

Surgical Microscope OMS2350 User Manual



The CE mark indicates that the product complies with the European medical device regulation (EU) 2017/745.



Zumax Medical Co., Ltd.

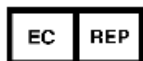
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Preface

Thank you for purchasing our Surgical Microscope. To prevent damage to your product or injury to you or to others, read the following safety precaution in their entirety before using this equipment. Keep these safety instructions where all those who use the product will read them.

Precautions

1. Do not use this instrument in the environment prone to fire and blast or where there is much dust and with high temperature. Use it in the room and simultaneously be careful to keep it clean and dry;
2. Check that all the wires are correctly and firmly connected before using. Ensure that the instrument is well grounded.
3. Please pay attention to all the rated values of the electrical connecting terminal.
4. Only use fuse according to the specifications and rated values stipulated by our product.
5. Use the power cable supplied with this instrument only;
6. Do not touch the surface of the lens and prism with hand or hard objects.
7. Turn off the main power first before replacing the illumination bulb and fuse.
8. To prevent the instrument from falling down to floor, it should be placed on the floor where the inclination angle is less than 10°.
9. Turn off the power and cover the instrument with dust-proof hood when it is not in use.
10. In case there is any trouble, please first refer to the trouble-shooting guide. If it still cannot work, please contact the authorized distributor or our After-sales Service Department.

* THE MARKS USED IN THIS INSTRUMENT



Operating instruction



Warning



Caution



Protective earth (ground).



ESD



The black dot is the video interface



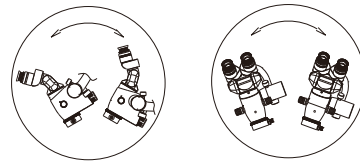
The blue dot is the LED power interface



light-dimmer

Increase the brightness clockwise

Reduce the brightness counterclockwise



Balance adjustment

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1. Purpose and Features

1.1 Purpose

The microscope OMS2350 is used for ENT surgery, dental surgery, neurosurgery, dermatology or other surgery except ophthalmology.

1.2 Features

- OMS2350 is based on a hanging arm design, it helps the operator by automatically adjusting the exposure, fatigue is minimized even after prolonged use.
- Six-step magnification for the main microscope, the optical system assures a perfectly clear images.
- Cool illumination by LED lamp. Natural colors.
- Hanging arm design, so the arm can be moved randomly. A special switch has been fitted into the Second Arm: The lamp will keep “on” when the arm is working in its normal range, in "parking" position, the lamp will turn off automatically.



