Leica Z6 APO & Z16 APO

User manual

Leica MICROSYSTEMS

Dear User,

Thank you for your faith in our product. We hope your work with it is both enjoyable and successful.

The Leica Z6 APO and Z16 APO from Leica Microsystems are the only fully apochromatically corrected zoom systems on the market, and are superior to other zoom systems in contrast, image sharpness, color fidelity and image precision. The Leica Z6 APO and Z16 APO are exceptionally well suited to high-precision inspections throughout the entire manufacturing process, all the way to the integration of them into machine vision systems, as well to scientific and medical applications.

Furthermore, you can create complete single measurement and testing stations tailored to your custom needs. The new zoom systems include the widest line of accessory products to meet every imaginable examination, training, and documentation task. With compatible stands, illuminators, binocular tubes and video/phototubes, motorized focus, modern CCD cameras, and much more, the Leica Z6 APO and Z16 APO are suitable for video inspection, measurement, documentation and analysis tasks in the QA lab, just as they are suited for biology, geology, histology, criminology and training.

In developing our instruments, we place great value on simple, self-explanatory operation. However, please take the time to read the user manual and the operating safety information to become familiar with the advantages and options of your Leica Z6 APO and Z16 APO zoom systems, so that you can use them optimally and safely.

Should you have any questions, please consult your local Leica representative. You will find the address of the closest local representative as well as valuable information about products and services from Leica Microsystems on our homepage at
www.leica-microsystems.com
We are gladly at your service. Customer service is a big thing with us. Not only before the sale, but afterwards as well.

Leica Microsystems (Switzerland) Ltd.
Business Unit Stereomicroscopy
www.stereomicroscopy.com

Overview of the instrument

Fig. 1 Basic components and controls: left, Leica Z16 APO zoom system with fine focusing and objective. Right, Leica Z6 APO zoom system with objective.

1 Leica Z16 APO zoom system
2 Leica Z6 APO zoom system
3 Fine focusing
(the diaphragm ring [10] is removed)
4 Objective
5 Switch for activating/deactivating the zoom click stop
6 Knurled ring for adjusting the zoom
7 Scale with magnification factors
8 Clamping screw for adjusting and locking the iris diaphragm
(1 = smallest diameter, 5 = OPEN)
9 Hexagon-head screws for fastening the zoom system to the tube
10 Diaphragm ring with thread for tightening the objective (when using the fine focusing, release the three hexagon-head screws on the diaphragm ring and remove the diaphragm ring)

Contents

1. Safety concept

1.1 The user manual

Included with your Leica Z6 APO and Z16 APO zoom systems is an interactive CD-ROM with all pertinent user instructions in German, English, French, Spanish, Italian, Portuguese, Dutch, Danish, Swedish, Finnish, and Greek. Keep it in a safe place, and readily accessible to the user. User manuals and updates are also available for you to download and print from our web site at www.stereomicroscopy.com.

This operating manual describes the special functions of the Leica Z6 APO and Z16 APO zoom systems and contains important instructions for their operational safety, maintenance, and accessories. The Leica Z6 APO and Z16 APO are zoom systems which can be expanded in a modular system, allowing an almost unlimited range of individual equipment configurations. The identical modules, such as stands, binocular tubes, accessories, etc. are described in User Manual M2-105-0 for Leica M stereomicroscopes, which also contains additional safety instructions pertaining to accessories and electrical accessories, as well as care instructions.

Special manuals are provided for the following accessories:
– User Manual M2-267-1 for the motorized focus system.
– User Manual M2-216-2 for the Leica HL RC™ transmitted-light base

Before installing, operating or using the instruments, read the user manuals listed above. In particular, please follow all safety instructions. To maintain the unit in its original condition and to ensure safe operation, the user must follow the instructions and warnings contained in these user manuals.

1.1.1 Diagrams

(1.5) Numbers in parentheses within the descriptions pertain to diagrams and the items in the diagrams.
Example **(1.5)**: Figure **1** is found on Page 3 and item **5** is the switch for activating/deactivating the zoom click stop.

1.1.2 Symbols used

Warning of a danger

This symbol indicates especially important information that, if not observed,
- can cause hazards to personnel,
- can lead to functional disturbances and damaged instruments.

Warning of hazardous electrical voltage

This symbol indicates especially important information that, if not observed,
- can cause hazards to personnel,
- can lead to functional disturbances and damaged instruments.

Danger due to hot surface

This symbol warns against touching hot surfaces, e.g. those of light bulbs.

Important information

This symbol indicates additional information or explanations that intend to provide clarity.

Action

▶ This symbol refers to actions described in the text that are to be carried out.

Explanatory notes

• This symbol indicates additional notes and explanations provided in the text.

1.2 Safety instructions

Description

The Leica Z6 APO and Z16 APO are optical systems with 6.3:1 or 16:1 magnification changer and a central beam path. The most precise information can be obtained thanks to the parallax error free observation. Measurements, adaptation tasks and evaluations become more precise; more high-quality information is obtained in photography and image processing. The vertical beam path is virtually predestined for digital recordings with multifocus programs. Polarized optical examinations provide true polarization colors, and the geometric layers of flat, highly reflective objects such as wafers appear without distortion when using coaxial illumination.

A comprehensive range of modular accessories such as objectives, carriers, video/phototubes, stands, binocular tubes, eyepieces, etc. are available for the Leica Z6 APO and Z16 APO.

Permitted uses

With the Leica Z6 APO and Z16 APO zoom systems and the apochromatic objectives, entire objects can be inspected and documented without distortion. As high-performance optical equipment, they lend themselves to use with measurement and testing systems including vision technology systems, and for high-end laboratory workstations.

Non-intended use

If the Leica Z6 APO or Z16 APO, its components or accessories are used other than as described in the user manual, injury or property damage may occur. Never:
- install other plugs or cables.
- change, rebuild or take apart parts, if not specifically instructed to in this in the manual.
- allow unauthorized persons to open parts.
- use the Leica Z6 APO and Z16 APO for examining, or operating on the human eye.

The devices and accessories described in this operating manual have been tested for safety and potential hazards. The responsible Leica affiliate must be consulted whenever the device is altered, modified or used in conjunction with non-Leica components that are outside of the scope of this manual.
Unauthorized alterations to the device or noncompliant use shall void all rights to any warranty claims!

Responsibilities of the person(s) in charge of instrument

Ensure that
- the Leica Z6 APO and Z16 APO and accessories are operated, maintained and repaired by authorized and trained personnel only.
- the operating personnel has read, understands, and is observing these instructions as well as those listed on page 5, and, in particular, the safety instructions.

Place of use

- The Leica Z6 APO and Z16 APO may only be operated in closed, dust-free rooms at +10 °C to +40 °C. Ensure that the room is free of oil and chemical fumes and extreme humidity.
- Electrical components must be assembled at least 10cm away from the wall and from flammable substances.
- Large temperature fluctuations, direct sunlight and vibrations should be avoided. These conditions can distort measurements and micrographic images.
- Optical systems in warm and warm-damp climatic regions require special care in order to prevent the build up of fungus.

Disposal

The products described here must be disposed off in accordance with applicable local laws and regulations.

Legal requirements

Adhere to general and local regulations relating to accident prevention and environmental protection.

Conformity with European Community directive

The Leica Z6 APO and Z16 APO and their accessories are constructed based on the state of the art of technology and are provided with an EU Declaration of Conformity.

Health risks

 Workplaces with optical systems facilitate and improve the viewing task, but they also impose high demands on the eyes and holding muscles of the user. Depending on the duration of uninterrupted work, asthenopia and musculoskeletal problems may occur. For this reason, appropriate measures for reduction of the workload must be taken:

– optimal arrangement of workplace, work assignments and work flow (changing tasks frequently).
– thorough training of the personnel, giving consideration to ergonomic and organization aspects.

The ergonomic optics concept and the design of Leica optics systems aim to limit the strain on the user to the lowest possible level. If you wish to equip your zoom system with one of our binocular tubes, we offer ErgoTubes® and ErgoModules®, which compensate for the varying design heights of the equipment, accessories and working distances, and for the variation of human height of its users. If you have problems with the viewing configuration, ask your Leica consultant for the most ergonomic Leica solutions.

 Direct contact with eyepieces is a potential transmission method for bacterial and viral infections of the eye. Users should be made aware of the potential risk of infection. The risk can be kept to a minimum by using personal eyepieces for each individual or detachable eyecups.

Repairs and servicing

– Only Leica Microsystems-trained service technicians, or technical specialists assigned by the person in charge of the instrument, are permitted to carry out repairs.
– Only original Leica Microsystems spare parts may be used.
– Unplug the power cable before opening voltage carrying parts.

 **Touching the live circuit can cause injury.**

Transport

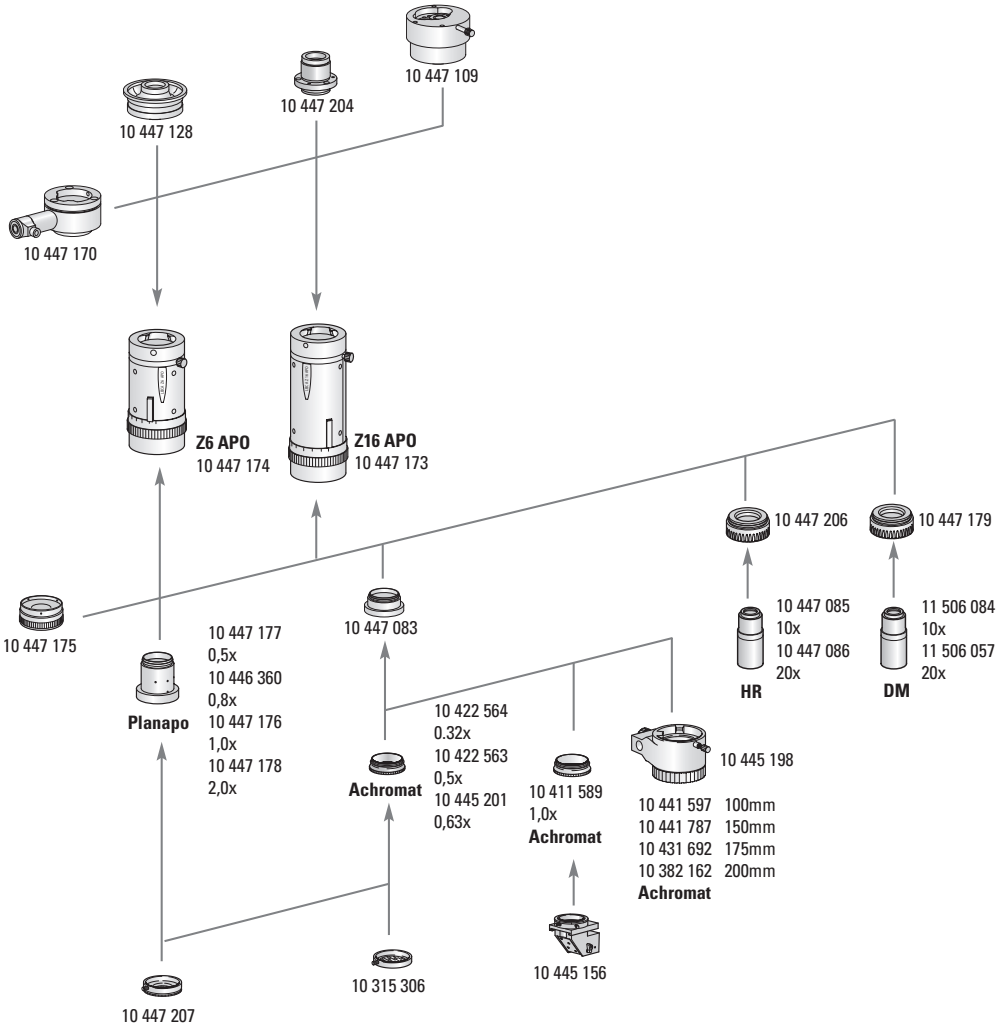
– Use the original packaging for shipping or transporting the zoom systems and their accessory components.
– In order to prevent damage from vibrations, disassemble all moving parts that (according to the user manual) can be assembled by the customer and pack them separately. These include the objective, video/phototube, carrier, binocular tube, eyepieces, etc.

Integration in third-party products

When installing Leica products into third-party products, note the following: The manufacturer of the complete system or its dealer is responsible for following all applicable safety instructions, laws and guidelines.

2. Assembly

Diagram 1: Zoom systems, objectives and accessories



2.1 Zoom systems

For every zoom system, please order a Leica Z6 APO and Z16 APO objective and, optionally, the fine focusing.

The basic components–the zoom system and objective–can be combined in modular fashion with various tubes, carriers, stands, focusing drives, binocular tubes, illuminators and accessories for digital imaging and expanded into complete workstations. Accessories that are also used for Leica M series stereomicroscopes are listed in the User Manual for Leica M stereomicroscopes, M2-105-0.

Either the integrated clamping screws or an Allen key is necessary for assembly; these are included in delivery.

