Ryeco AM-6000 Surgical Microscope
User Manual

（**Please read the instruction carefully before using it**）
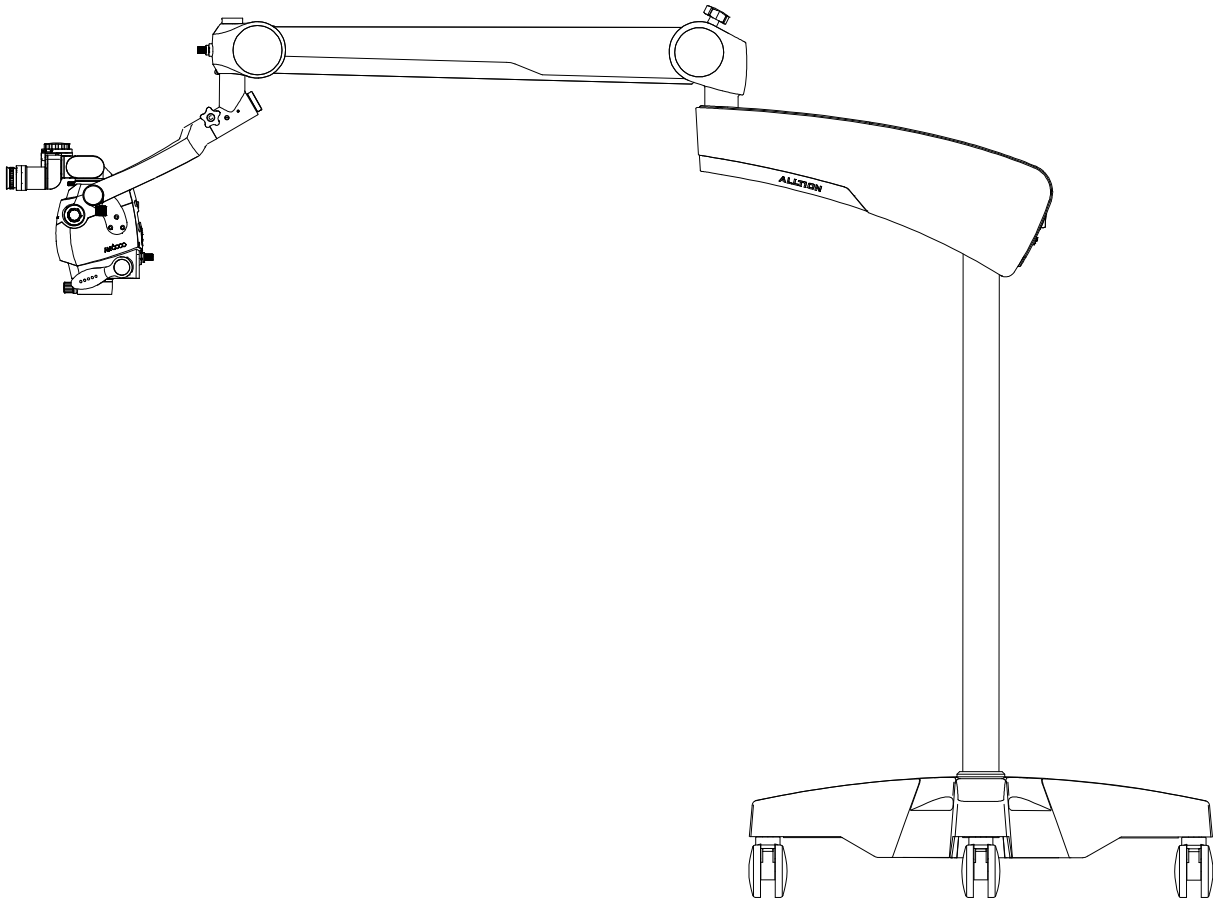
CE

Product Information:

Name: Surgical Microscope

Model: Ryf Ryeco AM-6000

Contents Ryeco AM-6000

CLEANING AND MAINTENANCE OF THE INSTRUMENT 49

MAINTENANCE RELATED INFORMATION 50

Safety Caution

When using the instrument, you must observe the safety instructions, and the meanings of these symbols are as follows:

Prompt Symbols

The following safety information has been incorporated into the user manual. Please note this information and be particularly careful in these cases, especially the contents with the following symbols.

⚠️	**Warning,** indicating that there is potential hazard, it may cause danger to the user if the prompted contents are not followed!
⚠️	**Note,** indicating that there is risk to damage the product, it may cause damage or malfunction to the product if the prompted contents are not followed!
ℹ️	**Annotation,** promoting the user of the instrument, or providing the useful information to the user.
📖	Please refer to the User's Manual.

Information Symbols

The item symbols used in this User's Manual are defined as follows:

- ● The content of the upper and lower items is equal, there is no sequence or subordination relation.
- ✓ The precondition of operation, the precondition that the product must meet before performing a certain operation.
- ▶❙ There is a sequential relationship between the upper and lower items, and the next step can be carried out after the previous step is completed.
- ➢ Results occurred after completion of related operations.

Scope of Use

The AM-6000 surgical microscope is a microscope for manual operation. It is a universal instrument for daily examination of a patient in a lying position. You can use it as:

- ● Surgical microscope
- ● Diagnostic microscope
- ● Training and anatomical microscope

Working Environment

- ● Ambient temperature range: 5℃ ~ 40℃;
- ● Relative humidity range: 10% RH ~ 80% RH;

- Atmospheric pressure range: 700hPa ~ 1060hPa;

Storage Environment

- Ambient temperature range: -20℃～+55℃;

- Relative humidity range: 10% ~ 60% RH

- Atmospheric pressure range: 500hPa ~ 1060hPa

Safety Characteristics

- Supply voltage of the whole machine: AC 100-240V 50/60HZ

- Power: 35-60VA

- Classification according to the degree of protection of the liquid: IPX0
  FS-1 Foot Switch: IPX6

- Standard IEC60601-1 Type I Equipment t

Safety Requirements on Installation and Use

Safety Requirements

- ✓ This instrument can be used only for the purposes described in the User's Manual.

- ✓ Only trained and instructed personnel are allowed to use this instrument. The customer or the organization operating the equipment has the responsibility to train and guide all personnel using the equipment.

- ✓ Before starting the instrument, please completely comprehend the User's Manual, including the User's Manual for accessories and other system components.

- ✓ Keep the User's Manual in order to facilitate the operator to read at any time.

- ✓ Please observe all symbols and labels of the instrument!

- ✓ The modification and repair of this instrument can only be performed by the Ryf Ltd. ervice personnel or others authorized by Ryf AG Grenchen, Switzerland.

- ✓ Do not place any container filled with liquid over the instrument. Confirm that no liquid can penetrate into the instrument.

Do not store or use the instrument in a damp room. Do not expose the instrument in the place with splashing, dropping or water mist.

When the instrument is generating smoke, electric spark or a strange noise, please immediately cut off power supply of the instrument. Do not use this instrument until it has been repaired by our service agent.

Please note that local regulations take precedence over the requirements of the above mentioned criterions. If you have any enquiry, please contact the local Ryf-Ryeco Dealer.

In order to prevent the instrument from tipping during handling, please keep the instrument at the posture shown as the right picture.
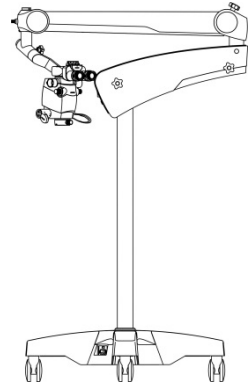
Requirements on Installation

The installation of the product will be completed by ourselves (Ryf Ltd.) or our service representative or by professional personnel authorized by us. Please make sure that the following operational requirements have been met:

✓ All the safety-related mechanical connections (please find the Manual for details) are properly connected and all screws have been tightened.

✓ All wires and plugs work normally.

✓ The voltage setting of the instrument is consistent with the local grid voltage.

✓ The plug of the instrument has been inserted into the power socket which has protective grounding connection.

✓ The adopted power wires meet the design requirements of this instrument.

Operating requirements

✓ Please pay special attention to the PROMPT symbols on the instrument (especially Warning sign).

✓ Avoid to watch the light source of the microscope directly, for example, the objective lens of the microscope.

This surgical microscope cannot be used for ophthalmic examination and surgery.

Do not use video images for diagnosis because the video camera and display are not calibrated. Therefore, the visual image may include deviation in in shape, contrast and color.

Safety Signs on the Instrument
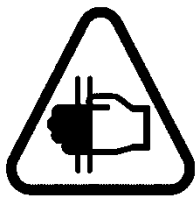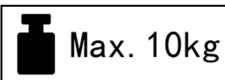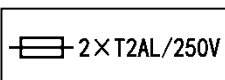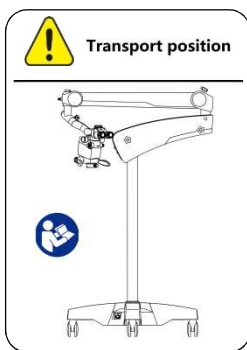
Name: Surgical Microscope Model: AM-6000 S/N: MIF180011 PD: 2018/03 V: AC 100-240V F: 50/60 Hz P: 35VA~60VA CE CLASS I	**1 Product label** It contains basic information of the product.

WARNING
HANDS PINCHING

2 Identification of pinching
There is risk of pinching hand or finger, please note when handling.

3 Warning
Make sure that the binocular tube is safely installed and the screw has been tightened, otherwise the binocular tube has the risk of falling.

4 Warning
Make sure that the safety screw has been tightened, otherwise the arm support has the risk of falling.

Transport position

5 Handling prompt
Keep the posture shown as the picture when handling the product; otherwise, the instrument has the risk of tipping during handling.

2×T2AL/250V

6 Identification of fuse specification

Max. 10kg

7 Identification of maximum load of horizontal arm support
The maximum load of the cross arm support is 10kg, if the load is over 10kg, it will result in the imbalance of balanced arm.

8   Warning

Make sure that the objective lens has been installed safely, the objective lens has the risk of falling.

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Name:	Surgical Microscope
Model:	AM-6000
S/N:	MIF180011
PD:	2018/03
V:	AC 100-240V
F:	50/60 Hz
P:	35VA~60VA
CE	CLASS I

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WARNING
HANDS PINCHING

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Transport position

2×T2AL/250V

Max. 10kg

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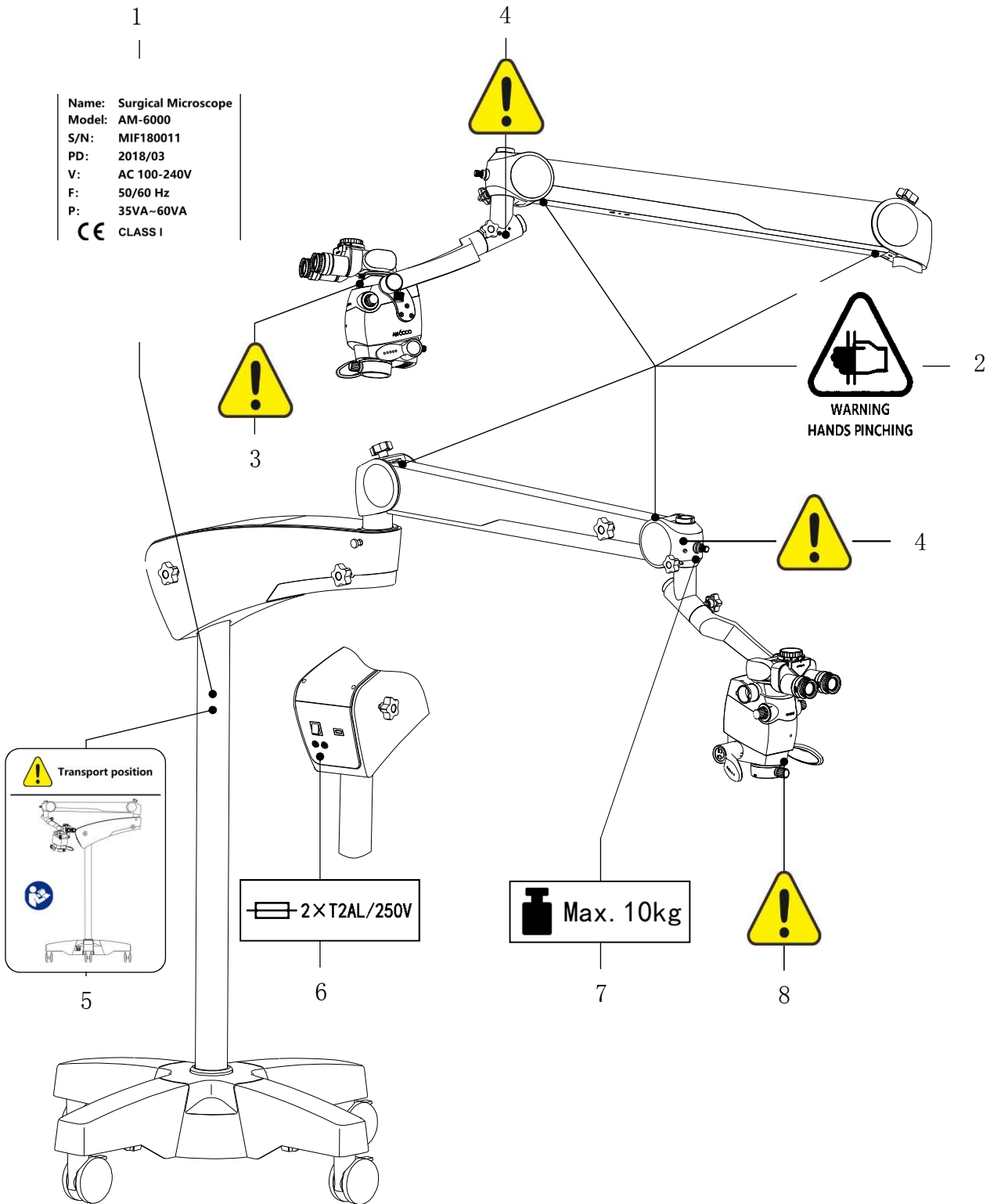
Product Assembly
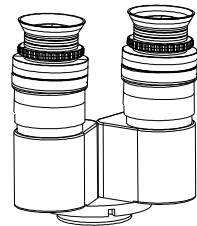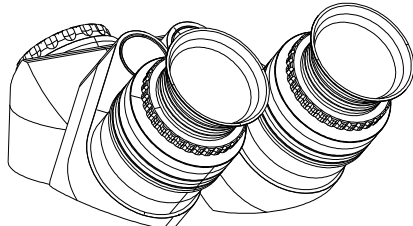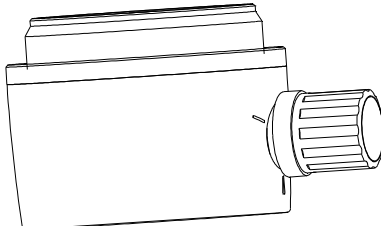
Standard Configuration
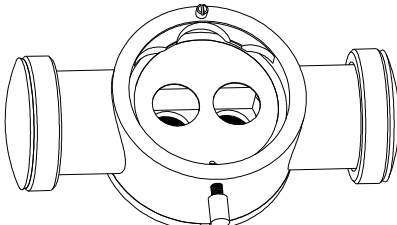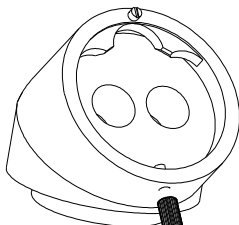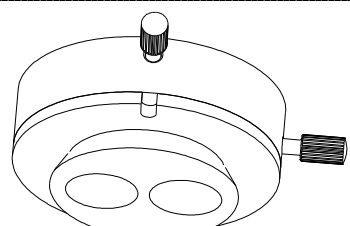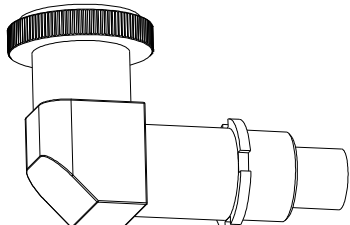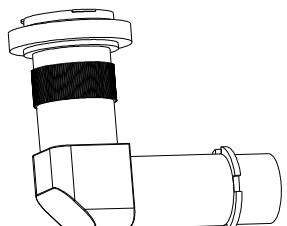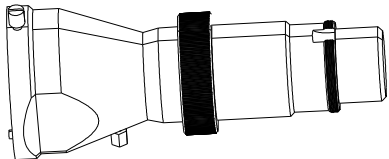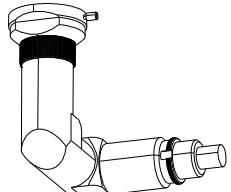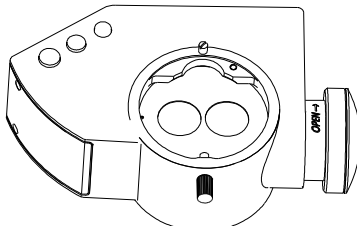
	Name of Components	Specification	Quantity
1	Suspension arm	Length: 940mm	1
2	Balance arm		1
3	Binocular tube and eyepiece	0-180 degrees inclinable binocular with Knob of Pupillary Distance Adjustable,10X/ Φ231	1
4	Magnification pod	1:8 zoom ratio , Beam splitter, HD Full function camera	1
5	Objective lens	F250 objective lens, optional F200 objective lens (please find the Optional Accessories List)	1
6	Floor stand	Other installation modes are available for option, please find the Optional Accessories List	1
7	Power cable	Chinese standard, USA standard and Europe standard are available for option, subject to the order	1
8	HDMI high definition video transmission wire	5m	1
9	U-disk (full electronic instructions is saved in U-disk)	8G	1
10	Wireless network card	5G	1
11	Mouse	2.4G wireless mouse	1

