



MICROSCOPY + METROLOGY SERVICES

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Instruction Manual ZEISS Primotech Upright Microscope



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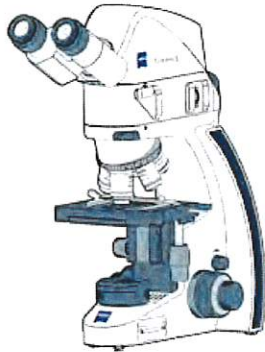
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1 Introduction

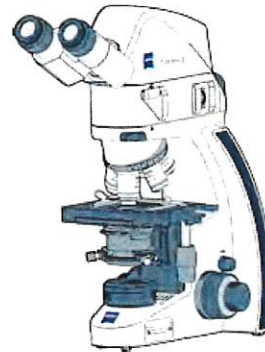
1.1 Welcome

Welcome to the Primotech User Documentation.

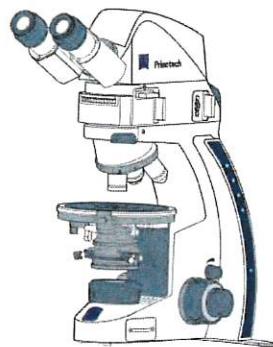
Primotech is the new family of upright microscope from ZEISS. Its design and intuitive controls result in a simple, robust, easy-to-use yet powerful microscope that helps you inspect a wide range of samples. Primotech microscopes can also be connected to iPad or Windows based ZEISS software Matscope to process and analyze images. Connecting the microscope to a WLAN network even enables multiple users to view a sample simultaneously.



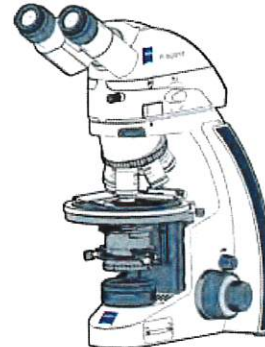
Primotech MAT



Primotech T/R MAT



Primotech T/R POL Conoscopy



Primotech T/POL Conoscopy

1.2 Primotech Features

Four types of Primotech microscope are available. The different microscopes have different features and are suitable for different applications:

Feature	Primotech MAT	Primotech T/R MAT	Primotech T/R POL Conoscopy	Primotech T/POL Conoscopy
Reflected light	Yes	Yes	Yes	-
Transmitted light	Yes	Yes	Yes	Yes
Condenser	-	Köhler	Köhler	Köhler
Stage	X-Y	X-Y, ESD	Rotatable	Rotatable
Centering of objectives	-	-	Yes	Yes

Feature	Primotech MAT	Primotech T/R MAT	Primotech T/R POL Conoscopy	Primotech T/POL Conoscopy
Main feature	Suitable for large sample heights (< 34 mm)	Suitable for medium sample heights (< 17 mm)	Designed for polarization analyses in RL or TL	Designed for polarization analyses in TL only

For a detailed list of components per microscope, see *Scope of Delivery* [▶ 69].

1.3 Overview of this Document

This document contains all the information you need to assemble your microscope, perform various types of examination, connect it to an iPad, as well as to perform troubleshooting and maintenance.

The majority of the documentation applies to all Primotech microscopes. General exceptions:

- Chapter 4 only applies to:
 - Primotech T/R MAT
 - Primotech T/R POL Conoscopy
 - Primotech T/POL Conoscopy
- Chapter 5 only applies to:
 - Primotech T/R POL Conoscopy
 - Primotech T/POL Conoscopy
- All topics related to reflected light do not apply to Primotech T/POL Conoscopy

Individual details that are only specific to a certain microscope are indicated within each topic.

Info

The appearance of the microscope in illustrations may differ from that of your microscope.

1.4 Intended Use

Primotech microscopes are all-purpose light microscopes primarily designed for industrial applications such as:

- Metallurgy
- Electronics
- Geoscience

Primotech microscopes are also designed for use in education.

Primotech microscopes, including their original accessories, must not be used for microscopic techniques other than those described in the Instruction Manual. Using the microscope for any other purpose is not allowed and could be hazardous.

Do not operate Primotech microscopes or any accessories in potentially explosive areas, in the presence of volatile anesthetics, or in the presence of combustible solvents, such as alcohol, benzene, or similar chemicals.

Info

The Safety Information document is also considered to be part of the Primotech microscope. You must follow all the instructions provided in this document.

Primotech microscopes have been designed, produced, and tested in compliance with the standard EN 61010-1 (IEC 61010-1) "Requirements for Electrical Measuring, Control, and Laboratory Instruments".



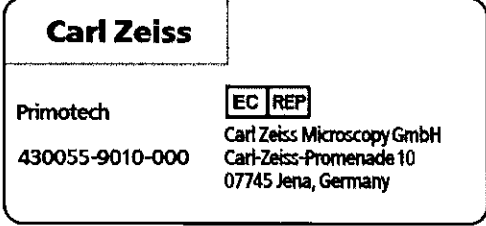
Primotech microscopes meet the requirements of EU directive 2014/35/EU, RoHS directive 2011/65/EU (including directive 2015/863/EU and their amending of Annex II to directive 2011/65/EU), and EMC directive 2014/30/EU and carry the mark. **CE**

Radio interference suppression complies with EN 55011 Group 1 Class A.

Primotech microscopes must be disposed of in accordance with the WEEE Directive 2012/19/EU. For more information on disposal and recycling please consult your ZEISS representative.

1.5 Information Labels

The meaning of the individual information labels is explained in the following:

Symbol	Description
	Microscope type label
	Microscope type label
	Primotech Authorized Representation in the EC Carl Zeiss Microscopy GmbH Carl-Zeiss-Promenade 10 07745 Jena, Germany

Also refer to the document Safety Information.

2 System Overview

2.1 Overview

This chapter describes the main components and controls of Primotech microscopes, as well as the types of illumination supported.

Primotech microscopes support both transmitted light and reflected light illumination.

Primotech MAT
430055-9000-000

Primotech MAT, bino tube 430055-9040-000



Primotech MAT, 3MP tube 430055-9140-000



Primotech T/R MAT
430055-9010-000

Primotech T/R MAT, ESD, bino tube
430055-9050-000



Primotech T/R MAT, ESD, 3MP tube
430055-9150-000



Primotech T/R POL
430055-9400-000

Primotech T/R POL conos., Pol tube
430055-9080-000



Primotech T/R POL conos., 3MP tube
430055-9180-000

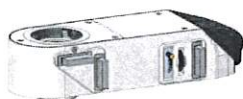


Primotech T/POL
430055-9420-000

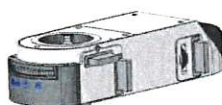
Primotech T/POL conos., Pol tube
430055-9071-000



Primotech T/POL conos., 3MP tube
430055-9170-000



Reflected Light Ill. LED 423733-9000-000



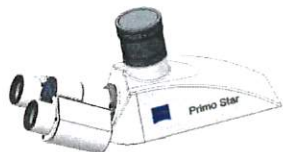
Intermediate tube T/R POL conos. 423733-9030-000



Bertrand system, transm. Light 423733-9100-000



Tube 30°/20 425538-9000-000



Binocular phototube 30°/20 (50:50) 425538-9010-000



Tube 30°/20 int. Cam. 5MP 425538-9020-000



Tube 30°/20 int. Cam. 3MP 425538-9030-000



Tube 30°/20 Pol 425538-9040-000



Quartz depolarizer 428106-9040-000



Polarizer Slider R, fixed 428108-9031-000



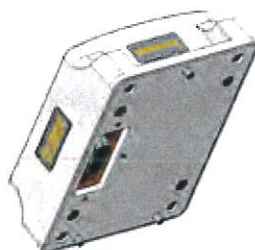
Analyzer Slider T/R rotat. 360° 428108-9021-000



Analyzer Slider T/R, fixed 428108-9050-000



Object guide Pol, attachable 35 x 30mm 432338-9000-000



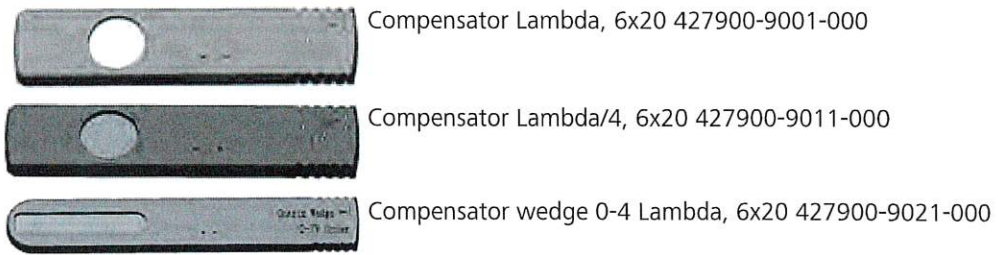
Interface module MNA basic, 430055-9100-000

Interface module MNA advanced, 430055-9110-000



Filter slider 2x, d=25mm 423733-9011-000

Filter slider 2x should be sold together with conversions filter 5700-3200 K, d=25 mm 427809-9010-000 (for reflected light)



Eyepieces:
 Eyepiece E-PI 10x/20 Br foc 444232-9904-000
 Eyepiece E-PI 10x/20 Br foc Pol (including crossline) 444037-9903-000
 Crossline graticule, d=26 mm 474064-0000-000

Objectives A-Plan 2,5x/0,06 WD=10.4mm - 441010-9901-000
 A-Plan 5x/0.12 Pol WD=9.9mm - 441023-9900-000
 A-Plan 10x/0.25 Pol WD=4.2mm - 441033-9900-000
 A-Plan 20x/0.45 Pol WD=0,50mm - 441043-9900-000
 A-Plan 40x/0.65 Pol WD=0.43mm - 441053-9900-000
 A-Plan 63x/0.8 Pol WD=0.30mm - 441063-9900-000
 Epiplan 5x/0.13 WD=20.5mm - 442020-9902-000
 Epiplan 10x/0.23 WD=11.1mm - 442030-9903-000
 Epiplan 20x/0.4 WD=4.1mm - 441043-9900-000
 Epiplan 50x/0.65 WD=1.6mm - 442060-9901-000
 Epiplan 100x/0.8 WD=1.3mm - 442080-9901-000

Camera AxioCam ERc 5s Rev.2 426540-9901-000
 AxioCam ERc 5s Rev.2 Accessory pack 426540-0003-000
 C-Mount Adapter 60N C 2/3" 0.5x 426112-0000-000

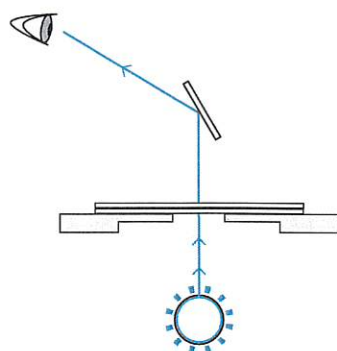
Others Color filter, mounted (for transmitted light) 000000-1764-617
 Calibration slide for Lab Scope 474029-9090-000
 Leveling press, w. Starter kit 434002-9010-000
 Case for transport and storage 434002-9000-000

2.2 Types of Illumination

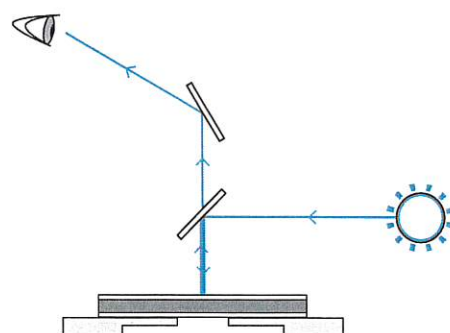
Primotech microscopes support both transmitted light and reflected light illumination.

Transmitted Light In transmitted light illumination, the light source is below the sample. The light passes through the sample before being focused into the eyepieces. Transmitted light is particularly suitable for the following scenarios:

- Thin samples
- Polarization examinations
- Conoscopy examinations



Transmitted light



Reflected light

Reflected Light In reflected light illumination, the light source is above the sample. The light is reflected from the surface of the sample before being focused into the eyepieces. Reflected light is particularly suitable for the following scenarios:

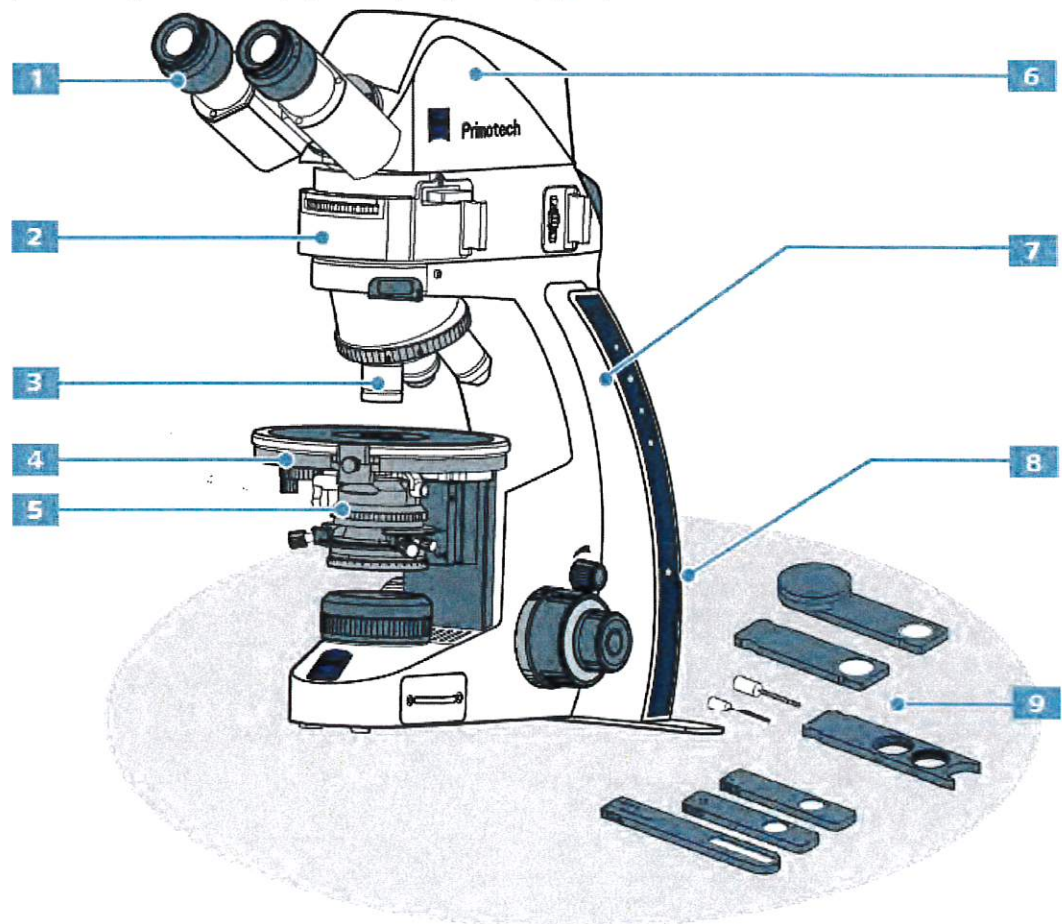
- Thick samples
- Surface examinations, especially of metallic or ceramic samples

Info

Primotech T/POL Conoscopy does not feature reflected light.

2.3 Main Components

Primotech microscopes consist of the following main components. For a detailed list of the components of your microscope, see *Scope of Delivery* [▶ 69].



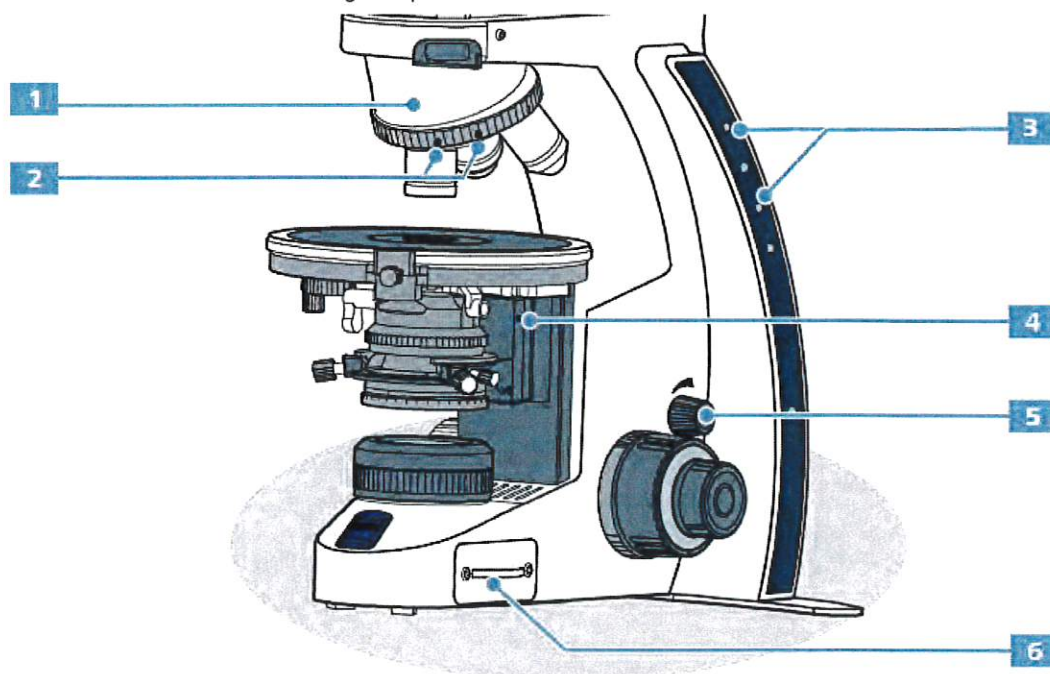
- 1** Eyepieces
- 2** Intermediate tube
- 3** Objectives
- 4** Stage
- 5** Condenser and aperture diaphragm
- 6** Tube
- 7** Microscope stand

- 8 Microscope Network Adapter (MNA) (see *Changing the Microscope Network Adapter* [▶ 58])
- 9 Accessories: polarizers, analyzers, compensators, filter holders, and tools

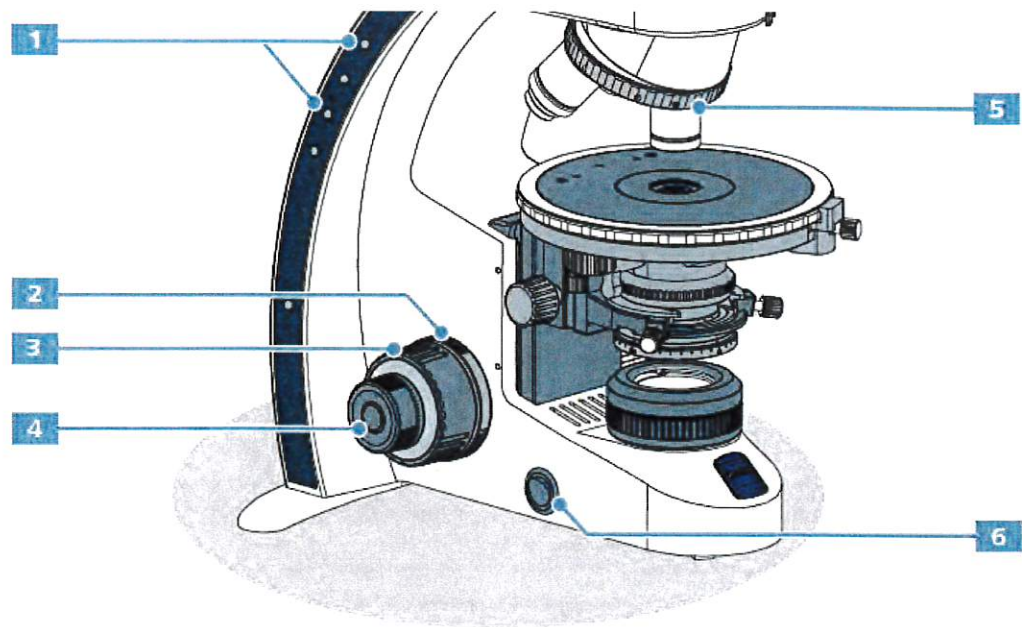
2.4 Components and Controls

Primotech microscopes consist of various components and controls. The exact configuration depends on your microscope. For more information, see *Scope of Delivery* [▶ 69].

The stand contains the following components and controls:



- 1 DIN 6x20 slot for lockable compensators
- 2 Objective centering screws
- 3 Reflected light intensity indicators
- 4 Condenser limit screw
- 5 Light intensity control
- 6 Transmitted illumination light source

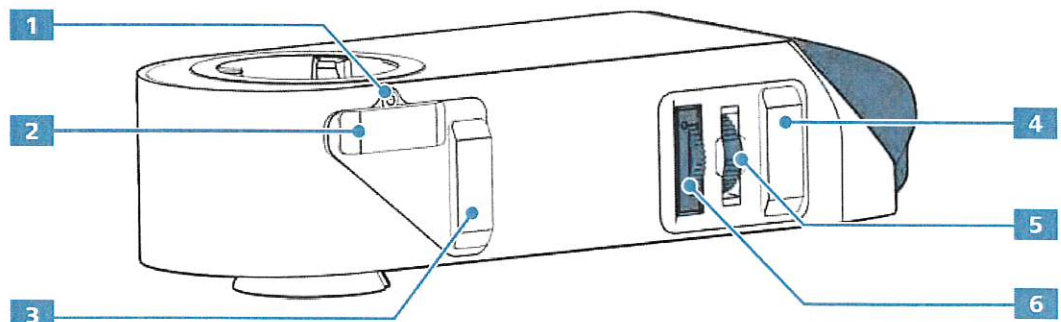


- 1** Transmitted light intensity indicators
- 2** Adjust torque of focus wheels
- 3** Coarse focus drive
- 4** Fine focus drive
- 5** Rotatable nosepiece to select objective
- 6** Power switch

2.4.1 Intermediate Tubes

Three different intermediate tubes are available. The standard intermediate tube is supplied with the following microscopes:

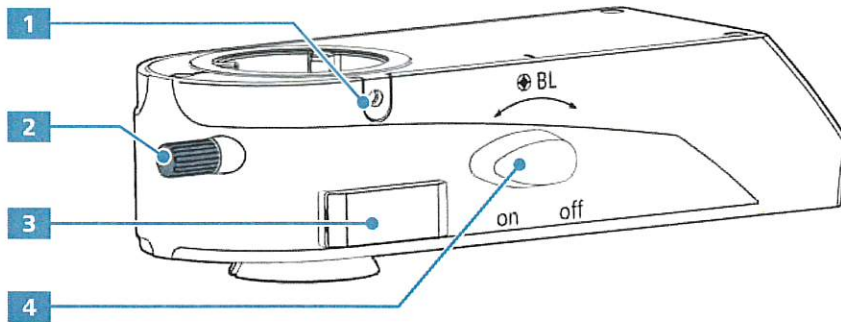
- Primotech MAT
- Primotech T/R MAT



- 1** Tube mounting screw
- 2** Slot for analyzer
- 3** Slot for polarizer (reflected light)
- 4** Slot for filters (e.g.color)
- 5** Aperture diaphragm (reflected light)
- 6** Oblique illumination slider

▪ Primotech T/POL Conoscopy

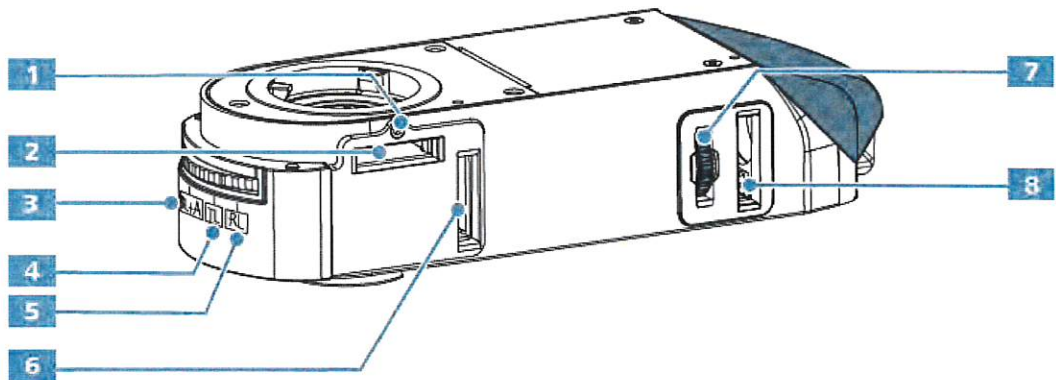
The intermediate tube with focusable Bertrand lens is only supplied with Primotech T/POL Conoscopy.



