



MM51 YOH Surgical Microscope System

**User's Manual
Ver. 1.0**

Mitaka Kohki Co., Ltd.

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Introduction

Introduction

Thank you for purchasing Mitaka Kohki's MM51 YOH System (the “equipment”). Please read through and understand this instruction manual before operating this equipment so that you can use it properly and safely. If you have any questions or problems with the product, please contact your distributor or Mitaka Kohki. Note that this instruction manual is intended for people who have sufficient basic knowledge about medical equipment, such as medical doctors and operating room personnel.

Important Notice

Accidents or failures resulting from operation, maintenance, or instruction of the equipment by a person who has no knowledge about the product or has not received sufficient training on the equipment are beyond the responsibility of the manufacturer. Failures of or damage to the equipment caused by improper use or forbidden operations are not covered by the product warranty. Any use or operation that is not included in this manual is not covered by warranty and is considered misuse by the manufacturer.

Assembly, repair, maintenance, inspection, and other technical services shall be performed only by a person who is authorized by Mitaka Kohki and has received training by Mitaka Kohki. For maintenance or repair, only genuine parts specified by the manufacturer may be used. Accidents or failures caused by installation and use of non-genuine parts are beyond the responsibility of the manufacturer. If you encounter a technical problem not described in this instruction manual, please contact your distributor or the manufacturer. On that occasion, please inform them of the model name and serial number of the equipment.

Keep this instruction manual in a safe place. As the product is subject to change for improvements, check that the instruction manual agrees with the specifications of the equipment.

Intended Purpose

This equipment is a surgical microscope used for microsurgery. Do not use it for any other purpose.



Warning

Never use the lighting system of the MM51 microscope **for ophthalmology**, because it is equipped with xenon lamps. **If used for ophthalmology, the patient could suffer impaired or complete loss of vision.**

Caution

The meanings of the symbols affixed to this equipment are as follows:



Warning

Improper use of the equipment could result in death or serious personal injury.



Caution

This indicates possible failure to make full use of the MM51.

Special care should be taken to locate and to understand all warning symbols and to read any instructions located on the body of the machine. Negligence in following those precautions could lead to personal accidents or mechanical damage involving operators and people around the machine.

Contents

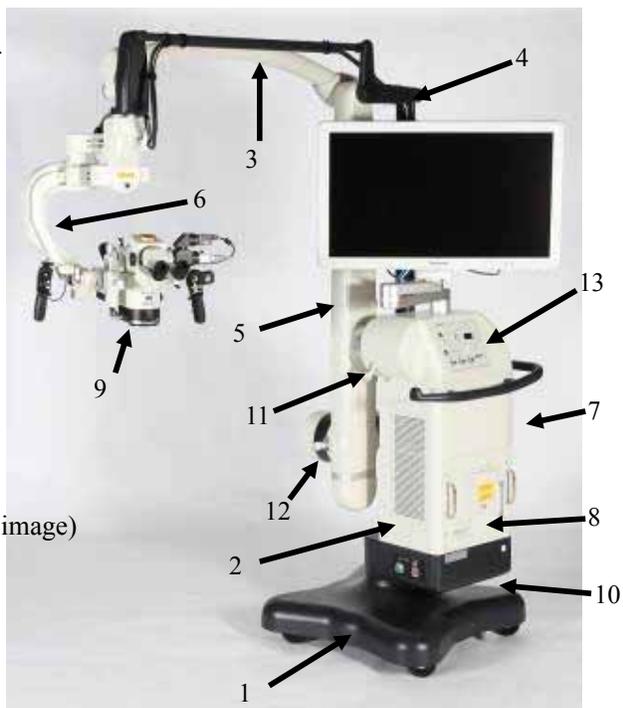
1.	Introduction	3
2.	Contents	6
3.	Names of parts	7
4.	Key features and basic operations	8
	4-1. Securing the stand base	8
	4-2. Powering up, turning on the lamp	9
	4-2-1. Names of the xenon lamp unit and parts	9
	4-2-2. Powering up	10
	4-2-3. Turning on the lamp	10
	4-2-4. Switching over to the backup lamp	10
	4-2-5. Replacing the xenon lamp	11
	4-2-6. Troubleshooting (the xenon lamp does not illuminate)	12
	4-3. Hand grip and foot pedal	13
	4-3-1. Adjusting the hand grip position	13
	4-3-2. Focus adjustment, zoom adjustment	14
	4-3-2-1. Adjustment by the hand grip	14
	4-3-2-2. Adjustment by the foot pedal	14
	4-3-2-3. Troubleshooting (the focus or zoom function does not work)	15
5.	Operating the MM51 surgical microscope	16
	5-1. Names of parts of the microscope	16
	5-2. High magnification observation by changing the objective lens	16
	5-3. Focal length extender	17
	5-4. Iris diaphragm	17
6.	Settings of the MM51 microscope	18
	6-1. Replacing accessories	18
	6-2. Adjusting eyepiece diopter	20
7.	Features of YOH stand	21
	7-1. Overhead position	21
	7-2. Tilting function	22
	7-3. Focus lock / XYZ plane function switching	23
8.	Settings of the YOH stand	24
	8-1. Names of parts of the balance control unit	24
	8-2. Steps to adjust the balance	25
9.	How to apply a drape	30
	9-1. Cover glass	30
	9-2. How to apply a drape	30
10.	Maintenance and storage	31
11.	Options and accessories	32
12.	Other precautions	33

3. Names of parts

Basic structure of the stand

The part names are shown in the figure below.

1. Base
2. Column
3. Swing arm (large)
4. Link arm
5. Vertical arm
6. Swing arm (small)
7. Weight unit (backside of the image)
8. Light source unit
9. Microscope
10. Base clamping lever (backside of the image)
11. Locking knob (second axis)
12. Locking knob (third axis)
13. Control panel



9. Microscope



4. Key features and basic operations

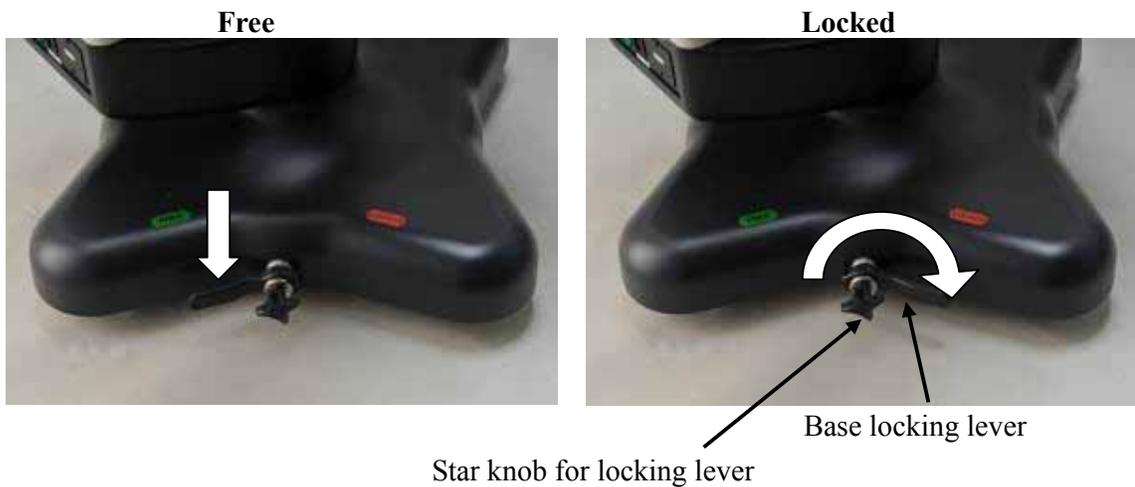
4-1 Securing the stand base

Check the balance of the stand and adjust if needed. (refer to Chapter 8, “How to adjust the balance”). Check the functions of focus, zoom, light, and video. Apply a drape over the stand before operation (refer to Chapter 9, “How to apply a drape”). You should keep in mind that the microscope will move slightly in the up-and-down directions when securing the base, which is due to the vibration reduction system.

