Mitutoyo

99MBA127B

Video Microscope Unit VMU Series

VMU-V / VMU-H

User's Manual

To obtain the highest performance and the longest service life from this product, carefully read this manual thoroughly prior to use, and use the product properly.
After reading this manual, keep it safe close at hand for future reference.

Before this product is shipped from the factory, sufficient inspections are conducted in order to insure its mechanical and optical performance. However, if an abnormality occurs or if there is something you have a question about, please contact the nearest Mitutoyo sales office.

Conventions Used in This Document

WARNING Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death.

NOTICE Indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Tips Indicates referential information such as that for when the operating methods and procedures which are printed in these sentences are to be applied to specific conditions.

Indicates referential locations if there is information that should be referred to in this document or an extraneous manual.
Example: For details about xxx, see "3.3 Mounting the Camera".

Safety Precautions

Read the following thoroughly before operating the product to use it properly.

WARNING Do not disassemble or modify this product. These actions may cause a performance deterioration, electric shock, injury or damage to this product.

Precautions for Use

- Be careful not to apply excessive shock or force to any of the parts when setting up or operating this product.
- If the product is disassembled by the user, its performance cannot be guaranteed even within the warranty period. Also, if a failure occurs, it will be subject to a repair charge.
- When transporting this product, make sure to hold and carefully support the main unit. Furthermore, be careful not to touch any movable parts.
- The performance of this product may be degraded if it is fallen over or dropped.
- Avoid using this product in areas subjected to direct sunlight, dirt, dust, high temperature, high humidity and excess vibration.
- Please contact the nearest Mitutoyo sales office when this product will be installed in high-speed or high-acceleration equipment.

Warranty

In the event that this product should prove defective in workmanship or material, within one year from the date of original purchase for use, it will be repaired or replaced free of charge. Please contact your dealer or the nearest Mitutoyo sales office.

If this product fails or is damaged for any of the following reasons, it will be subject to a repair charge even if it is still under warranty.

- Failure or damage owing to inappropriate handling or to unauthorized modification or repair
- Failure or damage owing to transport, dropping, or relocation of the product after purchase
- Failure or damage owing to fire, salt, gas, abnormal voltage, or natural disaster

Export Control Compliance

This product falls into the Catch-All-Controlled Goods and/or Catch-All-Controlled Technologies (including Programs) under Category 16 of Appended Table 1 of the Export Trade Control Order or under Category 16 of the Appended Table of Foreign Exchange Control Order, based on the Foreign Exchange and Foreign Trade Act of Japan.

If you intend re-export of the product from a country other than Japan, re-sale of the product in a country other than Japan, or re-provision of the technology (including program), you are obligated to observe the regulations of your country.

Date of publication: December 1, 2017

1 Outline

This product is a compact and light-weight microscope specifically for a camera observation. Various subjects can be observed, such as surfaces of metals, resins, and printed materials, as well as microorganisms.

2 Checking Accessories

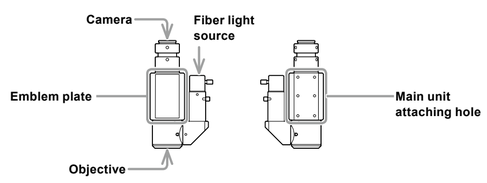
In addition to this document and the warranty card, a hexagon socket screw key (nominal 2) is included with this product. Check whether anything such as accessories are missing or have been damaged in transport when unpacking this product.

3 Setup

This product is used by securing it on a device or stand and mounting instruments such as an objective and a camera.

■ Position to mount each instrument

Example: VMU-V Front diagram Back diagram

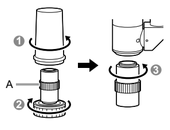


Tips The front side of the main body has main unit attaching holes (six threaded holes, M4, 0.7 pitch, 6 mm depth) to mount the main body on a device that are the same as on the back side. An emblem plate is affixed to the front side of the main body as shown in the diagram above. To mount a device on the front side, remove the emblem plate and secure it on the back side of the main body.

3.1 Mounting the Objective

NOTICE When mounting the objective, hold the knurled part (A) of the objective with care so that it does not drop. The performance of the objective may deteriorate if dropped.

1. Remove the case of the objective.
2. Remove the cap of the objective.
3. Screw in the threaded section of the objective into the objective mount.

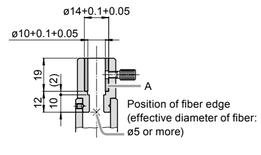


3.2 Mounting the Fiber Light Source

■ Mounting the fiber light source

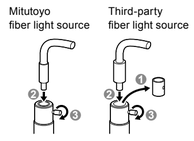
A fiber light source made by Mitutoyo (ø10) mounts directly into the fiber port. If a third-party fiber light source (ø14) is used, remove the fiber spacer (A) from the fiber port.