- 1** Tube mounting screw
- 2** Bertrand lens focus
- 3** Slot for analyzer (transmitted light)
- 4** Swing Bertrand lens into beam path

▪ Primotech T/R POL Conoscopy

The turret intermediate tube with 3 positions is only supplied with Primotech T/R POL. Conoscopy.

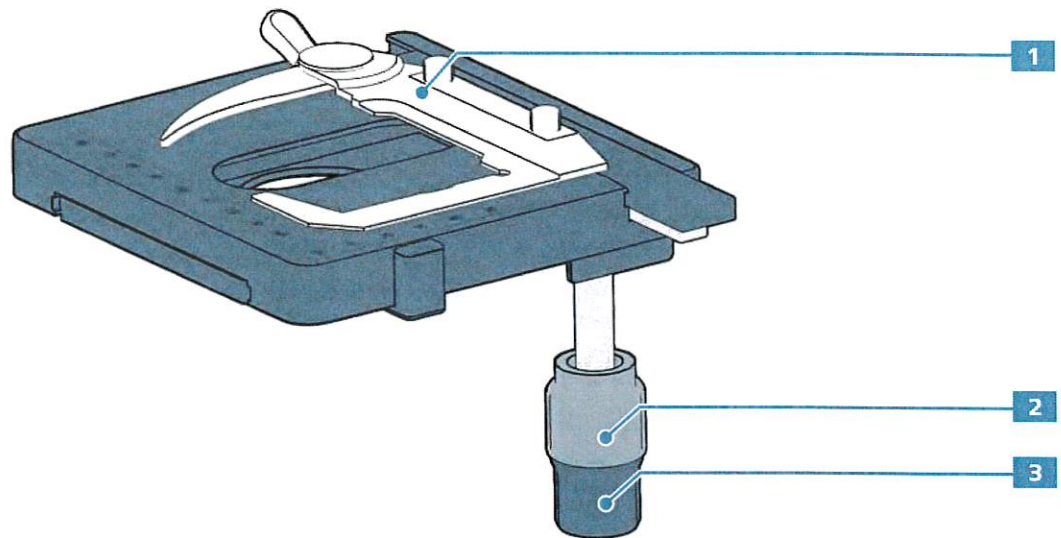


- 1** Tube mounting screw
- 2** Slot for analyzer slider
- 3** BL+A: integrated Bertrand lens and analyzer, fixed conoscopy for objective 63x
- 4** TL: Transmitted light in use
- 5** RL: Reflected light in use
- 6** Slot for Polarizer slider (reflected light)
- 7** Aperture diaphragm
- 8** Slot for filters(e.g. color)

2.4.2 Stages

Two different stages are available. The X-Y stage is supplied with the following microscopes:

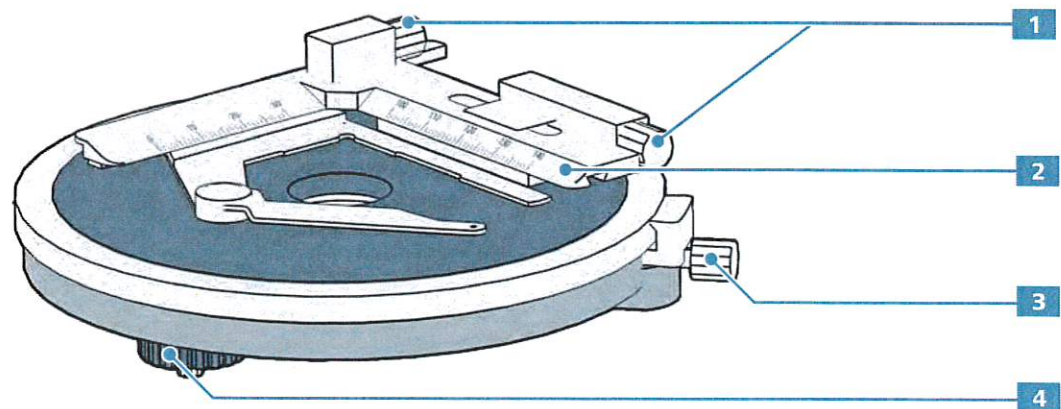
- Primotech MAT
- Primotech T/R MAT



- 1** Object guide
- 2** Move sample along y axis
- 3** Move sample along x axis

The rotatable stage is supplied with the following microscopes:

- Primotech T/R POL
- Primotech T/POL Conoscopy



- 1** Move sample on stage
- 2** Object guide
- 3** Stage rotation lock
- 4** 45° click-stop

2.4.3 Condenser

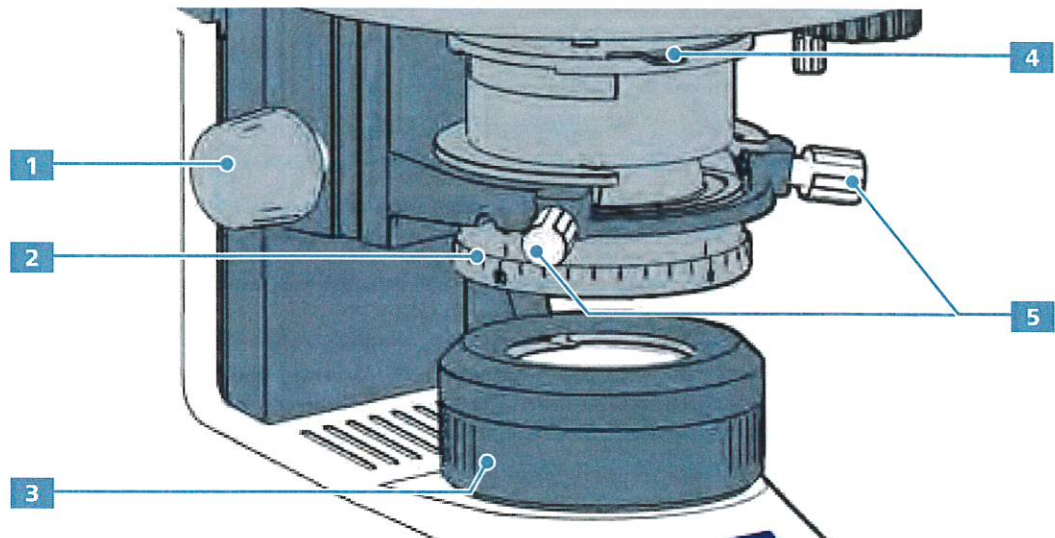
Two different condensers are available for Koehler illumination.

Abbe condenser 0.9 is supplied with the following microscope:

- Primotech T/R MAT

Strainless of Abbe condenser 0.9 is supplied with the following microscopes:

- Primotech T/ POL conoscopy



- 1** Adjust condenser position
- 2** Rotatable polarizer (transmitted light) Not available for Primotech T/R MAT.
- 3** Luminous field diaphragm
- 4** Aperture diaphragm (transmitted light)
- 5** Condenser centering screws

Strainless of Swin-in/out front lens condenser 0.9 is supplied with the following microscope (see item 3 in drawing stand components under *Primotech T/R POL Conoscopy (430055-9080/9180-000)* [▶ 72]).

- Primotech T/R POL conoscopy

Info

The Strainless condenser 0.9 with swin-in/out front lens is used in the situation of:

- ▶ Swing out the front lens when using lower magnification e.g. objective 2.5x for plane polarization observation.
- ▶ Swing in the front lens when using higher magnification e.g. objective 10x for orthoscopic and conoscopy polarization.

3 First Steps

3.1 Overview

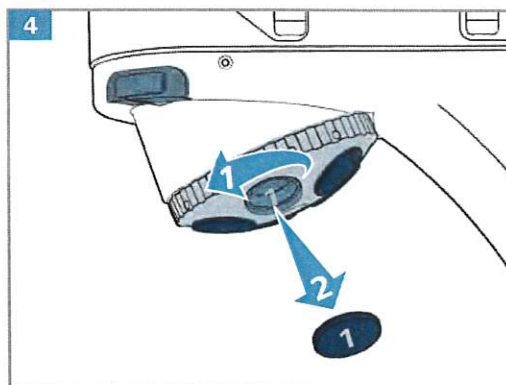
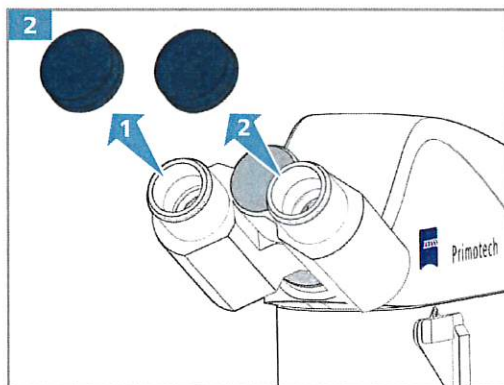
This chapter describes how to get started with your Primotech microscope, from assembling it and performing general one-off calibrations, through to acquiring your first image.

3.2 Assembling the Microscope

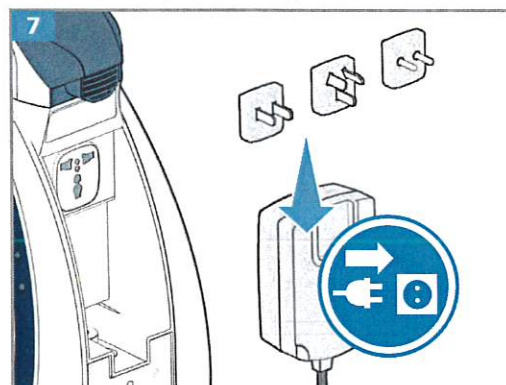
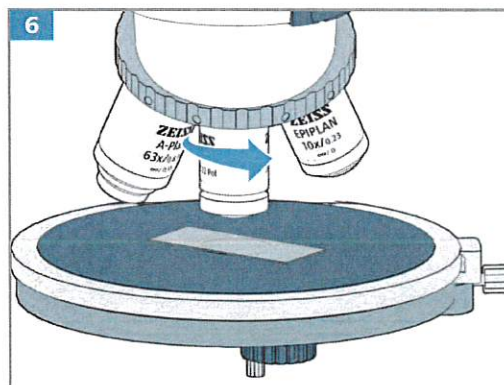
The Primotech microscope stand is supplied with the following standard components already attached:

- Tube
- Stage (rotatable or X-Y stage, as applicable)
- Light sources (transmitted or reflected, as applicable)
- Condenser (if available)

- Procedure**
1. Place the microscope stand on a stable, flat, and smooth surface.
 2. Remove the dustcaps from the tube.
 3. Remove the two eyepiece cups from the protective tubes and push the eyepieces into the tube.
 4. Unscrew the dustcap labeled 1 from the nosepiece.



5. Unscrew the objective with the lowest magnification out of its protective tube and screw it into the nosepiece.
6. Insert the remaining objectives in the nosepiece in order of increasing magnification.
7. Attach the power adapter that is appropriate for your country to the plug.



8. Attach the cables between the tube and the rear of the microscope:
 - Network cable between the network port of the tube and the top of the
 - MNA
 - 12 V power cable between the power socket of the tube and the rear of
 - the microscope stand
9. Plug the microscope into a power socket and press the power switch. The lowest LED on each side of the stand illuminates.

Info

Dirt and dust may impair the performance of the microscope. Use the dust cover to protect the microscope when not in use.

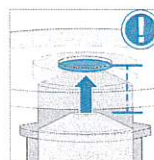
- ▶ Do not place the dust cover over the microscope while the microscope stand is turned on.
- ▶ Wait 10 minutes for the microscope to cool before placing the dust cover over the microscope.

3.3 Inserting the Sample

Primotech microscopes are suitable for a wide range of samples, for example material or mineral samples.

The samples should be prepared according to your standard company or institution guidelines and be within the guidelines specified in the technical data (see *Physical Dimensions and Key Specifications* [▶ 67]).

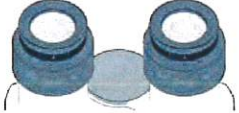
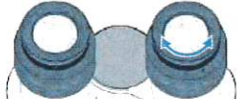
- Procedure**
1. Ensure the condenser tip (if available) is below the stage surface.
For more information, see *Specifying the Condenser Position* [▶ 45].



2. Lower the stage so that the sample can fit below the objectives.
The condenser automatically moves together with the stage. Ensure that the stage is low enough so that none of the objectives collide with the sample when rotating the objective nosepiece.
3. Place the sample on the center of the stage.
You can use the object guide (if available) to fix the sample in place. The object guide has non-overlapping axis scales (e.g. 0-60 mm and 100-140 mm) so that any coordinate pair is unambiguous.
4. If you know the area of interest already, move the sample so that the area is illuminated.
 - To move the sample on the rotatable stage, turn the corresponding screw on the object guide.
 - To move the sample on the static stage, turn the corresponding knob of the coaxial drive under the stage.
5. If the microscope has a rotatable stage, turn it to the desired angle by pushing the stage surface.
You can apply the 45° click-stop control under the stage to rotate the stage in 45° steps.

3.4 Adjusting the Eyepieces

The eyepieces can be used with or without glasses, and can be adjusted to compensate visual impairments. You can adjust various properties of the eyepieces to enhance your viewing experience:

Property	Procedure	Graphic
Distance between the Eyepieces ("interpupillary distance")	Swing the eyepiece tubes symmetrically up or down. The setting is correct when you see one round image when looking through the two eyepieces.	
Viewing height	Each separation has a high and a low viewing height. Swing the eyepieces to their upper or lower position at the desired separation.	
Rotation of the Crosshair Eyepieces with a crosshair are indicated by the additional red dot	To rotate the crosshair, rotate the entire eyepiece. Only Primotech POL stand packages with Tube 30°/20 Pol (425538-9040-000) are supplied with an eyepiece integrated a crossline graticule in fixed orientation.	
Use with glasses	Turn the ring of each eyepiece so that it is in the zero position. For eyepieces with a red dot, the zero should be next to the red dot. For other eyepieces the zero should be next to the white dot.	
Use without Glasses	If you have visual impairments and wish to observe the sample without glasses, you can adjust the eyepieces to compensate for the impairments:	
Procedure	<ol style="list-style-type: none"> 1. Ensure the left eyepiece is in the zero position. The zero on the ring should be next to the white dot of the eyepiece. 2. Select a magnification between 10x and 20x. 3. Look at the sample through the left eyepiece with your left eye only. 4. Raise or lower the stage until the sample is in focus. For more information, see <i>Selecting Objectives and Focusing</i> [▶ 20]. 5. Look at the sample through the right eyepiece with your right eye only. 	 

6. Turn the right eyepiece ring until the sample is in focus.
A diopter scale on the ring also helps you find the correct setting.
7. Turn the right eyepiece ring until the sample is in focus.
A diopter scale on the ring also helps you find the correct setting.

The sample should now be in focus when you look at it with both eyes. Once you have adjusted the eyepieces, you should subsequently only change the focus of a sample by turning the focus wheel. For more information, see *Selecting Objectives and Focusing* [▶ 20].

3.5 Selecting Objectives and Focusing

Selecting Objectives To select a different magnification:

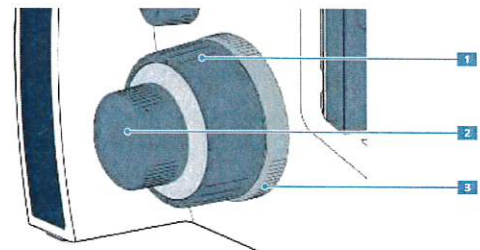
- Procedure**
1. Rotate the objective nosepiece until the objective with the desired magnification is at the front.
Ensure the nosepiece is rotated to a click-stop position.
Ensure the sample is sufficiently far below the objective that they do not collide.
 2. For Primotech T/R POL and Primotech T/POL Conoscopy, ensure the objective is centered.
For more information, see *Centering the Objectives* [▶ 49].



Focusing To focus the sample:

Prerequisite ✓ The eyepieces have been adjusted, see *Adjusting the Eyepieces* [▶ 19].

- Procedure**
1. Select the lowest magnification (e.g. 5 x).
 2. Look through the eyepieces and turn the focus wheel to raise or lower the stage until the sample is in focus.
Ensure that the stage does not collide with the objective during focusing.
 - Turn the larger wheel for coarse focus **1**.
 - Turn the smaller wheel for fine focus **2**.
 3. To view the sample in more detail, select a higher magnification and repeat step 2.
 4. You can adjust the torque of the focus wheel by tightening or loosening the ring between the focus wheel and the microscope stage **3**.



3.6 Adjusting the Illumination Properties

You can adjust the following illumination properties:

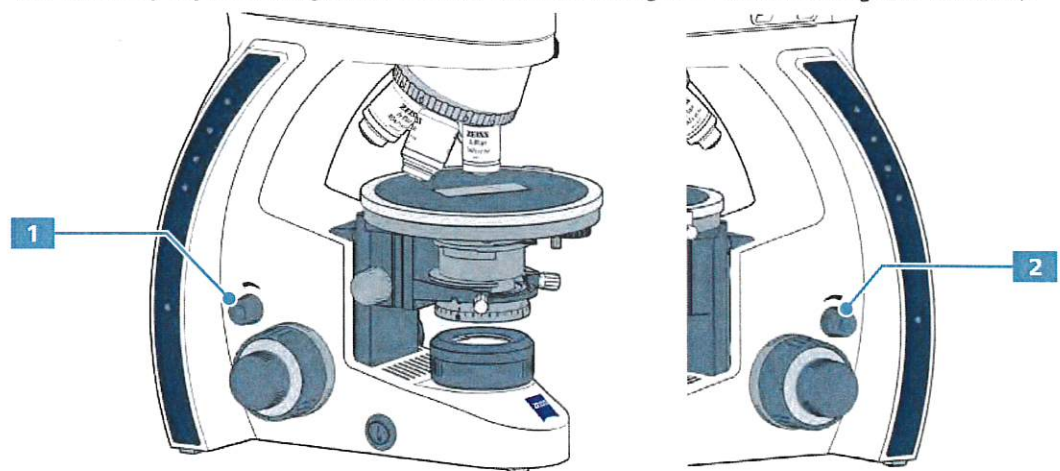
- Brightness of transmitted illumination
- Brightness of reflected illumination
- Color of reflected illumination
- Oblique illumination for reflected illumination

Info

Reflected illumination is not available for Primotech T/POL Conoscopy.

3.6.1 Adjusting the Illumination Brightness

You can freely adjust the brightness of either the reflected light or transmitted light (if available):



1 Transmitted light

2 Transmitted or reflected light (only available for Primotech T/R MAT)

The LEDs on the corresponding side of the microscope stand indicate the brightness of the illumination. You can adjust the brightness of the light sources independently or use both sources concurrently.

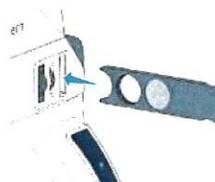
Info

Using reflected light on transparent samples may create reflections which lead to inappropriate illumination of the sample.

3.6.2 Adjusting the Color of Reflected Illumination

Primotech microscopes come with the conversion filters to change the color temperature or profile of the reflected illumination. Conversion filters can be used, for example, to make the color profile of the LED light similar to that of a halogen light.

- Procedure**
1. To use a conversion filter with reflected light, insert the filter slider into the vertical slot on the intermediate tube.



2. To use a conversion filter with transmitted light, place the conversion filter disc on the luminous field diaphragm.

3.6.3 Using Oblique Reflected Illumination

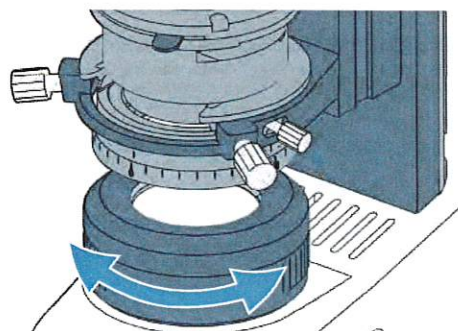
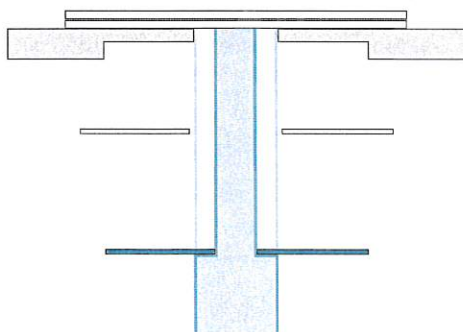
You can adjust the reflected illumination (only available for: Primotech MAT and Primotech T/R MAT) so that the light is projected obliquely onto the sample. This enhances the appearance of height differences on its surface.

- Procedure**
1. To change the direction of the oblique illumination, turn the wheel on the intermediate tube. The wheel has three settings:
 - Illumination from the left
 - Standard illumination / no oblique illumination
 - Illumination from the right



3.6.4 Adjusting the Transmitted Illumination Size

The luminous field diaphragm specifies how much of the object is illuminated without altering the brightness itself. Opening the diaphragm causes more of the sample to be illuminated.



- Procedure**
1. To adjust the luminous field diaphragm, turn the corresponding ring.
 2. Adjust the diaphragm such that it just disappears from the field of view when looking through the eyepieces.

3.7 Adjusting the Resolution and Depth of Field

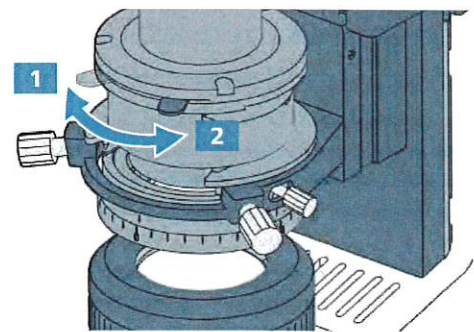
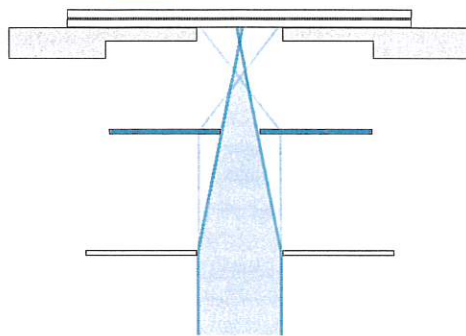
The aperture diaphragm controls the size and shape of the cone of light from the condenser. This in turn affects the resolution, depth of field, and contrast of the image.

Resolution refers to the size of object that can be observed: a higher resolution means smaller objects can be observed. Depth of field refers to the range of distances over which an object appears in focus: a large depth of field means that objects at different distances from the eyepiece are in focus. A short depth of field means that only objects at a specific distance are in focus.

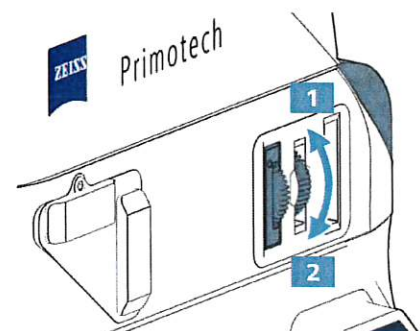
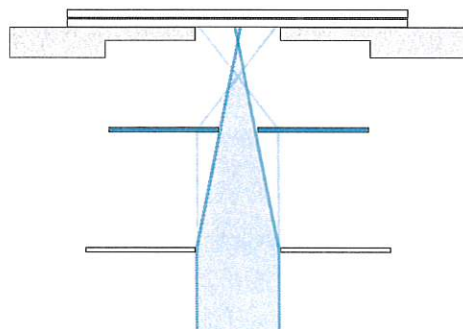
The resolution is inversely proportional to the depth of field and contrast:

- Opening the diaphragm increases the resolution but decreases the depth of field and contrast.
- Closing the diaphragm decreases the resolution but increases the depth of field and contrast.

- Procedure**
1. To adjust the aperture diaphragm for transmitted light, slide the lever left **1** (open) and right **2** (close).



2. To adjust the aperture diaphragm for reflected light, turn the wheel up **1** (open) and down **2** (close).



3. To achieve an optimal image, the size of the cone should be matched to the aperture of the objective.

Info

- ▶ Altering the diaphragm also affects the brightness of the sample but it should not be used for this purpose.
- ▶ To change the brightness, adjust the illumination or insert a filter. For more information, see *Adjusting the Illumination Properties* [▶ 21].
- ▶ If you select a different objective you need to subsequently re-adjust the corresponding aperture diaphragm.