2.2 Assembly of zoom system and objective

- We recommend using the 1×, 2×, 0.8×, 0.5× planapochromatic objectives, in order to take advantage of the high performance of the apochromatic zoom system.
- You can attach the quarter-wave plate for coaxial illumination, the analyzer for polarization or the ring illuminator to the planapochromatic objectives.
- Also available are the M series 0.63×, 0.5×, 0.32× achromatic objectives, which can be attached to the zoom or the fine focusing using an adapter (see assembly diagram on page 9).
- You can attach the vertical illuminator or the attachment for incident/oblique observation to the achromatic objectives.
- For magnifications in the microscopic range, DM and HR objectives are available, which can be attached to the zoom or fine focusing with an adapter (see assembly diagram on page 9). Always use the DM and HR objectives with fine focusing.

You can use the objectives on the Z6 APO or Z16 APO zoom systems or with the fine focusing.

Objective / zoom system

▶ Screw the planapochromatic objective (2.4) counterclockwise onto the diaphragm ring (2.3).
▶ Screw the achromatic objective onto the diaphragm ring (2.3) using an adapter.

Objective / fine focusing / zoom system

▶ Release the three hexagon-head screws (2.6) on the diaphragm ring (2.3) and remove the diaphragm ring.
▶ Tighten the fine focusing (2.5) to the zoom system using the three hexagon-head screws (2.7).
▶ Screw the planapochromatic objective (1.4) counterclockwise onto the fine focusing (2.5).
▶ Tighten the achromatic objective to the fine focusing (2.5) using an adapter.
▶ Tighten the DM and HR objectives (3.2) to the fine focusing (3.4) using an adapter (3.3).

Fig. 2 Assembly of zoom system and objective:
Left: Leica Z16 APO zoom system, objective mounted to the diaphragm ring.
Right: Leica Z6 APO zoom system with fine focusing (without diaphragm ring).

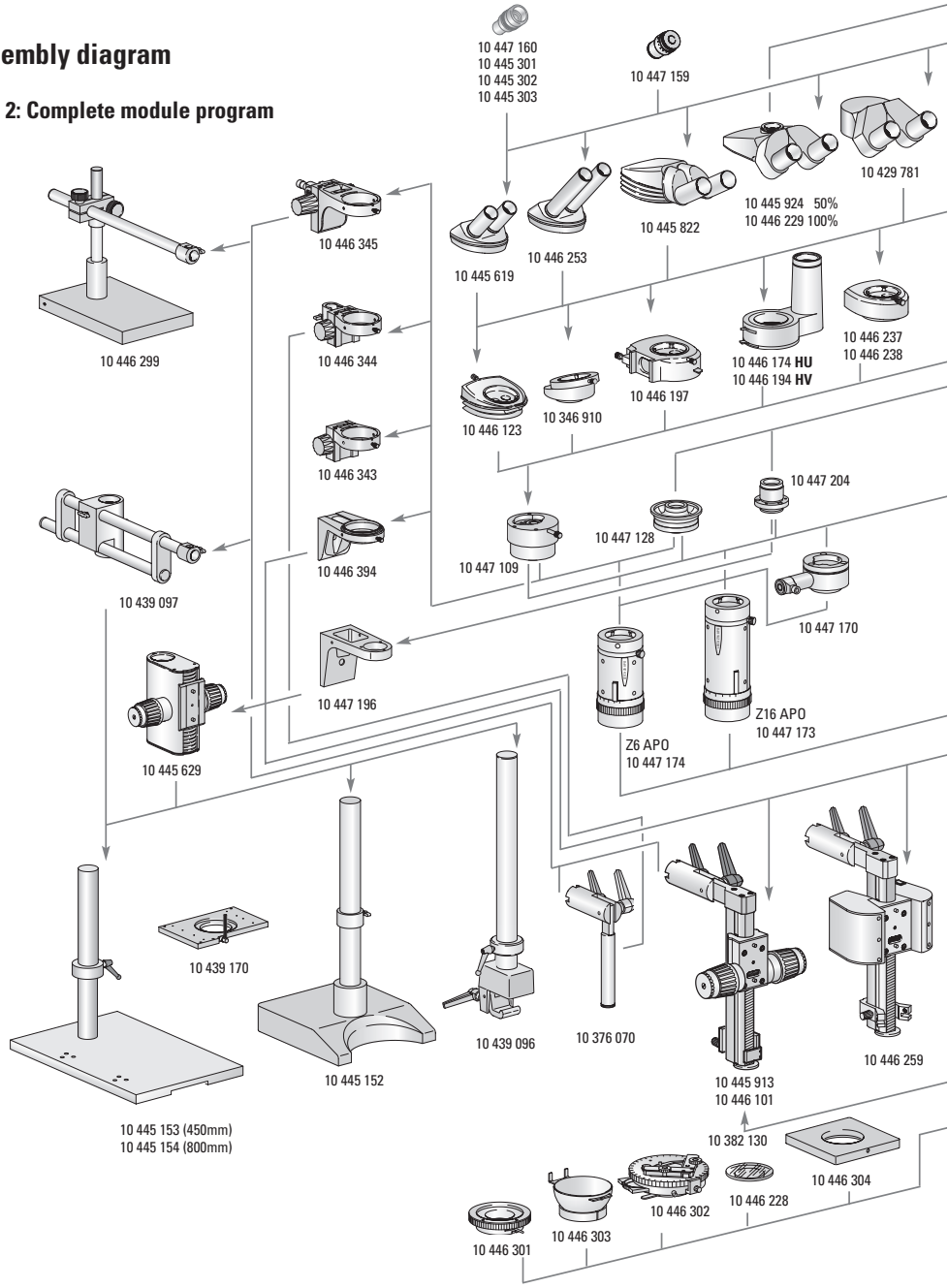
1 Leica Z16 APO zoom system
2 Leica Z6 APO zoom system
3 Diaphragm ring with thread for tightening the objective (when using the fine focusing, release the three hexagon-head screws on the diaphragm ring and remove the diaphragm ring)
4 Objective
5 Fine focusing
(the diaphragm ring [2.3] is removed)
6 The hexagon-head screws on the diaphragm ring fasten the diaphragm ring to the zoom system (one of the three hexagon-head screws is visible)
7 The hexagon-head screws fasten the fine focusing to the zoom system (one of three hexagon-head screws is visible)

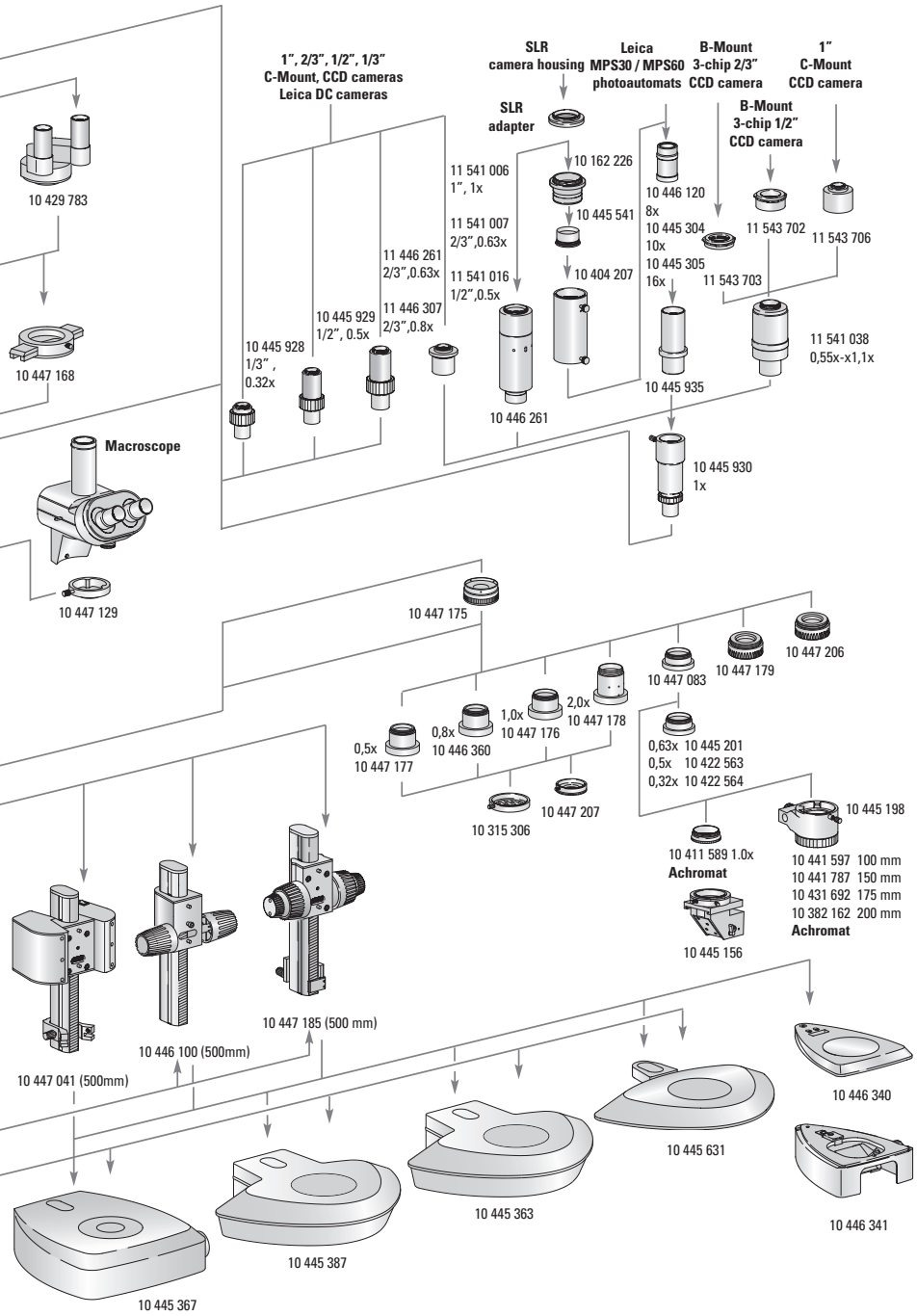
Fig. 3 Assembly of zoom system and micro-objective

1 Leica Z16 APO zoom system
2 Micro-objective
3 Adapter for micro-objective
4 Fine focusing
(the diaphragm ring [2.3] is removed)

