KEYENCE

96M11880

3D Laser Scanning Microscope

VK-X100K/X105/X110
VK-X200K/X210

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2 Set-Up
3 Before Measuring
4 Mounting Optional Devices
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User's Manual

Read this manual before using the system in order to achieve maximum performance.
Always keep this manual in a safe place for future reference.

Introduction

This manual describes the handling, operating procedures and precautions for the “3D Laser Scanning Microscope VK-X100K/X200K Series.”

Read this manual thoroughly before using the system to get the maximum performance out of the “3D Laser Scanning Microscope VK-X100K/X200K Series.”

Keep this manual at hand for reference whenever needed.

Symbols

This manual uses the following symbols to show important information at a glance.

Be sure to read this section.

DANGER	**It indicates a hazardous situation which, if not avoided, will result in death or serious injury.**
WARNING	**It indicates a hazardous situation which, if not avoided, could result in death or serious injury.**
CAUTION	**It indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.**
NOTICE	**It indicates a situation which, if not avoided, could result in product damage as well as property damage.**
Important	**It indicates cautions and limitations that must be followed during operation.**
Point	**It indicates additional information on proper operation.**
Reference	It indicates tips for better understanding or useful information.
	It indicates reference pages in this manual or other manual.

Precautions

- Reprinting any part or all of this manual without permission is prohibited.
- Please note that the content of this manual is subject to change without notice for the purpose of improvement.
- Should you find any problem with the content of this manual, such as an unclear point, mistake, or erroneous omission, contact your nearest KEYENCE office.
- If there are missing or misplaced pages, we will provide a new copy of this manual.

The company names and product names used in this manual are registered trademarks or trademarks of their respective companies.

Safety Information for VK-X100K/VK-X200K Series

To prevent damage and to correctly use the “3D Laser Scanning Microscope VK-X100K/X200K Series” (VK-X100K/X200K Series), follow the precautions below.

■ Precautions for use

WARNING	• **Do not use this product for the purpose to protect a human body or a part of human body.** • **This product is not intended for use as explosion-proof product. Do not use this product in a hazardous location and/or potentially explosive atmosphere.**

CAUTION	• **Confirm that the components of our product are working normally before use.** • **Considering the possibility of our product failing, use the product after implementing sufficient safety measures to prevent any damage.** • **Do not allow any foreign material to enter inside. It may result in fire, electric shock, malfunction or accident.** • **Never remove the case cover of the VK-X100K/X200K Series. Touching the inside may result in an electric shock.** • **Do not touch the lens revolver while it is moving, doing so risks catching hands or fingers in the mechanism.** • **The VK-X100K/X200K Series is grounded to the case. Make sure that the device is properly insulated if installed in a high-noise environment or a positive ground situation. Failure to do so may cause damage or electric shock.**

NOTICE	• **Please note we cannot guarantee the function and performance of products that are modified or used outside of the ratings shown in the specifications.** • **When our product is used in conjunction with equipment from other companies, the normal function and sufficient performance may not be attained depending on the condition of use and the environment. Be sure to make sufficient assessment before such use.** • **As the VK-X100K/X200K series uses precision optics, avoid any vibration or impact. Doing so may cause damage.** • **Make sure that the power of the VK-X100K/X200K Series is turned off before removing/inserting the power cable, controller cable, or camera cable. Doing so may cause failure.** • **Make sure that the lens does not come in contact with the sample. Doing so may cause damage.** • **Do not place objects that weigh more than 5 kg on the X-Y stage. Doing so may cause damage.** • **Do not turn the power off during measurement. Otherwise, some or all of the settings may be lost.** • **Do not remove/insert the USB cable while the ACCESS lamp on the control unit is lit. Doing so may cause damage.**

Important

- **Make sure that the ambient temperature is stable during measurements.**
- **Wait one hour or more for preheating after turning on the power before taking measurements.**
- **When the lens section is dirty, clean it with the lens blower or with a cotton swab dipped in alcohol.**
- **Make sure that the device is not subject to vibration during measurement. It is recommended that an anti-vibration stand be used.**
- **The measurement unit, the controller cable A/B, and the camera cable are adjusted together as a set. Make sure that all of them bear the same serial number.**

■ Precautions for abnormalities

CAUTION	**Turn off the power immediately in the following cases. Using the unit in abnormal conditions could cause fire, electric shock, or accident. Contact your nearest KEYENCE office for repair.** • **If water or foreign material enters inside the VK-X100K/X200K Series.** • **If the unit is dropped or the case is damaged.** • **If the unit emits smoke or odor.**

NOTICE	**Back up all data saved on the control PC before sending it in for repairs. The repair procedure carries a risk of data loss.** **Additionally, regular periodic backups are recommended.**

■ Precautions for installation

CAUTION	**Install the VK-X100K/X200K series so that it is level. There is a risk of the falling unit causing injuries.**

NOTICE	• **Do not obstruct the ventilation hole or the ventilation fan of the control unit. Internal temperature increases may result in damage.** **Avoid installation in the following locations. Doing so may cause failure.** • **Locations where the device will be subject to direct vibrations** • **Locations where the ambient temperature drops below 15°C or exceeds 28°C** • **Locations where the ambient humidity drops below 35% RH or exceeds 65% RH (no condensation)** • **Locations where the temperature changes rapidly** • **Locations where the device will be exposed to a direct breeze from an air conditioner** • **Locations where there are corrosive gases or volatile inflammable materials** • **Locations with large amounts of airborne dust, salt, iron or greasy fumes** • **Locations with a risk of exposure to airborne water, oil or chemical droplets** • **Locations where a strong magnetic or electric field is generated** • **Locations where the voltage varies greatly**

Important

- **It is recommended that the device be installed on a commercially available anti-vibration stand.**

■ Precautions for the power supply

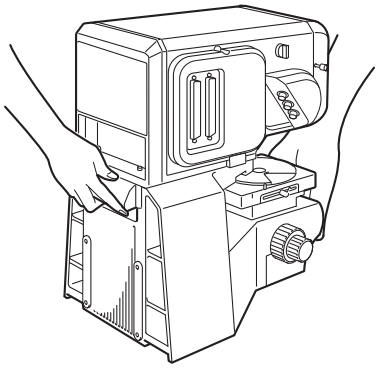
WARNING	**The VK-X100K/VK-X200K Series is Class I equipment. When installing this device, connect the protective grounding terminal of the power supply cord set to the protective grounding conductor of the installation place.** **Otherwise, it may cause electric shock or product damage.**

CAUTION	• **Do not bend forcefully or put any heavy objects on the power cable. Doing so may lead to a cable break, resulting in fire or electric shock. Do not use a damaged cable.** • **Make sure to use the VK-X100K/X200K Series under proper power supply voltage; otherwise, an electric shock, fire or product malfunctions may occur.** • **The power supply cord set is not provided with the VK-X100K/X200K Series. Use a power cable that complies with the regulations and standards in the country or the region in which the VK-X100K/X200K Series are used.**

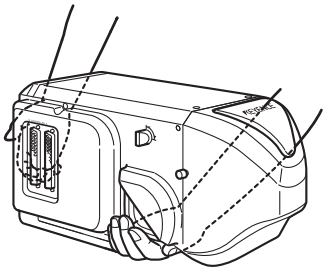
■ Precautions for transportation

CAUTION

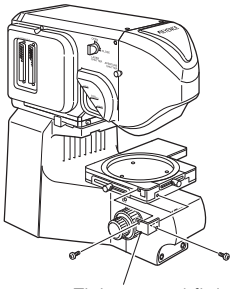
- **When transporting the device, carry it by holding the indentation in the measurement unit or the handle of the pedestal. Carrying the device by the measurement portion may damage it. There is also a chance of injury or damage if the device falls.**



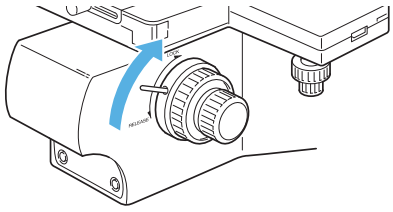
- **Carry the measurement portion of the device by the recessed portions on the front and back of the unit.**



- **Be sure to fix the X-Y stage with a fixture before transportation. Be sure to also lock the Z stage using the focusing handle.**



Fixing metal fittings



NOTICE	• As the VK-X100K/X200K series uses precision optics, avoid any vibration or impact. Doing so may cause damage. • Be sure to remove the objective lenses from the revolver when transporting. Doing so may cause damage. • Be sure to use packaging materials specified by KEYENCE for transportation. Doing so may cause damage. • The VK-X100K/X200K Series is a super precision optical instrument. Sudden changes in temperature may result in damage, including condensation and misalignment of the optical axis. Leave the device at room temperature (between 15°C and 28°C) for 24 hours after unpacking.

▶ Important	• The removed fixing metal fittings and the lens cases are required when the VK-X100K/X200K Series are transported. Be sure to keep them in a secure location.

■ Precautions for storage

NOTICE	• Store the device in its packaging if it will not be used for a long period of time. Doing so may cause failure. Avoid storing in the following locations. Doing so may cause failure. • Locations where the device will be subject to direct vibrations • Locations where the ambient temperature drops below 0°C or exceeds +40°C • Locations where the ambient humidity drops below 35% RH or exceeds 65% RH (no condensation) • Locations where the temperature changes rapidly • Locations where there are corrosive gases or volatile inflammable materials • Locations with large amounts of airborne dust, salt, iron or greasy fumes • Locations with a risk of exposure to airborne water, oil or chemical droplets • Locations where a strong magnetic or electric field is generated • Locations where the device may be exposed to direct sunlight, wind, or rain • Locations that are unstable or where the device may fall

■ Other precautions

NOTICE	When VK-X100K/X105/X110/X200K/X210 gets dirty, clean with a dry cloth.

Safety Precautions on Laser Products

WARNING	**Use of controls, adjustments or procedures other than those specified herein may result in hazardous laser radiation exposure.**

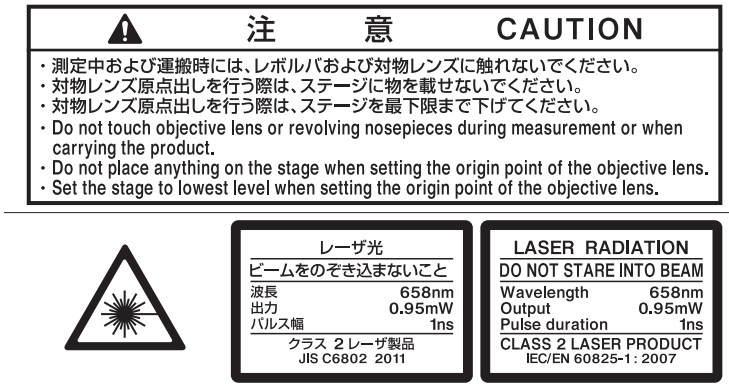
The VK-X100K/X200K Series employ a semiconductor laser as the light source.

Model	VK-X100K/X105/X110	VK-X200K/X210
Wavelength	658 nm (Red laser)	408 nm (Violet laser)
Output	0.95 mW	0.95 mW
Pulse width	1 ns	—

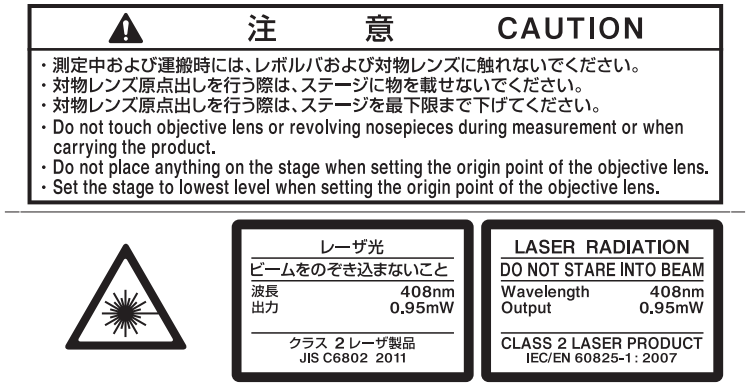
WARNING	**Follow the instructions mentioned in this manual. Otherwise, injury to the human body (eyes and skin) may result.** **Precautions on Class 2 Laser Products** • **Do not disassemble this product. Laser emission from this product is not automatically stopped when it is disassembled.** • **Do not stare into the direct or specularly reflected beam.** • **Do not direct the beam at people or into areas where people might be present.** • **Be careful of the path of the laser beam. If there is a possibility that the operator may be exposed to the specular or diffuse reflections, block the beam by installing a protective enclosure.** • **Install this product so that the path of the laser beam is not as the same height as that of human eye.**

A Warning label is attached to the microscope unit as shown below.

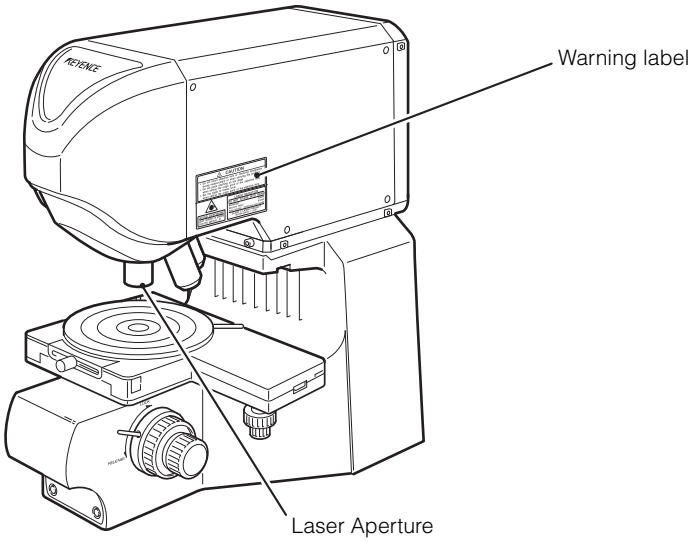
■VK-X105/X110



■ **VK-X210**



Label Location



Precautions on Regulations and Standards

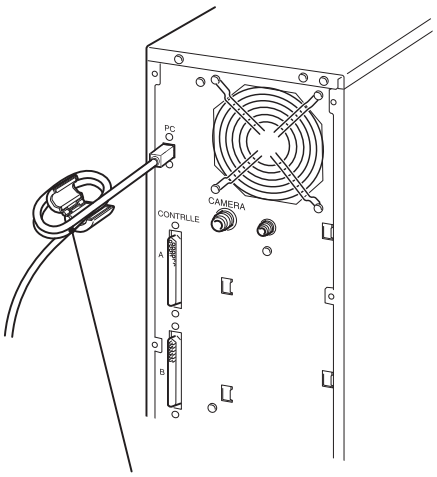
CE Marking

Keyence Corporation has confirmed that this product complies with the essential requirements of the applicable EC Directives, based on the following specifications. Be sure to consider the following specifications when using this product in a Member State of the European Union.

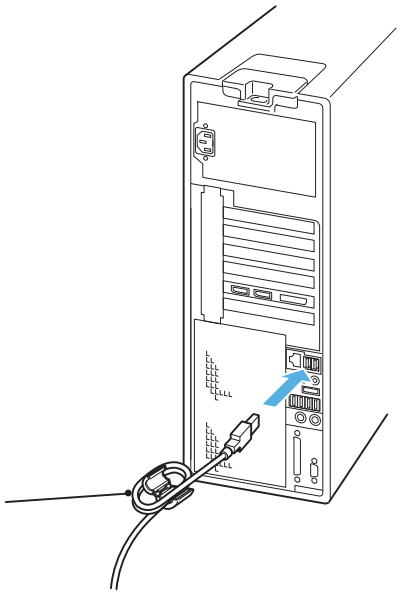
■ EMC directive (2004/108/EC)

- Applicable Standard EMI: EN61326-1, Class A
  EMS: EN61326-1

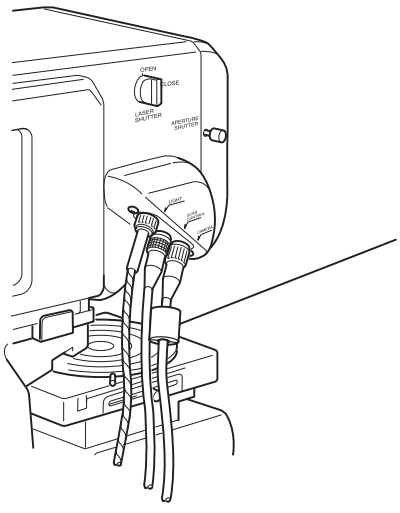
1 Install the sleeve ferrite clamp ZCAT3035-1330 (TDK) at both ends of the USB cable.



Wind so that 3 cables are going through the clamp.



2 Install the sleeve ferrite clamp ZCAT2035-0930A-BK(TDK) at the end of the camera cable (at the side of the measurement unit).



Install so that 1 cable is going through the clamp.

Remarks:

These specifications do not give any guarantee that the end-product with this product incorporated complies with this essential requirements of EMC Directive. The manufacturer of the end-product is solely responsible for the compliance on the end-product itself according to EMC Directive.

■ Low-Voltage directive (2006/95/EC)

- Applicable Standard EN61010-1
  EN60825-1 Class 2 laser product
- Overvoltage Category II
- Use this product under pollution degree 2.
- Install this product at an altitude of 2000 m or less.
- Indoor use only.
- This product is designed as a Class I equipment. Be sure to connect the protective earthing terminal on the AC power cable to the protective earthing conductor in the building installation.
- The AC power inlet falls under a disconnecting device. Install this product to be able to remove the AC cord set from the AC power inlet in abnormal situations immediately.

CSA Certification

This product complies with the following CSA and UL standards and has been certified by CSA.

- Applicable standard: CAN/CSA C22.2 No. 61010-1
  UL61010-1

Be sure to consider the following specifications when using this product as a product certified by CSA.

- Overvoltage category II
- Use this product under pollution degree 2.
- Install this product at an altitude of 2000 m or less.
- Indoor use only.
- This product is designed as a Class I equipment. Be sure to connect the protective earthing terminal on the AC power cable to the protective earthing conductor in the building installation.
- The AC power inlet falls under a disconnecting device.
  Install this product to be able to remove the AC cord set from the AC power inlet in abnormal situations immediately.

MEMO

Organization of This Manual

Chapter 1	Getting Started	This chapter describes the principles of the VK-X100K/X200K, the contents of the packaging and the names of each part.
Chapter 2	Set-Up	This chapter describes how to assemble the microscope unit and how to connect each device.
Chapter 3	Before Measuring	This chapter describes the preparation and basic adjustments to be made before taking measurements.
Chapter 4	Mounting Optional Devices	This chapter describes the optional devices and how to install them.
Chapter 5	Maintenance	This chapter describes the procedure for replacing the lamp and the fuse in the control unit.
Appendix	Dimensions/Specifications	This chapter describes the specifications and dimensions of the device.

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Chapter 1

Getting Started

This chapter describes the principles of the VK-X100K/X200K, the contents of the packaging and the names of each part.

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Summary of the VK-X100K/X200K Series

This manual gives a summary of the VK-X100K/X200K Series, which offers both magnified observation and height measurements.

Principles of the VK-X100K/X200K Series

Confocal laser optics

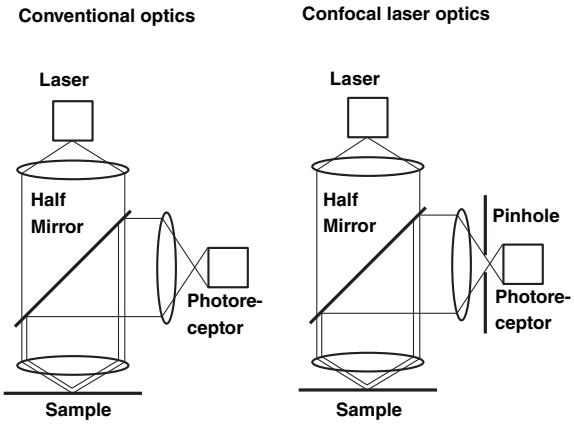
The VK-X100K/X200K Series is equipped with laser confocal technology that obtains images with a large depth of field that are in focus across the entire screen and that detect the finest details in the sample shape data.

In the laser confocal optics, a pinhole in front of the position where the reflected light from the sample forms an image (photoreceptor) ensures that no light other than that which passes through the focal point of the objective lens reaches the photoreceptor. Use of this type of optics as a sensor allows for the maximum possible amount of light to reach the photoreceptor and allows changes in the focal point to be measured and used as height information. Additionally, use of this technology in a microscope creates a device with almost no flare and significantly better contrast than a standard optical microscope.

The VK-X100K/X200K Series combines this laser confocal optics with a high-speed X-Y scanner to create a high resolution focal image and gather height information (shape and roughness) from the sample.

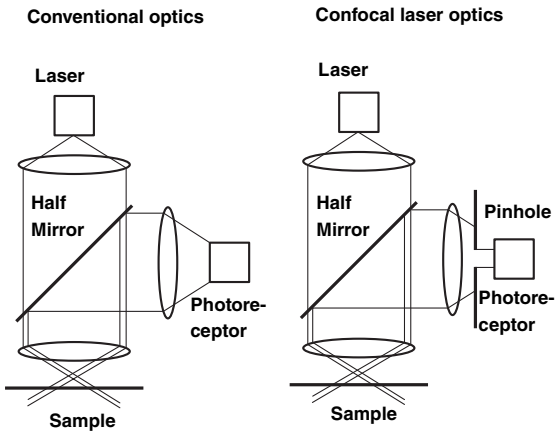
When in focus

Both conventional optics and confocal laser optics allow all of the reflected light to enter the photoreceptor.