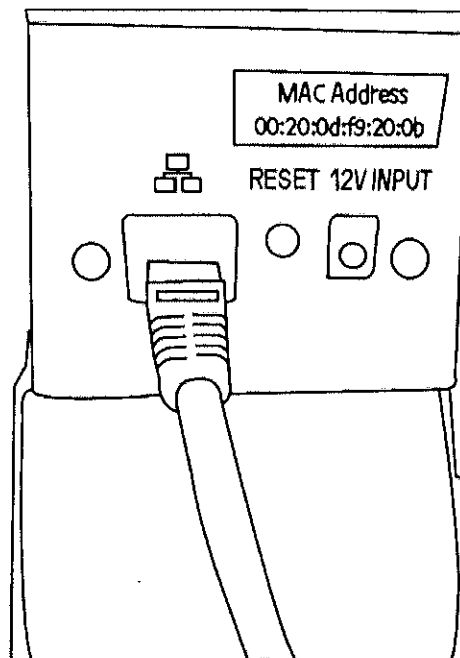
3.8 Assemble MNA with Primotech

The microscopy network adapter (MNA) is used to connect the microscopy to the network via a standard Ethernet cable. The MNA also performs the following functions:

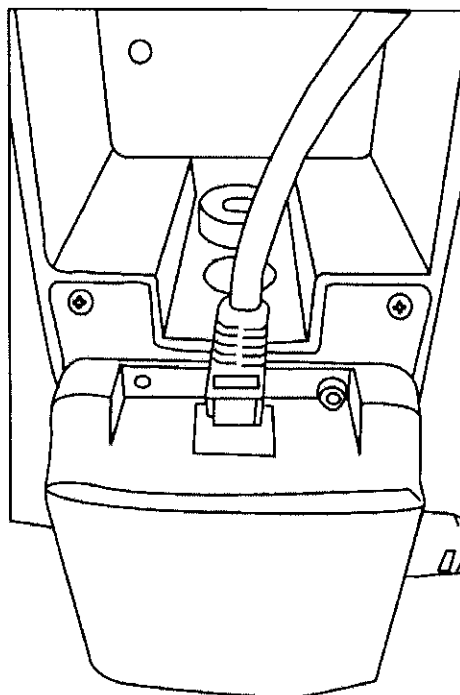
- It communicates the magnification of the objectives to the APP.
- It stores the scaling information so that calibration only has to be done once and is then available on any other APP.

- Prerequisite**
- ✓ Two Ethernet cables
 - ✓ Two power supply cables with are contained in the accessory of microscopy
 - ✓ Zeiss Matscope software

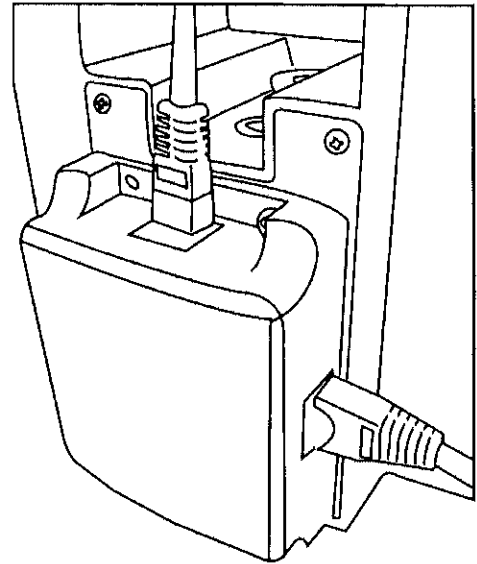
- Procedure**
1. Plug Ethernet cables into camera in the top of microscopy.



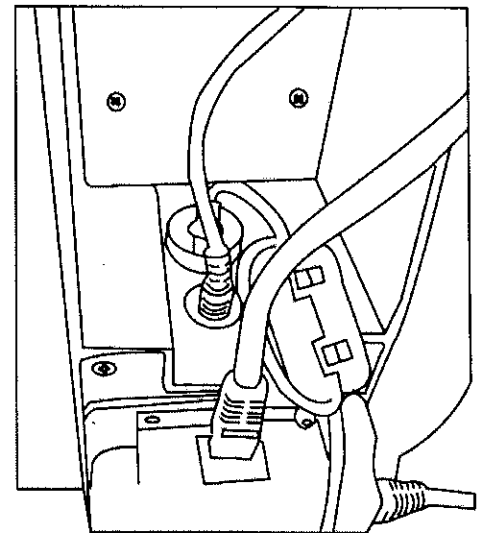
2. Plug same Ethernet cable into upper port of MNA box.



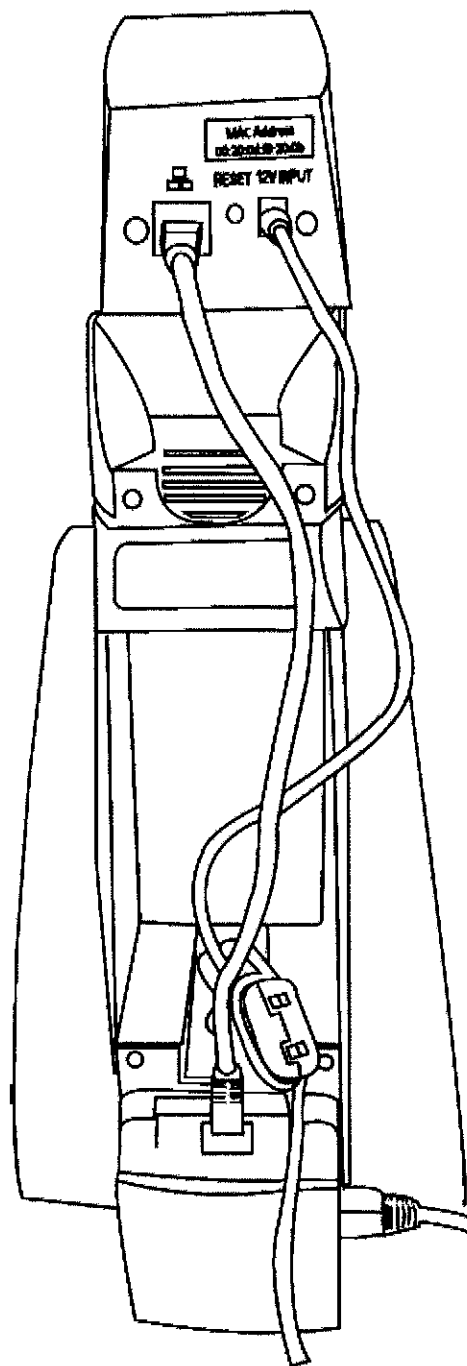
3. Plug another Ethernet cable into MNA side port.



4. Plug power cables into microscopy stand.



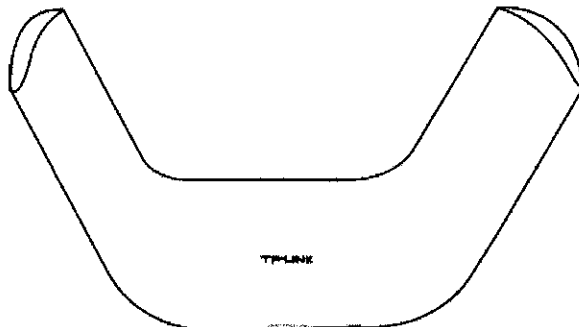
5. Plug same power cable into camera port.



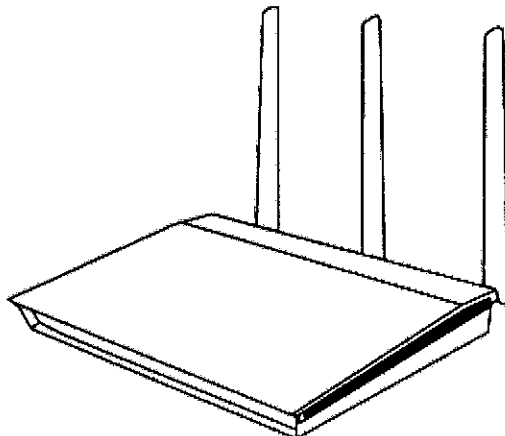
3.9 Connect microscopy with Network

3.9.1 Connect <= 8 Primotech microscopy with Network

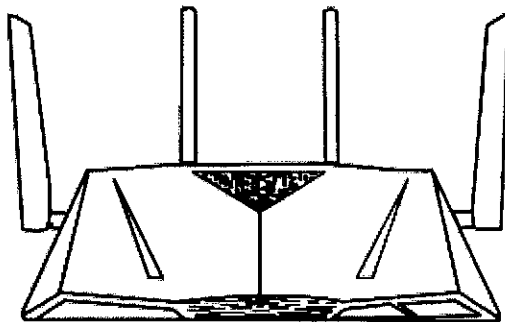
- Prerequisites**
- One WiFi router. We recommend three routers for digital classroom:
 - TP-Link TL-WDR8600 supports 4 microscopy.



- ASUS RT-AC66U supports 4 microscopy



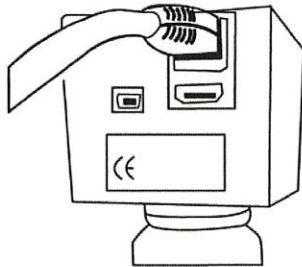
- ASUS RT-AC88U supports 8 microscopy.



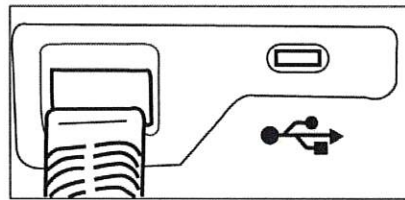
- Classroom ready Carl Zeiss microscopy such as:
 - Zeiss Primostar HDcam
 - Zeiss Primovert HDcam
 - Zeiss Primotech
 - Any microscopy equipped with Zeiss Axiocam ERC5s camera
- Zeiss Labscope or Matscope software
- Essential Connecting and power supply cable, such as Ethernet cable, USB cable, power supply.

- Procedure**
1. Select Router based on microscopy number.
We recommend three types of WiFi router:
TP-Link TL-WDR8600 and ASUS RT-AC66U with 4 LAN ports to support 4 microscopy at most.
ASUS RT-AC88U with 8 LAN ports to support 8 microscopy at most.
If your digital classroom has less than 8 microscopy, don't use switch.
 2. Plug the Ethernet cable into ERC5s camera or imbedded HD camera. If you are using Primotech with MNA, you must plug in the Ethernet cable into MNA box and make sure that you have finished connection procedure of Primotech MNA box.

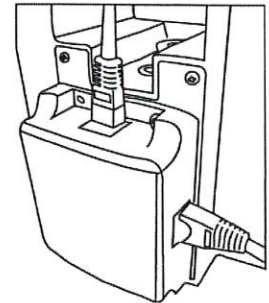
ERC5s camera



Imbedded HD camera

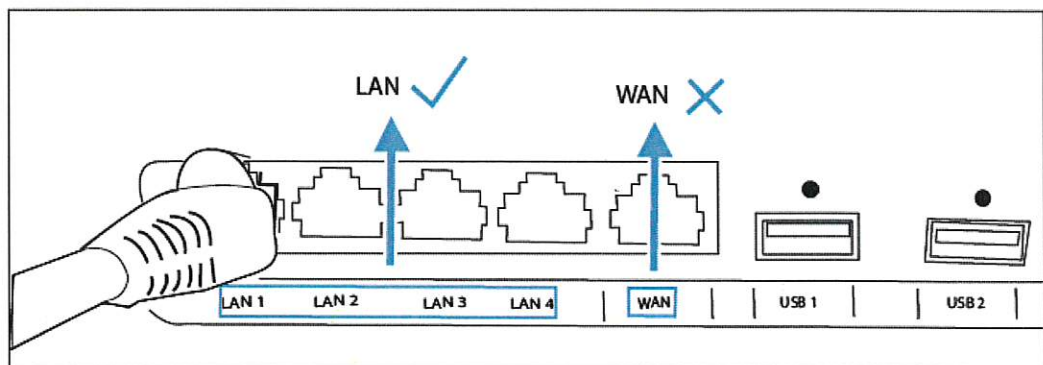


MNA

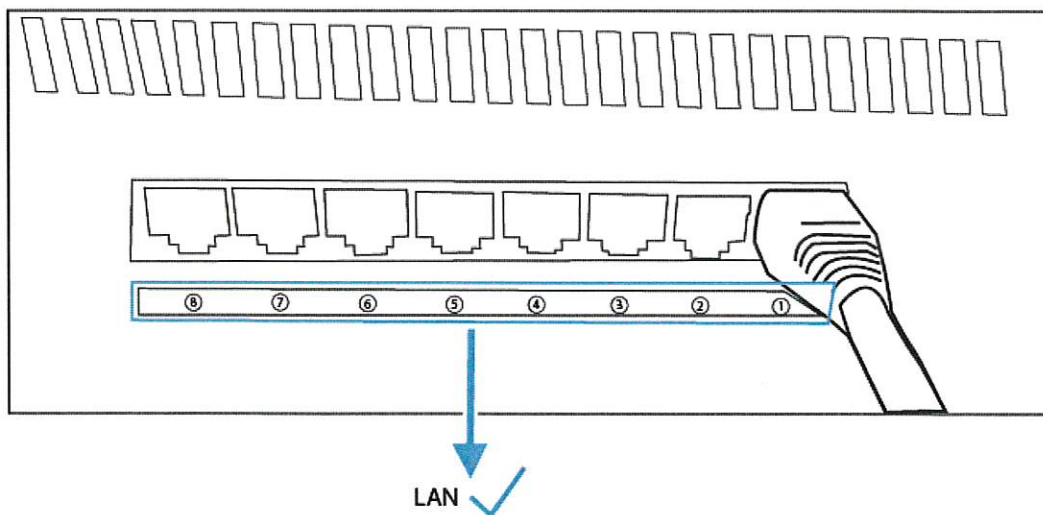


3. Plug the Ethernet cable, which has been connected with camera, into router. Use LAN port. Don't use WAN port.

TP-LINK

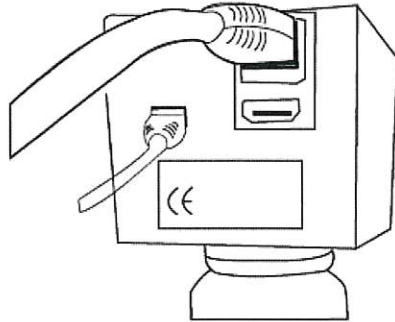


ASUS

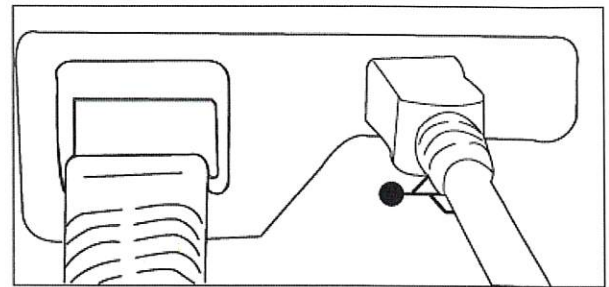


4. Plug USB cable into ERC5s camera or imbedded camera. If you use Primotech with MNA, you don't need this step.

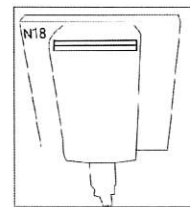
ERC5s camera




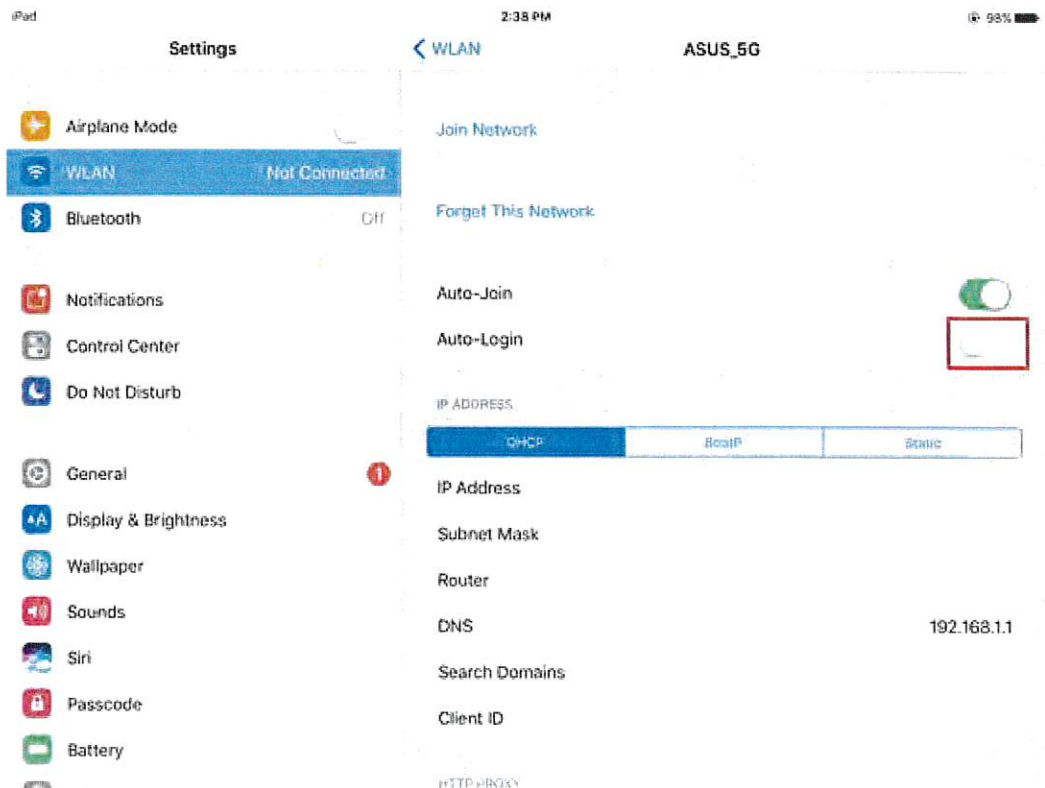
Imbedded HD camera



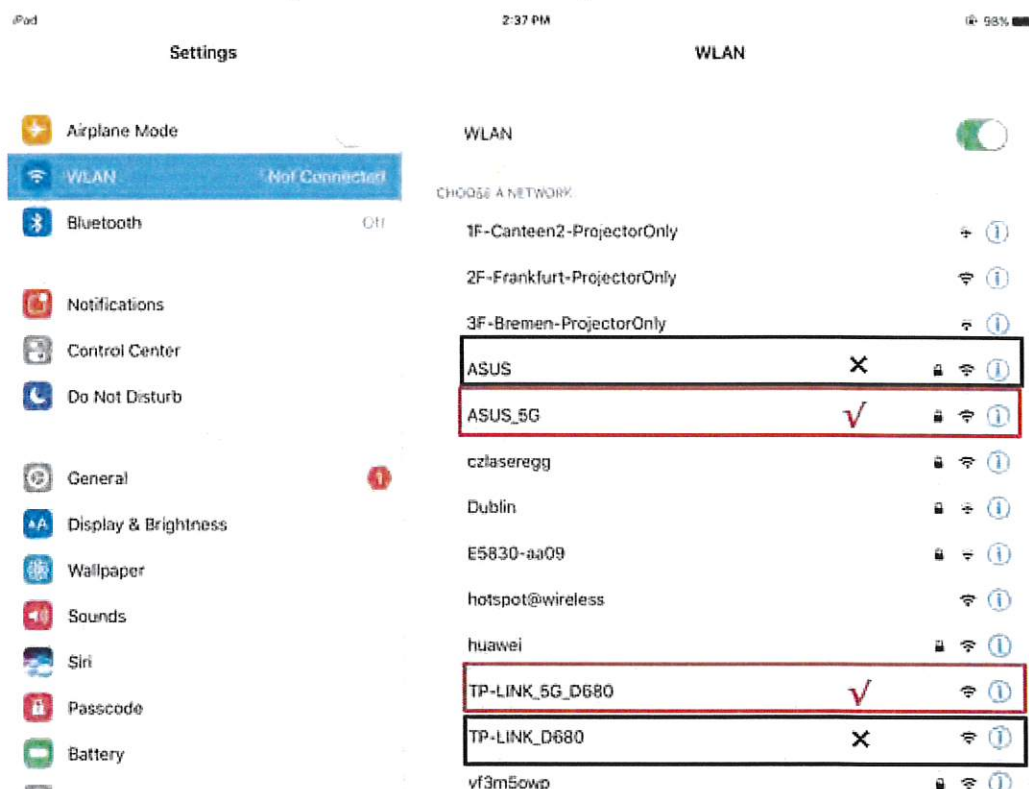
5. Plug in power supply of USB cable.



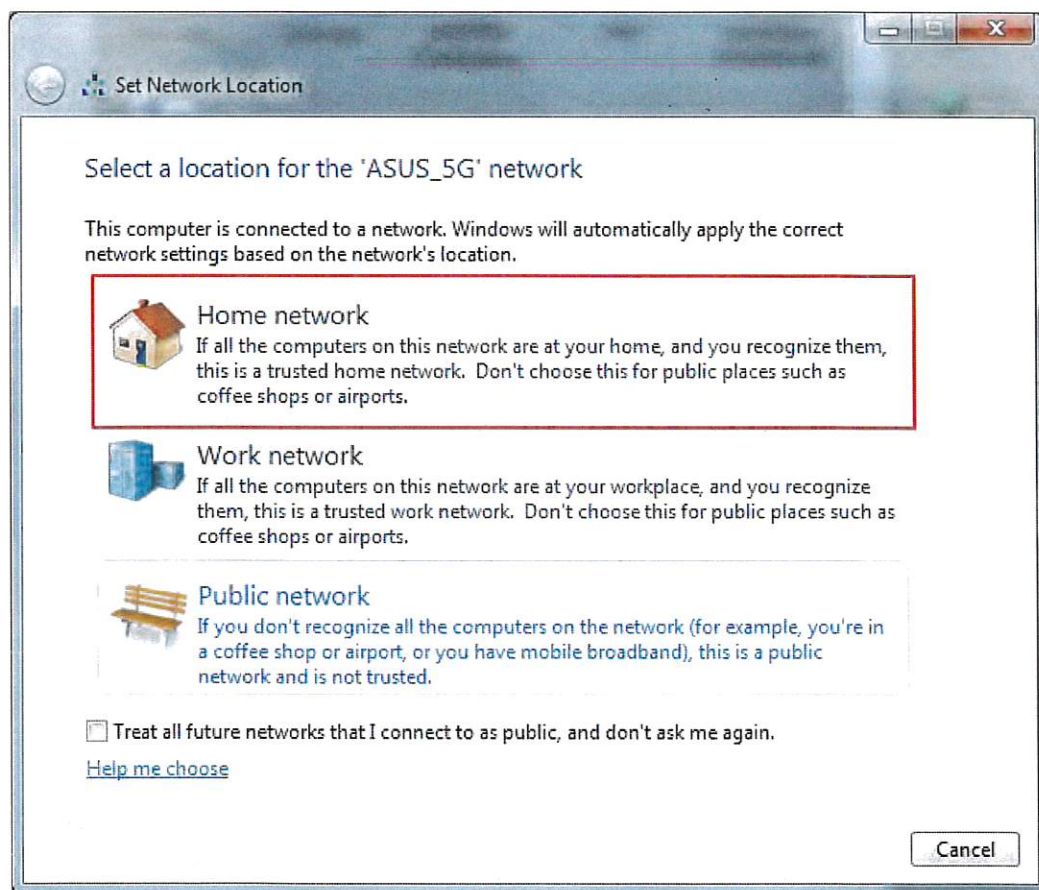
6. First open Router then open WLAN setting of iPad or Surface. If you use iPad, click  button before connect and close Auto-Login function.



7. You will connect 5G signal. Don't connect 2.5G signal.



8. (Optional) If you use window, please select "Home Network" when network location selection dialog pop out.

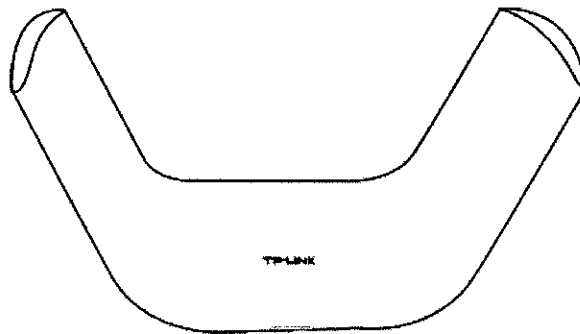


9. Open Labscope then you could find cameras in thumbnail tab.

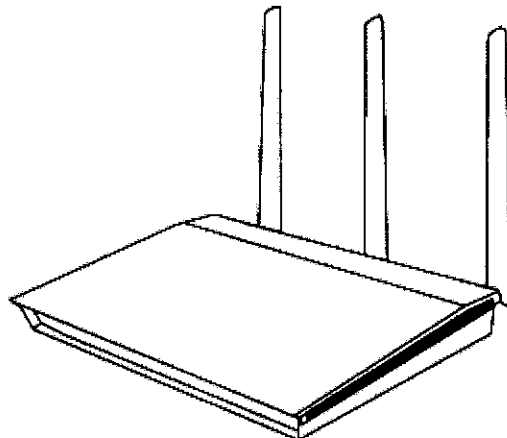


3.9.2 Connect > 8 Primotech microscopy with Network

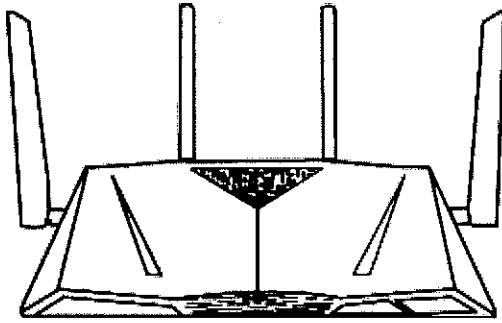
- Prerequisites**
- WiFi routers. You can calculate how many routers you need based on following instructions.
 - TP-Link TL-WDR8600 supports 3 microscopy at most.