For the dimensions of the fiber light sources that can be mounted, see the diagram below.



NOTICE If a fiber light source that is not supported is used, performance is not guaranteed. Please contact the nearest Mitutoyo sales office.

1. Remove the fiber spacer.
(Only if using a third-party fiber light source)
2. Insert the fiber light source into the fiber port.
3. Tighten the clamping screw.

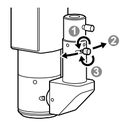


■ Adjusting the aperture diaphragm

The aperture diaphragm is for adjusting the numerical aperture (NA) of the illumination system. The NA is related to the image resolution, contrast and the depth of focus. Closing the aperture to a NA of about 80 % for the objective generally gives a quality image with the appropriate contrast.

NOTICE Make sure not to close the aperture diaphragm too much because the resolution deteriorates.

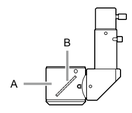
1. Loosen the aperture diaphragm knob slightly.
2. Move the aperture diaphragm knob in the horizontal direction to adjust the aperture diaphragm.
3. Tighten the aperture diaphragm knob.



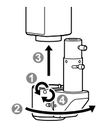
NOTICE Do not tighten the aperture diaphragm knob with excessive force because it can cause damage.

■ To change the direction to mount the fiber light source

NOTICE The illumination optical tube (A) has half mirror (B) built-in. Be careful not to scratch the half mirror during operation.



1. Loosen the illumination optical tube set screws (hexagon M4 × 3).
2. Rotate the illumination optical tube to an arbitrary position so as to align the position of the pin attached to the top surface of the illumination optical tube and the pin hole (45° intervals) on the bottom of the main body.
3. Insert the pin in the pin hole.
4. Tighten the illumination optical tube set screws.

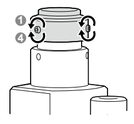


3.3 Mounting the Camera

NOTICE When using the optional TV adapter unit, mount the TV adapter unit before the camera. Note that when mounting the 2x TV adapter unit, the optical tube length becomes 18.2 mm longer.

■ Mounting the camera

1. Loosen the C-mount fixing screws (hexagon M4 × 3), and then remove the C-mount.
2. Set the C-mount on the camera.
3. Mount the C-mount with the camera to its original position.
4. Tighten the C-mount fixing screws.



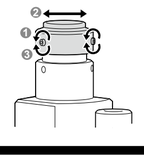
■ Checking the observation center and focus

When mounting and using multiple objectives with the revolver, check the observation center and the focus.

1. Switch the objective to the one with a maximum magnification.
2. Move the specimen in the X-axis direction and Y-axis direction of the device to adjust the specimen from an arbitrary position to the center of the monitor.
3. Move the specimen in the Z-axis direction of the device to adjust the focus.
4. Switch the objective to the one with a minimum magnification, and then confirm the observation center and focus.
5. If adjustments are necessary, make the adjustments following the procedures in "■ Adjusting the observation center" and "■ Adjusting the focus", and then check the observation center and focus again. (Repeat this procedure as necessary.)

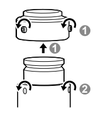
■ Adjusting the observation center

1. Loosen the C-mount fixing screws (hexagon M4 × 3).
2. Move the C-mount in the horizontal direction to adjust the observation center.
3. Tighten the C-mount fixing screws.

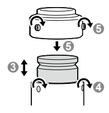


■ Adjusting the focus

1. Loosen the C-mount fixing screws (hexagon M4 × 3), and then remove the C-mount.
2. Loosen the C-mount adjusting frame fixing screws (hexagon M4 × 3).

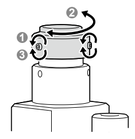


3. Move the C-mount adjusting frame up and down by rotating it to adjust the focus.
4. Tighten the C-mount adjusting frame fixing screws.
5. Mount the C-mount in its original position, and then tighten the C-mount fixing screws.



■ Adjusting the inclination of the observation image

1. Loosen the C-mount fixing screws (hexagon M4 × 3).
2. Rotate the camera together with the C-mount to adjust the inclination.
3. Tighten the C-mount fixing screws.