Securing the base

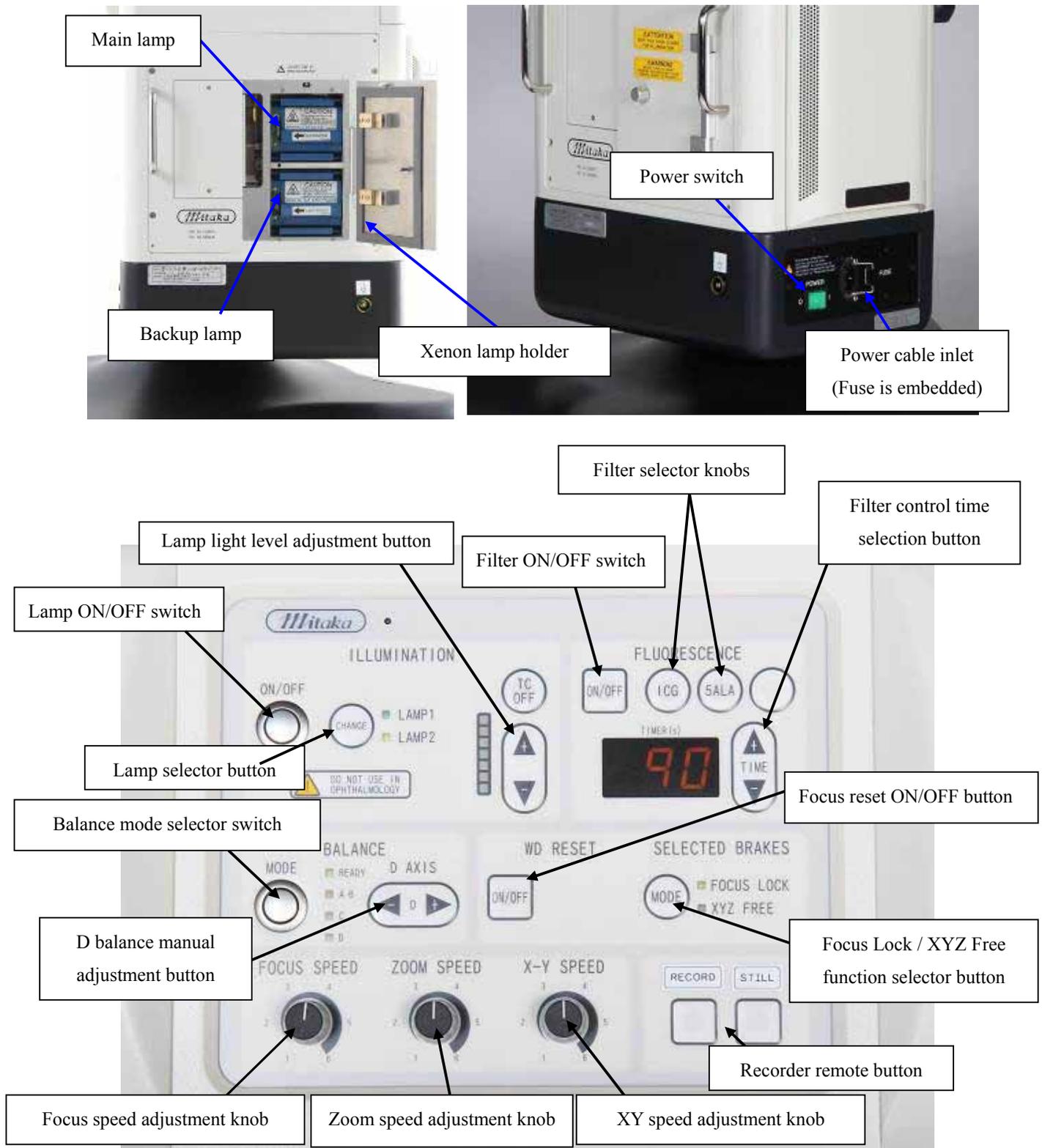
Apply the brake on the base so that the main body of the stand will not move while operating.

1. Rotate the base locking lever clockwise to secure the base.
2. Secure locking lever by tightening the star knob.



4.2 Powering up, turning on the lamp

4-2-1 Names of the xenon lamp unit and parts



4-2-2 Powering up

Turn on the power switch. The switch will illuminate green when the power is on. Be sure to observe the stipulated electric capacity.

4-2-3 Turning on the lamp

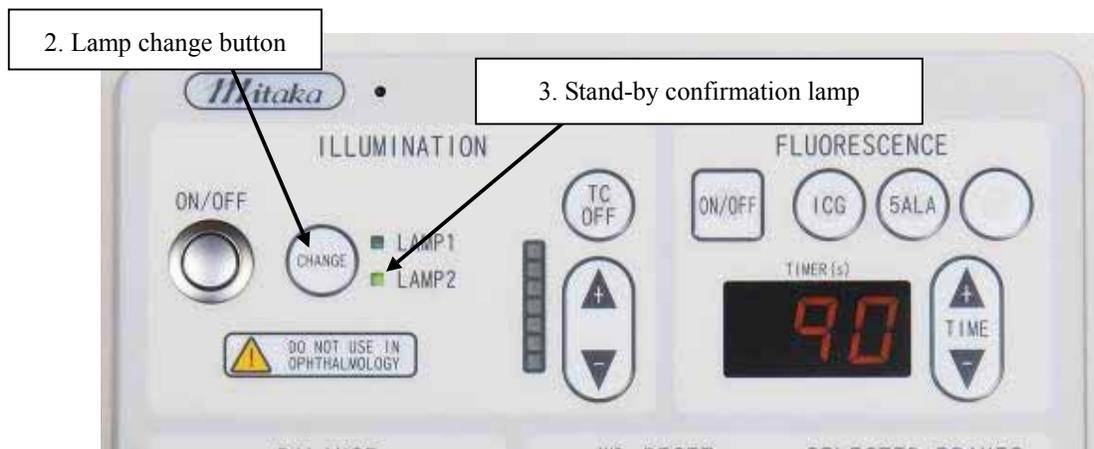
To turn on the xenon lamp push the lamp ON/OFF switch on the control panel. The lamp will illuminate approximately one second later. If the lamp does not illuminate, refer to 4-2-6, Troubleshooting.

The YOH stand is equipped with two xenon lamp units. In the event that the main lamp goes dead during a surgery, you can continue the surgery with the backup xenon lamp. In addition, the lamp units (main lamp and backup lamp) are controlled through separate lamp boards that are independent of each other, thereby ensuring a high level of safety.

4-2-4 Switching over to the backup lamp

In the event that the xenon lamp goes dead during a surgery, you can switch to the backup lamp by following the procedure below.

1. Turn off the lamp ON/OFF switch.
2. Push the lamp change button to switch between Lamp 1 and Lamp 2.
3. Check that the indicator light next to Lamp 2 is illuminated.
(The image below shows a state in which Lamp 2 is selected.)
4. Push the lamp ON/OFF switch to illuminate the lamp.



4-2-5 Replacing the xenon lamp

The xenon lamp is equipped with an hour meter, which can be used as a guideline for the life of the lamp*. When the hour meter indicates that it has exceeded 500 hours, the lamp should be replaced.



1. Open the cover.
2. Pull out the xenon lamp that you want to replace.

Caution!

The xenon lamp becomes hot during and after use. Be careful not to burn yourself.

Never touch the lamp glass when handling the xenon lamp. It is very dangerous to use the xenon lamp with oils and fats adhered. (Refer to the accompanying dedicated manual for the handling of the xenon lamp.)

* **The life of xenon lamps is 500 hours.**

Prepare a new lamp before the lamp reaches 450 hours.