Fig.1 Microscope head

2. Main components

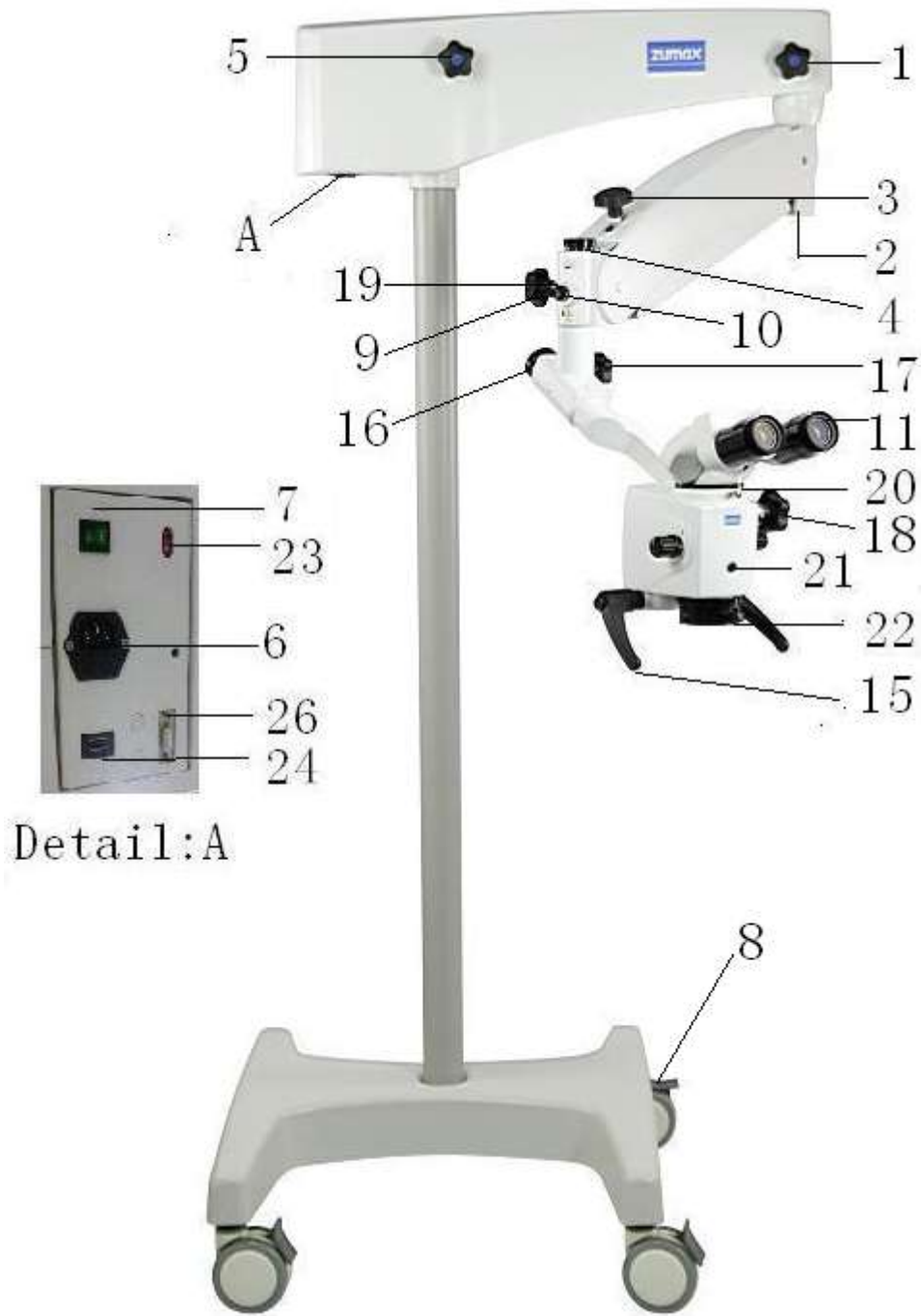


Fig.2 General assembly of microscope

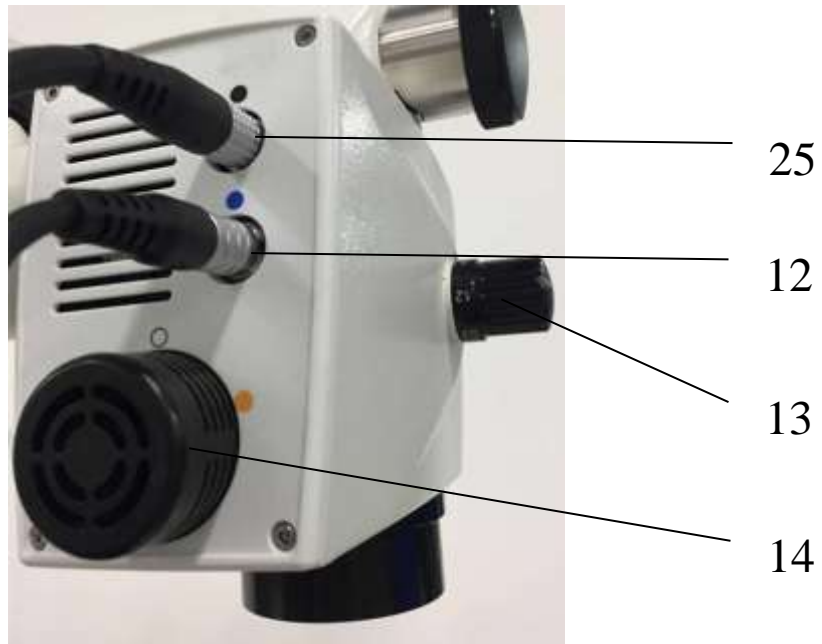


Fig.3 Back-side view

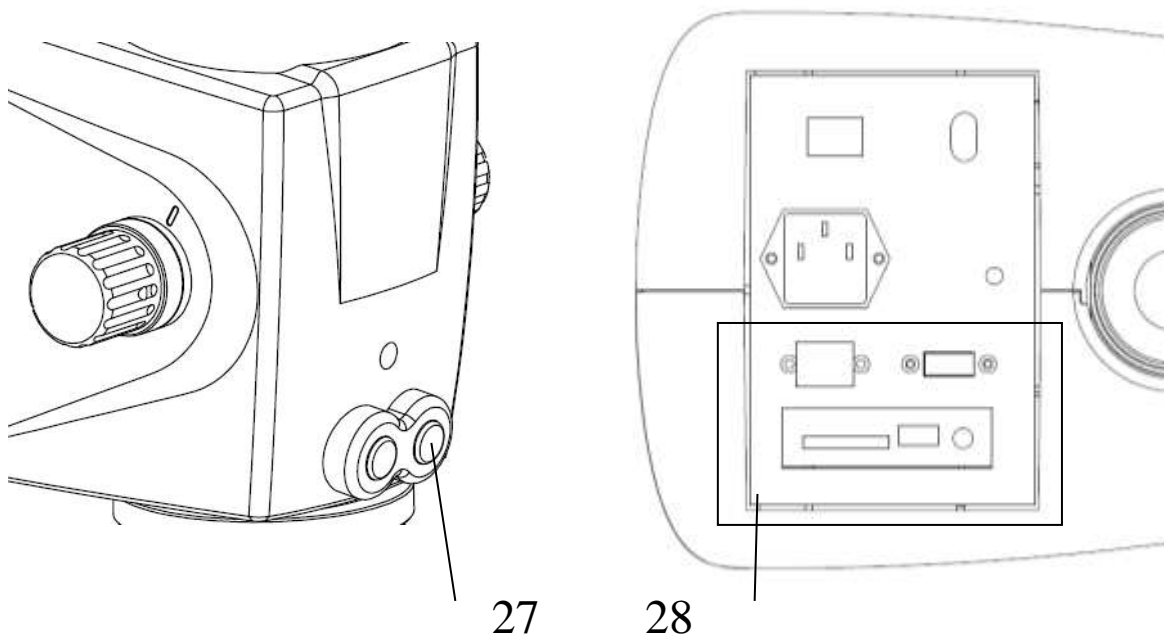


Fig.4 Integrated full HD camera

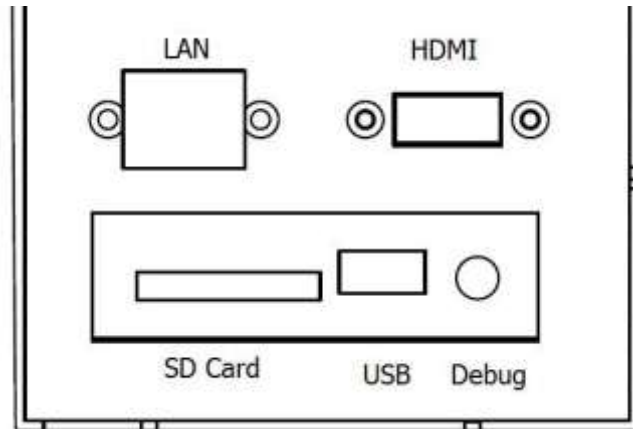


Fig.5 Interface details

[1] Star handler fixation screw.