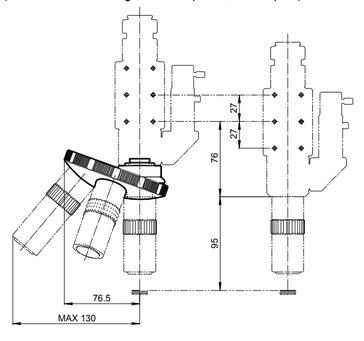
4 Mounting the Options

4.1 Revolver

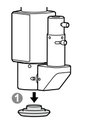
The following revolvers can be mounted to this product:

- Manual revolver: Code No. 378-707
- Manual revolver (with centering and parfocal): Code No. 378-717
- Motorized revolver (BF, five holes): Code No. 378-713

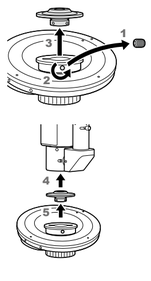
NOTICE When the revolver is mounted, the position of the objective mounting surface extends an additional 27 mm. To keep the position of the objective mounting surface the same, adjust the mounting position of the main unit by shifting which main unit attaching holes are used. (The main unit attaching holes are spaced 27 mm apart.)



1. Remove the objective mount with the revolver wrench supplied with the revolver.

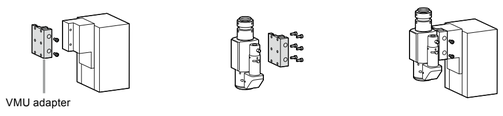


2. Mount the revolver to the illumination optical tube.
   1. Remove the locking screws (hexagon M4 × 3).
   2. Loosen the set screws (hexagon M4 × 3) behind the locking screws.
   3. Remove the revolver base.
   4. Insert the revolver base into the illumination optical tube.
   5. Mount the revolver to the revolver base.
   6. Tighten the set screws, and then tighten the locking screws as they were.



4.2 Focusing Unit A · B

1. Loosen and remove the VMU adapter set screws (hexagon M4 × 2), and then remove the VMU adapter.
2. Mount the VMU adapter to the main unit attaching holes by inserting and tightening the set screws supplied with the focusing unit (hexagon M4 × 6).
3. Mount the focusing unit to the main body by inserting and tightening the VMU adapter set screws.



NOTICE
- When combining the focusing unit B and the manual revolver, mount the revolver on the opposite side of the VMU adapter.
- The focusing unit B and the motorized revolver cannot be used together.

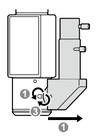
Tips
- When combining the focusing unit A and the simple stand, the stage center and optical axis of the main body are matched.
- When the focusing unit B is used, the distance between the focusing unit and the main body can be shortened.

4.3 Polarization Unit

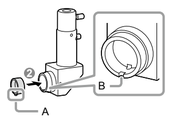
NOTICE When the polarization unit is mounted, the optical tube length becomes 15 mm longer.

■ Mounting the polarizer

1. Loosen the vertical illumination tube set screws (hexagon M3 × 2), and then remove the vertical illumination tube from the main body.



2. Align and mount the protrusion (A) of the polarizer with the notch (B) of the vertical illumination tube, and then tighten the set screw (hexagon M3 × 1) supplied with the polarization unit.



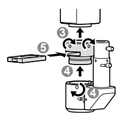
3. Mount the vertical illumination tube to the main body, and then tighten the vertical illumination tube set screws.

■ Mounting the analyzer unit

1. Remove the polarization plate from the analyzer unit.

2. Loosen the illumination optical tube set screws (hexagon M4 × 3), and then remove the illumination optical tube.

3. Insert the analyzer unit into the main body, and then tighten the analyzer set screws (hexagon M4 × 3).
4. Mount the illumination optical tube to the analyzer unit, and then tighten the illumination optical tube set screws.
5. Insert the polarization plate into the analyzer unit.



4.4 Mounting the TV Adapter Unit

NOTICE When using the TV adapter unit, mount the TV adapter unit before the camera. Note that when mounting the 2x TV adapter unit, the optical tube length becomes 18.2 mm longer.

■ Mounting the 2x TV adapter unit

1. Loosen the C-mount fixing screws (hexagon M4 × 3), and then remove the C-mount.
2. Screw the 2x TV adapter unit into the C-mount adjusting frame.

3. Mount the C-mount to the 2x TV adapter unit, and tighten the C-mount fixing screws.

■ Mounting the 0.5x TV adapter unit

1. Loosen the C-mount fixing screws (hexagon M4 × 3), and then remove the C-mount.
2. Screw the 0.5x TV adapter unit into the C-mount adjusting frame.

3. Mount the C-mount to the C-mount adjusting frame, and tighten the C-mount fixing screws.

5 Maintenance/Inspections

5.1 Daily Maintenance

Dust and dirt are particularly harmful to the product. It should be cleaned daily and stored carefully.

■ Cleaning optical parts

When cleaning optical parts such as lenses and filters, clean those parts carefully using the following methods.