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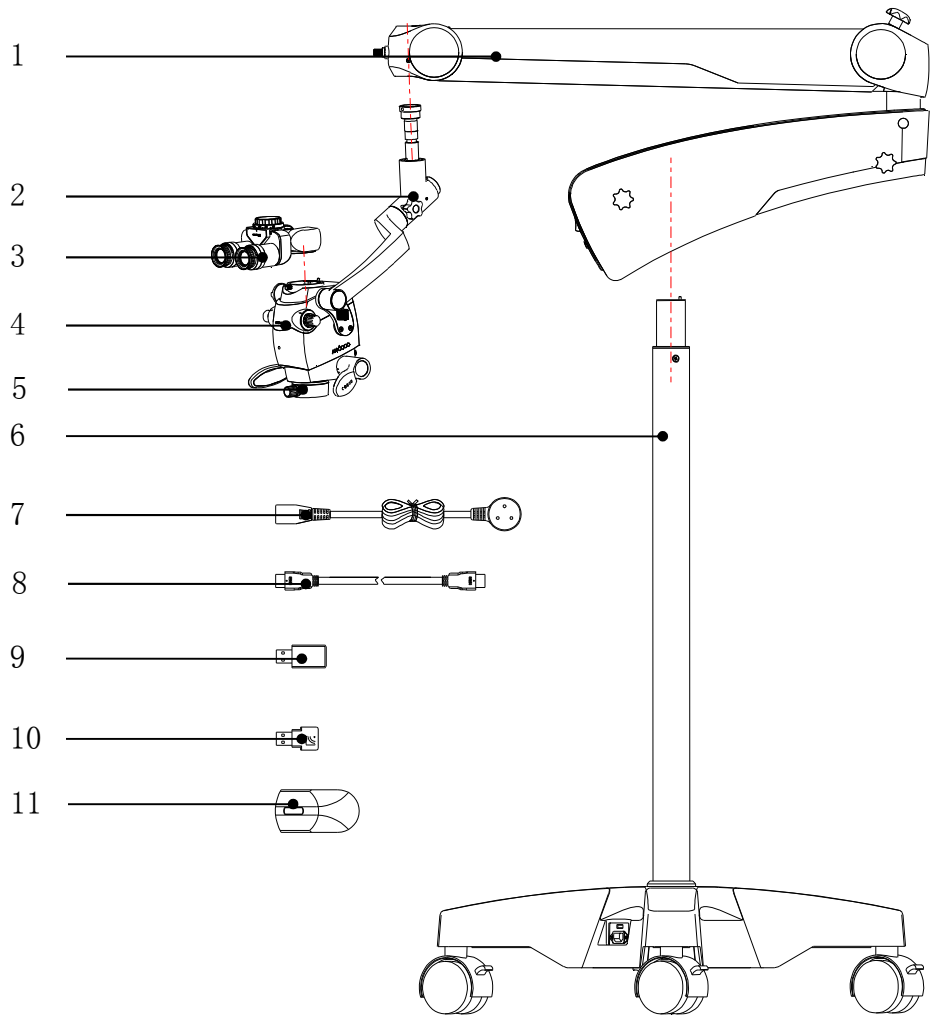
Supporting Components

<div align="center">Supporting Components List</div>

Name	Specification	Picture
1 Straight tube binocular head	Straight tube 12.5X	
2 45° binocular head	45°inclined, 12.5X	
3 F200 objective lens	F200	
4 F300 objective lens	F300	
5 F350 objective lens	F350	
6 F400 objective lens	F400	
7 200-300 Variable Objective Lens	Continuous zoom from 200mm to 300mm	

8	Beam splitter	2:8 beam splitting, optional 5:5 beam splitting	
9	45°Binocular Extender	45°angle	
10	Angle Rotation Device		
11	Camera adapter	Sony camera interface	
12	Video camcorder adapter	Sony video camcorder interface	
13	2-D Rotation Binocular Assistant Scope Connector		
14	3-D Rotation Binocular Assistant Scope Connector		
15	ALL-CAM2 Full Function Camera	1080P	

16	FS-1 foot switch	Used to control the built-in video camera	
17	Fixed Stand Mount		
18	Ceiling mount		
19	Low-position wall mount		
20	High-position wall mount		
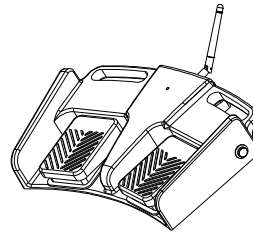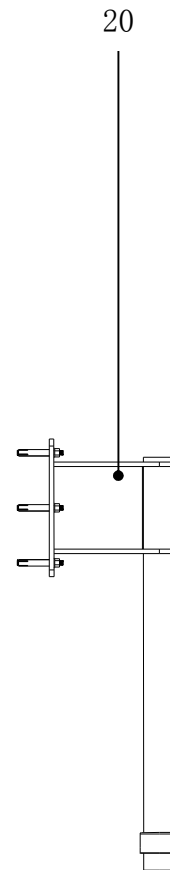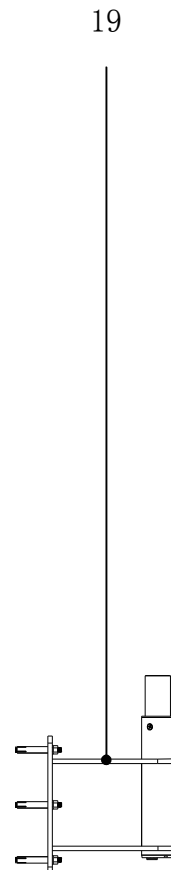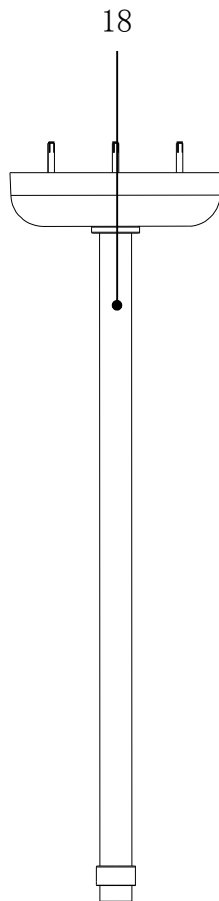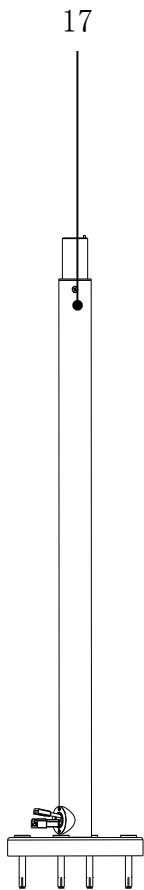
Inspection before Assembly

After opening the packaging box, find the packaging list, check the parts with the real objects one by one according to the package list, check if any component is not provided; if any component is not provided, please contact the local dealer in time;

Please check the product if there's any damage, especially the optical components, if any, please contact the local dealer in time;

The product is the high precision instrument, please handle with care when taking it out, and make sure the components are put at the safe place.

✓ Before assembly, make sure the staffs have carefully read the User's Manual and well know the assembly steps.

Installation of Support System

Installation of Mobile Floor Stand

✓ Move the base (1) from the wood pallet, take away the plastic cover (5) firstly and put it aside;

▶❙ Put base (1) on the horizontal ground and lock four casters;

▶❙ Loosen the screw (2) with inner hexagon spanner to ensure that the screw head does not protrude from the inner hole;

▶❙ Insert the upright post (4) in the installation hole of base (1), the positioning pin and the positioning hole need to be aligned to ensure that the upright post is installed in place;

▶❙ After the upright post is installed in place, tighten the screw (2);

▶❙ Mount the power socket on the base (1) with four M4 × 8 screws;

▶❙ Install the plastic cover (5) from the top of the pole (4) (avoid damaging the paint on the post) and then mount on the base (align the plastic cover notch with the power interface position).

▶❙ Finish the assembly of the mobile floor stand.
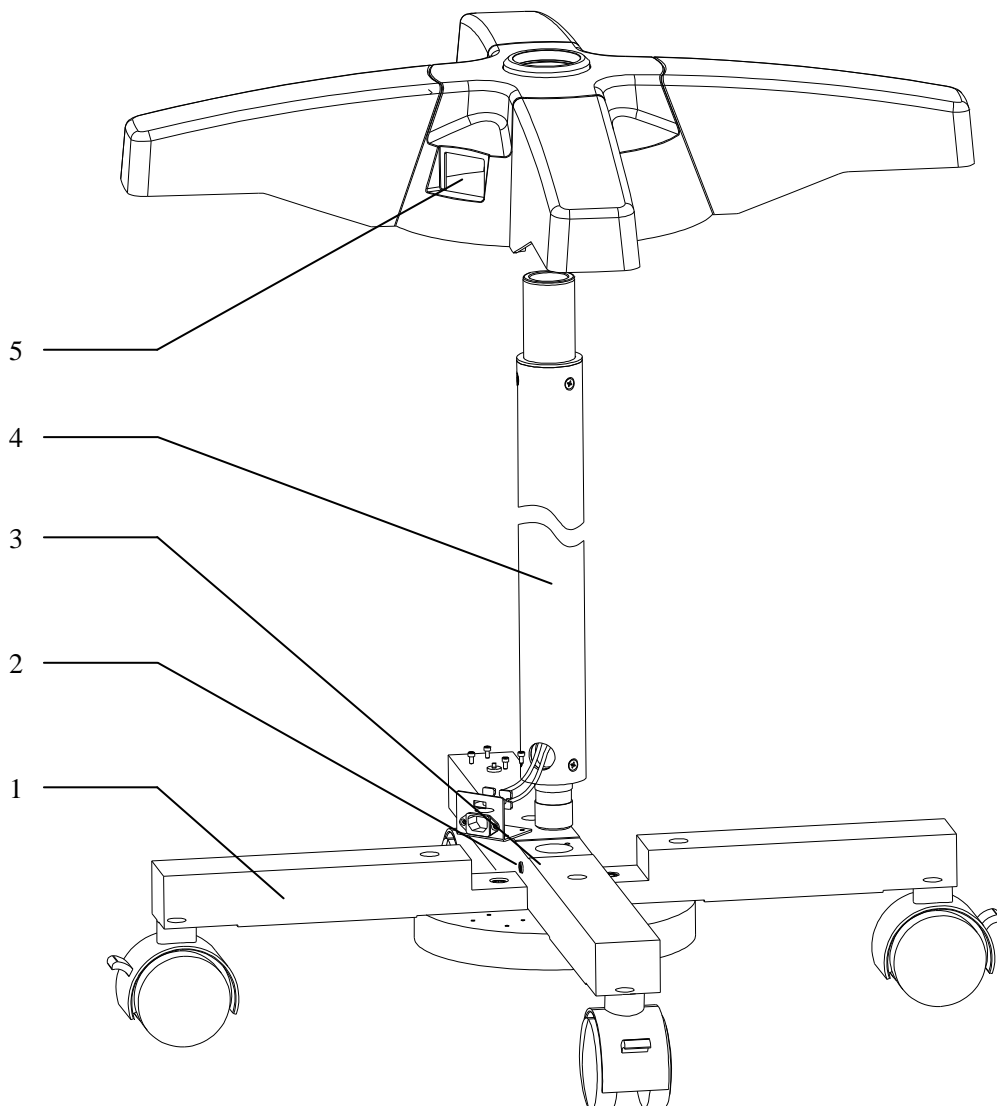
Installation of Fixed Floor Stand

⚠️ The floor to assemble the fixed floor stand must be made of concrete or material with higher hardness than concrete. Otherwise, it will be risk of tipping over.

ℹ️ The ground to install the fixed floor stand must be horizontal enough, otherwise, it will cause the product to be tilted after installation.

▶❙ Drill 4 holes in the ground with Φ14 driller, the hole depth is 75mm, and the hole position is as shown on the right diagram.
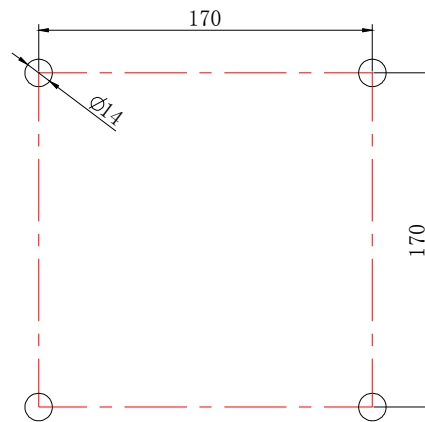
⚠️ If the position and dimension of the installation hole are incorrect, the stand can't be installed.

