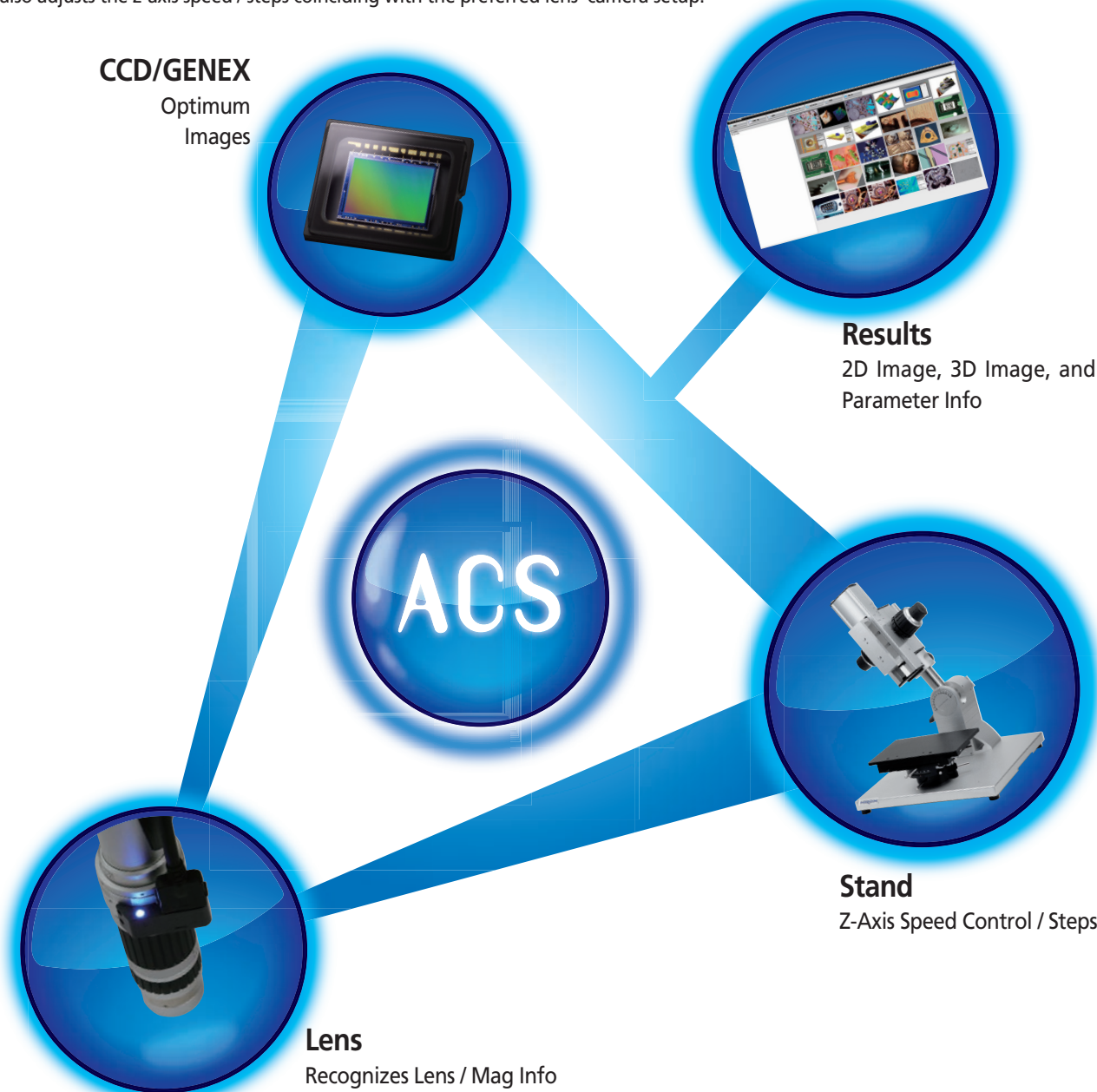
# Measurement

## Accurate Results with No Human Error

Incorporating various measurement technologies such as a highly accurate 3D measurement function, the KH-8700 outputs many values to answer your needs and objectives. In addition, the increased accuracy of measurement functionality has improved the usability for smarter and simpler operation.

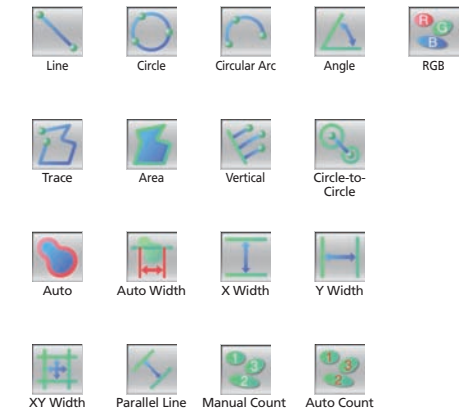
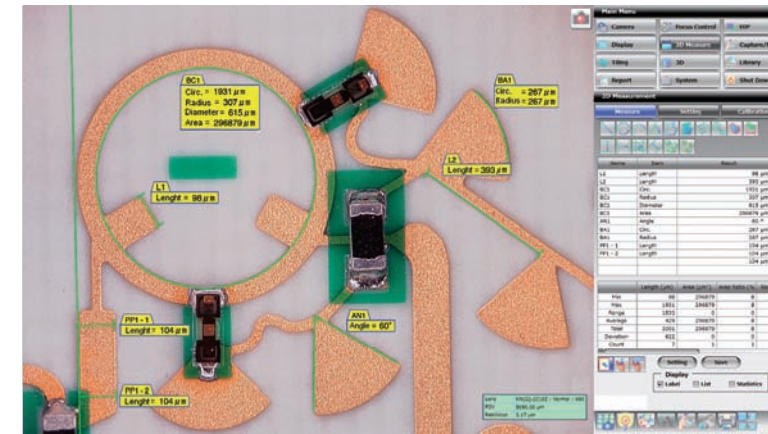
## The Unique Hirox ACS Communication

The Auto Calibration Select (ACS) sensor automatically applies the proper lens settings with each magnification or lens change, completely eliminating the need to choose proper calibration values. When a lens / mag is changed, the ACS feature also adjusts the z-axis speed / steps coinciding with the preferred lens' camera setup.



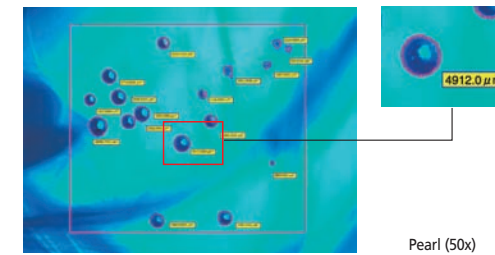
## 2D Measurement

Measurements including length, area, and surface area can be taken in various styles. Using only mouse operation, the object on the monitor can be measured in real-time. In addition, the actual dimension and measurement results can be saved on the capture image or as a CSV file.



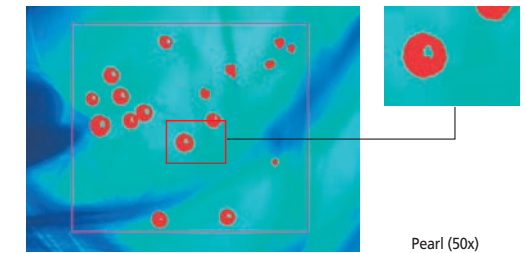
### Auto Count (Binarization)

Advanced software provides the end user the ability to auto-count particles, detect particle size and ratio.



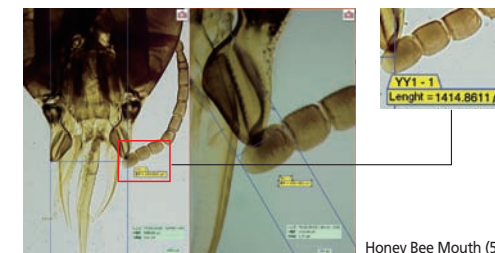
### Auto Count (RGB)

RGB function can be used to auto-count particles. Specify RGB color value or select a specific pixel, and the system automatically counts parts that have the same or similar RGB color.



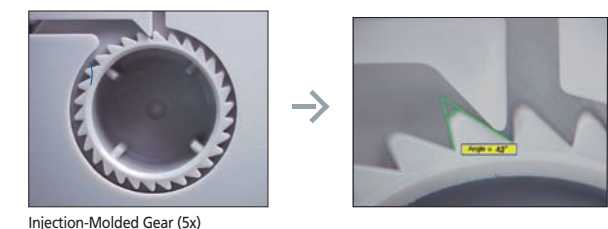
### Multi View Measurement

For the first time in the industry, Hirox is able to accurately use 2D measurement functions when splitting the monitor for multi-view display.



### Digital Zoom Measurement

By utilizing the real-time digital-zoom function, the end user can enhance pixels in order to locate the exact edge of a measurement, increasing accuracy and consistency.

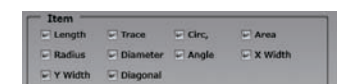


### Calibration / Lens Settings

Cleaning up the menu to improve work efficiency; it is now possible to display other lens manufacturer's information and hide Hirox lenses you do not own.

### Result Display Setting

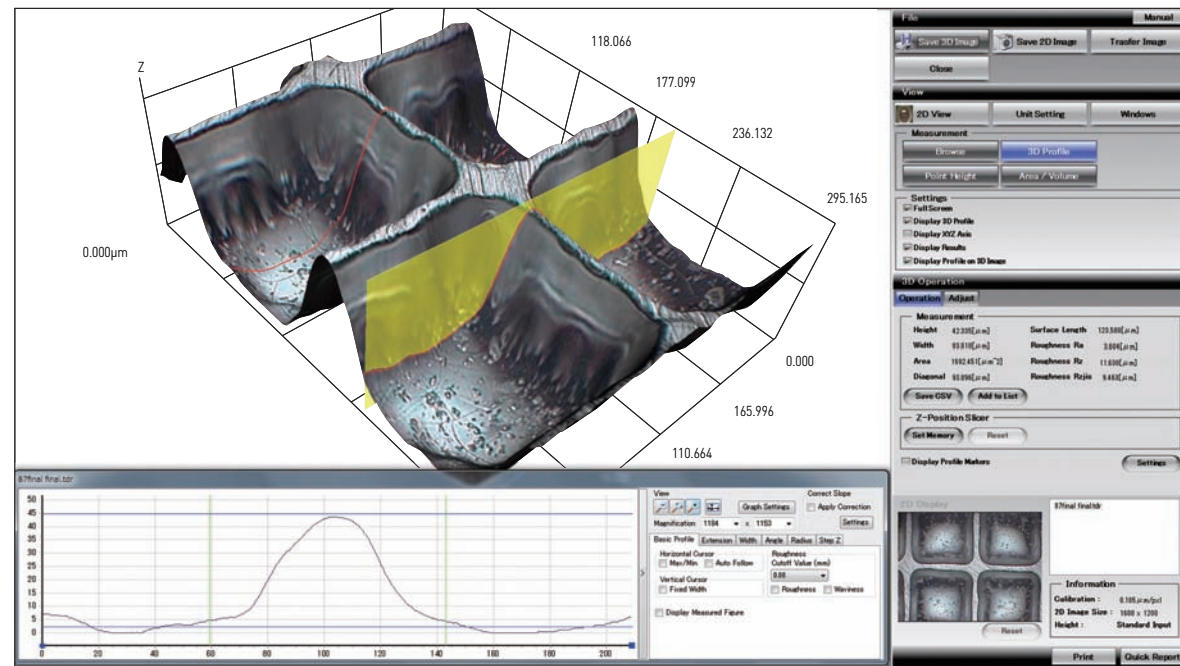
Based on your work scenario, measurement data displayed can be selected or deselected.



