ACCU-SCOPE®

MANUAL

EXI-600

RESEARCH GRADE INVERTED BIOLOGICAL MICROSCOPE SERIES

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EXI-600 Research Grade Inverted Biological Microscope

User Manual

This manual is written for EXI-600 research grade inverted biological microscope. To ensure the safety, obtain optimum performance and to familiarize yourself fully with the microscope, it is strongly recommended that you read this manual carefully before operating the microscope and put this manual in a place easy to get for reference.

The warning and notice signal used in this manual

We provide you the most safety and reliable instruments, but improper operate and ignorance of precautions may lead to a personal injury or a loss of property. To insure the right operating method, we hope you read this manual carefully before you use the product. Besides, it's highly recommended you to put this manual in a place easy to get for easy reference.

In this manual the safety notices will be emphasized by the below symbols, please obey the statement of these symbols.

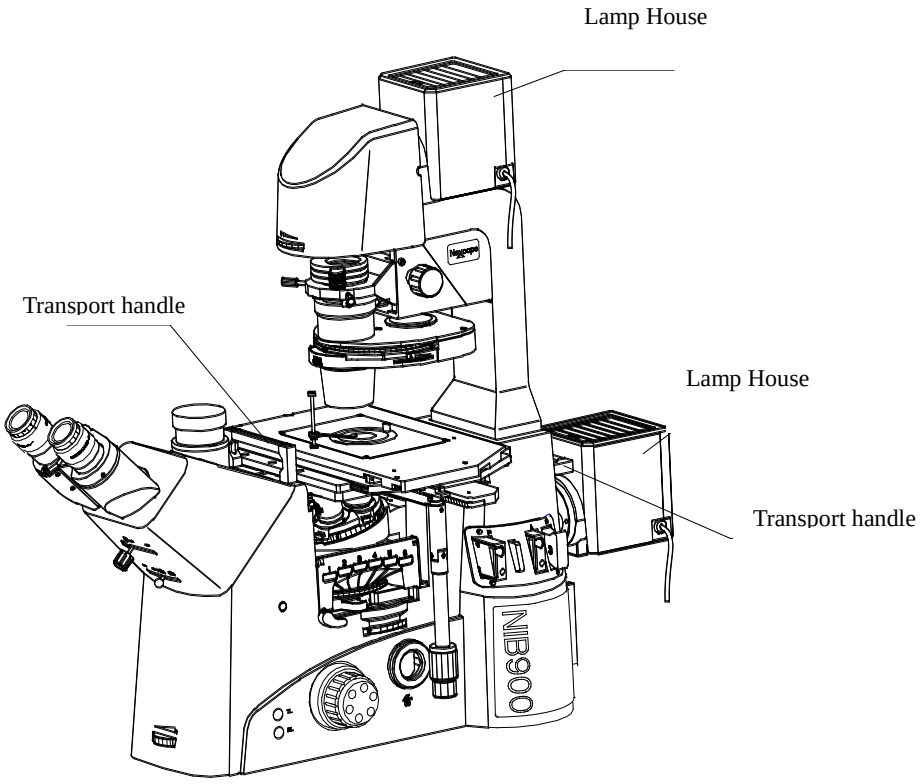
Symbol	Meaning
⚠ WARNING	Ignore this symbol may lead to a serious personal injury even death.
⚠ NOTICE	Ignore this symbol may lead to a personal injury or a property loss.

The meaning of symbols on the product

Symbol	Meaning
	Conductor protect terminal
	Caution of hot! Remind you of this situation: The lamp house and spaces nearby will get hot when using. Do not touch the lamp house in 30 minutes when it's closed and when it's on. The lamp house may still extremely hot after it's closed, please ensure enough cooling time before replacing the bulb
	This symbol appears in the electrical name board to remind you to make sure the voltage of your area is the same to the input voltage
—	Turn on the power , rotate the brightness knob to adjust the brightness of the field of view
	Turn off the power
	UV radiation
	Turn off the power before open the device

CONTENTS

Safety Precautions



1. Avoid placing the microscope in a place exposed to direct sunlight, with high temperature, with high humidity or easily vibrated, make sure the platform is flat, horizontal and stable enough. (weight of the mainframe is 29.5kg)
2. When moving the microscope, hold the transport handle tightly and keep a distance between the microscope and the platform before actually moving it.(shown in picture above)
3. If bacterial solution or water is dripped over the stage, objective or observe tube, turn off the power supply immediately and wipe out the solution, otherwise the instrument maybe damaged.
4. 

   When operating, the lamp house can be considerably hot, make sure there is enough space around the lamp house for heat dissipation to avoid the heat accumulates and damage the instrument.

5. 

   Before turn on the power of lamp house, make sure the power supply is connected properly.

   Before replacing the bulb or fuse, turn off the power and wait until the lamp house cooled

completely.

★the indicate bulb: 12V 100WHAL high brightness halogen bulb (OSRAM)

★the fuse should load the correct melting current, do not use a temporary fuse in case of the broken circuit.

6. Connect the power wires correctly, make sure the instrument is grounded in case of lightning stroke.

7. Use the dedicated electric wires.

8. 

The halogen lamp can radiate UV light thus may cause a burn of eyes and skins. Do not see through the light directly and take protective measures when using the microscope as much as possible.

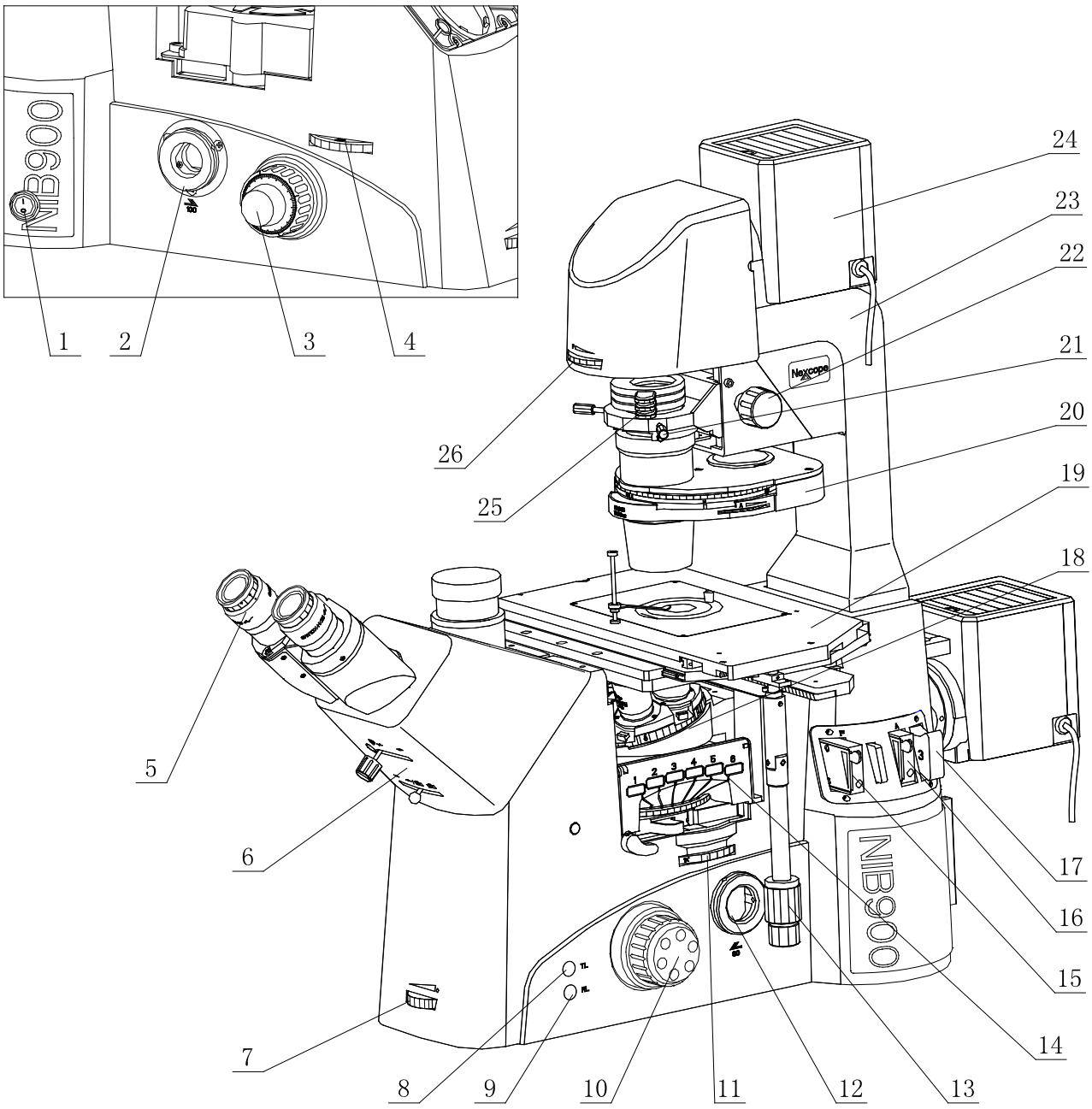
9. The product should store in a place with shelter and no acid gas, alkali, organic solvent or any harmful substances around.