2.3 Assembly diagram

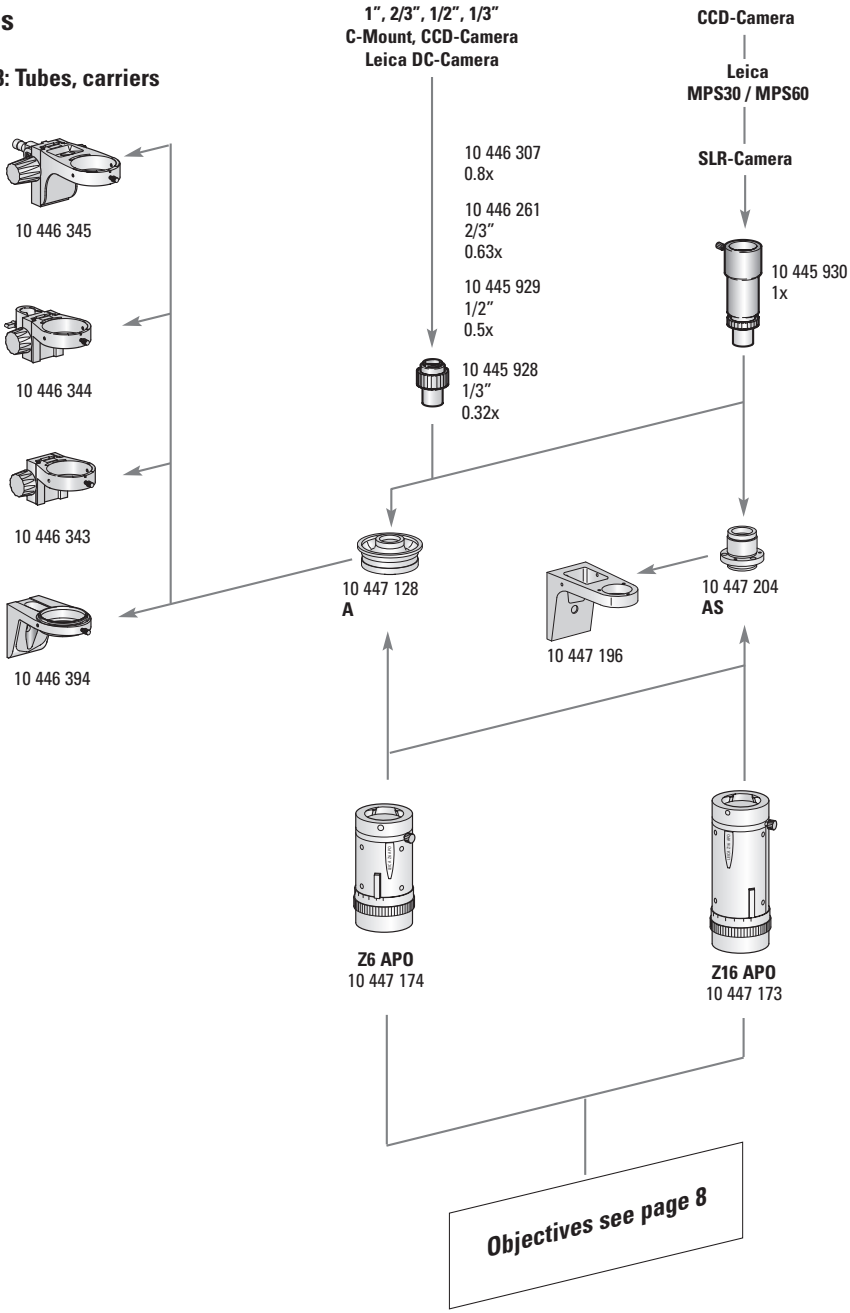
Diagram 2: Complete module program




1", 2/3", 1/2", 1/3"
C-Mount, CCD cameras
Leica DC cameras
SLR
camera housing
SLR
adapter
Leica
MPS30 / MPS60
photoautomats
B-Mount
3-chip 2/3"
CCD camera
B-Mount
3-chip 1/2"
CCD camera
1"
C-Mount
CCD camera
10 429 783
10 447 168
10 445 928
1/3" ,
0.32x
10 445 929
1/2", 0.5x
11 446 261
2/3",0.63x
11 446 307
2/3",0.8x
11 541 006
1", 1x
11 541 007
2/3",0.63x
11 541 016
1/2",0.5x
10 162 226
10 445 541
10 404 207
10 446 261
10 446 120
8x
10 445 304
10x
10 445 305
16x
10 445 935
11 543 702
11 543 703
11 543 706
11 541 038
0,55x-x1,1x
10 445 930
1x
Macroscope
10 447 129
10 447 175
10 447 206
10 447 179
10 447 083
0,5x
10 447 177
0,8x
10 446 360
1,0x
10 447 176
2,0x
10 447 178
0,63x 10 445 201
0,5x 10 422 563
0,32x 10 422 564
10 315 306
10 447 207
10 411 589 1.0x
Achromat
10 445 198
10 441 597 100 mm
10 441 787 150 mm
10 431 692 175 mm
10 382 162 200 mm
Achromat
10 445 156
10 447 041 (500mm)
10 446 100 (500mm)
10 447 185 (500 mm)
10 446 340
10 445 631
10 445 363
10 446 341
10 445 387
10 445 367

2.4 Tubes

Diagram 3: Tubes, carriers



The tubes allow you to attach accessories for photography and observation. The carriers allow you to attach the instrument to stands, machines and working equipment. The following tubes and carriers are available:

– AS video/phototube (10447204)
  For use with carrier (10447196).
– A video/phototube (10447128)
  For use with microscope carrier (10446394) or focusing arms (10446345, 10446343 and 10446344).
– Y tube (10447109) for tubes of the Leica M stereomicroscope line, 1.25× tube factor, 50/50 light splitting
  For use with microscope carrier (10446394) or focusing arms (10446345, 10446343 and 10446344).

The video/phototubes and the Y tube are attached to the dovetail ring of the zoom system, and fastened to the zoom system using the hexagon-head screw (1.9).

Similarly, you can also attach a coaxial illuminator between the zoom system and the tube (Chapter 2.5).

2.4.1 Digital imaging with AS video/phototube

You can mount digital cameras onto the AS video/phototube to create a slim, space-saving equipment configuration. This configuration consists of:

– Leica Z6 APO or Z16 APO zoom system, objective and optional fine focusing
– Video/phototube AS (10447204)
– Video objective with C-mount
– Digital camera

Zoom system → AS video/phototube

▶ Release the hexagon-head screw (4.10) using the Allen key provided.
▶ Adjust the zoom system (4.1) to the dovetail ring of the AS video/phototube (4.4) and tighten the hexagon-head screw (4.10).

Video objective → zoom system with AS video/phototube

▶ Screw the desired digital camera (4.6) onto the C thread of the video objective (4.5).
▶ Insert the video objective into the AS video/phototube (4.4) and tighten the knurled ring (4.11).

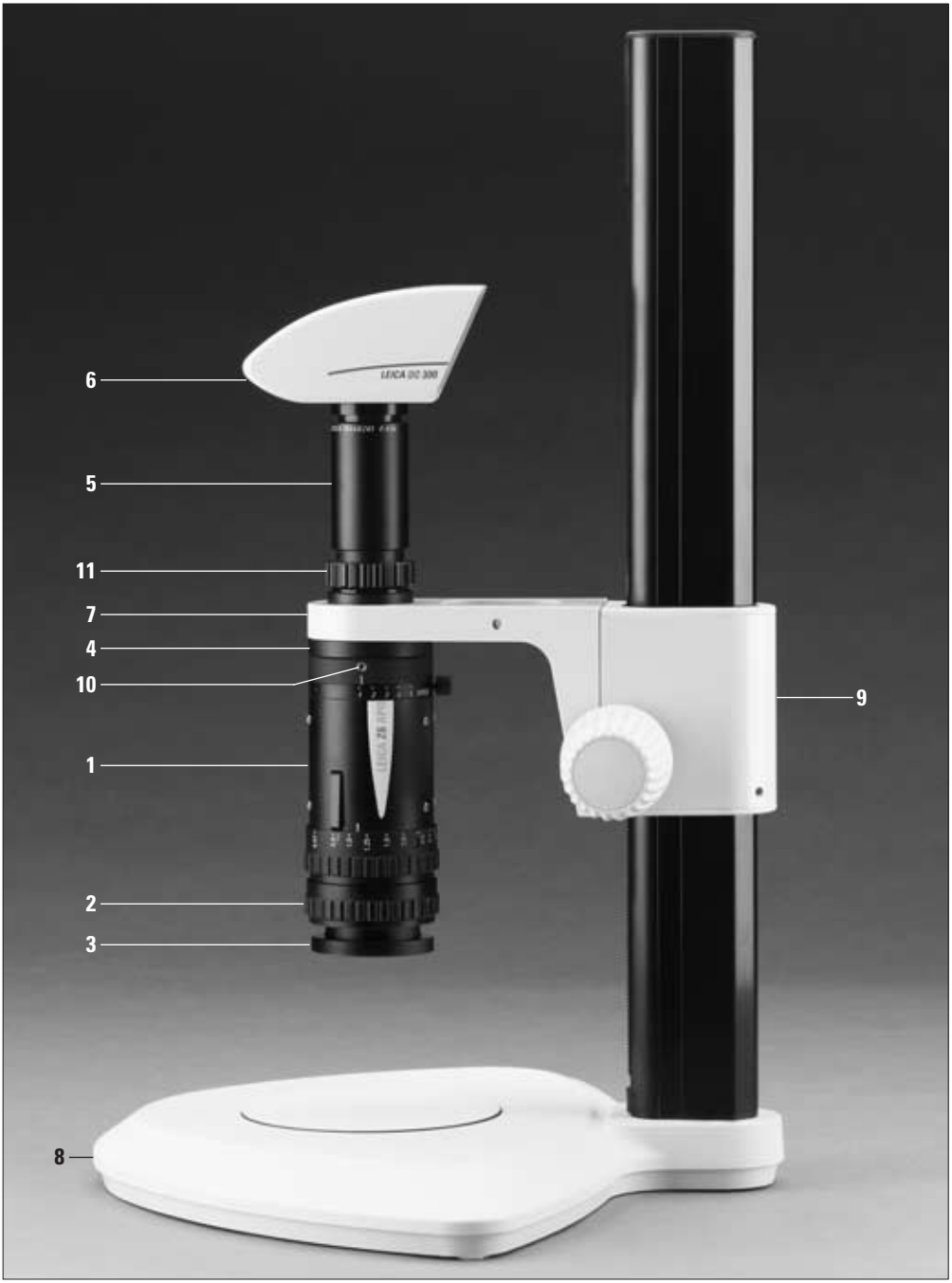
Attachment to stand

Use the carrier of the AS tube (10447196) to attach the unit to a Leica incident or transmitted light stand or the large swinging-arm stand.

For assembly instructions, please refer to Chapter 2.6.

Fig. 4 Equipment configuration for digital imaging with AS video/photo tube. Right side of the Leica Z6 APO.

1 Leica Z6 APO zoom system
2 Fine focusing
3 Objective
4 Video/phototube AS
5 Video objective with C-mount
6 Leica digital camera
7 Carrier for AS tube
8 Incident-light stand
9 Focusing drive, coarse, with column 500mm
10 Hexagon-head screw for fastening the zoom system to the AS video/phototube
11 Knurled ring for screwing on the video objective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2.4.2 Digital imaging with A video/phototube

You can mount digital cameras to the A video/phototube using a video objective. This configuration consists of:
– Leica Z6 APO or Z16 APO zoom system, objective and optional fine focusing
– A video/phototube (10447128)
– Video objective with C-mount
– Digital camera

Assemble as described in Chap. 2.4.1 (assembly with AS video/phototube).

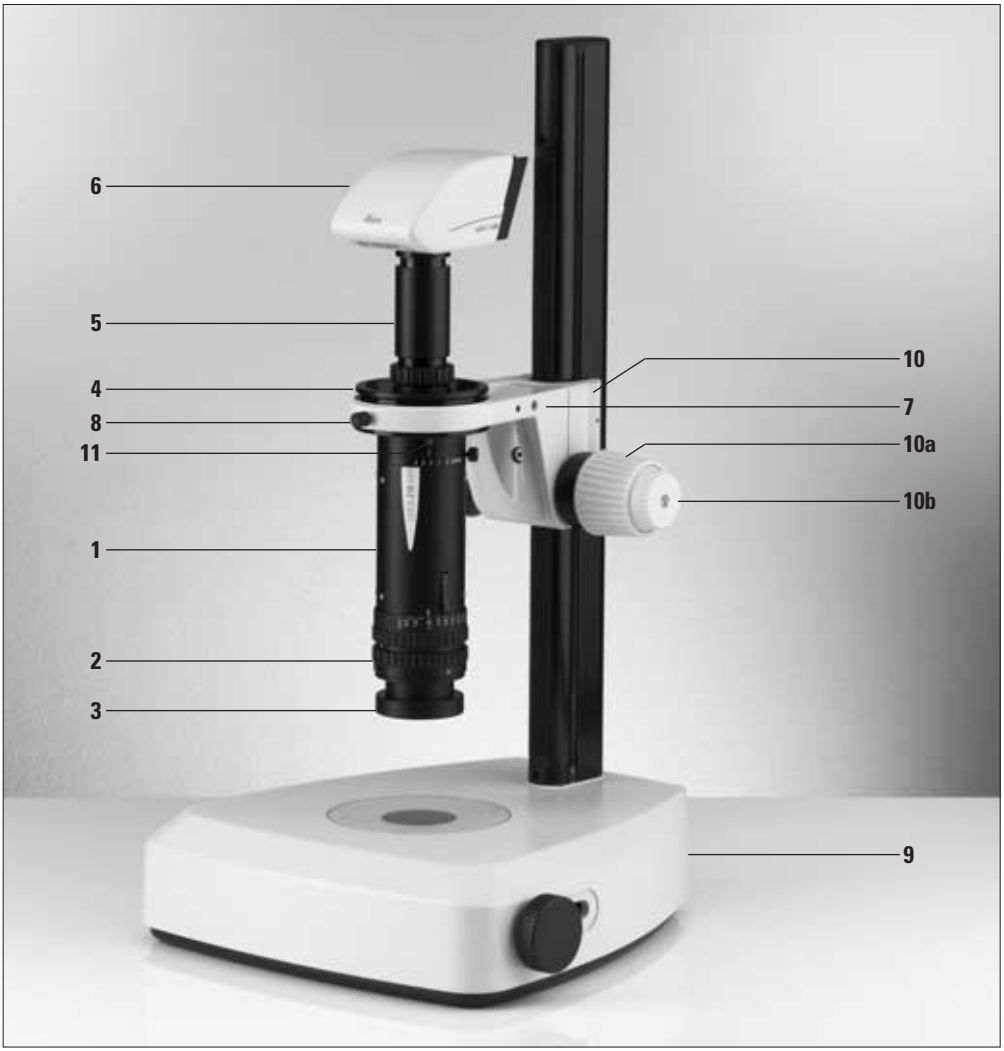
Attachment to stand
For attaching to a Leica incident or transmitted light stand or to the swinging-arm stand, use the microscope carrier (10446394).

For use with machines or working equipment, mount the equipment to the focusing arms 10446345 (can also be used for swinging-arm stands), 10446344 (for round columns, ∅ 25mm) or 10446343.

For assembly instructions, please refer to Chapter 2.6.

Fig. 5 Equipment configuration for digital imaging with A video/photo tube. Right side of the Leica Z16 APO.