## Display in High Resolution 3D

# Fastest System to Create a 3D Model

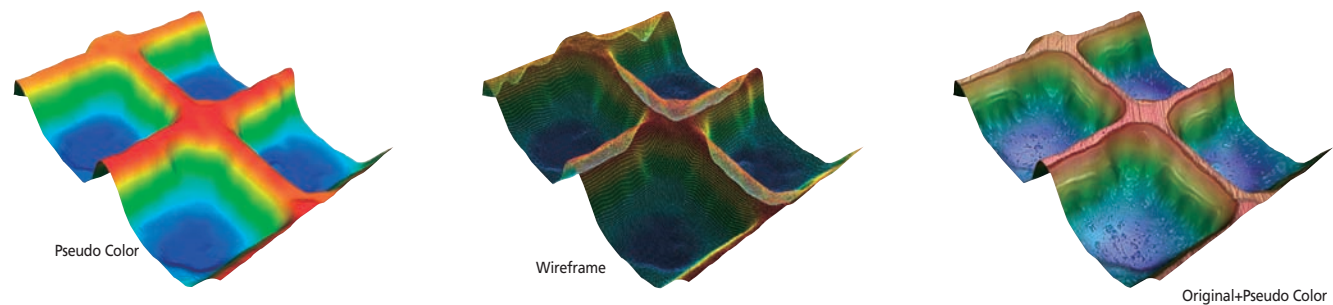
When capturing 10 image planes, it only takes 4 seconds to display a high quality 3D model. The integrated stepping motor allows for faster, smoother, and more accurate scanning with 0.05  $\mu\text{m}/\text{pulse}$  precision and 30 mm of automated travel. Paired with the CT-R01, controlling focus manually is a thing of the past.



3D Viewer

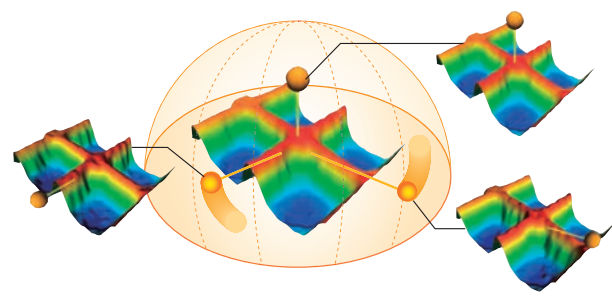
## 3D Display

3D model information can be displayed as original color, pseudo, or as a wireframe, maximizing the amount of information that can be taken from a 3D model. Original and pseudo color can be mixed on the 3D model.



## Lighting (Flashlight)

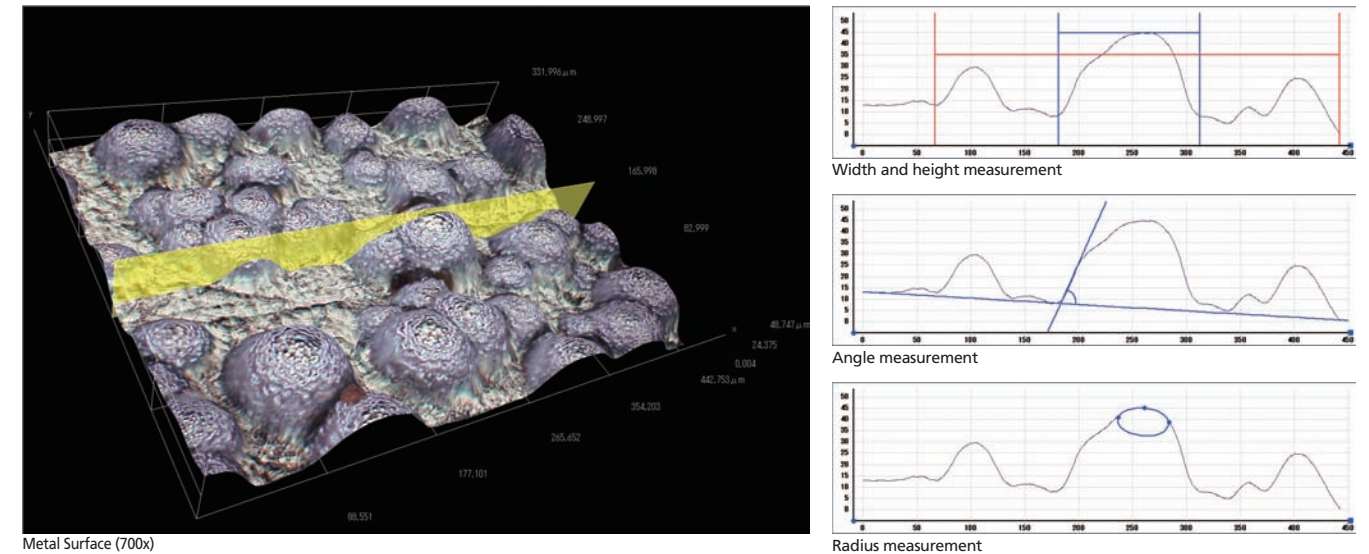
Manipulate the lighting digitally after building a 3D model in order to yield more data. Variable lighting through the software allows the end user to improve edge contrast after capturing.



## 3D Profile Measurement

# Numerical Data Supporting Accurate Analyses

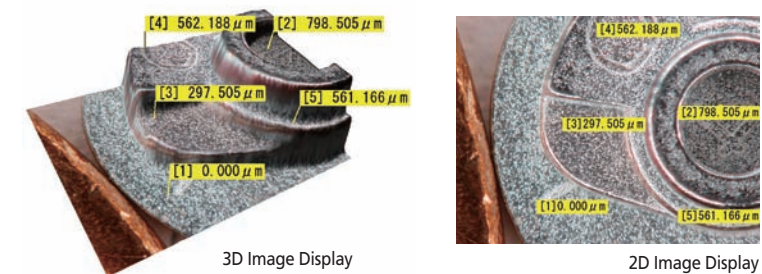
Quantify 3D data by associating the profile graph with the image display area. Intuitively measure 3D height information as well as have the capability to extract angle and radius data.



Metal Surface (700x)

## Point Height Measurement

Display point height by simply clicking on the 3D model. With each click, height value labels are displayed from a standard zero point or a zero point can be set (new reference point) to a specific position on the model. Point height measurements are possible in both 2D and 3D rendered images.

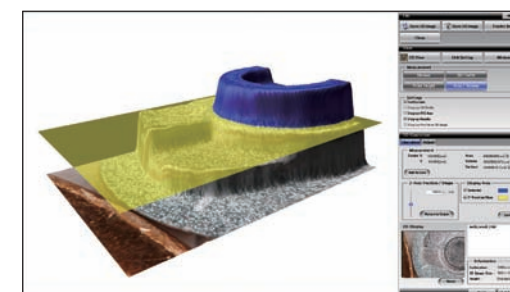


3D Image Display

2D Image Display

## Volume and Area Measurement

The operator can adjust the slicer to measure volume, surface and cross-section area on the 3D model.



## Roughness Measurement (Ra, Rz, Rzjis)

Engineering advances in the KH-8700's software includes profile line Roughness measurements giving the end user more quantitative data than before.

## Level Correction

The level correction feature gives the end-user the ability to adjust the surface on the image without touching the sample.

## Noise Filter and Reduction

The advanced Noise Filter reduces unwanted static and provides a more clear image.

## Export 3D Models Files by CSV Format

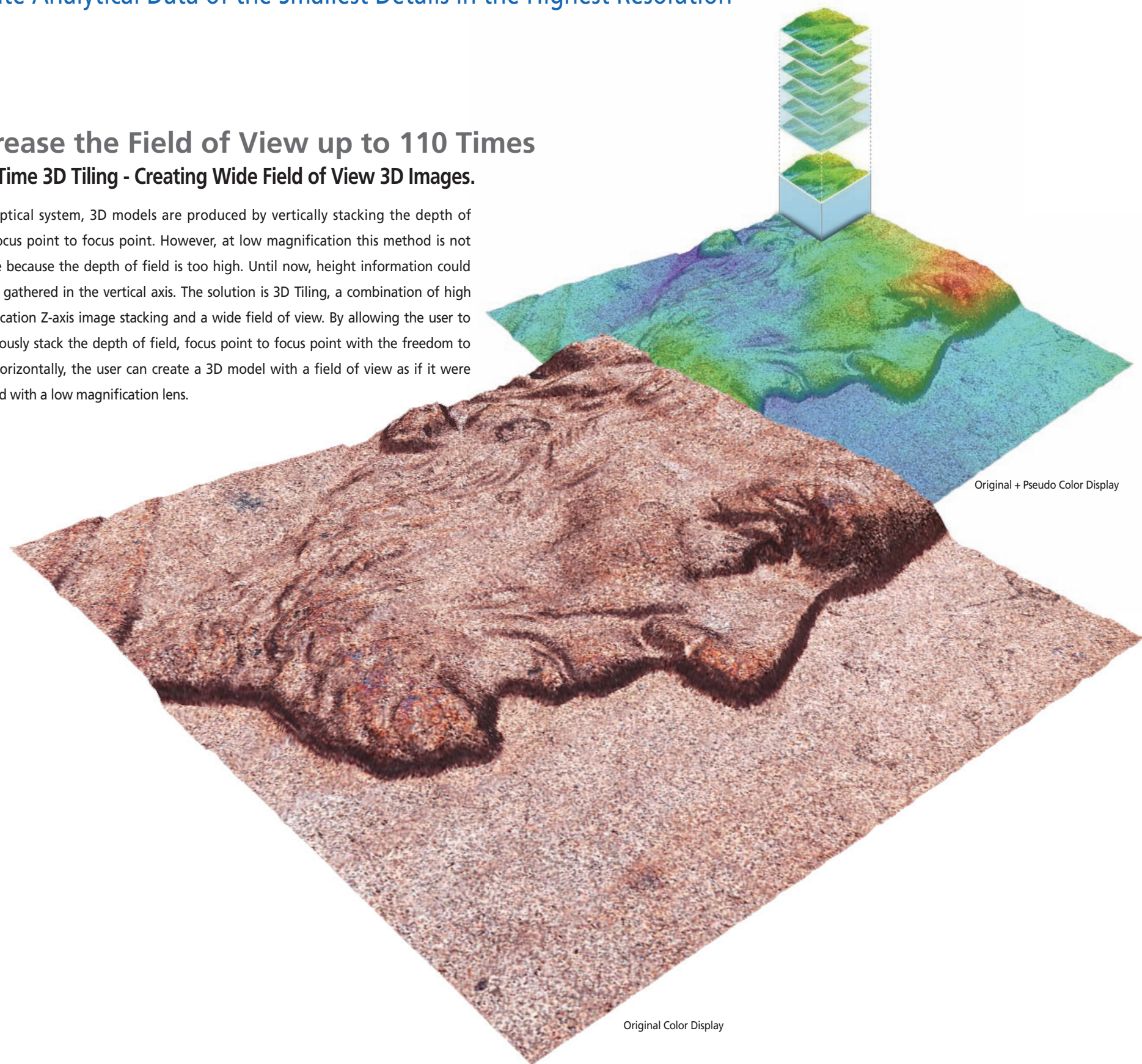
The 3D models can be exported as a CSV file format into any other 3D analysis application software.