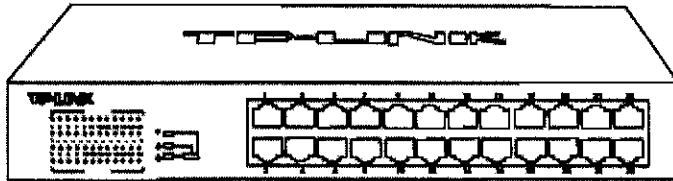
- ASUS RT-AC66U supports 3 microscopy at most.



- ASUS RT-AC88U supports 7 microscopy at most.



- Switch. We suggest you to select TP-Link TL-SG1024 24 ports switch.

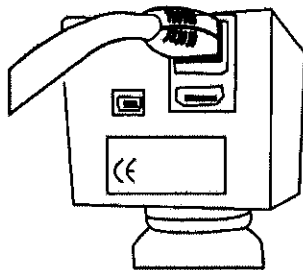


- Classroom ready Carl Zeiss microscopy such as:
 - Zeiss Primostar HDcam
 - Zeiss Primovert HDcam
 - Zeiss Primotech
 - Any microscopy equipped with Zeiss Axilocam ERC5s camera
- Zeiss Labscope or Matscope software
- PC or Laptop with browser
- Essential Connecting and power supply cable, such as Ethernet cable, USB cable, power supply.

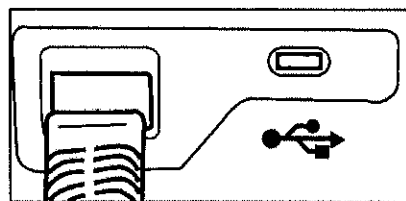
Connect Router

1. Select Router based on microscopy number.
We recommend three types of WiFi router.
TP-Link TL-WDR8600 and ASUS-AC66U with 4 LAN ports to support 4 microscopy at most.
ASUS RT-AC88U with 8 LAN ports to support 7 microscopy at most.
2. Plug the Ethernet cable into ERC5s camera or imbedded HD camera. If you are using Primotech with MNA, you must plug in the Ethernet cable into MNA box and make sure that you have finished connection procedure of Primotech MNA box.

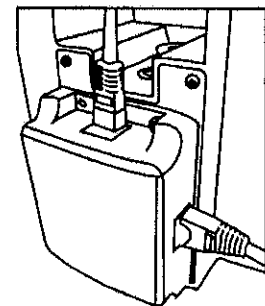
ERC5s camera



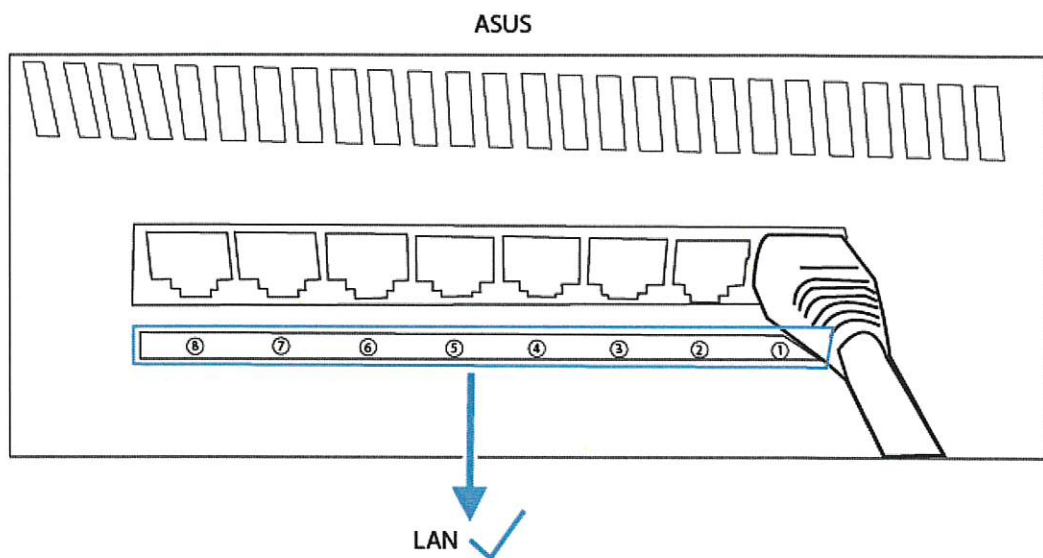
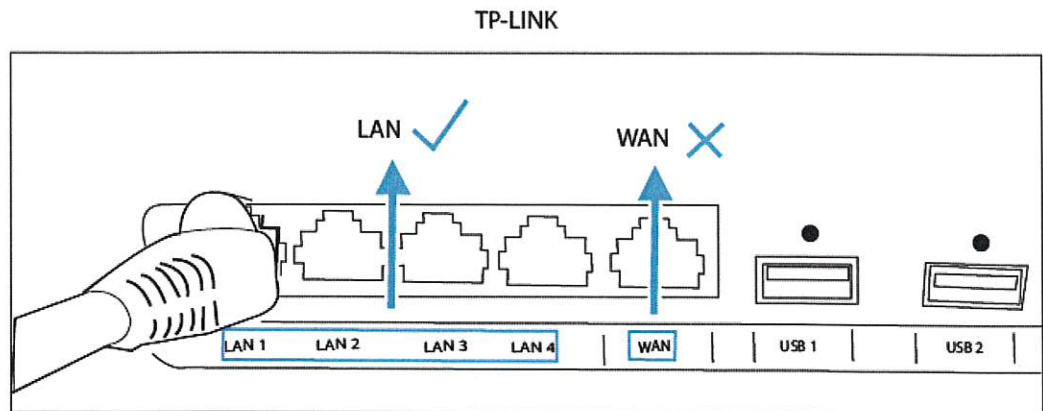
Imbedded HD camera



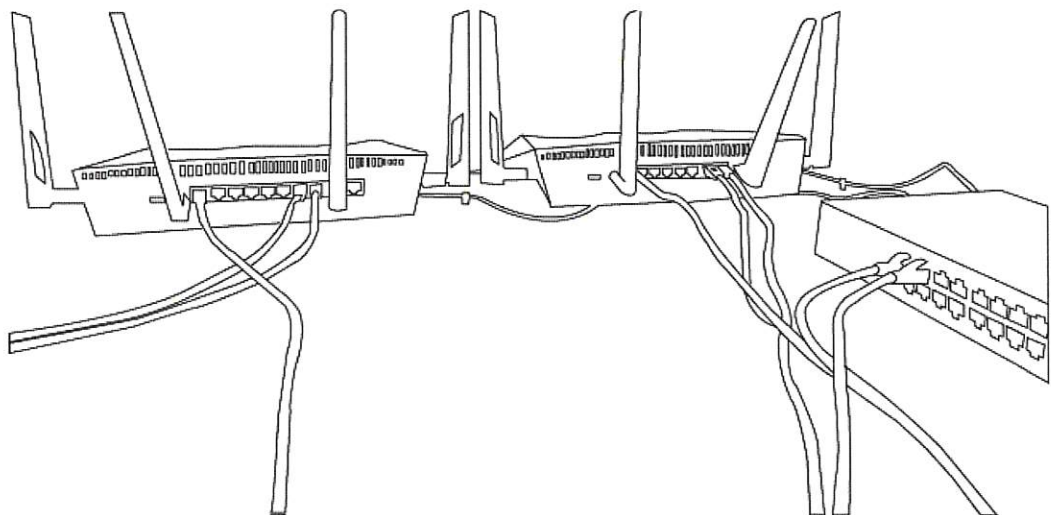
MNA



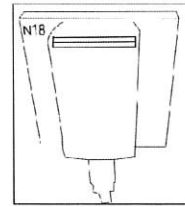
3. Plug the Ethernet cable, which has been connected with camera, into router. Use LAN port. Don't use WAN port.



4. Plug a separate Ethernet cable into router LAN port. Then use this cable to connect with switch. The picture below shows the connected routers. Don't use WAN port to connect router.



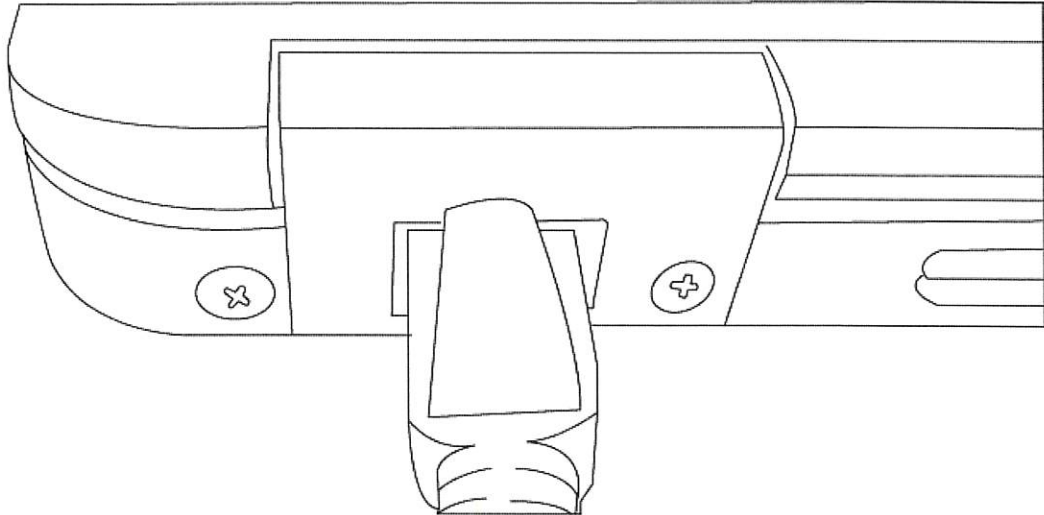
5. Plug in power supply of USB cable.



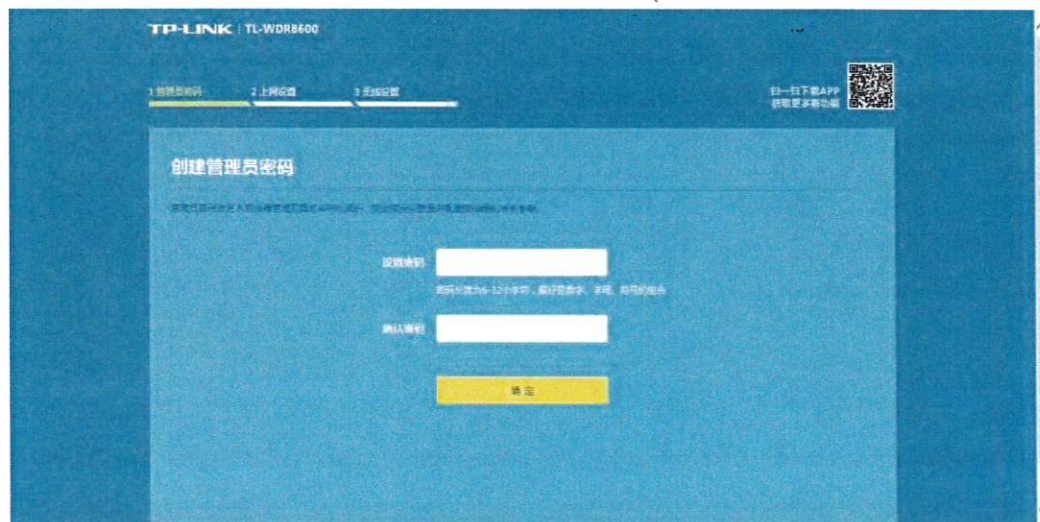
Disconnect unused DHCPs - TP-Link Close DHCP. Only keep one router' DHCP functionality open. For instance, if you have 5 routers, close 4 routers' DHCP functionalities one by one.

If you use TP-Link TL-WDR8600, follow the steps below:

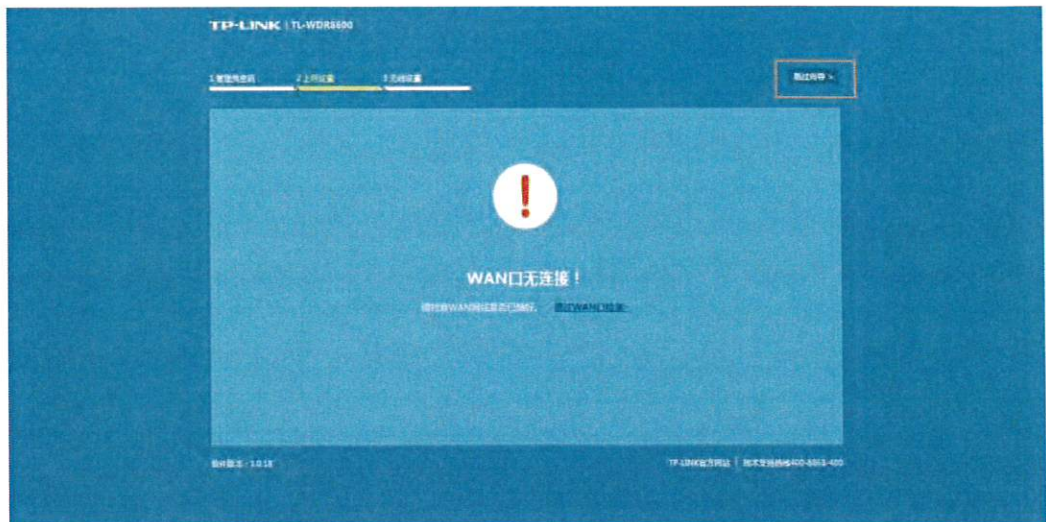
- Procedure**
1. Use PC to connect router via Ethernet cable.



2. Open browser and input tplogin.cn in the browser.
3. (Optional) If it is the first time to login router, you must set a password.



4. Then confirm and skip other settings.



5. Enter password.



6. Click "Settings" at bottom.



- Click "DHCP Server" on the left. Then change "Enable the DHCP server" setting to "Close" and click "Save" button at bottom.

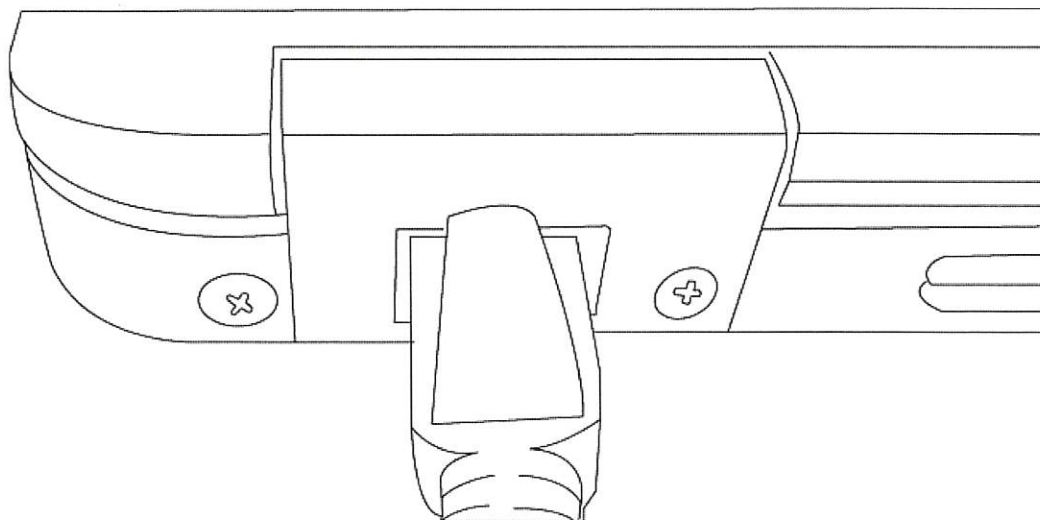


- Wait until applying is finished.

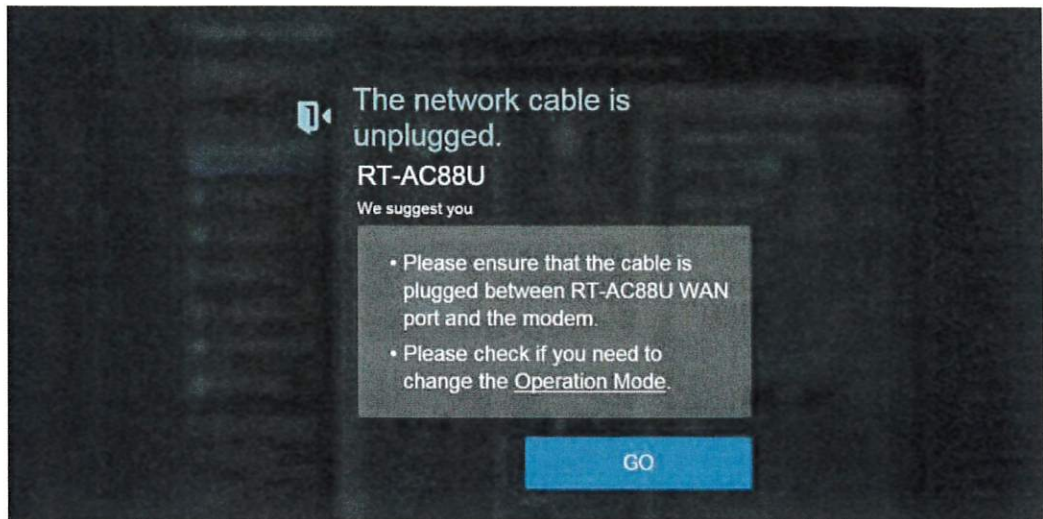
Disconnect unused DHCPs - ASUS Close DHCP. Only keep one router' DHCP functionality open. For instance, if you have 5 routers, close 4 routers' DHCP functionalities one by one.

If you use ASUS RT-AC88U or RT-AC66U, please follow the steps below:

- Procedure**
- Use PC to connect router via Ethernet cable.



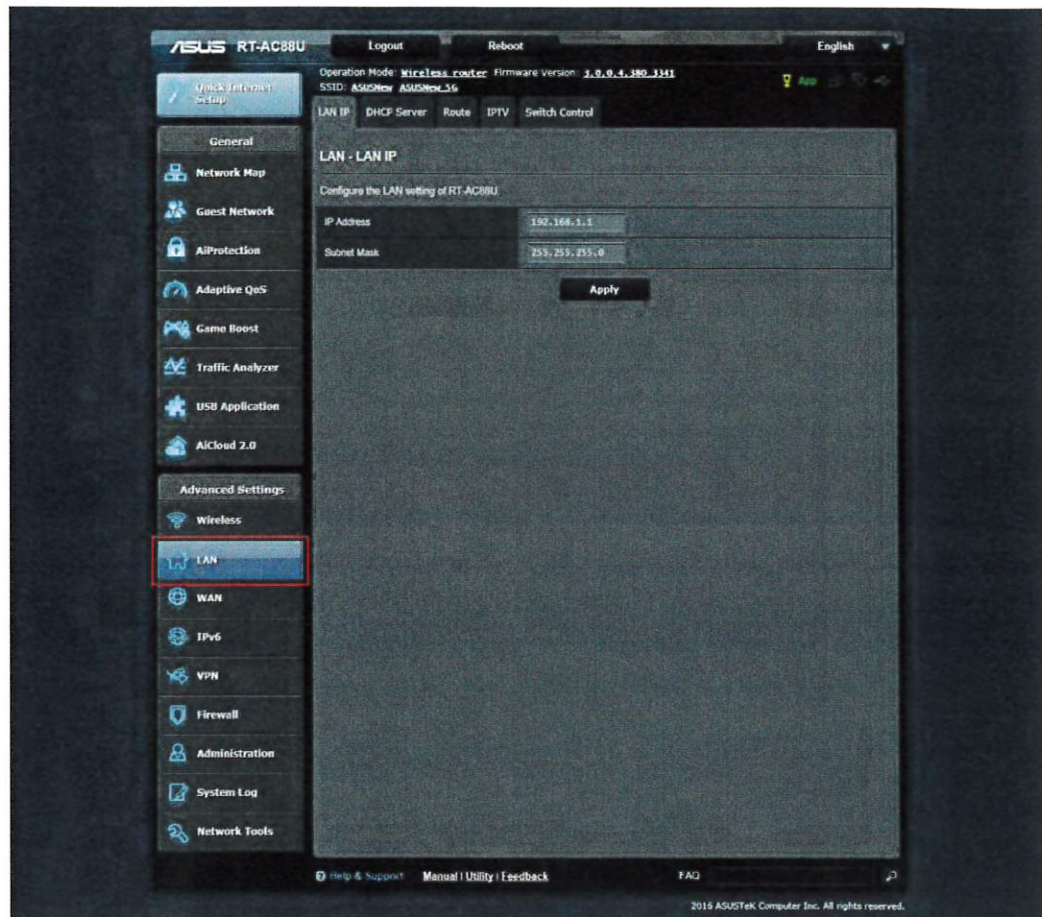
2. Open browser, then the setting dialog will pop out. If not, please input router.asus.com in the browser.



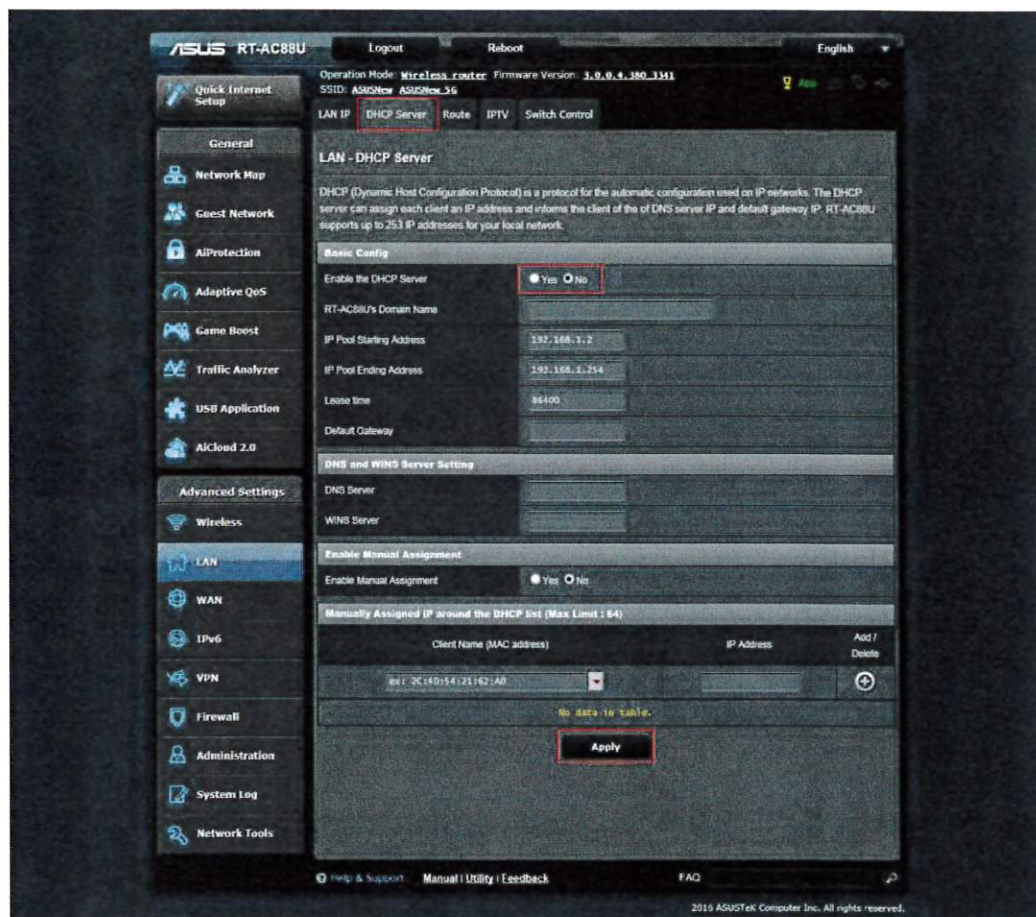
3. Click "Go" and input account and password of router. The default account and password are "admin".



