1.0 Title
Keyence VHX-500F Digital Microscope

2.0 Purpose
This manual describes the operation of the Keyence VHX-500F digital microscope.

3.0 Scope
The Keyence VHX-500F digital microscope is a high resolution CCD camera based system with a high intensity halogen lamp and image processing capabilities that integrates observation, recording, and measurement functions.

4.0 Applicable Documents
Revision History
4.1 VHX 600ESO User’s Manual hard copy (kept near machine at all times)
4.2 Quick Setup Guide (kept near machine at all times)

5.0 Definitions & Process Terminology

5.1 Stage
The stage may be adjusted in directions x, y, z, and theta (rotation). Use care when operating the stage. Do not contact the objective lens with the sample or stage.

5.2 Lens
The system is equipped with a VH-Z100R bright field lens (see figure 1). Rotating the zoom ring on the lens changes the magnification from roughly \( \sim 100x \) to \( \sim 1000x \). A separate ring controls the aperture setting. The lens may be tilted to achieve angled images of samples.

5.3 Console
The console is a keypad that can be used to quickly and easily perform major observation tasks (see figure 2). The functions on the console can also be selected through the software.

5.3.1 CLEAR SHOT – Used to freeze/pause the screen.

5.3.2 WHITE BALANCE – Adjusts the white balance. This is performed at the beginning of every session with a white card.

5.3.3 FRAME RATE – This switches between 15 and 28 fps. 15 fps yields better resolution and slower refresh rates, while 28 fps yields lower resolution and faster refresh rates.

5.3.4 ZOOM 2X – This is digital zoom, not optical.
5.3.5 **LIGHT CONTROL** – Adjusts intensity of the halogen lamp. Always turn it off when finished.

5.3.6 **BRIGHTNESS / GAIN** – Use this to adjust the shutter speed. Typically set to the 10-o’clock position.

5.3.7 **ENHANCE** – This uses incident light from a single direction to enhance surface projections and depressions on the sample.

5.3.8 **REC** – Use this to save an image to the hard disk of the computer.

5.3.9 **PAUSE** – Toggles between freeze/pause screen and live image.

5.3.10 **OPTIMIZE** – This creates four different images; normal, bump enhancement, image enhancement, and image sharpening.

5.3.11 **CONTRAST** – Used to optimize the contrast settings.

5.3.12 **HALATION REMOVAL** – This removes glare from highly reflective samples.

5.3.13 **S.C.F** – This is a shake correction function that removes noise caused by environmental vibrations.

5.3.14 **DEPTH UP** – Instantaneously creates a depth composition image. This is useful when the sample has a large degree of topography when the entire image is not in focus.

5.3.15 **3D DISPLAY** – This composes a 3D representation of the sample for further analysis/observation.

6.0 **Safety**

6.1 Be aware at all times where the lens is with respect to the stage or your sample. **Do not contact the objective lens with the sample or stage.**

6.2 Viewing the illumination light directly through the fiber optic port may cause eye injury.

6.3 The lamp is very hot and may cause burns even after being turned off.

6.4 No wet samples are allowed to be observed with this system. Do not attempt to put any sample with liquid on the stage.

7.0 **Statistical/Process Data**

8.0 **Available Processes, Gases, Process Notes**

**Available Processes**

8.1 Observing targets with universal zoom VH-Z100UR bright field roughly ~100x -> ~1000x mag

8.2 Image optimization

8.3 Freezing, recording and measuring images

8.4 Video recording

8.5 Image enhancement

8.6 Halation removal

8.7 Shake correction function

8.8 Real time depth composition (multiple focal plane integration)
8.9  3-D profile measurement

9.0  Equipment Operation

9.1  Enable the system.

9.2  Turn on the computer by pressing the power button.

9.3  Turn the halogen lamp on by setting the light control knob on the touchpad console to the 12-o’clock position. Set the gain knob to the 10-o’clock position.

9.4  Perform white balance by focusing on a white card and pressing the white balance button on the touch pad.

9.5  Place sample on stage and perform observation.

9.6  When imaging your sample, many of the software functions require users to manually set the magnification setting that is being used on the lens. Be sure to that the proper lens magnification is set within the software (bottom right on computer screen) and that this corresponds to the magnification set on the lens of the microscope. This is especially important for length measurements on a sample.

9.7  Save all images under a personal folder. Make sure you scan your USB drive for viruses on terminal 3 or 4 before connecting your USB drive to the microscope computer. Be sure to copy all of your images onto the USB drive as the hard disk of the microscope will be periodically purged of saved files without notice.

9.8  When finished, turn the light control knob all the way down and turn off the system by right clicking and selecting Power Off.

9.9  Wait for the computer to shut down and then disable the system.

10.0  Troubleshooting Guidelines

10.1  The Function Guide (right most icon on the VHX Main Menu Bar) provides step-by-step tutorials for basic software tools and microscope operation. This is an easy to use guide that describes the basic features of the microscope.
11.0 *Figures & Schematics*

**Figure 1. The optical column**

**Figure 2. The touch pad console**