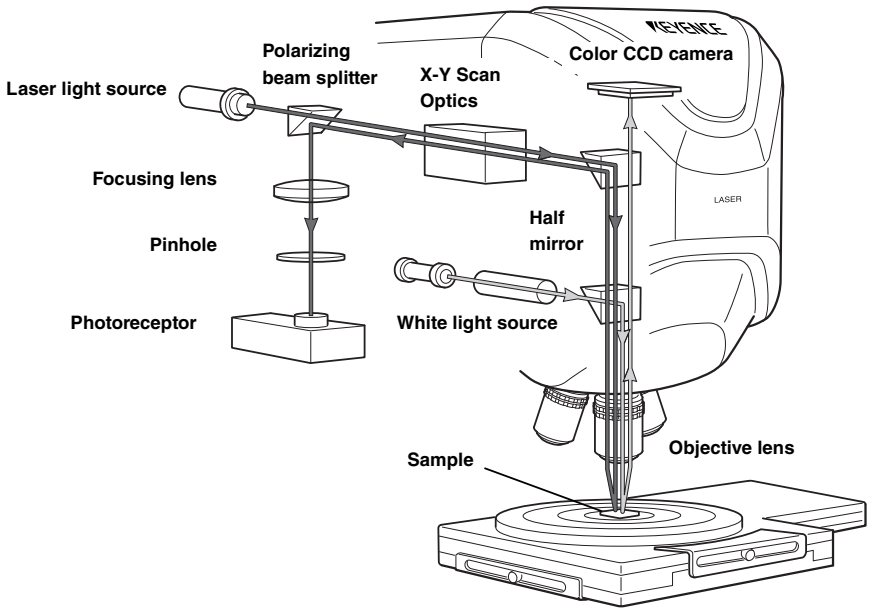


When out of focus

While conventional optics allow all of the reflected light into the photoreceptor, confocal laser optics allow only a fraction.



Principles of operation of the VK-X100K/X200K Series



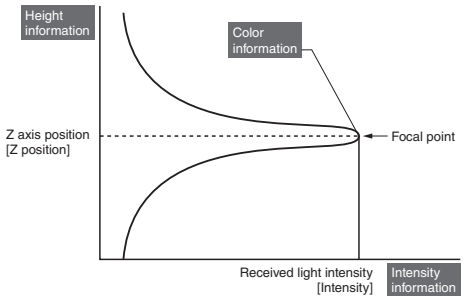
The VK-X100K/X200K Series uses a two-way light source comprised of a laser light source and a white light source. The two light sources together provide the colors, laser intensity and height information necessary to create deep field color images, laser intensity images or height images.

■ Detection of intensity and height with laser light

The light emitted from the laser light source of the laser microscope is focused onto the surface of the sample via X-Y scan optics and objective lens. The focused spot light scans the image area within the field of view using the X-Y scan optics. By dividing the field of view into 1024×768 pixels*1 to scan the image, the reflected light at each pixel is detected by the photoreceptor.

By driving the objective lens in the Z axis to repeat the scan of the image, the intensity of each pixel at every position on the Z axis is obtained. With the Z axis position of the highest intensity being the focal point, the height information and the laser intensity are detected. This allows for in focus laser intensity and height images to be obtained.

*1 When the measurement quality is “Fine”, 2048×1536 pixels are used, and when “Super fine”, 3072×2403 pixels are used.



The device reads the intensity of each Z position for each of the pixels on the 1024×768 pixel screen and determines the Z axis position (= focal point) of the maximum intensity, and records the intensity and color information for that position. Based on this information, three types of image data are constructed, a deep field color image, a laser intensity image and a height image.

■ Creating a color image with a CCD camera

On the other hand, the light reflected from the white light source is detected by the CCD camera. Color observation in the natural colors as seen by the naked eye is achieved by obtaining the color information for each pixel at the focal point detected by the laser.

■ Introduction to the digital microscope functions

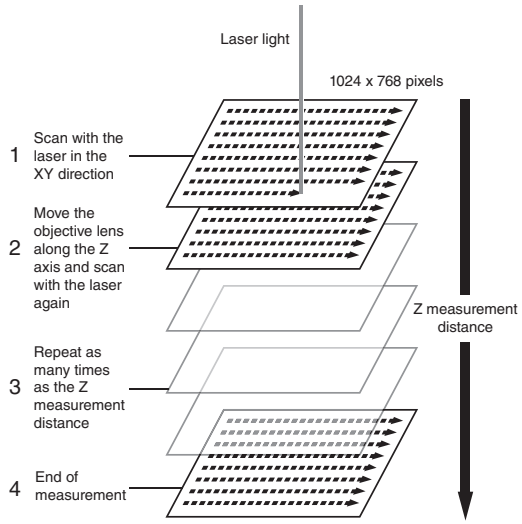
The VK-X100K/X200K Series have the same optics design as a metal microscope with lens barrel, coaxial incident light illumination optics and CCD camera built-in in the measurement unit.

The CCD image sensor is equipped with a pixel shift method CCD camera with a maximum of 21.6 million recording pixels, allowing for the capture of clear and high resolution magnified observation images. Combined with the digital zoom function, this offers high magnification observation of up to 18000x*2.

*2 The VK-X200K Series allows observation at up to 24000x magnification.

■ Data acquisition flow

●Optics (area image sensing)



1. Laser light from a semiconductor laser scans first by a resonant (horizontal) scanner in the horizontal direction.
2. The light then scans by a galvano (vertical) scanner in the vertical direction producing an area scanning beam.
3. The laser light that reflects off of the sample passes through a polarized beam splitter in front of the laser light source and then reaches the focusing lens, the pinhole and the photoreceptor (photomultiplier).
4. Light that has passed through the focusing lens and is focused at the pinhole only passes through the pinhole reaching the photoreceptor (laser light that is out of focus does not reach the photoreceptor).
5. The electrical signal sent by the photoreceptor upon receiving the laser light is transformed into an image (area information) based on sampling coupled with the vertical and horizontal movements of the scanner.
6. Once image area scanning has completed, the lens moves one step in the Z direction, where one step is equal to the pitch, and repeats the scan.

●Electric signal processing

7. Each time the lens moves, the laser intensity, the RGB data from the CCD camera and the linear scale value at the time of storing the data are recorded in the focal point memory (1024 × 768 pixels) of the control unit (VK-X100K/X200K Series).
8. During the data acquisition, the laser intensity at each pixel is monitored. This means that laser intensities higher than those stored in the memory of the control unit (VK-X100K/X200K Series) (i.e. light that is not attenuated when it reaches the photoreceptor after passing through the pinhole) will replace the previous CCD camera RGB data, laser intensity and linear scale values.

* When RPD mode is active, the peak value (focal point position) of the laser intensity is calculated based on changes in the laser intensity values gathered according to the pitch set by the numerical aperture of the objective lens and the result is stored in memory.

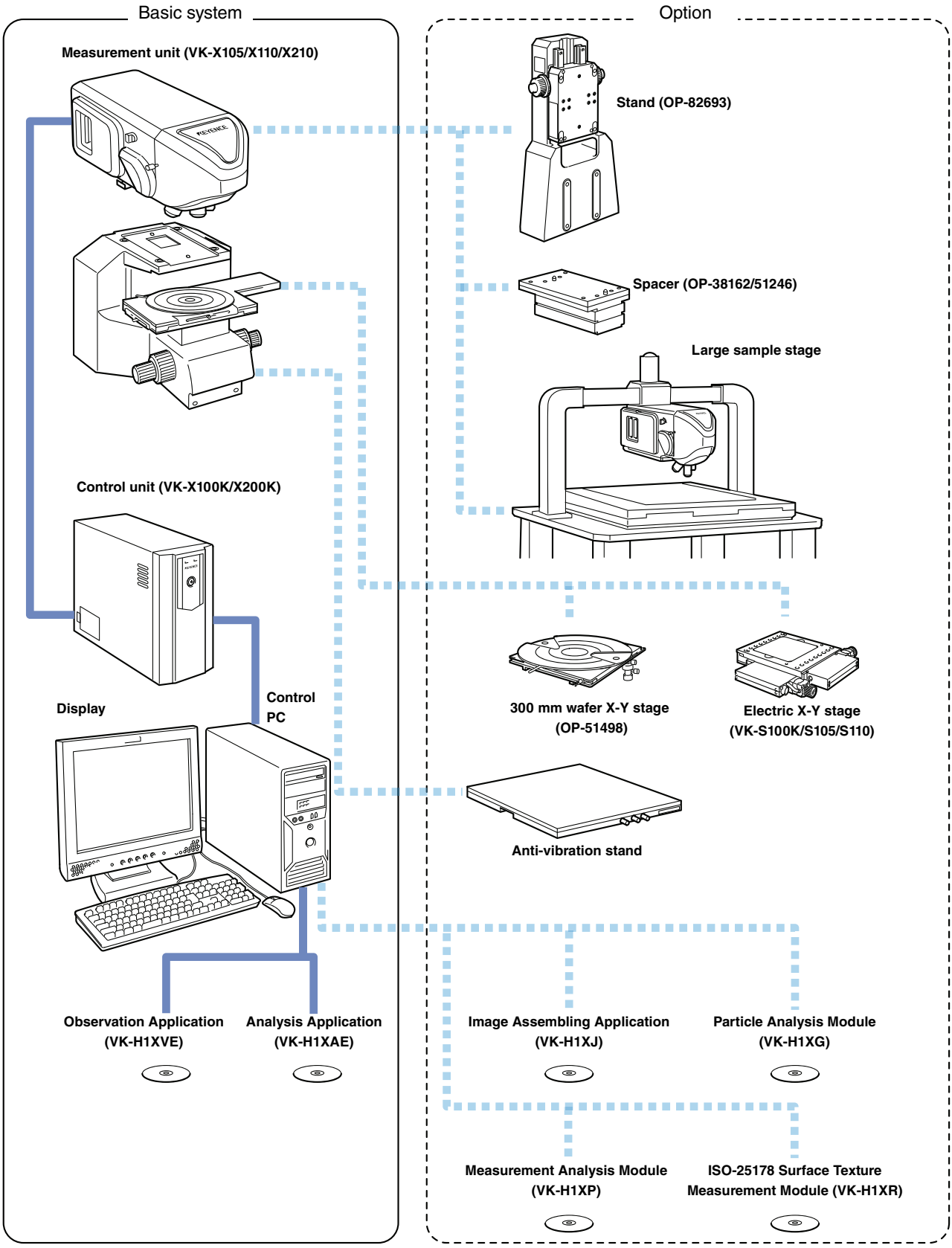
●Output data creation

9. By repeating the optics and electrical signal processing operations (steps 1 through 8), at the end of gathering data, each pixel contains the RGB values to be stored from the CCD camera, the laser intensity, and the linear scale value of the location where the laser intensity is highest.

   By combining the data, a color image that is completely in focus, a black and white image based on the laser intensity, and a height (contrast) image based on the linear scale value can be created.

System Configuration

The VK-X100K/X200K Series offers basic system along with optional devices and applications.



- Measurement unit (VK-X105/X110/X210)
  Measurement unit with semiconductor laser, color CCD camera and scan optics built-in. This is used as a microscope mounted on the pedestal provided.
- Control unit (VK-X100K/X200K)
  The laser, CCD camera controller, scanner control board, 100 W halogen lamp that serves as the light source, and so on are all built-in the control unit.
- Observation Application (VK-H1XVE)
  This software controls the VK-X100K/X200K Series to create laser intensity and height images. It adjusts the camera shutter, the gain on the photoreceptor and the scanning format.

> Important **The Observation Application is not functional unless a control unit (VK-X100K/X200K) is connected.**

- Analysis Application (VK-H1XAE)
  This software obtains data for color observation with high contrast, image processing for 3D displays, and operation/analysis processing of shape measurement and surface roughness from the laser intensity data and height data obtained by the Observation Application.
- Control PC
  This is the control PC for the VK-X100K/X200K Series (KEYENCE-specified product).
- Display
  Use a display recommended by KEYENCE or a commercially available one.
- Optional devices
  For the optional devices and installation, refer to “Chapter 4 Mounting Optional Devices” (Page 4-1).

Operating Environment

To activate the VK-X100K/X200K Series, an environment that meets the following conditions is required.

Control PC main specifications

Item	Specifications
Control PC	The control PC that can be used with the VK-X100K/X200K Series is KEYENCE-specified one.
OS	Windows 7 Professional 32-bit Windows 7 Professional 64-bit Windows Vista Business 32-bit (SP1 or later) Windows XP Professional Edition 32-bit (SP3 or later) must be pre-installed. (DirectX 9 or later)
CPU	Intel Core™2 Duo E6300 or higher
Memory	2048 MB or more
USB port	USB 2.0
HDD	160 GB or more
Video card	KEYENCE-specified product (NVIDIA® Quadro® FX600 1024 MB)

▶ Important

- **Log on to the control PC with administrator privileges.**
- **Set all of the power settings to "None" on the Power Options Properties dialog box for the control PC.**
- **Do not use other software while the Observation Application and the Analysis Application are running. Doing so may interfere with the device control.**
- **During measurement, the sleep feature of the energy saving function is disabled. (It is not necessary to disable the screen saver, etc.)**
- **When you perform the sleep operation from the Start Menu, the PC goes to sleep mode even if measurement is in progress. In this case, measurement is interrupted and the measurement result will not be saved.**
- **If the control unit is connected while the Observation Application is in use, using Windows sleep feature may result in the control unit being in the disconnected state when recovering from sleep mode. Turn the control unit power off and turn it on again or pull out and re-insert the USB cable to re-connect the control unit.**
- **Performing the sleep operation during 3D display may result in the image on display disappearing. Switch to another image temporarily to display the 3D again.**
- **When using external media like USB device or HDD (Hard Disk Drive) at the same time, connect them to ports attached to a different root hub.**
  Plugging/Unplugging other USB devices with the same root hub as this device may result in malfunction.

Display main specifications

Item	Specifications
Resolution	1920 × 1080 pixels or more

Unpacking

NOTICE	• **Unpack after leaving it at 15 to 28°C for 24 hours or more. The VK-X100K/X200K Series is a high precision optical instrument. Sudden changes in temperature may result in damage, including condensation and misalignment of the light beam.** • **Save the packaging after installing the device. Make sure to use this packing material when shipping.**

Unpacking the Control Unit and Control PC

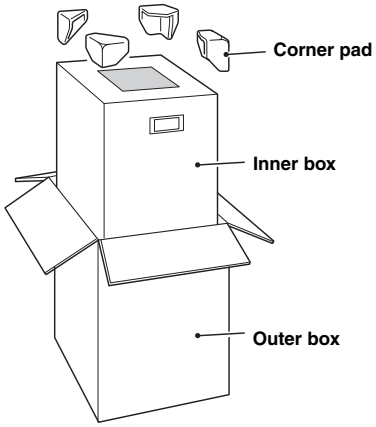
Unpack the box containing the control unit and take out the accessories and control unit.

Also unpack the boxes for the control PC and the display.

Unpacking the Microscope Unit

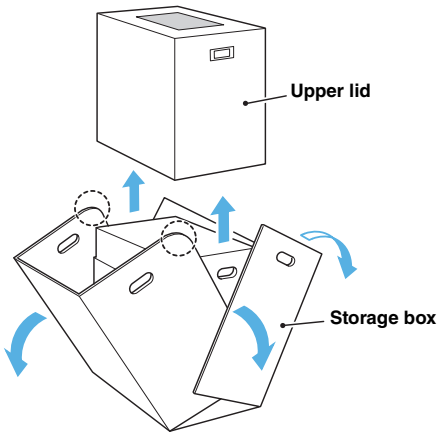
The microscope unit is packed in a special box. Unpack according to the steps below.

1 Remove the corner pads and inner box from the outer box.

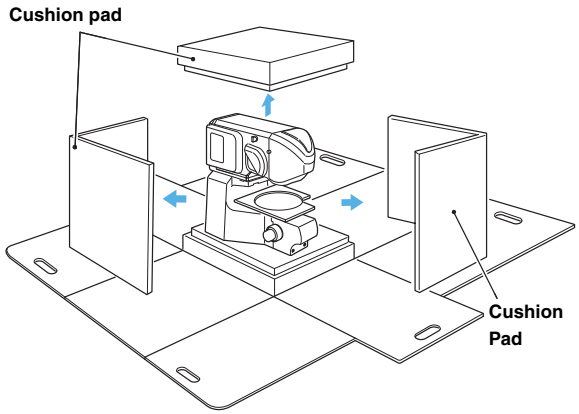


2 Remove the upper lid from the inner box and open the storage box.

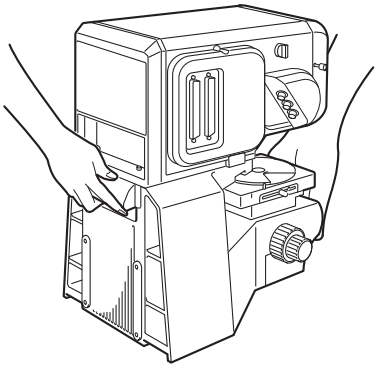
The flaps with round corners will be on the inside of the storage box.



3 Remove the cushion pads, taking the microscope unit out.



NOTICE	**When removing the microscope unit, carry it by holding the indentation in the measurement unit and the handle of the pedestal. Holding the revolver unit (the part where the lenses attach) may cause damage.**



■ When stored

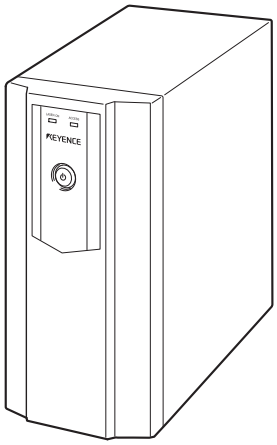
Follow these procedures in reverse to transport the device etc.

The flaps with round corners should be on the inside of the storage box when closing it.

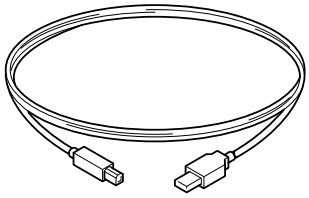
Checking the Package Contents

When you unpack the VK-X100K/X200K Series, check that the parts and equipment listed below are included in the package.
We have thoroughly inspected the package contents before shipment. However, in the event of defective or broken items, please contact the nearest KEYENCE office.

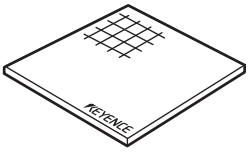
■ Control unit (VK-X100K/X200K)



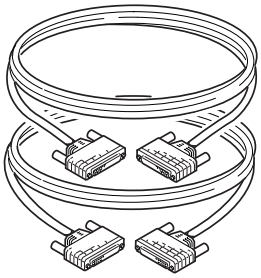
☐ Control unit: 1
* Between VK-X100K and VK-X200K, the designs are partially different.



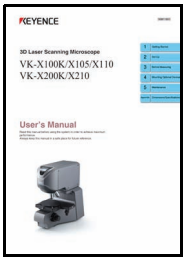
☐ USB cable 3 m : 1



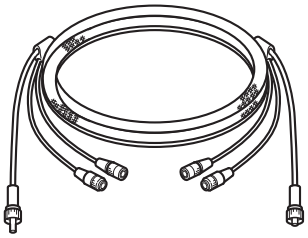
☐ Standard Chart (OP-51633) : 1



☐ Controller A cable (male) 3 m: 1
☐ Controller B cable (female) 3 m : 1



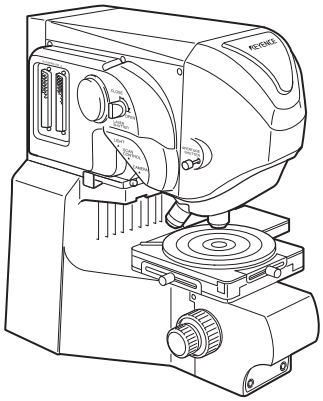
☐ User's Manual (this manual)



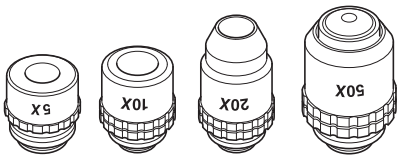
☐ Camera cable 3 m : 1
☐ Fiber optic cable 3 m : 1
☐ SCAN CONTROL cable 3 m : 1
* Packed with 3 cables bundled.

☐ Hexagonal wrench: 1
☐ Sleeve ferrite clamp ZCAT3035-1330 (TDK) : 2
ZCAT2035-0930 (TDK) : 1

■ Microscope unit (VK-X105)



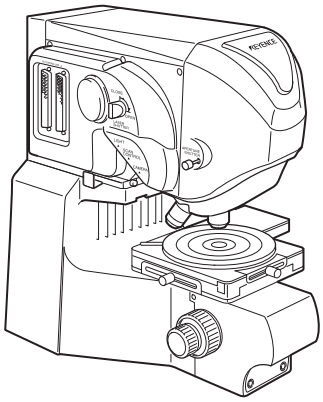
☐ Measurement unit: 1
☐ Rotating stage: 1
☐ Pedestal: 1



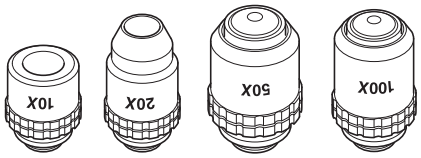
☐ Standard objective lens 1 each

CF IC EPI Plan 5X (Nikon)
CF IC EPI Plan 10X (Nikon)
CF IC EPI Plan 20X (Nikon)
CF IC EPI Plan 50X (Nikon)

■ Microscope unit (VK-X110)



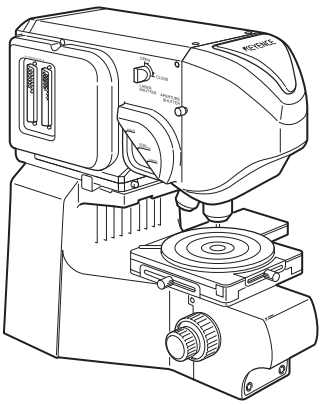
☐ Measurement unit: 1
☐ Rotating stage: 1
☐ Pedestal: 1



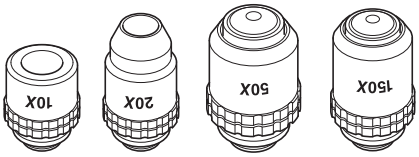
☐ Standard objective lens 1 each

CF IC EPI Plan 10X (Nikon)
CF IC EPI Plan 20X (Nikon)
CF IC EPI Plan 50X (Nikon)
CF IC EPI Plan 100X (Nikon)

■ Microscope unit (VK-X210)



☐ Measurement unit: 1
☐ Rotating stage: 1
☐ Pedestal: 1



☐ Standard objective lens 1 each

CF IC EPI Plan 10X (Nikon)
CF IC EPI Plan 20X (Nikon)
CF IC EPI Plan Apo 50X (Nikon)
CF IC EPI Plan Apo 150X (Nikon)

Checking the Installation Environment

The installation location of the VK-X100K/X200K Series needs to meet the following conditions.