- Click "LAN" button on the left side bar.



- Click "DHCP Server" button on the top right. Then change "Enable the DHCP server" setting to NO and click "Apply" button at bottom.



- Wait until applying is finished.

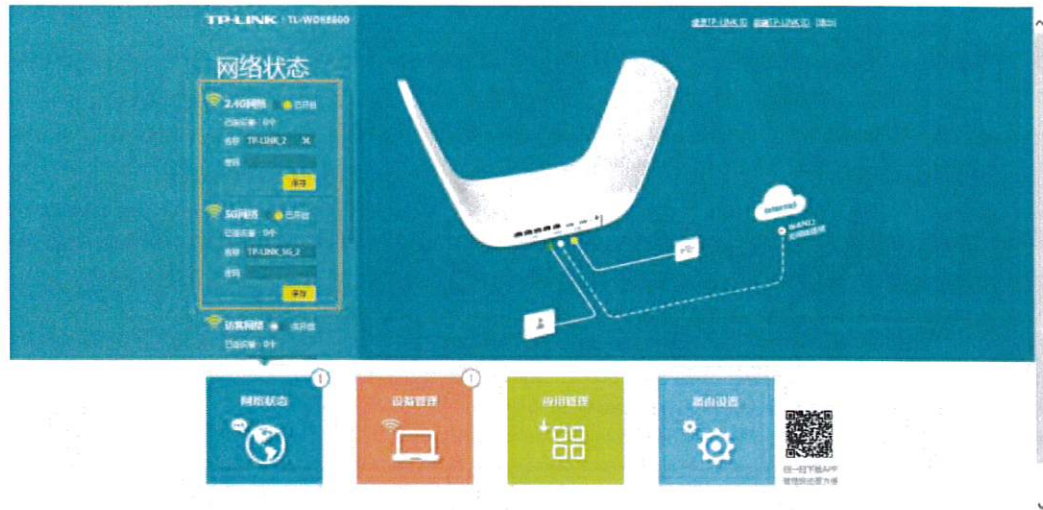


Changing SSIDs and IPs - TP-Link

Change every router's SSID and IP address.

If you use TP-Link TL-WDR8600, follow steps below:

- Procedure**
1. Use PC to connect router via Ethernet cable. Then enter setting dialog of router. You can refer to **Connecting WiFi Signals**.
 2. Change name of network for both 2.4G and 5G on the left. You should give different names to routers. For instance, you could give names as "TPLINK_5G_2", "TPLINK_2". Then click "save" button.



3. Click "Settings" button at bottom.



- Click "LAN Settings" on the left then change "LAN IP Settings" to manual. Change "IP Address" as follows: 192.168.1.*. The last number should be the same as network name in step 2. For instance, if you set name as "TPLINK_5G_5", then IP address should be "192.168.1.5". Then click "Save" button.



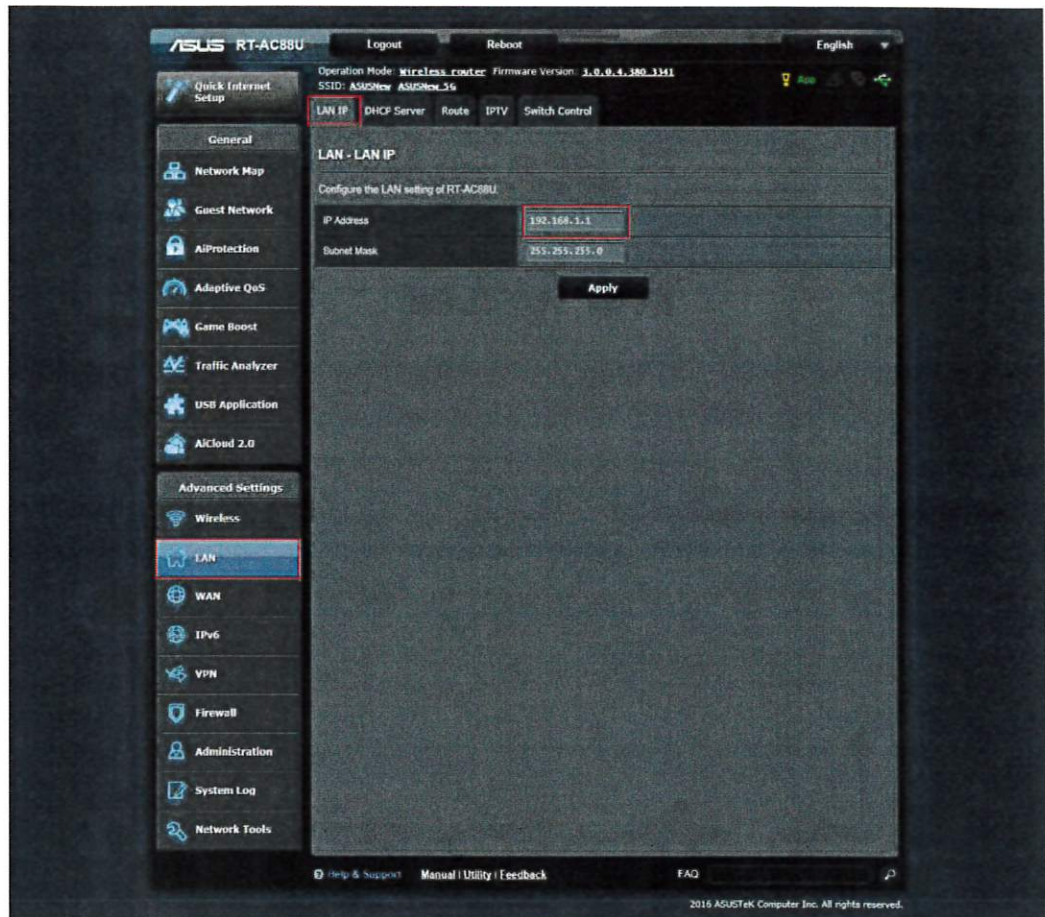
Changing SSIDs and IPs - ASUS Change every router's SSID and IP address. If you use ASUS RT-AC88U or RT-AC66U, follow the steps below:

- Procedure**
- Use PC to connect router via Ethernet cable. Then enter setting dialog of router. You can refer to **Connecting WiFi Signals**
 - Click "Network Map" button on the left side bar. You can see "System Status" on the right.



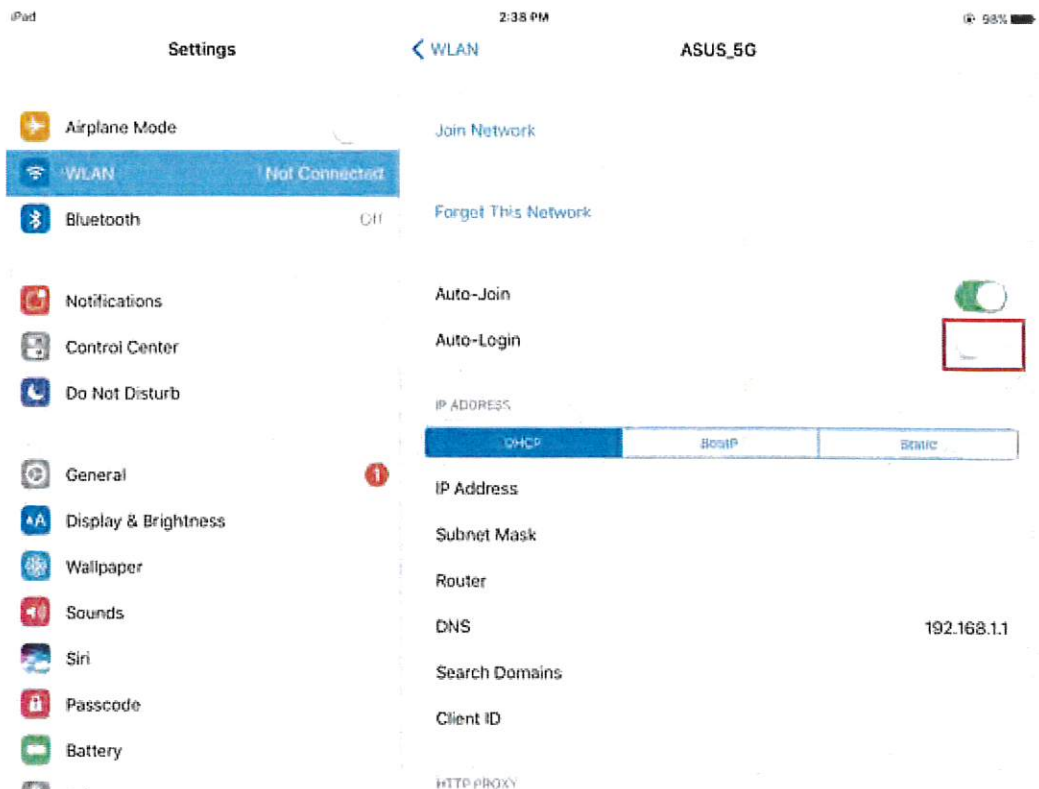
- Change "Network Name (SSID)" for both 5GHz and 2.4GHz. You should give different names to routers. For instance, you could give names as "ASUSNew_5G_1", "ASUS-New_5G_2". Then click "apply" button.

- Click "LAN" button on the left then click "LAN IP" button on the top right. Change "IP Address" as follows: 192.168.1.*. The last number should be the same as SSID in step 3. For instance, if you set SSID as "ASUS_5G_5", then IP address should be "192.168.1.5". Then click "Apply" button.

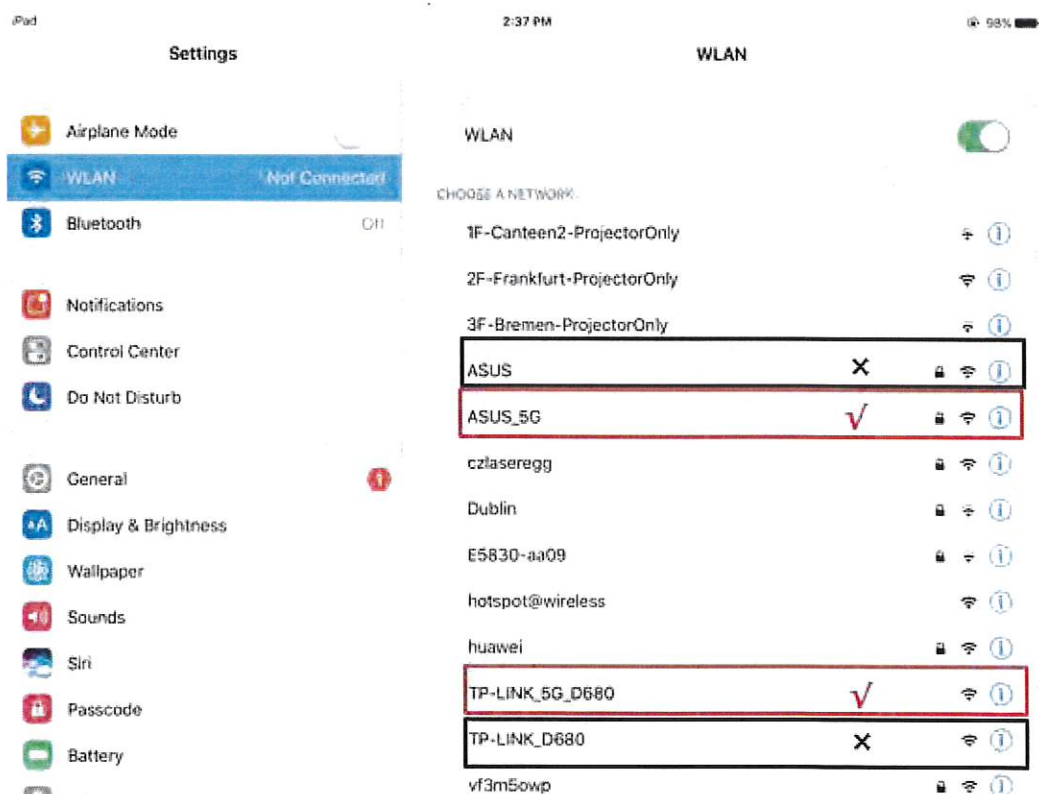


Connecting WiFi Signals After configuring all routers, use tablet to connect wifi signals.

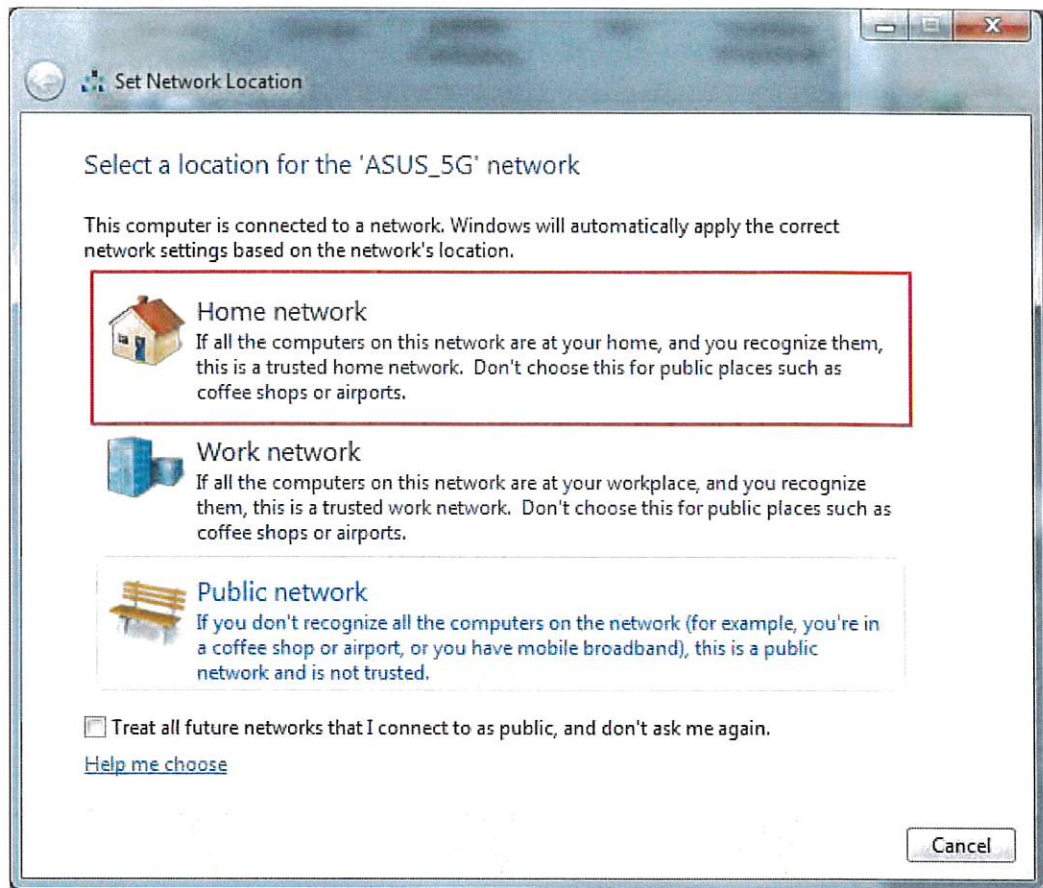
Procedure 1. If you use iPad, click button before connect and close Auto-Login function.



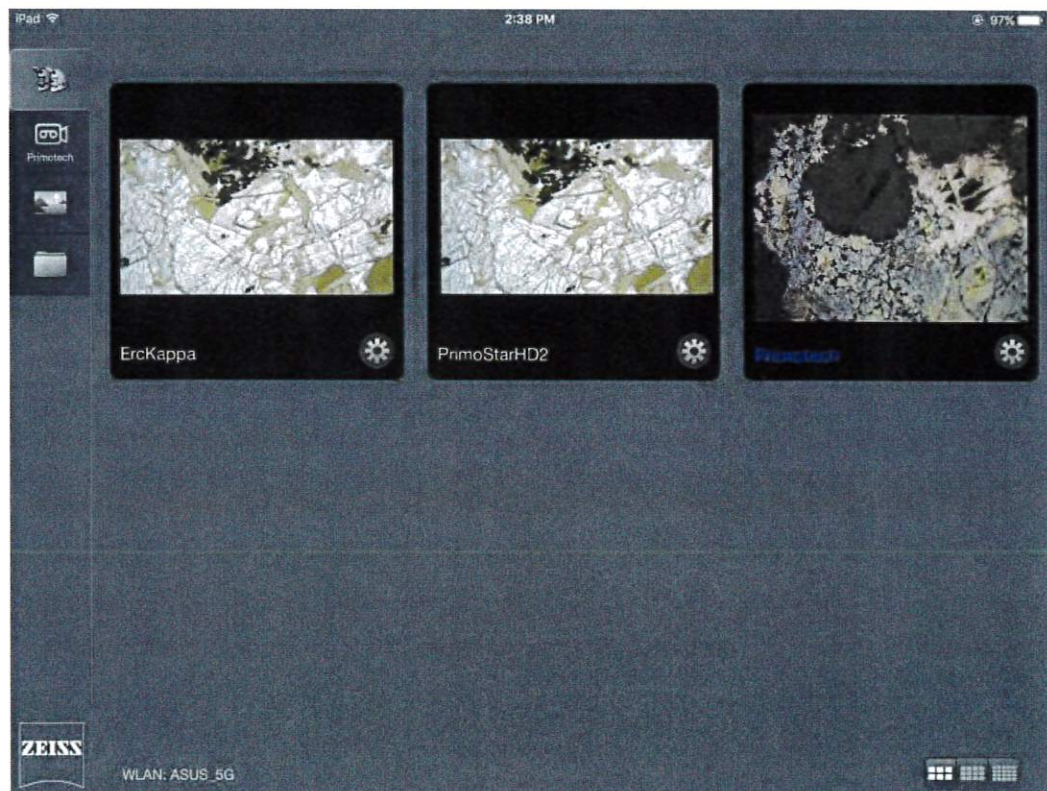
2. You will connect 5G signal. Don't connect 2.5G signal. You should also balance the number which connect to one router.



- (Optional) If you use window, please select "Home Network" when network location selection dialog pop out.



- Open Labscope then you could find cameras in thumbnail tab.



4 Adjusting the Condenser Settings

4.1 Overview

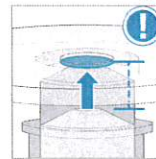
This chapter describes how to adjust properties of the condenser, such as its position, maximum height, and how to set the optimum contrast. Only the following microscopes have a condenser:

- Primotech T/R MAT
- Primotech T/R POL Conoscopy
- Primotech T/POL Conoscopy

4.2 Specifying the Condenser Position

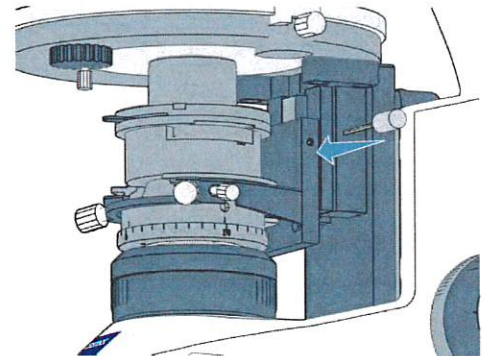
The condenser is located beneath the stage. It concentrates the light from the light source into a cone that illuminates the specimen with uniform intensity over the entire field of view.

- Procedure**
1. To raise or lower the condenser, turn the condenser vertical adjustment knob.
 2. Raise the condenser carefully and ensure that it does not collide with the bottom of the sample.



Maximum Height If desired, you can prevent the condenser from colliding with the bottom of the sample by specifying the maximum height (Z position) of the condenser:

- Procedure**
1. Insert the 1.5 mm hex key in the condenser clamp screw.



2. Loosen the condenser clamp screw.
3. Look at the stage from above and carefully raise the condenser until the tip is just below the sample.
4. Tighten the condenser clamp screw.

The condenser cannot move above this upper limit.

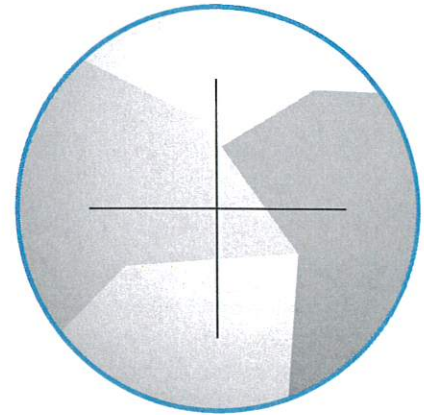
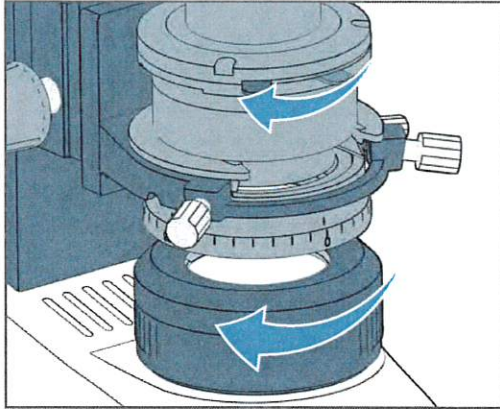
4.3 Adjusting the Köhler illumination

The condenser with Köhler illumination ensures a uniform illumination of the sample during transmitted light analyses. You can adjust the contrast of the illumination according to your preferences. The following is only a guide, the exact settings depend on your preferences.

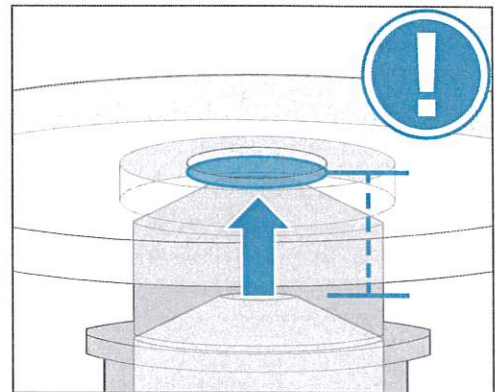
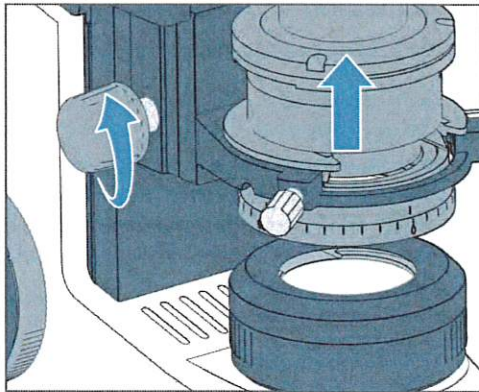
- Prerequisite**
- ✓ The area of the sample in the field of view has high contrast
 - ✓ The illumination brightness is low
 - ✓ The upper limit of the condenser has been set to prevent collision with the sample

- Procedure**
1. Select the lowest magnification and bring the area of interest into focus.

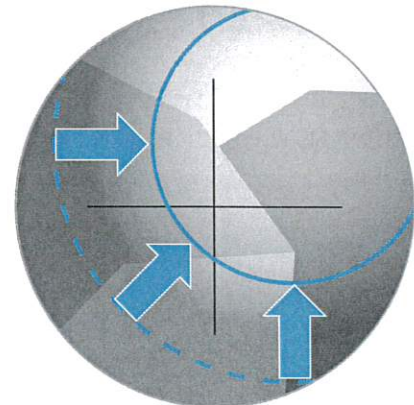
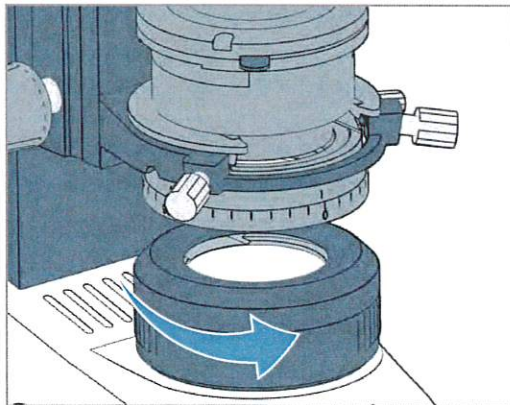
2. Open the luminous field diaphragm and the aperture diaphragm fully.