★ a 3-pin plug is reserved for the machine for safety concern , the machine is grounded through the 3-pin plug. Do not use any other adapter plug or e the safety performance may decrease.

★Do not put the instrument in a place where is hard to cut off the melting current.

★The protective offered by the device may be damaged if the device is not used in the way indicated by our company.

Ⅰ Structure and Names



Pic. 1

Component names:

1 Power switch

2 Left camera port

3 Left coarse/fine focusing handwheel

4 Side ports converter(light path convert—left and right side ports/observe)

5 Eyepiece

6 Trinocular tube

7 Brightness adjustment knob

8 Transmitted illumination shutter

9 Reflected illumination shutter

10 Right coarse/fine focusing handwheel

11 Middle magnification converter

12 Right camera port

13 X/Y axis handwheel of sample stage

14 Multifunction module turntable

15 Field diaphragm of reflected light

16 Aperture diaphragm of reflected light

17 3-hole filter spile

18 Obejective converter

19 Sample stage

20 Turntable condenser

21 Condenser centring screw

22 Lifting handwheel of condenser

23 Transmitted illumination support

24 12V 100W illumination lamp house

25 Filter support

26 Field diaphragm of transmitted light

Ⅱ Applications

The EXI-600 inverted biological microscope is mainly used to study the cells, cultured organization and sediment in culture bottles and culture dishes using transmitted and reflected light.

This device can be used in bright field, dark field, phase contrast, differential interference contrast, polarized light and fluorescence observation.

Main application of this device: study of human blood and tissue samples, observation of the connection, activity and growth between live cells, drug reaction, minimally invasive, external fertilization, toxicity test, digital record, automatic continuous time-point observation, single molecule detection, etc.

Ⅲ Assembly

Preparation before assembly and operation of the microscope

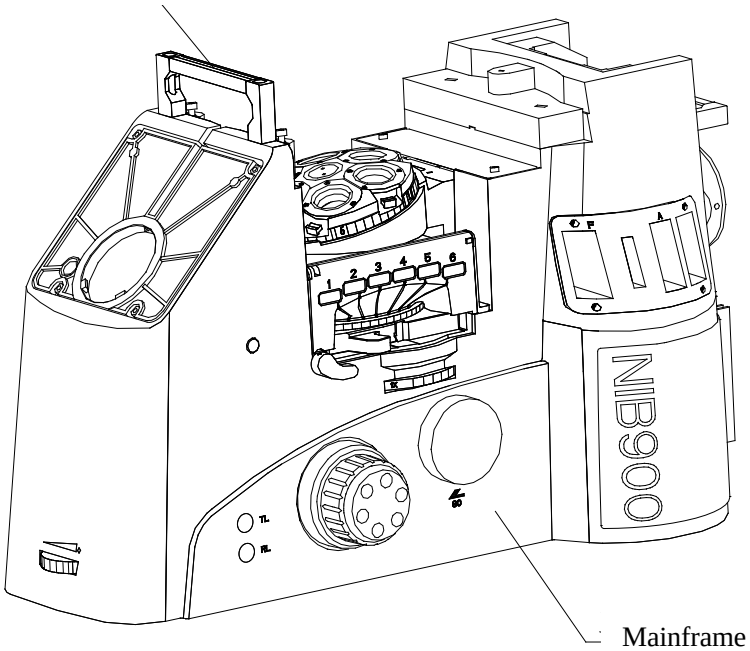
Tear down the packaging of the mainframe and the accessories.

The packaging include of mainframe, eyepieces, objectives, condenser support, lamp house and other accessories such as filters, DIC blocks, dust-proof shield, tools and user manual. The optional accessories will be packaged individually.

1. Tear down all the packaging, check the goods and confirm the accordance with the products you purchased.
2. Dismantle the transport handles shown in pic.2.

   Put the mainframe in a vibrate-proofed platform and then dismantle the handle with 4mm hexagon screwdriver.

★Please take proper preservation of the handles.



Pic.2

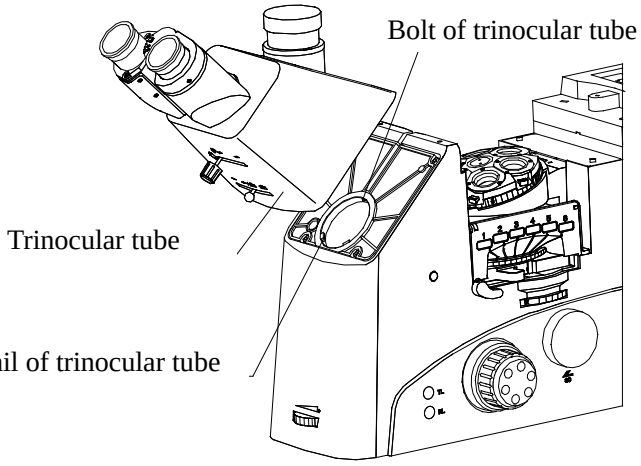
Assembly

1. Trinocular tube

①Use a 2mm hexagon screwdriver to loosen the bolt, take out the dust cover.

②Calibrate the trinocular tube and the swallow tail, fix it by 2mm hexagon screwdriver.

★Do hold the trinocular tube tightly in case of fallen down.



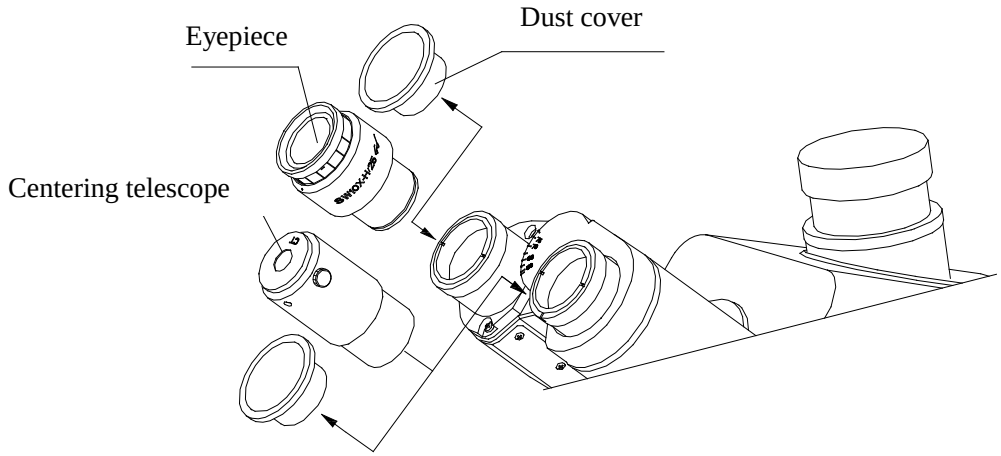
Pic.3

2. Eyepiece and centering telescope

①Take off the dust cover, insert the 2 eyepieces into the tube(the eyepiece should fully contact with the tube).

★②When observing with phase contrast, replace one eyepiece with the centering telescope, make the phase contrast ring focusing accurately.

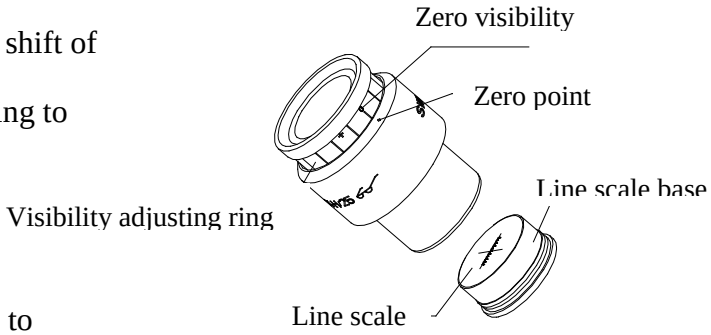
★when using centering telescope



Pic.4

3. Graduated ocular

The added line scale may cause a slightly shift of the image, rotate the visibility adjusting ring to focus the line scale of the eyepiece.