Caution

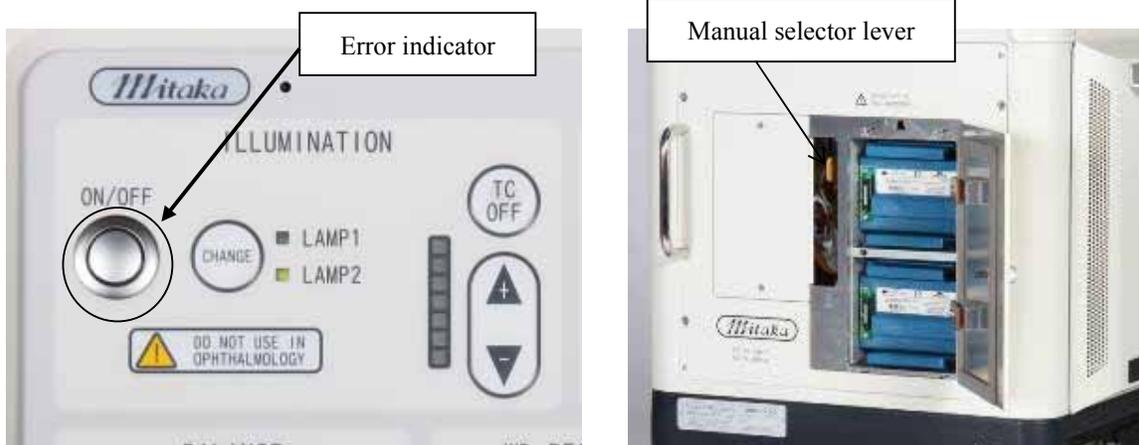
The xenon lamp becomes hot during and after use.
Extra care must be taken not to burn yourself.

4-2-6 Troubleshooting (the xenon lamp does not illuminate)

When the xenon lamp does not illuminate, troubleshoot the cause by following the procedure below. Contact Mitaka Kohki if you cannot solve the problem after the following points have been confirmed.

1. **Xenon lamp is not installed.**
Install a designated xenon lamp.
2. **The xenon lamp has failed.**
Check the xenon lamp. When the lamp fails, switch to the backup lamp.
Replace the failed lamp with a new one.
3. **The door of the xenon light source is not completely closed.**
Close the door securely until the notch is engaged as indicated by a clicking sound.
4. **The lamp 1 or 2 selector function is not working properly.**
If the selector button on the control panel malfunctions, open the xenon light source door and switch lamps manually with the manual selector lever, as indicated below.
5. **The lamp cooling fan is not working properly.**
If the cooling fan is not working, switch to the backup lamp.

Note: When the error indicator is flashing in blue, check items 1, 3, 4, and 5 above.



4-3 Hand grip and foot pedal

The hand grips have the following functions:

1. Control of the optical system of the microscope (focus, zoom)
2. Operation of the stand
3. Operation of the fluorescent observation filter (right side only)

The foot pedal has the following functions:

1. Control of the optical system of the microscope (focus, zoom)
2. Control of the operative field fine adjustment device (when the motor-driven XY device (optional) is installed)
3. Control for the fluorescence on-off function (optional).

4-3-1 Adjusting the hand grip positions

Hand grip positions can be adjusted with the lever shown in the figure below. Adjust the positions of grips as you want.

Caution After setting the hand grip at a preferred position, make sure that the grip does not interfere with other parts through the operation and movement of the microscope.

Hand grip positions can also be adjusted over the drape. Be sure to keep a distance between the microscope and the operative field when you adjust the position of a hand grip during a surgery.

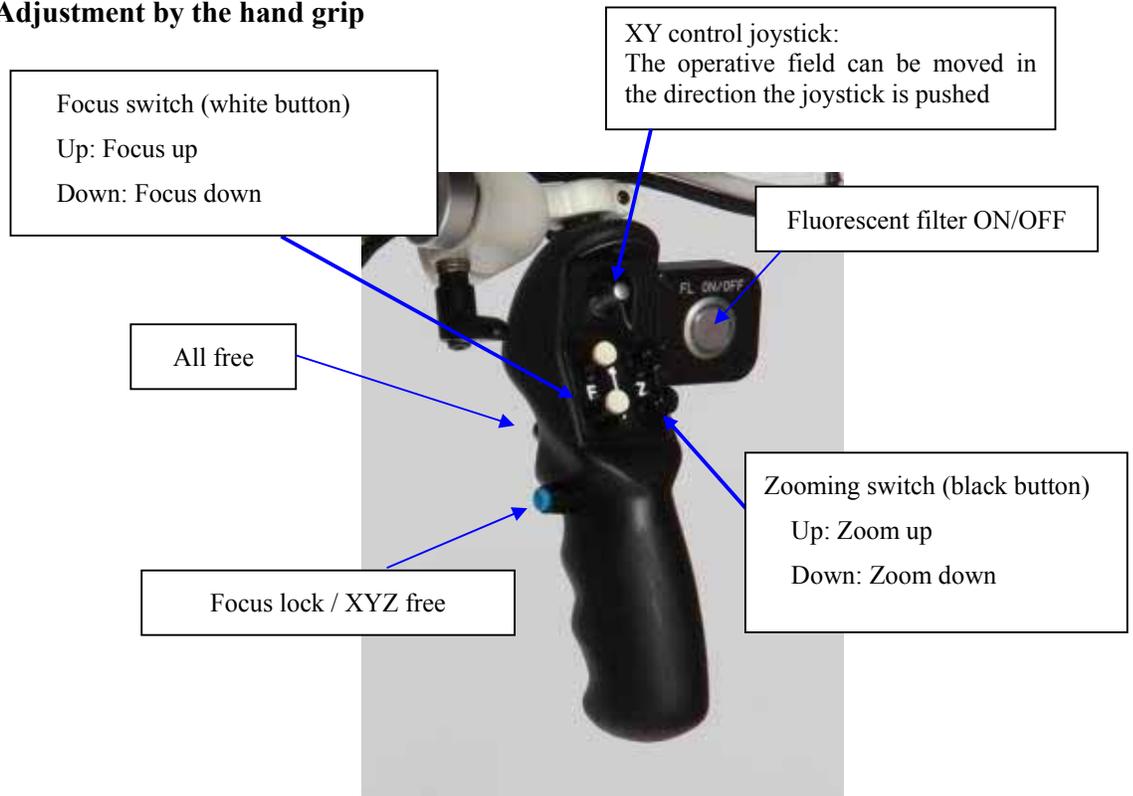


Note:

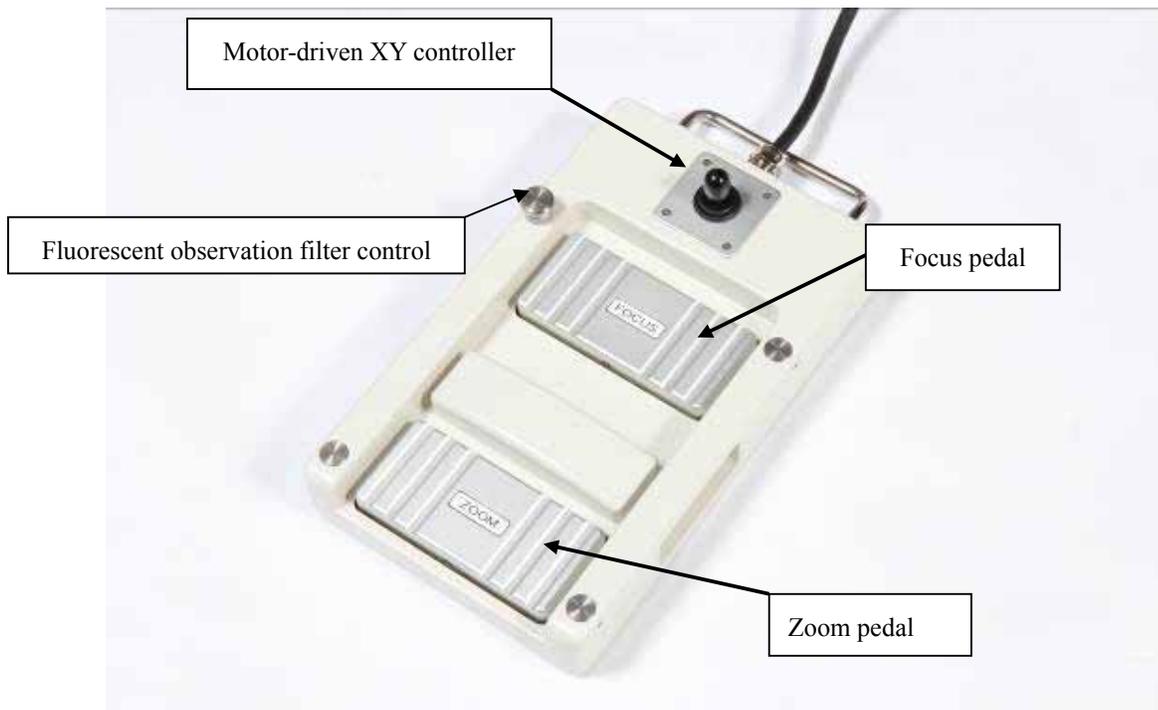
You can rotate tightening lever by lifting straight up and rotating.
Use this function when the lever interferes with other parts.