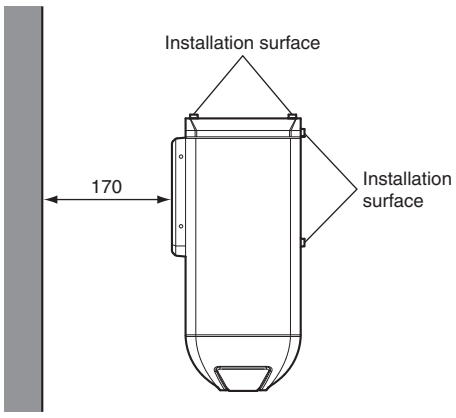
Installation environment

Item	Conditions
Ambient temperature	+15 to +28°C
Humidity	35 to 65% RH (No condensation)
Floor Vibration	1.5 x 10^{-3} m/s^2 or less (For frequencies less than 5 Hz, the amplitude should be less than 3 µm)

Space requirement

■ Microscope unit

Top view

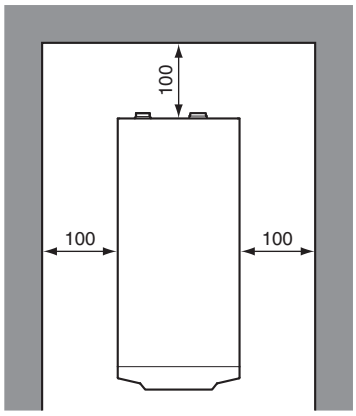


Unit: mm

- Leave at least 170 mm of space to insert the cable.
- Use the installation surface to install the measurement unit on the device or installation mount. Make sure that the measurement unit is installed so that vibrations from the frame are not transferred to the measurement unit.
- The outside cases of the devices are used as the ground potentials for the circuits. Make sure that the device is properly insulated if installed in a high-noise environment or a positive ground situation.

■ Control unit

Top view



Unit: mm

- It is recommended that the control unit be installed at least 100 mm from any walls or other structural objects.
- Be sure to ground the earth terminal attached to the AC power connector of the device.

■ Control PC and display

Make sure to check the manuals that come with the control unit and display to secure required installation space.

Power

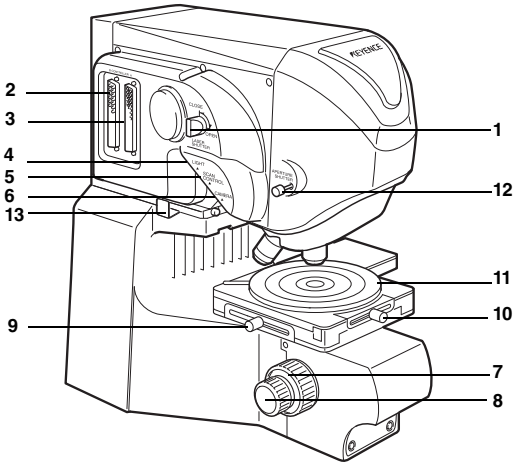
Secure 3 power outlets for the control unit, control PC and display.

Part Names and Functions

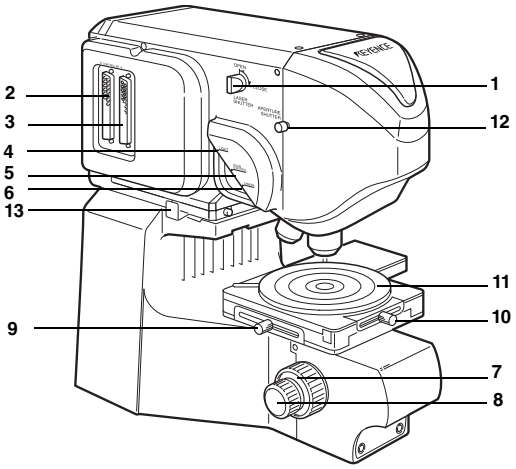
Microscope Unit (Left/Front View)

The VK-X100K/X200K Series microscopes use a measurement unit that contains both a CCD camera and confocal laser optics as well as a pedestal that includes the stage.

■ VK-X105/X110



■ VK-X210



1 LASER SHUTTER (Beam stop)
Switch OPEN/CLOSE for the laser aperture. The laser can pass through to the sample when this is OPEN and cannot when it is CLOSED.

2 CONTROLLER B connector
Connect this to the control unit with the provided controller B cable.

3 CONTROLLER A connector
Connect this to the control unit with the provided controller A cable.

4 LIGHT connector
Connects to the control unit via the provided fiber optic cable.

5 SCAN CONTROL connector
Use the provided SCAN CONTROL cable to connect to the control unit.

6 CAMERA connector
Connects to the control unit via the provided camera cable.

7 Focusing handle (Coarse)

8 Focusing handle (Fine)
The focus can be adjusted by moving the X-Y stage up and down.
Use Coarse for rough adjustment and Fine for precise movement.

Reference Focusing handles (Coarse and Fine) are found on both sides of the device. The handles on both sides operate exactly the same way and produce the same adjustments.

9 Y axis stage lock
Prevents the X-Y stage from moving in the Y axis.

10 X axis stage lock mechanism
Prevents the X-Y stage from moving in the X axis.

11 Rotating stage
Rotates, allowing the sample to be viewed from many angles.

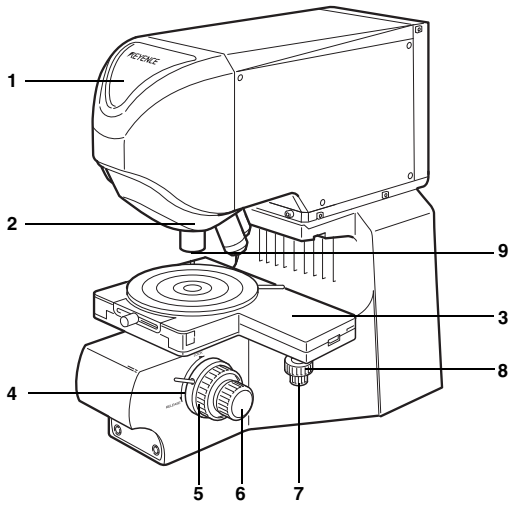
12 APERTURE SHUTTER (Aperture iris shutter)
You can adjust the brightness of the image by opening and closing the aperture iris shutter.
Press the knob to open the shutter and brighten the image.
Pull on the knob to close the shutter and darken the image.

Reference For the connection of each connector and the cable, refer to “Connections” (Page 2-4).

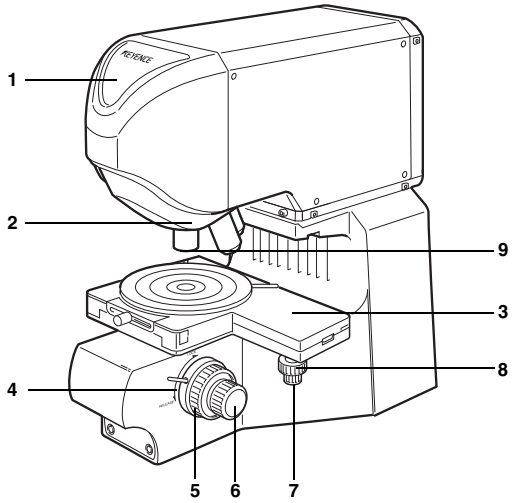
13 Cord hook
Hook Fiber optic cable, SCAN CONTROL cable and Camera cable to fix.

Microscope Unit (Right/Front View)

■ VK-X105/X110



■ VK-X210



1 Laser radiation emission warning
Lights up when the power to the control unit is ON.

2 Revolver
Switches the lens magnification.

3 X-Y stage
A stand for the sample to rest on.

4 Focusing handle lock
Locks the focusing handles for transporting the microscope unit.

LOCK : Locks the focusing handles.

RELEASE : Release the focusing handles.

NOTICE	**Make sure the focusing handle lock mechanism is in the LOCK position when transporting the microscope unit.**

5 Focusing handle (Coarse)

6 Focusing handle (Fine)
The focus can be adjusted by moving the X-Y stage up and down.

Use Coarse for rough adjustment and Fine for precise movement.

Reference Focusing handles (Coarse and Fine) are found on both sides of the device. The handles on both sides operate exactly the same way and produce the same adjustments.

7 X axis stage handle (left/right movement)
Moves the X-Y stage to the left or right.

8 Y axis stage handle (front/back movement)
Moves the X-Y stage forward or backward.

9 Objective lens

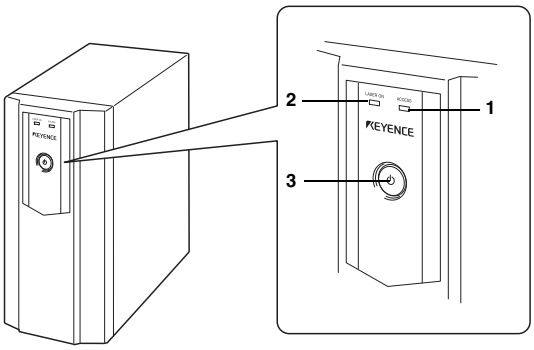
VK-X105 : 5x, 10x, 20x, and 50x are available.

VK-X110 : 10x, 20x, 50x and 100x are available.

VK-X210 : 10x, 20x, 50x and 150x lenses are available.

Control Unit (Front View)

■ VK-X100K/X200K



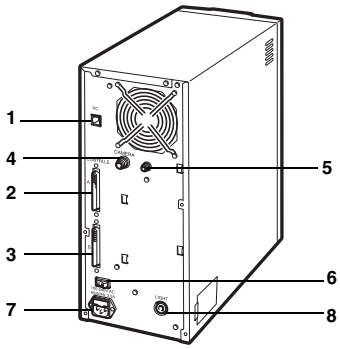
1 ACCESS lamp
Illuminates when the Observation Application is activated.

> Important **Pressing the POWER switch will not turn the device off while the ACCESS lamp is lit.**
> **Terminate the Observation Application to turn the power off.**

2 Laser radiation emission warning
Lights up when the power to the control unit is ON.

3 POWER switch
Turns the power to the control unit on or off.
“Startup and Shutdown” (Page 3-3)

Control Unit (Rear View)



1 PC connector
Connects to the control PC with the USB cable.

2 CONTROLLER A connector
Connects to the measurement unit with the provided controller A cable.

3 CONTROLLER B connector
Connects to the measurement unit with the provided controller B cable.

4 CAMERA connector
Connects to the measurement unit via the provided camera cable.

5 SCAN CONTROL connector
Connects to the control unit. with the provided SCAN CONTROL cable.

6 Main power switch
Turns the main power to the control unit on or off.
“Startup and Shutdown” (Page 3-3)

7 AC power inlet
Connects to the power supply with the appropriate AC power cable.

8 LIGHT connector
Connects to the measurement unit via the provided fiber optic cable.

> Reference For the connection of each connector and the cable, refer to “Connections” (Page 2-4).

Chapter 2

Set-Up

This chapter describes how to assemble the microscope unit and how to connect each device.

Assembling the Microscope Unit .....Page 2-2

Connections .....Page 2-4

Assembling the Microscope Unit

To prevent damage from vibration, when transporting the microscope unit the X-Y stage should be locked and the rotating stage as well as the objective lenses should be removed.

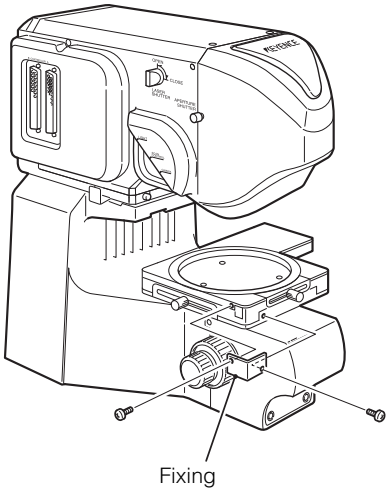
Before connecting to each device, unlock the X-Y stage and install the accessories.

Unlocking the X-Y Stage Lock

Removing the fixing metal fittings

Point A Phillips head screwdriver is required to remove the fixing metal fittings.

1 Remove the 2 screws that mount the fixing metal fittings on the corners of the X-Y stage using a Phillips head screwdriver.

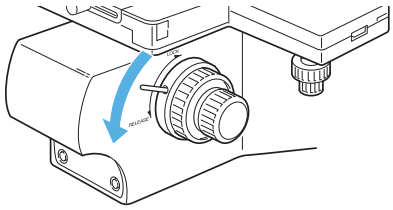


Removing the fixing metal fittings allows the X-Y stage to move front/back and left/right.

Important **The removed fixing metal fittings are required when transporting the VK-X100K/X200K Series. Be sure to keep them in a secure location.**

Unlocking the focusing handle lock

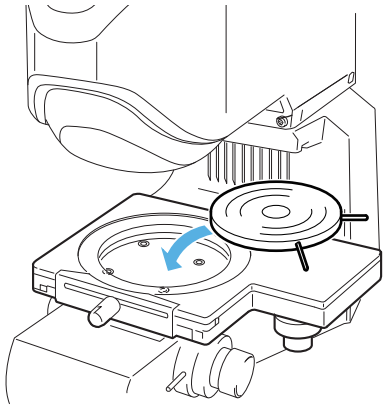
1 Tilt the lever for the focusing handle lock toward RELEASE.



The X-Y stage now can be moved up/down.

Mounting the Rotating Stage

1 Mount the rotating stage on the X-Y stage.



Mounting Optional Devices

Install optional devices, such as spacers or different stands, before installing the objective lens.

“Chapter 4 Mounting Optional Devices” (Page 4-1)

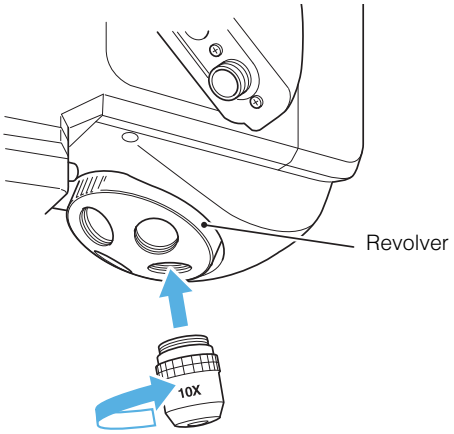
Mounting the Objective Lenses

Important **When mounting the objective lens, make sure the LASER SHUTTER is in the CLOSE position.**
For the LASER SHUTTER position, refer to “Part Names and Functions” (Page 1-12).

1 Remove the objective lens out of the lens case.

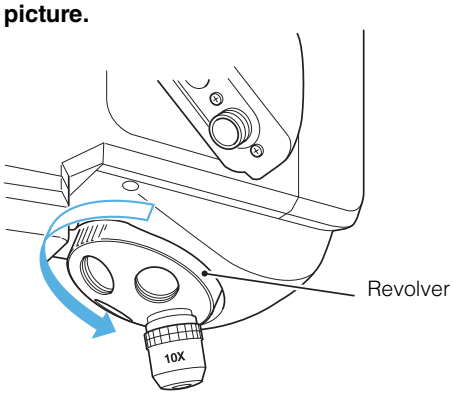
Important **The lens case is required when transporting the VK-X100K/X200K Series. Be sure to keep it in a secure location.**

2 Install the least-magnification objective lens at the installation position located forward-most of the revolver when viewing from the front.



Reference
- When unpacked, it is mounted so that the installation position of the least-magnification objective lens comes forward-most when viewing the microscope unit from the front.
- If you are unsure where each lens should be installed after removing all the lenses for relocation etc., select [Mount lens] from the [Tool] menu in the Observation Application. As the lens registered for the forward-most mounting position is displayed on the top of the list, mount the lenses accordingly.
  For the operation details, refer to “VK-X100K/X200K Observation/Image Assembling Application Reference Manual.”

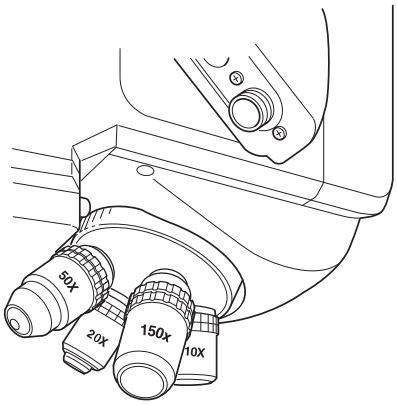
3 Turn the revolver in the direction shown in the picture.



The next objective lens mounting position comes toward you when viewing the microscope from the front.

4 Mount the second-least-magnification lens there.

5 Follow the same procedure to mount the rest of the objective lenses.



Mount them so that the magnification of the lens gets greater as the revolver is turned clockwise.

Connections

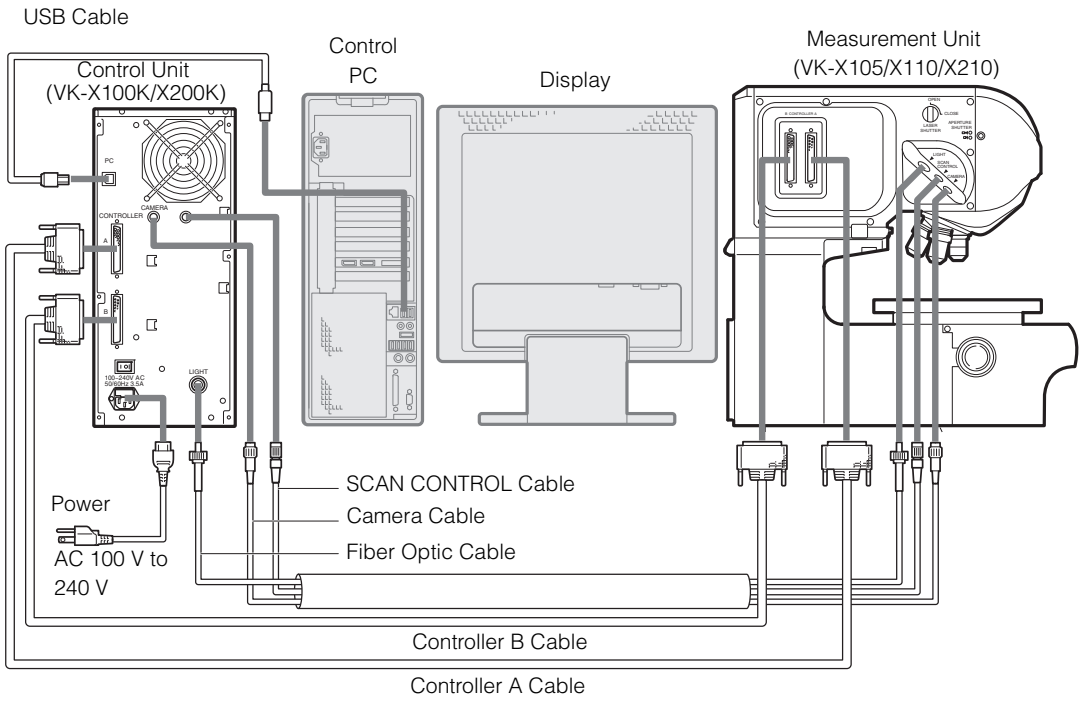
This section describes how to connect the equipment and accessories.

Connection Diagram

Microscope unit - Control unit - Control PC

Microscope unit (VK-X105/X110/X210), Control unit (VK-X100K/X200K), as well as the Control unit and Control PC, should be connected as shown below.

For the details of the connection, refer to “Connection Procedure” (Page 2-6).

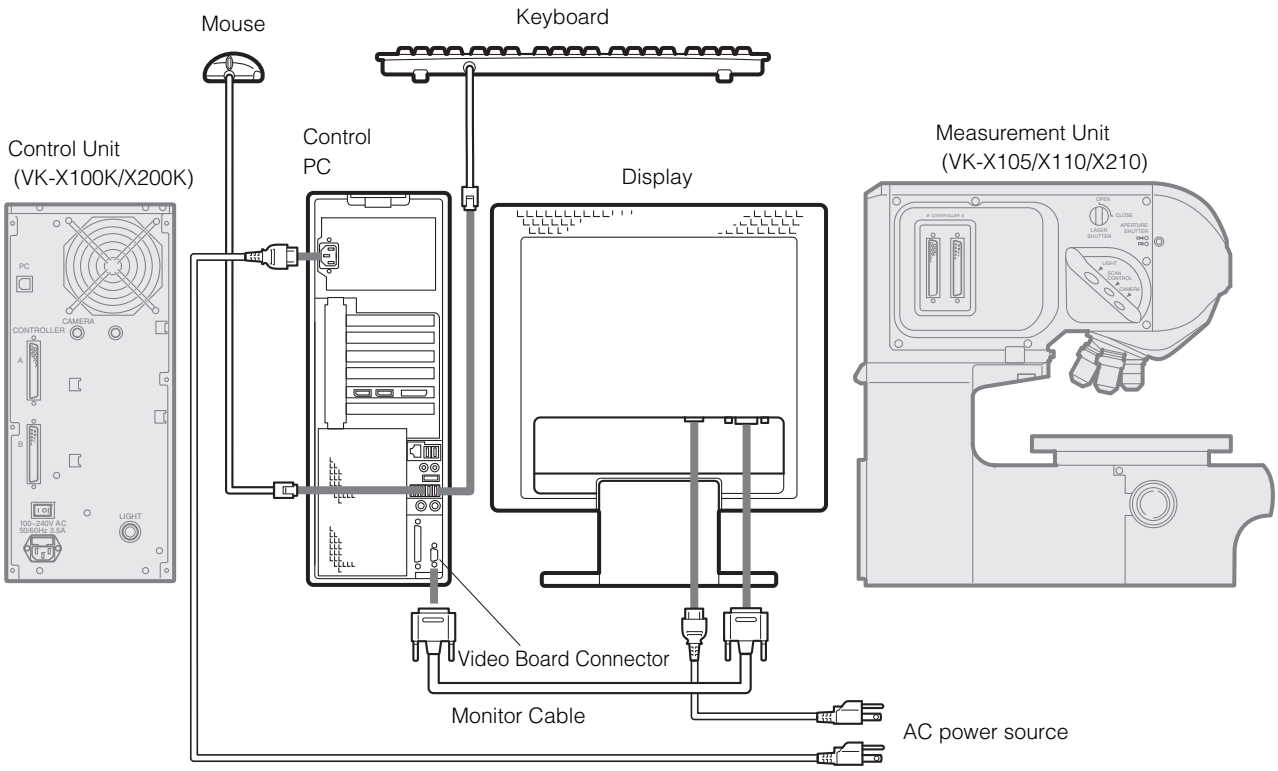


CAUTION	**• Be sure to connect the power cable to an outlet that has a grounding terminal.** **• Looking directly at the light from the LIGHT connector on the control unit (VK-X100K/X200K) may cause eye damage.** **Make sure that the power to the unit is off when installing the fiber optic cable.**

NOTICE	**• Make sure that power to the VK-X100K/X200K and all peripherals are off when connecting cables.** **• Do not use too much force when connecting cables, as this can break the connector pins.** **• Use screws to secure the connectors once they are connected.** **• When connecting the cable, use caution not to mistake the control unit side for the measurement unit side. Doing so may cause damage.** **• Connect the USB cable to the USB connector located at the rear of the control PC. Connecting to the front USB connector of the control PC may make the communication unstable.**

Control PC - Peripherals

Connect the control PC and peripherals (display, mouse, keyboard) as shown below.