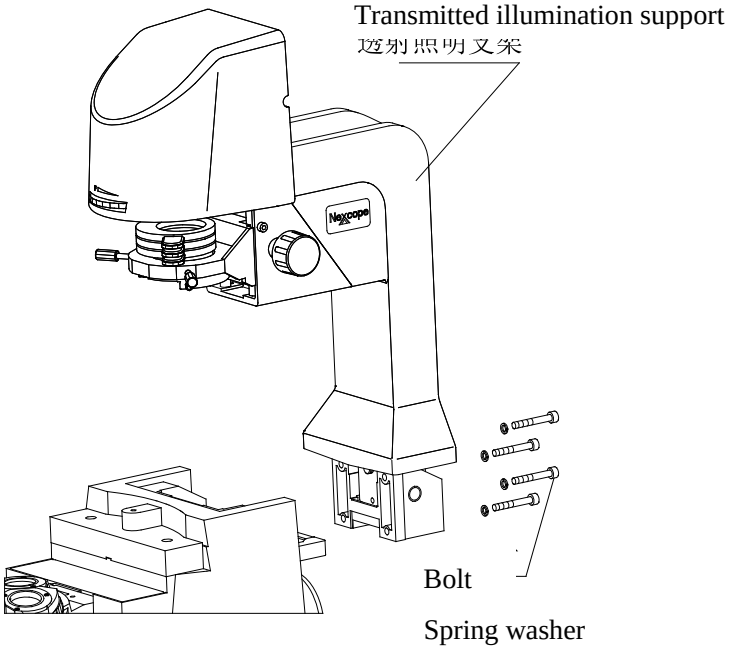


Only need to screw off the line scale base to Change the line scale.

Pic.5

4. Transmitted illumination support

Put the support at the back of mainframe and tighten it with M5X35 bolt and spring washer.



The transmitted support does not need any adjustment.

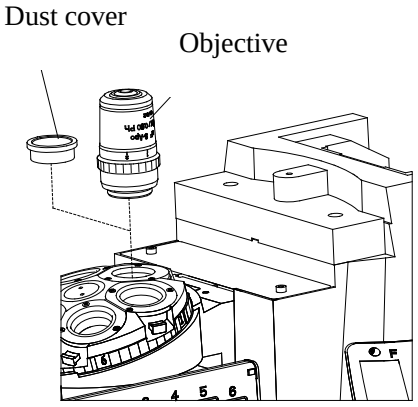
Pic.6

5. Objective

Screw off the dust cover on the converter, screw the objective into the trapped hole

The objectives should match the lettering on the converter by their magnification.

Screw the dust cover into other vacancies.



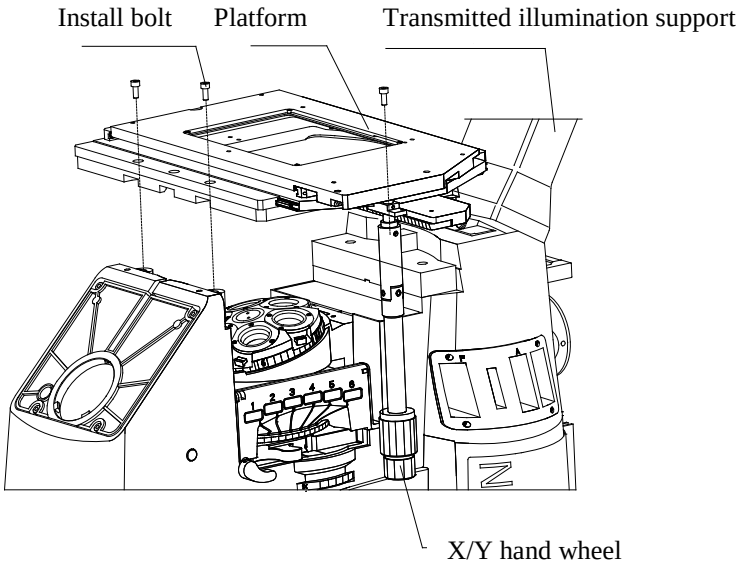
Pic. 7

6. Sample platform

Assemble the platform 135X85R/L with the mainframe by three bolt M4X10

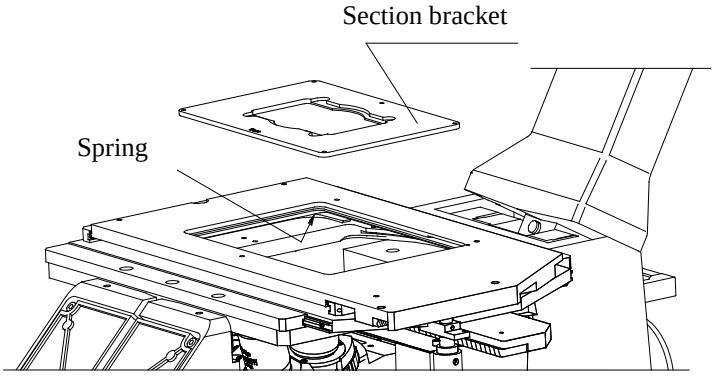
★The platform can be assembled at either right or left.（meanwhile the X/Y hand wheel can be at either right or left)

★The transmitted support can be tilt a bit to the back to assemble the platform.



Pic. 8

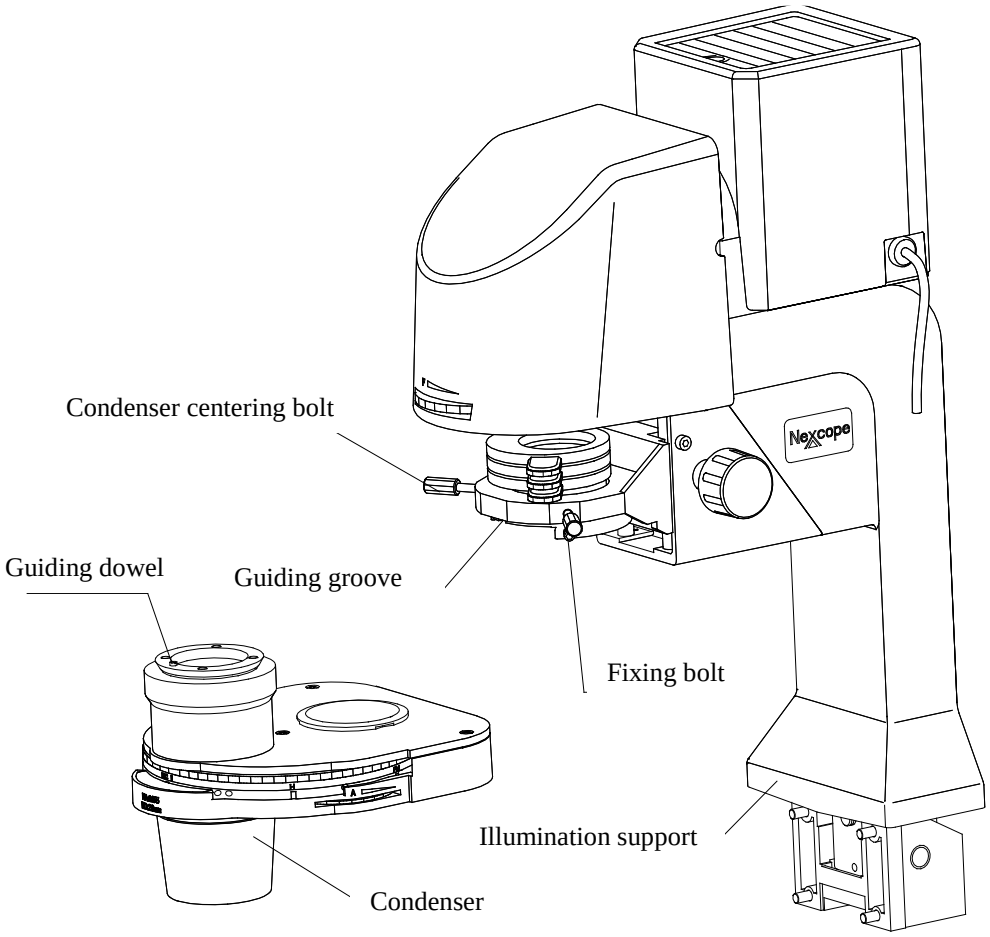
Put the section bracket close to the spring on the edge of the platform and press it to the platform levelly.



Pic. 9

7. Turntable condenser

Align the guiding dowel of the condenser to the guiding groove of the support and fix the condenser with the bolts after inserting it into the transmitted illumination support.