# Capture and Record

Create Analytical Data of the Smallest Details in the Highest Resolution

## Increase the Field of View up to 110 Times Real-Time 3D Tiling - Creating Wide Field of View 3D Images.

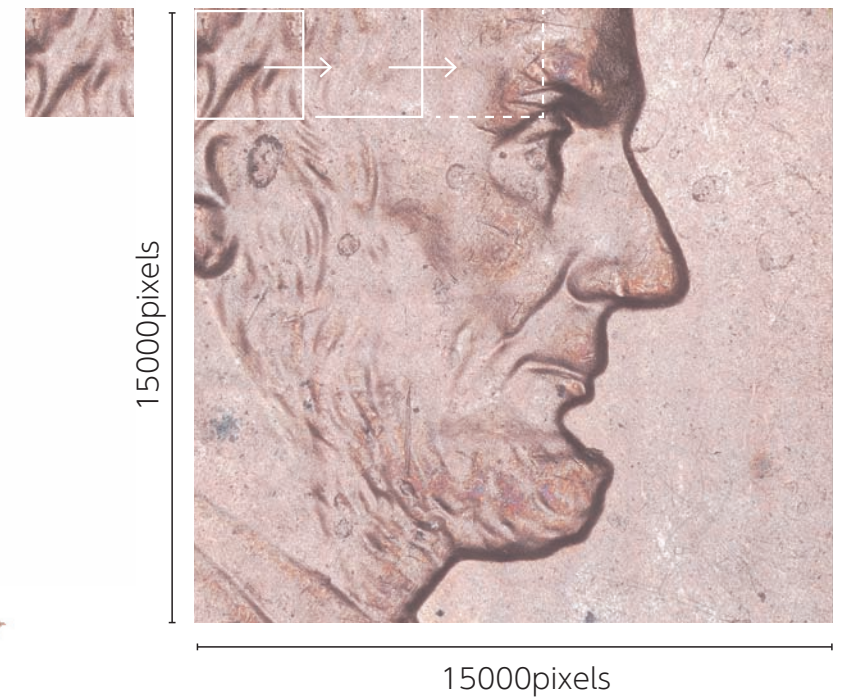
In an optical system, 3D models are produced by vertically stacking the depth of field, focus point to focus point. However, at low magnification this method is not possible because the depth of field is too high. Until now, height information could only be gathered in the vertical axis. The solution is 3D Tiling, a combination of high magnification Z-axis image stacking and a wide field of view. By allowing the user to continuously stack the depth of field, focus point to focus point with the freedom to move horizontally, the user can create a 3D model with a field of view as if it were captured with a low magnification lens.



### Real-Time 2D Tiling Feature

## A Hirox Original Algorithm Achieves Quick and Seamless Tiling

It is a constant challenge for optical microscopes to capture with a high optical resolution and a wide field of view simultaneously. This new process does not require a specified position to match tile to tile. The image will automatically begin tiling seamlessly in real-time just by moving the XY stage. This Hirox original method increases the field of view from 1200 x 1600 pixels up to 15,000 x 15,000 pixels while retaining a high optical resolution.



### Easy Operation and High Speed Processing

All you have to do is move the XY stage and the image will be tiled automatically by the software.



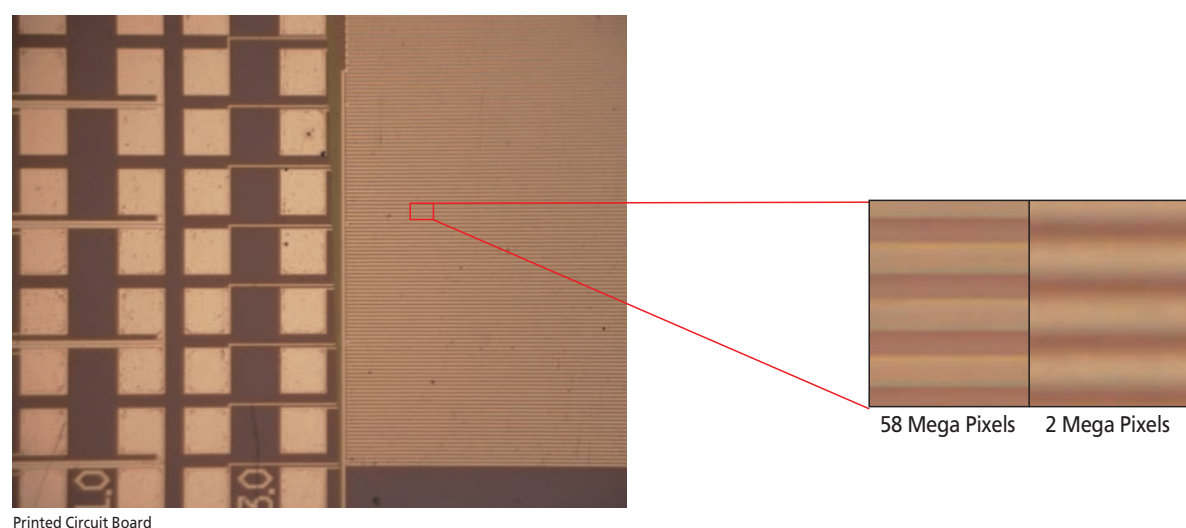
Moving the XY Stage

# EDP (Enhanced Digital Processing)

To perfect an on-screen image, Hirox has created an Enhanced Digital Processing feature to improve images to the desired outcome.

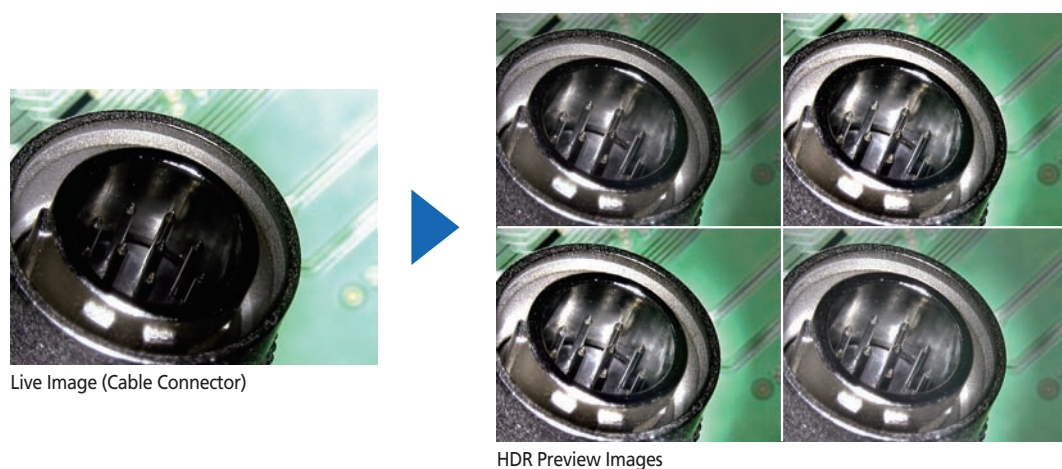
## New 58 Mega Pixel High Resolution Image

Constantly improving with technology, 58 mega pixel images are now supported to provide optimal resolution and on-screen clarity, also decreasing aliasing noise (pixilation) when controlling real-time digital zooms.



## Preview Function for HDR, Anti-Halation and 3D Models

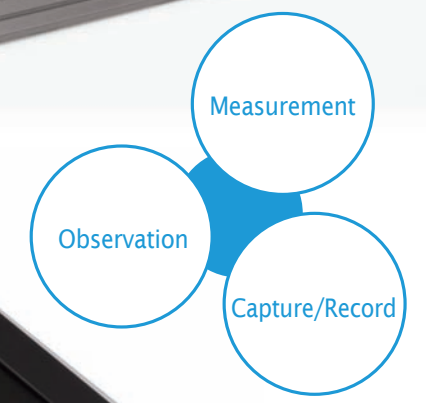
Preview your adjustments before processing an image. Various options are now imbedded into the KH-8700 to further broaden the field for image selection. Not only is this possible for HDR and Anti-Halation images, but 3D models as well.



New

## Offering Seamless Observation, Measurement, and Capture/Record Remote Device (CT-R01)

The user friendly controller simplifies operation by integrating all functions with a touch-screen. The remote device provides quick and easy operation. Main functions are displayed on the remote's home-screen for easy access. In addition, the device allows adjustments of shutter speed, the ability to quickly auto-white balance, and control Z-Axis movement as well as rotary speed/direction.



### Large Touch Screen

4.3 inch monitor provides easy access to features.

### Clear and Easy Menu

The menu was designed with icon and text to prevent confusion.

### Jog Shuttle

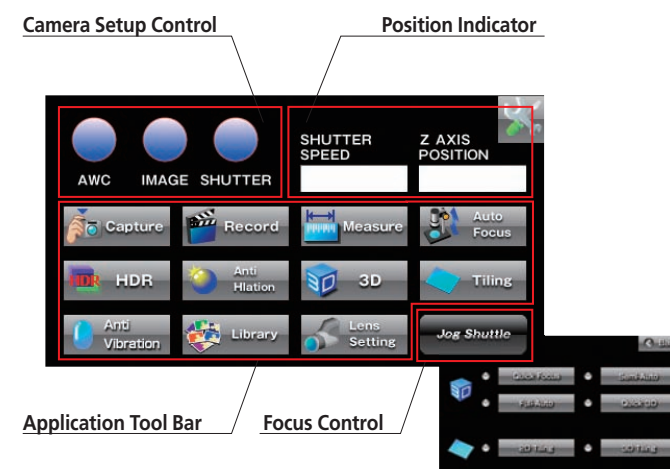
Controlling motorized Z-Axis and rotary head.

### Lighting Level Knob

Adjusting the lighting level of the on screen image.



### Remove Device Menu Screen



### Camera Setup Control -

Contains features such as white balance, image adjustment, and shutter speed.

### Position Indicator -

This area indicates camera shutter speed and Z Axis position.

### Application Tool Bar -

Simple operation allows one touch capture, recording, measurement, Auto Focus, HDR, and much more.

### Focus Control -

Allows control by the jog dial of functions such as Z-axis movement and rotation speed.

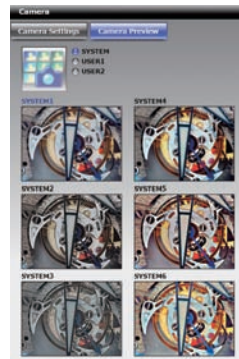


## Easy Operation Features

Designed for efficient interaction, an array of Hirox features help problems become solutions.

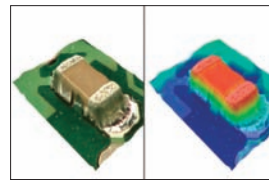
### Camera Preview

In the Camera Preview function, display a variety of images for different perspectives to choose from. Adjust edge, chroma, and contrast, and have the ability to customize each image displayed with user preferences.



### Split Window (Multi-View)

Multiple images can be simultaneously displayed for comparison. You can split the screen horizontally / vertically, or divide the screen into 4 windows. First in the industry to be able to access all functions when splitting the screen into vertical / horizontal comparisons or multi-view comparisons.



### Anti-Vibration (Camera Stabilization)

Some working environments can cause constant micron level shaking on microscopy stages. A solution to this problem is Hirox's new Anti-Vibration feature improving observations in adverse conditions.



Cutting Bit (20x)  
[Before Image Stabilization]

Cutting Bit (20x)  
[After Image Stabilization]

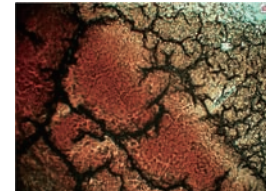
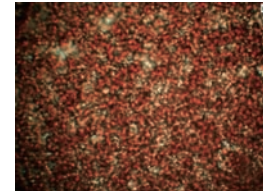
### Quick Launch

A quick launch feature is always present on screen to easily go to various controls that are most used. These controls include lighting adjustment, image capture, a print tab, and other shortcuts.



### Time Lapse

The KH-8700 can automatically take a sequence of frames at a specified interval to record changes over a set duration. To help reduce energy consumption, the LED lamp is only turned on when necessary.

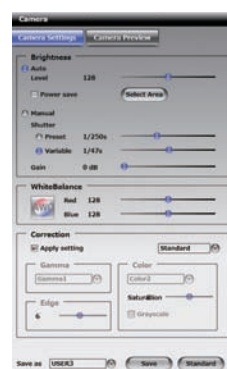


Blood Serum (1500x)  
[Recording Starts]

Blood Serum (1500x)  
[Recording Ends]

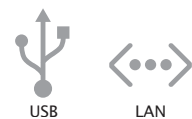
### Camera Set-Up / Individual User

A log-in screen helps distinguish users in a multi-user work environment. Personal preferences such as system settings and image data can be saved to a unique user profile. This is particularly helpful with numerous operators each making observations and measurements on different objects.