Hang the microscope on the second arm using this nut.

[2] Balance adjustment screw for second arm.

Rotate the screw with 8mm special spanner to adjust the balance of the second arm.

[3] Star handler fixation screw.

Use this screw to adjust the vertical moving balance on the second arm.

[4] Fixation nut.

Hang the microscope on the second arm using this nut.

[5] Star handler fixation screw.

Use this screw to adjust the damping of the horizontal movement of the first arm.

[6] Main power socket, fuse socket.

Pull out the power table, right side is fuse socket, fuse specification: T1.25 A/H250 V for 220VAC; T2.5 A/H250 V for 110VAC.

[7] Main Power Switch.

To turn on or turn off the main power of the microscope.

[8] Foot Wheel.

Lock the brakes to fix the microscope in place.

[9] Star handler fixation screw.

Use this screw to adjust the damping of the 120° connecting arm.

[10] Illumination brightness adjusting button.

Rotate this button to adjust the brightness of the illumination. A contact

switch installed in the second arm serves to switch off the bulb when the microscope is in "parking" position.

[11] Binocular tube

[12] LED power cable and the joint for power cable.

[13] Column

[14] Filter selection button.

Rotate this button to select the filters. There are positions: No filter/ Green filter/ Yellow filter

[15] Manipulating handle.

For rough focusing, move the microscope up and down or right and left. Available in Type '8'. (BFR: I don't understand, this needs a bit of explanation or leave the text away)

[16] Fixation nut.

Hang the microscope on the 120 °coupling using this nut.

[17] Star handler fixation screw.

Use this handle to adjust the damping of the microscope's hanging axis.

[18] Star handler fixation screw.

Use this handle to adjust the damping of the microscope's pitch.

[19] Locking pin.

Keep the microscope from falling when assembling and disassembling accessories.

[20] Fixation screw of main microscope.

Used to fix the main eyepiece tube.

[21] Manipulating handle position.

Available in Type 'T'.

[22] Fine focusing adjustment knob.

Rotate this knob to adjust the focus of the objective, focusing distance: 11mm.

[23] 110V/220V Voltage selector.

Pushing the selector upwards, input voltage is 110V, pushing the selector downwards, input voltage is 220V.

[24] The joint for monitor (Optional)

It can output video of built-in camera.

[25] video interface (Optional)

[26] HDMI debug interface (Optional)

[27] Integrated full HD camera with SD card (Optional)

Microscope head has two buttons as shown in the figure3. Press the left button will take a picture; press the right button will record video.

Interface details on the arm as shown in the figure4.

[28] Interface details on the arm(LAN、HDMI、SD Card、USB、Debug) (Optional)

[29] Inner Camera Remote Control Kit (Optional)

The details see instruction of inner camera remote control kit.

3. Assembly

The microscope is packed in one package. Please open the package and take out all parts and assemble them according to the following procedures.