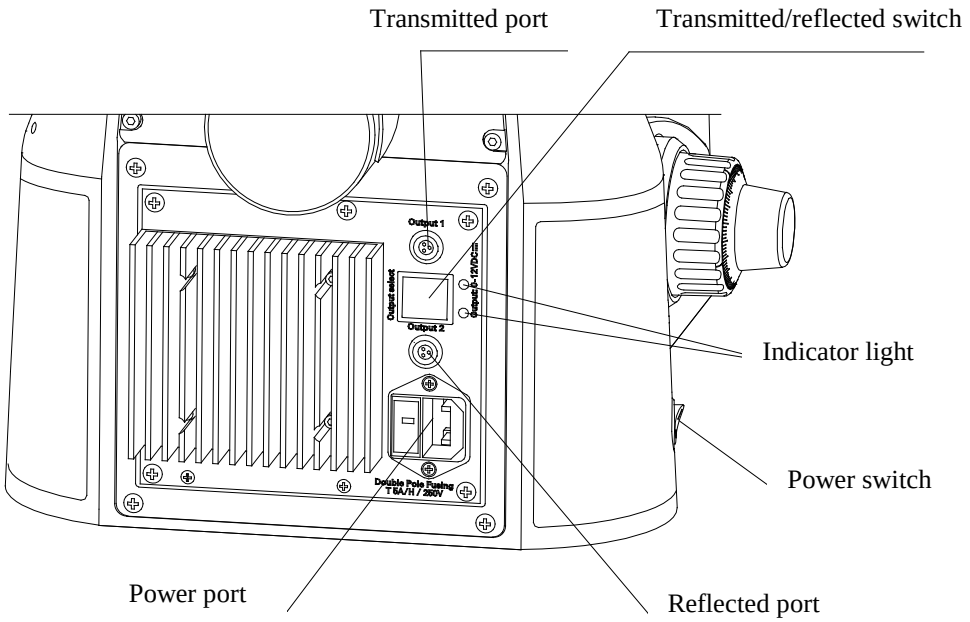
Pic. 10

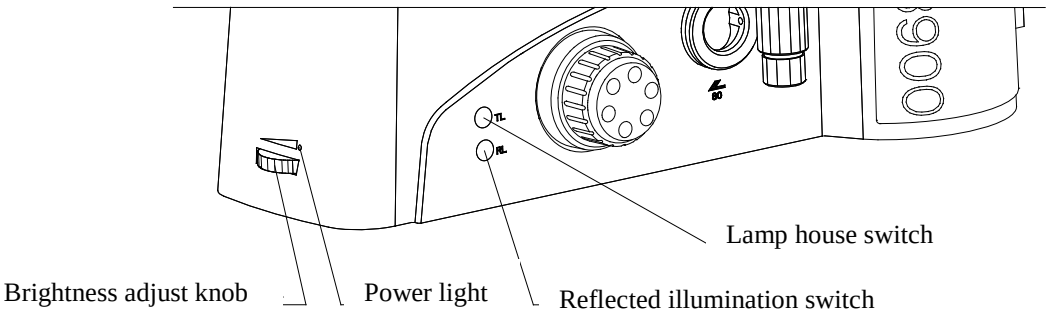
8. Microscope power port

Please off the power before installing any parts and accessories.

★The TL lamp house switch can control the transmitted lamp house without turning off the power.

★The RL lamp house switch can control the reflected lamp house without turning off the power.

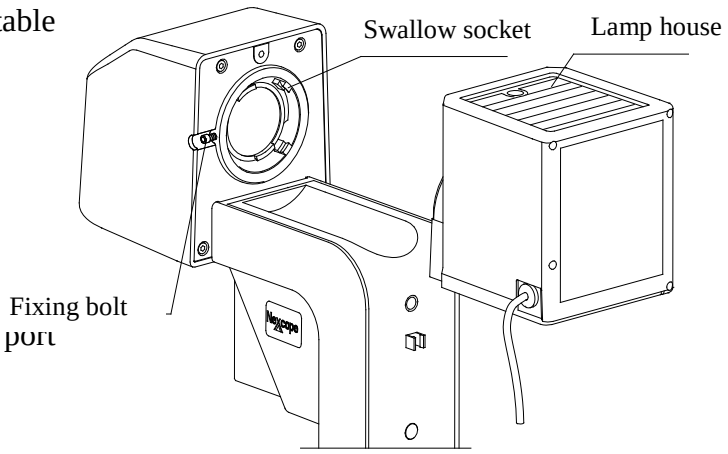




Pic.11

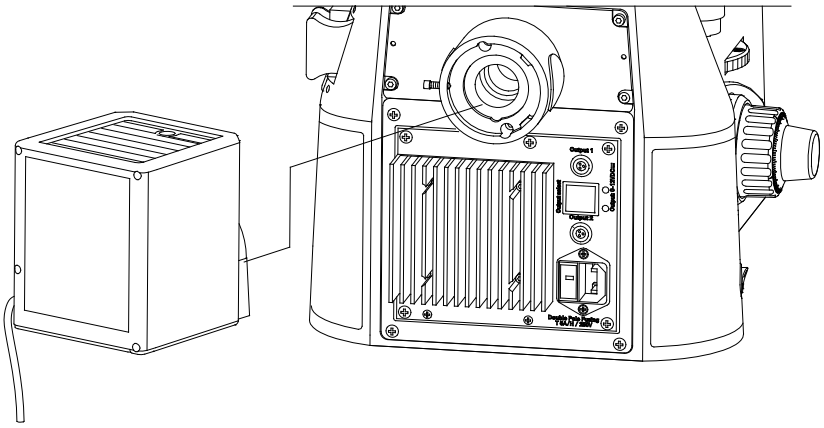
9. Illumination lamp house (halogen)

Insert the swallow tail of the lamp house to the socket, make the lamp house parallel to the stable table and then fixed it with bolts



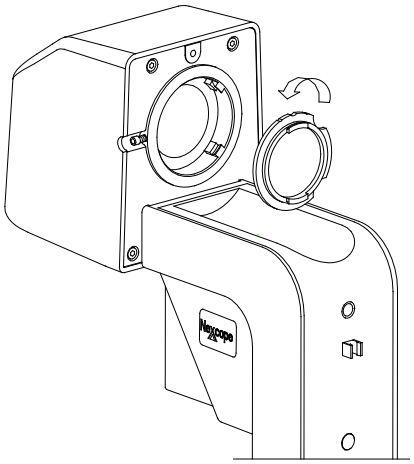
Connect power wires by the port position shown in pic.11.

Check the connection and open the power supply, rotate the potentiometer knob and see if the brightness changes.



Assemble the diffuser

Locate the two round grooves of the diffuser to the two bulged on the swallow tail socket and screw the diffuser into the socket groove. Screw it reversely when taking the diffuser out.



Pic.13

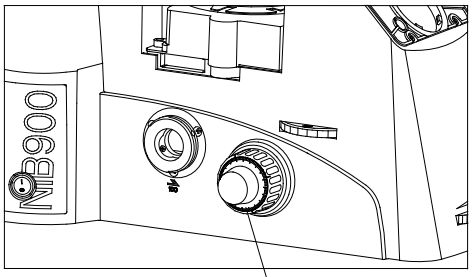
Ⅳ Operating and adjusting

1. Coarse and fine focusing hand wheel

move range：10mm

coarse focusing hand wheel：2mm/cycle

fine focusing hand wheel：0.2mm/cycle



Fine focusing hand wheel (scale)

Pic.14

★Focusing hand wheel is set at both side

Of the mainframe

The left hand wheel has scales

The right hand wheel has no scales

2. Side port converter/light path converter—observe from left, right port and ocular

The side port converter has three instruction of different splitting ratio.

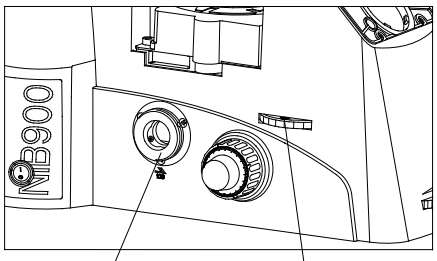
100%vis: 0% camera 

20%vis: 80% camera left 

0%vis: 100% camera right 

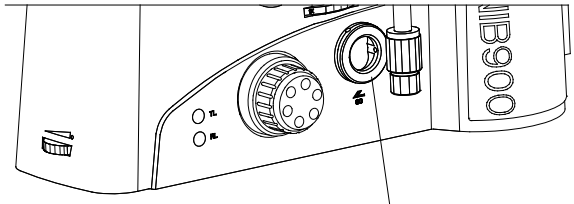
★：vis---observe by ocular

camera---photonic



Left port screw thread

Splitting tag



Right port screw thread

Pic. 15

3. Turntable condenser

(transmitted light)

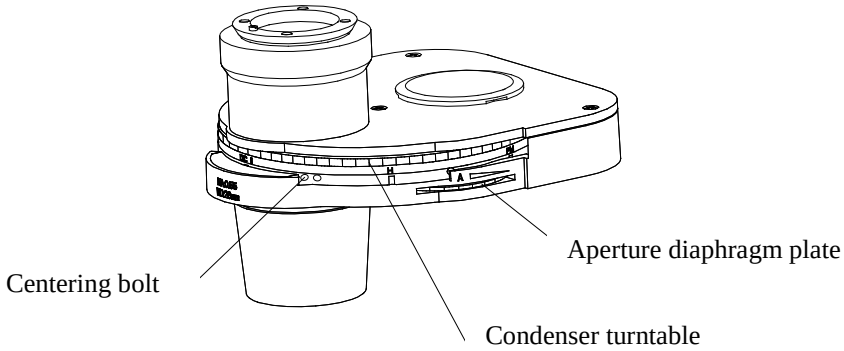
NA:0.55

WD：26mm

Condenser turntable/6 positions

Bright field：H

Phase contrast：PH1, PH2, PH3



Pic. 16

Adjust the aperture diaphragm: rotate the diaphragm plate

6 position adjust: rotate the condenser tunable, if you turned the bright field/H into the light path, make the mark “H” face you.