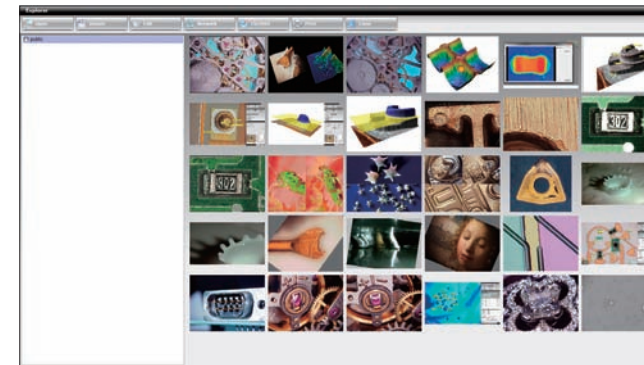
### External Ports

The KH-8700 system allows users to export/import data easily through 6 USB ports and a LAN port. Duplicating the screen is also quickly achieved through both an RGB port and a digital display port to connect via HDMI.



### Library – Explorer

Cover all storage access through the Explorer tab. Organize files by selecting the detail setup. Be able to edit, connect to a network, burn files to a CD/DVD, and print any file directly from the Library.



### Easy Report Writer

Save time by quickly transferring image files into the Easy Report Writer in order to make presentations. Several different templates are available or customize templates to taste. Reports can be printed, saved, or exported to spreadsheet applications.



## Auto XY Stage

### Total Imaging Solutions Motorized XYZ Axis Stage

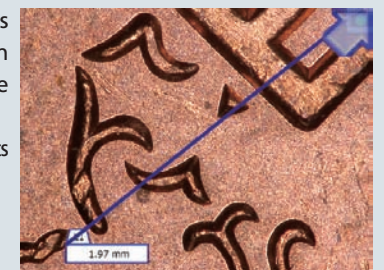
#### Click Observation

XY Stage can be moved around by double clicking or dragging the mouse in the direction of travel on screen. Double-click can be combined with auto-centering as well as auto-focus function simultaneously.



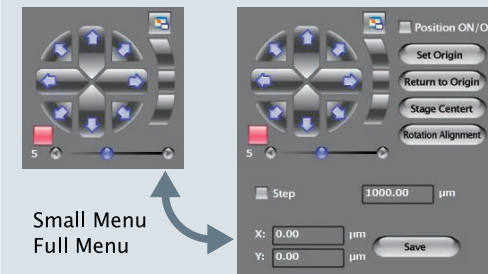
#### Extended Measurements

Extends 2D measurements beyond the field of view on a live image without the need for tiling. Makes low mag measurements at higher magnifications.



#### Control Panel

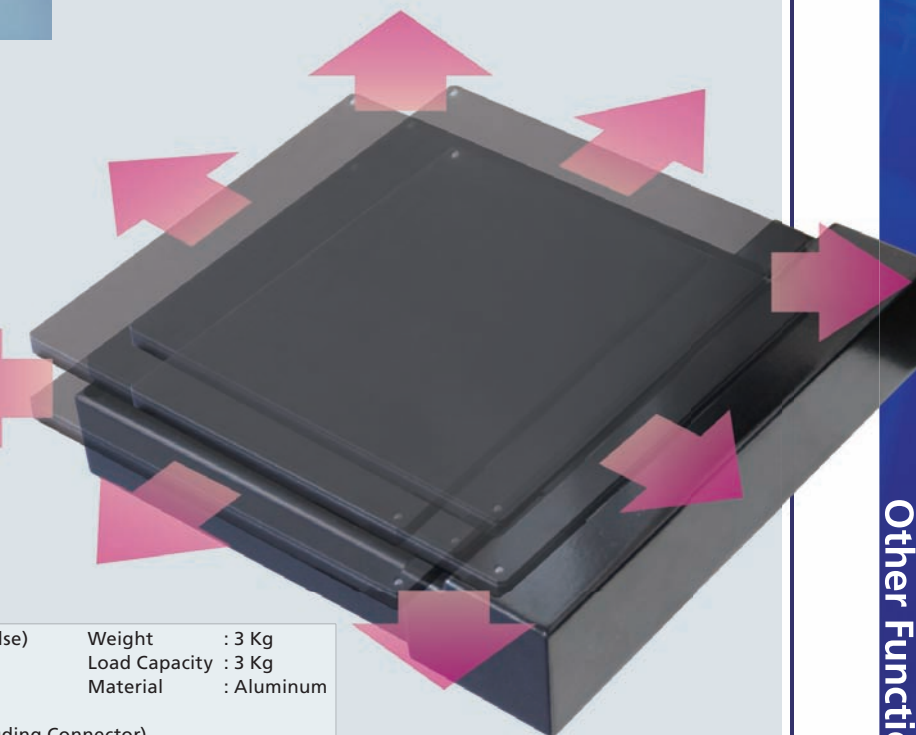
Easily operates the auto XY stage utilizing the KH-8700 software. This control panel can also be control with the keyboard.



Small Menu  
Full Menu

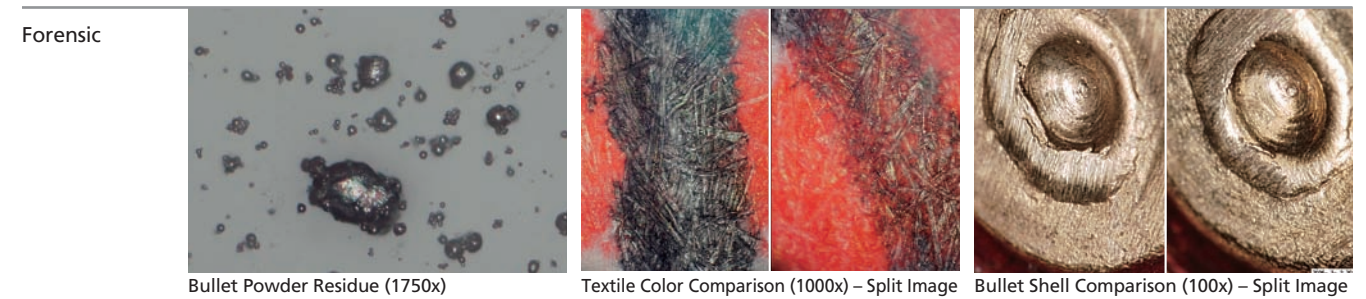
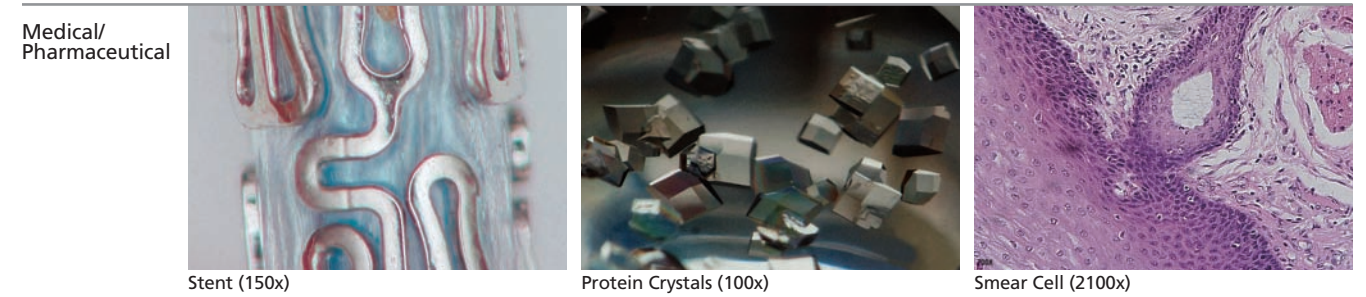
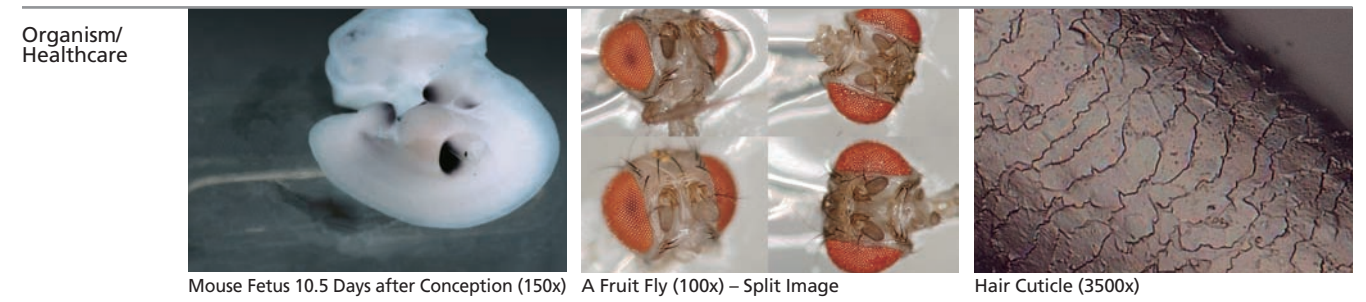
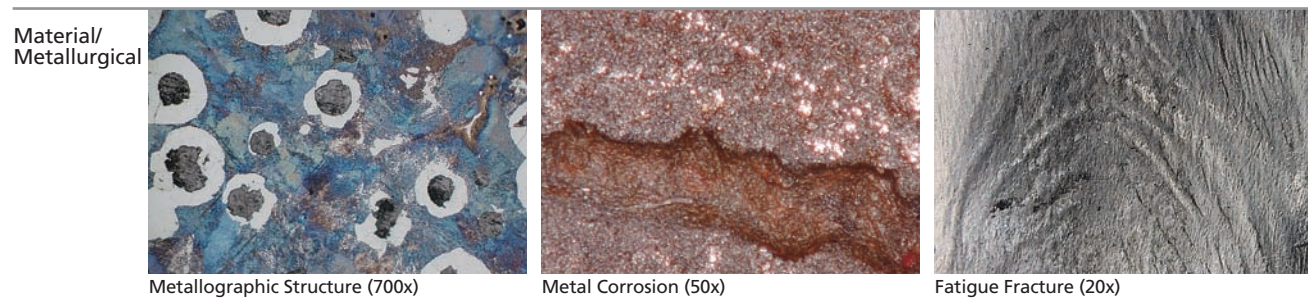
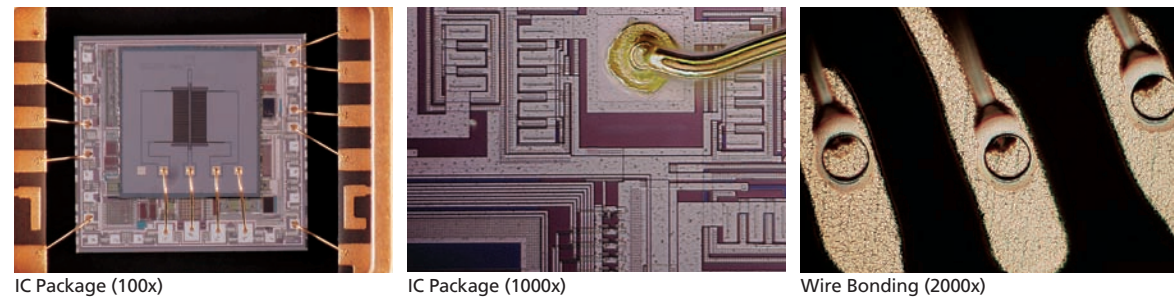
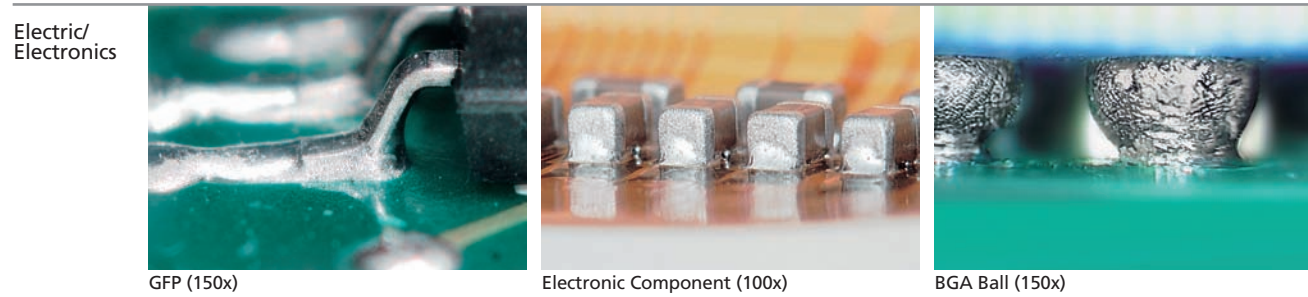
#### Specification

|                         |   |               |            |
|-------------------------|---|---------------|------------|
| Motor                   | : 5 Phase Stepping Motor (1µm/pulse)            | Weight        | : 3 Kg     |
| Resolution (Micro Step) | : 0.1µm = 1/20                                  | Load Capacity | : 3 Kg     |
| Working Range           | : X = 50 mm, Y= 50 mm                           | Material      | : Aluminum |
| Stage Maximum Speed     | : 10 mm / sec                                   |               |            |
| Dimension(W/D/H)        | : 250 mm / 223mm / 62.5 mm(Excluding Connector) |               |            |