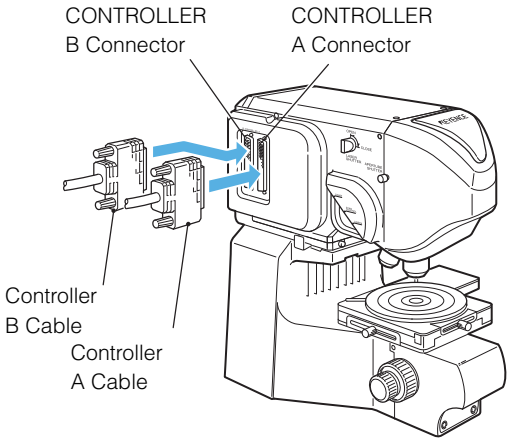
▶ Important **Specifications may be changed or updated without notice. This may cause the connection diagram to change.**

Connection Procedure

Connecting the microscope unit and control unit

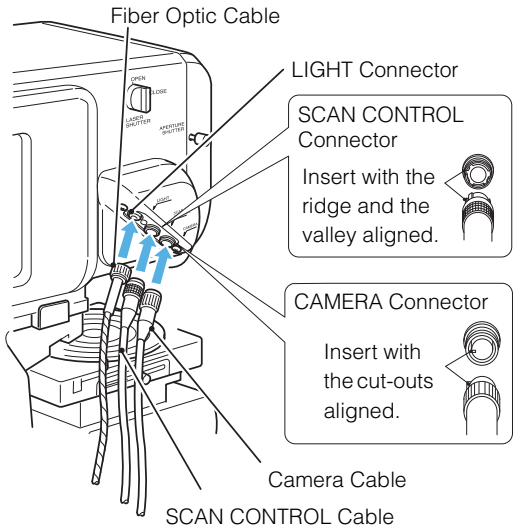
NOTICE	**Turn off the power to the control unit and control PC before connecting the cables. Connecting cables while the power is on could cause product failure.**

1 **Connect the controller A cable/B cable to the controller A connector/B connector located on the side of the microscope unit.**



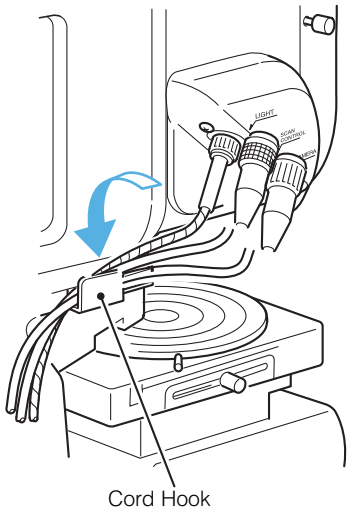
NOTICE	**Use screws to secure the connectors once they are connected.**

2 **Connect the fiber optic cable to the LIGHT connector on the side of the microscope unit, with the camera cable to the CAMERA connector and the SCAN CONTROL cable to the SCAN CONTROL connector.**

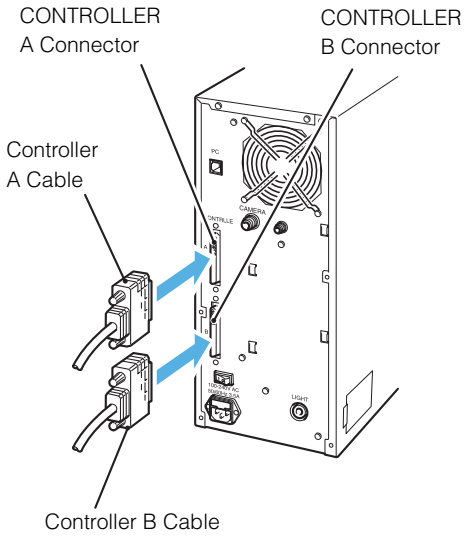


NOTICE	• **Inserting the cables in the wrong orientation may cause the connector pins to break.** • **Do not use too much force when connecting cables, as this can break the connector pins.** • **Any dust or dirt on the connector face of the fiber optic cable ends may cause degradation of the cable.** • **When connecting the cable, use caution not to mistake the control unit side for the measurement unit side. Doing so may cause damage.**

3 **Hold the cables with the cord hook after connected.**

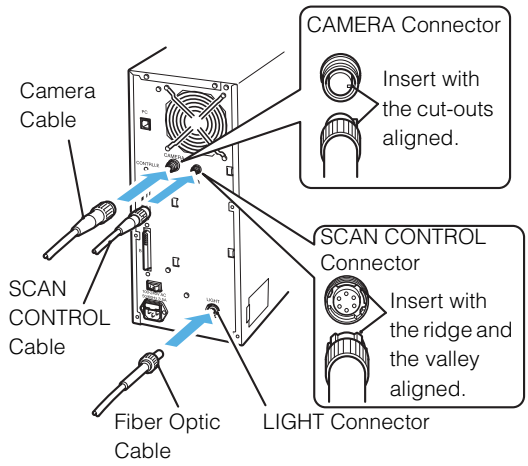


4 **Connect the CONTROLLER A cable/B cable to the controller A connector/B connector located on the rear of the microscope unit.**



NOTICE	**Use screws to secure the connectors once they are connected.**

5 **Connect the fiber optic cable to the LIGHT connector on the side of the microscope unit, with the camera cable to the CAMERA connector and the SCAN CONTROL cable to the SCAN CONTROL connector.**



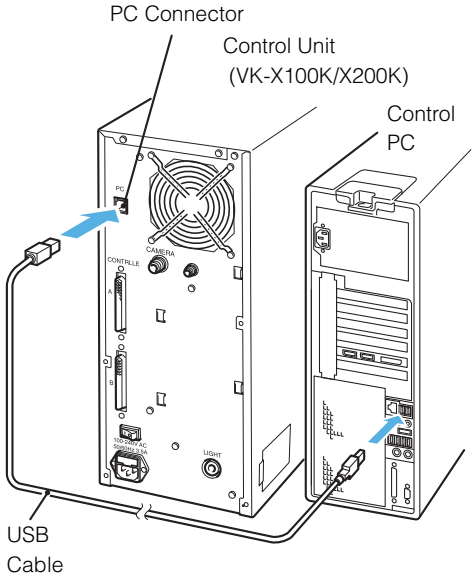
CAUTION	**The SCAN CONTROL connector is high voltage (150V DC). Do not connect other than the provided SCAN CONTROL cable of the VK-X100K/X200K Series. An electric shock or malfunction may occur.**

NOTICE	**• Inserting the cables in the wrong orientation may cause the connector pins to break. • Do not use too much force when connecting cables, as this can break the connector pins. • Any dust or dirt on the connector face of the fiber optic cable ends may cause degradation of the cable. • Turn off the power to the control unit before connecting the cables. Connecting cables while the power is on could cause product failure.**

Connecting the control unit to the control PC

NOTICE	**Connect the USB cable to the USB connector located at the rear of the Control PC. Connecting to the front USB connector of the control PC may make the communication unstable.**

1 **Connect the USB cable to PC connector on the back of the control unit and to the USB connector on the back of the control PC.**



Connecting the control PC and the peripherals

NOTICE	**Connect the control PC and the peripherals with the power of the control unit and the control PC turned off. Connecting cables while the power is on could cause product failure.**

1 Connect the display, keyboard and mouse to the control PC.

“Connection Diagram” (Page 2-4)

Connecting the power

Connect the control unit, the control computer and the display to an AC power source once all of the devices are connected.

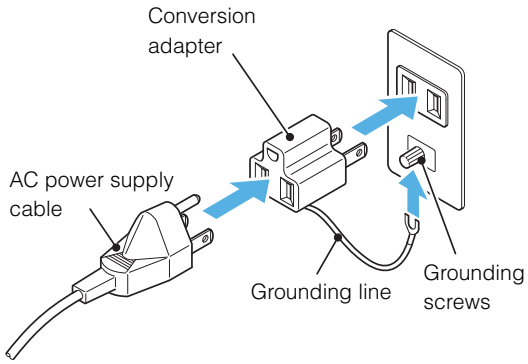
NOTICE	**Make sure that the power turned off on the control unit and the control PC etc., when connecting the AC power cable. Connecting cables while the power is on could cause product failure.**

1 Connect AC power cable to the control unit and the control PC.

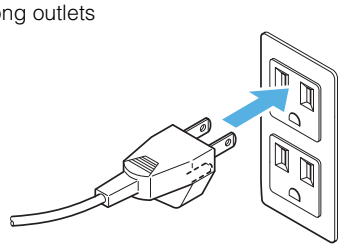
“Connection Diagram” (Page 2-4)

2 Connect the cables of the control unit, the control PC and the display to an AC power source.

For two-prong outlets



For three-prong outlets



CAUTION	• **Make sure that the earth terminal (the earth wire) of the AC power cable is grounded. Otherwise, an electric shock or malfunction may occur.** • **If the AC power source is a two-prong outlet, connect the cable using the supplied 3 to 2 conversion adapter. In such a case, be sure to ground the earth cable.**

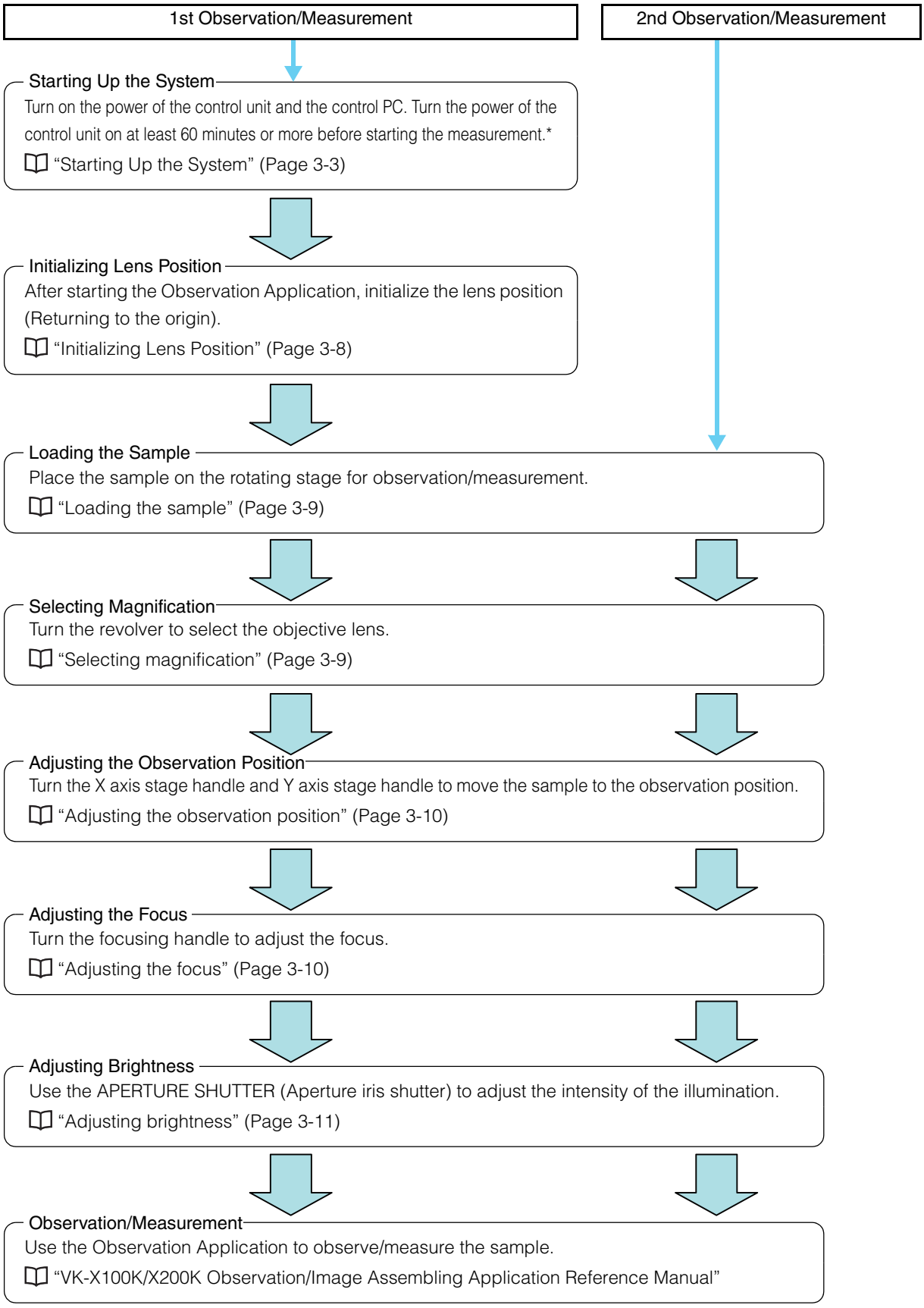
Chapter 3

Before Measuring

This chapter describes the preparation and basic adjustments to be made before taking measurements.

Sequence of Preparation before Measuring.....Page 3-2
Startup and Shutdown .....Page 3-3
Measurement Basics (For Proper Measurement) ..Page 3-5
Adjusting the Measurement Unit.....Page 3-8

Sequence of Preparation before Measuring

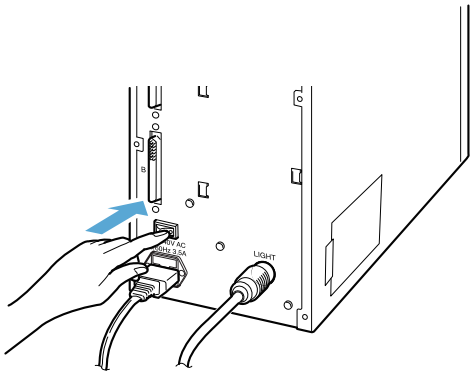


* Wait one hour after turning on the power of the control unit before taking measurements.
Measurements may fluctuate with the default drift if the temperature of the device is not stable.

Startup and Shutdown

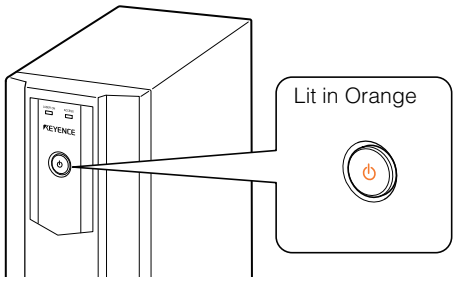
Starting Up the System

1 **If the power is not on, turn on the main power switch located on the rear of the control unit.**

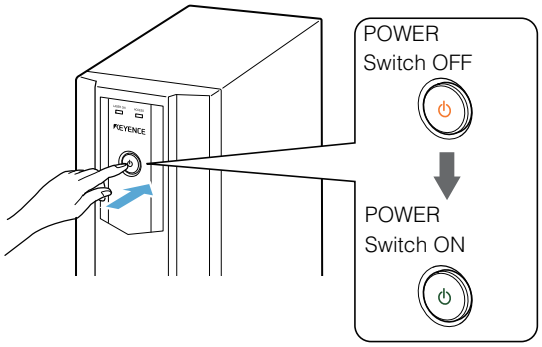


Point

When the POWER switch on the front of the control unit is lit in orange, the power is already on. No operation to switch the main power switch on the rear is required.



2 **Turn on the POWER switch located on the front of the control unit.**



The POWER switch light changes into green with the LASER ON (Laser radiation emission warning) lit.

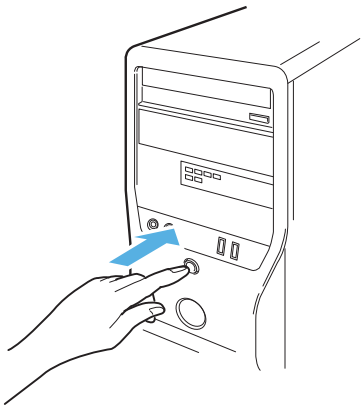
Important

Turn the power of the control unit on at least 60 minutes or more before starting the measurement.
To prevent fluctuations in measurements caused by the default drift with the internal temperature kept stable, 60 minutes or more of the pre-heating time is required.

3 **When using the electric X-Y stage (VK-S100K/S105/S110), turn the power for the stage driver on.**

"Special Electric X-Y Stage VK-S100K/S105/S110 for 3D Laser Scanning Microscope User's Manual"

4 **Turn on the power for the control PC.**



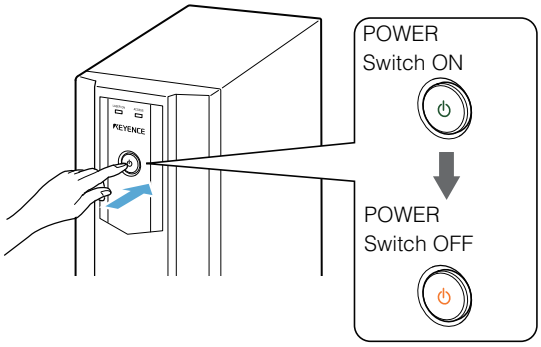
Reference

- While the control unit and the control PC may be turned on in a different order, it will take several seconds for communication to be established after the control PC recognizes the control unit.
- Log into the control PC using administrator privileges.

Shutting Down the System

1 **Shut down Windows.**
The control PC power turns off.

2 **Turn off the POWER switch on the front of the control unit.**



The LASER ON (Laser radiation emission warning) goes off with the POWER switch light changed to orange.

Reference

You do not need to turn off the main power every time you finish operation. Turn the main switch on the rear of the control unit off when the unit will not be used for a long time or when you are transporting the unit.

Measurement Basics (For Proper Measurement)

This section describes what you need to know before taking measurements.

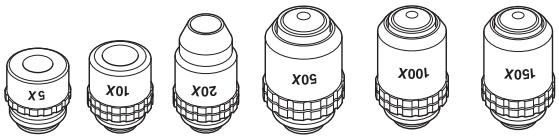
A Variety of the Standard Objective Lens and How to Select One

In VK-X105/X110/X210, each has the following 4 types of the standard objective lenses to mount. Select them according to their use.

Model	Standard objective lenses	Depth of Field (μm)*1	Angle characteristics	Plane measurements Width measurement	Height measurement	Film thickness measurement	Main use (Yardstick)
VK-X105	CF IC EPI Plan 5X	38.9	7.47	○	△	△	Aligning the Position for Measurement
	CF IC EPI Plan 10X	7.31	17.5	○	△	△	
	CF IC EPI Plan 20X	3.11	27.4	○	○	○	Shape and Film Thickness Measurement
	CF IC EPI Plan 50X	1.03	53.1	○	○	○	
VK-X110	CF IC EPI Plan 10X	7.31	17.5	○	△	△	Aligning the Position for Measurement
	CF IC EPI Plan 20X	3.11	27.4	○	○	○	
	CF IC EPI Plan 50X	1.03	53.1	○	○	○	Shape and Film Thickness Measurement
	CF IC EPI Plan 100X	0.73	71.8	○	○	X	
VK-X210	CF IC EPI Plan 10X	4.53	17.5	○	△	△	Aligning the Position for Measurement
	CF IC EPI Plan 20X	1.91	27.4	○	○	○	Shape and Film Thickness Measurement
	CF IC EPI Plan Apo 50X	0.45	71.8	○	○	○	
	CF IC EPI Plan Apo 150X	0.45	71.8	○	○	X	

*1 This is the depth of field in the laser images. The values listed above are theoretical values. ○ : Suited to the measurement.
△ : May be used depending on the condition.
X : Cannot be used for measurement.

■ Points for selecting the lens



● When measuring the height in high precision

Under normal circumstances, the standard 50x, 100x and 150x objective lenses are suited to height measurements.

In the measurement unit using confocal laser optics, the shallower the depth of field (range when the image is focused) of the objective lens, the better the repeat accuracy.

The highest magnification lens possible should be used for high-resolution height images.

● For measurements with a long Z measurement distance

The VK-X100K/X200K Series can set up to 7 mm in the Z measurement distance. However, when performing actual measurements, the size of the objective lens you are using will dictate the measurable Z measurement distance.

When taking measurements with broad Z measurement distance, it is recommended that you use the 10x or 20x objective lenses or lenses available on the market (long range or ultra-long range lenses).

● For high-resolution plane or width measurements

Plane measurements can be carried out with any standard objective lens.

When taking plane measurements, the narrower the field of view, the higher the resolution. Additionally, setting the measurement quality to super-fine detail will allow you to

read high-resolution images even with a low magnification lens.

● For a large area plane measurement

Under normal circumstances, the standard 10x and 20x objective lenses are suited for plane measurements.

■ About the long range/ultra-long range objective lenses

When a long focal distance (Z measurement distance) is preferred, long range/ultra-long range lenses on the market may be used. Select the best objective lens according to the size and shape of the sample.

Point

Some functions may not be available for measurement of the film thickness of a transparent object (top surface) etc. For more details, contact our Sales Dept.

Objective lens*1	Monitor magnification	Operating distance*2	Numerical aperture (N.A.)
Long distance 20X	400X	11.0 mm	0.4
Long distance 50X	1000X	8.7 mm	0.55
Long distance 100X	2000X	2.0 mm	0.8
Ultra-Long distance 20X	400X	20.5 mm	0.35
Ultra-Long distance 50X	1000X	13.8 mm	0.45
Ultra-Long distance 100X	2000X	4.7 mm	0.73

*1 All of these lenses are made by Nikon.