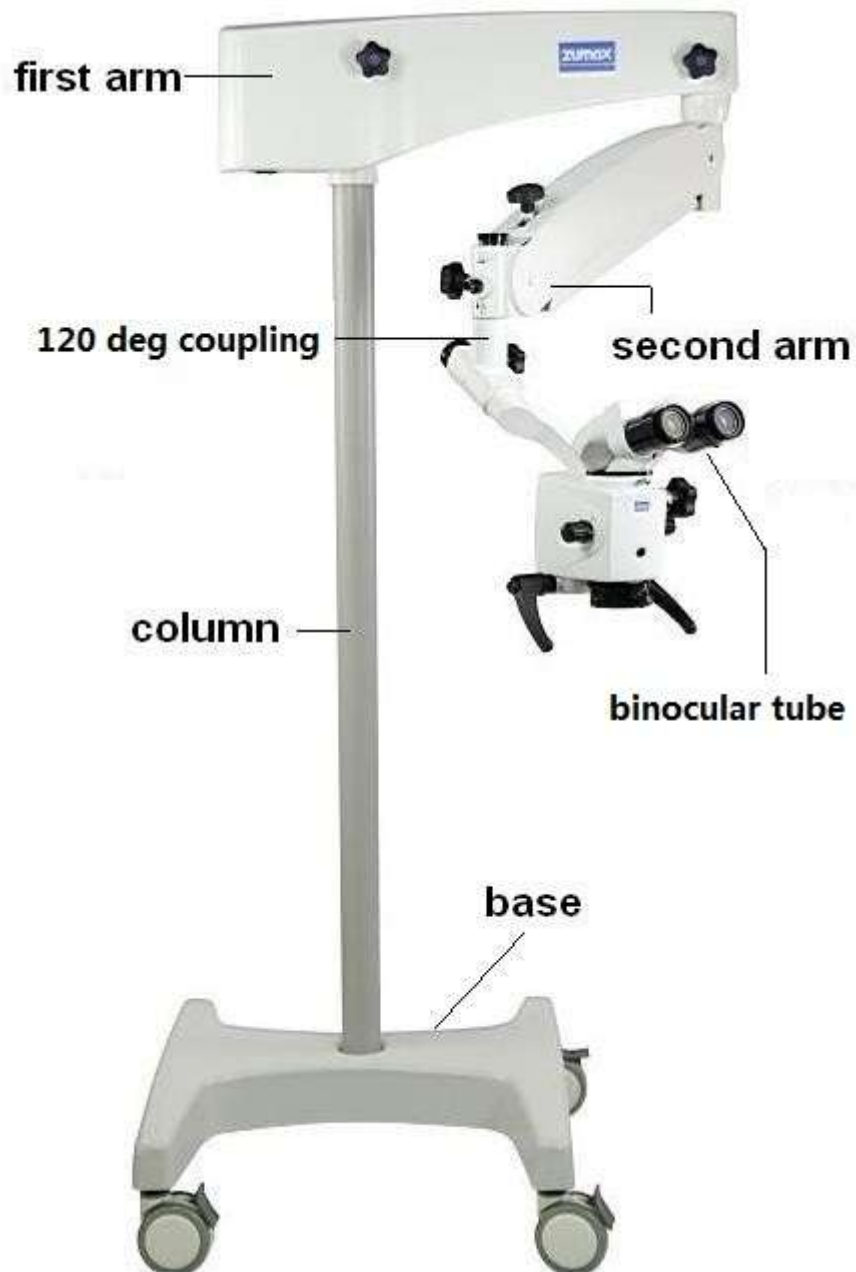


Fig 6. Assembly drawing of microscope

3.1 Assembly of base

- (1) Please take out the base support from the package, lay it on the ground.
- (2) Take out the pole, turn out the inner hexagonal screw and gasket. Insert the pole into the hole of the floor stand, make sure that the pin of the floor stand installed in the hole of the pole. Assemble everything in the following order: gasket, spring gasket, socket screw. Finally fasten the socket screw firmly with an 8mm allen key.

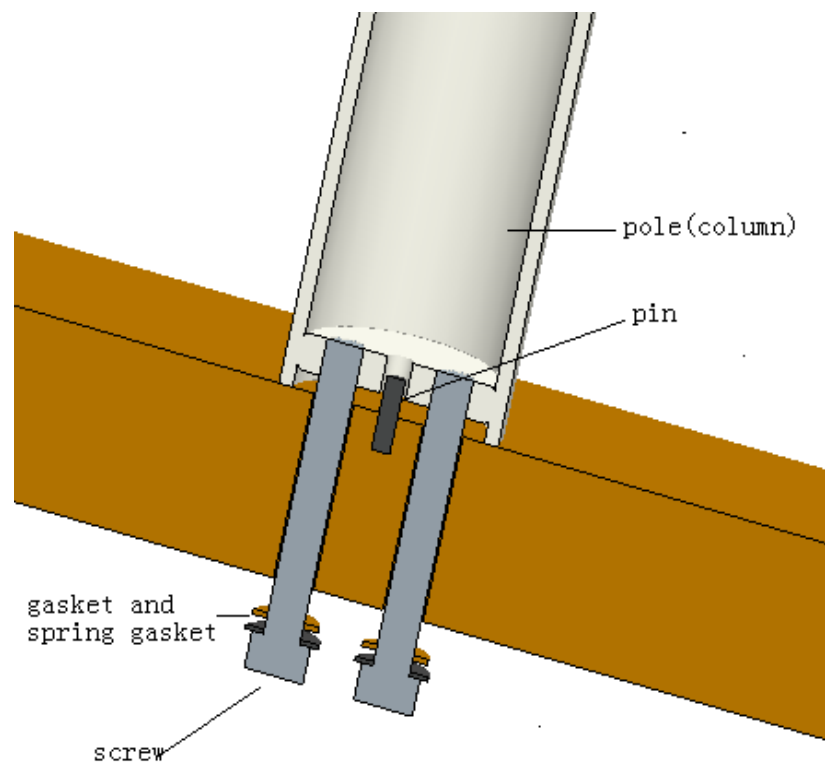


Fig 7. Assembly of base

3.2 Assembly of the first arm

Take out the first arm, please pay attention, the star handler fixation screw [3] must be tightened in advance, insert the hole to the axis, then use jump ring pliers to fix the two axis with jump ring in the circle groove, put on the cover.



Caution: The Second Arm use a spring to keep the balance. The star handler fixation screw [3] can only to tighten the arm, the arm can not be locked by this screw. The second Arm must be held before loosening the star handler fixation screw [3].

3.3 Assembly of 120 deg coupling

- (1) Rotate the star handler fixation screw [9] a little bit until the screw tip does not above the shaft hole; Rotate the Locking pin [19] a little bit until the tip does not above the shaft hole.
- (2) Take out the Fixation nut [4] from 120 °coupling, apply a little bit engine oil or grease on its axis, insert the axis into the hole of second arm from the bottom to up, tighten the locking pin [19] make the locking pin [19] into the axis groove, tighten the fixation nut [4] finally.