1 Leica Z16 APO zoom system
2 Fine focusing
3 Objective
4 Video/phototube A
5 Video objective with C-mount
6 Leica digital camera
7 Microscope carrier (10446394)
8 Clamping screw for fastening the A video/phototube to the microscope carrier
9 HL RC™ transmitted light stand
10 Focusing drive, coarse/fine, with column 500mm
10a Coarse drive
10b Fine drive
11 Hexagon-head screw for fastening the zoom system to the video/phototube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10a
10b
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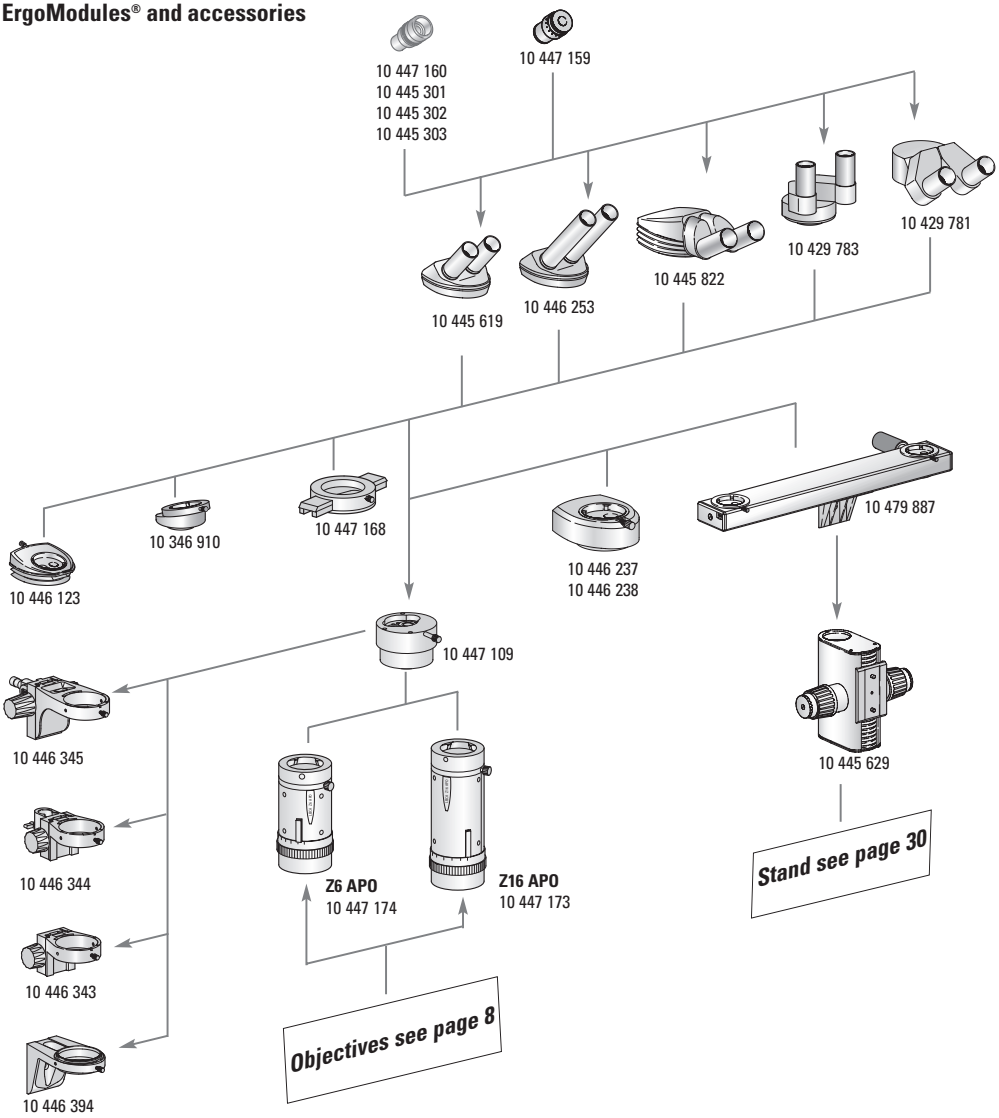
2.4.3 Assembly with Y tube

Diagram 4: Y tube with binocular tubes, ErgoModules® and accessories



You can use the Y-tube to attach binocular tubes, ErgoModules®, video/phototubes and the Leica IC A video module of the Leica M stereomicroscope line. The binocular tubes, ErgoModules® and video/phototubes are described in User Manual M2-105-0.

- ▶ Assemble the Y tube and zoom system as described in Chap. 2.4.1 (assembly with AS video/phototube).
- ▶ Assemble the desired binocular tube, video/phototube or module on the Y tube according to the M2-105-0 user manual.

Attachment to stand
For attaching to a Leica incident or transmitted light stand or to the swinging-arm stand, use the microscope carrier (10446394).

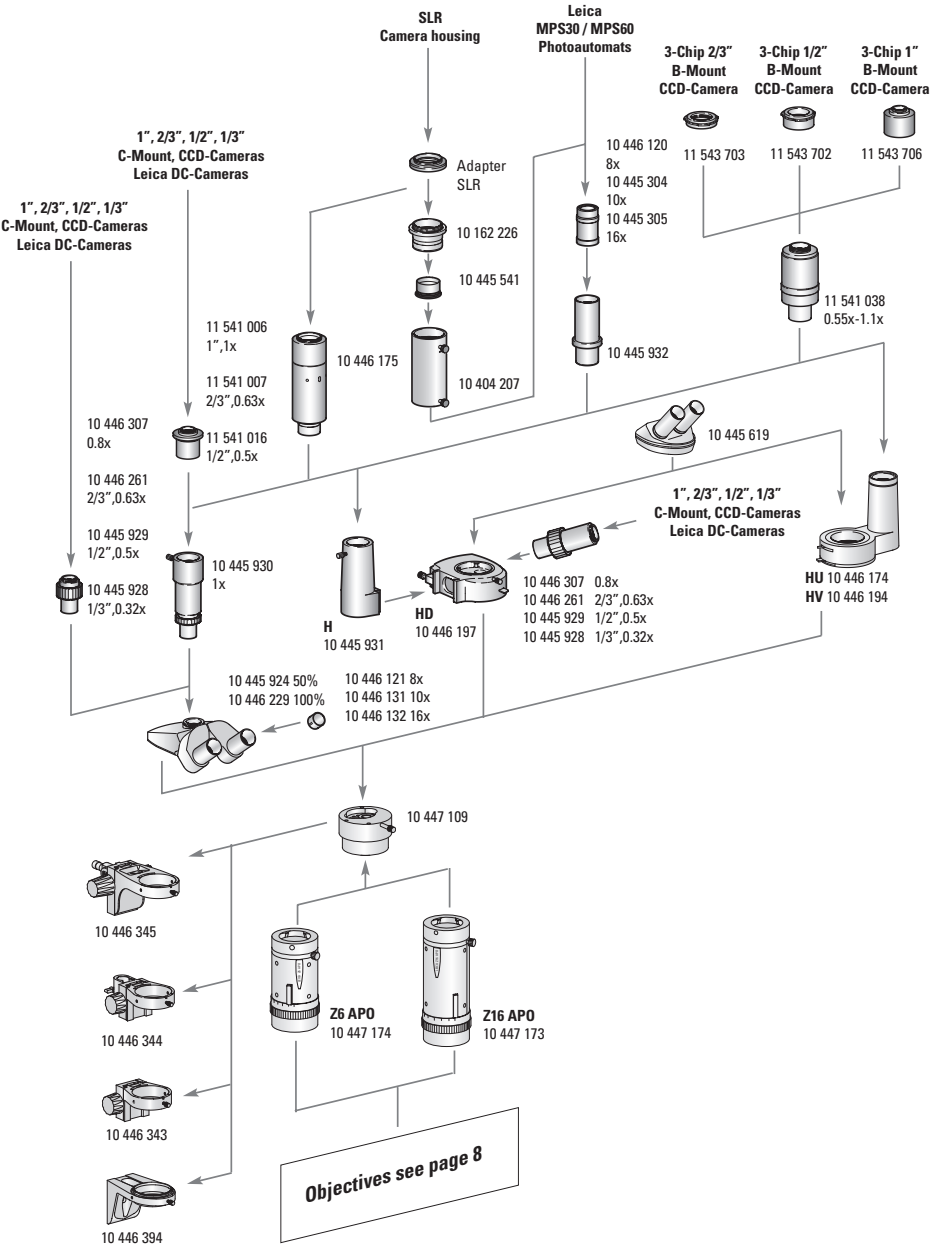
For use with machines or working equipment, mount the equipment to the focusing arms 10446345 (can also be used for swinging-arm stands), 10446344 (for round columns, ∅ 25mm) or 10446343.

For assembly instructions, please refer to Chapter 2.6.

Fig. 6 Visual equipment with Y tube and ErgoTube®

1 Leica Z16 APO zoom system
2 Fine focusing
3 Objective
4 Y tube
5 ErgoTube® with variable viewing angle of 10° – 50°
6 Eyepieces
7 Microscope carrier (10446394)
8 Clamping screw for fastening the Y tube to the microscope carrier
9 Hexagon-head screw for fastening the zoom system to the Y tube
10 Incident-light stand
11 Motorized focus with stand 500mm
12 Gliding stage
13 Ring illuminator
14 Cold light source

Diagram 5: Y tube with video/phototubes and accessories



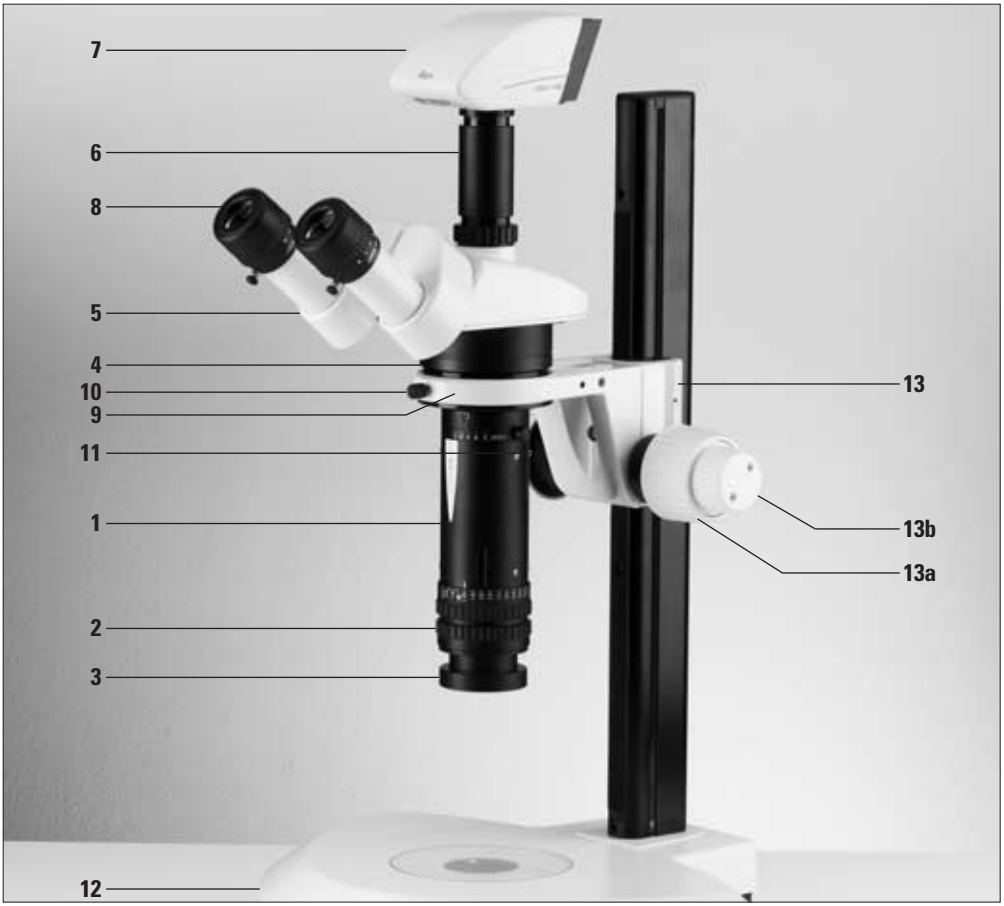


Fig. 7 Equipment configuration for digital imaging with Y tube and video/phototubes. Right side of the Leica Z16 APO.

1 Leica Z16 APO zoom system
2 Fine focusing
3 Objective
4 Y tube
5 Trinocular video/phototube
6 Video objective
7 Leica digital camera
8 Eyepieces
9 Microscope carrier (10446394)
10 Clamping screw for fastening the Y tube to the microscope carrier
11 Hexagon-head screw for fastening the zoom system to the Y tube
12 Transmitted-light base
13 Focusing drive, coarse/fine, with column 500mm
13a Coarse drive
13b Fine drive

For assembly instructions, please refer to Chapter 2.4.3.