4-3-2 Focus adjustment, zoom adjustment

4-3-2-1 Adjustment by the hand grip



4-3-2-2 Adjustment by the foot pedal



4-3-2-3 Troubleshooting (the focus or zoom function does not work)

When the focus and zoom are not working, troubleshoot the cause by following the procedure below. Contact Mitaka Kohki if you cannot solve the problem after the following points have been confirmed.

1. No motor-moving sound is produced from the main body of the microscope.

The motor-driven focus [F] and zoom [Z] are operated by the signals from the wire with circular connector located on the side of the microscope. First, check whether a motor sound is produced when you push the focus switch or the zoom switch on the hand grip or the foot pedal. When no sound is produced, check that the wire with a Lemo connector is securely connected.

If the symptom remains the same even after the check, proceed to the following steps.

2. The button is accidentally pressed by something.

Check that the switches are not pressed by the drape and freely click when you press them.

Also, check that the foot pedal is not being pressed by something and that the pedals make a clicking sound when pushed.

3. The focus/zoom speed adjustment knob is at the minimum position.

Check that the focus/zoom speed adjustment knob is not at the minimum position. You can check by pushing the opposite F or Z button.

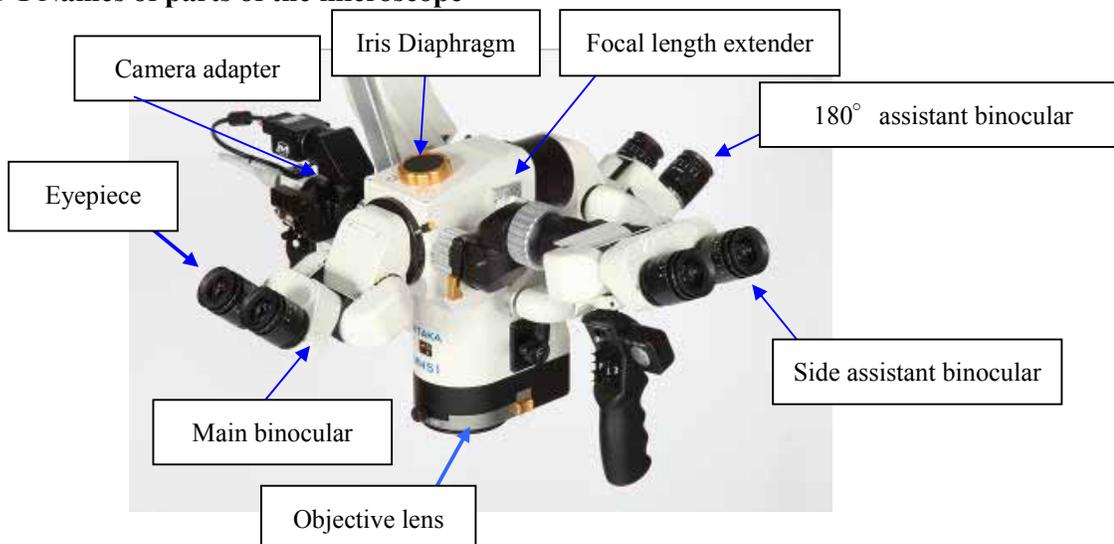
4. The foot pedal is not securely connected.

Check that the connector of the foot pedal is securely connected to stand.

5. If the focus/zoom are still not working correctly unplug the foot pedal and see if hand grip is functioning.
6. If the focus/zoom are still not working correctly unplug the silver Lemo connector at back of microscope and re-plug into microscope.
7. If the focus/zoom are still not working correctly please call your local representative.

5. Operating the MM51 surgical microscope

5-1 Names of parts of the microscope



5-2 High or low magnification observation by changing the objective lens

The MM51 has adopted interchangeable objective lenses with the aim of obtaining higher or lower resolution. The five types of objective lenses available are listed below. Select an appropriate lens according to the application and desired magnification.

Lens 190-250	Magnification (1)		Magnification (1.6)	
	Working Distance	Lowest	Highest	Lowest
190	6.1	48.6	9.6	77.2
220	4.7	37.6	7.5	59.9
250	3.8	30.7	6.1	48.9

Lens 240-330	Magnification (1)		Magnification (1.6)	
	Working Distance	Lowest	Highest	Lowest
240	4.9	39.3	7.8	62.5
285	3.7	29.3	5.8	46.6
330	2.9	23.4	4.6	37.2

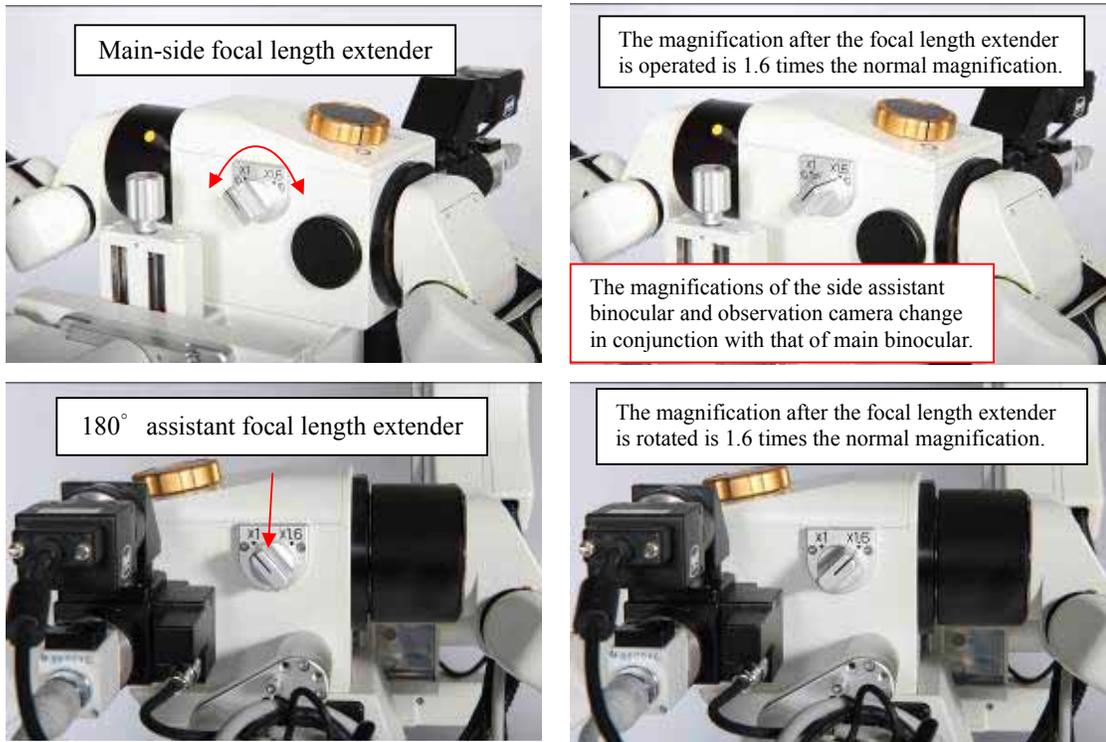
Lens 260-380	Magnification (1)		Magnification (1.6)	
	Working Distance	Lowest	Highest	Lowest
260	4.5	35.9	7.1	57.1
320	3.3	26.1	5.2	41.5
380	2.6	20.5	4.1	32.5