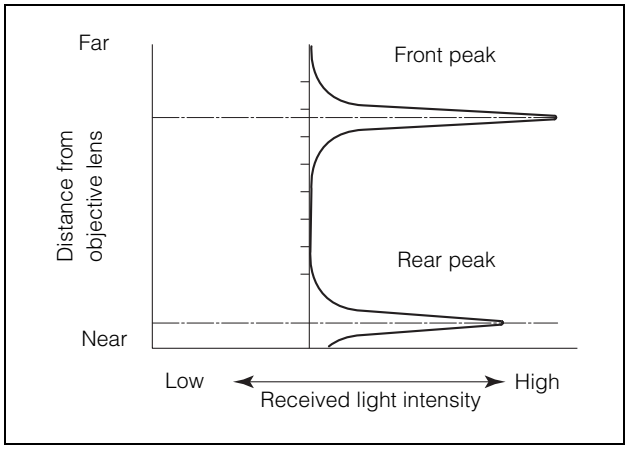
*2 Depending on differences between the individual lenses, the operating distance may be smaller than the above stated values. Make a judgement upon confirming the actual conditions.

Correction in the Film Thickness Measurement

There will be two focal points when measuring transparent samples, one in front and one behind. This means that the photoreceptor will also see two peaks. The VK-X100K/X200K Series can measure the thickness of a film by measuring the distance between those two peaks.

The value returned when measuring film thickness may be less than the actual thickness due to the refractive index of the material. These errors can be corrected by inputting the value for a master sample.

For the error correction method, refer to “VK-X100K/X200K Observation/Image Assembling Application Reference Manual.”



Adjusting the Positions of the Laser and the Camera

This feature allows you to correct for displacement of the camera or laser due to transportation or changes in temperature. These adjustments should be performed when registering a new lens or when you notice that the color or light intensity in color images are misaligned.

For the position adjustment method, refer to 📖 "VK-X100K/X200K Observation/Image Assembling Application Reference Manual."

Adjusting the Measurement Unit

Initializing Lens Position

Initialize the lens position (“Returning to the origin”).

Important

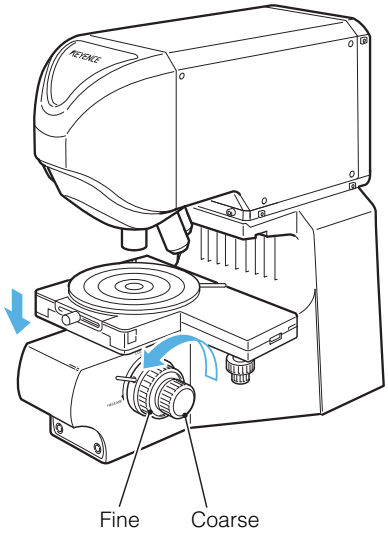
It is recommended that you initialize the lens position once per day when starting up the system. The lens position does not need to be initialized after each measurement.

NOTICE	**When initializing the lens position, do not place the sample on the rotating stage. Contact between the objective lens and the sample could damage either one.**

1 **Start the system.**

“Starting Up the System” (Page 3-3)

2 **Turn the focusing handle (Coarse/Fine) to lower the X-Y stage to the lowest level possible.**

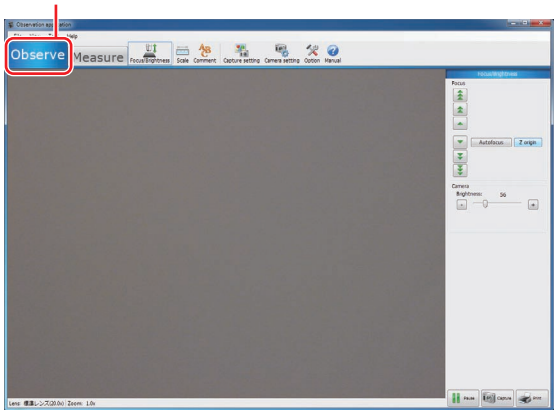


3 **Start the Observation Application.**

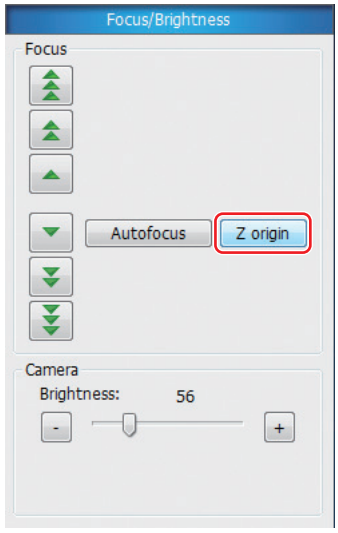
“VK-X100K/X200K Observation/Image Assembling Application Reference Manual”

4 **Select the [Observe] tab (<1>) in the tool bar.**

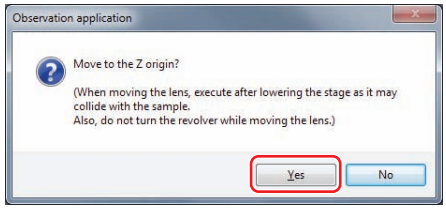
<1>



5 **Click the [Z origin] button.**



6 **Click [Yes] in the confirmation message.**

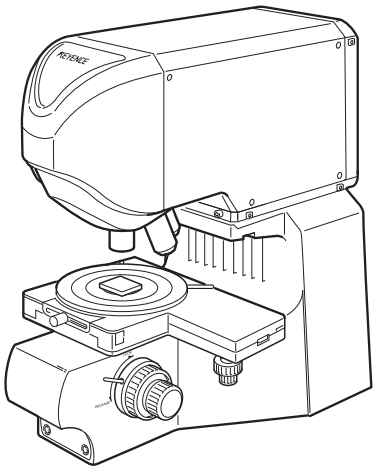


The revolver moves up/down automatically with the objective lens moving to the Z origin.

Adjustment of the Observation Position/Magnification

Loading the sample

1 Place the sample to be observed on the rotating stage.



NOTICE	**The standard X-Y stage can accommodate samples up to 28 mm in height and 5 kg in weight.**

Reference

If the sample height is larger than what can be accommodated by the standard stage, it is recommended that you install an optional spacer or stand.

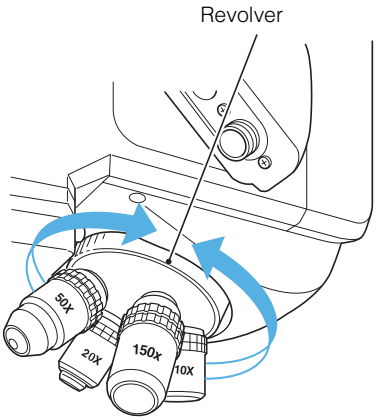
“Mounting the Spacer for the VK-X210” (Page 4-7)

“Mounting the Spacer for the VK-X105/X110” (Page 4-12)

“Mounting the Stand for VK” (Page 4-20)

Selecting magnification

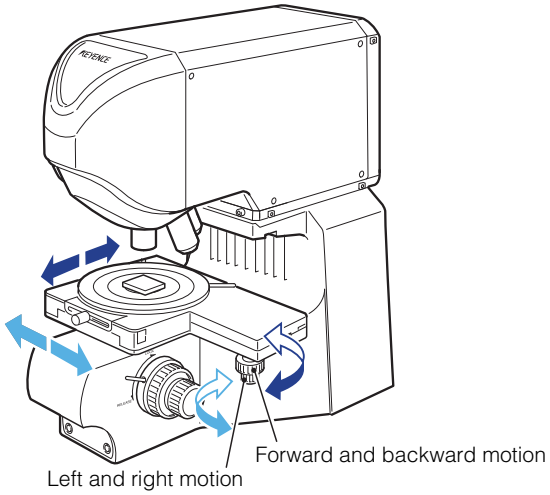
1 Turn the revolver manually, selecting the objective lens preferred for the observation.



NOTICE	**Do not bring the sample into contact with the objective lens when turning the revolver.** **Doing so may cause failure.**

Adjusting the observation position

1 Turn the X axis stage handle (left/right) and Y axis stage handle (forward/back) to move the sample to the observation position.

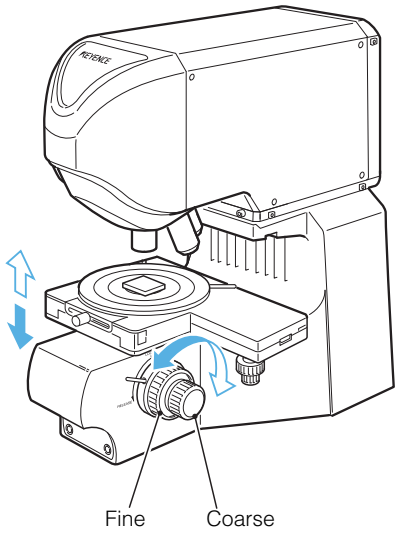


Handle	Maximum movement range	Distance covered by one rotation of the dial
X axis stage handle (left/right movement)	70 mm	18 mm
Y axis stage handle (Front/Back movement)	70 mm	36 mm

Adjusting Focus/Brightness

Adjusting the focus

1 Turn the focusing handle (Coarse/Fine) to adjust the focus.



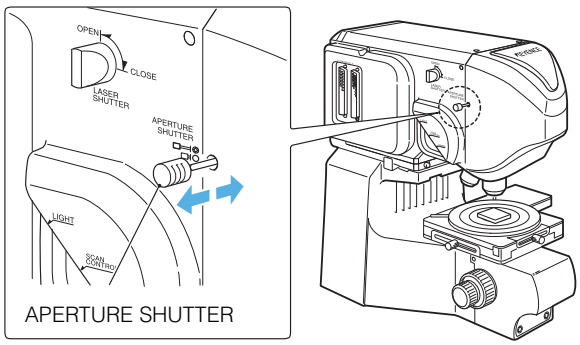
Handle	Distance adjusted	Maximum movement range
Focusing handle (Coarse)	Approx. 3.3 mm / turn	Approx. 28 mm
Focusing handle (Fine)	2 µm/scale	

NOTICE	**Do not bring the sample into contact with the objective lens when moving the X-Y stage up/down. Doing so may cause failure.**

Adjusting brightness

1 Push (or pull) the APERTURE SHUTTER (Aperture iris shutter) to adjust the intensity of the illumination.

For VK-X210



Reference

- To obtain the best images possible with 5x, 10x, 20x objective lens, keep the APERTURE SHUTTER open (by pressing and holding it) and use the shutter speed to adjust the brightness.
- When using the 100x or 150x objective lenses, use the APERTURE SHUTTER to adjust brightness. Chances are that there may be flares in the image if the aperture shutter is fully open (too bright).

MEMO

Chapter 4

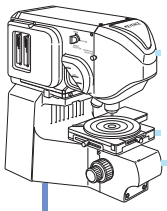
Mounting Optional Devices

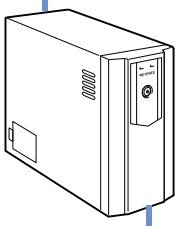
This chapter describes the optional devices and how to install them.

List of Optional Devices .....Page 4-2
Removing/Mounting the Measurement Unit.....Page 4-4
Mounting the Spacer for the VK-X210 .....Page 4-7
Mounting the Spacer for the VK-X105/X110.....Page 4-12
Mounting a 300 mm Wafer X-Y Stage .....Page 4-17
Mounting the Stand for VK.....Page 4-20

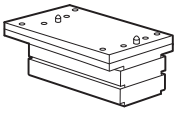
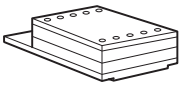
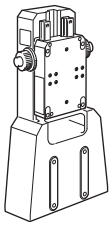
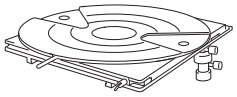
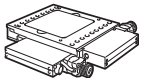
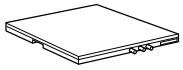
List of Optional Devices

In the VK-X100K/X200K Series, the following optional devices are available.
Contact your nearest KEYENCE office for more details.





●**Optional devices**

Name	Model Number	Function
Spacers (4 pieces) 	OP-51426	Use this when the sample is taller than can be viewed on a standard setup. The height can be adjusted by a combination of spacers. This spacer is for the VK-X210.
Spacers (4 pieces) 	OP-38162	Use this when the sample is taller or broader than can be viewed on a standard setup. The height and the area can be adjusted by a combination of spacers. This spacer is for the VK-X105/X110.
Stand 	OP-82693	Allows the measurement unit to change height by up to 100 mm when installed on the back of the microscope.
300 mm wafer X-Y stage 	OP-51498	A simple manual stage that allows wafers of 300 mm in diameter, LCD panels, circuit boards and other similar objects to be observed easily.
Electric X-Y Stage 	VK-S100K VK-S105 VK-S110	Swaps out for the standard X-Y stage when using the automatic image assembling function of the Image Assembling application.
Anti-vibration Stand 	971672 TAPC-45	Installing the microscope on an anti-vibration stand will improve its stability when exposed to vibration (made by TOKKYOKIKI CORPORATION).

Continue to next page

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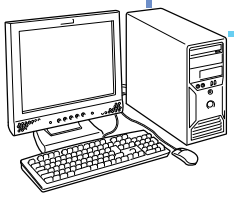


●Application

Name	Model Number	Function
Image Assembling Application	VK-H1XJ	Composes a single large image by image processing from a series of images measured by the Observation Application. When combined with the electric X-Y stage, this allows continuous measurement by automatic control.
Particle Analysis Module	VK-H1XG	Extends the functionality of the Analysis Application. This application allows measurement of the number as well as the area and length of the object particle, statistical processing of data etc.
Measurement Analysis Module	VK-H1XP	Extends the functionality of the Analysis Application. Automatic correction such as for uneven objects, measurement of volume, surface area, circumference, spherical curvature, plane angles, as well as observation position using a template etc., can be made.
ISO-25178 Surface Texture Measurement Module	VK-H1XR	Extends the functionality of the Analysis Application. This application allows measurement of ISO-25178 surface texture.

Removing/Mounting the Measurement Unit

When mounting the spacer (OP-38162/51246) and stand (OP-82693), the measurement unit must be removed from the pedestal of the microscope. This section describes how to remove/install the measurement unit.

CAUTION	**The measurement unit weighs approx. 8.5 kg for the VK-X105/X110 and approx. 10 kg for the VK-X210. Only place the device on stable, sturdy, level surfaces to prevent the device from falling and being damaged.**

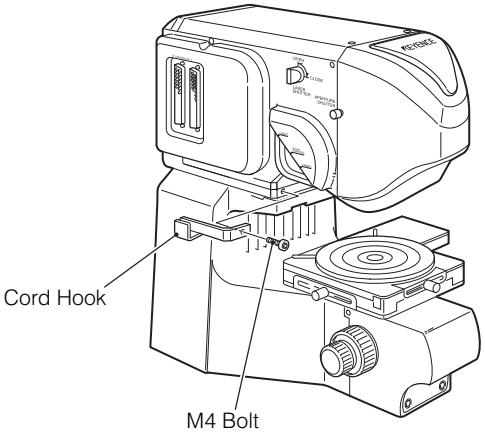
NOTICE	**Work with the objective lenses and cables removed from the measurement unit.**

Point Have a hexagonal wrench (M4/M5) ready to remove/install bolts.

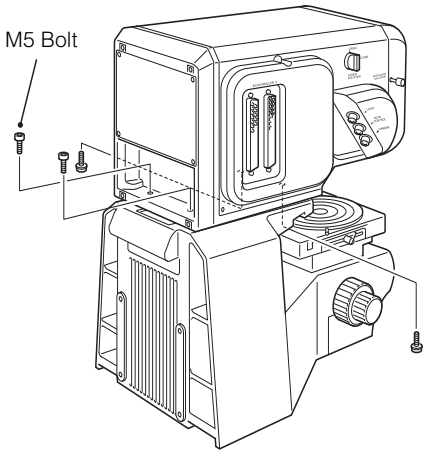
Removing the Measurement Unit

1 Confirm all of the objective lenses and cables are removed.

2 Remove the cord hook bolts that secure the cord hook from the side of the measurement unit, removing the cord hook.

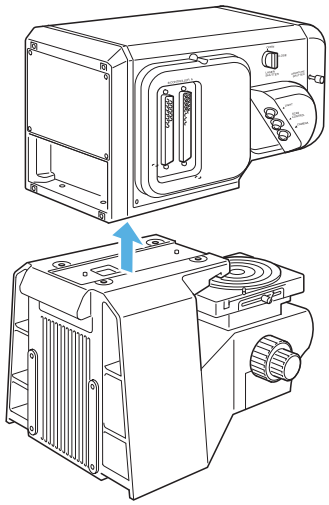


3 Remove the four bolts that secure the measurement unit and the pedestal.



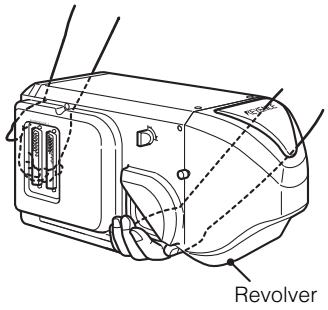
Important **The bolts are required for mounting the measurement unit when the spacer (OP-38162/51246) and stand (OP-82693) are removed. Be sure to keep them in a secure location.**

4 Remove the measurement unit from the pedestal.



NOTICE

- **To remove the measurement unit, hold the narrow part on the front and the indentation on the back of the unit, then lift it off of the pedestal.**
- **Do not lift the measurement unit by holding the revolver handle. Doing so may cause failure.**



Conditions for Mounting the Measurement Unit

When removing the measurement unit in order to use it mounted on the equipment and pedestal, confirm that the mounting position of the measurement unit meets the following conditions.

- The mounting panel is made of aluminum, stainless steel or iron with a thickness of 12 mm or more.
- 4 places on the side or back of the measurement unit are fixed to the mounting panel by M6 screws made of stainless steel or iron.

NOTICE

When used in an environment with positive grounding, an insulated mount is recommended.

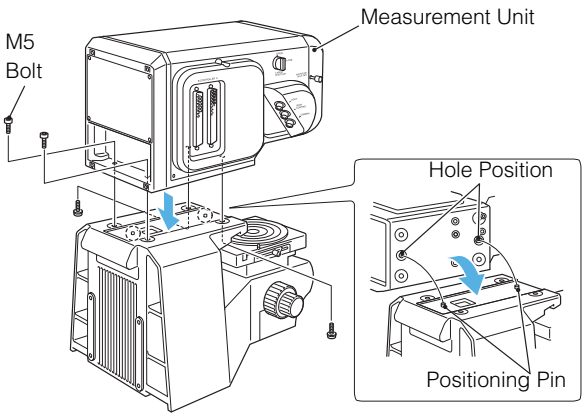
Mounting the Measurement Unit

After the spacer (OP-38162/51246) and the stand (OP-82693) are removed, mount the measurement unit.

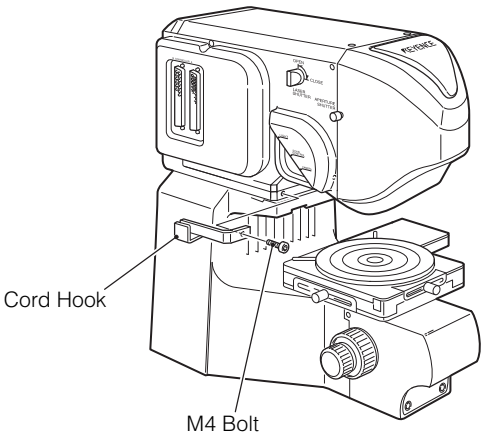
NOTICE	**When removing the spacer (OP-38162/51246) and stand (OP-82693) and mounting the measurement unit, work with the objective lenses and cables removed from the measurement unit.**

1 Reconnect the removed measurement unit to the pedestal by affixing the four connecting bolts.

When mounting, align the holes on the bottom of the measurement unit with the fixing pins on the pedestal.



2 Attach the cord hook.



3 Mount the objective lenses and connect the cables.

“Mounting the Objective Lenses” (Page 2-3)
“Connections” (Page 2-4)

Mounting the Spacer for the VK-X210

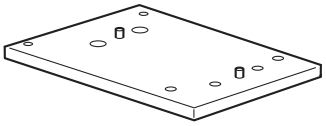
Mounting the spacer (OP-51426) on the VK-X210 allows for observation of samples that are taller than the standard specifications.

Point The spacer (OP-51426) is an option for the VK-X210. It cannot be used with other models.

Package List

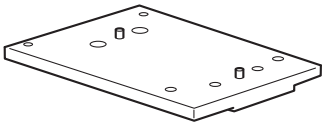
The spacer (OP-51426) consists of the following parts.

☐Spacer 1: 1 piece



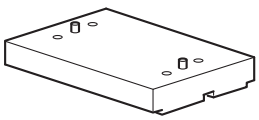
H 208×W 195×T 12 mm

☐Spacer 2: 1 piece



H 208×W 195×T 12 mm
The area and thickness are the same as those of spacer 1, but the shape is different.

☐Spacer 3: 2 pieces



H 186×W 155×T 25 mm
Smaller area than spacer 1/2, but thicker.

☐Stainless Steel Hexagon Socket Bolts

M6 length 15 mm: 4 pieces
M6 length 20 mm: 4 pieces
M6 length 40 mm: 2 pieces
M6 length 50 mm: 2 pieces
M6 length 65 mm: 2 pieces
M6 length 75 mm: 2 pieces

☐Stainless Steel Hexagon Socket Bolts with Washer

M6 length 25 mm: 4 pieces

☐Plain Stainless Steel Washers

Size M6: 10 pieces

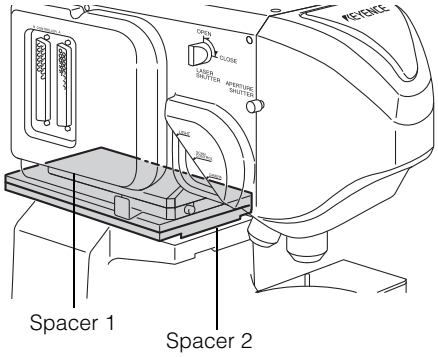
How to Use the Spacer

There are three ways to adjust the vertical clearance using the spacers for the VK-X210, as follows.

- Adjusting the height by 24 mm
  Combine spacer 1 and spacer 2.
- Adjusting the height by 49 mm
  Combine spacer 1, spacer 2 and spacer 3.
- Adjusting the height by 74 mm
  Combine spacer 1, spacer 2 and spacer 3 (2 pieces).