2.5 Illumination

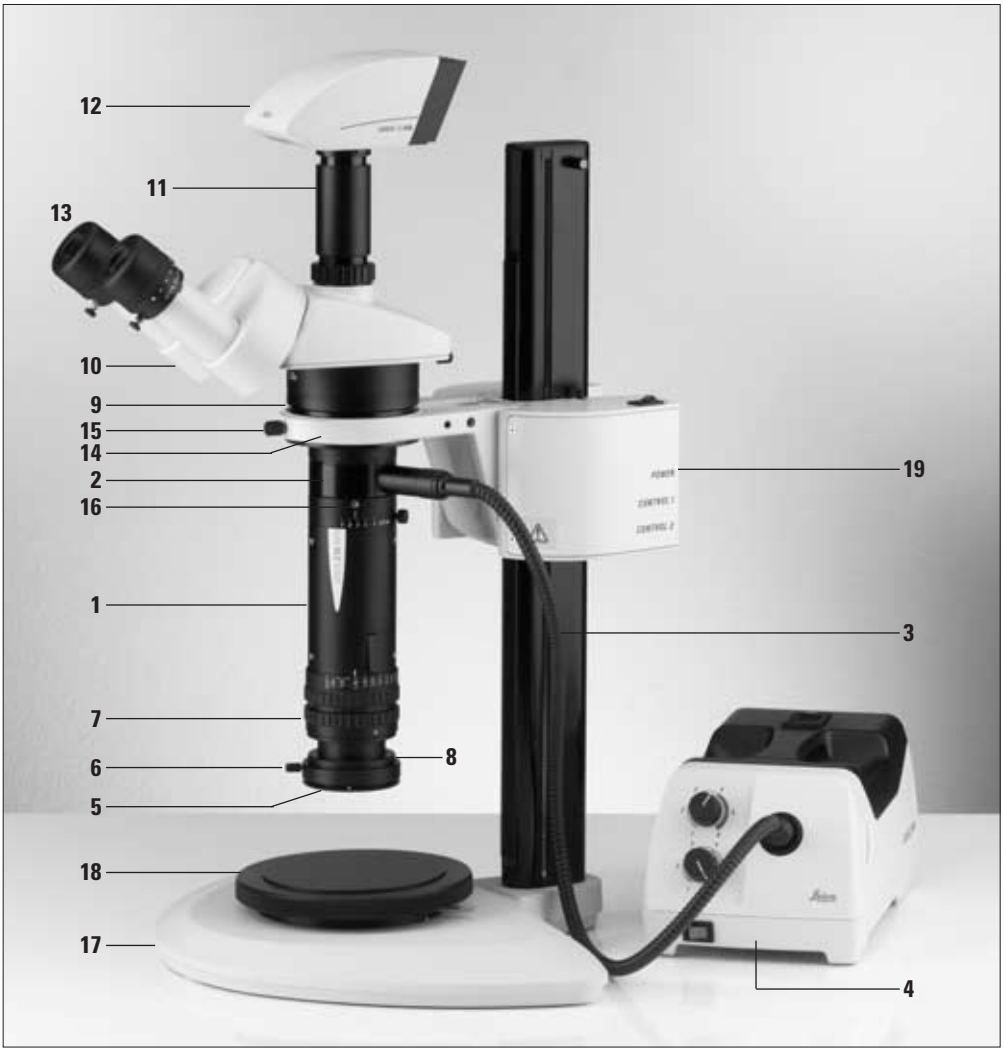
You can use the Leica Z6 APO and Z16 APO zoom systems with various illuminators. Ask your Leica consultant about our wide selection. The coaxial illuminator with quarter-wave plate for the Leica Z6 APO and the Z16 APO was specially developed for use with fiber-optic light guides and cold-light sources. Coaxial illumination makes the surface of flat, highly reflective wafers and metal sections visible. The revolving quarter-wave plate highlights various structures of metal sections and LCDs.

- ▶ Insert the coaxial incident light housing (8.2) with dovetail ring into the zoom system (8.1) and tighten the hexagon-head screw (8.16).
- ▶ The coaxial incident light housing (8.2) can be fastened to the AS, A and Y tube (8.9) using three hexagon-head screws.
- ▶ Equip the zoom system (8.1) with the objective (8.8) and, if available, the fine focusing (8.7).
- ▶ Attach the quarter-wave plate (8.5) to the objective (8.8) using the clamping screw (8.6).
- ▶ Connect the fiber-optic light guide (8.3) and the cold light source (8.4).

 By turning the quarter-wave plate on the knurled ring, you can make various structures and switching positions of LCDs visible.

Fig. 8 Coaxial illuminator with quarter-wave plate

1 Leica Z16 APO zoom system
2 Coaxial incident light housing
3 Fiber lamp
4 Cold light source (CLS)
5 Revolving quarter-wave plate with knurled ring
6 Clamping screw for fastening the quarter-wave plate
7 Fine focusing
8 Objective
9 Y tube
10 Trinocular video/phototube
11 Video objective
12 Leica digital camera
13 Eyepieces
14 Microscope carrier (10446394)
15 Clamping screw for fastening the Y tube to the microscope carrier
16 Hexagon-head screw for fastening the zoom system to the Y tube
17 Incident-light base
18 Gliding stage
19 Motorized focus with column 500mm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2.6 Attachment to stands

Please note the description and safety instructions of the stands in User Manual M2-105-0.

When using the motorized focus, read the separate User Manual M2-267-1, in particular the safety instructions.

The carriers and microscope carriers allow you to attach stands, machines and working equipment. The following carriers are available:

- Carrier (10447196) for AS video/phototube (10447204
- Microscope carrier (10446394) or focusing arms (10446345, 10446343 and 10446344) for A video/ phototube (10447128)
- Microscope carrier (10446394) or focusing arms (10446345, 10446343 and 10446344) for Y tube (10447109)

The carrier and microscope carrier are fastened to a focusing drive using a hexagon-head screw as described in User Manual M2-105-0.

The carrier and microscope carrier can be attached to the focusing drive in two positions:
- For short working distances and flat objects: lower angle bracket. Also for using the attachment for incident/oblique observation (see separate User Manual).
- For long working distances and for large objects: top angle bracket.

2.6.1 Incident and transmitted light stands with column 500mm

Diagram 6: Incident and transmitted light stands and accessories

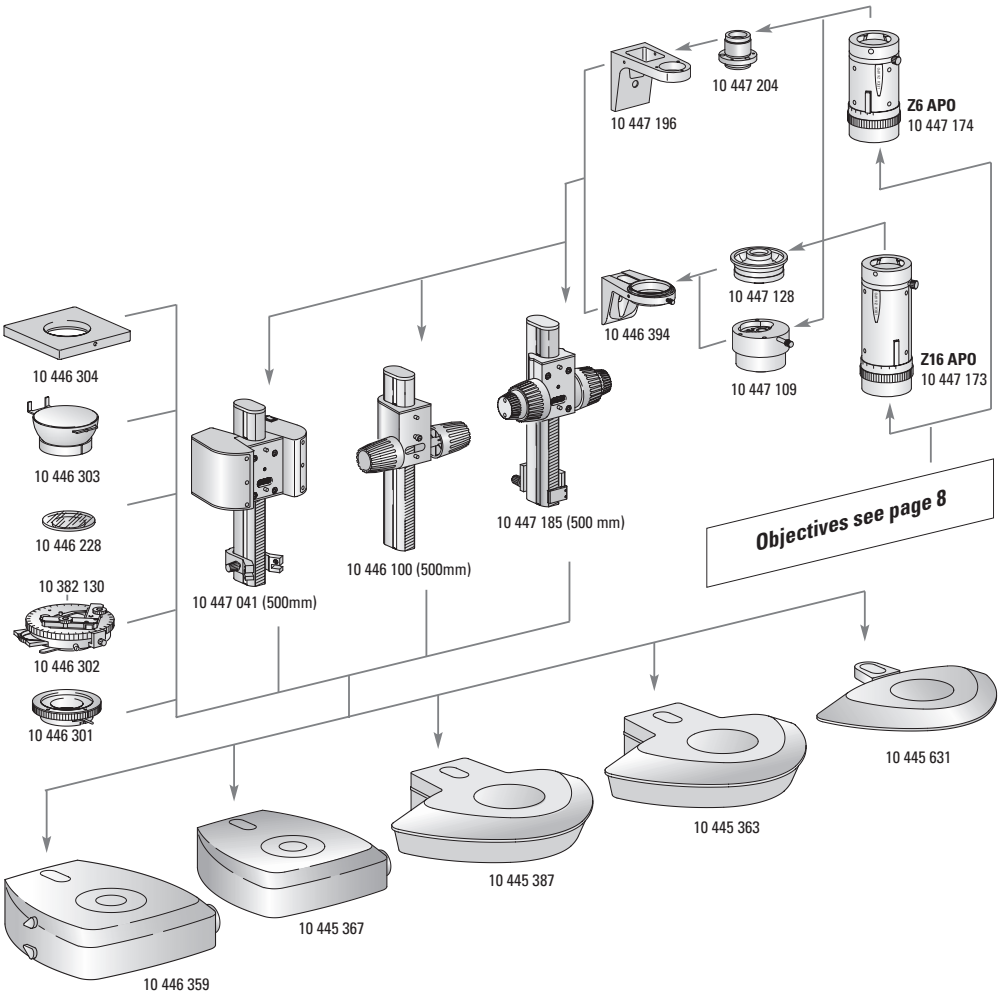


Fig. 9 Assembly with carrier for AS video/phototube

▶ Assembly of the stand in accordance with User Manual M2-105-0.
▶ Fasten the carrier for AS tube (9.1) to the focusing drive (9.2) using the hexagon-head screw and key.
• The assembly of the carrier is identical for the coarse, coarse/fine and motorized focus focusing drive.
▶ Fit the AS video/phototube (9.3) through the carrier opening **from below** and fasten it to the carrier from the top using the three hexagon-head screws.
▶ Loosen the hexagon-head screw (9.4) using the Allen key provided.
▶ Adjust the zoom system (9.5) to the dovetail ring of the AS video/phototube (9.3) and tighten the hexagon-head screw (9.4).

Mount the digital camera as described in Chapter 2.4.1.