Lens 280-430	Magnification (1)		Magnification (1.6)	
	Working Distance	Lowest	Highest	Lowest
280	4.1	32.9	6.5	52.3
355	2.9	23.2	4.6	36.9
430	2.2	18.0	3.6	28.6

Lens 330 - 530	Magnification (1)		Magnification (1.6)	
	Working Distance	Lowest	Highest	Lowest
330	3.7	29.3	5.8	46.6
430	2.5	19.9	4.0	31.7
530	1.9	15.1	3.0	24.0

5-3 Focal length extender

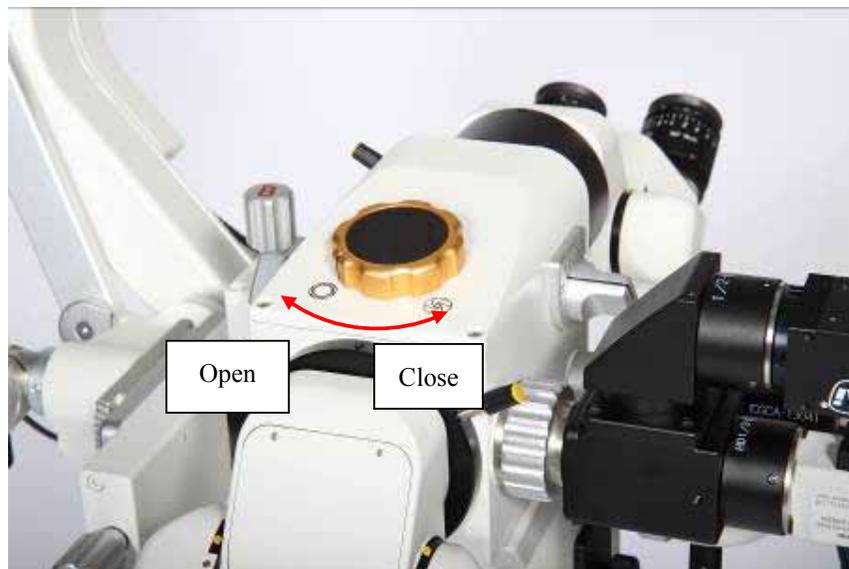
The MM51 includes a function for immediately increasing the magnification by 1.6 times with a single action. In addition, the 180° assistant binocular is equipped with a focal length extension function that is independent from the main binocular. **NOTE:** Always begin cases—always with both focal length extenders set at 1.



5-4 Iris diaphragm

The main binocular is equipped with an iris diaphragm. The aperture can be variably adjusted allowing you to secure an optimum depth of focus and resolution. Note that closing the iris reduces resolution and light, so use sparingly.

The iris diaphragm also adjusts the depth of focus, light level, and resolution of the side assistance binocular and observation camera.



6. Settings of the MM51 microscope

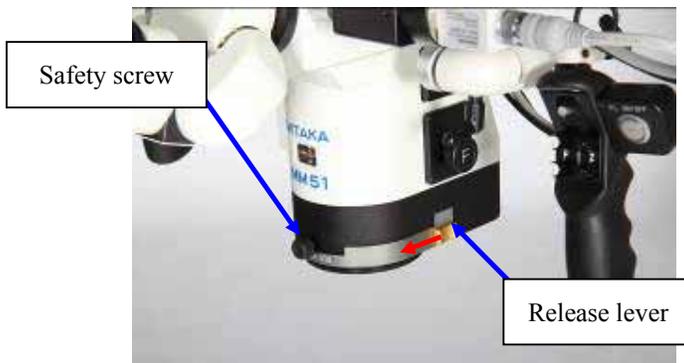
6-1 Replacing accessories

Steps to change the objective lens

1. Keep the microscope horizontal.



2. After loosening the safety screw on the lens mounting clamp, slide the lens release lever forward, and pull out the objective lens in the lateral direction.



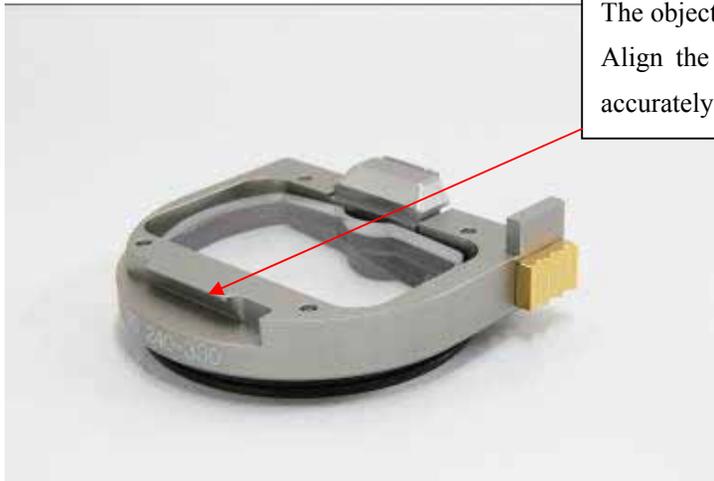
3. Dismount the objective lens.

Slowly slide the objective lens to the transverse direction to dismount it.



4. Changing the objective lens

To mount the objective lens, follow the steps above in the reverse order.



The objective lens has a guide rail for mounting. Align the guide rail to that of the microscope accurately before mounting the objective lens.



Caution

Be careful to avoid fingerprints or dirt on the lens when changing the objective lens.

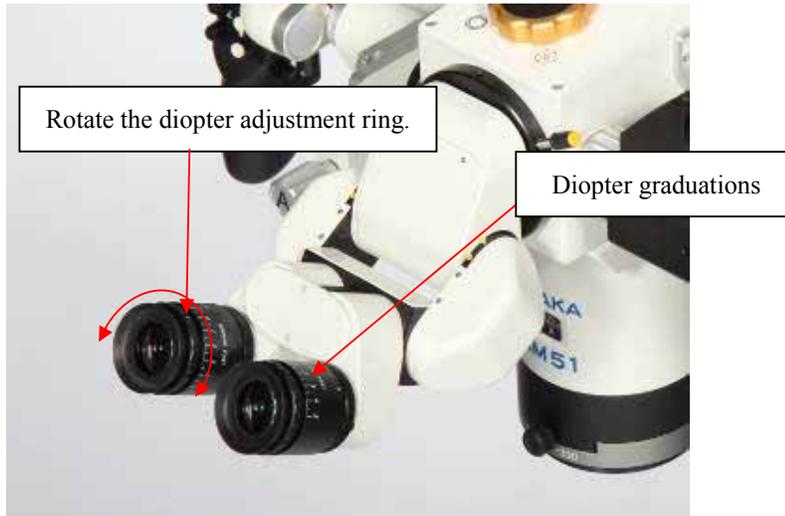


Caution

Exercise utmost caution not to drop the objective lens.

6-2 Adjusting eyepiece diopter

1. Set the diopter graduation of the eyepieces to zero, and then adjust the focus with the zoom magnification set to the maximum.



2. Set the zoom magnification to the minimum. If both eyes are still in focus, the observer's diopter is zero. Otherwise, adjust the focus of both eyes by rotating the diopter adjustment ring of the eyepieces (without moving the focus of the microscope).
3. Set the zoom magnification to the maximum again, and then adjust the focus of the microscope. If you can confirm that the focus position remains the same even after the zoom magnification is decreased, the diopter graduation indicated at that time is the observer's diopter. Record the indicated value.