# Applications

Creating a Wide Array of Applications for the Demands of Numerous Industries



# Lenses

High-resolution, high-precision, and high depth of field optical lenses made for everyday measurements. The MX(G) lenses can be used for highly complex 2D and 3D measurements down to the micron level.

## High Resolution Macro Zoom Lens

### MXG-MACROZ VI / MX-MACRO VI

0x-50x



The multi-functional macro zoom lens can achieve a view of the entire object and a magnification of up to 50x. A light source guide is integrated into the lens for diverse environments. This lens can be switched from a ∞-5x magnification lens to a 5x-50x par-focal magnification lens.



| Model            | MX - MACROZ VI / MXG - MACROZ VI |                        |
|------------------|----------------------------------|------------------------|
| Magnification    | ∞ - 5x                           | 5 - 50x                |
| View (mm / inch) | - 61 / - 2.4"                    | 61 - 6.1 / 2.4 - 0.24" |
| Working Distance | - 90 / - 3.54"                   | 90 / 3.55"             |
| ACS Option       | N/A                              | Yes                    |

## Low Range High Resolution Zoom Lens

### MXG-2016Z / MX-2016Z

20x-160x (6x-320x)



The high-performance zoom lens has a compact body, provides a high resolution image, and offers a large optical depth-of-field with the ability to utilize an even larger digital depth-of-field. The lens can be handheld and accommodates numerous applications through the attachment of 13 various adapters covering a magnification range of 6x-320x.



| Model           | MX - 2016Z / MXG-2016Z     |                              |                            |                           |
|-----------------|----------------------------|------------------------------|----------------------------|---------------------------|
| Adapter         | Normal                     | Low                          | High                       |                           |
| Magnification   | 20 - 160x                  | 6 - 48x                      | 40 - 320x                  |                           |
| mm / inch       | Working Distance           | 44 / 1.73"                   | 132 / 5.2"                 | 20 / 0.79"                |
|                 | Horizontal View            | 15.4 - 2.0 / 0.61 - 0.08"    | 50.8 - 6.35 / 2 - 0.25"    | 7.62 - 0.95 / 0.3 - 0.04" |
| Depth of Field* | 13.3 - 0.25 / 0.52 - 0.01" | 170.45 - 4.20 / 6.71 - 0.17" | 3.02 - 0.10 / 0.12 - 0.04" |                           |
| ACS Option      | Yes                        |                              |                            |                           |

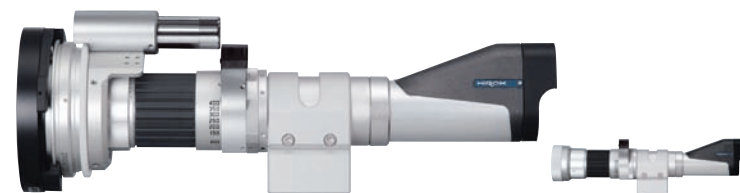
## Middle Range High Resolution Zoom Lens with Optical 3D Rotation

### MXG-5040RZ (SZ) / MX-5040RZ (SZ)

50x-400x (20x-800x)



This universal lens can be equipped with a wide selection of optical adapters. Attaching the rotary head adapter allows 360 Degree revolution with the ability to inspect at multiple angles. The various exclusive adapters snap-on, allowing one-touch replacement and a magnification range that expands observation from 20x-800x.



| Model           | MX - 5040RZ (SZ) / MXG-5040RZ (SZ) |                             |                                |                             |
|-----------------|------------------------------------|-----------------------------|--------------------------------|-----------------------------|
| Adapter         | Normal                             | Low                         | High                           |                             |
| Magnification   | 50 - 400x                          | 20 - 160x                   | 100 - 800x                     |                             |
| mm / inch       | Working Distance                   | 54 / 2.13" (63 / 2.48")     | 80 / 3.15" (80 / 3.15")        | 20 / 0.79" (29 / 1.14")     |
|                 | Horizontal View                    | 6.1 - 0.78 / 0.24 - 0.03"   | 15.4 - 2.0 / 0.61 - 0.08"      | 3.05 - 0.39 / 0.12" - 0.02" |
| Depth of Field* | 2.7 - 0.08 / 0.11" - 3.15 mil      | 16.81 - 0.58 / 0.66 - 0.02" | 0.68 - 0.02 / 0.03" - 0.79 mil |                             |
| ACS Option      | Yes                                |                             |                                |                             |

## High Range / High Resolution 10x Co-Axial Zoom Lens

### MXG-10C / MX-10C

35x-7000x



The high range optical zoom lens incorporates high expandability and the highest resolution in the MX(G) series. With six interchangeable objective lenses, the lens covers a magnification range of 35x-7000x. A directional lighting adapter is provided for co-axial vertical lighting to achieve intricate optical observation.



| Model           | MXG-2500 REZ                   |             |             |              |             |              |             |
|-----------------|--------------------------------|-------------|-------------|--------------|-------------|--------------|-------------|
| Lighting Method | Co-Axial, Dark Field and Mixed |             |             |              |             |              |             |
| Objective Lens  | OL - 35                        | OL - 70 II  | OL - 140    | OL - 140 II  | OL - 350 II | OL - 700II   |             |
| Magnification   | 35 - 350x                      | 70 - 700x   | 140 - 1400x | 140 - 1400x  | 350 - 3500x | 700 - 7000x  |             |
| mm / inch       | Working Distance               | 34 / 1.34"  | 21 / 0.83"  | 30.5 / 1.20" | 12 / 0.47"  | 10.6 / 0.42" | 3.4 / 0.13" |
|                 | Horizontal View                | 9.83 - 1.05 | 4.42 - 0.47 | 2.46 - 0.26  | 2.21 - 0.23 | 880 - 90 um  | 440 - 40 um |
| ACS Option      | Yes                            |             |             |              |             |              |             |

**New**

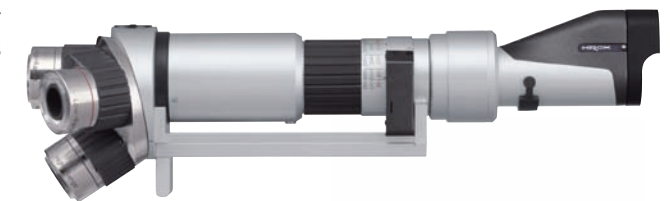
## Dual Illumination Revolver Zoom Lens

### MXG-2500REZ

35x-2500x

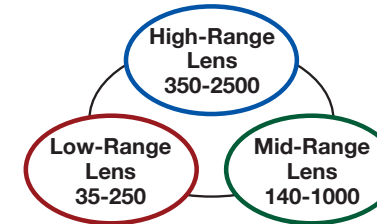


Incredibly wide zoom range with a triple objective turret. The dual illumination mechanism provides both co-axial and ring lighting. The operator is free to choose either setting or a mix of both in order to cover a multitude of applications. The lighting system is integrated into the lens and no additional cables are required.



### Field of View from 8 mm ~ 0.12 mm

Turning the turret allows the operator to access each objective lens with an optical zoom range over 70 times the minimum magnification. Lens parfocality allows for sustained focus across the entire magnification spectrum from 35x-2500x. The ACS is integrated and recognizes the objective lens positioning as well as the zoom level.



| Model           | MXG-2500 REZ                   |                |                |
|-----------------|--------------------------------|----------------|----------------|
| Lighting Method | Co-Axial, Dark Field and Mixed |                |                |
| Range           | Low-Range                      | Mid-Range      | High-Range     |
| Magnification   | 35-250x                        | 140x-1000x     | 350x-2500x     |
| mm / inch       | Working Distance               | 10 mm / 0.39"  |                |
|                 | Horizontal View                | 8.71 - 1.22 mm | 2.18 - 0.31 mm |
| ACS Option      | Yes                            |                |                |

# Lenses

Highly Compact, Extensive Field-of-View Macro Lens

## MX-MACRO IV / MX-020Z-US:

∞-50x / ∞-20x



|               |                  |                   |
|---------------|------------------|-------------------|
| Model         |                  | MX - MACROZ IV    |
| Magnification |                  | 0 - 50x           |
| mm / inch     | Horizontal View  | ∞ - 6.1 / 0.24"   |
|               | Working Distance | ∞ - 21.44 / 0.84" |
| ACS Option    |                  | N/A               |



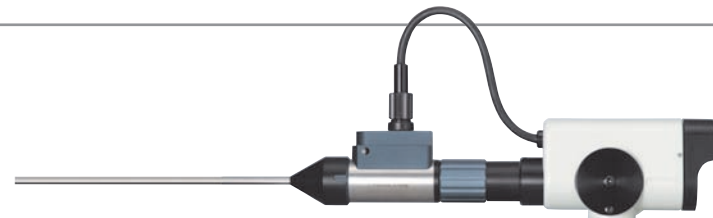
|               |                  |                  |
|---------------|------------------|------------------|
| Model         |                  | MX - 020Z-US     |
| Magnification |                  | 0 - 20x          |
| mm / inch     | Horizontal View  | ∞ - 15.4 / 0.61" |
|               | Working Distance | ∞ - 19 / 0.75"   |
| ACS Option    |                  | N/A              |

### Designed Simply to Support an Incredible Field-of-View

The aperture function varies lighting, and the magnification is correlative with working distance, expanding on available options for macro inspection, and image capture.