▶❙ Install the pole assembly (1) into the installation hole of the ground fixing plate (2), lock it with two M10 screws (3), and the positioning pin must align with the positioning hole during assembly;
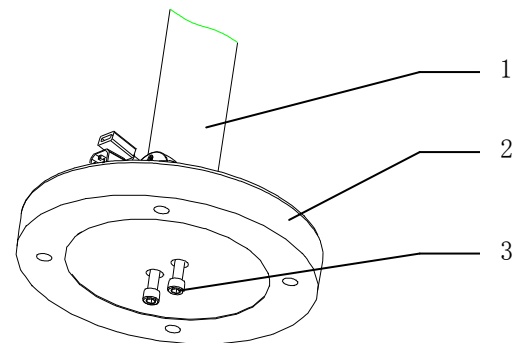
▶❙ Take out the socket spanner from the tool box, insert the M10 expansion bolt (4) in the installation hole, align the stand with the bolts, and tighten, assemble the decorative cover (5);
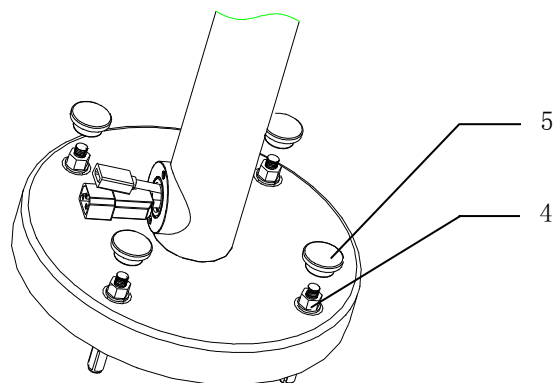
▶❙ Finish the installation of the fixed floor stand.
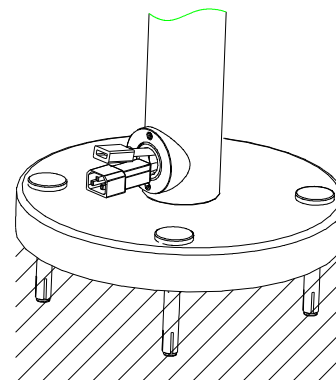
Installation of Ceiling Mount

⚠️ The ceiling to assemble the ceiling mount must be made of concrete or material with higher hardness than concrete. Otherwise, it will be risk of falling down.

▶▌ Drill 7 holes in the ground with Φ14 driller, the hole depth is 75mm, and the position dimension of the hole is as shown on the right diagram;
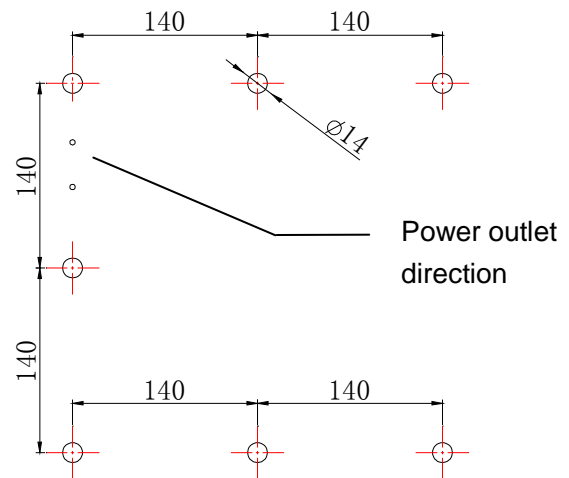
ℹ️ When drilling, please note the direction of power cord connection.

Power outlet direction

▶▌ Lock the ceiling mount assembly (2) to the ceiling with seven M10 expandable bolts (1);
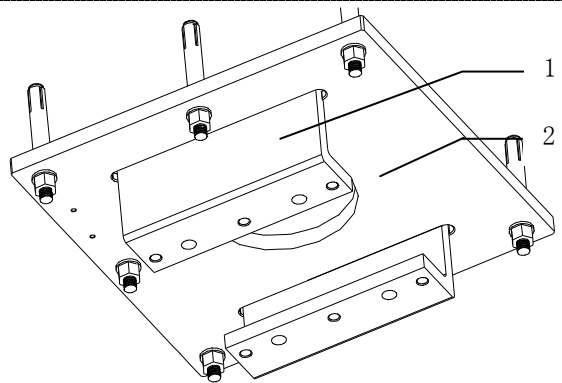
▶▌ Install the pole assembly (3) on the ceiling mount assembly (2) according to the shown direction, pay attention to the installation direction and place it from the gap; adjust the pole assembly (3) to be vertical with six sets of M10 bolts and nut (4);
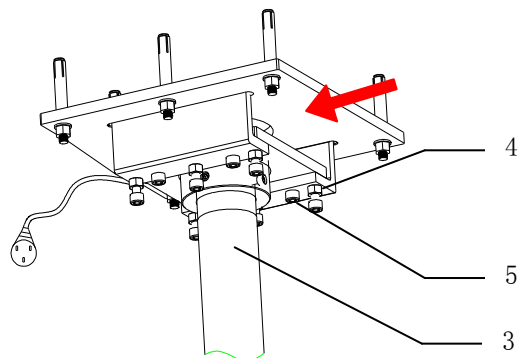
▶▌ Then fix the pole assembly to the ceiling mount assembly (2) with four M10 bolts (5);

▶▌ Plug the power cord (6) inside the pillar assembly (3) into the externally mounted power base.

Network power supply
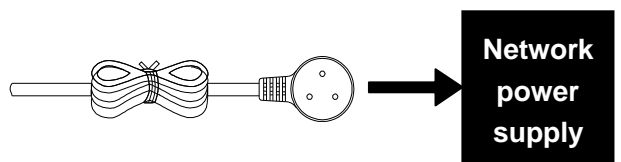
▶❙ Install the decorative cover (7) from the bottom of the pole and bottom cover limit block (8), tighten the bolts(9) of the locking limit block after installation.

▶❙ Finish the installation of the ceiling mount.

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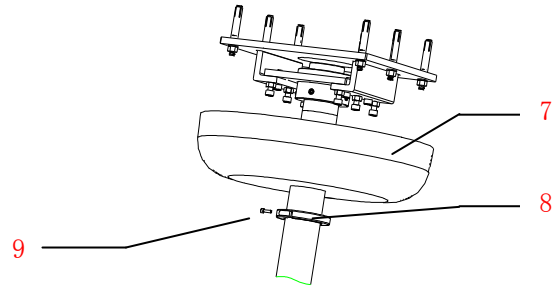
Installation of Low-Position Wall Mount.

⚠️ The wall to install the low position wall mount must be made of concrete or material with higher hardness than concrete. Otherwise, it will be risk of falling down.

ℹ️ The wall to install the low-position wall mount shall be smooth enough; otherwise, it will cause the product to be tilted after installation.

⚠️ ▶❙ Drill 6 holes in the wall with Φ14 driller, the hole depth is 75mm, The position and dimension of the hole is as shown on the right diagram;
If the position and dimension of the installation hole are incorrect, the installation could not be done.
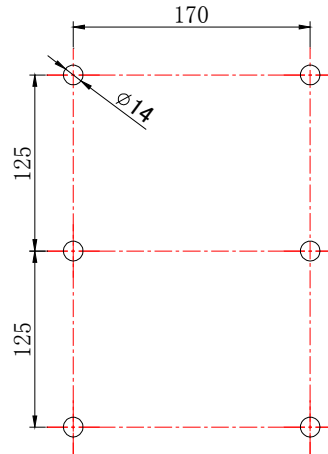
▶❙ Install the low-position wall mount (1) to the wall with hole by M10 expandable bolts (2), then tighten the nuts (3).
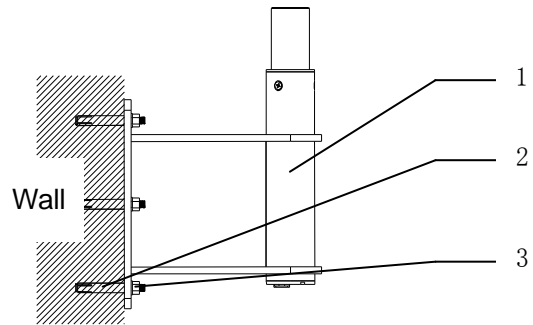
Wall

▶❙ Finish the installation of the low-position wall mount.

High-Position Wall Mount

The wall to install the high-position wall mount must be made of concrete or material with higher hardness than concrete. Otherwise, it will be risk of falling down.

The wall to install the high-position wall mounted support shall be smooth enough, otherwise, it will cause the product to be tilted after installation.

▶▌ Drill 6 holes in the wall with Φ14 driller, the hole depth is 75mm, The position and dimension of the hole is as shown on the right diagram;

If the position and dimension of the installation hole are incorrect, the installation could not be done.
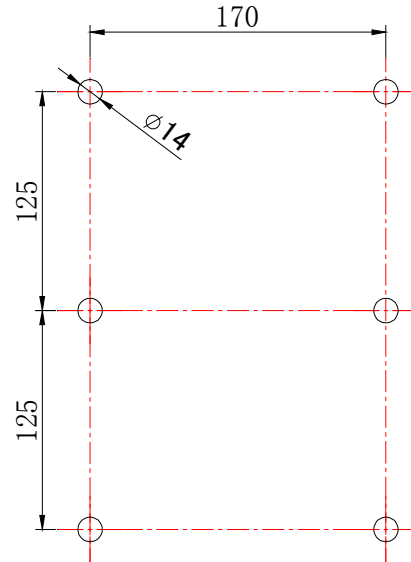
▶▌ Install the high-position wall mount (1) to the wall with hole by M10 expandable bolts (2) and tighten the nuts (3).
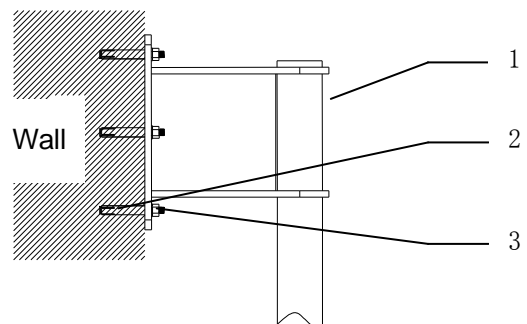
Wall

▶▌ Finish the installation of the high-position wall-mount.

Installation of Support Arm System

Upright Installation of Support Arm

The upright installation of support arm is applicable to mobile floor stand, fixed floor support and low-position wall mount.

Because the cross arm is heavy and long,, please install by two operators for safety.

▶❙ Loosen two fastening bolts (2) on the support arm,   remove the plastic cover (1) and put it aside;
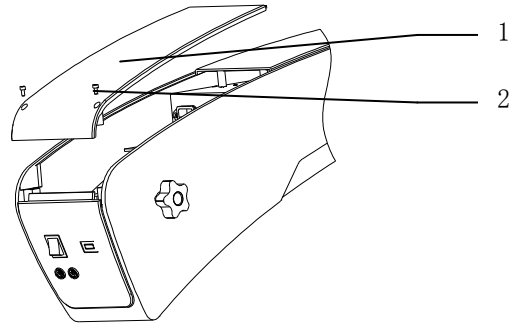
▶❙ Lift the support arm over the pole, cross the power cable and HDMI cable (4) from the mounting hole of support arm (3), as shown by the right arrow.

▶❙ Install the support arm (3) to the pole (5)

In order to install it in place, completely loosen the locking knob (6) before inserting the support arm into the pole.

▶❙ After the support arm is installed in place, insert the power plug into the power interface (7), and the HDMI connector into the video interface (8), then fix the power wire at the reserved position on the sheet metal.
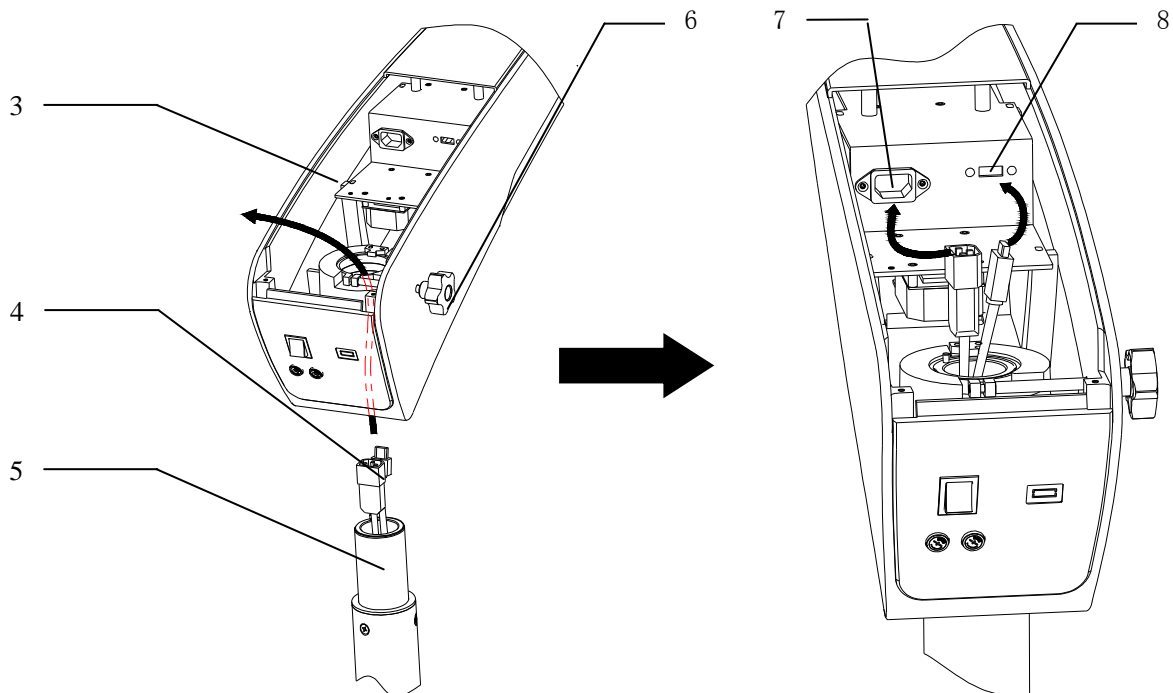
▶❙ Install the plastic cover (1) on the support arm (3), finish installation.

Suspending of Ceiling Mount

The suspending installation of first arm is applicable to ceiling mount System and high-position wall mount system.

Because the first arm has certain weight and is long, please install by two operators together for safe installation.

▶▌ Lift the first arm support (1) under the upright post, install the upright post into the decorative ring (2), connect the power plug (3) of the upright post with the power interface (4), and tighten them with clip.
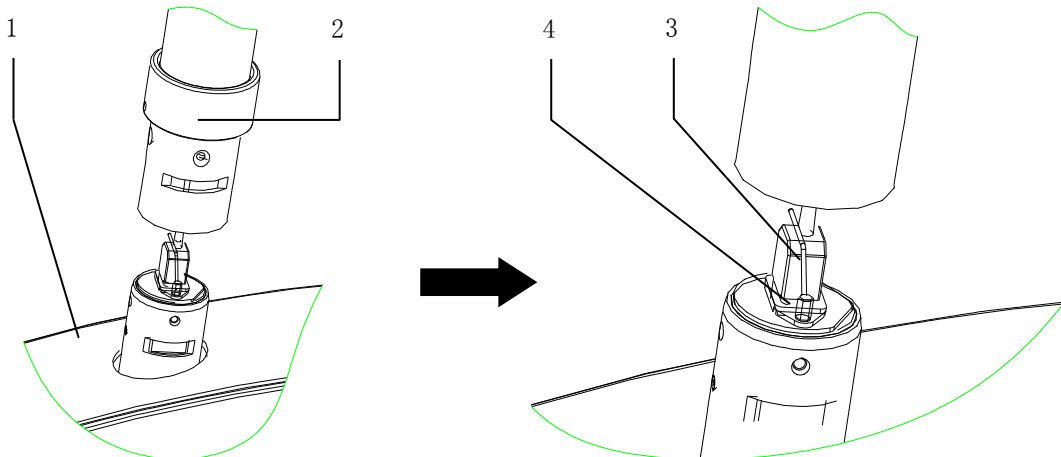
▶▌ Insert the connecting shaft on the first arm support into the upright post, align at the clamping groove and insert the limit block (5); tighten four M6 × 16 hexagon socket countersunk head screws (6) around four sides.