The indicated diopter graduation for a nearsighted person is negative, whereas that for a farsighted person is positive.

7. Features of YOH stand

7-1 Overhead position

The YOH stand features flexible arm adjustments, allowing the most efficient use of space in the operating room or for storage.

True overhead

The Mitaka Kohki stand is the first overhead stand in the world to remain balanced even when the microscope is moved. This patented device contributes to a more comfortable surgeon and better patient care delivery.



7-2 Tilting function

The YOH has a tilting mechanism in which only the microscope moves, featuring the following advantages:

1. Fatigue free use of the operator's arms. The YOH can substantially alleviate the load to the operator's arms and allow the surgeon to focus on microsurgery.
2. The MM51 microscope has a very large range of motion.



7-3 Focus lock / XYZ plane function switching



Black button: "All free"
Button to set the stand to the all free mode

Blue button: "Functional free"
Button to set the stand to the free mode with focus lock/XYZ plane free

Note:

The same buttons are symmetrically located on the left and right sides of the grip.



Upper: Focus lock
Lower: XYZ free

This button changes functions with a push.

XYZ plane function



The microscope moves on 3 planes (X, Y, & Z)

Focus lock function



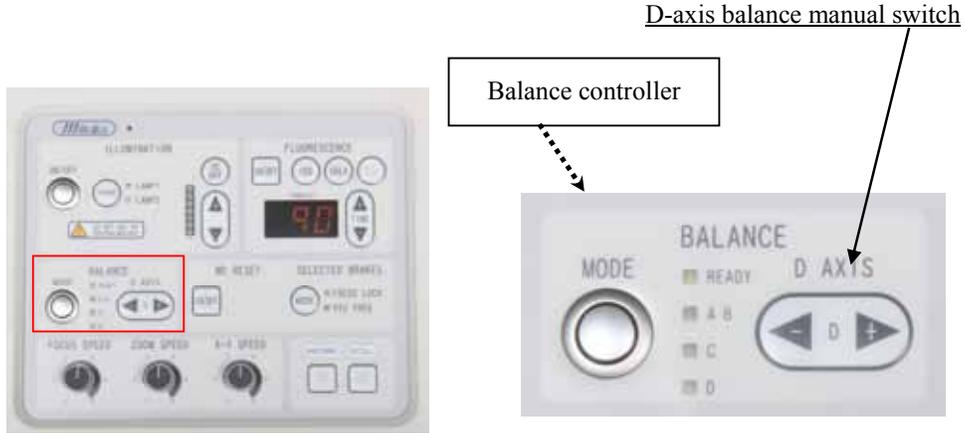
The microscope is allowed to rotate in the 3 planes (X, Y, & Z) but not allowed to move from one plane to another

8. Settings of the YOH stand

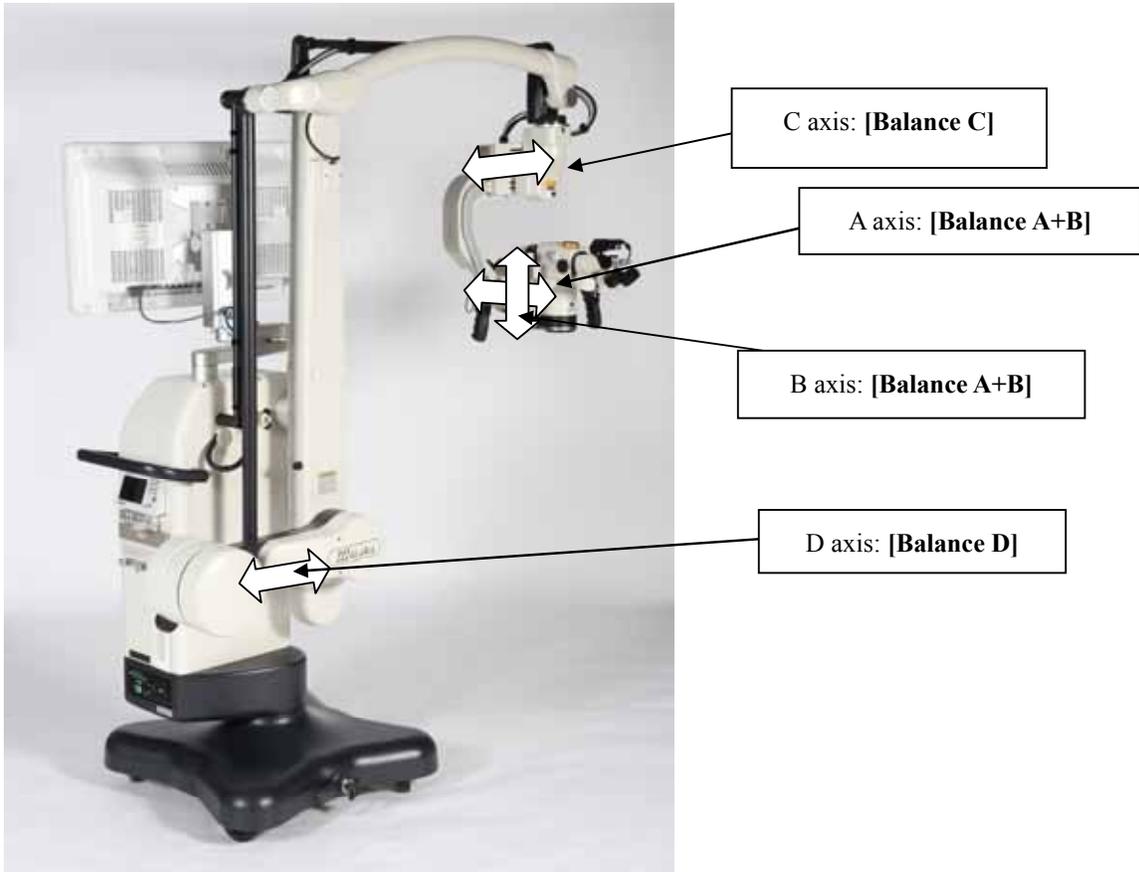
The MM51/YOH is a machine that should be used with the balance well-adjusted where all the axes are balanced. Accurate balancing is an important element that leads to comfortable surgeries and the ability to focus on patient care.

The balance of the microscope supporting device (YOH) must be adjusted when accessories on the microscope are changed. Below is how to perform that balance.

8-1 Names of parts of the balance control unit



Names of YOH balance adjustment axes



8-2 Steps to adjust the balance

Basic sequence of balance adjustment

First, mount accessories to the MM51 microscope and set the microscope to the surgery position.

The sequence of balance adjustment of the microscope and stand is as follows:

1 Preparation before balance adjustment

2 [With Mode set to A B]

Balance adjustment of A axis (microscope) by turning Knob A.

Balance adjustment of B axis (microscope) by turning Knob B.