- Dust: Remove dust on the lenses with a lens brush or soft brush, or lightly wipe it off with gauze.
- Fingerprints and oily substances: Wipe off fingerprints and oil with lens paper or gauze soaked in a small amount of alcohol.

■ Cleaning metal parts

Gently wipe away dust or other contaminants with a silicon cloth.

NOTICE Do not use agents, solvents, or metal polish when cleaning, as they may result in surface discoloration or paint peeling.

■ Storing when not in use

Store this product in areas with minimal humidity that are free from mold. Store optical parts in a case such as the objective in particular.

5.2 Regular Inspections

Regular inspections by a professional technician are recommended to maintain the performance of this product over the long term.

Please contact the dealer where you purchased this product or the nearest Mitutoyo sales office.

6 Troubleshooting

If trouble occurs while this product is in use, try the following troubleshooting methods. Please contact the dealer where you purchased this product or the nearest Mitutoyo sales office if you cannot resolve the problem.

Issue	Check point	Remedy
There is an obstruction or dark portion in the view field.	Is the aperture diaphragm closed too tightly?	Adjust the aperture diaphragm.
	Is the lens or specimen contaminated?	Wipe the dirty area clean.
The image quality, such as the contrast or resolution, is poor.	Is the lens or specimen contaminated?	Wipe the dirty area clean.
	Is the brightness of the illumination sufficient?	Increase the illumination brightness.
	Is the aperture diaphragm closed too tightly?	Adjust the aperture diaphragm.
	Is the specimen observed through another medium other than air (such as cover glass)?	Prepare the dedicated objective. Remove parts such as the cover glass.
The image is out of focus or the image sways.	Is the specimen tilted?	Fix the inclination of the specimen.
	Is the objective screwed all the way in?	Screw in the objective firmly.

7 Specification

7.1 Basic Specifications

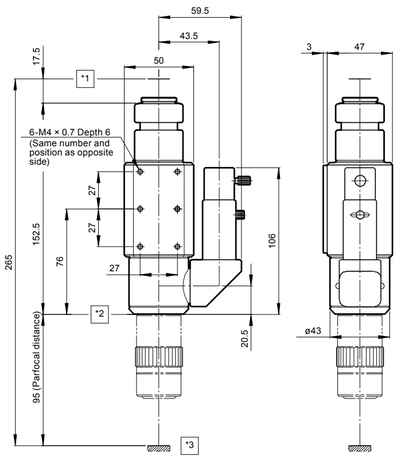
Model		VMU-V	VMU-H
Code No.		378-505	378-506
Direction to mount camera		Vertical direction	Horizontal direction
Observation image		Bright-field, erect image	Bright-field, inverted image
Camera port			
	Optical system	Magnification: 1x, visible ray	
	Mounting	C-mount (The parfocal adjustment and the centering adjustment are performed independently.)	
Applicable objective (option)			
	For observation	M/G Plan Apo series M/LCD Plan Apo NIR series	
Applicable camera		CCD camera 2/3-type or less (C-mount specifications)	
Vertical illumination optical system		Telecentric illumination with aperture diaphragm	
Main unit mass		570 g	590 g

7.2 Common Options

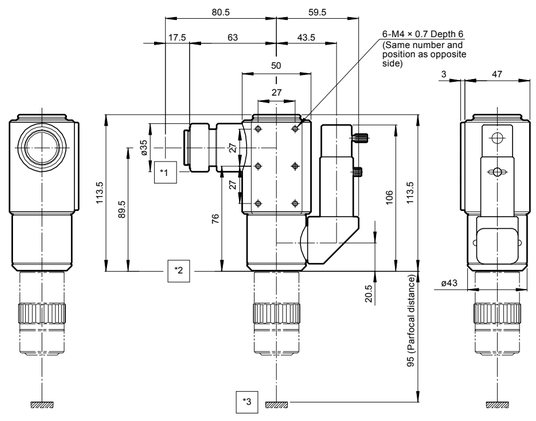
Part name	Code No.
Fiber optics cable illumination unit	378-700
2x adapter unit	378-703
1.5x adapter unit	378-704
Digital camera: ImageX PRO 3000	00AAB008
Focusing unit (A)	378-705
Focusing unit (B)	378-706
Simple stand	378-730
X-Y stage	378-020
Manual revolver (BF)	378-707
Manual revolver (with centering and parfocal)	378-717
Motorized revolver (BF, five holes)	378-713
Polarization unit	378-710
Objective: M/G Plan Apo series	
Objective: M/LCD Plan Apo NIR series	

7.3 Dimensions of Each Part

VMU-V (Code No. 378-505)



VMU-H (Code No. 378-506)



*1 Image position
*2 Objective mounting surface
*3 Workpiece surface

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