After the limit block (5) is inserted in place, the first arm support can be loosened;
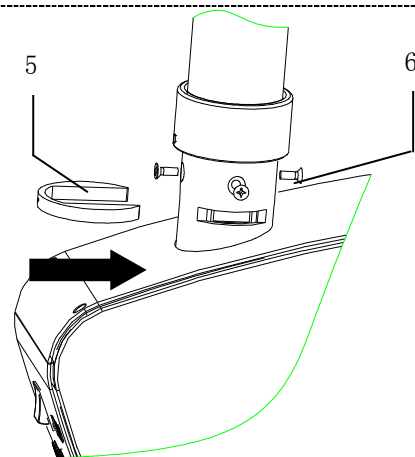
▶▌ Put the decorative ring (2), lock the side edge with M3 × 6 hexagon socket countersunk head screws (7), finish installation.
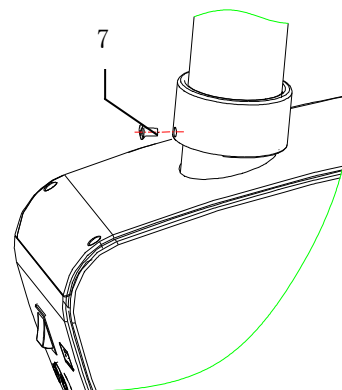
Installation of Connection Arm

✓ Loosen the safety screw (1), please ensure that the screw head does not protrude from the installation hole.

(i) Loosen the locking knob (3), if the knob is locked, then the connecting shaft of the wall-mounted arm can't be inserted into the installation hole.

▶❙ Remove the retaining ring (1) from the wall-mounted connection arm (4);

▶❙ Insert the connection arm (4) into the installation hole, and tighten the retaining ring (1) after it is in place;

▶❙ Tighten the safety screw (2) in place.

⚠ Please notice: If the safety screw (2) is not tightened in place, the microscope body and the connection arm are at risk of falling when the retaining ring (1) is loosened.
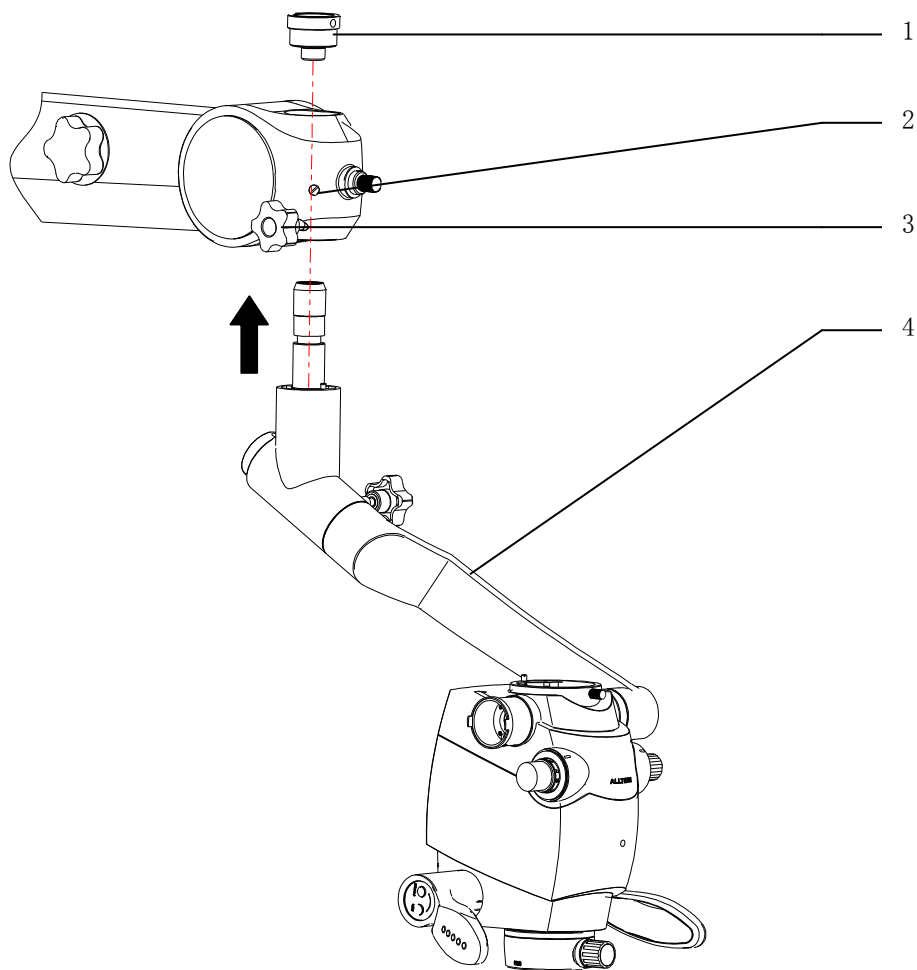
Installation of Binocular Head Barrel

✓ Make sure that the locking screw (2) is completely loosened before installation;

▶▌ Align the binocular tube (1) at the positioning pin, and install it in the bayonet of microscope body (3);

▶▌ Tighten the locking screw (2);

⚠ Before loosening the grip, please make sure: ① the binocular head barrel has been fully installed in place and has been completely clamped in the bayonet; ② the locking screw has been tightened. Otherwise, the binocular head barrel will be at risk of falling.
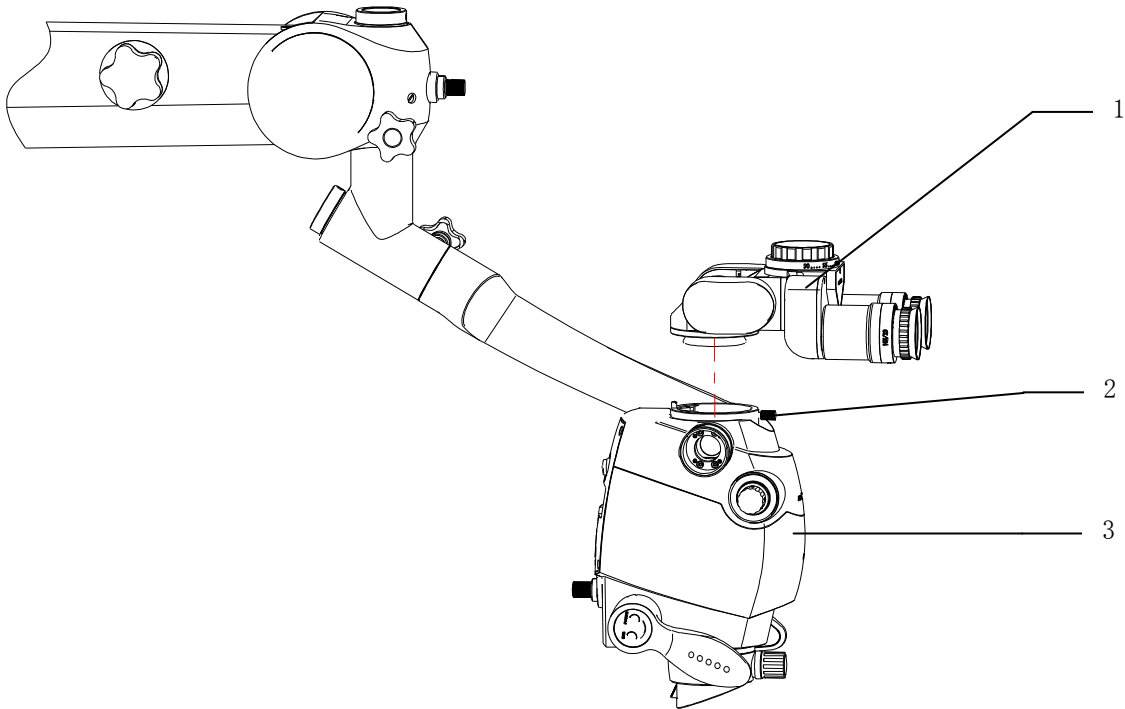
Wiring

▶❙ Insert the video cable (1) on suspension arm into the HDMI interface;

▶❙ Insert the connector of power cable (2) on the suspension arm into the power interface;

ⓘ When the connector of the power supply cable is inserted in, it needs to be aligned with the "●" mark (3) on the housing;
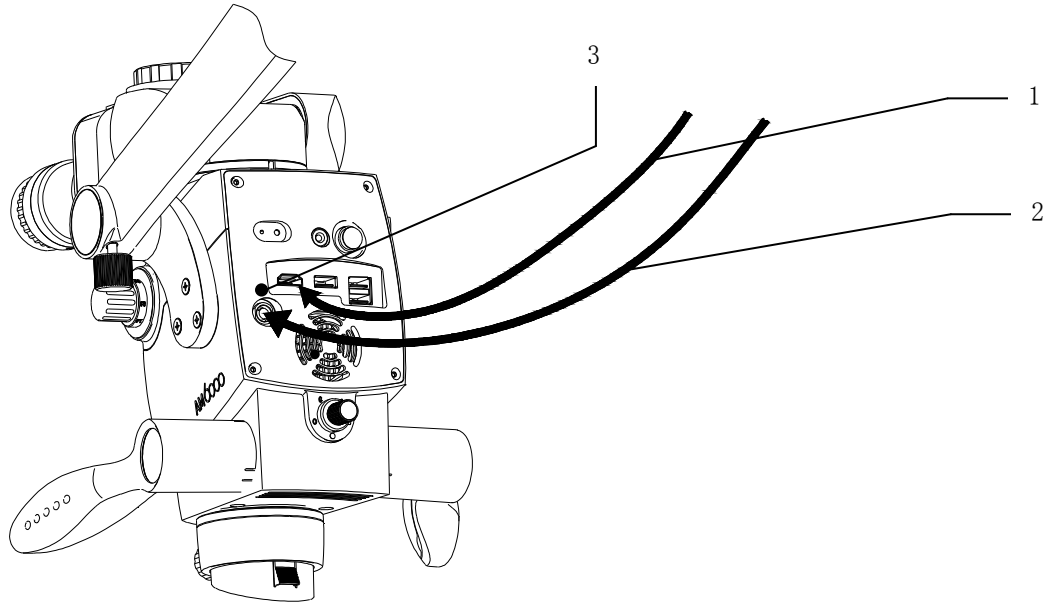
▶❙ Connect the attached HDMI cable according to the following picture;

ⓘ Please check whether the input channel of the HDMI cable is consistent with the display channel of the monitor, otherwise, it will cause the display to have no image output.

▶❙ Connect the attached power wire according to the following picture;

ⓘ If the specification of power cord plug does not match the local socket standard, please contact your local dealer or store for replacement.
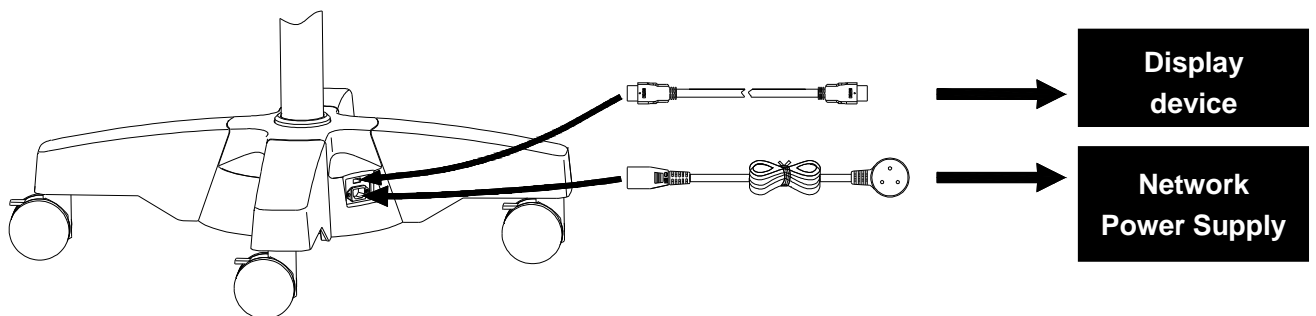
Installation Confirmation

- Check whether the threaded connection of all assembled positions have been tightened, judge whether the whole machine has completed installation;

- Loosen all locking knobs, check if the rotation and movement of all joints of the whole machine are smooth, judge whether the mechanical function is normal;

- Check whether the locking knob of each joint is valid, judge whether the locking function is normal;

- Turn on the power switch, observe whether the indicator of the power switch turns on, whether the light is illuminated from the microscope body, judge whether the power is supplied;

When the suspension arm moves to the highest point, there is no illumination light; when the dimming knob is adjusted to the minimum, there is no illumination light;

- Turn the dimming knob to observe whether the lighting spot changes bright and dark, judge whether the dimming function is normal;

- Press the built-in camera switch to observe whether the indicator of the switch turns on, whether image is output from the display, judge whether the built-in camera is normal;

If the above functions are normal, it can be confirmed that the product is well installed.

Installation of Supporting Components

Installation of Straight Binocular Head and 45° Binocular Head

The installation method is the same as the Installation of Binocular Head Barrel, see Page 19.

Installation of Objective Lens

⚠️ The installation methods for the 200mm objective lens, 300mm objective lens, 350mm objective lens, 400mm objective lens and 200-300mm objective lens are the same.

Through threaded connection method, the large objective lens can be directly mounted on the main lens of the microscope, and the position of the knob on the objective lens can be adjusted by the locking ring on the objective lens.
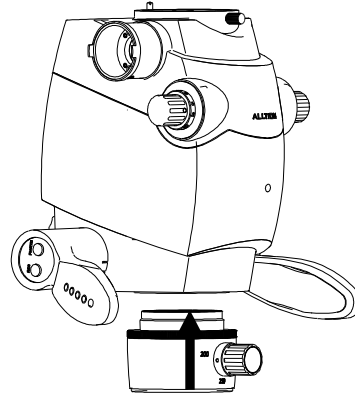
Installation of Beam Splitter

▶▎ Loosen bolt (1), install the beam splitter (2) in the bayonet of the microscope body, and tighten bolt (1);

▶▎ Loosen bolt (3) and install the binocular barrel (4) in the bayonet of the beam splitter; and tighten bolt (3)

⚠️ Before loosening the grip, please make sure: ① the beam splitter has been installed in place and the bolt are tightened; ② the binocular head has been installed in place and has been completely clamped in the bayonet, and the locking screw has been tightened, otherwise, there is a risk of falling.
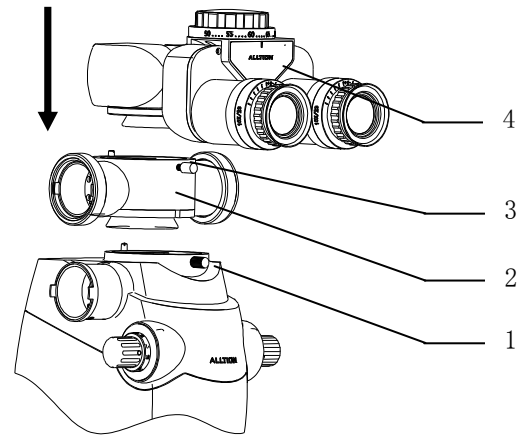
Installation of 45°Binocular Extender

▶▎ Loosen bolt (1), install the 45°binocular extender (2) in the bayonet of the microscope body, and tighten bolt (1);

▶▎ Loosen bolt (3) and install the binocular head barrel (4) in the bayonet of the 45° binocular extender; and tighten bolt (3)

⚠️ Before loosening the grip, please make sure: ① the 45°binocular extender; has been installed in place and completely clamped in the bayonet, and the bolts are tightened; ② the binocular head barrel has been installed in place and has been completely clamped in the bayonet, and the
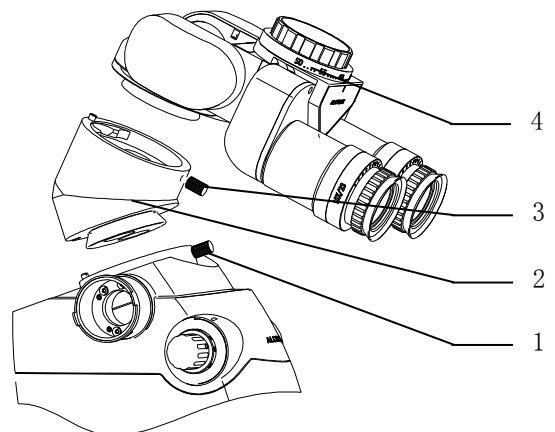
locking bolt has been tightened, otherwise, there is a risk of falling.