[With Mode set to C]

Adjust C axis by pushing button left or right

3 [With Mode set to D]

Adjust D axis (weight) by pressing the + or -

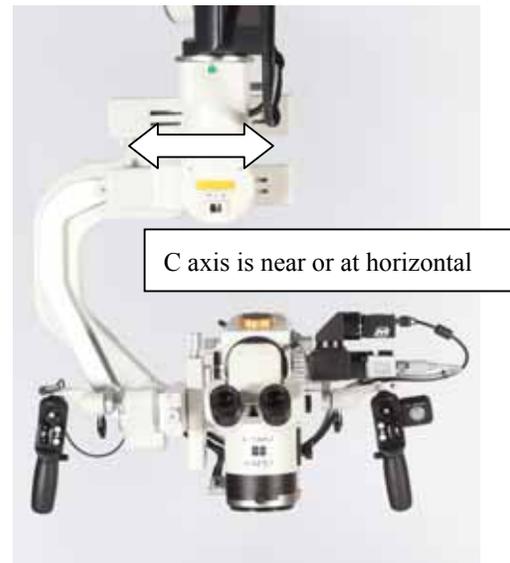
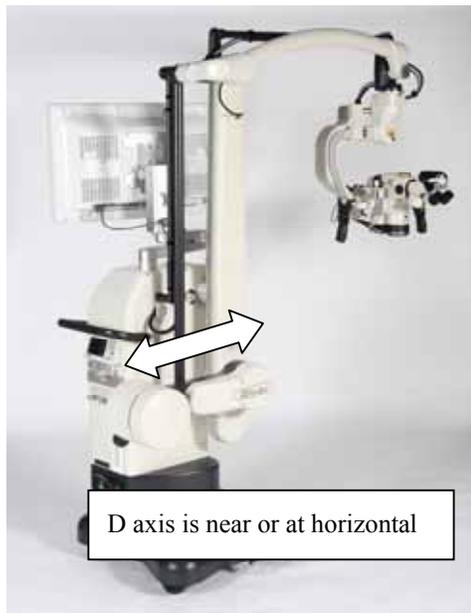


4 [With Mode set to System ready] Confirm overall balance state by pressing All Free button on MM51 handle.

1. Preparation before balance adjustment

Mount accessories to the MM51 microscope and set the microscope to the surgery position.

- Check that D axis is almost horizontal. When it is at an excessive angle, adjust the microscope to a position where D axis is almost horizontal.
- Check that C axis is almost horizontal.



Caution

Pay attention to the surrounding spaces whenever adjusting the balance of various parts. Do not adjust balance under the OR lamp, over the operative field, or over objects located in the sterile field.

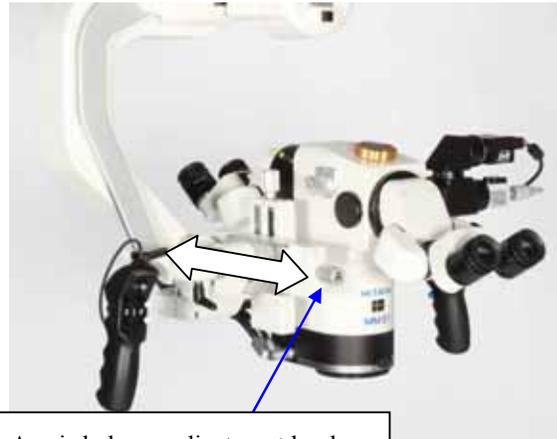
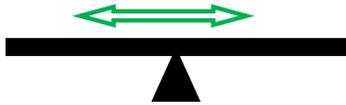
2. [Balance A + B] Adjustment start

Press the balance adjust button to select [Balance A + B].*
* Flashes during selection.



Adjustment of A axis (microscope)

Rotate the A axis balance adjustment knob for adjusting the balance of the microscope to A axis. The principle is the same as that of a seesaw. The knob is moving the seesaw left or right on the pivot point.



A axis balance adjustment knob

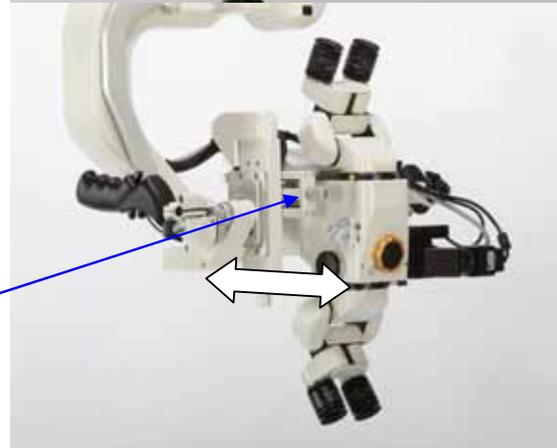
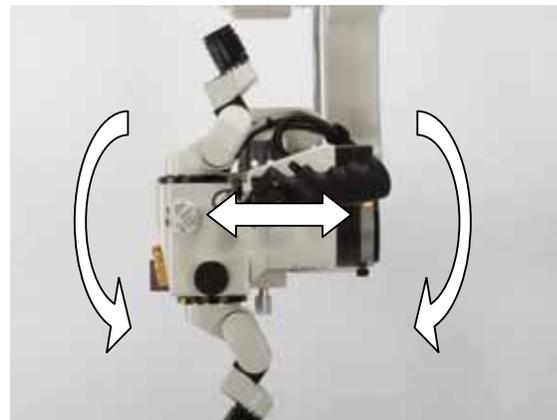
Adjustment of B axis (microscope)

Arrange the microscope to the form shown in the figure (optics horizontal position).

The B axis balance adjustment is the same as that of A axis except the microscope is now rotated 90 degrees.

Rotate the B axis balance adjustment knob for adjusting the balance of the microscope to B axis.

The principle is the same as that of a seesaw. Turn the B knob till the seesaw is in perfect balance checking by pressing the all free button.



B axis balance adjustment knob

1. [Balance C] Adjustment start

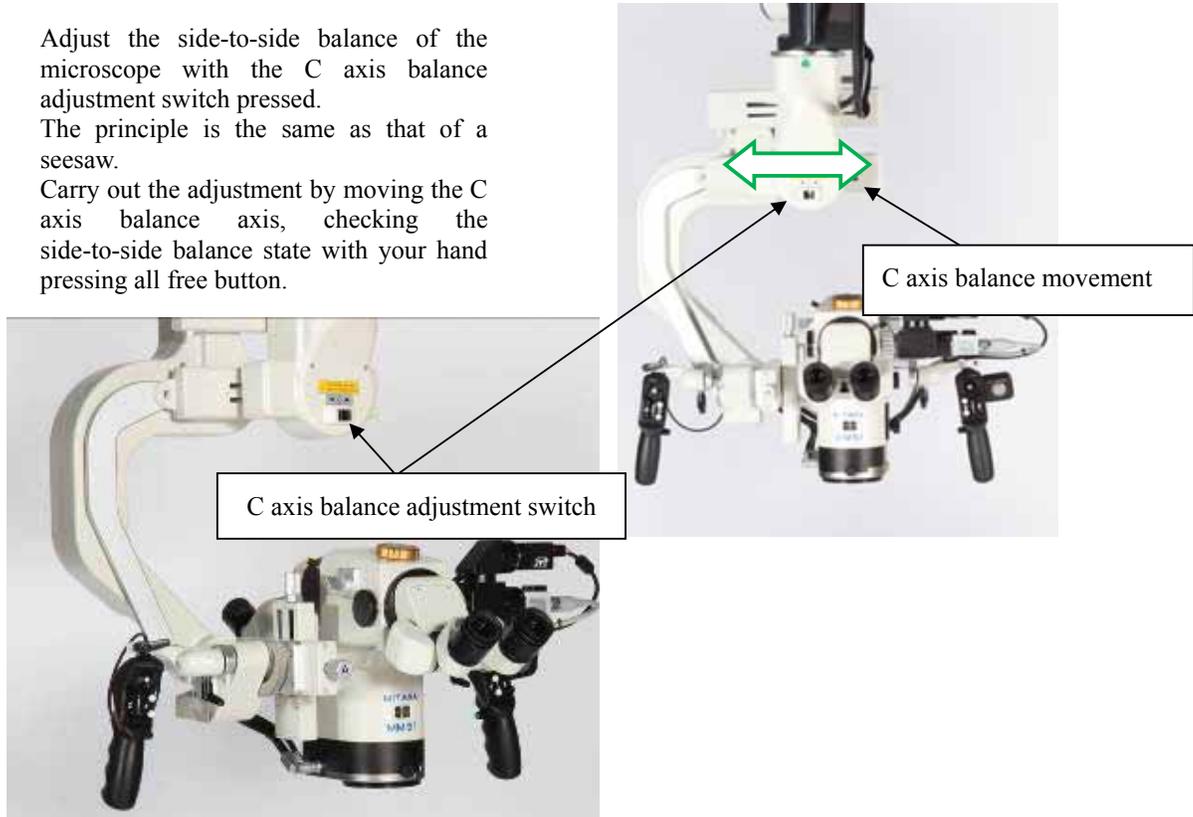
Press the balance adjust button to select [Balance C].*

* Flashes during selection.