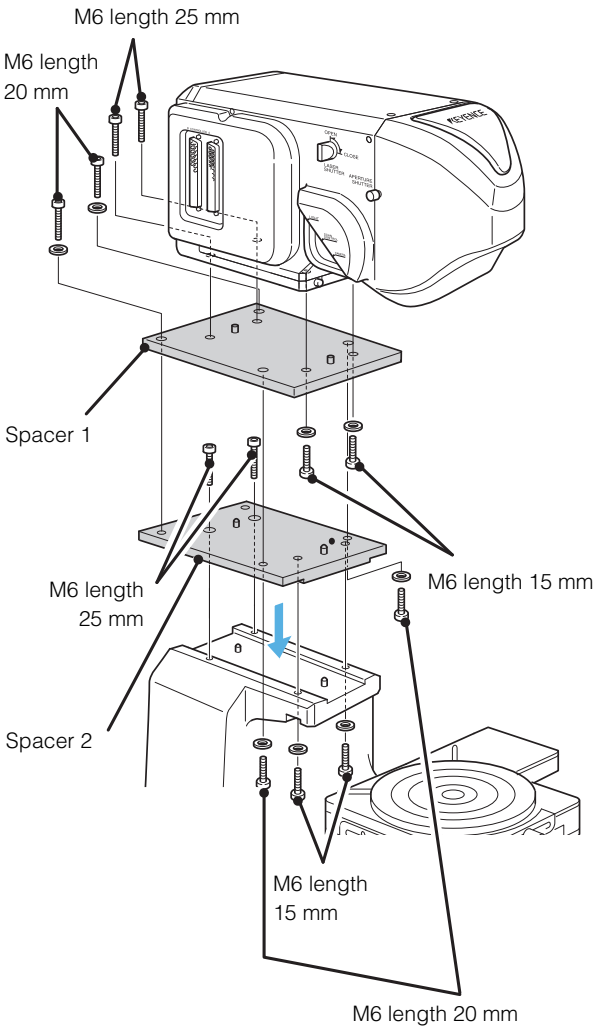
Adjusting the height by 24 mm: Spacer 1 + spacer 2

Combining spacers 1, and 2 (2 pieces) increases the vertical clearance by 24 mm.
Spacers 1 and 2 must be used together.



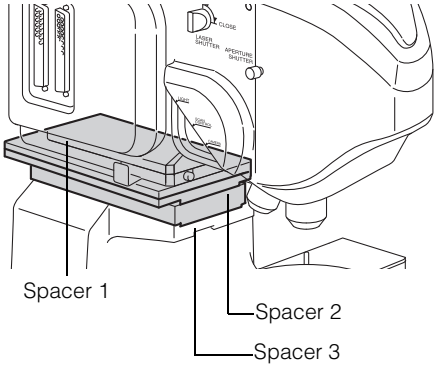
■ Bolts and washers to use

Name	Description	How to use
Stainless Steel Hexagon Socket Bolts	M6 length 15 mm: 4 pieces	Fastening spacer 1 to the measurement unit 2 pieces
		Fixing spacer 2 and the pedestal 2 pieces
	M6 length 20 mm: 4 pieces	Fixing spacer 1 and spacer 2 2 pieces
		Fixing spacer 2 and spacer 1 2 pieces
Stainless Steel Hexagon Socket Bolts with Washer	M6 length 25 mm: 4 pieces	Fastening spacer 1 to the measurement unit 2 pieces
		Fixing the pedestal and spacer 2 2 pieces
Stainless steel round plain washer	Size M6: 8 pieces	M6 not used for 25 mm bolt.



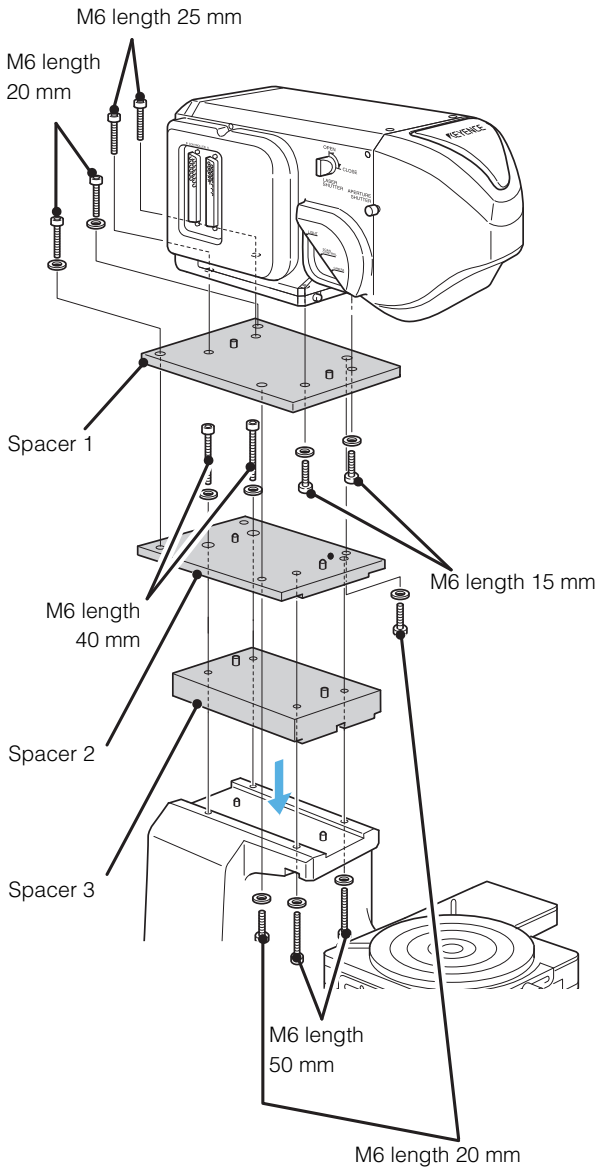
Height adjustment by 49 mm: Spacer 1 + spacer 2 + spacer 3

Combining spacers 1, 2 and 3 increases the vertical clearance by 49 mm.



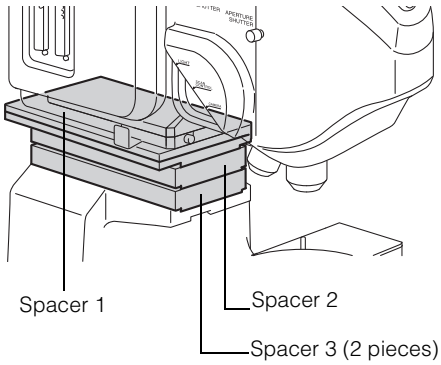
■ Bolts and washers to use

Name	Description	How to use
Stainless Steel Hexagon Socket Bolts	M6 length 15 mm: 2 pieces	Fastening spacer 1 to the measurement unit
	M6 length 20 mm: 4 pieces	Fixing spacer 1 and spacer 2 2 pieces
		Fixing spacer 2 and spacer 1 2 pieces
	M6 length 40 mm: 2 pieces	Fixing spacers 2 and 3 to the pedestal
	M6 length 50 mm: 2 pieces	Fixing spacers 3 and 2 to the pedestal
Stainless Steel Hexagon Socket Bolts with Washer	M6 length 25 mm: 2 pieces	Fastening spacer 1 to the measurement unit
Stainless steel round plain washer	Size M6: 10 pieces	M6 not used for 25 mm bolt



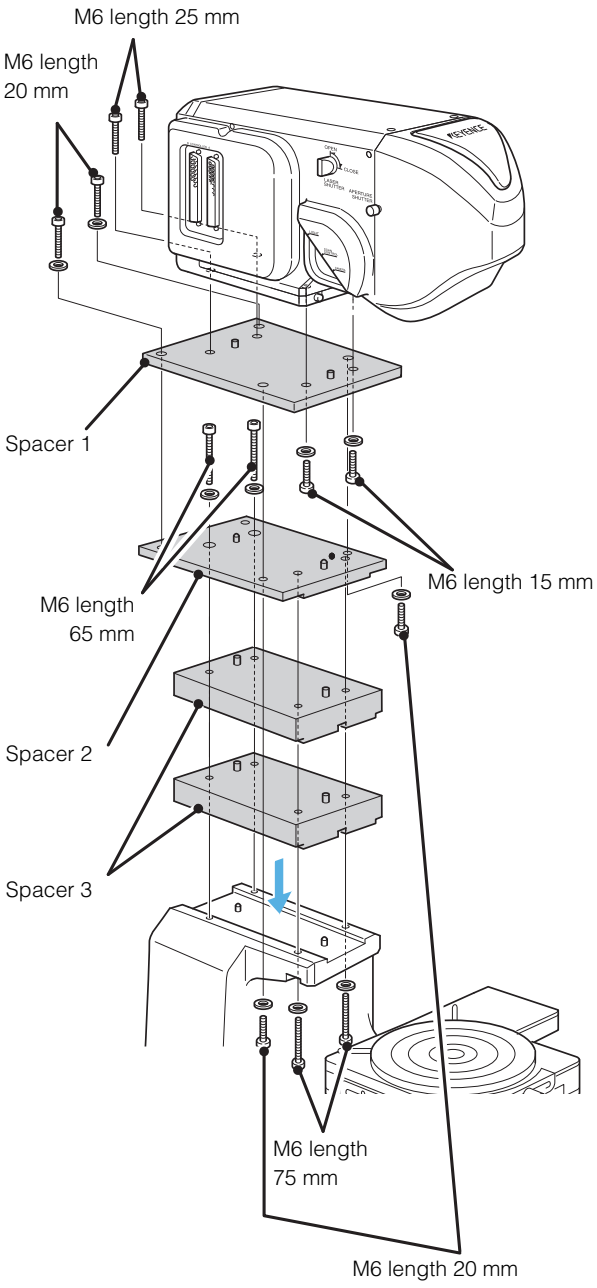
Height adjustment by 74 mm: Spacer 1 + spacer 2 + spacer 3 (2 pieces)

Combining spacers 1, 2 and 3 (2 pieces) increases the vertical clearance by 74 mm.



■ Bolts and washers to use

Name	Description	How to use
Stainless Steel Hexagon Socket Bolts	M6 length 15 mm: 2 pieces	Fastening spacer 1 to the measurement unit
	M6 length 20 mm: 4 pieces	Fixing spacer 1 and spacer 2 2 pieces
		Fixing spacer 2 and spacer 1 2 pieces
	M6 length 65 mm: 2 pieces	Fixing spacers 2 and 3 (2 pieces) to the pedestal
	M6 length 75 mm: 2 pieces	Fixing spacers 3 (2 pieces) and 2 to the pedestal
Stainless Steel Hexagon Socket Bolts with Washer	M6 length 25 mm: 2 pieces	Fastening spacer 1 to the measurement unit
Stainless steel round plain washer	Size M6: 10 pieces	M6 not used for 25 mm bolt



Mounting Spacers

CAUTION	**The measurement unit weighs approx. 8.5 kg for the VK-X105/X110 and approx. 10 kg for VK-X210. Only place the device on stable, sturdy, level surfaces to prevent the device from falling and being damaged.**

Required items

- Take the necessary number of bolts and plain washers out according to the number of the spacers to be mounted.
  For the number of spacers, bolts and plain washers, refer to “How to Use the Spacer” (Page 4-7).
- Have hexagonal wrenches (M5/M6/M8) ready.

How to mount

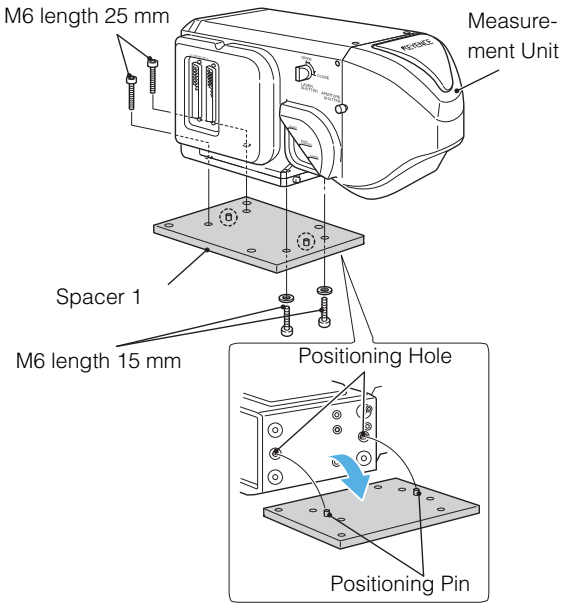
Here we will explain the case to use spacer 1, spacer 2 and spacer 3 (2 pieces) as an example.

Point

- When mounting a bolt, insert washer (except for M6 length 25 mm).
- When using spot-faced holes (bolt mounting hole), no washers are required.

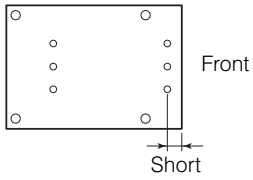
1 Remove the measurement unit.
“Removing the Measurement Unit” (Page 4-4)

2 After aligning the holes on the measurement unit over the pins for positioning of spacer 1, install M6 bolt of 15 mm (x2) and M6 bolt of 25 mm (x2).



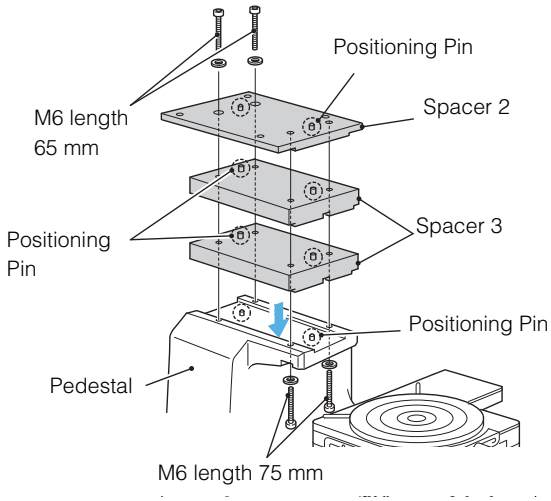
Point

- The spacer is placed so that the edge from which the distance to the positioning pins is shorter, faces the front of the device (toward the objective lens).



- Begin with spacer 1 to affix to the measurement unit with M6 length 15 mm bolt.
- Begin with the measurement unit to affix spacer 1, with M6 length 25 mm bolt (2 pieces).

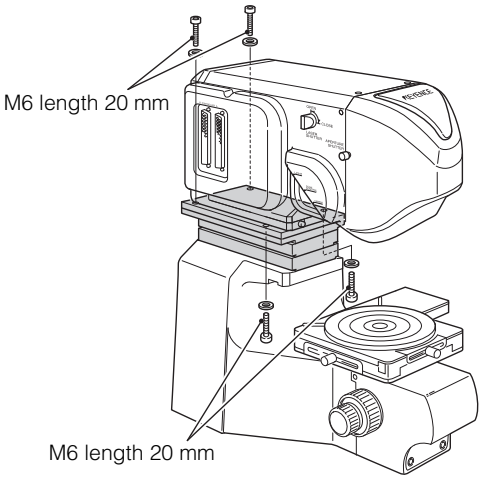
3 Install spacer 3 (2 pieces) and then spacer 2 in order on the pedestal by aligning the positioning pin to positioning hole and fix with M6 65 mm bolt (2 pieces) and M6 75 mm bolt (2 pieces).



Point

- Begin with spacer 2 to fix to the pedestal with M6 length 65 mm bolt (x2).
- Begin with the pedestal to fix spacer 3 (x2) and spacer 2 with M6 length 75 mm bolt (x2).

4 After aligning the positioning holes on spacer 1 over the positioning pins for on spacer 2, install M6 bolt of 20 mm (x4) to fix .



5 Attach the cord hook.

“Mounting the Measurement Unit” (Page 4-6)

6 Mount the objective lenses and connect the cables.

“Mounting the Objective Lenses” (Page 2-3)
“Connections” (Page 2-4)

Mounting the Spacer for the VK-X105/X110

Mounting the spacer (OP-38162) on the VK-X105/X110 allows for observation of samples taller than the standard specifications.

Point

Spacer (OP-38162) is optional for the VK-X105/X110. It cannot be used with other models.

Package List

Spacer (OP-38162) consists of the parts below.

☐Spacer 1 (Top panel): 1 piece

H 175×W 185×T 12 mm

☐Spacer 2 (middle panel): 2 pieces

H 175×W 185×T 25 mm
The area and the height are the same as for spacer 1, but with approx. twice as much in thickness.

☐Spacer 3 (Bottom panel): 1 piece

H 175×W 280×T 12 mm
The thickness is the same as for spacer 1, but with different area.

☐Stainless Steel Hexagon Socket Bolts

M6 length 15 mm: 2 pieces
M6 length 20 mm: 2 pieces
M6 length 25 mm: 4 pieces
M8 length 25 mm: 4 pieces
M8 length 50 mm: 4 pieces
M8 length 75 mm: 4 pieces

☐Plain Stainless Steel Washers

Size M6: 8 pieces
Size M8: 8 pieces

☐Stainless Steel Round Spring Washer

Size M6: 8 pieces
Size M8: 8 pieces

How to Use the Spacer

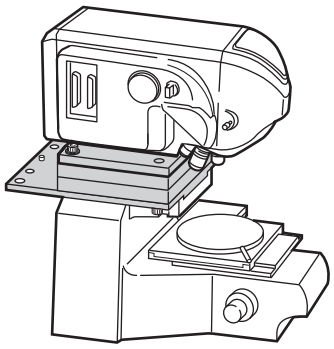
There are three ways as follows to adjust the vertical clearance using a spacer for the VK-X105/X110.

- Pattern A - Adjusting the height of the measurement unit
  For use with a tall sample.
- Pattern B - Adjusting the position of the measurement unit.
  For use with a sample wider than X-Y stage.
- Pattern C - Adjusting the orientation of the measurement unit.
  For use with a sample unable to place on X-Y stage.

Pattern A - Adjusting the height of the measurement unit

For use with a tall sample. Adjust the height of the measurement unit with a combination of spacers 1 to 3.

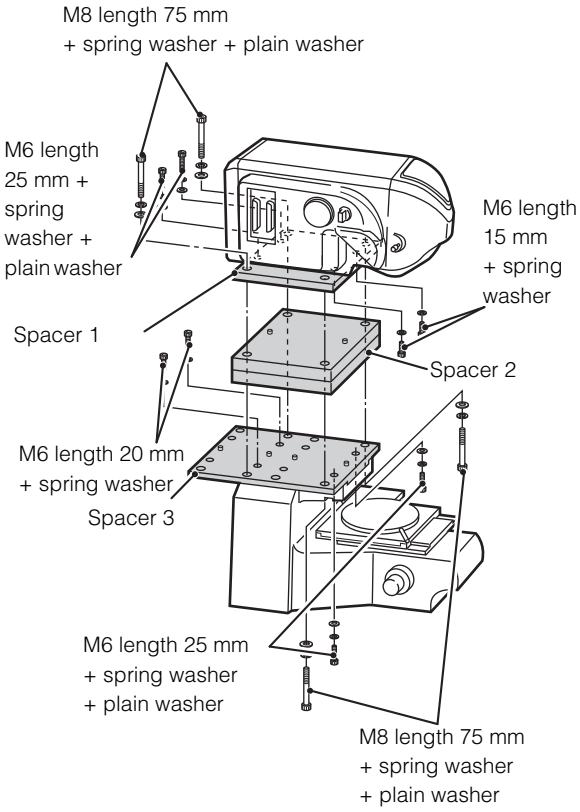
Spacers 1 and 3 must be used together. Spacer 2 is used in necessary number of pieces.



■ Bolts and washers to use

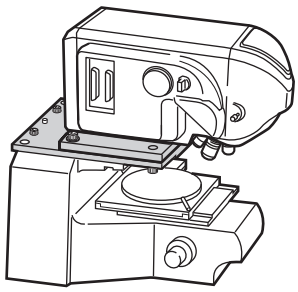
Name	Description	How to Use
Stainless Steel Hexagon Socket Bolts	M6 length 15 mm: 2 pieces	Fastening spacer 1 to the measurement unit
	M6 length 20 mm: 2 pieces	Fixing spacer 3 and the pedestal
	M6 length 25 mm: 4 pieces	Fastening spacer 1 to the measurement unit 2 pieces
		Fixing the pedestal and spacer 3 2 pieces
	M8 length 75 mm: 4 pieces	Fixing spacer 3 and spacer 1 2 pieces
		Fixing spacer 1 and spacer 3 2 pieces

Stainless steel round plain washer	Size M6: 4 pieces Size M8: 4 pieces	
Stainless steel spring washers	Size M6: 8 pieces Size M8: 4 pieces	



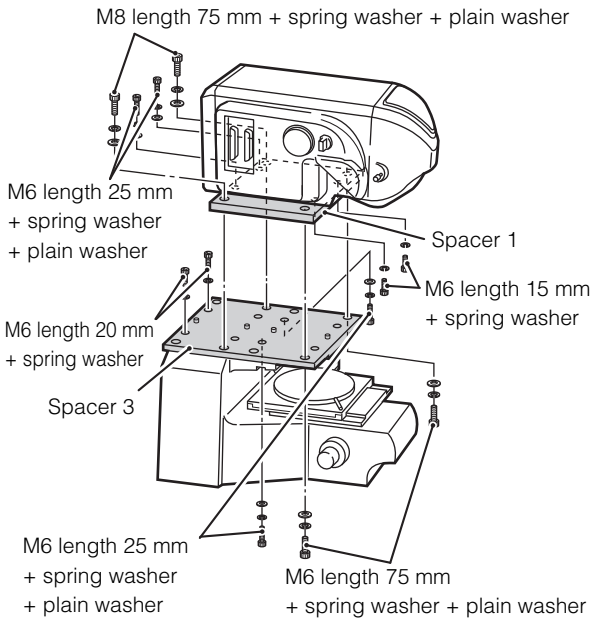
Pattern B - Adjusting the position of the measurement unit

For use with a sample wider than X-Y stage. Adjust the position of the measurement unit with a combination of spacers 1 and 3.