Installation of Angle Rotation Device

▶❙ Loosen bolt (1), install the angle rotation device (2) in the bayonet of the microscope body, and tighten bolt (1);

▶❙ Loosen bolt (3) and install the binocular head barrel (4) in the bayonet of the angle rotation device; and tighten bolt (3)

⚠ Before loosening the grip, please make sure: ① the angle rotation device has been installed in place and the bolts are tightened; ② the binocular head barrel has been installed in place and has been completely clamped in the bayonet, and the locking bolt has been tightened, otherwise, there is a risk of falling.
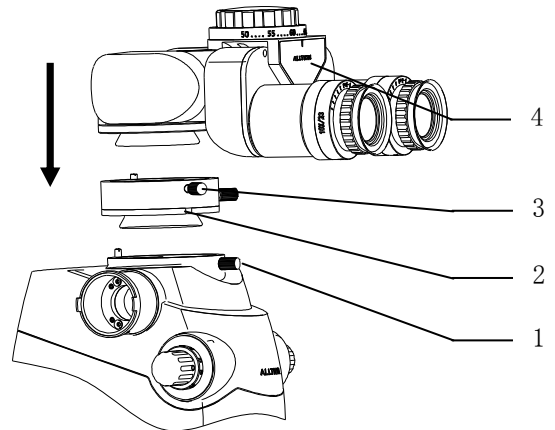
Installation of Digital Camera Adapter

▶❙ Install the digital camera adapter (3) on the beam splitter interface (1), and then lock it with locking ring (2);

▶❙ Then install the camera with the adapter of the camera.

⚠ Before loosening the grip, please make sure that the camera adapter and the camera have been installed and locked, otherwise, there is a risk of falling.
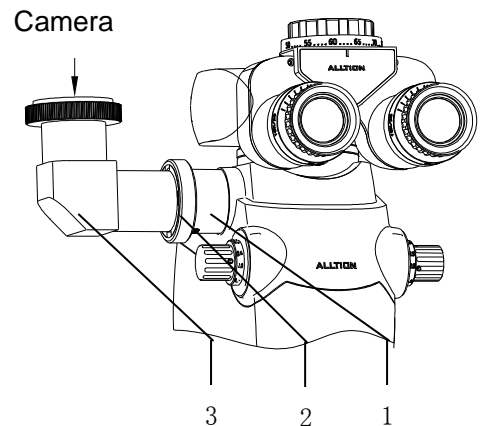
Installation of Video Camera Adapter

Install the camera adapter (3) on the beam splitter interface (1), and then lock it with locking ring (2);

Then install the camera with the adapter of the camera.

⚠ Before loosening the grip, please make sure that the camera adapter and the camera have been installed and locked, otherwise, there is a risk of falling.
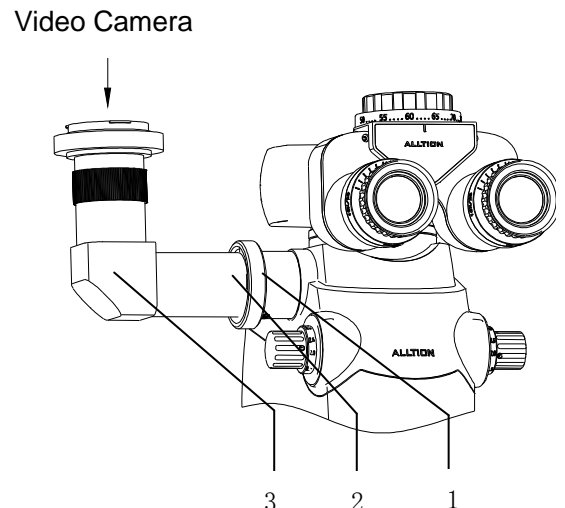
Installation of 2-D Rotation Binocular Assistant Scope Connector

▶▌ Install the 2-D rotation binocular assistant scope connector (3) on the beam splitter interface (1), and then lock it with locking ring (2);

▶▌ Install the binocular head barrel (5) with the 2-D rotation binocular assistant scope connector (3), and lock screw (4).

⚠ Before loosening the grip, please make sure that the 2-D rotation binocular assistant scope connector and the binocular head barrel have been installed and locked, otherwise, there is a risk of falling.
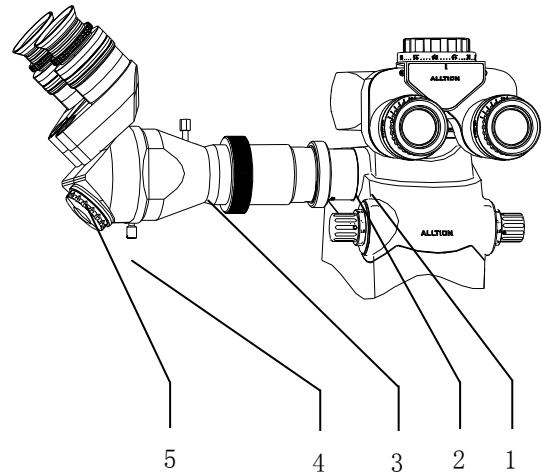
Installation of 3-D Rotation Binocular Assistant Scope Connector

Install the 3-D rotation binocular assistant scope connector (3) on the beam splitter interface (1), and then lock it with locking ring (2);

Install the binocular head barrel (5) with the 3-D rotation binocular assistant scope connector (3), and lock screw (4).

⚠ Before loosening the grip, please make sure that the 3-D rotation binocular assistant scope connector and the binocular head barrel have been installed and locked, otherwise, there is a risk of falling.
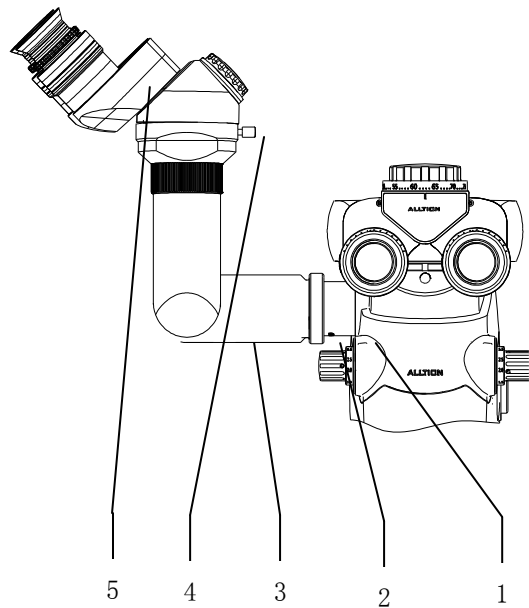
Installation of ALL-CAM2 Full Function Camera

▶▌ Loosen bolt (1), install the ALL-CAM2 full function camera (2) on the microscope main body, and tighten bolt (1);

▶▌ Loosen bolt (3) and install the binocular (4) on the ALL-CAM2 full function camera; and tighten bolt (3)

⚠️ The consistence between the interface in this product and installation interface of microscope

should be confirmed before assembly.

After every change in configuration and before every use, make sure that the modules and accessories are securely locked in position. Make sure that all securing screws and locking screws are firmly tightened!

Never Install or remove the modules during a surgical procedure or above the patient!
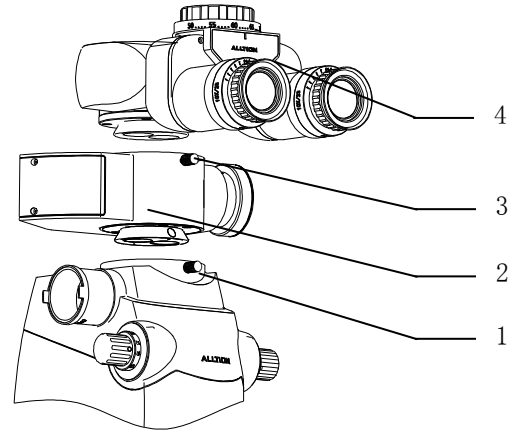
Installation of FS-1 Foot Switch

FS-1 footswitch is no need to be installed. For the method of pairing it with the built-in camera of the microscope, please see Page 28 "Wireless Remote Controller Pairing".

Product Functions

Product Components

1	Main body of microscope
2	180° binocular and eyepiece
3	Objective lens
4	120°connecting arm
5	Suspension arm
6	Mobile floor stand
7	Fixed floor stand
8	Low-position wall mounted stand
9	High-position wall mounted stand
10	Ceiling mount system
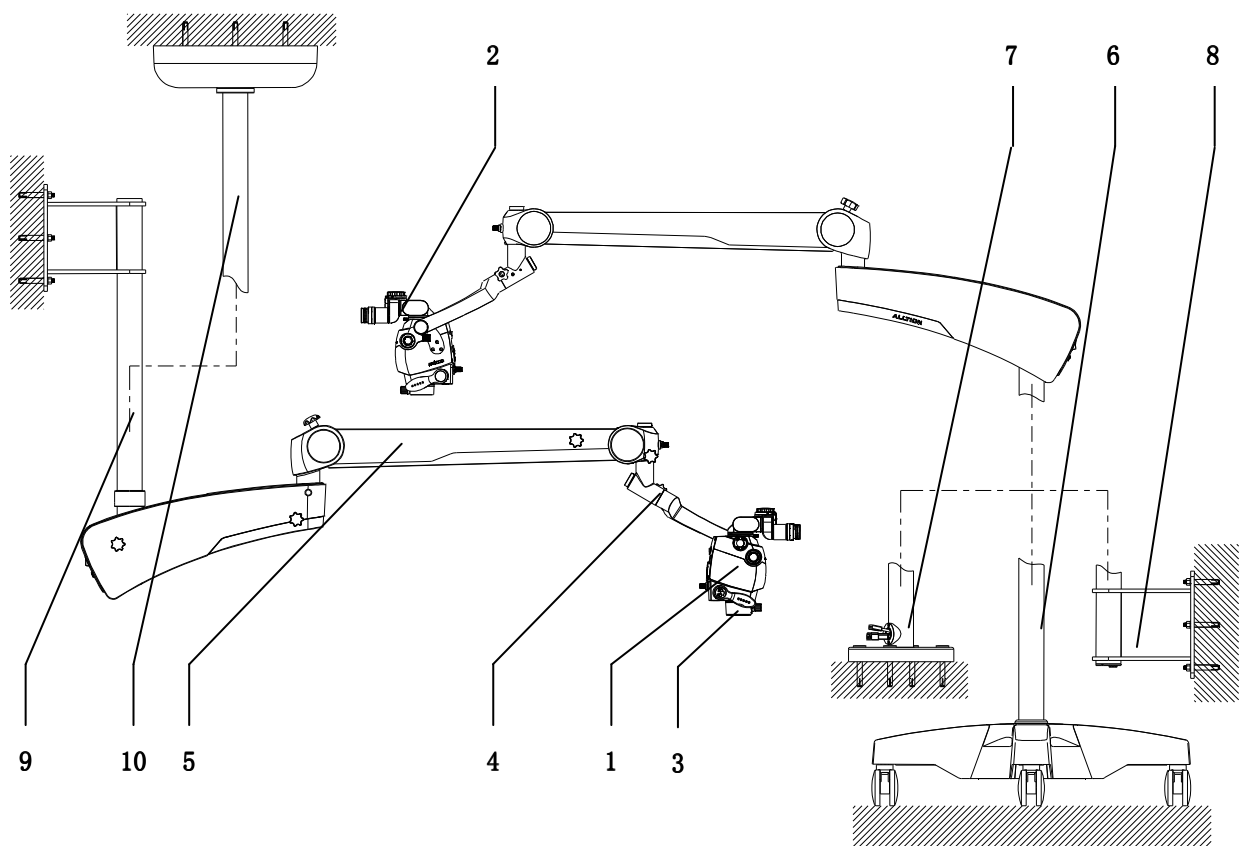
Main body lens of microscope

	1	Wireless remote controller pairing
		Pairing: Under the On state, press the pairing button (1) of the wireless module with needle till the wireless pairing indicator (2) light on, then kick the photo button(3) 4 second of pedal switch, the indicator(4) of pedal switch light on and light off after 4 second, then indicator(2) (4) flashes 2 times, and lights off, finish pairing;
	2	USB interface
		It is used for connecting wireless mouse and U-disk.
	3	HDMI video output interface
		It is used for outputting high definition video
	4	Power supply interface
		It is used for connecting the power supply wire to supply power to the main body of the microscope. The mark on the plug needs to be aligned at the "●" identification on the rear cover plate.
G ● O ● ●	5	Lighting shift knob
		For switching different illumination, "●" means large spot without color filter, "●" means medium spot without color filter, "•" means small spot without color filter, "G" means green filter, "O" means orange filter.
	6	Video recording key of Built-in camera
		For controlling the video recording function, press it to begin the recording, and press it again to exit recording;
	7	Photographing key of the Built-in camera
		It is used for take pictures with the built-in camera, press it once to take one picture.
DC5V	8	DC5V power output interface
		For outputting 5V DC power.
	9	Switch of Built-in camera
		For controlling the on and off of the built-in camera.
	10	Beam splittier interface
		Connect the camera and the assistant lens with the visual kit of our ALLTION
	11	Optical zoom knob
		For manually adjusting the optical magnification rate, the magnification rate is 1:8, the number on the knob is the amplification factor.
	12	Hand grip
		It can be removed from the joint direction, and can be assembled in different directions depends on environment.
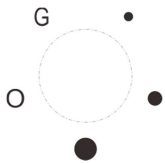
1. 1   1. 2   8   9   10   1. 3   1. 4

1

2

3

4

5

Wireless foot switch (optional)