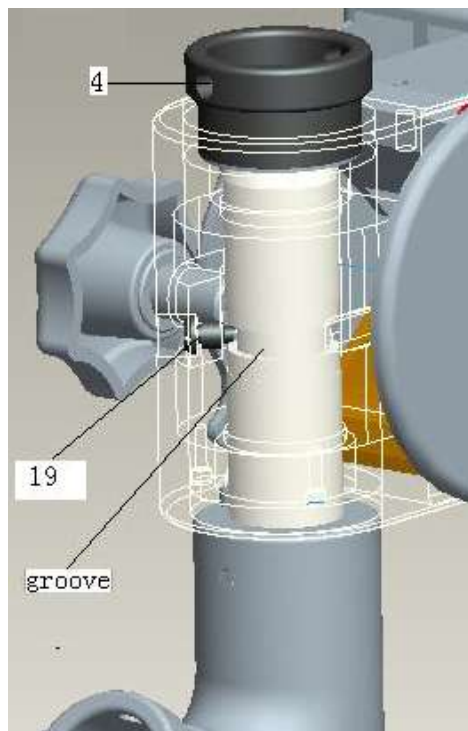


Fig 8 Assembly drawing of 120 °coupling

3.4 Assembly of microscope head

Take out the microscope head connect it with the hanging axis. Use the method as same as 3.3 to assemble the microscope head to the 120 °coupling.

3.5 Assembly of 180 °inclinable binocular tube

Take out the 180 °inclinable binocular from the package, fix it to the microscope head make sure the pin is in the right position, then tighten the screw [21].

3.6 Assembly of handle

Manipulating handle [15] is fixed on the lower part of microscope, T type handle [21] is fixed on the front of microscope. Assemble the manipulating handle [15] or T type handle supplied with your equipment, then tighten the screw.

According your needs, select manipulating or T type handle.

3.7 Assembly of the LED power cable

The LED power cable is fixed on the first and second arm. Plug LED power cable into the joint [12].



Caution: The terminals of LED power cable must be plugged in the right holes of the joint.

3.8 How to connect the power cable

Take out the power cable and plug it into the power socket [6].

4. Use of the microscope



Warning: To avoid the risk of electric shock, this equipment must only be connected to a supply mains with protective earth.



Warning: To avoid the risk of mechanical hazards, this equipment must only be used in room without threshold.



Warning: Exposure to eyes limit $t_{max} = 90$ seconds.

4.1 Working conditions

Please make check the following points, and continue thereafter:

- Please check whether the main voltage and frequency complies with what required by this equipment. If you will operate the equipment at 110V, please switch the selecting switch [23] to the 110V block and change the fuse to type T2.5 A/H250 V as supplied. If you will operate the equipment at 220V, please switch the selecting switch [23] to the 220V block and change the fuse to type T1.25 A/H250 V as supplied.
- Check the grounding of power supply. Make sure the equipment has a good ground-wire connection.
- Please use the power cable supplied with this equipment.
- Please make sure that all mechanical parts important for your security are assembled correctly.



cautions:

- Please never watch the light source directly through the objective.
- The terminals of LED power cable must be plugged in the right holes of the joint.
- Please do not cover the heat elimination grooves of power source.
- Please pay special attention to the caution signs on the equipment.

4.2 Installation and Adjustment before use

4.2.1 Adjusting the balance of second arm

- Hold the second arm, unscrew the star handle fixation screw [3].
- Insert an 8 mm inner hexagon spanner into the screw [2].
- Rotate the screw [2] to adjust the balance of second arm.
- Adjust the second arm, check the balance of second arm in multiple positions.
- Adjust the star handle fixation screw [3] until the upwards and downwards resistance are almost equivalent.
- When adding or removing accessories, readjustment of the balance of the second arm is necessary.



Caution: The second arm must be held firmly before unscrewing the star handle fixation screw [3].

4.2.2 Adjusting the microscope

- Carry out this adjustment in your normal working position, switch to 0.3 x magnification, adjust the working distance and pupil distance of the microscope.
- Emmetropes/ operators who do not need corrective glasses: adjust the eyepiece to 0.
- Operators using his/her corrective glasses: adjust the eyepiece to 0.
- Ametropes/ operators who need corrective glasses who know their refractive powers and perform surgery without wearing their glasses: adjust the eyepiece to his/her own eyesight.
- Ametropes/ operators who need corrective glasses, who do not know their refractive powers and perform surgery without wearing their glasses, use the following procedure: Adjust both eyepieces to +5D, take the eyepiece and eyepiece tube from the microscope, observe a distant object through the eyepiece, just like using a telescope. Then rotate the diopter adjustment hoop until the image is clear. If necessary, repeat this process for three times. Use the same method to adjust the second eyepiece. Assemble the eyepiece and eyepiece tube back to microscope head, tighten the fixation screw [20].
- Adjust the eye-cover until the whole visual field can be observed. Adjust the magnification to 3x, when you feel image clear, return to the magnification you want. The image is still clear when you change the magnification, but different in

depth of field for each magnification.



Caution: It is necessary to make a form if several doctors share an operation microscope. Every doctor's diopter should have noted. Keep the form where all those doctors who use the microscope find it.

4.3 Inspection before use

Please inspect the following points before the operation:

- Check if all fixation screws and lock pins have been tightened.
- Turn on the power switch, then check the following items:

Illumination:

- LED should be in good condition.
- When moving the second arm up and down, the LED light must switch on and off.
The LED turns off automatically when the microscope is in "parking" position.
- The LED power cable has been connected.

Set balance:

- Ground must be level, so the column will be level.
- The damping of first arm, second arm, 120 °connecting arm (optional accessories) and the microscope has already been adjusted.

Microscope:

Adjusting the magnification:

- Magnifying knob is [13] working correctly.

Eyepiece:

- The screw [11] to fix the eyepieces has been tightened.
- Operating microscope and eyepieces have been adjusted in a suitable position for the operation.
- Pupil distance has been adjusted.
- The eye-cover height has been adjusted to assure the whole visual field can be observed.
- The diopter has been adjusted.
- The images are clear in each magnification setting.