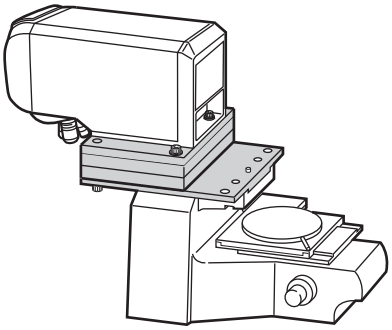
■ Bolts and washers to use

Name	Description	How to Use
Stainless Steel Hexagon Socket Bolts	M6 length 15 mm: 2 pieces	Fastening spacer 1 to the measurement unit
	M6 length 20 mm: 2 pieces	Fixing spacer 3 and the pedestal
	M6 length 25 mm: 4 pieces	Fastening spacer 1 to the measurement unit 2 pieces
		Fixing the pedestal and spacer 3 2 pieces
	M8 length 25 mm: 4 pieces	Fixing spacer 3 and spacer 1 2 pieces
		Fixing spacer 1 and spacer 3 2 pieces
Stainless steel round plain washer	Size M6: 4 pieces Size M8: 4 pieces	
Stainless steel spring washers	Size M6: 8 pieces Size M8: 4 pieces	



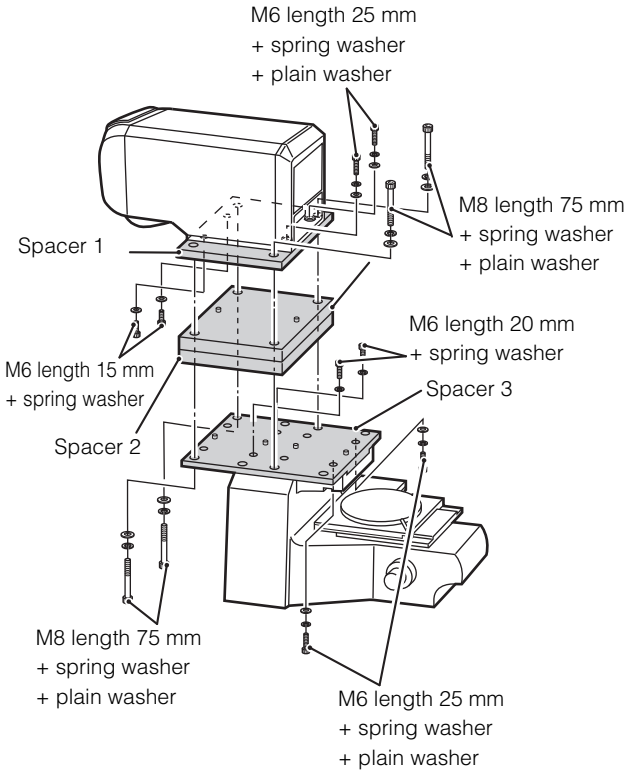
Pattern C - Adjusting the orientation of the measurement unit

For use with a sample unable to place on the X-Y stage. Adjust the orientation of the measurement unit with a combination of spacers 1 and 3.



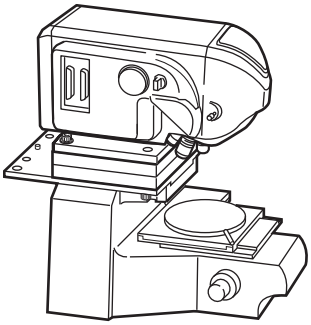
■ Bolts and washers to use

Name	Description	How to Use
Stainless Steel Hexagon Socket Bolts	M6 length 15 mm: 2 pieces	Fastening spacer 1 to the measurement unit
	M6 length 20 mm: 2 pieces	Fixing spacer 3 and the pedestal
	M6 length 25 mm: 4 pieces	Fastening spacer 1 to the measurement unit 2 pieces
		Fixing the pedestal and spacer 3 2 pieces
	M8 length 75 mm: 4 pieces	Fixing spacer 3 and spacer 1 2 pieces
		Fixing spacer 1 and spacer 3 2 pieces
Stainless steel round plain washer	Size M6: 4 pieces Size M8: 4 pieces	
Stainless steel spring washers	Size M6: 8 pieces Size M8: 4 pieces	



Mounting Spacers

This portion uses the spacer with pattern A as an example of installing spacers. When selecting other pattern, refer to the combinations on the previous page and work accordingly.



CAUTION	**The measurement unit weighs approx. 8.5 kg for the VK-X105/X110 and approx. 10 kg for the VK-X210. Spacers are heavy. Only place the device on stable, sturdy, level surfaces to prevent the device from falling and being damaged. Moving the center of gravity of the microscope unit too far forward may cause the microscope to fall and cause injury or damage.**

Required items

- Take the necessary number of bolts and washers out according to the number of the spacers to be mounted. As for the number of spacers, bolts, and plain washers, refer to “How to Use the Spacer” (Page 4-12).
- Have hexagonal wrenches (M5/M6/M8) ready.

How to mount

Point

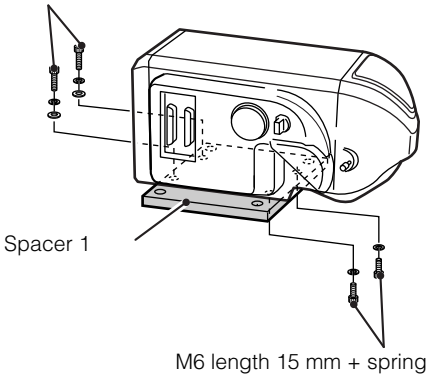
When installing bolts, for a place where both of the spring washer and the plain washer are used, put the spring washer through the bolt first (line up in the order of bolt head - spring washer - installation position).

1 Remove the measurement unit.

“Removing the Measurement Unit” (Page 4-4)

2 Install spacer 1 on the measurement unit with M6 bolt of 15 mm (x2) and M6 bolt of 25 mm (x2).

M6 length 25 mm + spring washer + plain washer

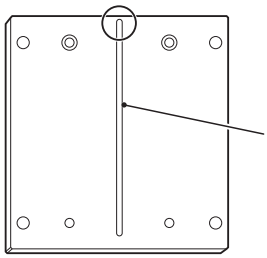


M6 length 15 mm + spring washer

Point

- The spacer is placed so that the edge from which the distance to the positioning pins is shorter, faces the front (toward the objective lens).

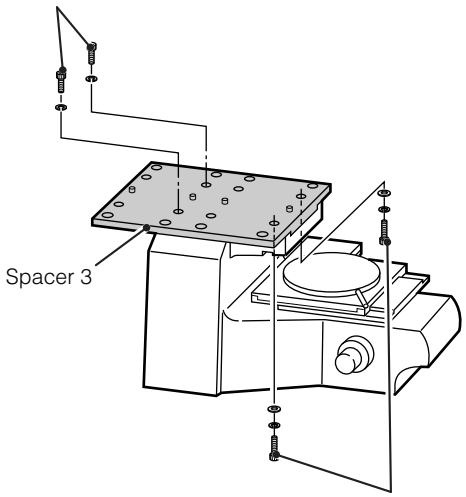
The shorter side faces the front of the device (toward the objective lens)



- Begin with spacer 1 to affix to the measurement unit with M6 15 mm long bolt.
- Begin with spacer 1 to affix to the measurement unit with M6 25 mm long bolt (2x) and spring washer + plain washer.

3 **Install spacer 3 on the measurement unit with M6 bolt of 20 mm (x2) and M6 bolt of 25 mm (x2).**

M6 length 20 mm + spring washer



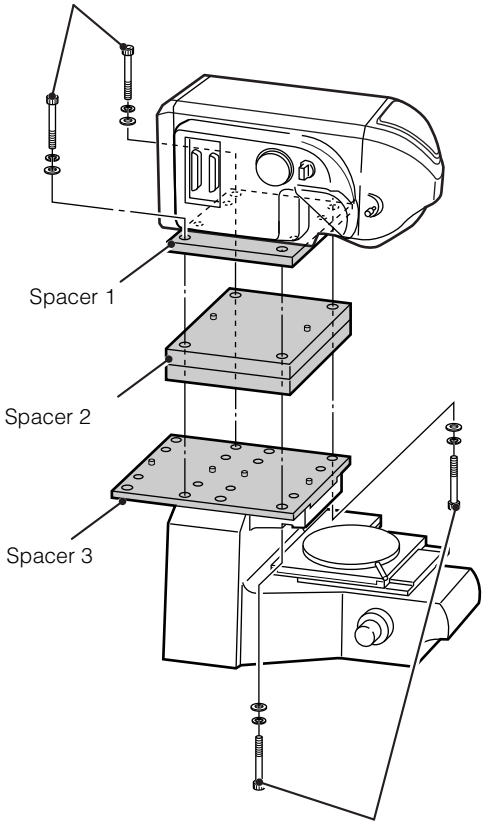
M6 length 25 mm + spring washer + plain washer

Point

- Begin with spacer 3 to affix to the measurement unit with M6 20 mm long bolt (2x).
- Begin with the pedestal to affix to the spacer 3 with M6 25 mm long bolt (2x) and spring washer + plain washer.

4 **Place spacer 2 (2x) on top of spacer 3 paying attention to the correct orientation.**

M8 length 75 mm + spring washer + plain washer



M8 length 75 mm + spring washer + plain washer

5 **Place spacer 1 and the measurement unit on spacer 2, fixing with M8 75 mm long bolt (4X).**

6 **Attach the cord hook.**

“Mounting the Measurement Unit” (Page 4-6)

7 **Mount the objective lenses and connect the cables.**

“Mounting the Objective Lenses” (Page 2-3)
“Connections” (Page 2-4)

Mounting a 300 mm Wafer X-Y Stage

When the 300 mm wafer X-Y stage is installed, such broad range of samples as 300 mm wafers, circuit boards and LCD panels, can be observed.

CAUTION	**Do not use the 300 mm wafer X-Y stage (OP-51498) in a way the loads concentrate on one place on the stage with the stage moved to the farthest front and right direction. Moving the center of gravity of the microscope unit too far forward may cause the microscope to fall and cause injury or damage.**

NOTICE	• **Do not place objects that weigh 1 kg or more on the 300 mm wafer X-Y stage (OP-51498). Doing so may cause damage.** • **Do not use the stage in a way having a large load concentrated on single place on the stage. Doing so may cause damage.** • **Do not turn the handles while the lock is set. Doing so may cause damage (The stage is locked when it leaves the factory. Be sure to release the stage before using).**

Point The 300 mm wafer X-Y stage (OP-51498) is shared by the VK-X105/X110/X210/8710/9710.

Package List

The 300 mm wafer X-Y stage (OP-51498) consists of the parts below.

☐300 mm wafer X-Y stage: 1

Moving range	:	X axis 160 mm, Y axis 160 mm
Rotating direction	:	360 degrees
Stroke of one rotation of the handle	:	X axis 18 mm, Y axis 36 mm
Load endurance	:	1.0 kg

☐12 inch wafer holder (Rotating stage): 1

☐Hexagonal wrench: 1

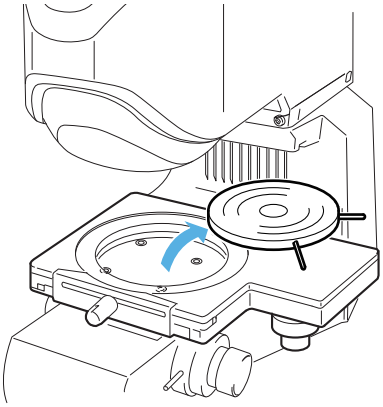
☐Operation Manual: 1

Reference The 4.5 inch wafer holder (OP-51561) can be mounted on the 300 mm wafer X-Y stage.

Mounting a 300 mm Wafer X-Y Stage

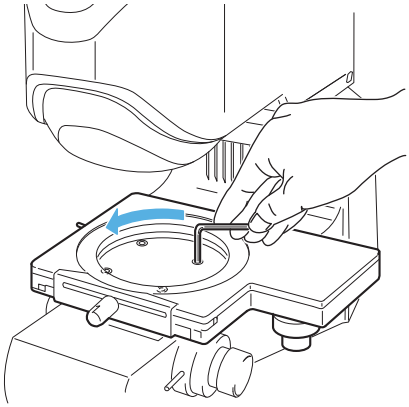
1 Confirm all of the objective lenses and cables are removed.

2 Remove the rotating stage from the pedestal.



3 Remove the standard X-Y stage from the pedestal.

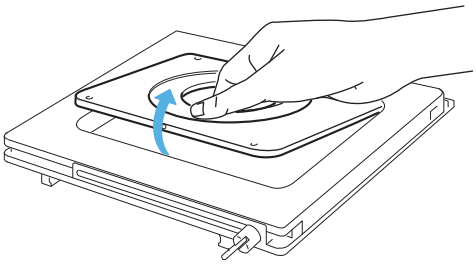
Remove 4 bolts with provided hexagonal wrench.



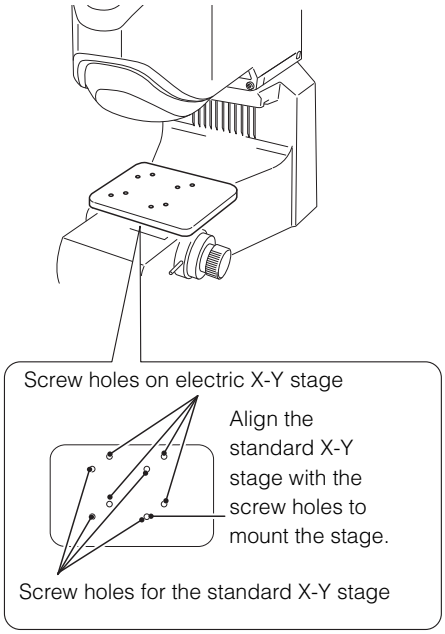
4 Remove the top panel from the 300 mm wafer X-Y stage.

The square panel with 4 white screws is the top panel. Remove the top panel to leave the stage by itself.

If the 12 inch wafer holder is mounted on the 300 mm wafer X-Y stage (rotating stage), remove it as well.

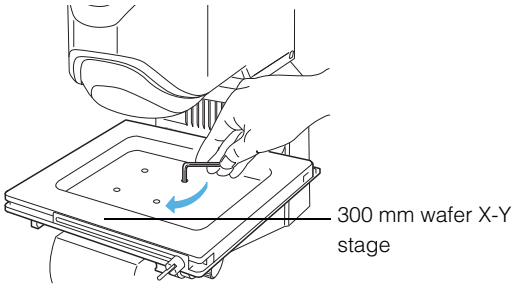


5 Align the stage with the screw holes on the pedestal to mount the 300 mm wafer X-Y stage.



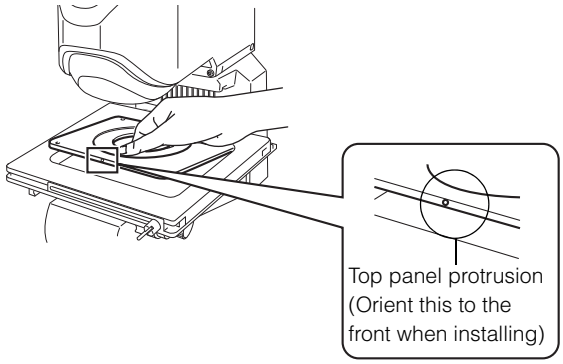
6 Fix the 300 mm wafer X-Y stage to the pedestal.

Using the bolts that fixed the standard X-Y stage, fix 4 points with the provided hexagonal wrench.



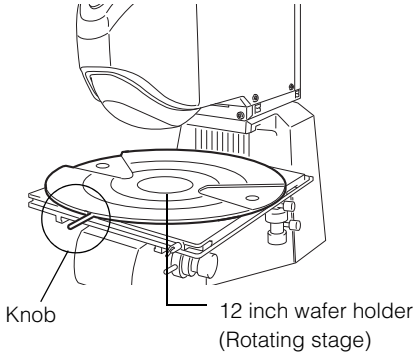
7 Mounting the top panel for the 300 mm Wafer X-Y Stage.

Orient the top panel (the rectangular panel with the four white screws) so that the protrusion is toward the front of the device when installing.



8 Install the 12 inch wafer holder (rotating stage).

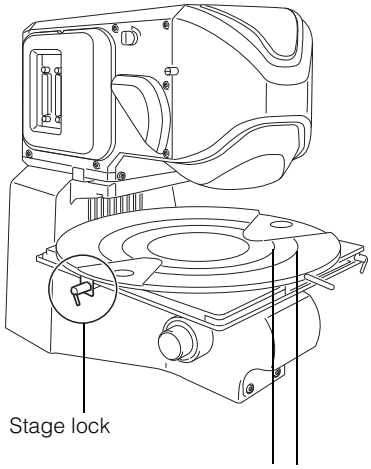
Install the wafer holder with the knob pointed toward the front.



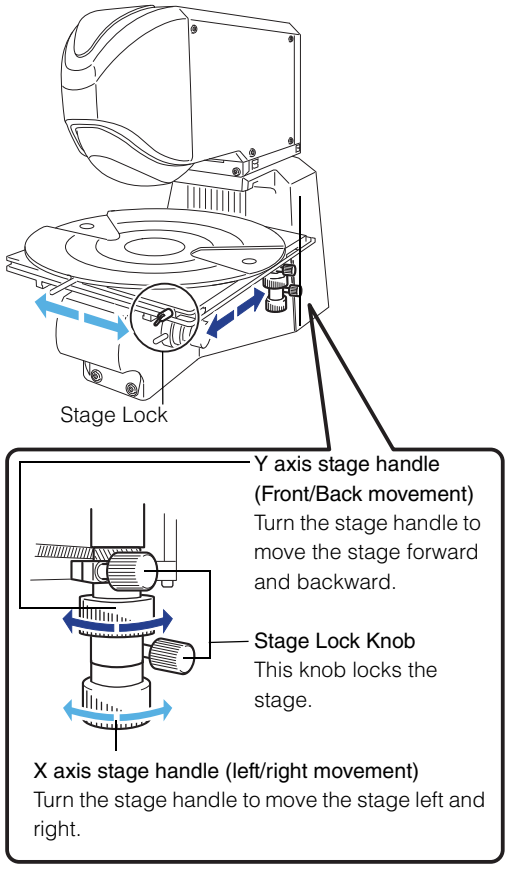
9 **Mount the objective lenses and connect the cables.**

“Mounting the Objective Lenses” (Page 2-3)
“Connections” (Page 2-4)

Names and Functions of the Components of the 300 mm Wafer X-Y Stage



When observing a 6 or 8 inch wafer, align the wafer to the edge of the stage and fix it there.



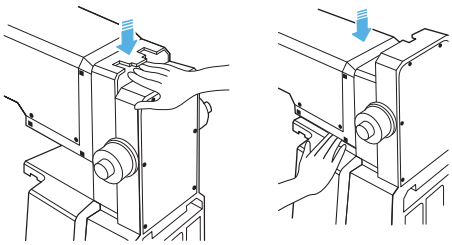
Reference When used in conjunction with the stand for VK (OP-82693), fixing Z axis (locked) during measurement is recommended.

Mounting the Stand for VK

Attaching the stand for VK (OP-82693) allows the measurement unit to change height by up to 100 mm.

CAUTION

- **Do not touch the movable portion of the Z stage or the lower portion of the measurement unit while either is in motion. Doing so risks catching hands or fingers in the mechanism.**



- **Be sure not to drop the stand or spacers on your feet. This may cause injury.**
- **Make sure that your hands and fingers are not caught when inserting a spacer. This may cause injury.**

NOTICE

- **Make sure that the measurement unit is firmly attached to the stand before beginning operation to ensure that the measurement unit does not fall. Doing so may cause damage to the device.**
- **Do not attach anything other than the measurement unit (with a maximum weight of 12 kg) to the Z stage. Doing so may cause damage.**
- **Do not turn the handles while the lock is set. Doing so may cause damage. (The stage is locked when it leaves the factory. Be sure to release the stage before using the microscope.)**

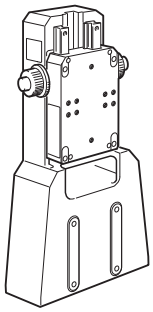
Important

When using a stand for the VK, make sure to use the combined spacers that are provided. Without them, the optimal performance of the equipment may not be reached to the specs due to the effects of such as disturbance vibration.

Package List

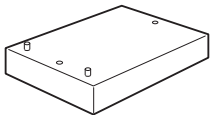
Stand for VK (OP-82693) consists of the parts below.

☐Stand unit: 1



Effective movement range : 100 mm
Distance moved in one rotation of the handle : 30 mm
Load endurance : 12 kg

☐Spacer



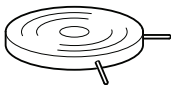
10 mm, 20 mm, 30 mm, 40 mm of thickness: 1 each

☐Stainless Steel Hexagon Socket Bolts

M6 length 20 mm: 8 pieces

☐ Hexagonal wrench M6: 1

☐Rotating stage: 1



17 mm thickness

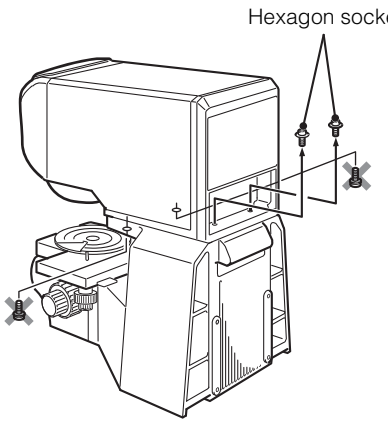
Mounting the Stand for VK

NOTICE	**Remove the objective lenses before installing or removing the stand. Doing so may cause damage.**

1 **Confirm all of the objective lenses and cables are removed.**

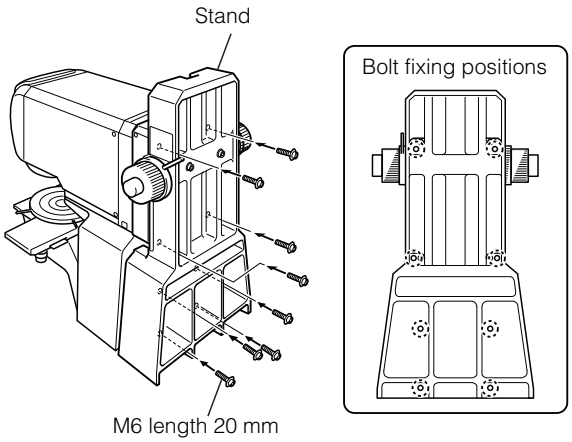
2 **Remove the hexagonal fixing bolts from the back of the microscope unit (measurement unit).**

Do not remove the hexagon socket bolts from the front of the device.