6

7

11   12
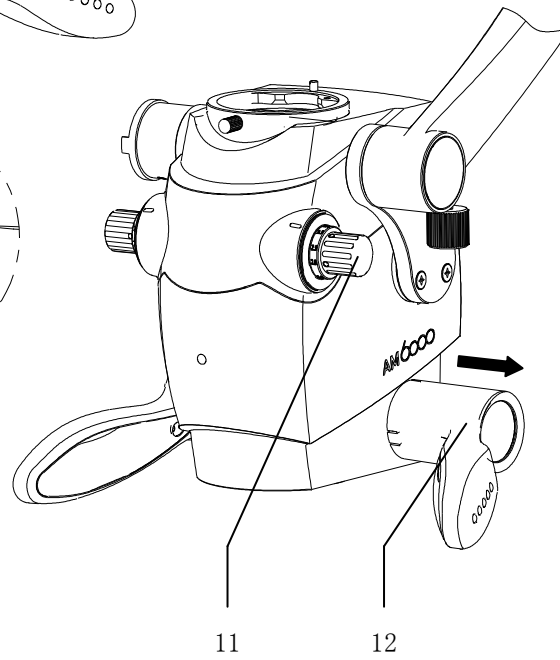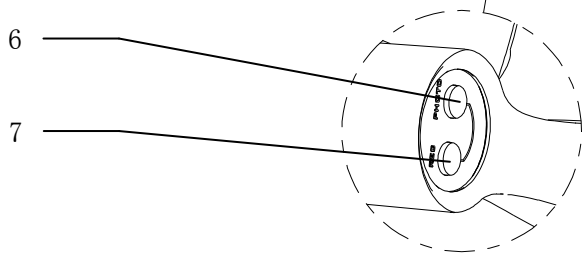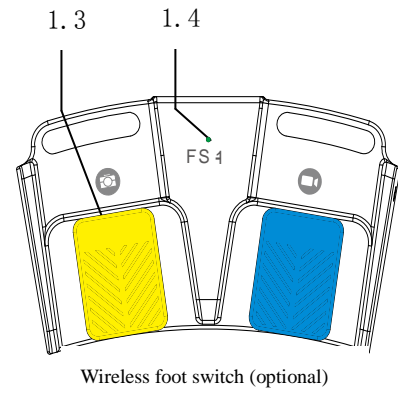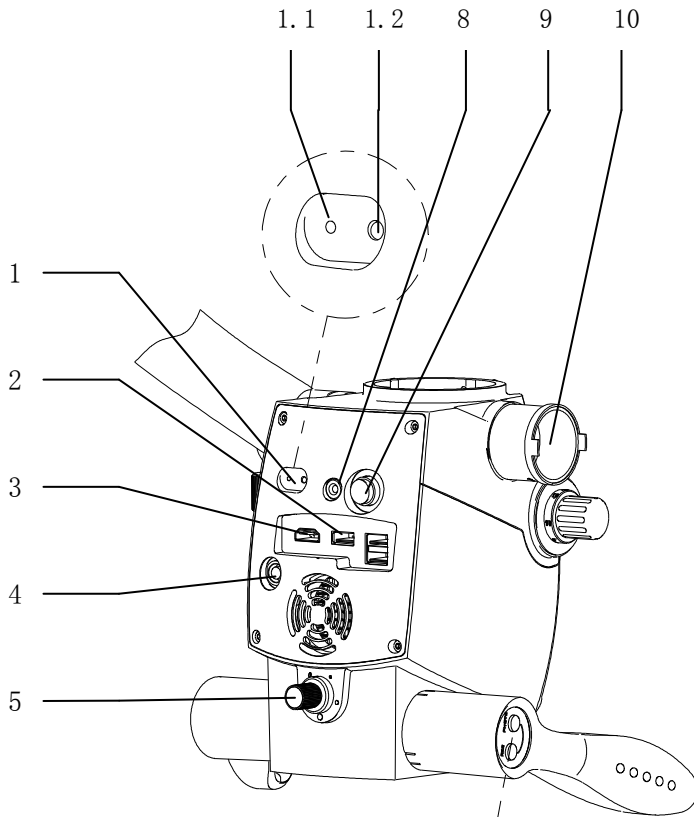
180°binocular and eyepiece

1   Pupillary distance adjustment

Adjust the papillary to make two images through both of eyepieces into one. The number on the knob is the pupillary distance.

2   Diopter adjustment

The eyepieces provide diopter compensation at -6D and +6D. Setting the diopter adjustment at 0D if the operator wear glasses. Rotatting the diopter adjustment to the best position till you see the most clear view if the operator doesn't wear glaases. In the positioning device, the built-in brake can keep the diopter adjustment still.

3   Eyecup

Adjust the eyecup to the right place till you can see the whole field of view.

● View with glasses: turn the eyecup inwards

● View without glasses: turn the eyecup outwards until you see the whole field of view
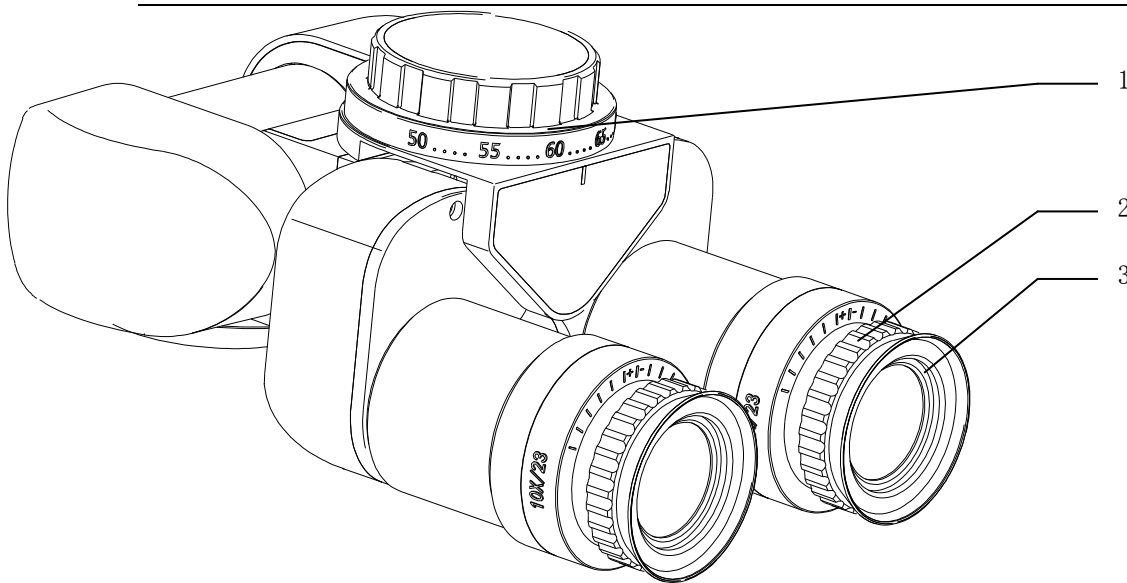
Objective lens

1   Focusing knob

It is used for manually setting the image definition (focusing, working distance).
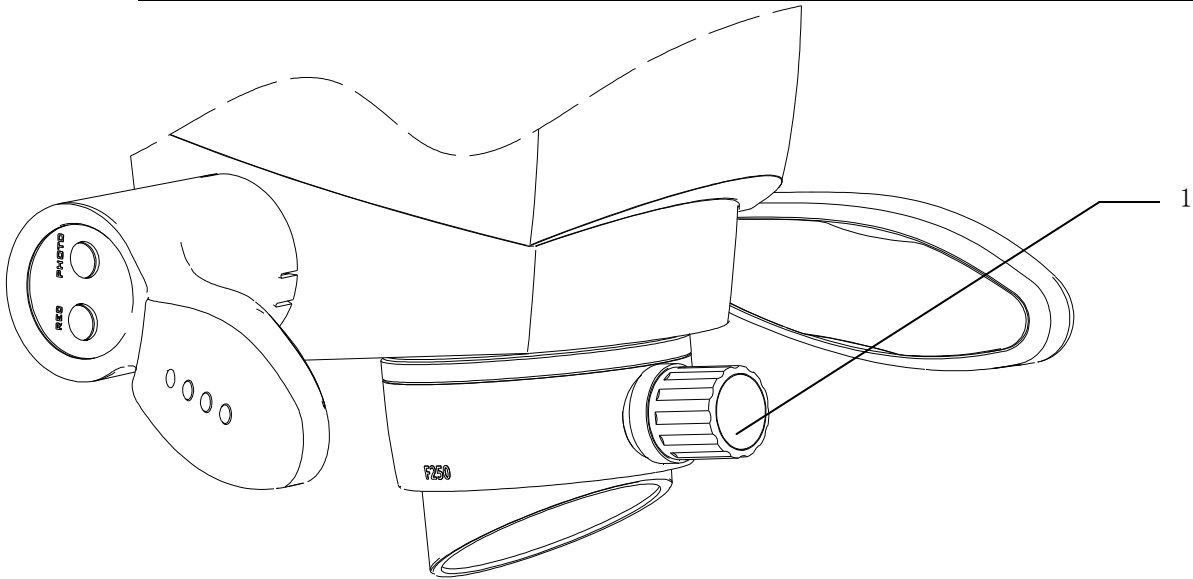
120°connecting arm
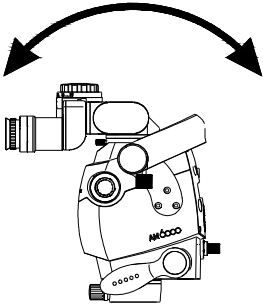
1   The adjustment knob

For adjusting the friction when moving the main body pitch or rotate (as the arrow in the left picture)
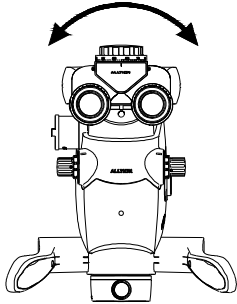
2   The adjustment knob

For adjusting the friction when moving main body horizontally (as the arrow in the left picture).

2

1
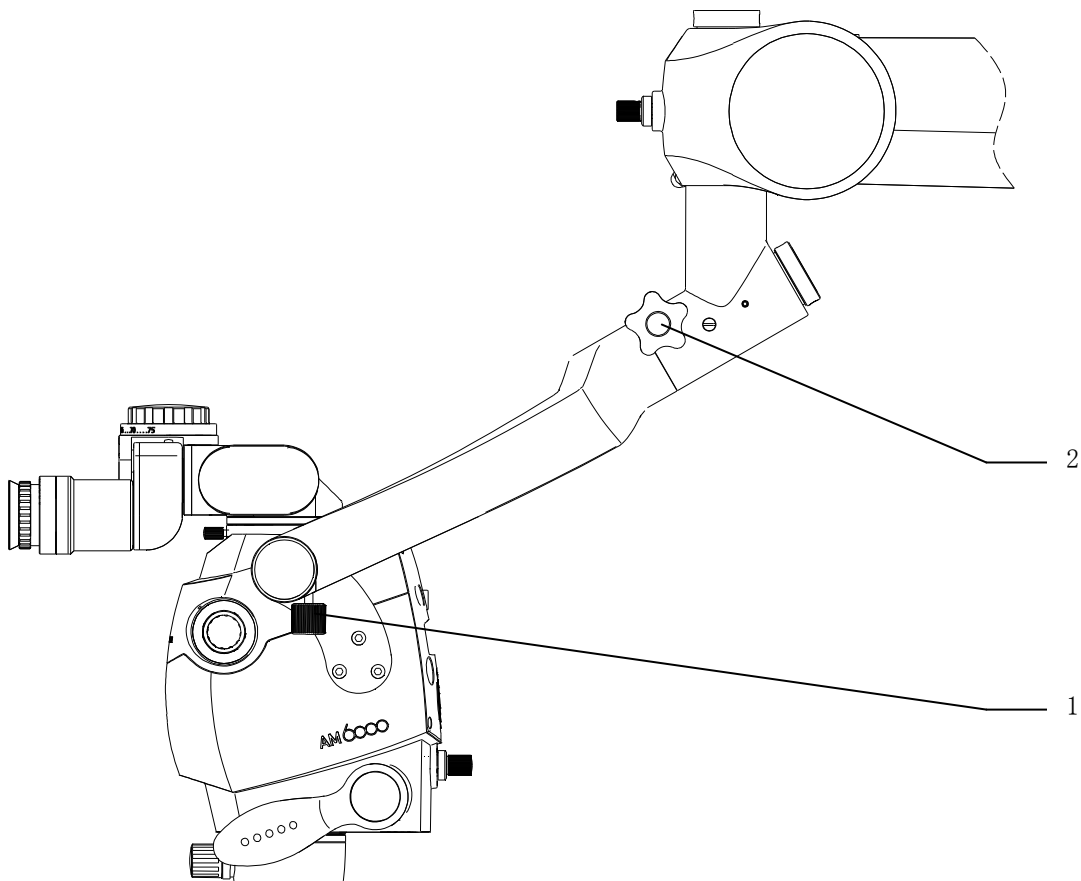
Suspension arm and mobile floor stand\ fixed floor stand\ low-position wall mount stand

	1	Dimming knob
		For adjusting the brightness of the illumination, The dimming identification as the one in the left picture.
	2	Rotation friction adjustment of 120°connecting arm
		For adjusting the rotation friction of 120°connecting arm
	3	Friction adjustment of balance arm
		For adjusting the rotation friction when moving the balance arm up and down
	4	Balance adjusting knob
		For adjusting the spring force for balancing. After installing the surgical microscope with all accessories, adjust the balance of the balance arm with the knob, the adjusting identification as the one in the left picture.
		For rotating the knob easily, the balanced arm shall be in the horizontal position when adjusting balance.
	5	Anti-collision pin
		For limiting the rotation range of the balance arm, preventing balance arm hit the load-bearing arm. The moving range is free when the anti-collision pin is pulled
	6	Balanced arm rotation friction adjusting knob
		It is used for adjusting the rotation friction of the balanced arm.
	7	Load-bearing arm rotation friction adjusting knob
		It is used for adjusting the rotation friction of the load-bearing arm.
	8	LOGO indicator
		When the instrument works normally, the LOGO indicator keeps on;
		When the balance arm moves to the highest point, the illumination light is off but the power is still on, the LOGO indicator flashes once every second.
		When the LED lamp in the main body of the microscope is faulty, the LOGO indicator flashes once every 2 seconds.
		When the potentiometer is faulty, the LOGO indicator flashes at once every 3 seconds.
	9	Power switch with green indicator
		It is used for starting and stopping the power supply of the instrument, when the instrument is started, the green indicator of the power switch turns on.
	10	Fuse
		For protecting overloading power, specification of fuse is:T2AL/250V；
	11	HDMI interface
		It is used for outputting high definition video
	12	Power interface
		Power supply interface.
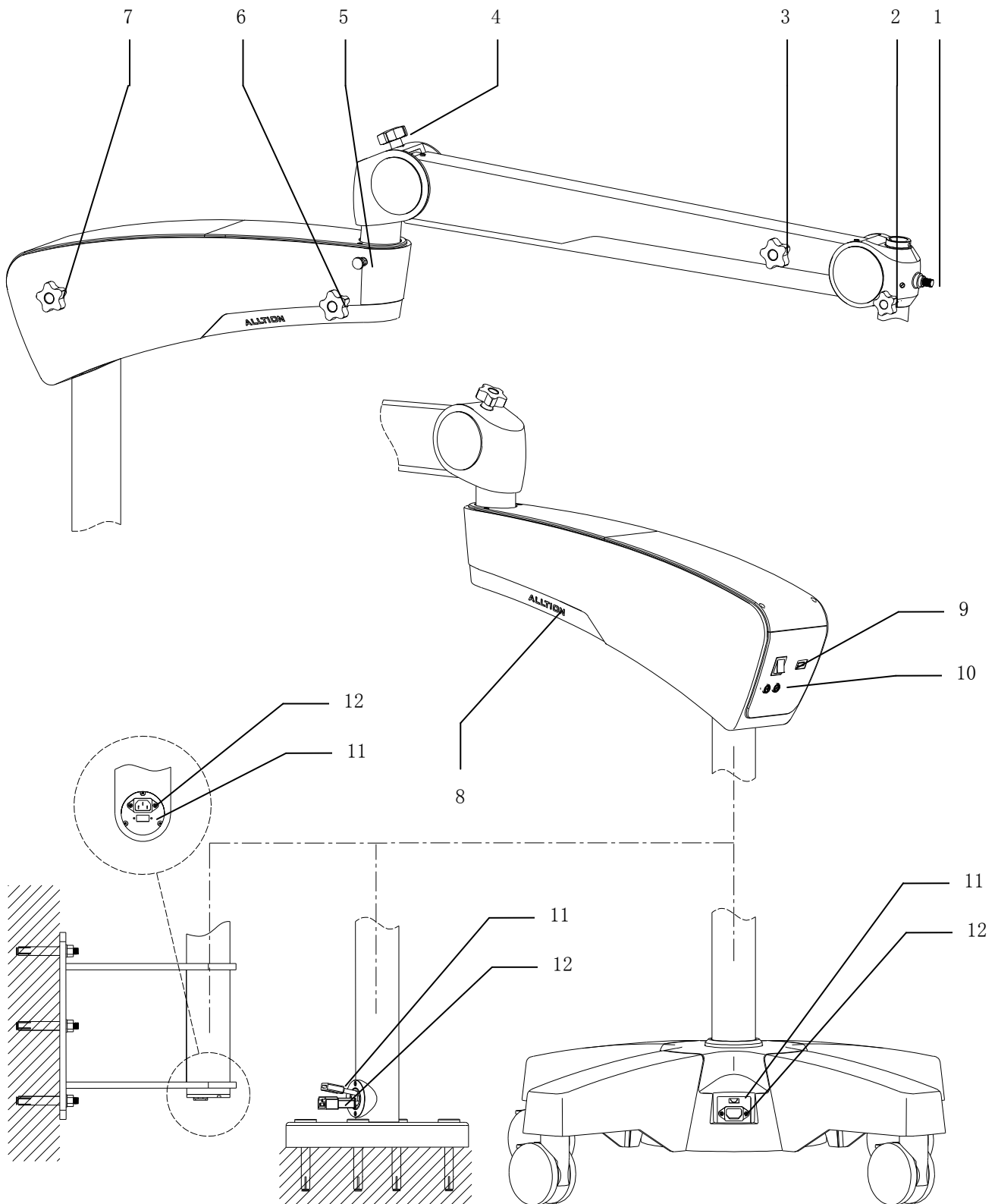
Carrier/Suspension arm and ceiling mount system/high-position wall mount system