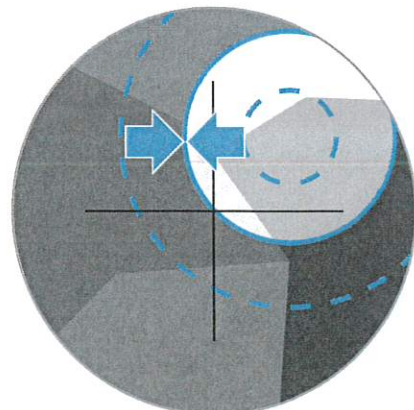
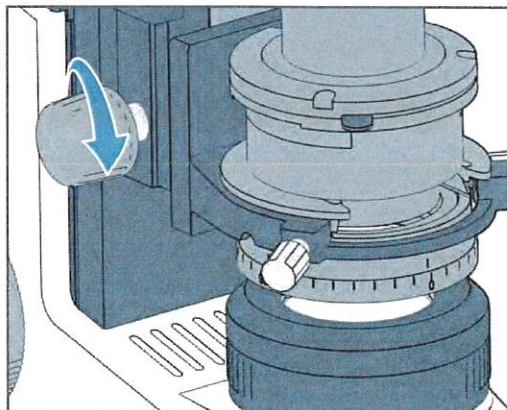
3. Raise the condenser to its maximum vertical position.



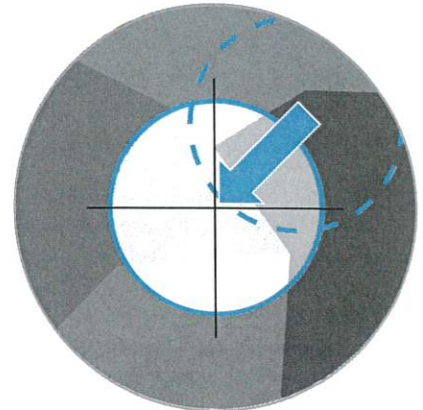
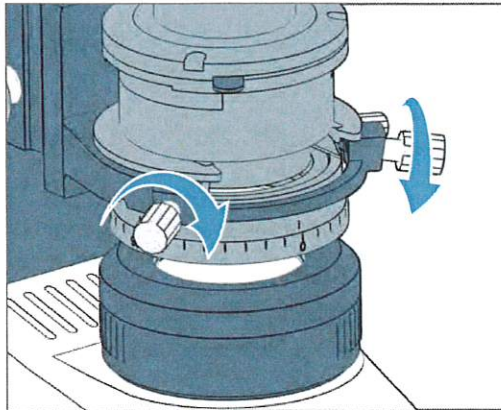
4. Close the luminous field diaphragm until the bright area is half the size of the field of view.



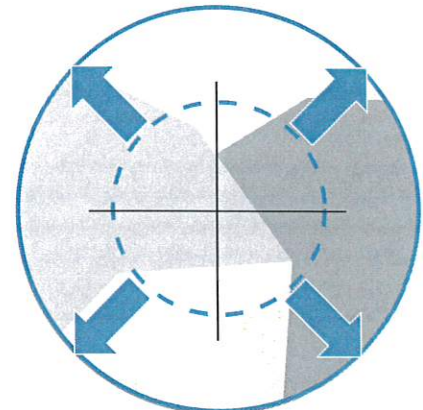
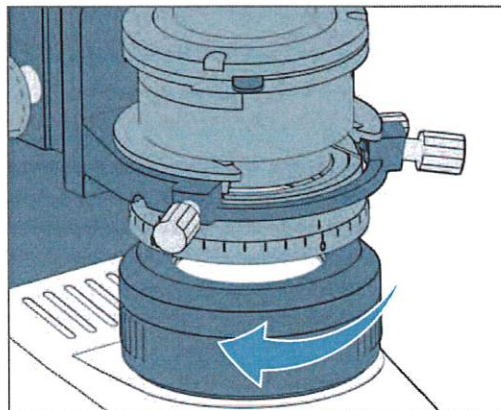
5. Lower the condenser until the edges of the luminous field diaphragm are in focus.



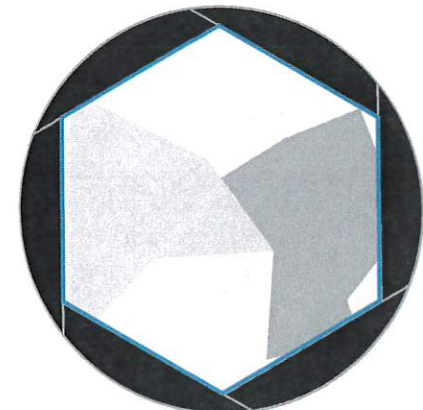
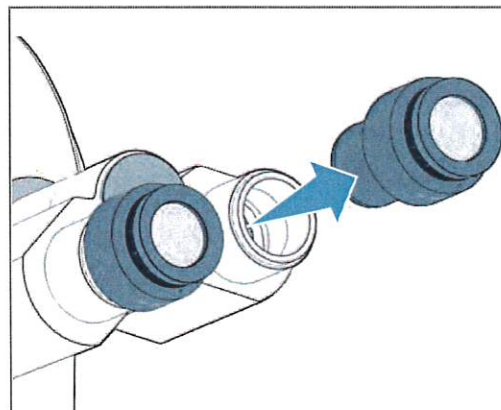
6. Turn the condenser centering screws until the bright area is centered in the field of view.



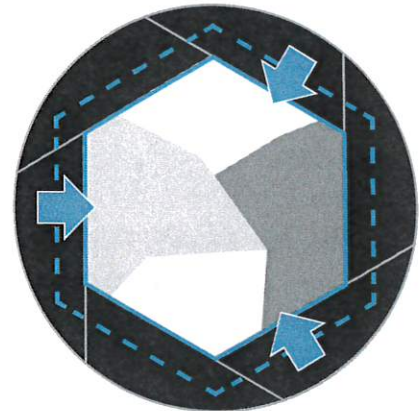
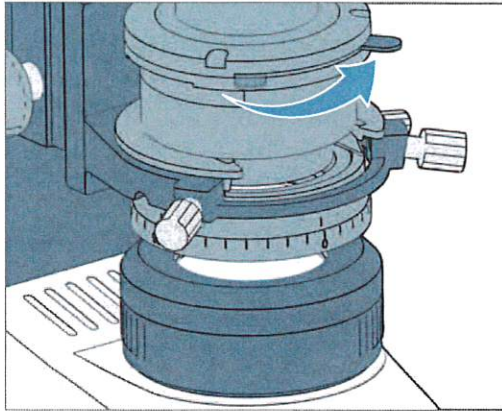
7. Open the luminous field diaphragm until the edge just disappears out of the field of view.



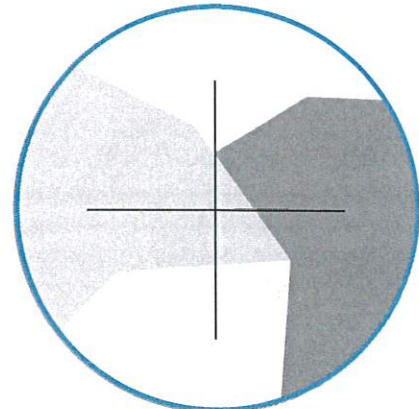
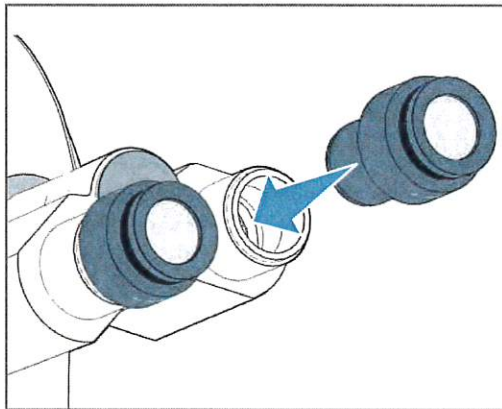
8. Remove one of the eyepieces and look directly into the eyepiece tube. This enables you to see the edges of the aperture diaphragm in focus.



9. Close the aperture diaphragm until the image has the optimal contrast.
This is typically the case when the bright area fills approximately 2/3 of the field of view.



10. Reinsert the eyepiece.



The sample should now have the highest possible contrast.

5 Polarization and Conoscopy

5.1 Overview

This chapter describes how to perform polarization and conoscopy examinations, as well as providing an introduction to the basic principles of such examinations.

Polarization and conoscopy can be performed with the following microscopes:

- Primotech T/R POL Conoscopy
- Primotech T/POL Conoscopy

If you purchase optional polarizers, you can then also perform polarization with Primotech MAT and Primotech T/R MAT.

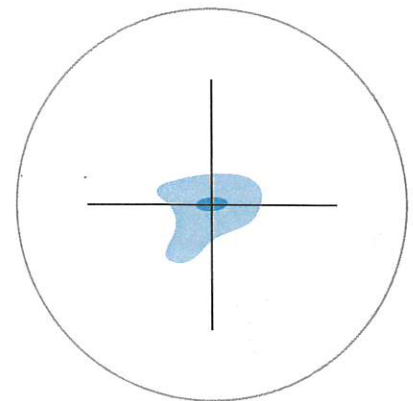
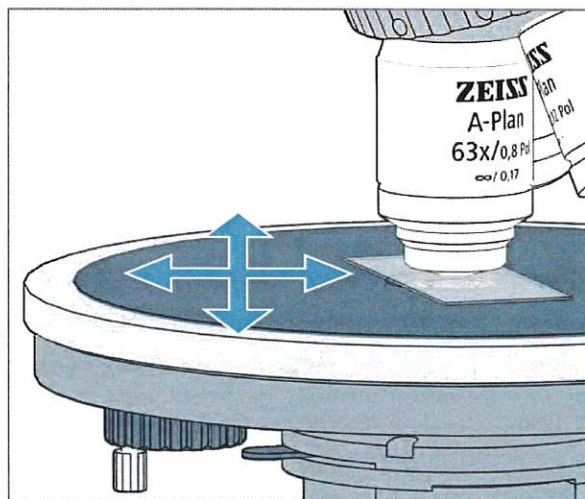
For more information, contact your ZEISS representative.

5.2 Centering the Objectives

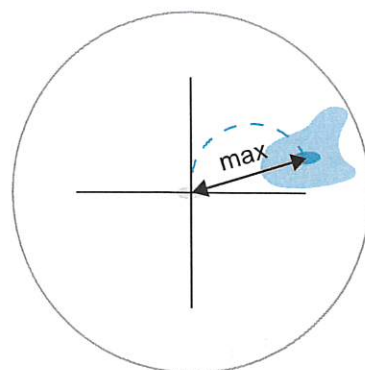
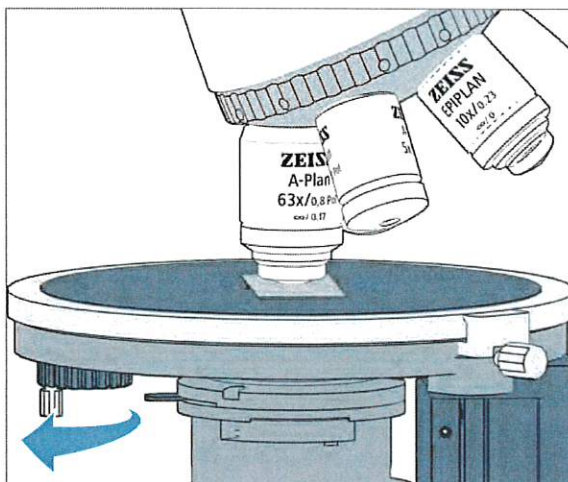
When viewing a sample on the rotating stage, it is important that the objective is located exactly above the center of rotation of the stage.

Therefore, the objectives of the Primotech T/R POL and Primotech T/POL Conoscopy can be centered. The centering procedure should also always be performed after changing an objective.

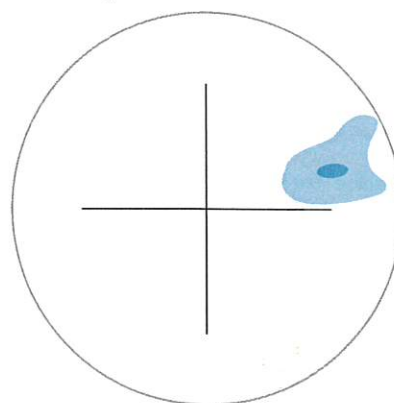
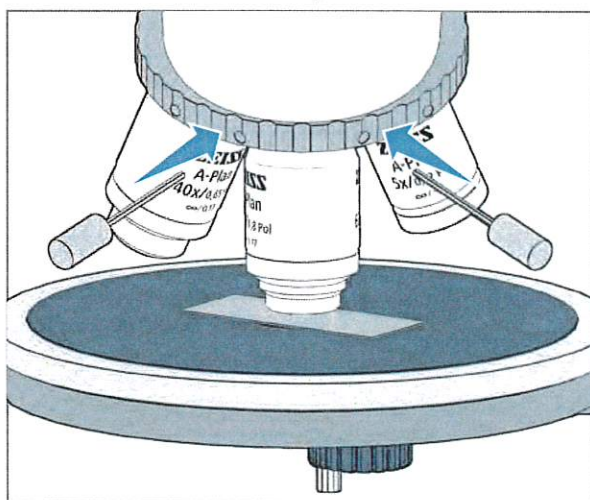
- Procedure**
1. Move the object guide to place a distinctive object in the sample at the center of the crosshair by moving the sample on the table.



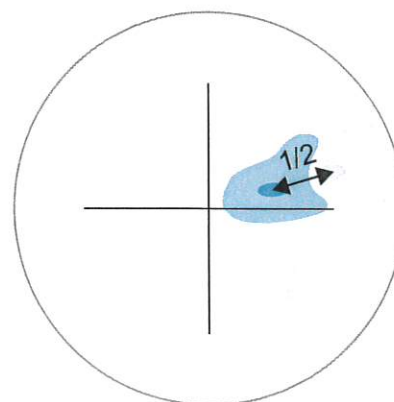
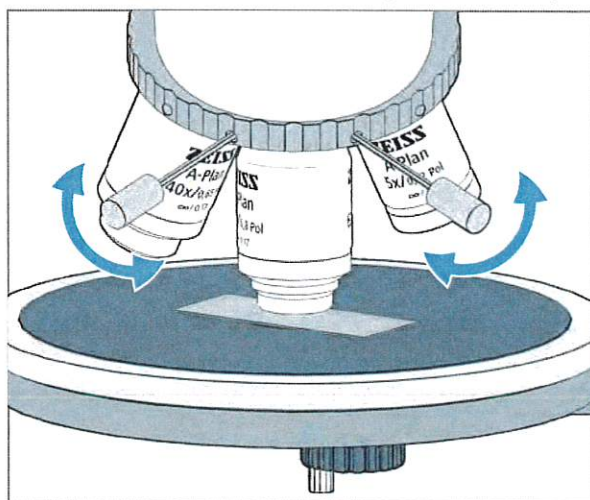
2. Slowly rotate the stage until the object is at the furthest point from the crosshair.



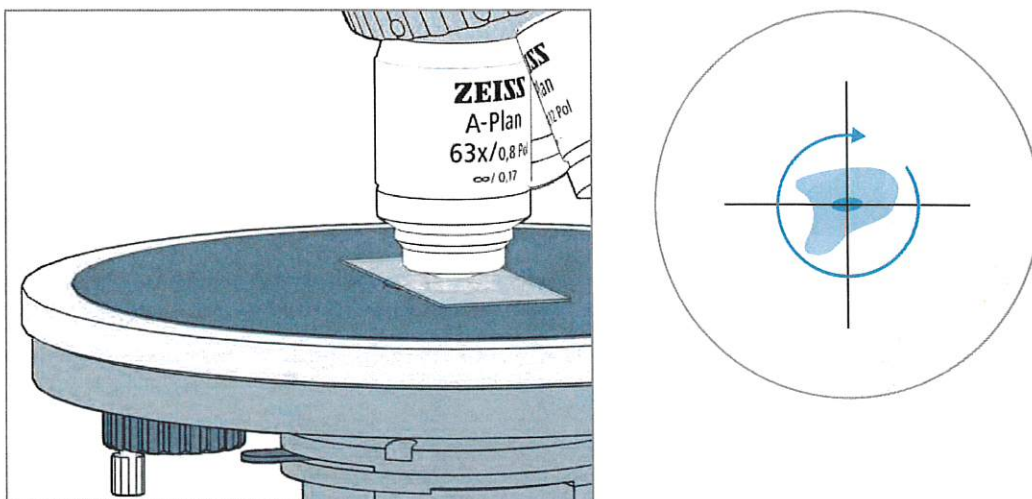
3. Insert the 1.5 mm hex key into the screws on either side of the objective.



4. Turn the screws to move the object half the way back to the center of the crosshair.



5. Repeat the steps above until the object no longer moves when the stage is rotated.



Info

Primotech POL stand comes with a pre-centered stage. Each objective needs to be centered individually.

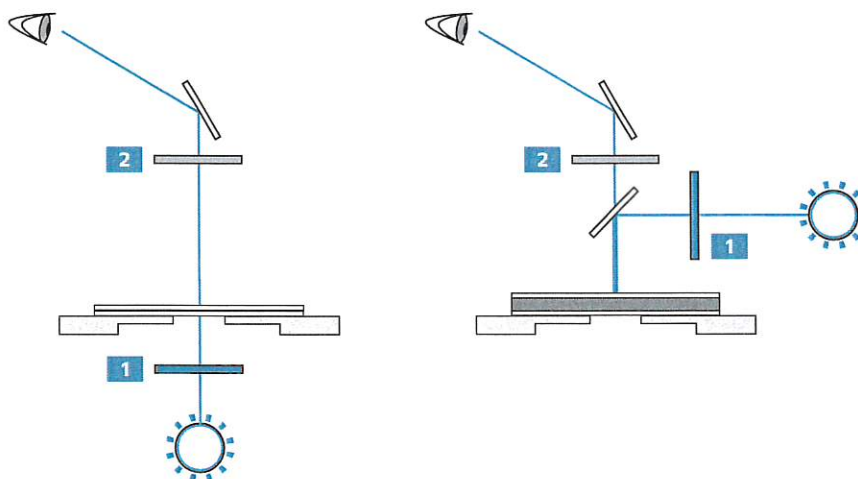
5.3 Polarization Examinations

Polarization examinations allow you to analyze how a sample changes the properties of light interacting with the sample, specifically the direction in which the light oscillates. Such examinations can be performed with both transmitted or reflected light.

To perform a polarization examination, you can insert polarizing elements in the beam path, on either side of the sample. The polarizing elements only allow light that oscillates in a certain direction to pass.

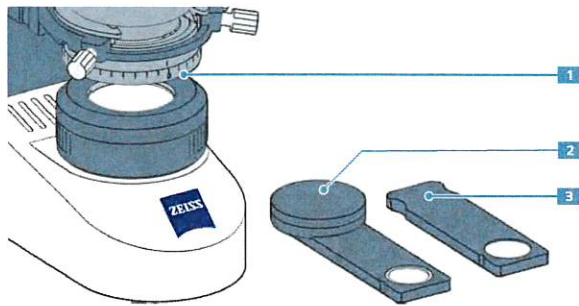
Polarizers and Analyzers The polarizing elements are referred to as either Polarizers or analyzers depending on their location in the beam path:

- The element between the light source and the sample is referred to as the polarizer **1**
- The element between the sample and the eyepiece is referred to as the analyzer **2**



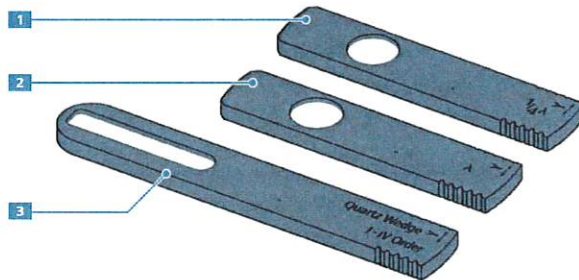
Rotating the sample, polarizer, or analyzer alters the amount – and color – of the light received in the eyepiece. Thus it is possible to deduce properties of the sample, for example the orientation of the crystals within it or their refractive index.

The following polarizers / analyzers are available for Primotech:



- 1** Rotatable polarizer in the microscope stand
- 2** Rotatable analyzer slider
- 3** Fixed analyzer slider

Compensators Compensators enhance the intensity of colors in a sample making it easier to identify and differentiate samples. Various compensators are available for Primotech microscopes. Each increases the path difference of beams polarized in a certain direction by a multiple of the wavelength (λ) of visible light. The following compensators are suitable for transmitted light.



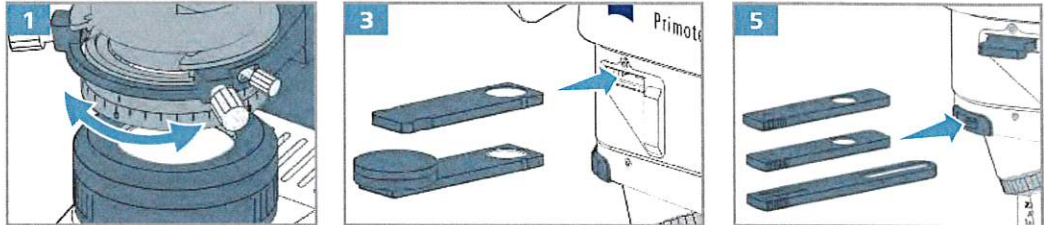
- 1** $\lambda / 4$
- 2** λ
- 3** Quartz wedge

A special form of compensator that ranges from 0λ to 4λ over its length

5.4 Performing Polarization Examinations with Transmitted Light

- Prerequisite**
- ✓ You are using Primotech T/R POL or Primotech T/POL Conoscopy
 - ✓ The sample is illuminated by transmitted light only
 - ✓ No polarizers or analyzers are in the beam path
 - ✓ The objectives are centered (see *Centering the Objectives* [▶ 49]).

- Procedure**
1. Turn the polarizer ring under the sample to the 0° position.

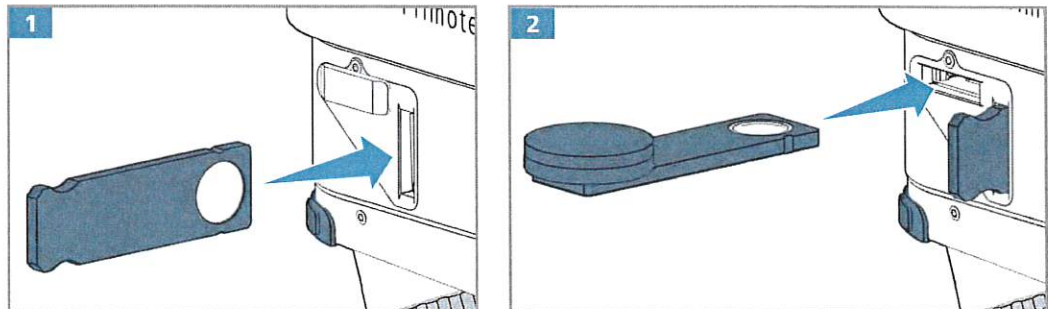


2. If desired, observe the sample in the polarized light, for example to determine the fracture direction of a material.
3. Insert the fixed analyzer into the horizontal slot of the intermediate tube. Alternatively, insert the rotatable analyzer, set to the 0° position, into the slot.
4. Rotate the stage and observe how the sample changes color.
5. To investigate the sample further, insert a compensator in the 45° slot on the microscope stand.

5.5 Performing Polarization Examinations with Reflected Light

- Prerequisite**
- ✓ The sample is illuminated by reflected light only
 - ✓ No polarizers or analyzers are in the beam path

- Procedure**
1. Insert the fixed polarizer into the vertical slot of the intermediate tube. For more information about locking sliders, see *Locking sliders for anti-loss features* [▶ 58].



2. Insert the rotatable analyzer, set to the 0° position, into the horizontal slot of the intermediate tube.
3. If desired, rotate the sample and observe how the sample changes.

5.6 Conoscopy Examinations

In conoscopy examinations, the sample is illuminated by a wide cone of light. This means that individual beams within the cone travel through the sample at different angles.

In certain types of sample, these beams interact with each other to create an interference pattern. This interference pattern can be used to infer properties of the sample. Conoscopy refers to the examination of interference patterns caused by such samples.

Conoscopy can only be performed with Primotech T/POL Conoscopy as it contains a Bertrand lens which can be inserted into the beam path. The Bertrand lens causes the interference patterns to be in focus when looking through the eyepieces rather than the sample itself.