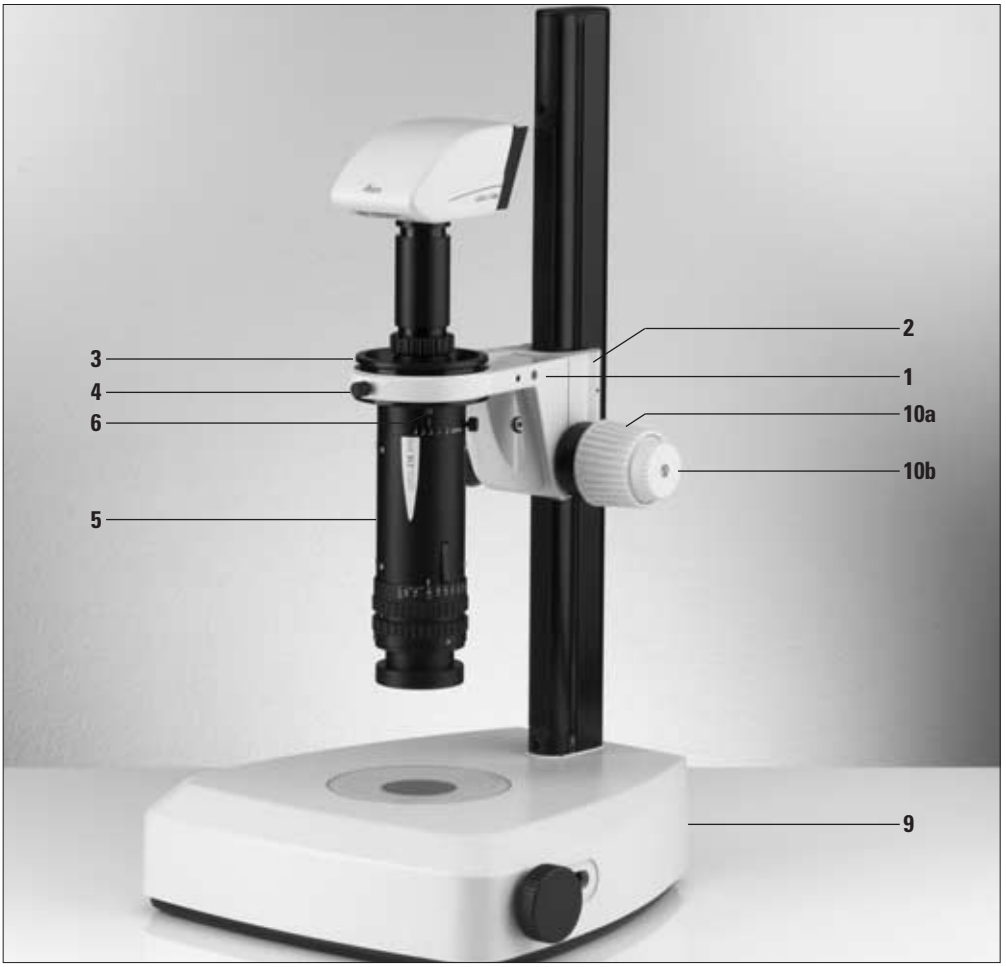


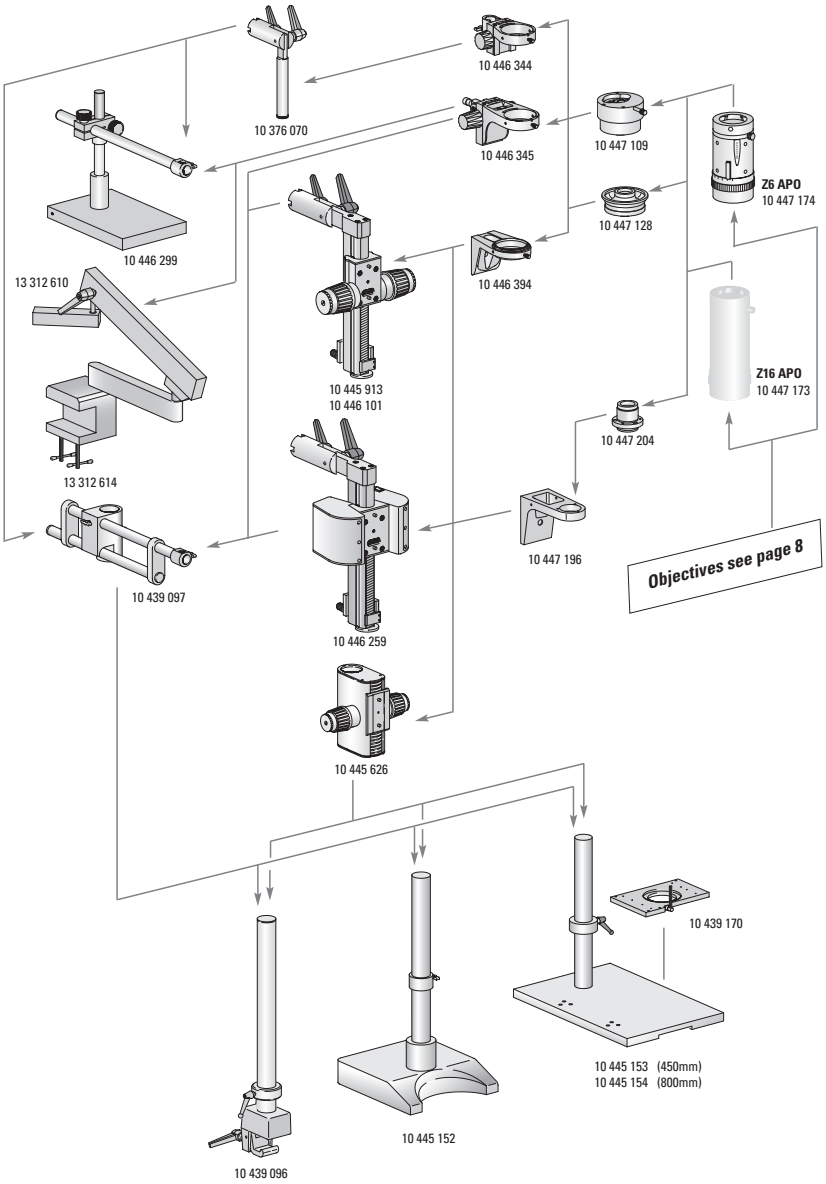
Fig. 10 Assembly with microscope carrier for A video/phototube or Y tube

▶ Assembly of the stand in accordance with User Manual M2-105-0.
▶ Fasten the microscope carrier (10.1) to the focusing drive (10.2) using the hexagon-head screw and key.
• The assembly of the carrier is identical for the coarse, coarse/fine and motorized focus focusing drive.
▶ Insert the A video/phototube (10.3) into the carrier opening **from above** and tighten the clamping screw (10.4).
▶ Adjust the zoom system (10.5) to the dovetail ring of the A video/phototube (10.3) or Y tube (6.4) and tighten the hexagon-head screw (10.6).

Mount the digital camera as described in Chapter 2.4.2.

2.6.2 Swinging-arm stands

Diagram 7: Swinging-arm stands and accessories



Swinging-arm stand ESD

Use the ESD swinging-arm stand with the Leica Z6 APO zoom system only; use the Z16 APO with the large swinging-arm stand.
To attach the zoom system to the ESD swinging-arm stand, use the tiltable focusing arm (10446345) with plug. You can insert the A video/phototube and the Y tube into the tiltable focusing arm.

⚠ Please note the description and safety instructions in the User Manual M2-105-0.

- ▶ Assembly of the stand (11.1) and fastening the tiltable focusing arm (11.2) with plug according to User Manual M2-105-0.
- ▶ The assembly of the zoom system (11.5) and the A video/phototube or the Y tube (11.3) is as described in Chapter 2.

Fig. 11 with ESD swinging-arm stand

1 ESD swinging-arm stand with foot, column and horizontal arm
2 Tiltable focusing arm
3 Y tube
4 Inclined binocular tube 45°
5 Leica Z6 APO zoom system
6 Objective
7 Ring illuminator with cold light source

2.6.3 Large swinging-arm stand

You can use the large swinging-arm stand with the Leica Z6 APO or the Z16 APO. You have various options for using the zoom system on the large swinging-arm stand:

– with tiltable focusing arm (10446345) as for the ESD swinging-arm stand. You can insert the A video/phototube and the Y tube into the tiltable focusing arm.
– for use with the motorized focus or focusing drive with tiltable column, coarse or coarse/fine, and the carrier (10447196) for the AS video/phototube or the microscope carrier (10446394) when you use the A video/phototube or the Y tube.
– with focusing arm (10446344) when using the tiltable carrier rod ∅ 25mm. In the focusing arm for columns ∅ 25mm, you can insert the A video/phototube or Y tube.

⚠ Please note the description and safety instructions in the User Manual M2-105-0.

▶ Assembly of the stand and fastening the focusing arms in accordance with User Manual M2-105-0.
▶ The assembly of the zoom system and the video/phototube or Y tube is as described in Chapter 2.4.

2.6.4 OEM

The following focusing arms are available for use with bonders, probers, machines or working equipment:

– Focusing arm (10446345) with plug receptacles ∅ 15.8mm (5/8)
– Focusing arm (10446344) for round columns, ∅ 25mm, and bonders
– Focusing arm (10446343) for probers

The focusing arms can be used with the A video/phototube or the Y tube.

▶ The assembly of the zoom system and the A video/phototube or Y tube is as described in Chapter 2.4.

3. Operation

3.1 Starting up

 **When switching on electrical accessories, observe the safety instructions.**

3.2 Zoom systems

- The Leica Z6 APO zoom system with 6.3:1 zoom allows continuous magnification change from 0.57× – 3.6×.
- The Leica Z16 APO zoom system with 16:1 zoom allows continuous magnification change from 0.57× – 9.2×.
- There are certain switchable zoom positions which can be activated for repetitive tasks:
  For the Leica Z6 APO, these are for 0.57 / 0.8 / 1 / 1.25 / 1.6 / 2 / 2.5 / 3.2 / 3.6
  For the Leica Z16 APO, these are for 0.57 / 0.8 / 1 / 1.25 / 1.6 / 2 / 2.5 / 3.2 / 4 / 5 / 6.3 / 8 / 9.2
- With the Y tube, the magnification is increased by a factor of 1.25. The visual data with the Y tube are listed in the table on page 49.

Fig. 12 Zoom, zoom click stop: Left, Leica Z16 APO zoom system with fine focusing and objective. Right, Leica Z6 APO zoom system with objective.

1 Knurled ring for adjusting the zoom
2 Scale with the magnification factors
3 Switch for activating/deactivating the zoom click stop
4 Fine focusing
5 Clamping screw for adjusting and locking the iris diaphragm
6 Objective

▶ Adjust the magnification by rotating the knurled ring (12.1).
▶ You can read the zoom positions (magnification factor) from the scale (12.2).
▶ You can activate and deactivate the zoom click stop by pressing the button (12.3).

3.3 Iris diaphragm

The iris diaphragm is for continuous adjustment of the depth of field without changing the magnification. You can reduce the aperture diameter to enlarge the depth of field. The size of the light cone is also reduced, and the brightness of the image decreases.
The clamping screw (12.5) is for adjusting and locking the iris diaphragm: 1 = smallest diameter, 5 = OPEN.

3.4 Fine focusing

The fine focusing allows sensitive and precise focusing in a range of 10mm. The fine focusing is required for precise focusing at high magnifications, particularly when using microscope objectives.

▶ Adjust the sharpness by turning the knurled ring (12.4).

3.5 Working with a binocular tube

The Y tube allows you to use zoom systems with the binocular tubes and trinocular video/photo-tubes of the Leica M stereomicroscope line.

Please refer to User Manual M1-105-0 for adjusting the individual settings such as eyebase (interpupillary distance), viewing angle, eyecups, eyelenses, eyepoint, etc.

3.5.1 Adjusting diopter settings

The observer can compensate for any vision problems by making adjustments to both eyepieces. For this purpose, the eyepieces are equipped with adjustable eyelenses which can be operated with knurled rings. The dioptric values can be read from +5 to –5. Each observer needs set his or her dioptric values only once.

The correct setting is necessary so that the adjustment remains constant for zooming (parfocal). Once the setting is correct, you no longer have to refocus when zooming.

Procedure

- ▶ Set up the zoom system in the working distance (13.5) of the objective used (see table on p. 49).
- ▶ Set the eyebase (interpupillary distance) (13.1).
- ▶ Open the iris diaphragm (13.6) completely (OPEN).
- ▶ Set the eyelenses (13.2) to 0.

- ▶ Set the highest zoom position (13.7).
- ▶ Illuminate a flat test object with sharp contours using transmitted light or incident light and focus it in using the focusing drive (13.8).
- ▶ Rotate the eyelenses (13.2) as far as they will go in the "+" direction without looking into the eyepieces.

- ▶ Set the lowest zoom position (13.7).
- ▶ Individually set the image sharpness for each eye by rotating the eyelens (13.2):
  For example, first observe the specimen with the left eye, while closing the right eye. Rotate the eyelens (13.2) slowly in the "–" direction until you see the test object in focus with your open eye.
- ▶ Now close your left eye and adjust the eyelens (13.2) for the right eye.

- ▶ Set the highest zoom position (13.7).
- ▶ If necessary, use the focussing drive (13.8) to fine-focus again.
- ▶ Set the lowest zoom position (13.7).
- ▶ Check the sharpness and parfocality: slowly zoom to the highest zoom position (13.7).

The image sharpness will now remain constant at all magnification levels, without the need to refocus with the focusing drive.
If this is not the case, repeat this procedure.