1	**Brightness adjustment knob**	It is used to adjust the brightness of the illumination, the dimming identification is as shown on left picture.
2	**Rotation friction adjustment knob of wall-mounted arm support**	It is used to adjust the rotation friction of the wall-mounted arm support.
3	**Balanced arm up-and-down movement friction adjustment knob**	It is used to adjust the rotation friction of the balanced arm.
4	**Balance adjusting knob**	It is the knob to adjust the spring force for balance. After installing the surgical microscope with all accessories, adjust the balance with the knob. The adjusting identification is shown on the left picture.
5	**Limiting pin**	It is used to limit the rotation range of the balance arm, prevent the collision risk between carrier arm and suspension arm. The moving range of the balance arm won't be limited when the limiting pin is raised.
6	**Balance arm rotation friction adjustment knob**	It is used to adjust the rotation friction of the balance arm.
7	**Load-bearing arm rotation friction adjusting knob**	It is used to adjust the rotation friction of the load-bearing arm.
8	**LOGO indicator**	When the instrument works normally, the LOGO indicator keeps on; When the balanced arm moves to the highest point and the inching switch is close, the LOGO indicator flashes at the frequency of 1 second ON and then 1 second OFF; When there is a fault in the LED lamp of the main lens of the microscope, the LOGO indicator flashes at the frequency of 2 seconds ON and then 2 seconds OFF. When the potentiometer is faulty, the LOGO indicator flashes at the frequency of once every 3 seconds.
9	**Power switch with green indicator**	It is used to start and stop the power supply of the instrument, when the instrument start working, the green indicator of the power switch turns on.
10	**Fuse**	It is used to protect in case the power is overload , specification of fuse is: T2AL/250V;
11	**HDMI interface**	It is used to output the high definition video.

9

11

10

7　　　8　6　　5　4　　　　3　　2　1
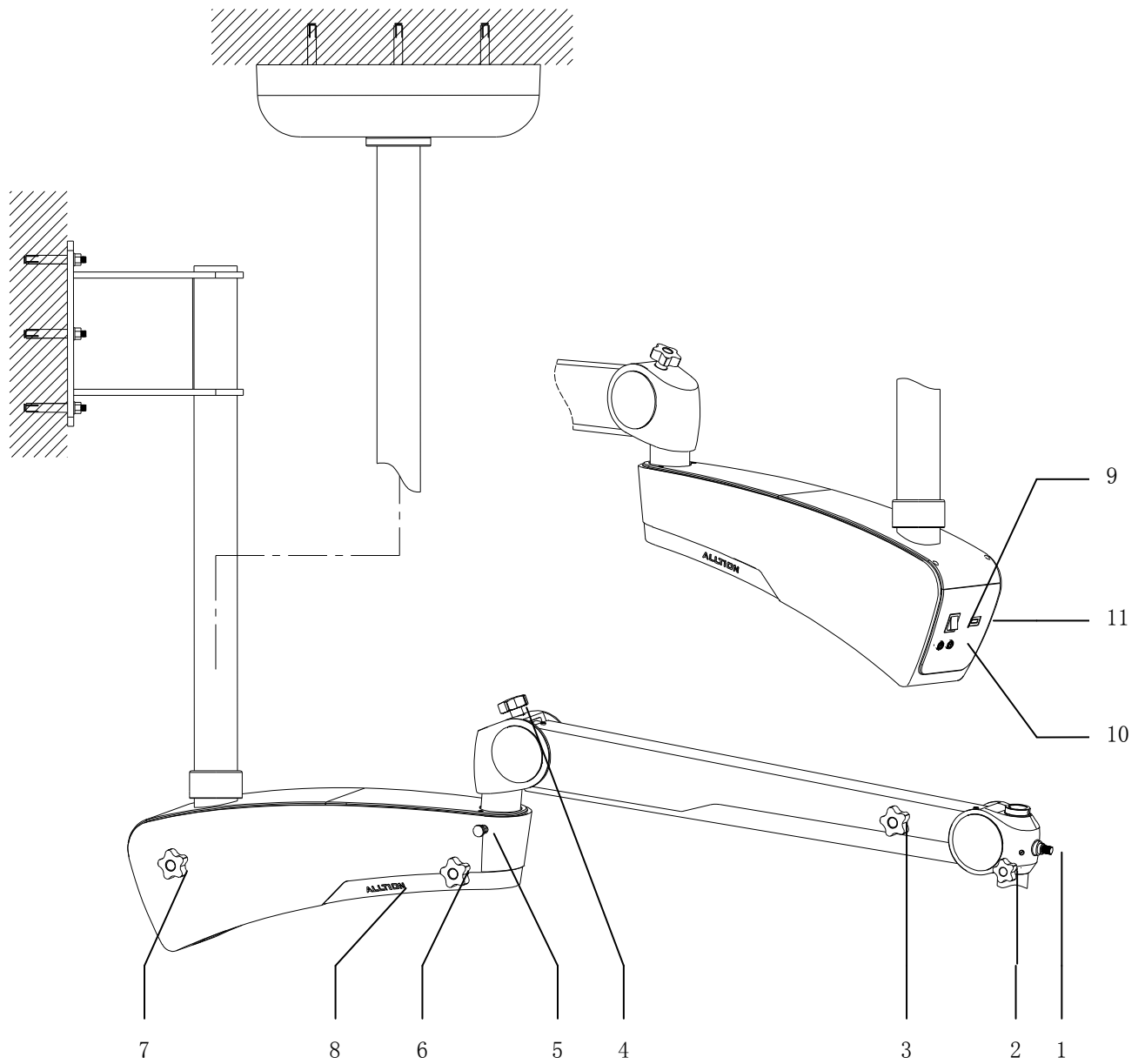
Operation of the Ryeco Microscope

Check before use

⚠️ There must be no patient when checking the microscope!

- ✓ Check if the bolts (1, 2, 3, 4) have been locked;

- ✓ Check whether the binocular barrel has been installed in place, and whether bolt (5) has been locked well;

- ✓ Check whether the objective lens (6) has been safely installed.
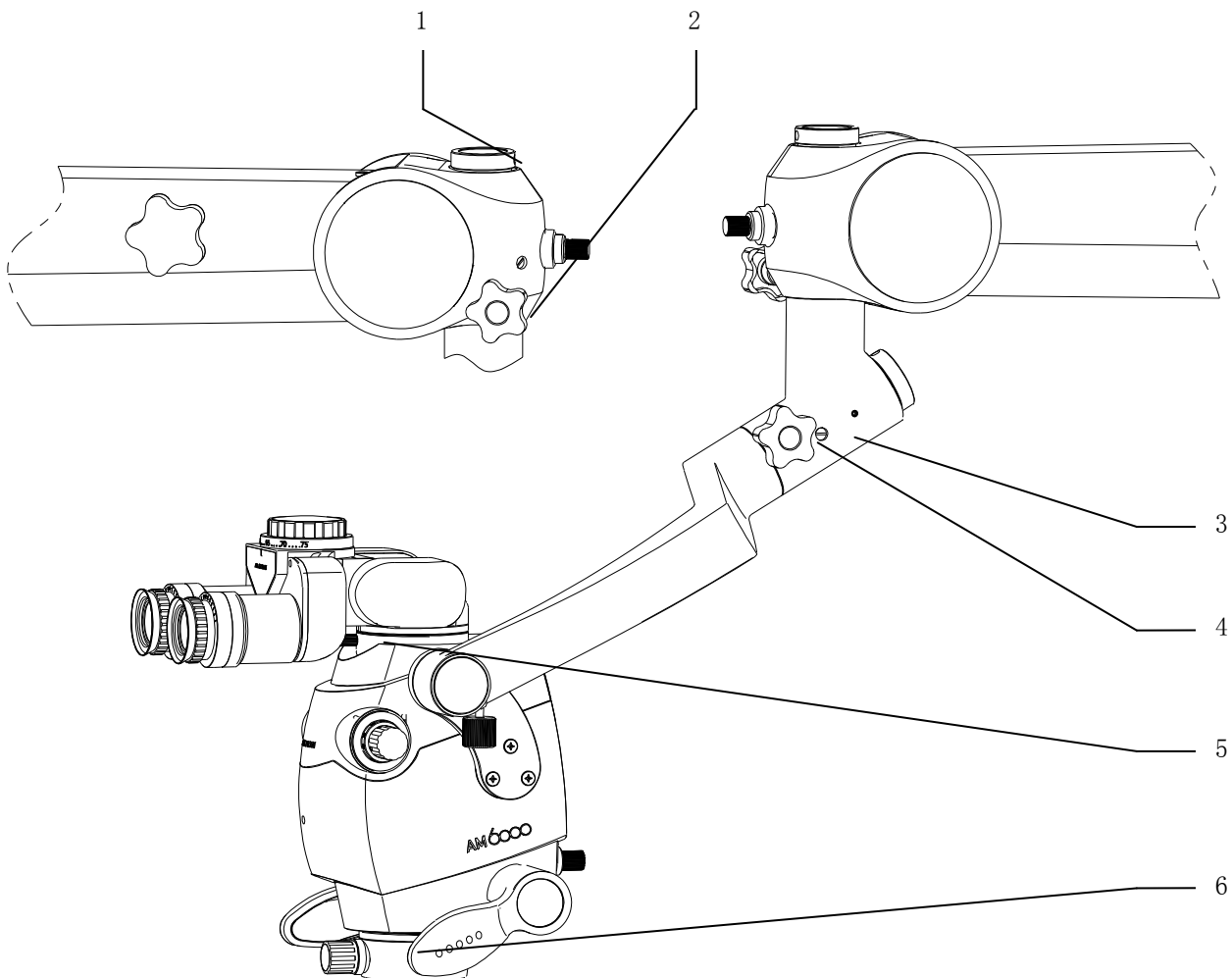
Optical adjustment of surgical microscope

▶▌ Adjust the surgical microscope to the minimum magnification, move the surgical microscope to the chosen position till the object is observed clearly.

▶▌ Adjust the pupillary distance of the binocular barrel, and when the images of the two eyepieces merge into one, the correct position is reached.

▶▌ Adjust the surgical microscope to the maximum magnification and move the surgical microscope to the position that has clearest image.

Clearer image can be obtained by fine adjustment of the focus knob on the objective lens.

▶▌ Change the surgical microscope to the minimum magnification, and adjust the knob of diopter on the eyepiece until the clearest image is observed.

- User with normal version: adjust the diopter to 0;
- User with abnormal version and wearing glasses: adjust the diopter to 0;
- User with abnormal version and not wearing glasses: adjust the diopter till gaining clearest image.

▶▌ Finish optical adjustment

Built-in Camera Operation Interface

For operation of the built-in camera, please refer to the "Operating Instructions for Ryeco CamSys Camera Operating System".

Performance Parameters

Basic dimension

The basic dimensions of the whole machine and the motion range of the joint are shown in the following figure:
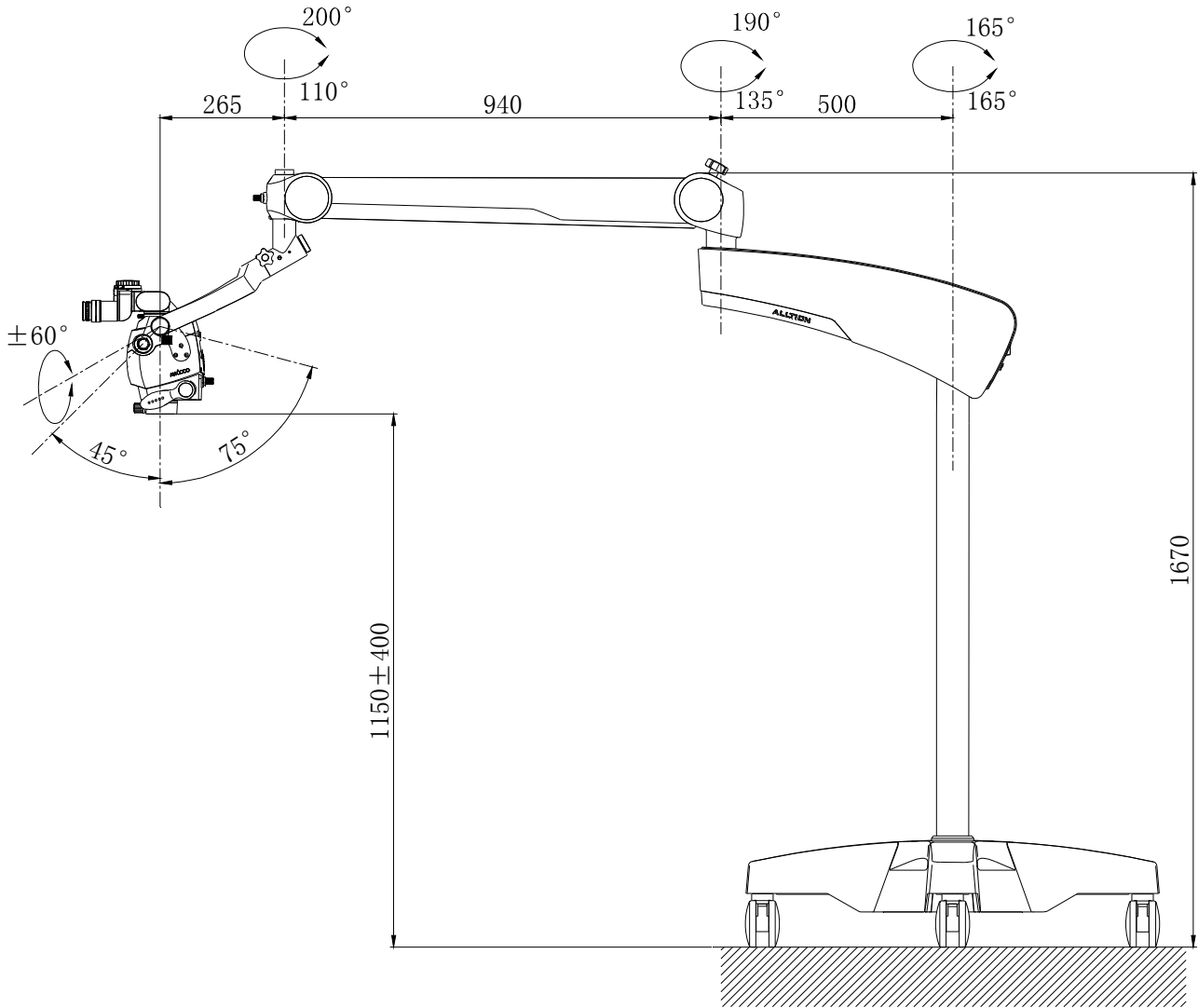
Microscope Parameters