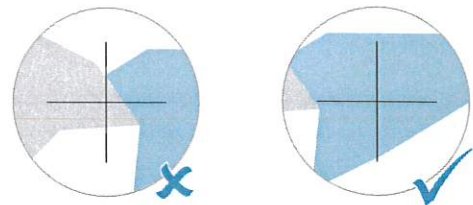
5.7 Performing Conoscopy Examinations

Info

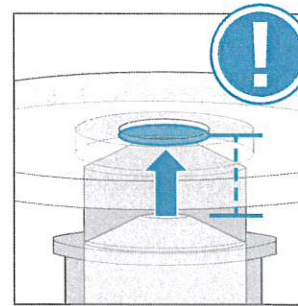
Conoscopy can only be performed with transmitted light.

- Prerequisite**
- ✓ You are using Primotech T/POL Conoscopy
 - ✓ The sample is illuminated by transmitted light only
 - ✓ The objective has an aperture > 0.6 (e.g. the 40x or 63x objective)
 - ✓ The objectives are centered (see *Centering the Objectives* [▶ 49]).

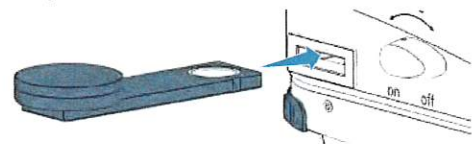
- Procedure**
1. Select the objective with the largest magnification. A minimum of 40x should be used. The 63x objective is recommended for conoscopy examinations.
 2. Focus the sample and move it so that only one mineral grain is in the field of view. This ensures the interference patterns are based only on a single grain.



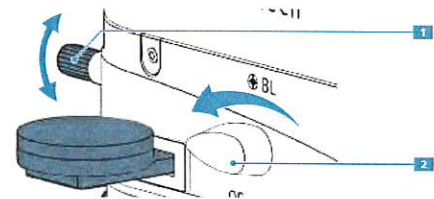
3. Move the condenser to the maximum vertical position to increase the size of the beam.



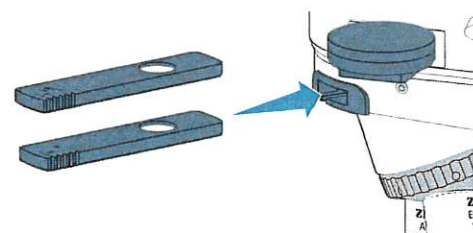
4. Open the aperture diaphragm and the luminous field diaphragm completely.
5. Turn the polarizer ring under the condenser to the 0° position.
6. Insert the rotatable analyzer into the horizontal slot of the intermediate tube.



7. Turn the lever **2** to the left to insert the Bertrand lens into the beam path. You can alter the focus of the Bertrand lens by turning the screw **1**.

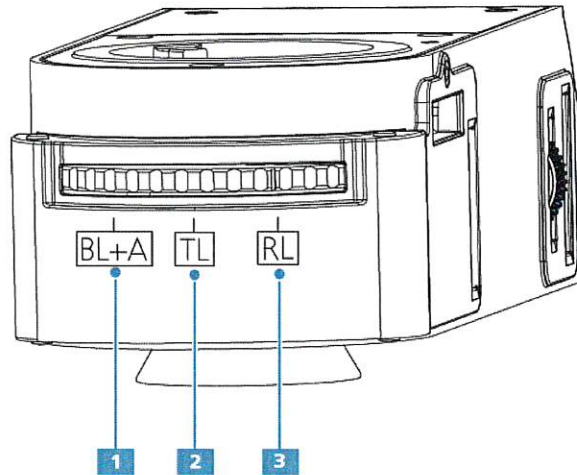


8. Observe the interference patterns through the eyepiece. You can rotate the stage to change the orientation of the sample.
9. If desired, insert a compensator into the 45° slot of the stand to further investigate and analyze the properties of the sample.



Prerequisites You are using Primotech T/R POL Conoscopy

Procedure Rotating the turret to the designated position of BL+A when the white line matches. The light source can be self-switched into transmitted or reflected light in use.



- 1** BL+A= Integrated Bertrand lens and analyzer, fixed conoscopic for objective 63xTL
- 2** TL= Transmitted light in use
- 3** RL= Reflected light in use

6 Changing Components

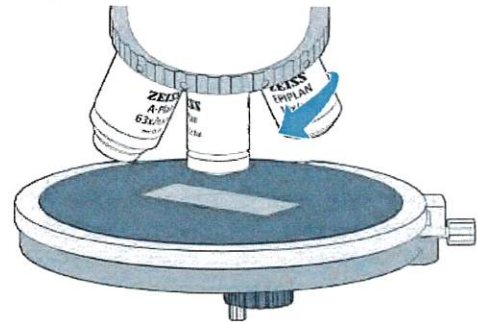
6.1 Overview

This chapter describes how to change or replace components, for example to attach a higher-resolution camera, replace the light source, or upgrade to an advanced MNA.

6.2 Changing Objectives

- Series (Epi-Plan)
- Magnification (5x)
- Numerical aperture (0.13)
- Screw connection (W0.8)

- Procedure**
1. Lower the stage.
 2. Rotate the nosepiece so that the objective to be changed is at the back or side.
 3. Unscrew the objective and remove it from the nosepiece.

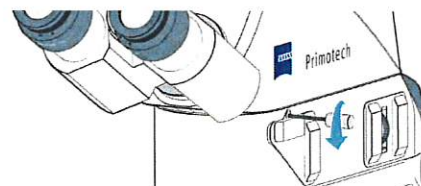


4. Screw the objective into the protective tube.
5. Unscrew the new objective from its protective tube.
6. Screw the new objective into the nosepiece.
7. If you are using T/R POL or Primotech T/POL Conoscopy, center the objective. For more information, see *Centering the Objectives* [▶ 49].
8. If you are using the Matscope app to view the sample via an iPad, you may need to recalibrate the app. For more information, see www.zeiss.com/matscope

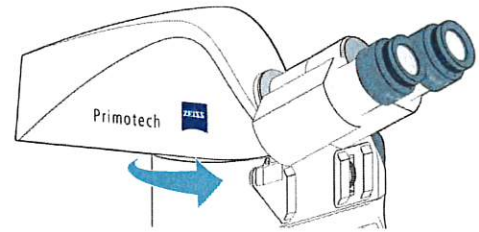
To achieve an optimal image, the size of the aperture diaphragm should be matched to the aperture of the objective. Thus, when you change an objective, you should also adjust the aperture diaphragm. For more information, see *Adjusting the Resolution and Depth of Field* [▶ 23].

6.3 Changing the Tube

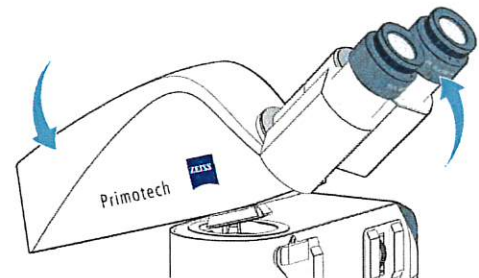
- Procedure**
1. Unplug the cables between the tube and the rear of the microscope:
 - Network cable between the network port of the tube and the top of the MNA
 - 12 V power cable between the power socket of the tube and the rear of the microscope stand
 2. Use the 2.5 mm hex key to loosen the tube mounting screw on the right side of the tube.



3. Rotate the tube 90° counter-clockwise.



4. Tilt the tube upwards and lift it out of the support.



Inserting Tubes To insert a tube:

- Procedure**
1. Place the tube on the support with the eyepieces pointing to the right.
 2. Tilt eyepiece end of the tube upwards so that the dovetail of the mount fits under the support.
 3. Lower the tube so that it is flush with the intermediate tube.
 4. Rotate the tube 90° clockwise so that the eyepieces are at the front of the microscope. Alternatively, rotate the tube 90° counter-clockwise to save space.
 5. Use the 2.5 mm hex key to tighten the hexagonal bolt on the right of the tube.
 6. Attach the cables between the tube and the rear of the microscope:
 - Network cable between the network port of the tube and the top of the MNA
 - 12 V power cable between the power socket of the tube and the rear of the microscope stand

6.4 Replacing the Light Source

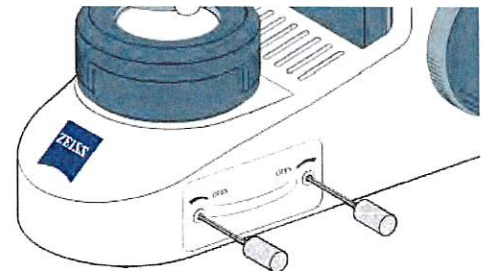
If the transmitted illumination light source stops working, the entire light source needs to be replaced, even if only the bulb has stopped working.

Info

The reflected illumination light source cannot be changed.

To change the transmitted illumination light source:

- Procedure**
1. Use the 1.5 mm hex key to loosen the two hexagonal bolts of the light source in the direction of the arrows.



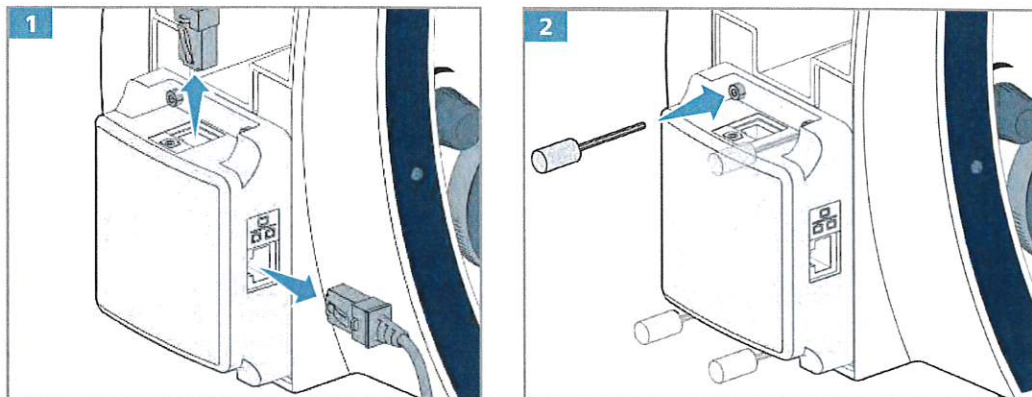
2. Grip the handle of the light source and slide it out of the stand.
3. Slide in the replacement light source.
Use cotton gloves to avoid fingerprints on the new light source.
4. Use the 2.5 mm hex key to tighten the two hexagonal bolts.

6.5 Changing the Microscope Network Adapter

The procedure for changing a microscope network adapter (MNA) is the same for the standard and advanced MNA.

Removing the MNA To remove the MNA:

Procedure 1. Unplug the Ethernet cables connected to the MNA.



2. Use the 2.5 mm hex key to undo the four hexagonal bolts of the MNA.
3. Carefully remove the MNA from the stand.

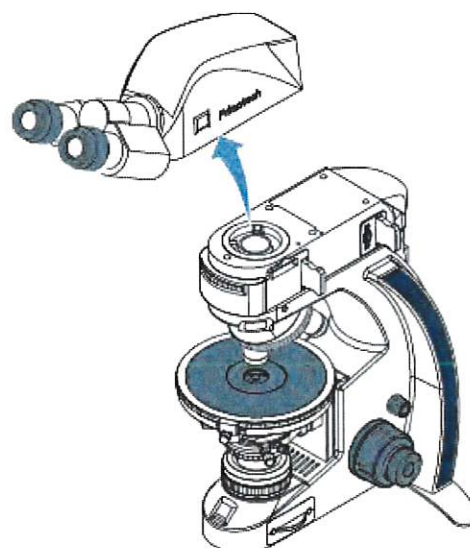
Attaching the MNA To attach the MNA:

- Procedure**
1. Place the MNA on the rear of the stand.
 2. Use the 2.5 mm hex key to tighten the four hexagonal bolts of the MNA.
 3. Attach the cables to the MNA:
 - Network cable from the camera to the MNA
 - Network cable from the MNA to the router

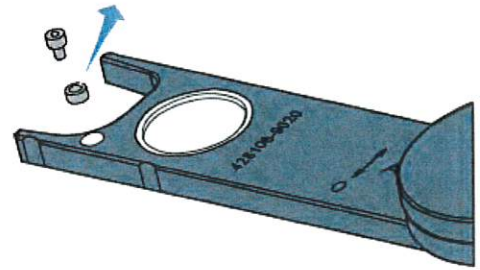
6.6 Locking sliders for anti-loss features

Locking Analyzer & Polarizer sliders To lock Analyzer and Polarizer sliders:

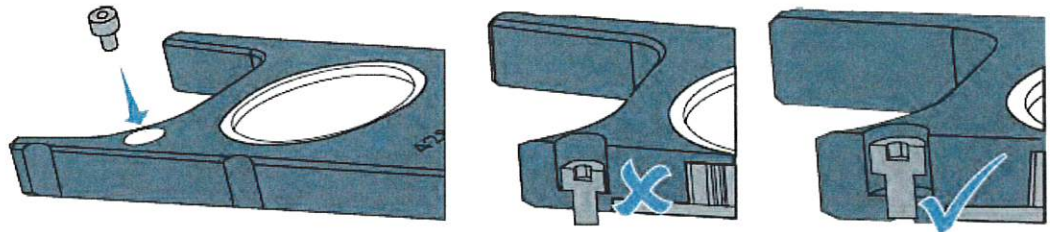
- Procedure**
1. Remove the tube from the microscope. See *Changing the Tube* [▶ 56].



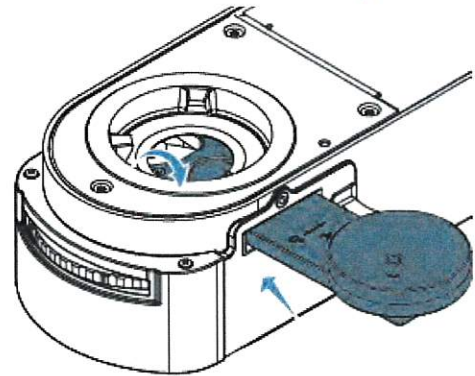
2. Remove the small sleeve beneath the M2x3 screw with an 1,5mm allen key.



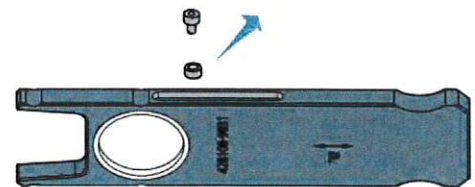
3. Insert the screw into the slot of slider, do not tighten it.



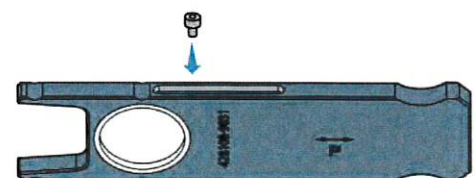
4. Insert the slider to a position between both click stop positions and tighten the screw.



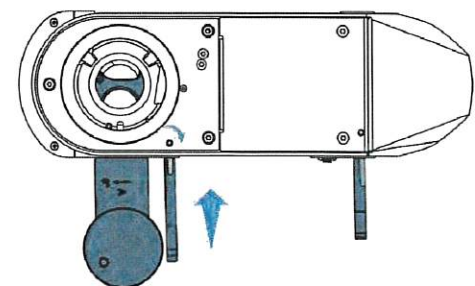
5. Remove the small sleeve beneath the screw for Polarizer with an allen key.



6. Insert the screw into the slot of slider, do not tighten it.



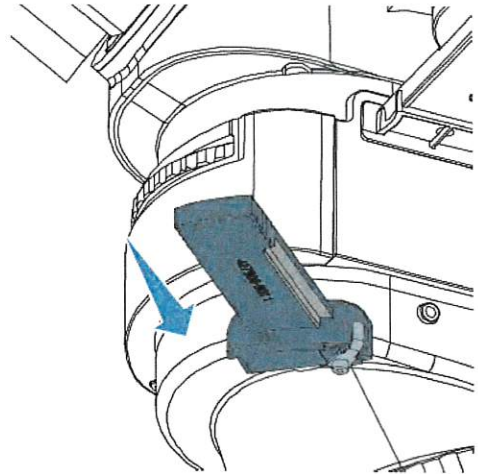
7. Insert the polarizer slider to a position between both click stop positions and tighten the screw.



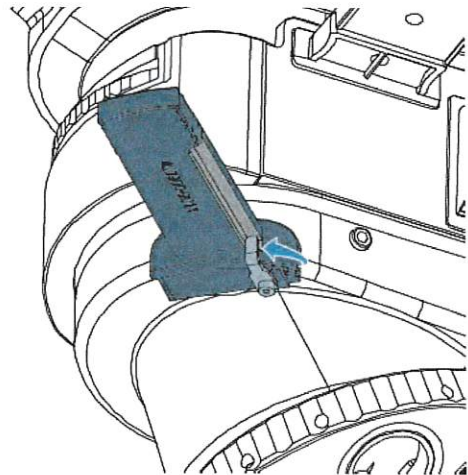
8. Reassemble the tube.

Locking Lambda sliders To lock Lambda sliders:

Procedure 1. Insert Lambda slider into the slot.



2. Loosen the M2x3 screw with a 1.5mm allen key.
3. Rotate the sheet metal to the lock position.



4. Tighten the screw.

Info

Unlocking sliders has the reverse steps with locking.

7 Maintenance and Disposal

7.1 Routine Cleaning and Care

The maintenance to be carried out by the customer is limited to the following activities:

- Cleaning the external optical surfaces of the following components
 - Objectives and eyepieces
 - Condenser
 - Polarizers/analyzers and compensators
 - All other glass surfaces
- Cleaning all other surfaces

Info

Do not clean the internal optical surfaces. Touching or cleaning these surfaces may lead to serious damage to the optical system.

Cleaning the Optical Surfaces To clean the external optical surfaces of components:

- Procedure**
1. Switch the device off completely and pull the mains plug.
 2. Remove the component from the microscope or move the stage so that the component can be accessed.
For a list of components that can be removed and the corresponding instructions, see *Disassembling the Microscope* [▶ 62].
 3. Gently rub the optical surfaces with an optical cleaning cloth dipped in an optical cleaning solution (mixture of 85% petroleum ether and 15% isopropanol).
 - Rub the surfaces in a circular motion from the center outwards.
 - To avoid scratches, do not use dry lens paper or a dry cloth.
 - Make sure that no fluid enters the system.
 4. Once the optical surfaces have dried, reinsert the component into the microscope.
For more information, see *Assembling the Microscope* [▶ 17].

Cleaning Other Surfaces To clean all other surfaces except the optical surfaces:

- Procedure**
1. Switch the device off completely and pull the mains plug.
 2. Wipe the surfaces with a clean cloth moistened with water to which a small amount of cleaning agent has been added.
Do not use a solvent.
Make sure that no fluid enters the system.
 3. Dry the surfaces with a lint-free cloth.

Info

The device manufacturer cannot be held responsible for damage caused by improper use, negligence, or unauthorized intervention in the system, in particular removal or replacement of device components or the use of unsuitable accessories from other manufacturers. Such actions will render all warranty claims invalid.

7.2 Corrective and Preventive Maintenance

To maintain the availability and performance of your Primotech system at a fully predictable budget we recommend you enter into a Protect service agreement with your ZEISS representative.

Damaged devices or components may only be repaired or replaced in accordance with the manufacturer's maintenance specifications. This may include the exchange of components by the end user.

Modifications to and retrofitting of system components may only be carried out in accordance with manufacturer's specifications. Such actions may need to be carried out by the manufacturer, ZEISS representative, or persons authorized and trained for the purpose by the manufacturer.

Replacement Parts Primotech does not require scheduled preventive maintenance by a ZEISS representative. Worn or defective components can be replaced by the end user.

Please contact your ZEISS representative to order a replacement. After receiving the replacement, please use the corresponding packaging material to return the defective component.

7.3 Support

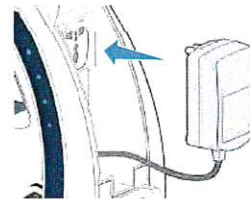
If you need support, please contact your ZEISS representative or use the following addresses:

- http://microscopy.zeiss.com/microscopy/en_de/website/forms/sales-and-service-contacts.html
- http://microscopy.zeiss.com/microscopy/en_de/service-support/microscopy-contact.html

7.4 Disassembling the Microscope

If the microscope is not going to be used for a short period of time (days), place the dust cover over it. If it is not going to be used for a longer period of time, disassemble and store the microscope.

- Procedure**
1. Press the power switch to turn off the microscope.
 2. Remove any samples from the stage.
 3. Lower the stage and move it to a central position.
 4. Unplug the power supply (plug) and store it in holder on the rear.



5. Unscrew the objective with the lowest magnification and place it in its protective tube.
6. Screw the dustcap labeled **1** into the nosepiece.
7. Repeat these steps for the other objectives.
8. Remove the eyepieces from the tube and place the protective caps on the tube.
9. Place the eyepieces in the corresponding protective packaging.
10. Unplug the cables between the tube and the rear of the microscope:
 - Network cable between the network port of the tube and the top of the MNA
 - 12 V power cable between the power socket of the tube and the rear of the microscope stand
 This does not apply to the Primotech T/POL Conoscopy.
11. Place the microscope stand in its original packaging or the case for transport and storage.

7.5 Disposal of Primotech

Electronic equipment must not be disposed of in the domestic waste. It has to be disposed according to your national regulations and guidelines.

Samples inspected using Primotech must be disposed according to the valid legal standards and company regulations.

7.6 Warranty

The manufacturer guarantees that the instrument has no material or production defects when delivered. You must inform us of any defects immediately and do everything to minimize any damage. If the manufacturer is informed of such a defect, he is obligated to rectify it; it is his decision whether he does this by repairing the instrument or by delivering an instrument free of any defect. No guarantee is provided for defects caused by natural wear (wearing parts and consumables in particular) and improper use.

The instrument manufacturer is not liable for damage caused by faulty operation, negligence, or any other tampering with the instrument, particularly the removal or replacement of instrument components, or the use of accessories from other manufacturers. This invalidates all warranty claims.

With the exception of the work specified in this manual, no maintenance or repair of Primotech may be undertaken. Repairs may only be performed by a ZEISS representative. Should any defect occur with the instrument, please contact your ZEISS representative.

8 Troubleshooting

The following table lists possible issues with Primotech and corresponding remedies. If the suggestions do not resolve the issue, search the Online Help or contact your ZEISS representative.

Category	Symptom	Remedy
Illumination	Image is too dark	<p>Check the desired illumination type is on. If so, increase the brightness (see <i>Adjusting the Illumination Brightness</i> [▶ 21]).</p> <p>Check the polarizer and analyzer are inserted correctly. If so, rotate the sample (see <i>Performing Polarization Examinations with Transmitted Light</i> [▶ 53]).</p> <p>Check the diaphragms are open sufficiently (see <i>Adjusting the Transmitted Illumination Size</i> [▶ 22]).</p>
	Light source is defective	<p>Check the microscope stand is plugged in (see <i>Assembling the Microscope</i> [▶ 17]).</p> <p>Replace the light source (see <i>Replacing the Light Source</i> [▶ 57]).</p>
	The field of view is not completely visible	<p>Ensure the nosepiece is rotated into a click-stop position.</p> <p>Change the height of the condenser (see <i>Specifying the Condenser Position</i> [▶ 45]).</p> <p>Adjust the opening of the aperture diaphragm (see <i>Adjusting the Resolution and Depth of Field</i> [▶ 23]).</p> <p>Adjust the opening of the luminous field diaphragm (see <i>Adjusting the Transmitted Illumination Size</i> [▶ 22]).</p> <p>Check the filters, polarizers, and/or compensators are inserted correctly.</p>
	Contrast is insufficient	<p>Perform Köhler settings again (see <i>Adjusting the Köhler illumination</i> [▶ 45]).</p> <p>When using transmitted light, make sure that reflected light illumination is turned off.</p>
	Hotspot when inspecting a semi-translucent sample with reflected light	<p>Cover or lower down the condenser in order to prevent it from reflecting light (see <i>Specifying the Condenser Position</i> [▶ 45]).</p>
Focus and appearance	Image is out of focus.	<p>Raise or lower the stage (see <i>Selecting Objectives and Focusing</i> [▶ 20]).</p> <p>Adjust the eyepieces (see <i>Adjusting the Eyepieces</i> [▶ 19]).</p> <p>Clean the objectives and other optical surfaces (see <i>Routine Cleaning and Care</i> [▶ 61]).</p>
	Object of interest disappears from field of view when rotating the stage	<p>Center the objective (see <i>Centering the Objectives</i> [▶ 49]).</p>
	Image too bright	<p>Reduce the power of the light source.</p>
	Edges of image too bright	<p>Close the aperture diaphragm (see <i>Adjusting the Resolution and Depth of Field</i> [▶ 23]).</p>

Category	Symptom	Remedy
Hardware	Condenser cannot be raised	Check the maximum height of the condenser (see <i>Specifying the Condenser Position</i> [▶ 45]).
	Stage moves downwards by itself	Adjust the torque of the focus wheel (see <i>Selecting Objectives and Focusing</i> [▶ 20]).
Tube 30°/20 with int. 3 MP camera	Camera is not shown in Matscope app	<p>Check the iPad's WLAN settings.</p> <p>Check the iPad and microscope are in the same network.</p> <p>Check the iPad is within range of the WLAN.</p> <p>Check that the LEDs on the network port of the tube are blinking. If not, check cabling and network.</p> <p>Make sure that you have waited at least 30 seconds after switching on the microscope.</p> <p>Make sure that there is a DHCP service in the network you are connecting the tube to.</p> <p>If all of the above points have been checked and confirmed, do a factory reset of the camera by pressing and holding the reset button for 10 seconds (using a bent paper clip, for example). The camera will reset itself and restart - this may take up to three minutes.</p>

9 Technical Data and Conformity

9.1 Power Requirements and Operating Data

The Primotech system must be connected to the AC network via the central power supply by a country-specific mains power cable.