Straw-Scope Lens

## MX-STZ Lens:



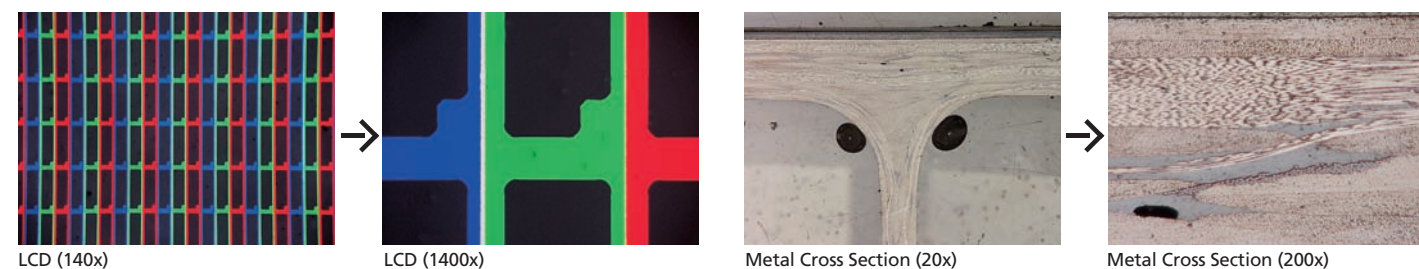
### The Straw-scope Lens allows Observation in Congested Areas

The sleeve is designed with independent optical and lighting systems to achieve an outstanding resolution impossible for existing optical straw-scopes. Additional optical magnification allows the image to be rectangular instead of circular.

| Model     | MX - STZ           | 25-128      | 40-120       | 40-245      | 58-135      | 58-275       |
|-----------|--------------------|-------------|--------------|-------------|-------------|--------------|
|           | AD-STL             |             |              |             |             |              |
| mm / inch | Outer Diameter     | 2.8 / 0.11" | 4.0 / 0.16"  | 4.0 / 0.16" | 4.0 / 0.16" | 5.8 / 0.23"  |
|           | Effective Length   | 125 / 4.92" | 120 / 4.27"  | 245 / 9.65" | 135 / 5.31" | 275 / 10.83" |
|           | Direct View        |             |              |             |             |              |
|           | View Angle         |             |              |             | 40°         |              |
|           | Adapter View Angle |             |              |             | 90°         |              |
|           | Adapter Diameter   |             | 3.05 / 0.12" | 4.5 / 0.18" | 4.5 / 0.18" | 6.3 / 0.25"  |

## Wide Range Optical Zoom Lens

Hirox MX(G) lenses cover a large optical zoom range and even more than 10x by switching adapters. The par-focal MX(G) lenses retain working distance across the entire zoom range, target and accurate measurement to adjust the best focus point in the low magnification range. This provides efficient operation in finding the target and making accurate measurements by adjusting the best focus point in the low magnification range.



**New**

## Easy and Accurate BGA Exterior Observation

MX-BGAZ II:

Inspect the shape of all the components. The mode-switch ring changes from normal to wide mode enabling not only detailed observation of the BGA, but also confirmation of surrounding component integrity.



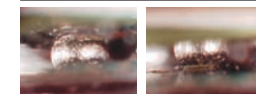
|                        |   |
|------------------------|---|
| Prism chip structure   | Soft spring structure for protecting substrates |
| Prism adaptation width | 0.9mm   |
| Observation angle      | 90 degrees or higher                            |
| Illumination methods   | Optical multi illumination                      |
| Magnification          | 100 - 180x power *1                             |
| Operational distance   | 0.9 - 8.0mm *2                                  |
| Weight                 | 695g  |
| ACS                    | No  |

\*1: Mode Switch Ring set to 'Normal' magnification.

\*2: Distance from the Prism tip to the BGA ball.

Rotate the Lens for Large PCBs

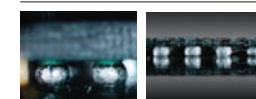
### Optical Rotary Ring



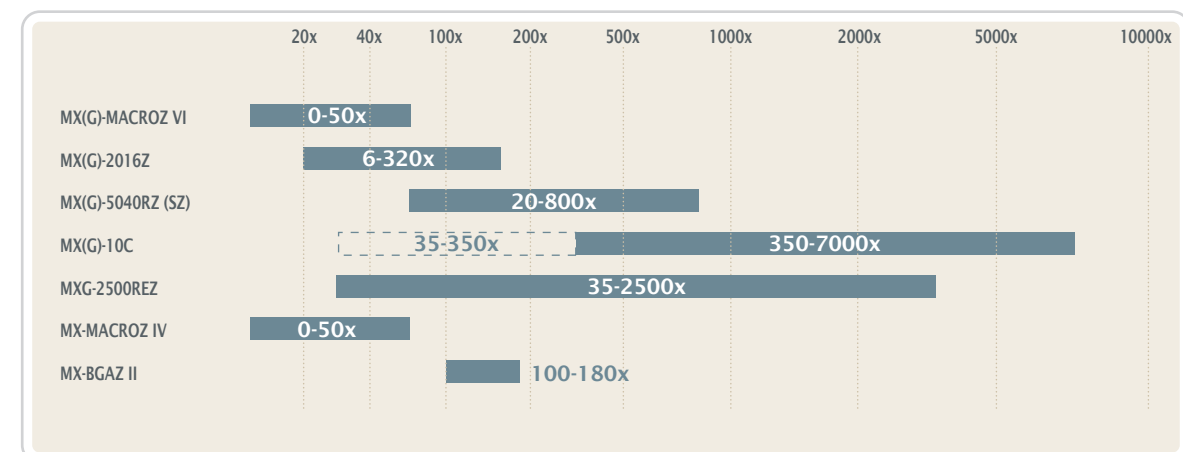
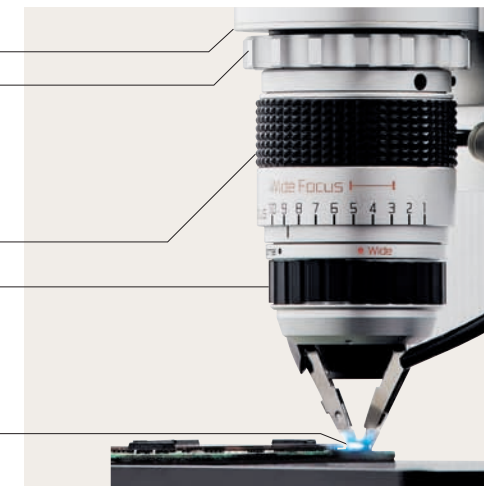
Upper Connection Lower Connection

### Focus Ring

### Mode Switch Ring



### Prism Chip



# Optical Adapters

Acquire Various Views of the Object Using Hirox Original Optical Adapters

## Variable Angle Lighting Adapter

This adapter varies the lighting angle from vertical to lateral. This is effective for detecting scratches, burns and blotches.



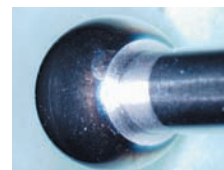
Coin (20x)  
[Vertical Lighting]



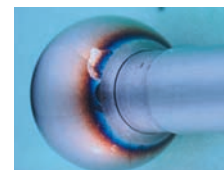
Coin (20x)  
[Lateral Lighting]

## Diffuse Lighting Adapter

Producing diffused and soft illumination in every direction, this adapter reduces strong reflections, allowing clear observations of metallic surfaces without halation.



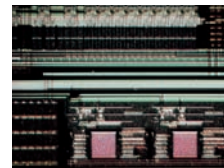
Ball Joint (40x)  
[Vertical Lighting]



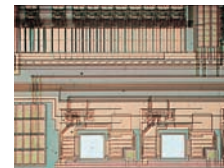
Ball Joint (40x)  
[Diffuse Lighting]

## Co-Axial Lighting Adapter

Observation through lighting that is parallel with the lens axis can be difficult to ascertain and inspect intensely reflective surfaces. With this adapter, the light is reflected perpendicular to the lens axis.



IC Pattern (1400x)  
[Dark Field Lighting]



IC Pattern (1400x)  
[Bright Field Lighting Using Co-Axial Lighting]

## Co-Axial Directional Lighting Adapter

In comparison with standard high-resolution bright field images, this adapter can help clearly identify shapes on extremely microscopic surfaces.



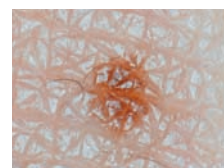
Bottom of a Can (250x)  
[Vertical Lighting]



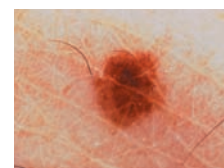
Bottom of a Can (250x)  
[Co-Axial Directional Lighting]

## Polarizing Adapter

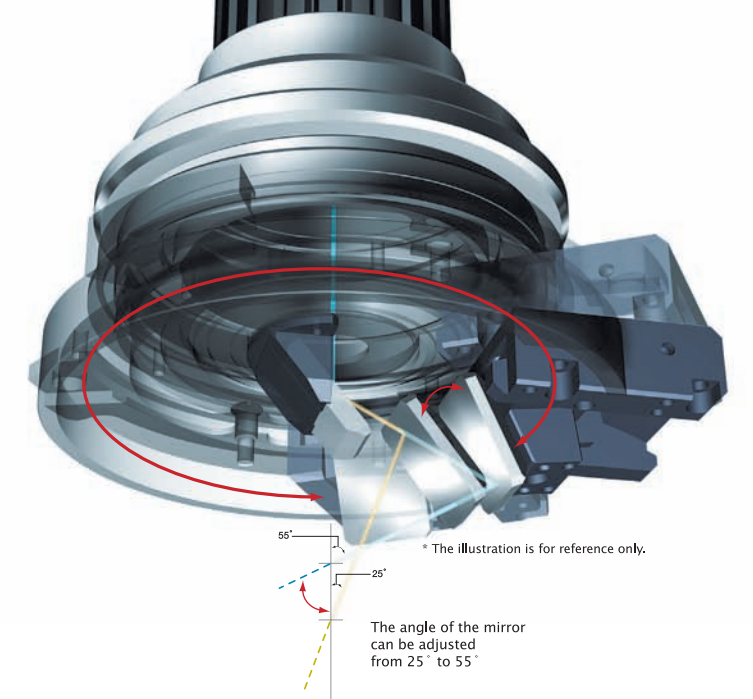
Polarizing filter is specialized to change the multi-directionality of natural light wave patterns and hones them to eliminate surface reflection and aid in the analysis of surface colors.



Freckle (50x)  
[Lateral Lighting]

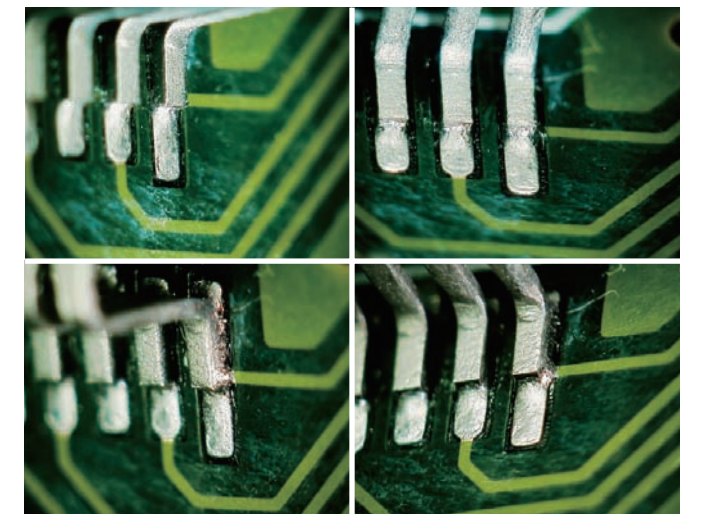


Freckle (50x)  
[Polarized Lighting]



## 3D Rotary Head Adapter

These adapters rotate the mirrors to allow 360° observation of a subject's sides. The rotation makes it possible to easily obtain an understanding of the subjects shape. Subject size is of no concern. These adapters are HIROX original designs.



QFP Contacts (30x) (45° Observation Angle)  
[Solder Application]

## Easy Control of the Angle, Rotational Direction, and Speed

With the variable angle rotary-head, subjects can be captured as desired by operating a 360° degree rotating mirror vertically within 25 to 55 degrees. Rotation, direction, and speed can be controlled from software or remote device.

**New**

## DIC Adapter (Differential Interface Contrast)

DIC is a beam-shearing interference system in which the linear polarized light is sliced into two rays. The technique produces a monochromatic image that effectively displays topography on the specimen. Depending on the difference in wavelength of the optical paths, a single shading streak on the brightest and darkest parts of the object's height difference can be observed over one hundred nanometers.