Magnification rate	Manual zoom ratio,1:8
Large objective lens	Standard configuration: F250 large objective lens (with fine focus mechanism), optional: F200 large objective lens (with fine focus mechanism), 300 large objective lens, 350 large objective lens, 400 large objective lens and 200-300 variable objective lens.
Binocular barrel	180° variable angle binocular barrel, f=210mm
	Rang of Pupillary distance:: 55mm~75mm
Eyepiece	10X/Φ23, diopter adjustment range: ±5D

Object surface illumination (lx)	Maximum illumination > 60000 lx (with F250 large objective lens)
Diameter of illumination spot	Φ85mm (with F250 large objective lens)
Illumination shift	Orange filter, green filter, large spot without filter, medium spot without filter, small spot without filter

Optical parameters

Large objective lens	F200		F250		F300		F350		F400	
Variable magnification shift	Total magnification rate	Field of view	Total magnification rate	Field of view	Total magnification rate	Field of view	Total magnification rate	Field of view	Total magnification rate	Field of view
0.4X	4.1X	54.0	3.4X	66.0	2.8X	66.0	2.4X	92.9	2.1X	105.5
0.5X	5.1X	44.0	4.2X	53.7	3.5X	53.7	3.0X	74.2	2.6X	84.4
0.8X	8.2X	29.0	6.7X	35.0	5.6X	35.0	4.8X	49.5	4.2X	56.3
1.0X	10.3X	22.0	8.4X	27.0	7.0X	27.0	6.0X	37.2	5.2X	42.2
1.5X	15.4X	14.5	12.6X	17.8	10.5X	17.8	8.9X	24.8	7.9X	28.1
2.0X	20.5X	10.9	16.8X	13.3	14.0X	13.3	11.9X	18.6	10.5X	21.1
2.5X	25.6X	8.7	21.0X	10.8	17.5X	10.8	14.9X	14.9	13.1X	16.9
3.3X	33.8X	6.6	27.7X	8.1	23.0X	8.1	19.6X	11.4	17.3X	13.0

Built-in camera

Photosensitive chip	1/2" SONY high sensitivity and low noise CMOS
Output interface	HDMI
	USB2.0
Resolution	HD1080P 60FPS (16：9)
Storage	Built- in 32G storage, connected with external U-disk (FAT32 format)
	Photo: JPG format, video: MP4 format
WIFI	Support extended WIFI function, support WIFI image transmission
Camera optical splitter ratio	2:8
Splitter interface ratio	2:8, optional 5:5
Video setting	1080P/720P

Picture size	2M(1920x1080)
Basic functions	Freezing，Snap Image，Video Recording，Automatic Exposure，White Balance，Image Echo， Crosshairs
Image effect	Exposure Value，Best Brightness，Gain, Red Gain, Blue Gain, Saturation, Contrast, Sharpness, ALC, HDR
Advanced functions	Horizontal Flip, Vertical Flip, Enlarge, Reduce, AOI, Image Contrast
System setting	In Camera/In U Disk, Auto Name/Manu Name, Time Show/Time Hide, Show LOGO/Hide LOGO,中文/English, System Update, Restore Default, Export, Formatting, Version Information
Measuring function	Ruler，Function：(P2P、P2L、L2L、C2C、P2C、L2C、Angle、Arc、Circle、Rect、Polygon、Crease、Text、Del All、Color Settings、To Pictures、To Excel)，Information、Ruler Show

Electrical parameters

Rated voltage	AC 100-240V，50/60 Hz
Input power	35-60VA
Fuse	T2AL/250 V
Electrical safety standard	IEC60601-1:2005＋A1：2012 IEC60601-1-2:2014 RoHS: 2011/65/EU
Thermal circuit breaker of transformer	Action temperature is 130℃.
Lighting system	LED bulb, life time is over 50,000 hours
Noise	≤65dB
Running mode	Continuous running

Electromagnetic Compatibility

⚠️ Without approval from Ryf Ltd, Switzerland, it may result in the electromagnetic compatibility of the device or other equipment if it is not authorized to change or refit the device.

⚠️ The design and test of Ryeco AM-6000 surgical microscope comply with relevant operating instructions on electromagnetic compatibility.

⚠️ The equipment or system shall not be adjacent to or stacked together with other equipment. If it is required, observe and verify whether it can operate correctly in such a configuration.

Requirements on wire installation

Name of Wire	Type	Length (m)
Power cable	Non-shielded parallel wire	5m

Key components for electromagnetic compatibility

The electromagnetic compatibility key components of the product include the switching power supply module, camera module, wireless network card and 2.4G remote controller (foot switch). It will cause significant decreasingly in electromagnetic compatibility transmission and immunity performance to use or replace with the accessories with non-matched design, switching power supply module, camera module, wireless network card and 2.4 G remote controller (foot switch).

⚠️ Do not replace the components without authorization.

Guidance and manufacturer´s declaration – electromagnetic emission

– for all EQUIPMENT AND SYSTEMS

Guidance and manufacturer´s declaration – electromagnetic emission		
The Ryeco AM-6000 surgical microscope is intended for use in the electromagnetic environment specified below. The customer or the user of the Ryeco AM-6000 surgical microscope should assure that it is used in such an environment.		
Emissions test	**Compliance**	**Electromagnetic Environment - Guidance**
RF emissions CISPR11	Group 1	AM-6000 surgical 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 CISPR11	Class A	AM-6000 surgical 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 IEC 61000-3-2	Class A	
Voltage fluctuations / flicker emissions IEC 61000-3-3	Complies	

Guidance and manufacturer's declaration – electromagnetic immunity

– for all EQUIPMENT and SYSTEMS

Guidance and manufacturer´s declaration – electromagnetic immunity			
The Ryeco AM-6000 surgical microscope is intended for use in the electromagnetic environment specified below. The customer or the user of the Ryeco AM-6000 surgical 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	± 8 kV contact ± 15 kV air	± 8 kV contact ± 15 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 %.
Electrostatic transient / burst IEC 61000-4-4	± 2 kV for power supply lines	± 2 kV for power supply lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV differential mode	± 1 kV differential mode	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	0 % U_T ; 0.5 cycle At 0°,45°,90°,135°, 180°,225°,270° and 315° 0 % U_T; 1 cycle and 70 % U_T; 25/30 cycles Single phase: at 0° 0 % U_T; 250/300 cycle	0 % U_T ; 0.5 cycle At 0°,45°,90°,135°, 180°,225°,270° and 315° 0 % U_T; 1 cycle and 70 % U_T; 25/30 cycles Single phase: at 0° 0 % U_T; 250/300 cycle	Mains power quality should be that of a typical commercial or hospital environment. If the user of the AM-6000 surgical microscope requires continued operation during power mains interruptions, it is recommended that the AM-6000 surgical microscope be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

U_T is the a. c. mains voltage prior to application of the test level

Guidance and Statement from Manufacturer - Electromagnetic Immunity

⇨ **for EQUIPMENT and SYSTEM that are not LIFE-SUPPORTING**

Guidance and manufacturer´s declaration – electromagnetic immunity			
The Ryeco AM-6000 surgical microscope is intended for use in the electromagnetic environment specified below. The customer or the user of the Ryeco AM-6000 surgical microscope should assure that it is used in such an environment.			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Conducted RF IEC 61000-4-6	3 V rms 150 kHz to 80 MHz 6 V in ISM bands between 0,15 MHz and 80 MHz	3 V rms 150 kHz to 80 MHz 6 V in ISM bands between 0,15 MHz and 80 MHz	Portable and mobile RF communications equipment should be used no closer to any part of the AM-6000 surgical microscope, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance** $d = [\frac{3.5}{V_1}]\sqrt{P}$ $d = [\frac{3.5}{E_1}]\sqrt{P}$ 80 MHz to 800 MHz $d = [\frac{7}{E_1}]\sqrt{P}$ 800 MHz to 2.7 GHz
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.7 GHz	3 V/m 80 MHz to 2.7 GHz	where *p* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and *d* is the recommended separation distance in metres (m).[b] Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range. 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 is affected by absorption and reflection from structures, objects and people.

[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the AEL-100 is used exceeds the applicable RF compliance level above, The AEL-100 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the AEL-100.

[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3V/m.

Recommended separation distances between portable and mobile

RF communications equipment and the EQUIPMENT or SYSTEM
for EQUIPMENT and SYSTEMS that are not LIFE-SUPPORTING

Recommended separation distances between portable and mobile RF communications equipment and the AEL-100		
The AM-6000 surgical microscope is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the AM-6000 surgical microscope can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the AM-6000 surgical microscope as recommended below, according to the maximum output power of the communications equipment		
Rated maximum output of transmitter W	**Separation distance according to frequency of transmitterm**		
	150 kHz to 80 MHz	80 MHz to 800 MHz	800 MHz to 2.7 GHz

	$d = [\frac{3.5}{V_1}]\sqrt{P}$	$d = [\frac{3.5}{E_1}]\sqrt{P}$	$d = [\frac{7}{E_1}]\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above the recommended separation distance d in metres (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for 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.

The Ryeco AM-6000 surgical microscope has been tested in accordance with YY 0505-2012/ IEC 60601-1-2:2004, which cannot be guaranteed against electromagnetic interference in any way, and should avoided to be in a high electromagnetic environment.

Cleaning and Maintenance of the Instrument

⚠️ If possible, the equipment and accessories shall be cleaned immediately after use. Contaminants cannot be dried on the object as this will make it more difficult to clean and disinfect.

Clean the optical surface

⚠️ The optical component has a multi-layer laminating (e.g., eyepiece, objective) to ensure optimum image quality, the contaminants attached to the surface of the optical component will reduce the image quality. The internal optical equipment shall be protected from dust, the equipment shall not be stored without objective lens, binocular and eyepiece. After use, cover the dust cover on the surface of the system to avoid dust on the equipment. When the optical components and accessories are not in use, they are always kept in the dust-free box.

⚠️ Do not use any chemical cleaning agent, corrosive solvent or detergent with scratching effect, which will damage the surface of the optical device.

▶❙ The stain (blood stains, etc.) on the surface of the optical part shall be removed with distilled water having added an appropriate amount of washing liquid. The surface can only be wiped with humid cloth, and the surface of the component must not be scrubbed with wet cloth;

▶❙ After removing the stains from surface, use a clean cloth to dip 75% medical alcohol for further cleaning.

Clean the mechanical surface

All mechanical surfaces of the instrument can be cleaned by wiping with humid cloth. Do not use any irritative or corrosive cleaning agent. The residual dirt shall be wiped off with the mixture of 50% of normal alcohol and 50% of distilled water and a small amount of household tableware cleaning liquid.

⚠️ Disconnect the power supply when wiping the instrument.

Replace the fuse

⚠️ Disconnect the power supply when replacing the fuse.

Remove the fuse base with screwdriver, take out the molten fuse, replace it with new fuse, and then insert the fuse holder into the instrument.

Fuse specification: T2AL/250V;

Disposal of waste

The wastes generated during use include the sight glass wiping paper or absorbent cotton. Please don't throw it at will. If there is special garbage disposal facility near you, use it as much as possible.

The scrapped instruments shall be handled according to the provisions of local

environmental protection laws for avoiding polluting the environment (free of charge recycling by Ryf Ltd for your old microscope purchased at Ryf Ltd).

Maintenance related information

Troubleshooting

Faults	Possible Reasons	Solutions	Refer to
Lighting failure	Power cable is not connected	Connect the power wire	
	Power switch is not turned on	Turn on the power switch	
	The dimming knob is adjusted to minimum position	Adjust the dimming knob	See Page 34/36
	Fuse is melted	Replace the fuse	See Page 43
	Instrument electrical failure	Contact local dealer or after-sale service agent	
	The power supply wire of the microscope main lens is not connected well	Connect the LED power wire correctly	See Page 22
	The instrument is in the non-working area and the balanced arm is at high position	Move the balanced arm to the working area	
	LED bulb is damaged	Contact the local dealer or after-sales service agent	
Illumination fails intermittently during use	The cooling window and the air inlet are covered or blocked by external object	Remove the foreign object and clean the cooling window	
	Failure of cooling fan	Contact the local dealer or after-sales service agent	
	Instrument electrical failure	Contact the local dealer or after-sales service agent	
The instrument cannot stop at any time when it moves up and down	Balanced arm is not adjusted to balance after adding or decreasing accessories of the microscope	Balance the balanced arm	See Page 34/36
	Spring failure	Contact the local dealer or after-sales service agent	
The instrument is running stiffly	The friction adjustment knob is adjusted too tight.	Loosen the friction adjusting knob, and moderately adjust the friction.	See Page 33/34/36
Optical magnification switching	Mechanical failure of the instrument	Contact the local dealer or after-sales service agent	

failure			
Failure of lighting shift function	The lighting shift knob is not in place	Adjust the lighting shift knob	See Page 22
	Mechanical failure of the instrument	Contact the local dealer or after-sales service agent	
Without image output	The built-in camera switch is not turned on	Turn on the switch	See Page 22
	The input channel of the video cable is not consistent with the display channel of the display.	Change the display channel of the video cable or the display channel of the display.	
	Video cable is not connected correctly	Reconnect the video cable	
	There is problem for the video cable	Replace the video cable	
	Built-in camera failure	Contact the local dealer or after-sales service agent	
Color distortion	Color is not properly adjusted	Restore factory settings, adjust white balance	
	White balance is not adjusted properly		
	Video wire has quality problem	Please use the original video cable	
Camera halted	System crash	Restart or update the system	
	The cooling window and the air inlet are covered or blocked by external object	Remove the foreign object and clean the cooling window	
The pictures are not clear	There is stain on the objective lens of the microscope	Clean the objective lens of the microscope	
	Inaccurate focusing	Carry out optical focusing again	See Page 39
	Microscope vibrates when taking pictures	Keep the microscope still or take photos with mouse/ foot pedal	
No image at the WiFi client terminal	USB WiFi transmitter is not connected	Check whether the WiFi hardware is connected and whether the WiFi function is functional	
	Check if the IP address is consistent with the IP address of the camera	Check if the IP address of the client terminal software is consistent with the IP address of the camera	

Ryf After-sale service   // Swiss Warranty with Ryf Ltd.

Any unauthorized repair on the instrument shall not enjoy warranty service anymore. In order to safely return to Ryf Ltd. Grenchen, Switzerland for repair, please keep, if possible, the original packaging box and packaging materials of the instrument.

One year Ryf-Swiss warranty-- cost for parts and labor are included in the product you have purchased.

Notes:

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