Phase contrast ring centering bolt: use 1.5mm hexagon screwdriver to adjust the phase contrast ring to match the objective.

Replacing DIC prism

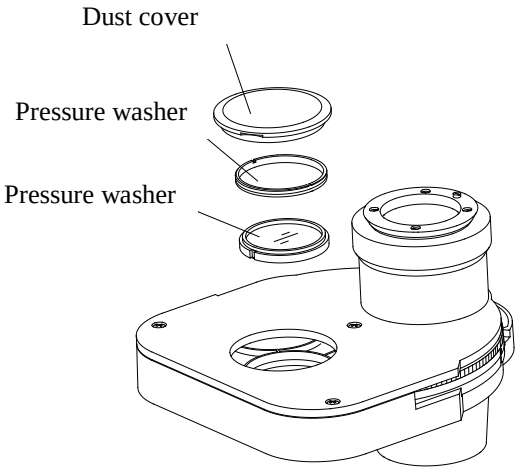
Take out the condenser and put it on the plate form before replacing the DIC prism

Take out the dust cover, screw out the pressure washer with matched tools, and turn over the condenser to let the DIC prism slip off.

Put the new DIC prism to the groove of condenser, screw the pressure washer in and cover the dust cover, shown in pic.17

★attention the direction of the DIC prism and clip it into condenser carefully to protect the prism surfaces.

★make sure the scale ring in the tunable is right.



Pic. 17

4. Transmitted light field diaphragm

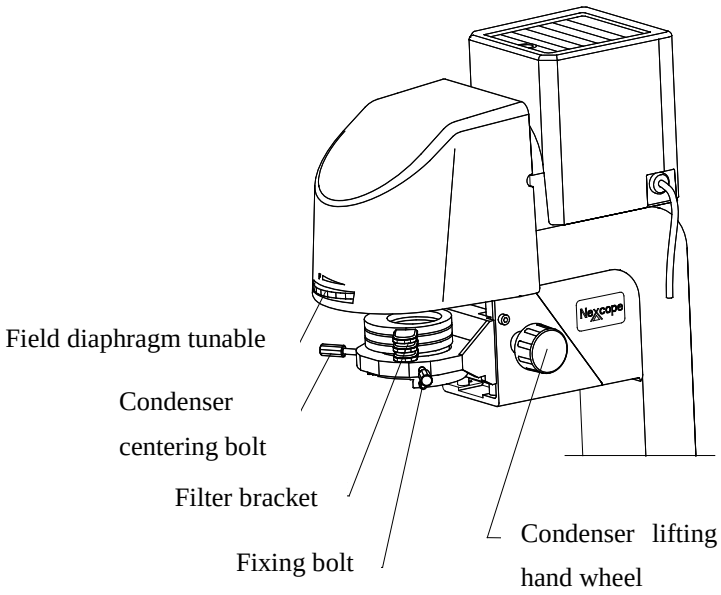
When using transmitted illumination, screw the tunable to adjust the field diaphragm.

Screw the condenser lift hand wheel to lift the condenser and set the observe height.

The condenser is fixed by fixing bolts.

Screw the 2 condenser centering bolts to move the condenser to the center of the light path.

The filter bracket can hold different filters.

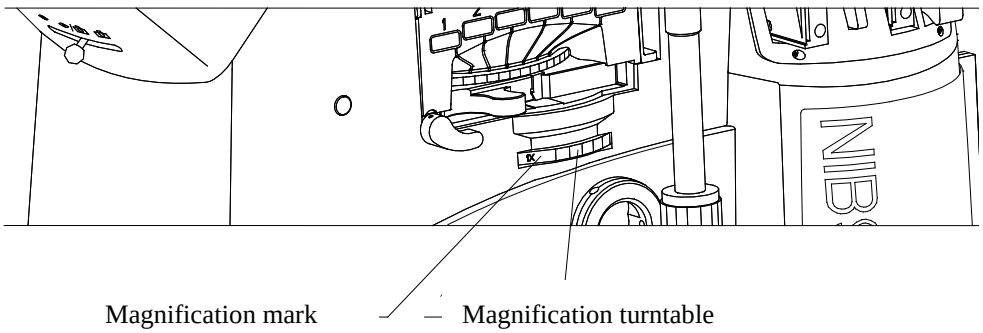


Pic. 18

5. Middle magnification converter

The middle magnification mark: 1X/1.5X

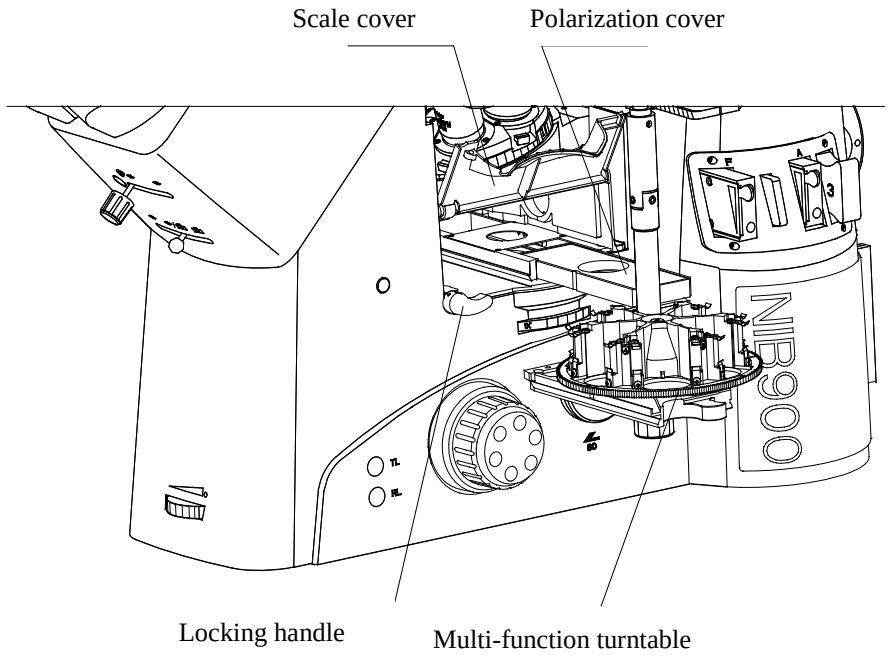
You can directly convert the middle magnification the change the observe magnification.



Pic. 19

6. Multi-function modules

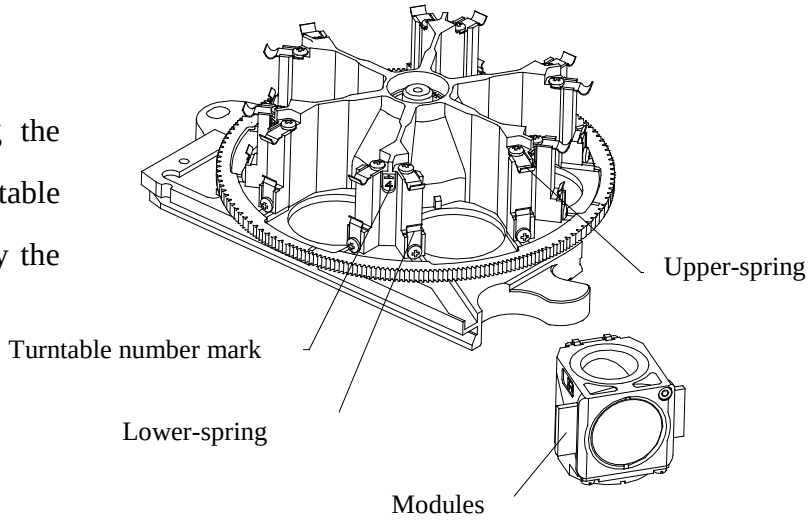
6 modules optional .Turn over the scale cover plate, turn down the locking handle, you can insert and extract the turntable.