Indentations of LCD Conduction Poles (200x)  
[Bright Field Lighting]



Indentations of LCD Conduction Poles (200x)  
[Differential Interference]

# Stands

## High Precision Straight and Free Angle Stand

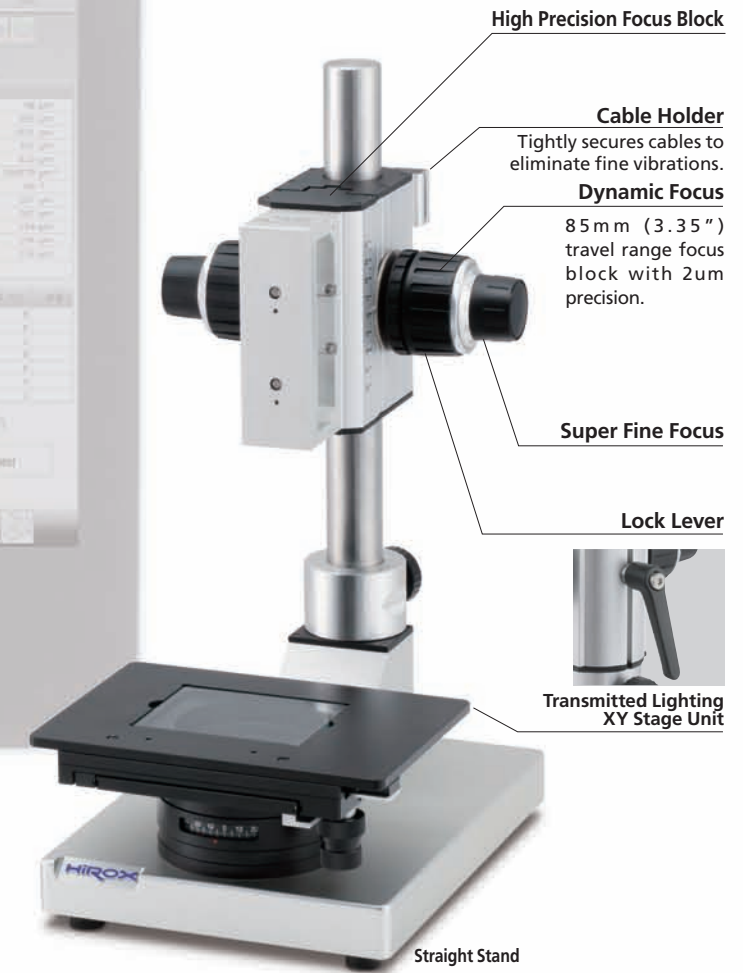
A high performance lens only shows its power when it is operated. It is the stand that connects the lens to the operator's hand, meaning that the stand must have a high level of precision and be easy to use. The operator is free to choose 180 degrees of inclination and 360 degrees of stage rotation for target observation. This is combined with the option of the Electronic Focus Block (0.05um/pulse) for 3D observation and height measurements.

### Dynamic Focus Control

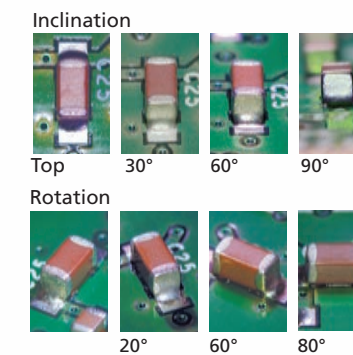
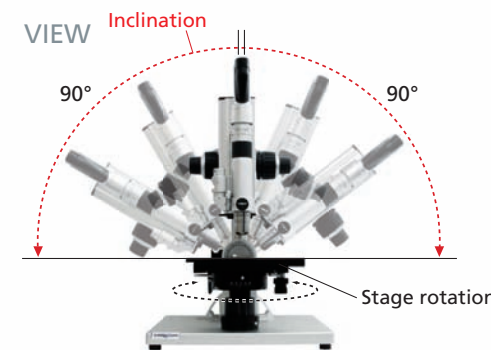
With the motor controller built into the main unit, the stand is able to easily achieve extremely high precision. The stand also has an incredibly long travel range with 30mm of motor controlled travel and 85mm of manually controlled travel.



Free Angle Stand

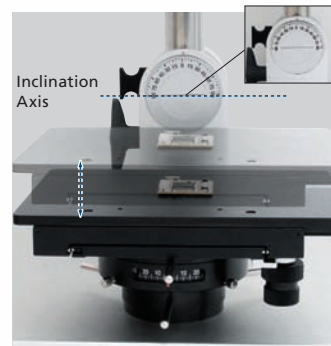


Straight Stand



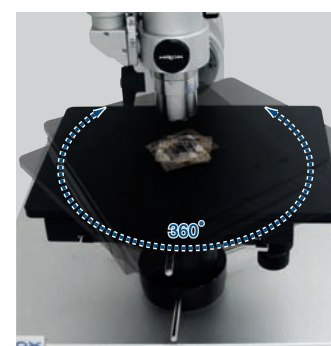
### [Stage] Stage Z-Movement

Easy Z-axis movement allows stress free inclination.



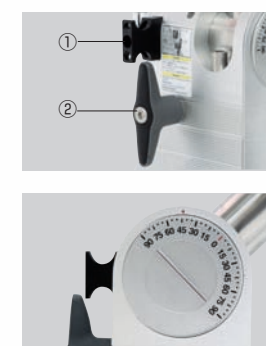
### [Stage] Flexible Operation

Reach unattainable angles with 360° rotation.



### [Control Part] Angle Adjustment

Inclinations safely stop at 45°, 60°, 90° and any angle within 180 degrees can be secured with the lock lever.



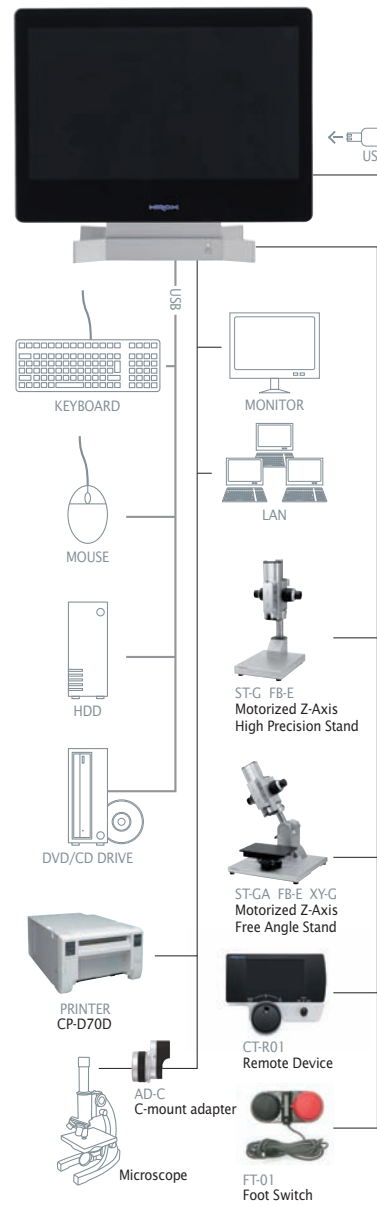
### [Base] Structured Stability and Vibration Absorber

Weight distribution designed to eliminate vibrations and a specialized material reduces a wide range of vibrations.



# System Configuration

An extensive lens adapter line up and the connectivity of peripheral devices make it easy to build a customized configuration.



MXG-2016Z/MX-2016Z  
20-160x zoom lens

MXG-5040RZ\*/MX-5040RZ\*  
50-400x zoom lens

MXG-5040SZ/MX-5040SZ  
50-400x zoom lens

MXG-10C/MX-10C  
Coaxial vertical-lighting,  
10x zoom lens

MXG-2500REZ  
Revolver zoom lens,  
35-2500x

MXG-MACROZ V/  
MX-MACROZ VI  
Macro zoom lens,  
0-50x

MX-MACROZ IV  
Macro lens,  
0-50x

MX-BGAZ II  
BGA lens,  
100-180x

MX-STZ28-125  
Straw-scope lens  
Diameter: 2.8-5.8 mm;  
Length: 120-275 mm

MX-020Z-US  
C-mount lens,  
0-20x

|  |                                       |   |   |  |  |  |
|--|---------------------------------------|---|---|--|--|--|
| AD-2016H<br>Non-contact adapter        | AD-2016S<br>Variable lighting adapter | AD-2016SV<br>Contact adapter                                | AD-2016LOW<br>Low-magnification adapter | AD-2016HI<br>High-magnification adapter        | AD-2016RLD<br>Diffuse lighting adapter for rotary head | AD-2016LOWR<br>Low-magnification rotary head |
| AD-2016LS/L<br>Lateral viewing adapter | AD-2016D<br>Diffuse lighting adapter  | AD-2016HIS<br>High-magnification, variable-lighting adapter | AD-2016P<br>Polarizing adapter          | AD-2016C<br>Coaxial, vertical-lighting adapter | AD-2016RLM<br>Rotary head                              | AD-2016LH<br>Lens holder                     |

|   |  |  |  |  |  |  |
|---|--|--|--|--|--|--|
| AD-5040HS<br>Non-contact adapter        | AD-5040DS<br>Diffuse-lighting adapter    | AD-5040SVS<br>Contact adapter          | AD-5040LOWRS<br>Low-magnification rotary head adapter        | AD-5040HRS<br>High-magnification rotary head adapter | AD-5040RVS<br>Variable-angle rotary head adapter | AD-5040RVD<br>Diffuse-lighting adapter for rotary head |
| AD-5040LWS<br>Low-magnification adapter | AD-5040HIS<br>High-magnification adapter | AD-5040SS<br>Variable-lighting adapter | AD-5040SHIS<br>High-magnification, variable-lighting adapter | AD-5040CS<br>Coaxial vertical-lighting adapter       | AD-5040PS<br>Polarizing adapter                  | AD-5040VLS<br>Lift-off adapter                         |

|                                |                                 |   |   |   |                            |
|--------------------------------|---------------------------------|---|---|---|----------------------------|
| AD-5040SD<br>Snap-type adapter | AD-5040H<br>Non-contact adapter | AD-5040LOW<br>Low-magnification adapter | AD-5040HI<br>High-magnification adapter | AD-5040SHI<br>High-magnification, variable-lighting adapter | CT-101<br>Motor controller |
|--------------------------------|---------------------------------|---|---|---|----------------------------|

|  |                              |                                  |                                     |   |
|--|------------------------------|----------------------------------|-------------------------------------|---|
| AD-10S<br>Directional lighting adapter | AD-10P<br>Polarizing adapter | AD-10R<br>Optical Rotary Adapter | AD-10DIC + AD-U-P200<br>DIC adapter | R-OL-D<br>Diffuse Adapter for NR-405-OL |
|--|------------------------------|----------------------------------|-------------------------------------|---|

|                                  |                                     |   |  |  |  |
|----------------------------------|-------------------------------------|---|--|--|--|
| OL-35<br>Objective lens, 35-350x | OL-70 II<br>Objective lens, 70-700x | OL-140/OL-140 II<br>Objective lens, 140-1400x | OL-350 II<br>Objective lens, 350-3500x | OL-700 II<br>Objective lens, 700-7000x | NR-405-OL<br>Ring lighting for MX(G)-10C |
|----------------------------------|-------------------------------------|---|--|--|--|

|   |                               |                                  |                                |  |                                      |                                   |
|---|-------------------------------|----------------------------------|--------------------------------|--|--------------------------------------|-----------------------------------|
| AD-25S1<br>Directional lighting adapter | AD-25S2<br>Fixed-iris adapter | AD-25S3<br>Variable-iris adapter | AD-25S4<br>Center-iris adapter | AD-25P1<br>Polarizing adapter (Set of 2 units) | AD-25P2<br>Single-wavelength adapter | AD-25R1<br>Optical rotary adapter |
|---|-------------------------------|----------------------------------|--------------------------------|--|--------------------------------------|-----------------------------------|