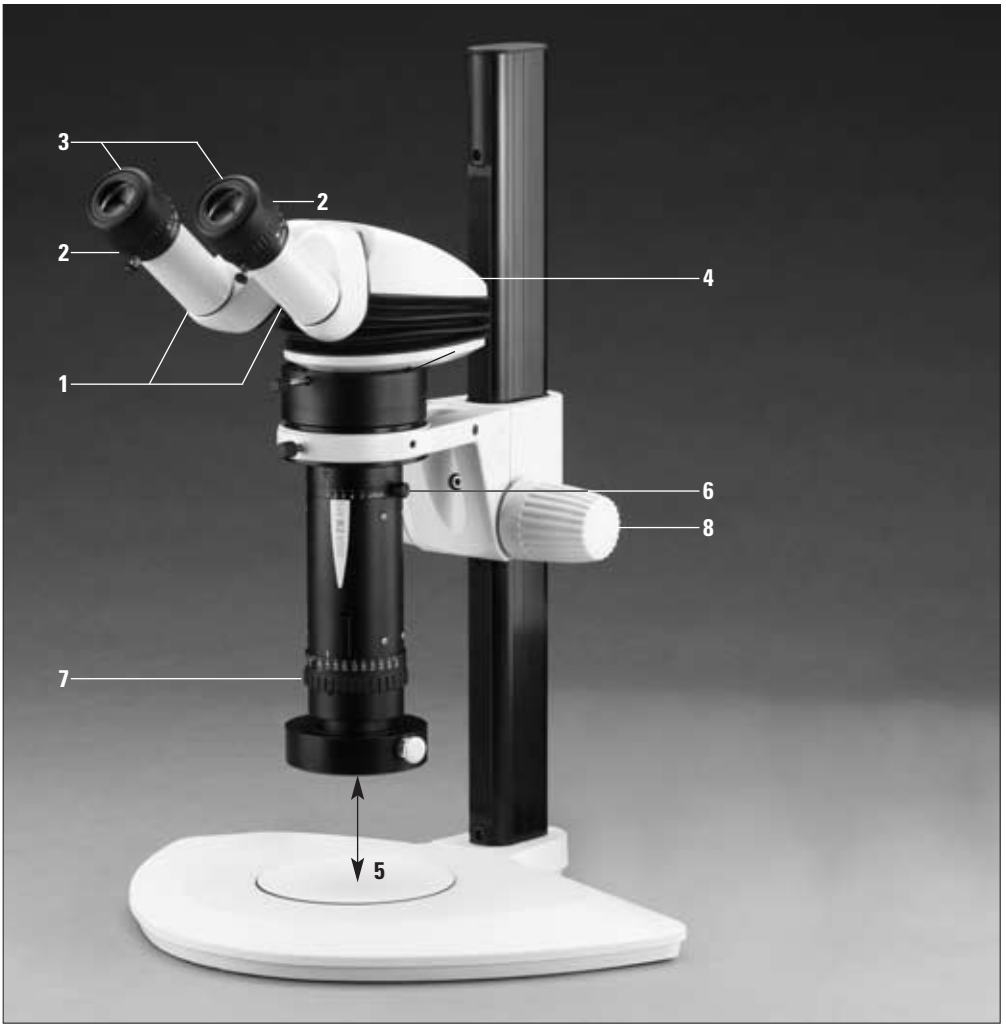


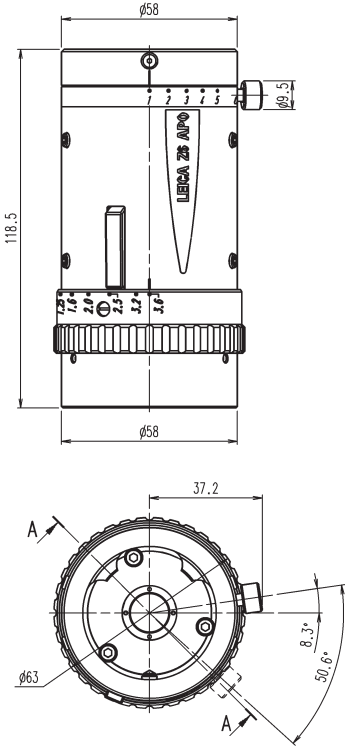
Fig. 13 Parfocality, visual

1 Adjustable eyepiece tubes for adjusting the interpupillary distance from 52–76mm
2 Eyelenses for adjusting the diopter settings from +5 to –5
3 Adjustable eyecups
4 ErgoTube® with variable viewing angle 10° – 50°
5 Working distance
6 Iris diaphragm
7 Knurled ring for adjusting the zoom
8 Focusing drive (if applicable, motorized focus)