Filter selector:

- Filter selector [14] is in good condition.

Base:

- The foot wheels' brakes have been set.

Disinfection cover and handles:

- Star handle fixation screws, magnifying knob, illumination brightness adjusting button、 pupil distance adjustment knob, fine focusing adjustment knob etc. have been equipped the sterile covers.
- Microscope head may be equipped with a single use sterile cover according to doctor's requirement.



Caution: When foot wheels are fixed, pushing horizontal prohibited

4.4 Using the microscope

- Please make sure the above steps had been taken care of.
- The equipment had been inspected according to the requests of Inspection Form.
- Turn on the power switch.
- Move the second arm up and down to the right working position.
- Adjust the illumination.
- Select the filter which will be used.
- Move the microscope lens into the operation area, then adjust it to a suitable position.
- Adjust the magnification.
- Move the operation microscope, adjust rough focusing through the eyepieces, then adjust fine focus.
- Move the second arm to working scope, set an available angle, then lock it by Star handler fixation screw [3].
- if the equipment is not in use, main power should be off.



Caution: Make sure the heat elimination groove is not covered.

4.5 Movement and Storage after use

- Put off all sterilizable caps and handles which can be sterilized in autoclaves.
- Fold the microscope back near the column. Fasten every star knob firmly to fix the arm and the microscope.

- Release the brakes of the wheels.
- While moving the equipment, hold the movement handles and make the equipment move slowly and carefully to avoid falling and bumping.
- When the storage place has been reached, lock the brakes of the wheels.
- Put on the dust cover.

5. Maintenance

5.1 Replacing the consumable parts

5.1.1 Replacing the LED

Please contact the after-sales service department.

5.1.2 Replacing the fuse

The fuse is integrated with main power input socket.

Please replace the fuse according to the following steps:

- Turn off the main power switch.
- Pull out the power plug from the main power plug [6].
- Find the fuse socket on the right side of power plug [6], take out the fuse socket from the side with a small screwdriver.
- Take out the melted fuse.
- Insert a new fuse and insert the fuse socket back again.
- Plug in power cable.
- Turn on the main power switch.

Specification of fuse: T1.25 A/H250 V for 220VAC

T2.5 A/H250 V for 110VAC



Caution: Please use the bulb specially designed for this equipment.

5.1.3 Replacing the power supply cords

Replacement the power supply cords should by the manufacturer specifies service person.



Warning: To avoid the unacceptable risk, please use the special cords for the equipment.

5.2 Cleaning and Sterilization



Caution: Dirt on the lens must be cleaned immediately after the surgery. It will be hard to clean when the dirt air-dried.

5.2.1 Cleaning the surface of equipment

The outer surface of the equipment may be cleaned with a wet cloth. The remaining stains can be cleaned off with a mixture of 50% C₂H₅OH and 50% distilled water. Do not use any corrosive detergent or the surface may be damaged.

5.2.2 Cleaning the surface of the optical lens

To prevent the dust from staining the lens, never expose the optical lens to air without the objective, eyepiece tube and eyepiece. Please use the dust cover after using the microscope.

Cleaning the surface of the optical lens: To clean the dirt on lens, such like bloodstain, please use a special paper or absorbent cotton with a little bit of distilled water and wash off, the remaining stains can be cleaned off with a mixture of 50% ethanol and 50% ether. If there is dust on the lens, blow the dust off with a dust pen. Do not wipe the lens with any corrosive detergent, otherwise it may be damaged.

5.2.3 Cleaning and disinfection of sterilizable caps

Cleaning and Disinfection in Automatic cleaning machine with pure water according to the instruction of the Automatic cleaning machine, the Damp and heat disinfection, degree $\geq 93^{\circ}\text{C}$, time ≥ 150 seconds or A0 ≥ 3000 .

5.2.4 Sterilization of sterilizable caps

All sterilizable caps should be sterilized by autoclave. The following temperature and time are recommended:

Sterilization temperature 134°C , the min. temp. shall not lower than 134°C and the max. temp. shall not upper than 137°C .

Holding time shall be not less than 5 minutes;

Dry time 15 minutes.

6. Microscope accessories list

Order Code	Description
800-0030	180 deg inclinable binocular tube
800-0031	Stereo observation tube
800-0033	180 deg inclinable binocular with PD adjustment device
800-0037	Dual iris diaphragm
800-0112	Beam Splitter (50%:50%)
800-0113	Beam Splitter (20%:80%)
800-0114	Extender and Beam Splitter (50%:50%)
800-0115	Extender and Beam Splitter (20%:80%)
800-0190	Micro3D Full HD Camera Set (External)
800-0121	1/3" CCD Adapter f=80mm
800-0122	Binocular extender
800-0123	Binocular rotation ring
800-0124	1/3" CCD Adapter f=50mm
800-0130	12.5X Eyepiece (2 pcs)
800-0131	10X Eyepiece (2 pcs)
800-0132	16X Eyepiece (2 pcs)
800-0133	20X Eyepiece (2 pcs)
800-0134	12.5X Eyepiece with target reticle
800-0139	Rubber Eye Guard (2 pcs)
800-0151	New 120 deg coupling
800-0152	balance arm
800-0166	Canon Digital Camera Adapter
800-0167	Sony Digital Camera Adapter
800-0168	Nikon Digital Camera Adapter
800-0169	Nikon 1J5 Digital Camera Adapter
800-0170	Canon Digital Camcorder Adapter
800-0171	Nex5 Digital camera Adapter
800-0174	Sony Digital Camcorder Adapter
800-0175	F340 Sony Nex Digital Camera Adapter
800-0176	F340 Canon Digital Camera Adapter
800-0177	F340 Sony Digital Camera Adapter
800-0178	F340 Nikon Digital Camera Adapter
800-0180	M32 Digital Camcorder Adapter
800-0181	M43 Digital Camcorder Adapter
800-0182	M46 Digital Camcorder Adapter
800-0183	M49 Digital Camcorder Adapter
800-0184	M52 Digital Camcorder Adapter
800-0185	M58 Digital Camcorder Adapter