NR-405-M4  
Ring lighting for MX-MACROZ IV

AD-BGABL  
Backlight

AD-STL28-125  
Lateral viewing adapter  
Others  
φ3.3~6.3mm L120~275mm

HS-CH (V7)  
Lens holder

**ST-G Series Stands / Stages**

**STAND**

- High-precision stand
  - Base plate and pole section (ST-G)
  - High-precision block (FB-M)
- Motorized Z-Axis High Precision Stand
  - Base plate and pole section (ST-G)
  - Motor block (FB-E)

**STAGE-UNIT**

- XY stage unit
  - XY stage block (XY-GX)
  - Stage block (XY-C)
- XY stage unit for transmitted lighting
  - XY stage for transmitted lighting (XY-GBX)
  - Stage block for transmitted lighting (XY-CB)
  - Fiber for transmitting unit (R578)

**High-precision angle stand**

- Base plate and angle pole section (ST-GA)
- High-precision block (FB-M) and XY stage (XY-G)

**Motorized Z-Axis Free Angle Stand**

- Base plate and angle pole section (ST-GA)
- Motor block (FB-E) and XY stage (XY-G)

**Standard Stands / Stages**

**STAND**

- ST-HE  
Standard stand
- ST-HL  
Large stand

**STAGE-UNIT**

- AS-XYL  
Large slide stage
- AS-BH  
BGA PCB holder
- AS-XY  
XY stage
- XY-CE-US/CT-X4-US  
Auto XY Stage/ Controller

# Specifications

## Main Control Unit (Basic Functions)

|                          |                          |   |
|--------------------------|--------------------------|---|
| Camera                   | Imaging Device           | 1/1.8-inch, 2.11 Mega-pixel CCD Sensor  |
|                          | Scanning Mode            | Progressive Scan  |
|                          | Total Pixels             | 2.11 Mega-pixels 1688 (H) x 1248 (V)  |
|                          | Effective Pixels         | 2.01 Mega-pixels 1688 (H) x 1236 (V)  |
|                          | Visual Pixels            | 1600 (H) x 1200 (V)   |
|                          | Frame Rate               | 24 Frame at 1600 x 1200 Pixel Resolution  |
|                          | High Dynamic Range (HDR) | 32 Bit Resolution Process and 16 Bit Resolution Output  |
|                          | Electronic Shutter       | AUTO (1/24 ~ 1/100000)  |
|                          |                          | MANUAL<br>(8, 4, 2, 1, 1/2, 1/4, 1/8, 1/24, 1/60, 1/100, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/8000, 1/15000)                     |
|                          | Supercharge Shutter      | Preference Setup (17 ~ 1/100000)  |
|                          | Gain                     | Auto (0dB ~ 6dB), Manual (0, 3, 6, 9, 12dB), OFF  |
|                          | White Balance            | Auto (One Push), Manual (R, B)  |
|                          | Camera Cable Length      | 2 Meter (Option: up to 10 meter extension)  |
| Back-Focus Adjustment    | NOT Required             |   |
| Image                    | Format                   | Exif-JPEG (compressed), Exif-TFF (non-compressed), BMP (non-compressed)   |
|                          | Maximum Pixel Resolution | 58 Mega-pixels - 8600 (H) x 6600 (V) (Non-Tiled Image)  |
|                          | Maximum Pixel Size       | 225 Mega-pixels - 15000 Pixels (H) x 15000 Pixels (V) (Tiling Image)  |
|                          | Movie Format             | AVI (non-compressed), WMV (compressed)  |
| Monitor                  | Display Size             | Full HD LCD 21.5" Monitor   |
|                          | Panel Size               | 18.75" (H) x 10.56" (V) - 476.2 (H) x 268.11 (V) mm   |
|                          | Pixel Pitch              | 0.01" (H) x 0.01" (V) - 0.248 (H) x 0.248 (V) mm  |
|                          | Number of Pixels         | 1920 (H) x 1080 (V)   |
|                          | Display Color            | Approx. 16,770,000 colors   |
|                          | Brightness               | 300cd/m2 (typical)  |
|                          | Contrast Ratio           | 1000:1 (typ)  |
| Light Source             | Lamp                     | High Intensity LED  |
|                          | Lamp Life                | 30,000 hours (Average)  |
|                          | Color Temperature        | 5700K   |
| Output                   | Video                    | Analog RGB / Display Port (Requires higher than 1920x1080 Pixels)   |
|                          | Step Motor               | Z-Axis Step Motor Controller Port (5 Phase Motors Driver Integrated)  |
|                          | Rotary Head              | DC Motor Controller Port  |
| Input                    | ACS Terminal             | ACS Sensor Connection Port  |
|                          | Keyboard and Mouse       | Support 2.0 USB Keyboards and Mouse   |
|                          | External Remote          | Foot Switch (Freeze / Capture Image) Port   |
|                          | Remote Device            | Remote Device (CT-R01)  |
| Interface                | Extra Controller         | RS-232C Connector Port  |
|                          | LAN                      | 10BASE-T/100BASE-TX/1000BASE-T  |
| Storage Capability       | USB 2.0                  | 6 Ports (2 x Side, 4 x Back)  |
|                          | Hard Disk Drive          | 500 GB Hard Drive (300 GB of Recording Capacity)<br>Approx. 1,500,000 Images (compressed) to Approx. 50,000 Images (not compressed) |
| Power Supply             | Other Drives             | USB 2.0 external CD-R/RW, DVD±R/R, DVD±RW/-RAM, HDD   |
|                          | Rated Voltage            | AC100~240V, 50/60Hz   |
| Environmental Resistance | Power Consumption        | 400W  |
|                          | Ambient Temperature      | 5° C to 40° C (no freezing or condensation)   |
|                          | Storage Temperature      | -10° C to 50° C (no freezing or condensation)   |
|                          | Relative Humidity        | 25 to 85% RH (no condensation)  |
| Weight                   | Atmosphere               | Corrosive Gas Prohibited  |
|                          | Main Unit                | Approx. 14 kg   |
|                          | Camera                   | Approx. 1 kga   |
| Dimensions               | Remote Device (CT-R01)   | Approx. 0.5 kg  |
|                          | Main Unit                | 20.67" (W) x 17.51" (H) x 8.2" (D) - 525 (W) x 445 (H) x 210 (D) mm   |

## Optional Motorized Z-Axis Specifications

|      |                       |  |
|------|-----------------------|--|
| FB-E | Stage Stroke Distance | 30 mm (1.18") Motor / 85 mm (3.34") Manual   |
|      | Resolution            | 0.05 um (0.002 Mil) / pulse - 5 Phases Motor |
|      | Repeatability         | 0.5 um (0.23 Mil)                            |
|      | Weight                | 1 kg   |

## Numerous Functions

|  |   |
|--|---|
| Observation Settings                             | Camera Preview Function (displays automatically adjusted image previews)                  |
|  | Auto Camera Settings / Camera Image Settings  |
|  | Mode Function (save camera settings)  |
|  | Auto Calibration Select (ACS) (zoom mag is automatically relayed to the system)           |
|  | Edge Enhancement Function   |
|  | Hue Correction and Chroma Correction Setting including Chroma ON/OFF                      |
|  | Gamma Correction / Contrast Settings including Live Anti-Halation Mode                    |
|  | Camera Shake Correction   |
|  | Brightness Level  |
|  | Light Source ON/OFF and adjustable lighting intensity                                     |
| Observation Tool and Enhanced Digital Processing | White Balance (Auto / Manual)   |
|  | Quick Focus (Quick extended depth composition)  |
|  | Auto Focus (Point Focus) - Just Double Click  |
|  | HDR (High Dynamic Range) Function / HDR Preview Function                                  |
|  | Anti-Halation Function / Anti-Halation Preview Function                                   |
|  | Focus Control (Auto Z-axis controller) / Focus Indicator                                  |
|  | Rotary Head Control (Visual 3D image controller)  |
|  | Real-Time Digital Zoom  |
|  | High-Resolution Image Function  |
|  | Grid Settings (Various Functions are available)   |
| 2D Measurement Function                          | Image Adjustment (contrast, edge enhancement, noise removal, binarizing)                  |
|  | Custom Tool Bar and Quick Function Key on Remote Device                                   |
|  | Distance, Angle, Radius, Diameter, Area, etc.   |
|  | High Resolution Measurement   |
|  | Auto Calibration (Auto / Manual) / Calibration Data Protection / Custom Lens List Setting |
|  | Automatic Measurement (Auto-Count, Auto-Area, Auto-Edge Detection)                        |
|  | Scale Display (Metric/English)  |
|  | Statistic Data Output from Measurement Result   |
|  | CSV output (Measurement Result)   |
|  | Image Data Parameter  |
| 3D Measurement Function                          | Depth Composition: AMF3D merge function: Auto Multi-focus 3D Merge function               |
|  | Depth Composition: APS function: Auto-Positioning function                                |
|  | 3D Multi-Focus (Quick 3D, Semi-Auto, Full-Auto, Manual) / 3D Model Preview Function       |
|  | HDR and Anti-Halation 3D Model / 3D Model Preview Function                                |
|  | 3D Display (Original Color / Wireframe / Pseudo Color Display)                            |
|  | 3D Model Illumination Simulation Function   |
|  | 3D Profile Measurement (Height, Length, Angle, Radius etc.) on 3D Model Image or 2D Image |
|  | 3D Profile Roughness Measurement  |
|  | 3D Volume and Area Measurement  |
|  | 3D Image Height Point Measurement   |
| Tiling   | 3D Image Map CSV Output (Import to Various 3D application Software)                       |
|  | 3D Model Level Correction / Noise Filter and Removal                                      |
|  | 2D Tiling (Up to 15000 x 15000 pixels)  |
| Recording  | 3D Tiling (Up to 10000 x 10000 pixels)  |
|  | Capture Still Image (1600x1200, 1440x1080, 1200x960, 1024x768, 800x600, 640x480)          |
|  | High-Resolution Image (8600x6600, 6400x3600, 3200x2400, 2400x1800)                        |
| Library  | Movie - 1200x1600 (15FPS), 800x600 (24FPS) including Time Lapse (Timer Recording)         |
|  | Cropping Image  |
|  | Browser   |
| Display  | Explorer  |
|  | Split Monitor (Horizontal, Vertical, 4 window splitting) - All Functions are accessible   |
|  | Turning Over, ±90 Rotation  |
| Utility  | Comments / Annotation   |
|  | Grid, Scale, Date, Comments, Annotation, Image Information                                |
|  | Easy Report Function and Export with Excel Format   |
|  | System / User Settings / Network Settings   |
|  | Password Protection (Calibration / User setup)  |
|  | Language Setting (English, Japanese)  |
| Additional Software for PC                       | Help (Pop-up User Guide / Manual) / Version Information                                   |
|  | Printer / Compatible with a Foot Switch   |
| Free 3D Image File Viewing Software              |   |

## [Compliance with the RoHS Environmental Protection Program]

Hirox is compliant with the [RoHS Directives] based on the fundamental principles and plan stated below. These directives regulate goods manufactured after October 2006 that use hazardous substances that have an adverse effect on the environment or human life.

■ Fundamental Principles: Recognizing that preservation of the environment is the greatest problem facing the human race, Hirox is working with all of its divisions to reduce its environmental impact.

■ Plan: In order to reduce the environmental impact of all manufacturing and consumption practices related to the production and sale of our digital microscopes as well as future products and services, Hirox is pursuing an environmental management program striving to achieve harmony with the environment.

RoHS Directive: Known as the "Directive for the reduction of the use of certain hazardous substances in electrical and electronic equipment." It is effective in all areas of the EU. The use of the following six hazardous substances in electrical and electronic equipment is regulated: Pb (lead), Cd (cadmium), Hg (mercury), hexavalent chrome, PBB (polybrominated biphenyl), and PBDE (polybrominated biphenyl).