Property	Value
Protection class	II
Degree of protection	IP 20
Electrical safety	In accordance with EN 61010-1 (IEC 61010-1) including CSA and UL regulations
Overvoltage category	II
Radio interference suppression	In accordance with EN 55011 Group 1 Class A
Resistance to interference	In accordance with EN 61326-1
Line voltage for power supply	100 to 240 V \pm 10% The supply voltage does not need to be transformed.
Line frequency	50 to 60 Hz
Input current of power supply (plug)	Max. 0.8 A
Power supply output	12 V DC; max. 2.5 A
Microscope 12 V / 6 V DC	Adjustable from 1.5 V to 6 V
LED class of complete device	LED risk group 1 according to EN 62471

Light Source - LED

Property	Value
Type	White light LED, LED risk group 1 according to EN 62471
Color temperature	5000 K
Homogenous field illumination	20 mm diameter
Suitable for objectives with magnification	5x - 63x for transmitted light 5x - 100x for reflected light
Analogous brightness adjustment	5x to 100x approx. 15 to 100%
LED lifetime	10 000 hours

Tube 30°/20

Property	Value
Viewing angle	30°
Viewing height	380 - 415 mm
Interpupillary distance	Adjustable, 48 - 75 mm

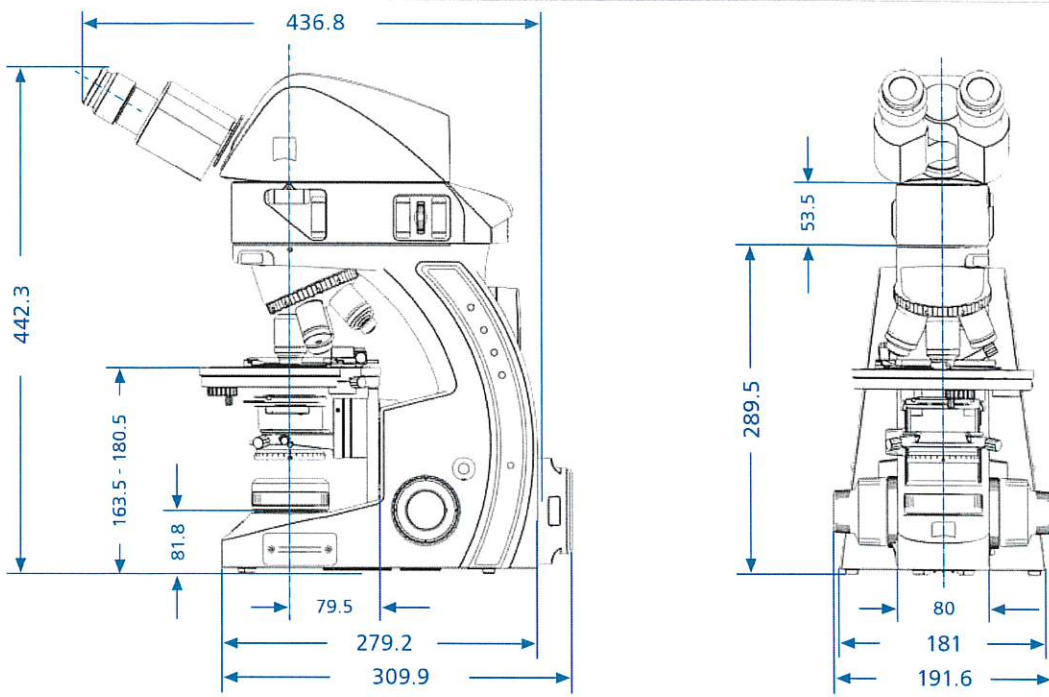
**Tube 30°/20 with
int. 3 MP camera**

Property	Value
Viewing angle	30°
Viewing height	380 - 415 mm
Interpupillary distance	Adjustable, 48 - 75 mm
Optical split ratio	50% / 50%
Camera adapter magnification	0.39x
Camera field of view, diagonal	73% of eyepiece field of view (sensor cropped for performance reasons)
Sensor	Micron MT9P031, 1/2.5" (7.13 mm diag.) CMOS, 24 bit color, 2560 x 1920 pixels, 2.2 µm pixel size Spectral sensitivity without IR filter 400 - 700 nm
Live / Video recording over LAN / WLAN	<ul style="list-style-type: none"> ▪ 640 x 480 pixels (VGA) ▪ 20 fps, latency: ~400 ms ▪ Bitrate: 1.5 / 3 / 6 Mbit/s
Snap resolution	3 MP / 2048 x 1536 pixels, YUV color
Auto white balance	Yes (Auto/Lock)
Electrical interfaces	<ul style="list-style-type: none"> ▪ 12 V DC power input (provided by the microscope via interconnection cable) ▪ Network (RJ45), 100 Mbit/s
Buttons	Reset button (backside)

9.2 Physical Dimensions and Key Specifications**Dimensions and
Key Specifications**

Property	Primotech MAT	Primotech T/R MAT	T/R MAT Pri- motech Conoscopy	Primotech T/ POL Conoscopy
Microscope stand (width x depth x height)	Approx. 192 x 467 x 442 mm (incl. eyepieces, network adapter, not in- cluding base plate)	Approx. 192 x 467 x 442 mm (incl. eyepieces, network adapter, not in- cluding base plate)	Approx. 192 x 467 x 442 mm (incl. eyepieces, network adapter, not in- cluding base plate)	Approx. 192 x 467 x 442 mm (incl. eyepieces, network adapter, not in- cluding base plate)
Weight	Approx. 8.5 kg	Approx. 9.5 kg	Approx. 10.1 kg	Approx. 9.1 kg
Stage travel range	75 x 50 mm	75 x 50 mm	35 x 30 mm	35 x 30 mm
Stage surface size	140 x 135 mm	140 x 135 mm	ø = 160 mm	ø = 160 mm
Maximum sam- ple weight	500 g	500 g	500 g	500 g

Property	Primotech MAT	Primotech T/R MAT	T/R MAT Primotech Conoscopy	Primotech T/POL Conoscopy
Maximum sample height	34 mm	17 mm	17 mm	17 mm



9.3 Environmental Requirements

Primotech must be installed and operated in an enclosed space.

Category	Property	Value
Transport (in packaging)	Permissible ambient temperature	-40 to +70 °C
	Permissible air humidity (without condensation)	max. 75 % at 35 °C
Storage	Permissible ambient temperature	+10 to +40 °C
	Permissible air humidity (without condensation)	max. 75 % at 35 °C
	Permissible ambient temperature	+10 to +40 °C
	Permissible air humidity	max. 75 % at 35 °C
	Air pressure	800 hPa to 1060 hPa
Operation	Height above sea level	max. 2000 m
	Degree of pollution	2

9.4 Scope of Delivery

The following standard components are supplied with all products:

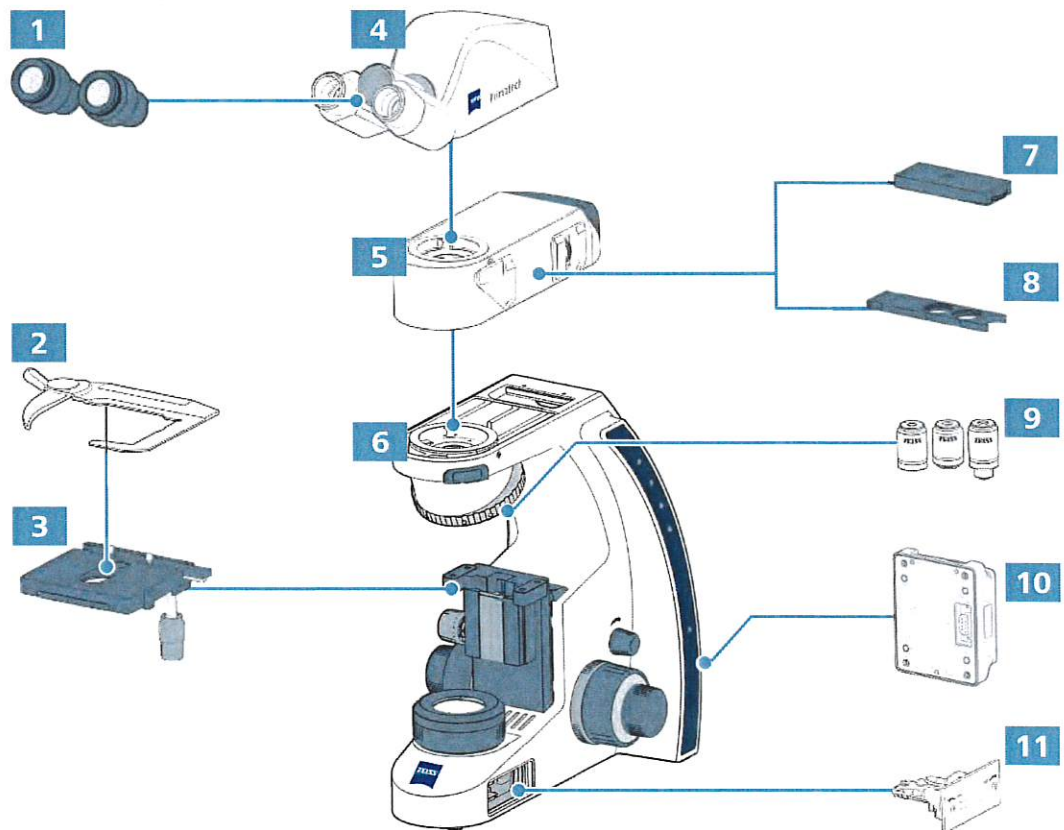
- Power cable including country-specific plug adapters
- Base plate
- Calibration slide for Matscope App
- Dust cover to protect the microscope when not in use
- Zeiss toolkit, including
 - 1.5 mm hex key
 - 2.5 mm hex key
- Documentation
 - Safety information (printed)
 - Quick start guide (printed)
 - Instruction manual (on USB stick)

Furthermore, an optional case for transport and storage (434002-9000-000) is available for all stands.

The following sections list the standard and optional components of each stand.

9.4.1 Primotech MAT (430055-9040/9140-000)

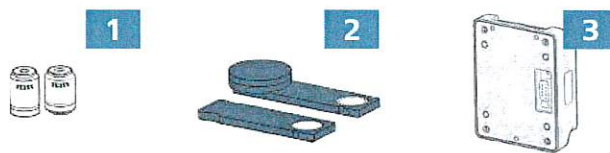
Standard components:



- 1** Eyepiece E-PL 10x/20 Br.foc.
- 2** Specimen holder
- 3** X-Y stage
- 4** Tube 30°/20 w/o int. 3 MP camera

- 5** Intermediate tube, reflected light illumination
- 6** Microscope stand
- 7** Slider for oblique illumination
- 8** Conversion filter slider (3200 K), d = 25 mm
- 9** Objective Epiplan 5x/0.13 W0.8"
Objective Epiplan 20x/0.4 W0.8"
Objective Epiplan 50x/0.65 W0.8"
- 10** Microscope network adapter
- 11** Transmitted illumination LED
Other (not shown): Leveling press, w. starter kit

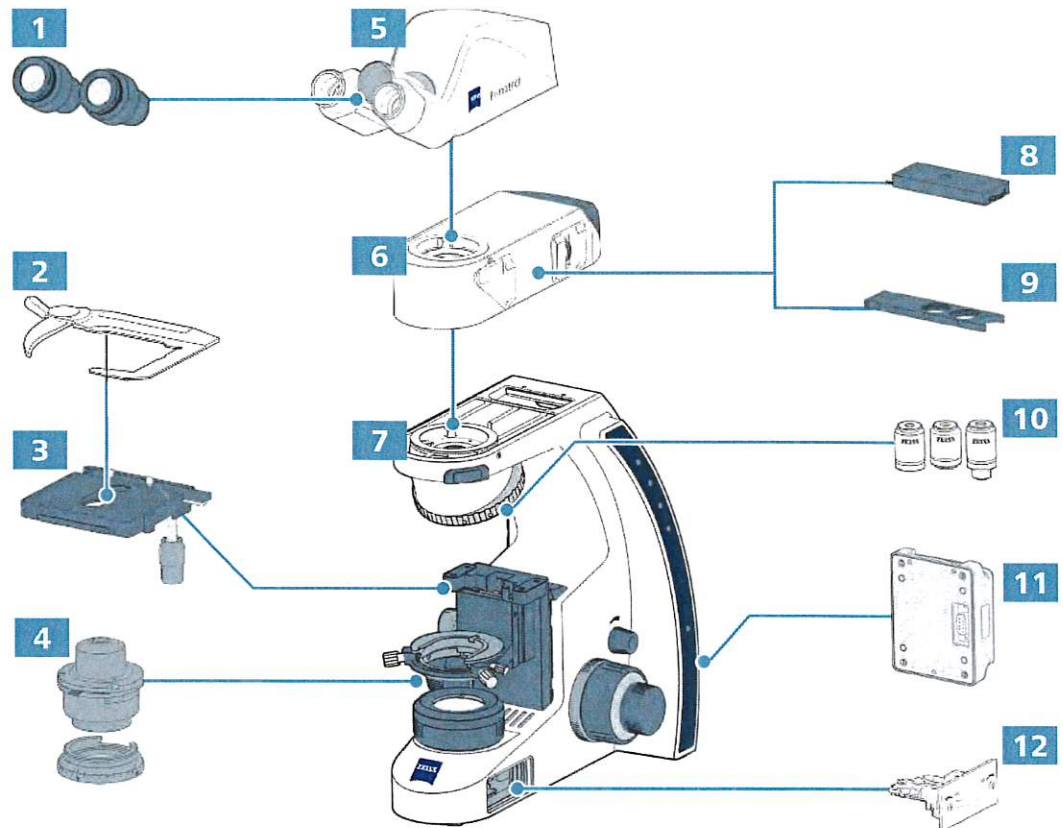
Optional components:



- 1** Objectives:
Epiplan 10x/0.23 W0.8
Epiplan 100x/0.8 W0.8
- 2** Analyzer slider T/R rotat. 360°
Polarizer slider A, fixed
- 3** Advanced microscope network adapter
Other (not shown): transportation case

9.4.2 Primotech T/R MAT (430055-9050/9150-000)

Standard components:



- 1** Eyepiece E-PL 10x/20 Br.foc.
 - 2** Specimen holder
 - 3** ESD stage
 - 4** Köhler condenser incl. aperture diaphragm
 - 5** Tube 30°/20 w/o integrated 3 MP camera
 - 6** Intermediate tube, reflected light illumination
 - 7** Microscope stand
 - 8** Slider for oblique illumination
 - 9** Conversion filter slider (3200 K), d = 25 mm
 - 10** Objectives:
 - Objective Epiplan 5x/0.13 W0.8"
 - Objective Epiplan 20x/0.4 W0.8"
 - Objective Epiplan 50x/0.65 W0.8"
 - 11** Microscope network adapter
 - 12** Transmitted illumination LED
- Other (not shown): Leveling press, w. starter kit

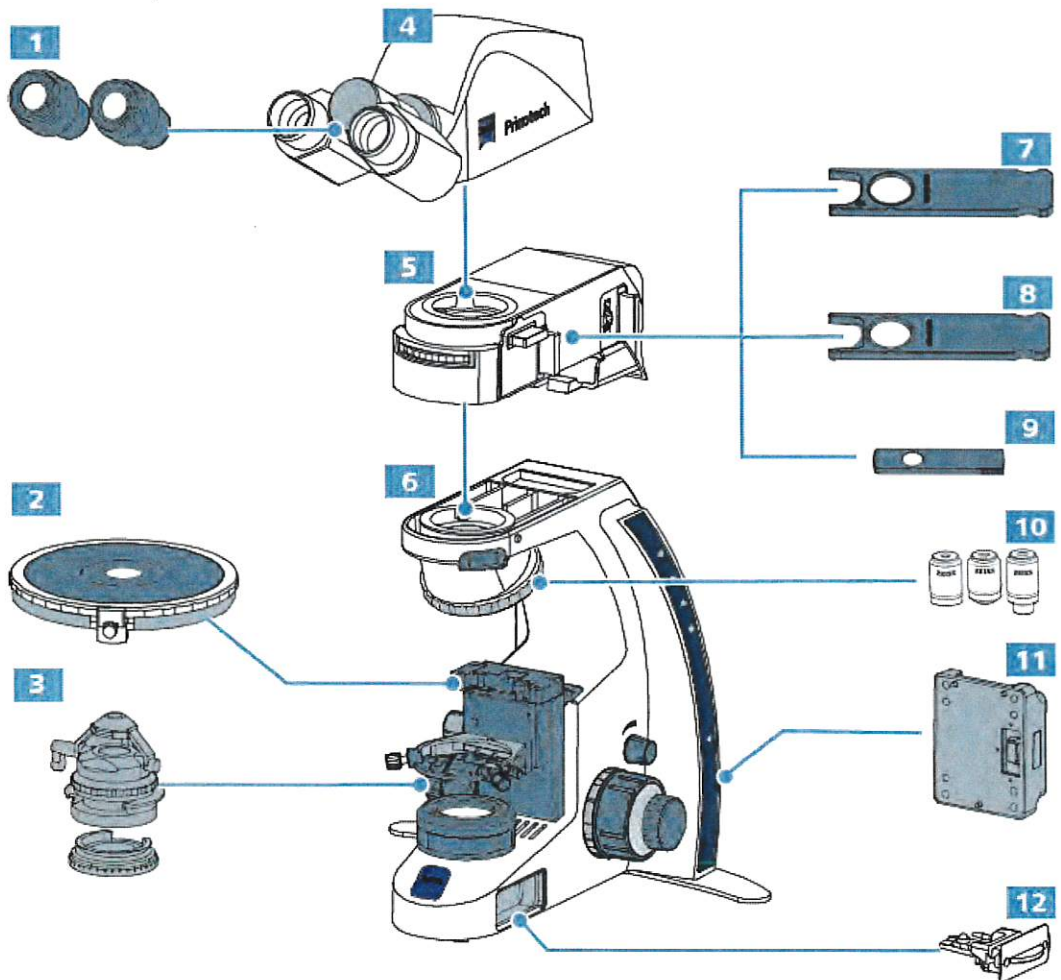
Optional components:



- 1** Objectives:
Epiplan 10x/0.23 W0.8
Epiplan 100x/0.8 W0.8
- 2** Analyzer slider T/R rotat. 360°
Polarizer slider A, fixed
- 3** Advanced microscope network adapter
Other (not shown): transportation case

9.4.3 Primotech T/R POL Conoscopy (430055-9080/9180-000)

Standard components:



- 1** Eyepiece E-PL 10x/20 Br.foc. pol w/o crossline graticule Rotatable
- 2** Stage
- 3** Köhler condenser with swing-in and front lens

- 4** Tube 30°/20 w/o int. Camera 3MP
- 5** Intermediate tube T/R POL conos.
- 6** Microscope stand
- 7** Analyzer Slider T/R, fixed
- 8** Polarizer Slider A, fixed
- 9** Compensator Lambda, 6x20
- 10** Objectives:
Epi-Plan 5x/0.12 Pol WD=9.9mm
A-Plan 10x/0.25 Pol WD=0,50mm
A-Plan 63x/0.8 Pol WD=0.30mm
- 11** Microscope network adapter
- 12** Transmitted illumination LED
- 13** Color filter (TL) (not shown)
- 14** Quartz depolarizer for tubes (not shown)

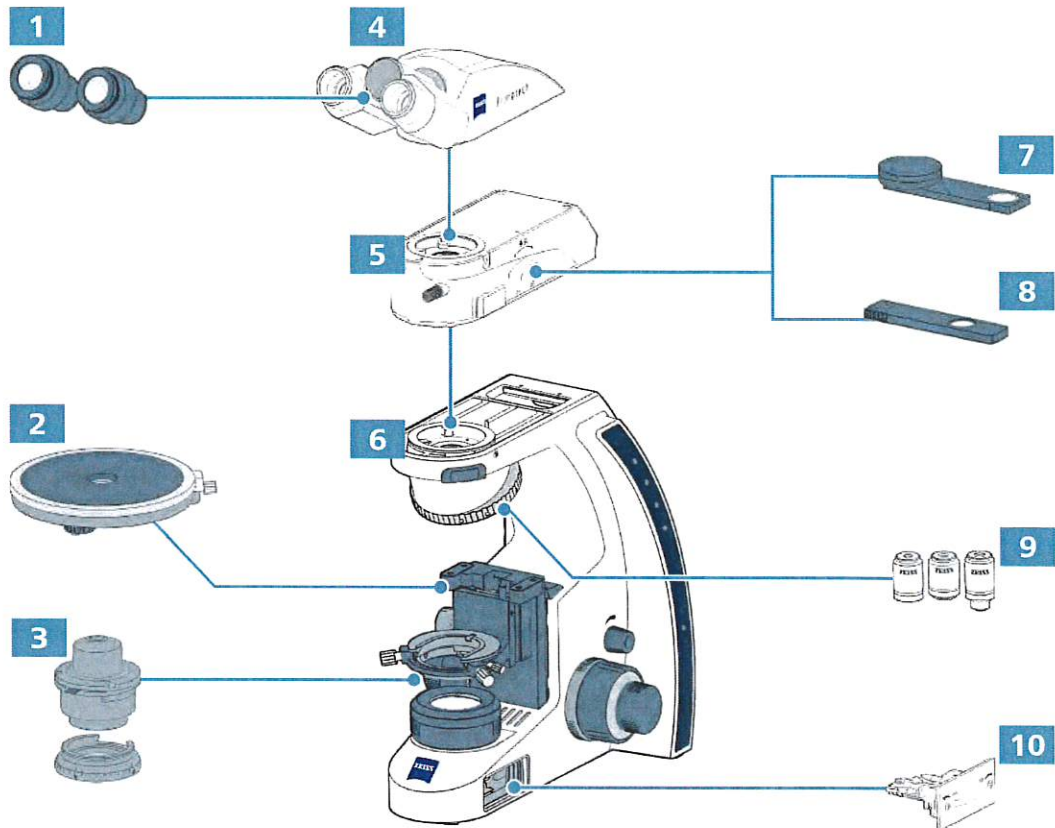
Optional components:



- 1** Compensator Lambda/4, 6x20 Compensator wedge 0-4 Lambda, 6x20
- 2** Analyzer slider T/R rotat. 360°
- 3** Filter slider
- 4** Color filter d=25 (not shown)
- 5** Object guide Pol

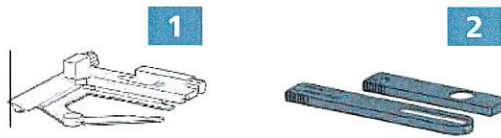
9.4.4 Primotech T/POL Conoscopy (430055-9071/9170-000)

Standard components:



- 1** Eyepiece E-PL 10x/20 Br.foc. pol with crossline graticule
- 2** Rotatable stage
- 3** Abbe condenser 0.9 POLTube
- 4** POLTube 30°/20 Pol w/o int. camera
- 5** Bertrand system, focusable
- 6** Microscope stand
- 7** Analyzer slider T/R rotat. 360°
- 8** Compensator Lambda, 6x20
- 9** Objectives:
 - Epi-Plan 5x/0.12 Pol WD=9.9mm
 - A-Plan 10x/0.25 Pol WD=0,50mm
 - A-Plan 63x/0.8 Pol WD=0.30mm
- 10** Transmitted illumination LED
- 11** Color filter (TL) (not shown in the drawing)
- 12** Quartz depolarizer for tubes (not shown in the drawing)

Optional components:



1 Object guide Pol

2 Compensator Lambda/4, 6x20 Compensator wedge 0-4 Lambda, 6x20

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