Adjustment of C axis (small swing arm)

Adjust the side-to-side balance of the microscope with the C axis balance adjustment switch pressed. The principle is the same as that of a seesaw. Carry out the adjustment by moving the C axis balance axis, checking the side-to-side balance state with your hand pressing all free button.



2. [Balance D] Adjustment start

Press the balance mode button to select [Balance D].*

* Flashes during selection.



Adjustment of D axis (weight)

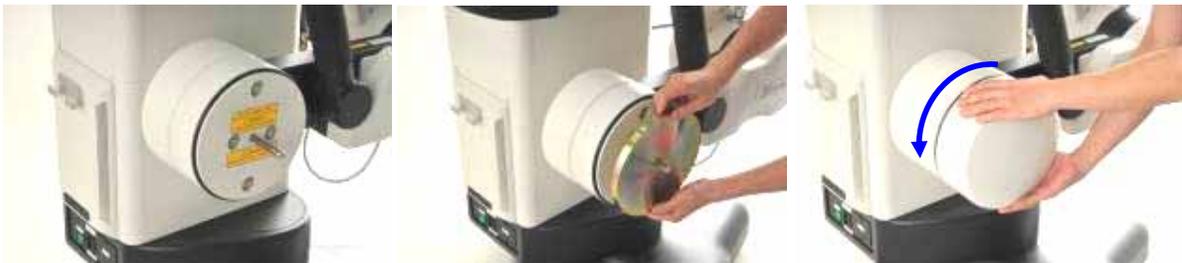
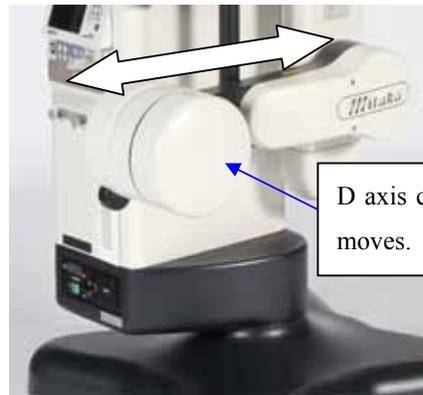
Press the left or right side of the weight adjustment switch to adjust the balance. If microscopes falls press + and if microscopes raises press -



D axis balance adjustment is also the same as that of other axes.

Press the D weight adjustment switch to adjust the counter balance against the weight of the microscope.

This is rarely needed but if a substantial change to the microscope has been made since it was first installed you may need to add or subtract actual D weights as shown below. Please ask your local representative for help at this point.



Caution

This work must be done by technically trained persons on their own authority because there is a risk of an accident due to a dropping weight.

Finish Balancing

Press the balance mode button to select **[Ready]**.*

It will be a steady green light.

Check that microscope is balanced by pressing All Free button.



9. How to apply a drape

9-1 Cover glass



Mount a sterilized cover glass.



Warning

Although cover glass will be draped, care should be taken to keep the glass as hygienic as possible.

Cover glass

Note: The cover glass can be used repeatedly by **EOG gas sterilization or autoclave sterilization.**

9-2 How to apply a drape

1. Preparation of the microscope

Prepare the microscope in accordance with the surgery to be performed.

Attach accessories (side-view lens-barrel and opposed lens-barrel) and adjust the balance.

After that, set the microscope at the position you are actually going to use.

2. Mounting a cover glass

Mount a sterilized cover glass.

3. Applying the drape

Caution! Use a drape designed specifically for the MM51.

Open the drape package, and temporarily fix the rubber part of the drape to the cover glass.

4. Draping

OR staff should be trained by a technician on appropriate draping technique.

5. Remove the plastic lens supplied with the drape

10. Maintenance and storage



Pay careful attention to the surrounding area when transporting or storing the stand. The microscope and light guide cable (fiber cable from the lamp unit) are optical goods and can easily be broken when pushed against a wall. Pay particular attention to the handling when pushing through OR doorways.

When an optical glass (e.g., objective lens, eyepieces) becomes soiled, wipe it with a clean gauze or cotton swab dampened with a little alcohol.

11. Options and accessories

Name	Specification / model number		Description
Surgical microscope system			
MM51/YOH-5	MM51	Standard equipment	MM51 microscope main body
	YOH-5		YOH-5 stand main body
	FTSW-30		Foot pedal
	MCG-51		Cover glass
	ZL-30		Xenon lamp
-----	-----	-----Options follow-----	-----
1-way adapter	OWA-3		1/3-inch CCD adapter TV focus controller
1-way adapter	OWA-2		1/2-inch CCD adapter TV focus controller
2-way adapter for fluorescent observations	ICGCA		1/3-inch CCD + 1/2-inch NIR camera adapter TV focus controller

Motor-driven XY device

The microscope can be remotely operated by electromotion. The joystick on the foot pedal allows for hands-free operation by the surgeon so that both hands may remain in the surgical field. As this option cannot be retrofit, only orders at the time of purchase of the system can be accepted.

CCD camera adapter

Any CCD camera you desire can be mounted on the MM51 microscope. In addition, the previously required rotation of the CCD camera is not necessary even when the mounting position of the CCD camera is changed between the left and right sides of the microscope. The TV focus controller is standard equipment. If the CCD becomes out of focus, it can be adjusted outside of the sterile field with the TV focus controller; this will not impact the image viewed by the surgeon through the microscope.

12. Other precautions

1. **Only persons experienced at the handling of the MM51 YOH can use the equipment.**
2. **When installing the equipment, observe the following:**
 - (1) Install the equipment where it will not get splashed with water or other liquid.
 - (2) Avoid using the equipment outside of an operating room.
 - (3) Great attention should be given to the handling of the equipment, to prevent dents or other damage.
 - (4) Securely fix the parts.
 - (5) The loading weight of the equipment must not exceed 14 kg or 31 lbs.
 - (6) Do not use any parts other than genuine parts provided by Mitaka Kohki.
3. **When using the equipment, observe the following:**
 - (1) Always check the operation before surgery.
 - (2) Pay extra attention to the handling of the equipment. Whenever the equipment has an impact or bump during transportation, suspend equipment use and contact Mitaka Kohki.
 - (3) Check the cables for damage. When cracks or other defects are found, suspend equipment use and contact Mitaka Kohki.
4. **Pay attention to the following points while using the equipment:**
 - (1) Be careful not to exceed the time and amount required for the diagnosis or medical treatment when using fluorescent mode(s).
 - (2) Always check for abnormalities with the equipment or patient.
 - (3) The equipment must be used in an operating room at a temperature ranging from 15 to 29°C or 59 to 84°F and humidity ranging from 45 to 90%.
5. **Pay attention to the following points after using the equipment:**
 - (1) When you are going to remove wires and cables, do not apply abnormal force.
 - (2) With respect to the storage location, observe the following:
 - I Store the equipment in a place that will not get splashed with water or other liquid.
 - II Store the equipment in a place that will not be subjected to vibrations or impacts.
 - III Store the equipment at room temperature (approximately 20°C or 68°F).
 - (3) After washing accessories and wires, store them in an organized fashion.
 - (4) Avoid using an organic solvent for washing the equipment.
Suspend using the equipment when a flaw or evidence of deformation is observed on the surface of the hoses. Contact Mitaka Kohki and request an inspection.
6. **In the event of failure**

In the event of failure, place an out-of-order sign on the equipment. Repair shall be performed only by a person who is authorized by Mitaka Kohki or a person who has received training at Mitaka Kohki.
7. **Maintenance and inspection.**

Never fail to check the operation before using the equipment and check all the parts for flaws.



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