Pic. 20

Install the multifunction module

Make the module sides along the lower-spring to insert it into turntable and press the module tightly by the upper-spring.

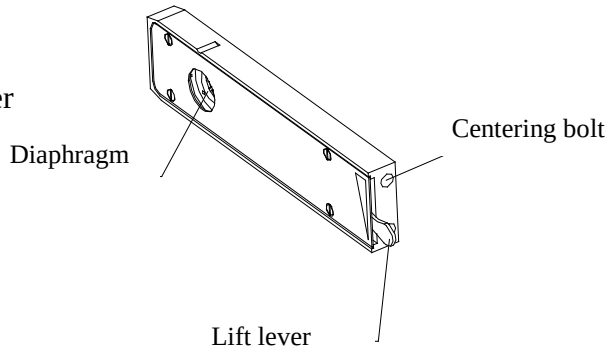


★ Notice that the module mark should match the number mark on the turntable.

Pic. 21

7. Aperture/field diaphragm of reflected light

Adjust the diaphragm by move the lifting lever



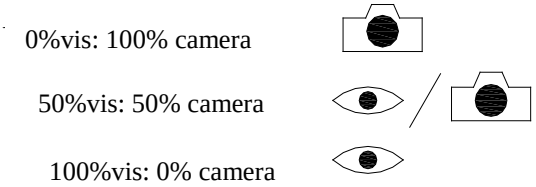
Set the diaphragm center to the optical path center by adjust two centering bolt using 3mm hexagon screwdriver.

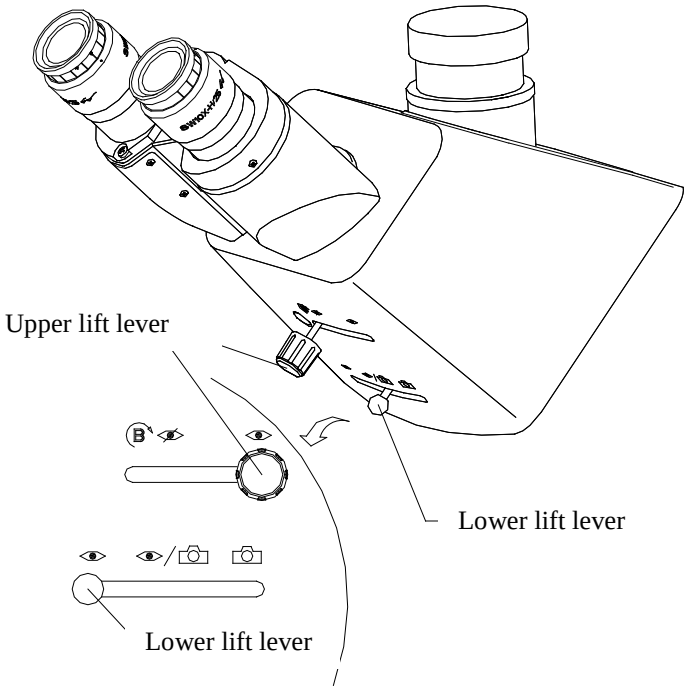
Pic.22

8. Trinocular tube

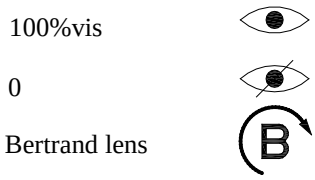
Trinocular tube：

45°/25 trinocular tube equipped with vis/doc slip prism, Bertrand lens and manual vis switch.





Upper lift level-a lift block to focus the Bertrand lens



Pic. 23

Cautions in observation

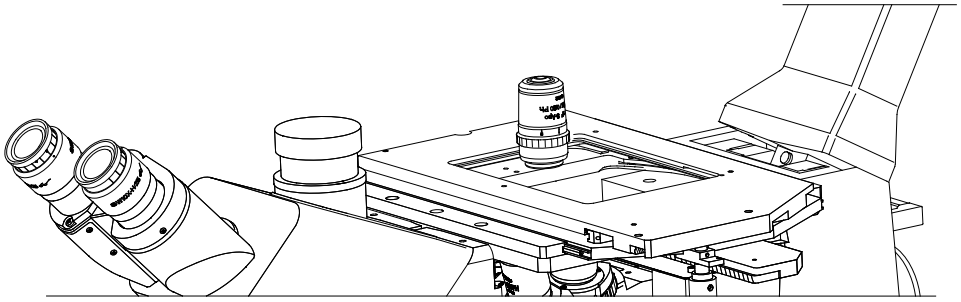
1. Objective

① When rotating the converter to change objectives, a sound of click can be heard if the objective is right at the center of the light path.

② when operating, firstly search and focus the sample by a low magnification objective(4X or 10X) and then change to a high magnification objective to observe according to your needs.

③ The objectives can also be changed by install through the aperture in the platform.

Notice that the magnification should match the scale on the converter, in normal cases when you rotate the converter clockwise, the magnification will get higher.



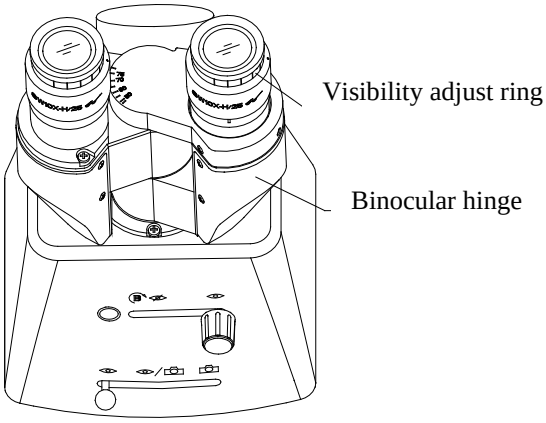
Pic. 24

2. Trinocular tube

①Visibility adjustment

Observe one eyepiece by one eye and rotate the coarse focusing hand wheel to focus on sample, then observe another eyepiece by another eye. If the image is not clear, use the visibility adjust ring to it clear by both eyes.

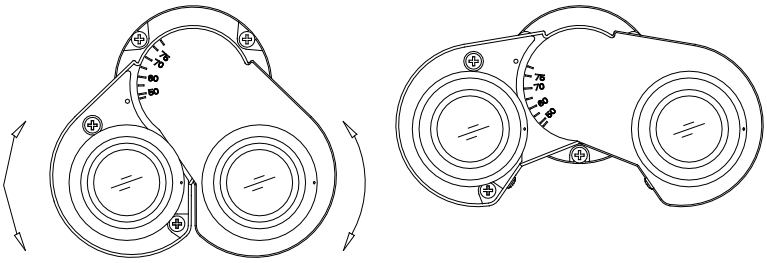
★There are ±5 diopters on the visibility adjust ring of the eyepiece , the value which align at the dots on eyepiece holder is the visibility of eyes.



Pic. 25

②Interpupillary distance adjustment

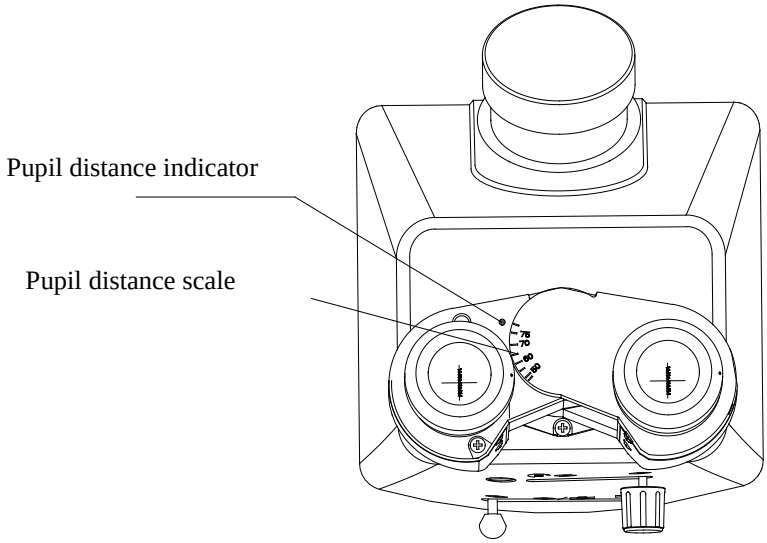
Rotate the binocular hinge to adjust the pupil distance and unity the field of two eyes, also adjust the height of exit pupil.