800-0186	M62 Digital Camcorder Adapter
800-0187	M55 Digital Camcorder Adapter
800-0192	Flash adapter for Canon
800-0194	Flash adapter for Nikon
800-0201	Protective Lens Caps
800-0203	Protective glass lens for VarioDist
800-0205	Laser Filter Module
800-0210	Objective lens,f=200mm,with fine focusing mechanism
800-0211	Objective lens,f=250mm,with fine focusing mechanism
800-0212	Objective lens,f=300mm
800-0213	Objective lens,f=350mm
800-0214	Objective lens,f=400mm
800-0216	Vario objective lens F260-F350
800-0250	F450 Sony Nex Digital Camera Adapter
800-0251	F450 Canon Digital Camera Adapter
800-0252	F450 Sony Digital Camera Adapter
800-0253	F450 Nikon Digital Camera Adapter
800-0270	Rota360 F180 Canon Digital Camera Adapter
800-0271	Rota360 F180 Sony Digital Camera Adapter
800-0272	Rota360 F180 Nikon Digital Camera Adapter
800-0274	Rota360 F180 Sony mirrorless digital camera Adapter
800-0312	Wall Mount System with plastic covers
800-0324	Ceiling Mount System for new arm
800-0400	Easy360 mobile phone adapter
800-0410	Plastic case for iPhone of Mobile phone adapter
800-0412	Plastic case for Huawei of Mobile phone adapter
800-0414	Plastic case for Samsung of Mobile phone adapter
800-0416	Plastic case for Sony of Mobile phone adapter
800-0418	Plastic case for Mi of Mobile phone adapter
800-0430	wireless Foot pedal for mobile phone
800-0460	Micro 2D
800-0470	wireless Foot pedal for Micro2D
800-0472	wireless photo&video set for integrated full hd video camera
800-0475	Wireless router & Networking cables
800-3010	Nissin MF18 Macro Flash for Canon/Nikon SLR cameras
800-3011	Canon MT-24EX Macro Twin Lite Flash
800-9314	Inner power supply for Canon digital camera
800-9315	Inner power supply for Canon digital camera,long arm
800-9318	Inner power supply for Nikon digital camera
800-9319	Inner power supply for Nikon digital camera,long arm
800-9350	Inner power supply for Sony camcorder
800-9351	Inner power supply for Song camcorder,long arm

800-9354	Inner power supply for Canon camcorder
800-9355	Inner power supply for Canon camcorder, long arm
800-9370	Wireless control Kit by footswitch for Canon camera
800-9372	Wireless control Kit by footswitch for Sony camera
800-9374	Wireless control Kit by footswitch for Nikon camera
800-1106	sterilizable caps for friction adjustment knobs
800-1206	sterilizable small caps for friction adjustment knob
800-1303	sterilizable cap for fine focus
800-1304	sterilizable cap for magnification changer
800-1306	sterilizable cap for rotation handle
800-1307	sterilizable cap for T handle
800-1308	sterilizable caps for balancing arm

7. Trouble-shooting guide

In case there is any trouble, please first refer to the trouble-shooting guide. If you can not solve the problem, please contact the authorized distributor or our after-sales service department.

Trouble	Possible reason	Remedy
Equipment not working	Main power switch is not turned on	Turn on the main power switch or plug in power cable
	Main power down	Contact a local electrician
Illumination does not work	Main power is not turned on	Switch on the main power
	The fuse has been melted	Replace the fuse
	Power cable broken-down	Replacing the power cable
	Main power down	Contact a local electrician
	Electric part broken	Contact the after-sales service department
	The LED power cable is not inserted to the joint correctly	Insert it to the joint correctly
	Microscope not in working area but in "parking position"	Move the second arm to working area
	The LED has burnt	Contact the after-sales service department
	Illumination brightness adjusting button is in low position	Adjust the button a higher position
Bulb turns on and off during the surgery.	Something covered the heat elimination grooves	Take away the cover and clean the heat elimination grooves
	Blower fan defect	Contact the after-sales service department
	Electric part defect	Contact the after-sales service department
The microscope is obstructed when making movement downwards	The star handle fixation screw of the second arm was fixed too tightly	Re-adjust the star handle fixation screw
Magnification change defect	-	Contact the after-sales service department
Filters defect or cannot be switched	-	Contact the after-sales service department