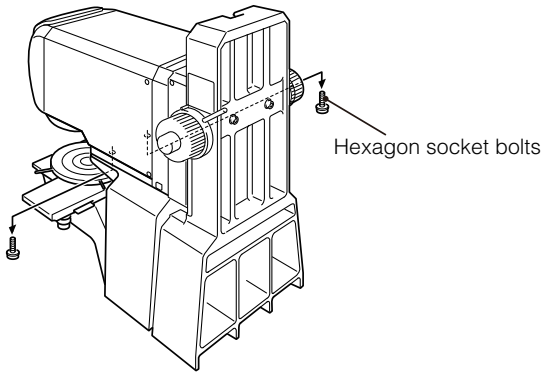


3 **Attach the VK stand to the microscope unit.**

Fix the stand for VK to the measurement unit and the pedestal with 20 mm long M6 bolts (at 8 points).



4 **Remove the 2 hexagonal fixing bolts from the front of the microscope unit (measurement unit).**



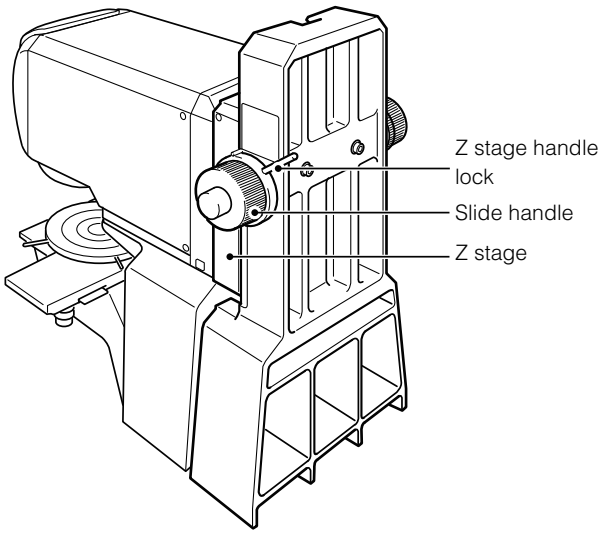
5 **Place the provided rotating stage (17 mm thickness) on the X-Y stage.**

6 **Mount the objective lenses and connect the cables.**

“Mounting the Objective Lenses” (Page 2-3)
“Connections” (Page 2-4)

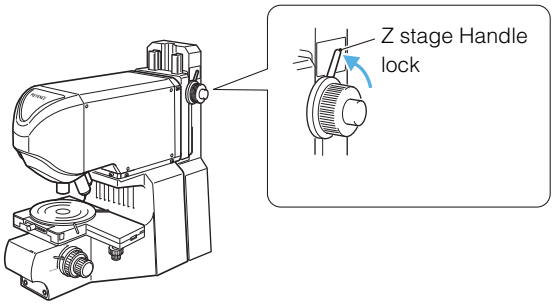
How to Use the Stand for VK

Names of each part

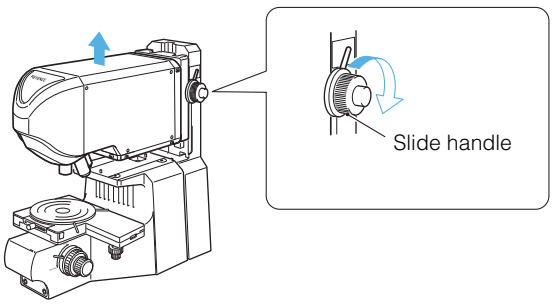


Using the stage

1 Unlocks the Z stage handle lock.

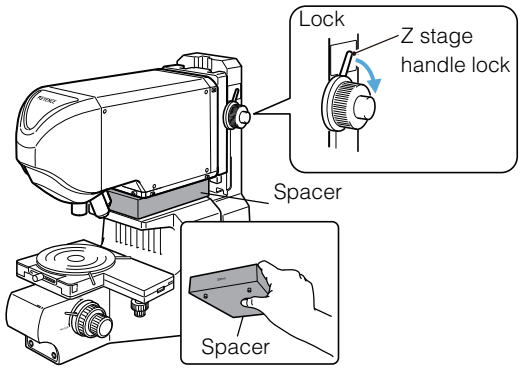


2 Turn the slide handle to adjust the height of the measurement unit so that it meets the height of the sample.



3 After fixing the measurement unit with Z stage handle lock so that it does not move, insert spacers between the measurement unit and the pedestal.

Insert the spacer that is the closest in thickness in the gap between the measurement unit and the pedestal. Multiple spacers can be combined for insertion.



4 Unlock the Z stage handle lock, to lower the measurement unit onto the spacer slowly.

5 Lock the Z stage handle once again.

After this, perform normal adjustment and measurement.

NOTICE	**Locking the lock mechanism should be done after inserting the spacer. Locking without inserting the spacer may cause failure.**

Chapter 5

Maintenance

This chapter describes the procedure for replacing the lamp and the fuse in the control unit.

Replacing the Lamp in the Control Unit .....Page 5-2

Replacing the Fuse .....Page 5-4

Replacing the Lamp in the Control Unit

The average life of the lamp is about 1000 hours of illumination (when used at room temperature).
This section explains how to change the lamp.

CAUTION	**Turn the main power off on the control unit and wait for thirty minutes or more before replacing the lamp. The lamp is extremely hot and may cause burns.**

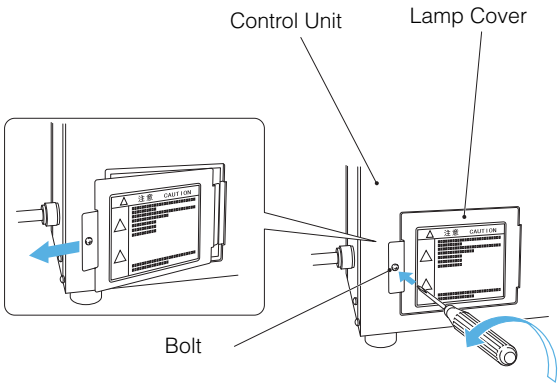
NOTICE	**Use a JCR12V100W10H (OP-91641) or the equivalent as a replacement lamp. Doing so may cause damage.**

Point — Have a Phillips head screwdriver ready to remove/install the bolts.

1 Shut down the system and turn the main power of the control unit off.

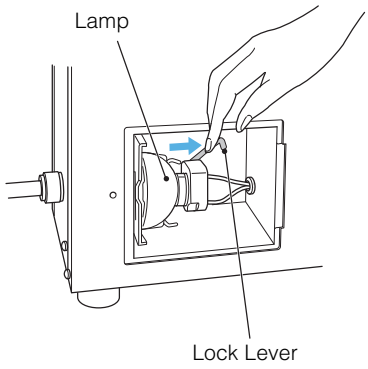
“Shutting Down the System” (Page 3-4)

2 Pull out the bolt on the lamp cover out of the control unit, removing it by pulling the lamp cover to the left.



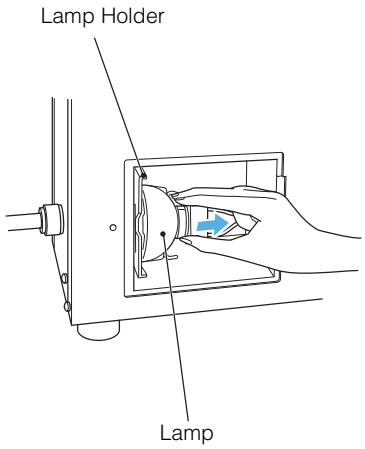
3 Bring down the lock lever to the right.

The lamp in the lamp holder comes out toward you by approx. 1/3.



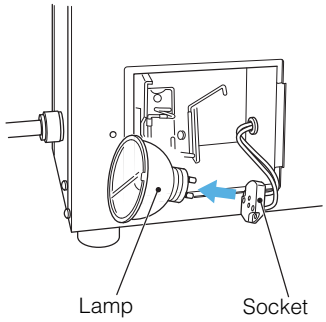
4 Pull the lamp out toward you.

The lamp holder holds the lamp from above and below.

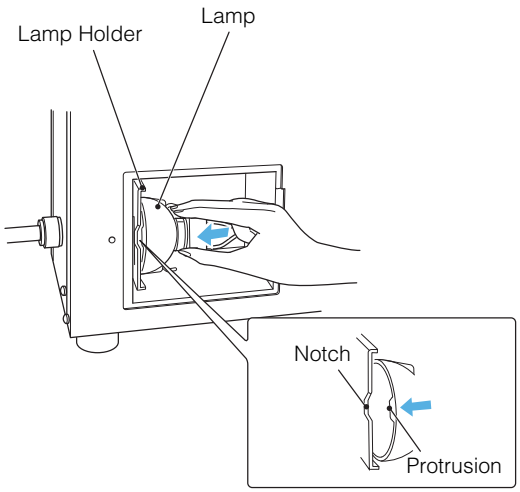


NOTICE	**Do not use excessive force to remove the lamp. Doing so may result in damage to the socket cable.**

5 Remove the lamp from the socket and replace it with a new lamp.

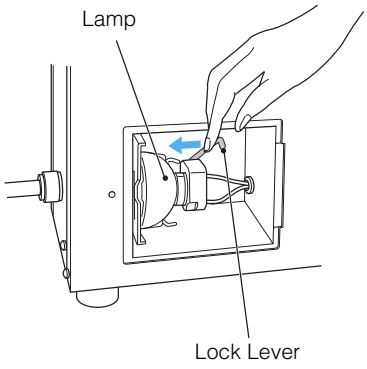


6 **Insert the lamp into the lamp holder.**

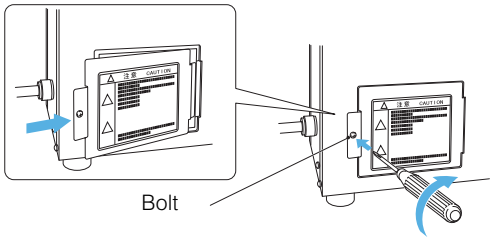


7 **Return the lock lever to the original position.**

The lamp will be fixed to the lamp holder.



8 **Attach the lamp cover, fixing with bolts.**



Replacing the Fuse

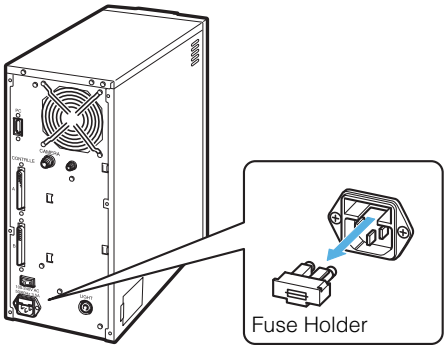
This section explains how to change the fuse in the control unit.

▶ Important **Use the product below as a replacement fuse.**
SOC-made HT Series
Rated voltage : 250 V
Rated current : 6.3 A
Blowout Characteristic : Time lag

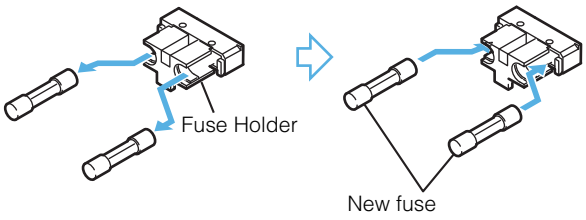
1 Shut down the system and turn the main power of the control unit off.
“Shutting Down the System” (Page 3-4)

2 Remove the power cable.

3 Pull out the fuse holder from the power connector.

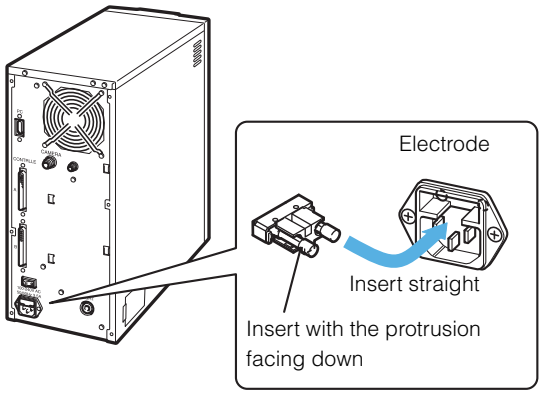


4 Install a new fuse in the fuse holder.



5 Return the fuse holder back to the power connector.

With the protrusion of the fuse holder facing down, insert it straight so that the fuse comes in contact with the electrode of the fuse holder.



Appendix

This chapter describes the specifications and dimensions of the VK-X100K/X200K Series.

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Dimensions ..... Page A-4

Specifications

Model		Control unit (VK-X100K)								Control unit (VK-X200K)			
		Microscope unit (VK-X105)				Microscope unit (VK-X110)				Microscope unit (VK-X210)			
Monitor magnification		100	200	400	1000	200	400	1000	2000	200	400	1000	3000
Objective lens magnification		5x	10x	20x	50x	10x	20x	50x	100x	10x	20x	50x	150x
Observation measurement range*1	H (horizontal): µm	2700	1350	675	270	1350	675	270	135	1350	675	270	90
	V (vertical): µm	2025	1012	506	202	1012	506	202	101	1012	506	202	67
Operating distance: (mm)		22.5	16.5	3.1	0.54	16.5	3.1	0.54	0.3	16.5	3.1	0.35	0.2
Numerical aperture (N.A.)		0.13	0.3	0.46	0.8	0.3	0.46	0.8	0.95	0.3	0.46	0.95	0.95
Measurement optics		Pinhole confocal optics											
Height measurement	Measurement Range	7 mm											
	Display resolution	0.005 µm								0.0005 µm			
	Repeatability σ	0.02 µm*2								0.012 µm*2			
Width measurement	Display resolution	0.01 µm								0.001 µm			
	Repeatability 3σ	0.05 µm*3				0.03 µm*4				0.02 µm*5			
Frame memory	Images (monochrome)	16 bits											
	Images (color)	RGB 8 bits each											
	Height measurement	21 bits								24 bits			
Measurement quality	Superfine	2048 × 1536											
	Standard/High speed	1024 × 768											
	Part 1/12	1024 × 64											
Frame rate (Hz)	Superfine	4 Hz											
	Standard/High speed	9 Hz											
	High speed (skip)	15 Hz											
	High speed (skip double)	25 Hz											
	Part 1/12	70 Hz, skip double 120 Hz											
	Line peak/Line film thickness	7800 Hz (when Z pitch is 0.1 µm or less)											
Optical zoom		1 to 8x											
Auto function		Setting the Auto-gain/Auto-focus/Auto-selection of up/down limits/Double-scan brightness											
Measurement laser light source	Wavelength	Red laser 658 nm								Violet laser 408 nm			
	Output	0.95 mW											
	Pulse width	1 ns								—			
	Class	Class 2 Laser Product (IEC60825-1, FDA(CDRH) Part1040.10*6)											
Photoreceptor		PMT (Photomultiplier)											
Optical observation light source	Lamp	100 W halogen											
	Service life	1000 hours (average)											
	Color temperature	3100 K											
Optical observation Color camera	Image pickup device	1/3 color CCD image sensor											
	Resolution	800000 pixels 2.4 million pixels: 800K pixels × 3 CCD mode 3.2 million pixels: 800K pixels × pixel shift(2 × 2) mode 7.2 million pixels: 800K pixels × pixel shift (3 × 3) mode 21.6 million pixels: 800K pixels × pixel shift (3 × 3) mode × 3 CCD mode											
	Adjustment	Gain, Shutter speed											
	White balance	AUTO/MANUAL/PUSHSET											

Model		Control unit (VK-X100K)		Control unit (VK-X200K)
		Microscope unit (VK-X105)	Microscope unit (VK-X110)	Microscope unit (VK-X210)
Maximum sample size	Maximum sample height	28 mm*7		
	Maximum sample size	Diameter of 318 mm to observe the entire object at once		
Z stage	Stroke	28 mm		
	Maximum load	5 kg		
X-Y stage	Stroke	70 × 70 mm		
Rotating stage	Rotation angle	360 degrees		
Data processing unit		Dedicated PC specified by KEYENCE (OS: Windows 7 Professional) *8		
Power	Power voltage	100 to 240 VAC, 50/60 Hz		
	Current consumption	Up to 450 VA		
Environmental resistance	Ambient temperature	+15 to +28°C		
	Ambient humidity	35 to 65% RH		
	Floor vibration at the installation place	1.5×10^{-3}m/s^2 or less (For frequencies less than 5 Hz, the amplitude should be less than 3 µm)		
Weight	Microscope unit (Measurement unit and pedestal)	Approx. 25 kg (Measurement unit alone when separated: Approx 8.5 kg)		Approx. 26 kg (Measurement unit alone when separated: Approx. 10 kg)
	Control unit	Approx. 11 kg		

*1 The observation measurement range is set as the minimum field of vision.

*2 When using the 50x objective lens to measure the standard step of 2 µm

*3 When using the 50x objective lens (2x optical zoom) to measure the line peak (8x image averaging) of a 1 µm wide line from the KEYENCE Standard Chart

*4 When using the 100x objective lens to measure the line peak (8x image averaging) of a 1 µm wide line from the KEYENCE Standard Chart

*5 When using the 150x objective lens to measure the line peak (8x image averaging) of a 1 µm wide line from the KEYENCE Standard Chart

*6 The laser classification for FDA(CDRH) is implemented based on IEC60825-1 in accordance with the requirements of Laser Notice No.50

*7 This can be increased by up to 128 mm using the optional spacer and the stand.

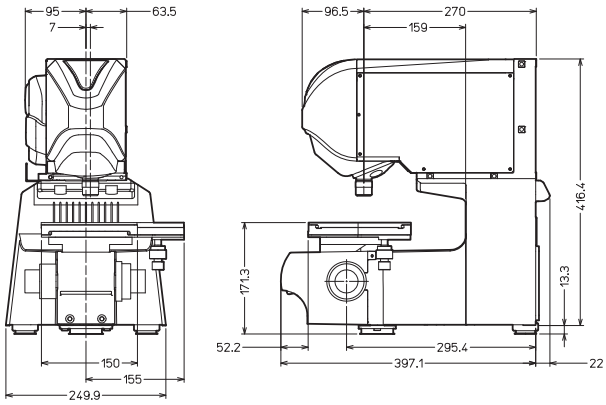
*8 Windows 7 is the registered trademark of U.S. Microsoft Corp.

Dimensions

VK-X105/X110

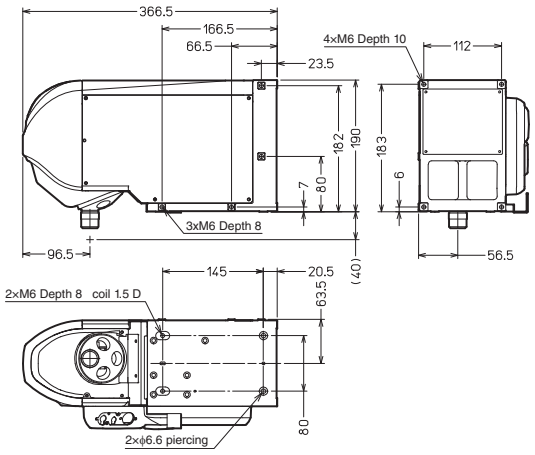
■ Microscope unit

Unit: mm



■ Measurement unit

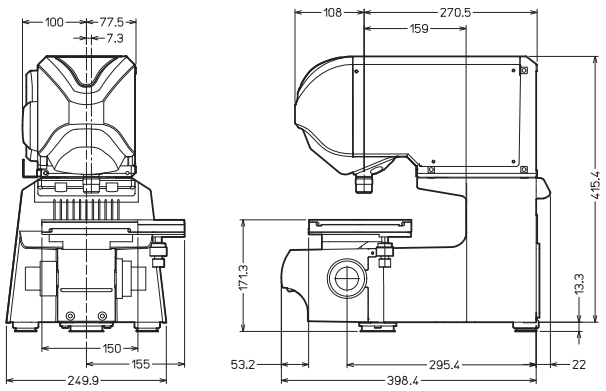
Unit: mm



VK-X210

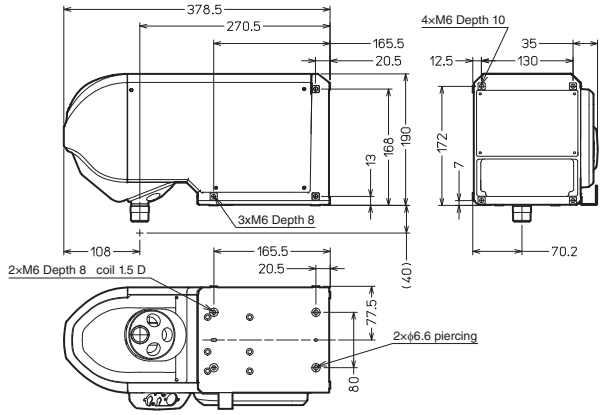
■ Microscope unit

Unit: mm



■ Measurement unit

Unit: mm

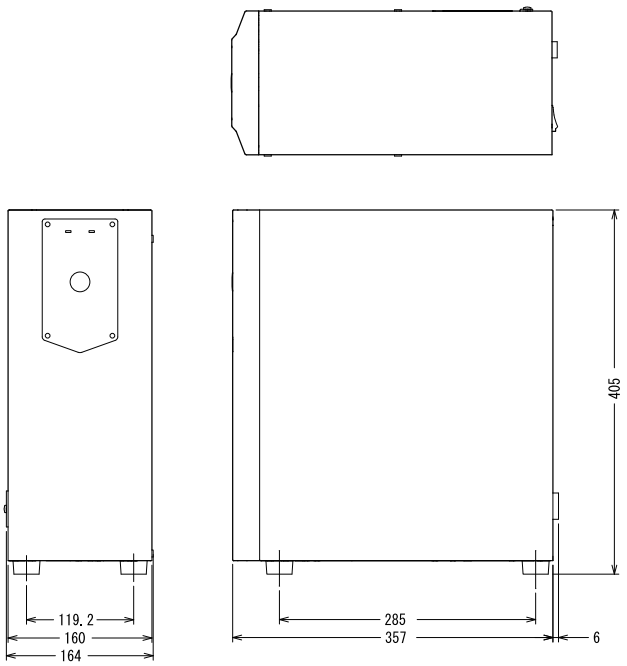


A

Appendix

VK-X100K/X200K (Control Unit)

Unit: mm



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Revision History

Print date	Revision no.	Description
June 2011	Initial release	
November 2011	2nd edition	
April 2012	3rd edition	
July 2013	4th edition	

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