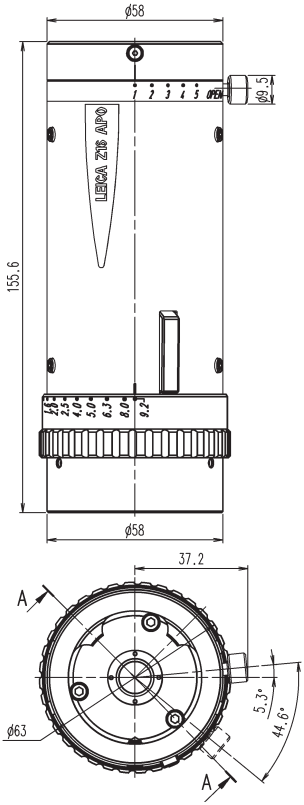
4. Appendix

4.1 Dimensions

4.1.1 Dimensions of zoom systems

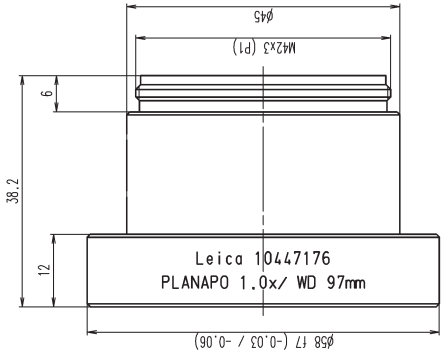


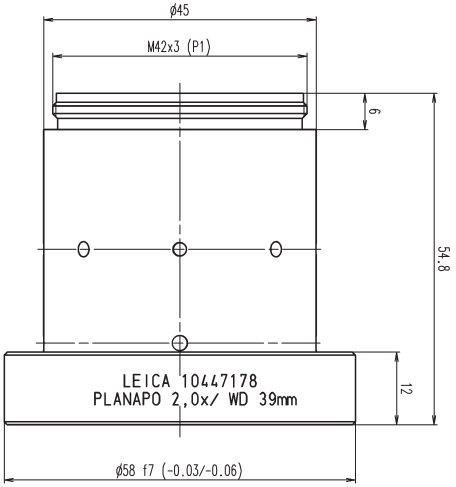
Leica Z6 APO

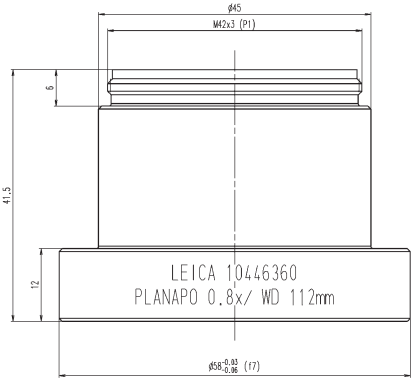


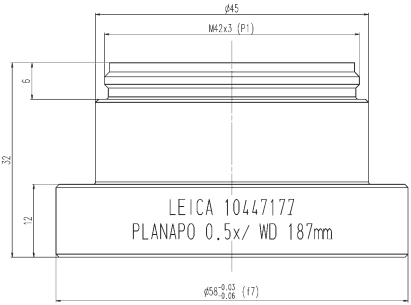
Leica Z16 APO

4.1.2 Dimensions of objectives

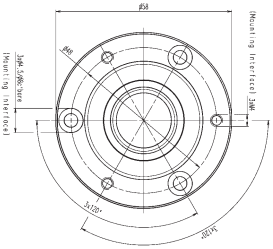




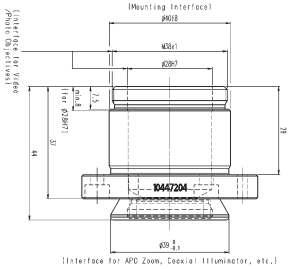


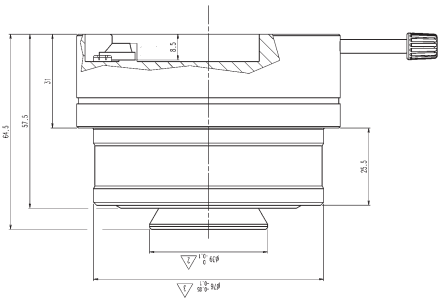


4.1.3 Dimensions of tubes

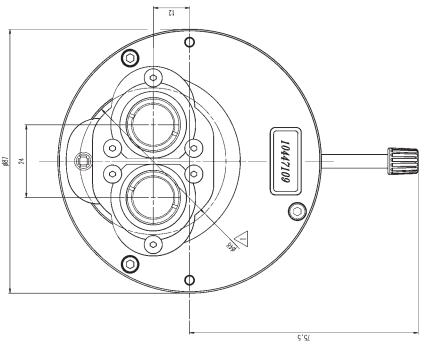


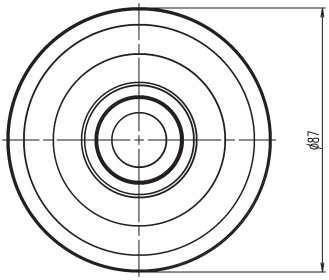
Video/phototube AS

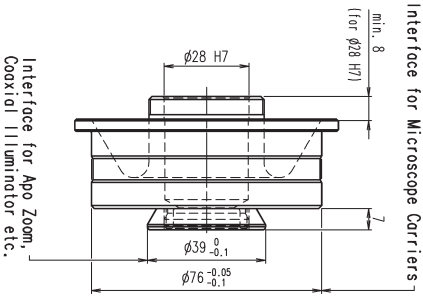


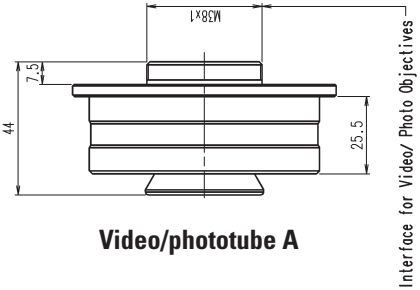


Y tube





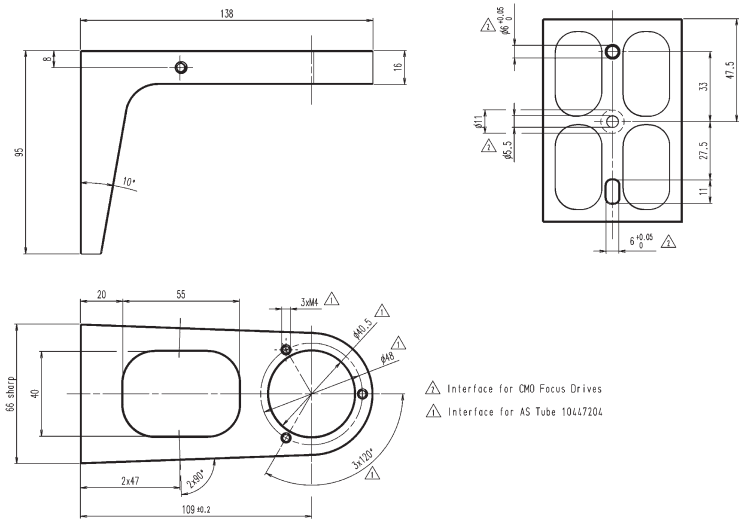




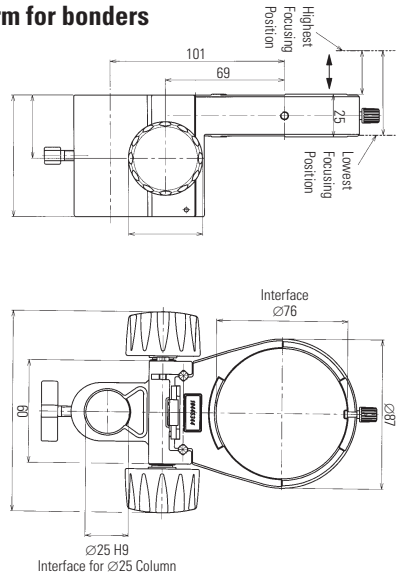
Video/phototube A

4.1.4 Dimensions of carriers

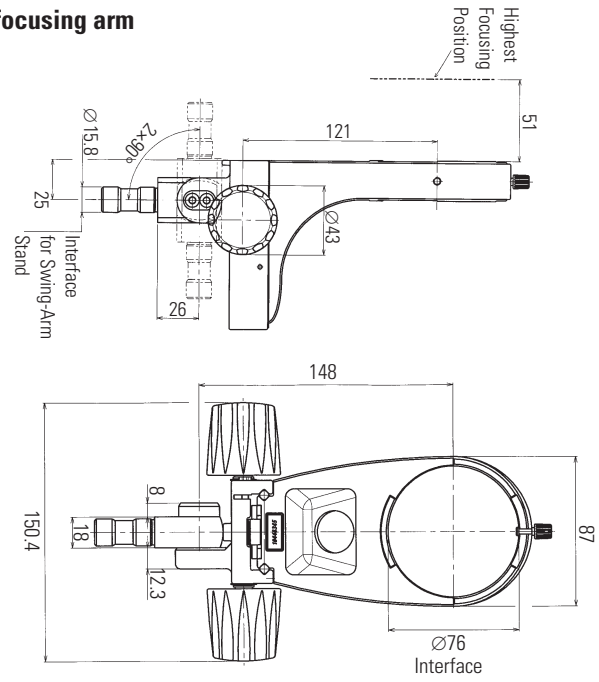
Carrier for AS tube



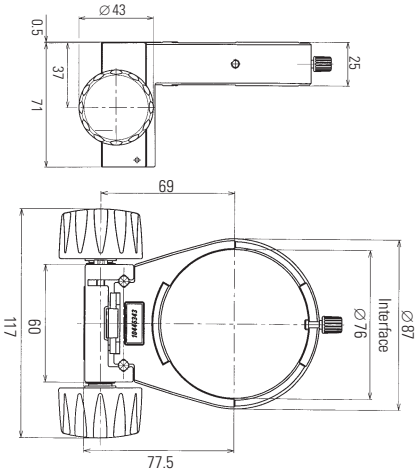
Focusing arm for bonders

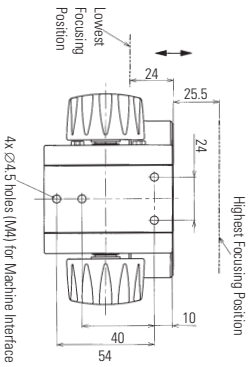


Tiltable focusing arm

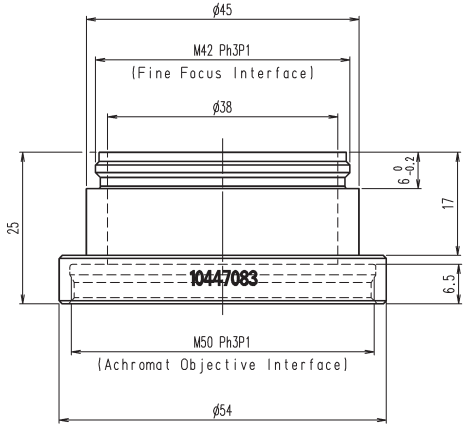


Focusing arm for probers

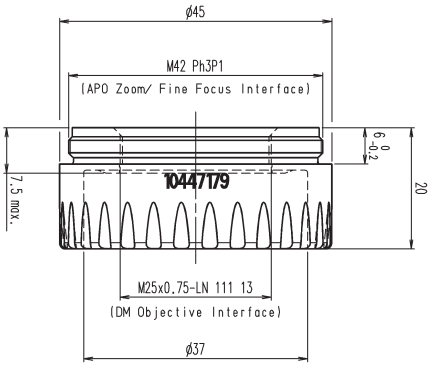




4.1.5 Dimensions of adapters

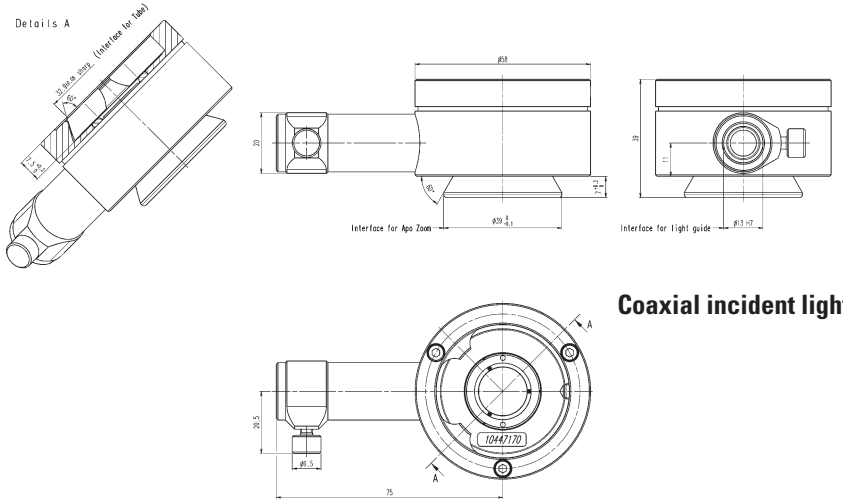


Adapter for achromatic objectives



Adapter for DM objectives

4.1.6 Dimensions of coaxial incident light housing



Coaxial incident light housing

4.2 Technical data

Zoom system	Leica Z6 APO	Leica Z16 APO
Type	apochromatic zoom system 6.3:1 (zoom factor 0.57× – 3.6×) with central beam path, lead-free	apochromatic zoom system 16:1 (zoom factor 0.57× – 9.2×) with central beam path, lead-free
Built-in iris diaphragm	continuous depth of field adjustment	
Switchable zoom positions for repetitive tasks	0.57 / 0.8 / 1 / 1.25 / 1.6 / 2 / 2.5 / 3.2 / 3.6	0.57 / 0.8 / 1 / 1.25 / 1.6 / 2 / 2.5 / 3.2 / 4 / 5 / 6.3 / 8 / 9.2
Visual with 1× planapochromatic objective / 10× eyepieces / 1.25× Y tube		
– Magnification	7.1× – 45×	7.1× – 115×
– Resolution	60 – 351Lp/mm	51 – 336Lp/mm
– Visible structural width	16.7 – 2.85µm	19.6 – 2.98µm
– Numerical aperture	0.02 – 0.117nA	0.017 – 0.112nA
– Field of view ∅	29.5mm – 4.7mm	29.5mm – 1.83mm
– Depth of field	3.1mm – 0.09mm	3.8mm – 0.05mm
Visual with 2 × planapochromatic objective / 40 × eyepieces / 1.25× Y tube		
Magnification	57× – 360×	57× – 920×
Resolution	120 – 702Lp/mm	102 – 672Lp/mm
Visible structural width	8.3 – 1.4µm	9.8 – 1.49µm
Numerical aperture	0.04 – 0.234nA	0.034 – 0.224nA
Field of view ∅	4.2mm – 0.67mm	4.2mm – 0.26mm
Data with Leica DC480 digital camera / 1× planapochromatic objective / AS tube / 0.63× video objective		
– Magnification Chip: specimen	0.36× – 2.3×	0.36× – 5.8×
– Magnification Print: specimen	5.3× – 33.5×	5.3× – 85.6×
– Digital resolution	26.4 – 167Lp/mm	26.4 – 336Lp/mm
– Hard copy resolution	15.7 – 99Lp/mm	15.7 – 253Lp/mm
– Field of view projected onto chip	24.5mm × 18.6mm / 3.8mm × 2.9mm	24.5mm × 18.6mm / 1.5mm × 1.15mm
– Depth of field	1.16 – 0.03mm	1.5 – 0.03mm

Optical accessories	Leica Z6 APO / Leica Z16 APO
Objectives	– planapochromatic 1×, 2×, 0.8×, 0.5× – achromatic objectives M series 0.63×, 0.5×, 0.32×, lead-free
Working distances	– 97mm (planapochromatic 1×) – 112mm (planapochromatic 0.8×) – 39mm (planapochromatic 2×) – 187mm (planapochromatic 0.5×) – 149mm (achromatic 0.63×) – 187mm (achromatic 0.5×) – 297mm (achromatic 0.32×)
Objective adapters	– for M series achromatic objectives – for 10× and 20× HR objectives – for 10× and 20× DM objectives
HR objectives	– HR 10×/0.45, working distance 19mm – HR 20×/0.42, working distance 13mm
DM objectives	– DM objective N Plan L 20×/0.40 corr – DM objective N plan 10×/0.25–/A5.8
Fine focusing	10mm travel
Binocular tubes, Ergonomic	– inclined and straight binocular tubes – apochromatic ErgoTube® 10° – 50° with synchronous eyebase (interpupillary distance) adjustment – various ErgoModules® (optional) *ErgoTube® and ErgoModule® are registered in the United States Patent and Trademark Office*
Eyebase (interpupillary distance)	55mm – 75mm
Wide-field eyepieces for persons wearing glasses	10×, 16×, 25×, 40×, distortion-free plug-on eyecups for protection from infection

Technical data

Ambient operating conditions:		
– Ambient temperature	+10 ˚C to +40 ˚C	
– Relative humidity	up to 35 °C ambient temperature: 75%	
– Atmospheric pressure	700 ... 1060hPa	
Transport and storage:		
– Temperature	– 20 °C ... + 52 °C	
– Relative humidity	10 ... 95% (non-condensation)	
– Atmospheric pressure	500 ... 1200hPa	
Weights		
	– 10447174 Leica Z6 APO zoom system	0.590kg
	– 10447173 Leica Z16 APO zoom system	0.760kg
	– 10447176 Planapochromatic objective 1×	0.150kg
	– 10447178 Planapochromatic objective 2×	0.270kg
	– 10446360 Planapochromatic objective 0.8×	0.170kg
	– 10447177 Planapochromatic objective 0.5×	0.170kg
	– 10447175 Fine focusing	0.100kg
	– 10447204 Video/phototube AS	0.120kg
	– 10447128 Video/phototube A	0.200kg
	– 10447109 Y tube	0.430kg
	– 10447196 Carrier for AS tube	0.340kg
	– 10446394 Microscope carrier	0.440kg
	– 10447185 Focusing drive, coarse/fine, with column 500mm	1.650kg
	– Motorized focus with column 500mm	4.640kg
	– 10446261 Video objective 0.63×	0.150kg
	– 10445929 Video objective 0.5×	0.150kg
	– 10447170 Coaxial incident light housing	0.190kg
	– 10445352 Quarter-wave plate	0.060kg
	– 10447179 Adapter for DM objectives	0.030kg
	– 10447178 Adapter for HR objectives	0.030kg
	– 10446229 Trinocular video/phototube	1.380kg
	– 10447160 2× wide-field eyepieces for persons wearing glasses 10×/21B	0.320kg

4.3 Optical data

Objectives		Planapochromatic 1×		Planapochromatic 0.5×		Planapochromatic 0.8×		Planapochromatic 2×	
		Working distances							
		97mm		187mm		112mm		39mm	
Eyepieces	Zoom position	Total magnification ×	Field of view diameter mm	Total magnification ×	Field of view diameter mm	Total magnification ×	Field of view diameter mm	Total magnification ×	Field of view diameter mm
10×/21B	0.57	7.1	29.5	3.56	58.9	5.7	36.8	14.3	14.7
	0.8	10	21	5	42	8	26.3	20	10.5
	1	12.5	16.8	6.25	33.6	10	21	25	8.4
	1.25	15.6	13.4	7.81	26.9	12.5	16.8	31.3	6.72
	1.6	20	10.5	10	21	16	13.1	40	5.25
	2	25	8.4	12.5	16.8	20	10.5	50	4.2
	2.5	31	6.72	15.6	13.4	25	8.4	62.5	3.36
	3.2	40	5.25	20	10.5	32	6.56	80	2.63
	3.6	45	4.67	22.5	9.33	36	5.83	90	2.33
	4	50	4.2	25	8.4	40	5.25	100	2.1
	5	62.5	3.36	31.3	6.72	50	4.2	125	1.68
	6.3	79	2.67	39.4	5.33	63	3.33	158	1.33
	8	100	2.1	50	4.2	80	2.63	200	1.05
	9.2	115	1.83	57.5	3.65	92	2.28	230	0.91
16×/14B	0.57	11.4	19.6	5.7	39.3	9.12	24.6	22.8	9.82
	0.8	16	14	8	28	12.8	17.5	32	7
	1	20	11.2	10	22.4	16	14	40	5.6
	1.25	25	8.96	12.5	17.9	20	11.2	50	4.48
	1.6	32	7	16	14	25.6	8.75	64	3.5
	2	40	5.6	20	11.2	32	7	80	2.8
	2.5	50	4.48	25	8.96	40	5.6	100	2.24
	3.2	64	3.5	32	7	51.2	4.38	128	1.75
	3.6	72	3.11	36	6.22	57.6	3.89	144	1.56
	4	80	2.8	40	5.6	64	3.5	160	1.4
	5	100	2.24	50	4.48	80	2.8	200	1.12
	6.3	126	1.78	63	3.56	101	2.22	252	0.89
	8	160	1.4	80	2.8	128	1.75	320	0.7
	9.2	184	1.22	92	2.43	147	1.52	368	0.61
25×/9.5B	0.57	17.8	13.3	8.91	26.7	14.3	16.7	35.6	6.67
	0.8	25	9.5	12.5	19	20	11.9	50	4.75
	1	31.3	7.6	15.6	15.2	25	9.5	62.5	3.8
	1.25	39.1	6.08	19.5	12.2	31.3	7.6	78.1	3.04
	1.6	50	4.75	25	9.5	40	5.94	100	2.38
	2	62.5	3.8	31.3	7.6	50	4.75	125	1.9
	2.5	78.1	3.04	39.1	6.08	62.5	3.8	156	1.52
	3.2	100	2.38	50	4.75	80	2.97	200	1.19
	3.6	113	2.11	56.3	4.22	90	2.64	225	1.06
	4	125	1.9	62.5	3.8	100	2.38	250	0.95
	5	156	1.52	78.1	3.04	125	1.9	313	0.76
	6.3	197	1.21	98.4	2.41	158	1.51	394	0.6
	8	250	0.95	125	1.9	200	1.19	500	0.48
	9.2	288	0.83	144	1.65	230	1.03	575	0.41
40×/6B	0.57	28.5	8.42	14.3	16.8	22.8	10.5	57	4.21
	0.8	40	6	20	12	32	7.5	80	3
	1	50	4.8	25	9.6	40	6	100	2.4
	1.25	62.5	3.84	31.3	7.68	50	4.8	125	1.92
	1.6	80	3	40	6	64	3.75	160	1.5
	2	100	2.4	50	4.8	80	3	200	1.2
	2.5	125	1.92	62.5	3.84	100	2.4	250	0.96
	3.2	160	1.5	80	3	128	1.88	320	0.75
	3.6	180	1.33	90	2.67	144	1.67	360	0.67
	4	200	1.2	100	2.4	160	1.5	400	0.6
	5	250	0.96	125	1.92	200	1.2	500	0.48
	6.3	315	0.76	158	1.52	252	0.95	630	0.38
	8	400	0.6	200	1.2	320	0.75	800	0.3
	9.2	460	0.52	230	1.04	368	0.65	920	0.26

Z6 APO: Zoom 0.57 – 3.6, Z16 APO: Zoom 0.57 – 9.2

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