Pic. 26

Range of pupil distance：55～75mm

The scale on the pupil distance board corresponded with the dot "· " is the value of pupil distance.



Pic.27

Transmitted illumination

1. Bright field observation

Trinocular tube-------upper lift level , lower lift level

Condenser--------H/bright field

Middle magnification converter------1X

Multi-function modules ----transmitted module (number 3)

2. Phase contrast observation

Trinocular tube------ upper lift level , lower lift level

Condenser--------PH1/PH2/PH3

Middle magnification converter------1X

Multi-function modules ----transmitted module (number 3)

① The magnification of phase contrast objective should match the condenser phase contrast mark. PH1/10X-20、PH2/40X、PH3/60X

② Centering phase contrast ring shown in pic.28.

If the phase contrast ring is not centered, use 1.5mm hexagon screwdriver to adjust by following steps:

a. Put a sample on the platform and focus it.

b. Take out the eyepiece and insert the centering telescope into the eyepiece tube.

c. Make sure the matched phase contrast ring 2(in the objective) and phase contrast ring 1(in the condenser) have shifted in the light path.

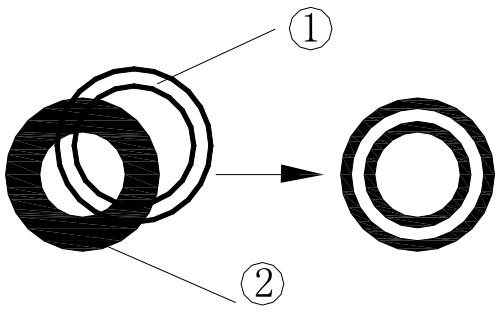
d. Observe through centering telescope, adjusting the phase contrast ring by 1.5mm hexagon screwdriver until the 2 centers overlaps.

f. The above methods apply to objectives of different magnification.

★ If the phase contrast ring is not centered properly, the best effect can't be get.

★ The phase contrast ring may shifted after remove the sample or replace it with a thicker sample, if this occurs, repeat the above steps until the 2 centers overlap.

★ If the glass slide or vessel is not flat, for a bigger contrast, repeat the above steps to adjust the 2 centers overlap.



Pic.28

3. Differential Interference Contrast (DIC) observation

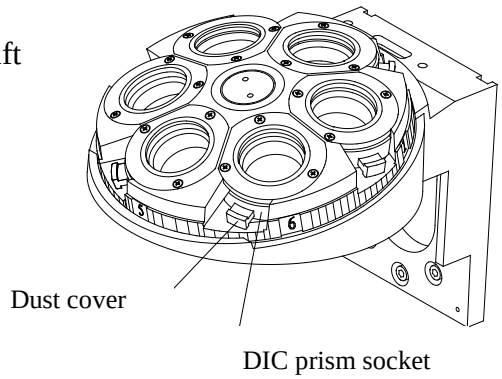
Trinocular tube----- upper lift level , lower lift level

Condenser--------DIC、DIC Ⅱ

Middle magnification converter------1X

Multi-function modules ----transmitted module (number 3)

Side port converter------



Pic. 29

The condenser DIC mark should match the DIC prism in the socket of objective converter.

The polarizer should be put into the light path. First install the polarizer into the top most filter holder above the condenser – the pin on the bottom of the polarizer should fit into the large slot of the filter holder.

The analyzer slider should be put into the light path. Insert the slider

Reflected illumination

1. Bright field observation

Trinocular tube----- upper lift level , lower lift level

Middle magnification converter------1X

Multi-function module ----bright field module (number1)

2. Dark field observation

Trinocular tube----- upper lift level  , lower lift level 

Middle magnification converter------1X

Multi-function module ----dark field module (number2)

3. Reflected polarization and cone light observation

Trinocular tube-----upper lift level  , lower lift level 

Middle magnification converter------1X

Multi-function module-----polarization light module (number4/single polarized, 5/polarized, 6/circular polarization light)

Side port converter------ 

4. Vertical fluorescence

Trinocular tube-----upper lift level  , lower lift level 

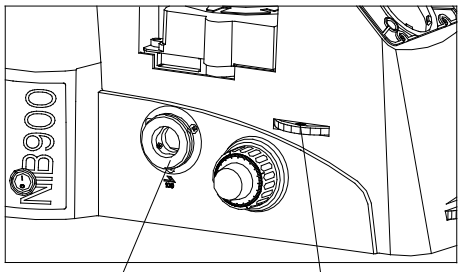
Middle magnification converter------1X

Multi-function module------ fluorescence module（B、G、U、V）

Side port converter------ 

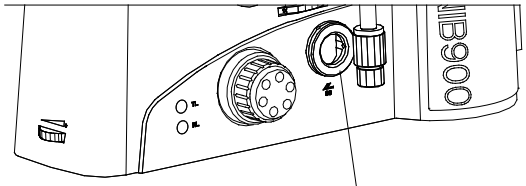
Ⅵ Microscopy imaging

1. Side port imaging



Left side port screw thread

Splitting label



Right side port screw thread

Pic.30

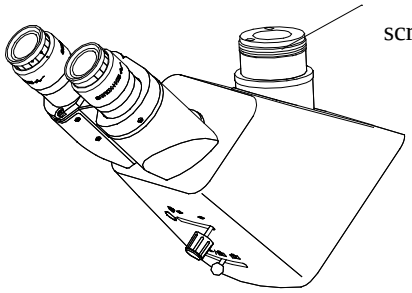
20%vis: 80% camera left 

0%vis: 100% camera right 

2. Trinocular tube imaging

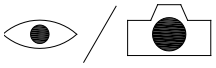
upper lift level:

100%vis 

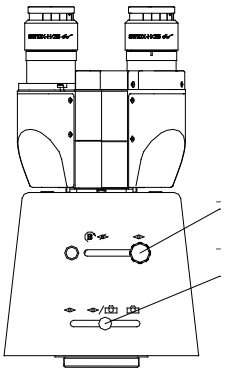


Trinocular port screw thread

lower lift level

50%vis: 50% camera 

100%vis: 0% camera 



Upper lift level

Lower lift level

Pic. 31

Ⅶ Technical specification

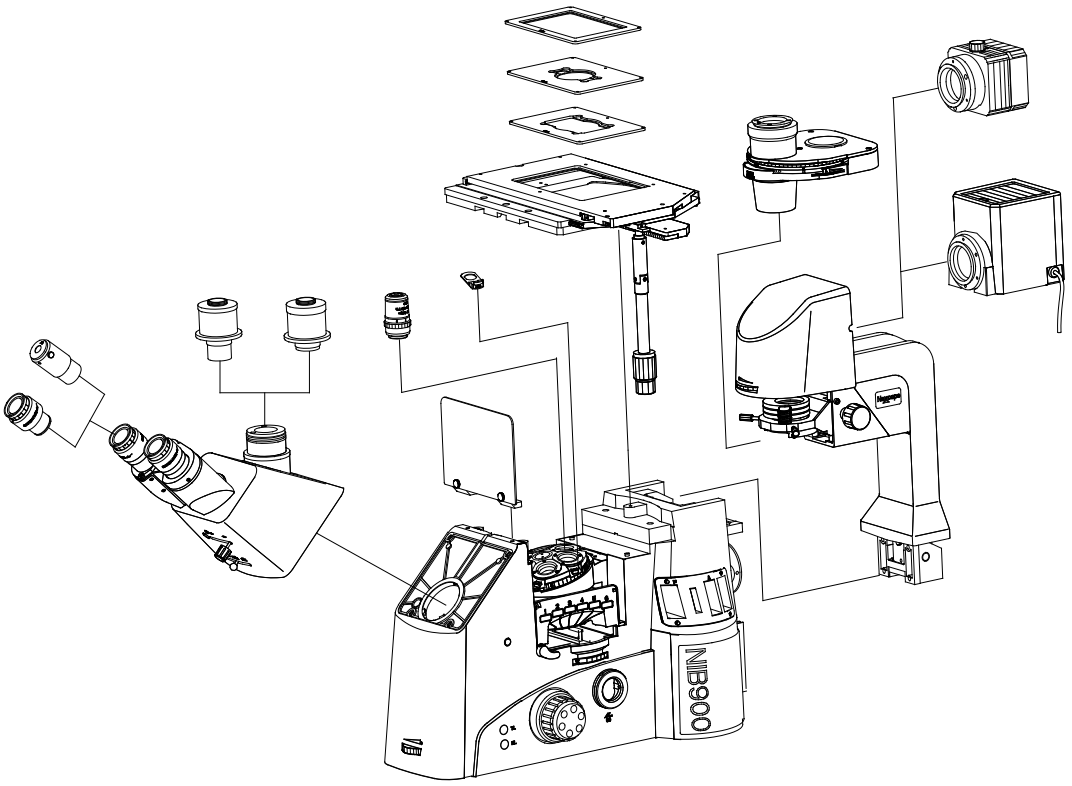
1. Main technical specification

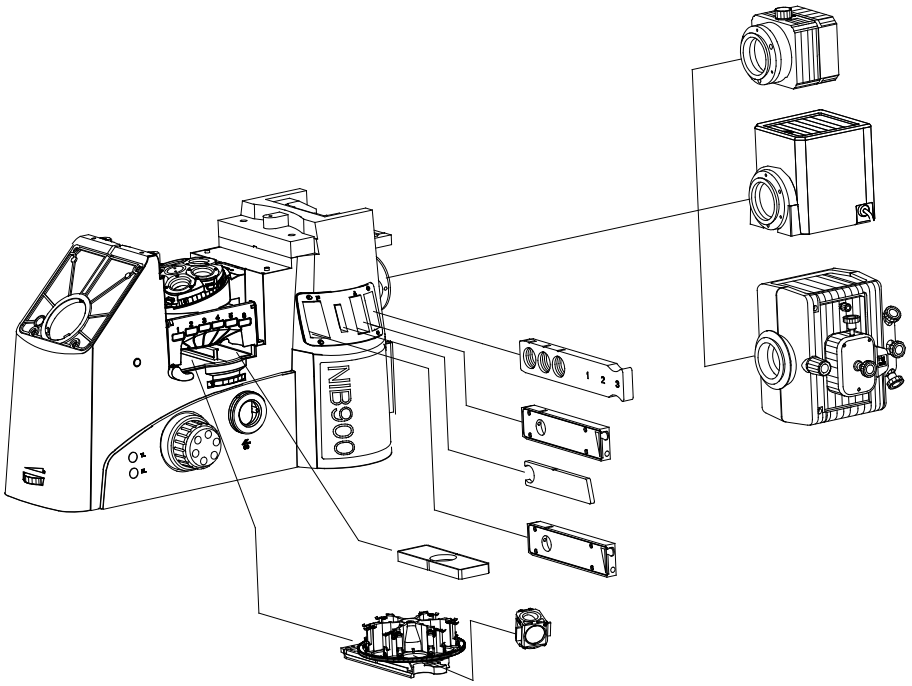
Optical system	Infinite system
Observe tube	Hinge binocular tube，45° tilt
Eyepiece	10X wide field eyepiece with line field ofΦ25mm
Objective converter	Six-hole converter
Objective	Infinite plan phase contrast：10X, 20X, 40X, 60X
Focusing	Coarse and fine coaxial focus Coarse focusing 2mm/cycle Fine focusing 0.2mm/cycle Stroke (from the plat focal point):up 7mm，down 2mm
Platform	Range of move：135(length)X 80(wide)mm
Illumination	12V 100W halogen tungsten lamp with center preset and brightness adjustable continently
Condenser	Working distance LD26mm, NA0.55
Operating environment	● Used indoor ● Max altitude: 2000m ● Environment temperature：5℃~40℃(41℉～109℉) ● Max relative humidity: 80% at temperature of 31℃(88℉) Decreased linear with temperature 70% at temperature of 34℃(93℉) 60% at temperature of 37℃(99℉) 50% at temperature of 40℃(104℉) ● Pollution level：level 2 ● Power supply：100-240V AC ±10%, 50/60HZ ● Consumed power：100W ● Fuse：T5A/250V Φ5X20mm ● Air pressure：80kPa～106kPa ● Overvoltage category：category Ⅱ

2. Objective parameters

Class	Magnification	Number aperture （N.A）	Working distance (mm)	Conjugate distance (mm)	Parfocal distance (mm)	Glass Slide thickness (mm)
Infinity plan apochromatic objective	10X	0.30	7.4	∞	60	1.2
	20X	0.45	7.5-8.8			0-2
	40X	0.60	3-4.4			0-2
	60X	0.70	1.8-2.6			0.1-1.3

Ⅷ Configuration diagram of EXI-600 inverted biological microscope





Trouble shooting

In particular cases, the performance of this device may be affected reversible by some non-deficit factors. If trouble occurs, take the proper solution listed by the following chart. If the trouble is still not solved, please contact the sales department of our company.

Problem	Cause	Solution
1.Optical part		
a. Although the illumination is on, the field of view is still dark.	Lamp holder pin has not connected to the illumination device	Connect them correctly
	The bulb burns	Exchange a new bulb
	Brightness adjusted too low	Adjust the brightness properly
	Too many filters used	Minimize the filters according to actual needs
	The bulb is not indicate	Use 12V 100W halogen bulb
b. The edge of the field of view has shadow or not evenly illuminated	The objective converter is not in the correct position	Make sure the converter is in the correct position
	Filter stops in middle way	Push it completely
	Phase contrast plate is not in the correct position	Push the phase contrast plate to the located position
c. See dusts or pollution in the field of view	There are dust or pollution on the sample	Exchange a clean sample
	There are dust or pollution on the eyepiece	Wipe the eyepiece
d. There is ghost image	Aperture diaphragm is too small	Increase the aperture diaphragm
e. Resolution troubles ● The image is not obvious; ● The contrast is not good; ● The detail is not clear; ● No phase contrast	The objective converter is not in the correct position	Make sure the converter is in the correct position
	Aperture diaphragm is too small or too big in bright field observe	Adjust the aperture properly
	Lenses (condenser, objective, eyepiece or culture dish) is soiled	Make them fully cleaned
	The thickness of culture dish bottom is over 1.2mm in phase contrast observation	Use a culture dish with the thickness of bottom less than 1.2mm

effect gained	The bright field objective is used	Use the phase contrast objective
	The condenser ring is not match the objective ring	Adjust the condenser ring to match the objective ring
	The light ring is not centered with phase contrast	Adjust the centering bolts
	The objective is not compatible with the phase contrast observe	Use a objective compatible with the phase contrast observe
	When observing the edge of culture dish, the phase contrast ring deviate the light ring	Move the culture dish to get the phase contrast effect
f. The image blurs at one side	The objective converter is not in the correct position	Make sure the converter is in the correct position
	The sample is not correctly positioned on the platform	Positioned the sample correctly
	The optical performance (such as the profile) of the culture dish bottom is poor	Use a well profiled culture dish

2. Electrical part

a. Bulb didn't shine	No power supply Bulb isn't installed correctly Bulb burns out	Check and connect the power wire Install the bulb correctly Exchange the bulb
b. Bulb burns out frequently	Non-indicate bulbs used	Use indicate bulbs
c. Brightness is not enough	Non-indicate bulbs used	Use indicate bulbs
	The brightness adjust knob is not used correctly	Use it correctly
d. The light twinkles	Bulb is nearly burned out	Exchange the bulb
	Power wire is badly connected	Connect the power wires correctly

3. Observe tube

The field of one eye is not coincide with the field of another eye	Pupil distance is wrong	Adjust the pupil distance
	Diopter is not correctly adjusted	Adjust the diopter
	Have not adapt the microscope observation yet	When observing from the eyepiece, observe the whole field of view before concentrate on the sample, it is benefit to look up or faraway before observe.

4. Microscopy imaging

a. Image defocused	Focusing incorrectly	Adjust the focal length to make the double cross line and sample visible clearly.
b. Edge of image blurred	The using achromatic objective can't focus the edge	Blur is inevitable
c. The image of window or light appeared	The outside beam entered the eyepiece or viewfinder is reflected	Cover the objective and viewfinder of the illumination system

Ⅹ Maintenance

1. Use gauze to swipe glass components slightly. If you want to remove the fingerprints and oil stains, use thimbleful alcohol and diethyl ether mixed liquor (3:7) or dimethylbenzene to wipe.

★Diethyl ether and alcohol are both extremely flammable, DO NOT get them near to open flames or any potential electro sparks such as the switch of electrical device. Use these chemical products in well ventilated rooms as much as possible.

2. Do not use organic solvent to wipe any non-optical components. If you want to clean these components, use a hairless and soft cloth to dip a little of neutral cleaner to wipe.

3. If the microscope is wetted by liquid when operating, cut off the power supply immediately and wipe the liquid.

4. Do not separate any parts of the microscope otherwise the function and performance of the microscope may be affected.

5. The hole on the objective converter must be covered with dust cover if it is not occupied with objective in case of dusts or culture solution enter the inside of the device.

6. The microscope should cover with dustproof shield when it is unused. Wait until the lamp house fully cooled before covering the dustproof shield.

7. The check and replacement of components of this product should be executed by our company or the indicated agency which also provide the accessories.