8. Technical specification

Microscopes section (including binocular microscope, objective, eyepiece)						
Magnification factor	0.3x, 0.5x, 0.8x, 1.2x, 2x, 3x					
Objective	250mm					
Fine Focus by knob on objective	11mm					
Binocular	180 °inclined or straight, F=170mm					
Adjustable range for pupil distance	55mm~75mm					
Eyepiece magnification	12.5X/17.7B, adjustable dioptor: ±7D					
Magnification factor	0.3x	0.5x	0.8x	1.2x	2x	3x
Magnification	2.8x	4.2x	6.9x	10.4x	17.0x	25.6x
Diameter of field-of-view(mm)	78.0	52.0	32.0	21.0	13.0	9.0
Work distance (250mm)	Coaxial Illumination				> 60,000 lx	
	Illumination diameter of light spot (mm)				> Φ80	
Stand Section (including base, column, first arm and second arm)						
Second Arm	Length	600mm				
	Rotational angle	±150 °				
	Distance	±300mm				
First Arm	Length	500mm				
	Rotational angle	360 °				
Height	1750mm					
Base dimension	610×600mm					
Electrical specifications						
Rated voltage	AC230V ±10%/50Hz, AC120V ±10%/60Hz					
Input voltage	40VA					
Fuse	AC 120V T2.5 A/H250V AC 230V T1.25 A/H250V					
Electrical Safety Standard	EN 60601-1: 2006 EN 60601-1-1-2: 2015					
Illumination source	Supplies bright, white and shadow-free light, >20,000 hours lifetime					
Conditions for use	Environment temperature	+10°C ~+40°C				
	relative humidity	30%~75%				
	atmospheric pressure	700 hPa~1060 hPa				
Shipping and Storage	Environment temperature	-40°C ~+55°C				
	relative humidity	10%~90%				
	atmospheric pressure	500 hPa~1060 hPa				

9. EMC (electromagnetic compatibility)

When using the device, the EMC precautions specified below must be observed.

- Only use spare parts approved by zumax for this device.
- Do not use any portable or mobile RF communication equipment in the vicinity of the device as this may impair the device's function.
- Do not use a mobile phone in the vicinity of the equipment because the radio interference can cause the equipment to malfunction. The effects of radio interference on medical equipment depend on a number of various factors and are therefore entirely unforeseeable.
- Please note the EMC guidelines on the following pages.



Warning: The microscope should not be used adjacent to or stacked with other equipment and that if adjacent or stacked use is necessary, the ME EQUIPMENT or MESYSTEM should be observed to verify normal operation in the configuration in which it will be use.




Warning: Use of ACCESSORIES, transducers and cables other than those specified, with the exception of transducers and cables sold by the MANUFACTURER of the microscope as replacement parts for internal components, may result in increased EMISSIONS or decreased IMMUNITY of the microscope.

Guidance and manufacturer's declaration – electromagnetic emissions		
The microscope is intended for use in the electromagnetic environment specified below. The customer or the user of the microscope should assure that it is used in such an environment.		
Emissions test	Compliance	Electromagnetic environment – guidance
RF emissions CISPR 11	Group 1	The microscope uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	The microscope is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEV 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

Electromagnetic immunity for ME equipment and ME systems

Guidance and manufacturer's declaration – electromagnetic immunity			
The microscope is intended for use in the electromagnetic environment specified below. The customer or the user of the microscope should assure that it is used in such an environment.			
IMMUNITY test	IEC 60601 test level	Compliance level	Electromagnetic environment – guidance
Electrostatic discharge (ESD) IEC 61000-4-2	± 6 kV contact ± 8 kV air	± 6 kV contact ± 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
Electrical fast transient/burst IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/output lines	± 2 kV for power supply lines ± 1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5 % U_T (>95 % dip in U_T) for 0,5 cycle 40 % U_T (60 % dip in U_T) for 5 cycles 70 % U_T (30 % dip in U_T) for 25 cycles <5 % U_T (>95 % dip in U_T) for 5 s	<5 % U_T (>95 % dip in U_T) for 0,5 cycle 40 % U_T (60 % dip in U_T) for 5 cycles 70 % U_T (30 % dip in U_T) for 25 cycles <5 % U_T (>95 % dip in U_T) for 5 s	Mains power quality should be that of a typical commercial or hospital environment. If the user of the microscope requires continued operation during power mains interruptions, it is recommended that the microscope be powered from an uninterruptible Power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3A/m	3A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE U_T is the a.c. mains voltage prior to application of the test level.			

Electromagnetic immunity for non-life-supporting ME equipment and ME systems

Guidance and manufacturer's declaration – electromagnetic immunity			
The microscope is intended for use in the electromagnetic environment specified below. The customer or the user of the microscope should assure that it is used in such an environment.			
IMMUNITY test	IEC 60601 test level	Compliance level	Electromagnetic environment – guidance
Conducted RF EN 61000-4-6 Radiated RF IEC 61000-4-3	3 Vrms 150 kHz~80 MHz 3 V/m 80 MHz~2.5 GHz	3 Vrms 3V/m	Portable and mobile RF communications equipment should be used no closer to any part of the microscope, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d=1.2\sqrt{P}$ $d=1.2\sqrt{P}$ 80 MHz~800 MHz $d=2.3\sqrt{P}$ 800 MHz~2.5 GHz where P is the output power rating of the transmitter in watts (W) according to the transmitter manufacturer's specifications and d is the recommended safety distance in meters (m). Field strengths from stationary RF transmitters, as determined by a site survey ^a , should be less than the compliance level in all frequency ranges. ^b Interference may occur in the vicinity of equipment marked with the following symbol: 
NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies. NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			
a Field strengths of stationary transmitters such as base stations for mobile telephones and mobile land radio equipment, amateur radio stations, AM and FM radio broadcast and TV broadcast transmitters cannot be theoretically predicted accurately. To assess the electromagnetic environment with respect to stationary RF transmitters, a site study of the electromagnetic phenomena should be considered. If the measured field strength in the location where the device is used exceeds the compliance levels indicated above, the device should be monitored to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the ME equipment or ME system.			
b Field strengths should be less than 3 V/m over the frequency range from 150 kHz to 80 MHz.			