



Leica S7 E User Manual

General Instructions

Safety concept

Before using your stereo microscope for the first time, please read the "Safety Concept" booklet included with your instrument. It contains additional information about handling and care.



Use in clean rooms

The Leica S series can be used in clean rooms without any problems.

About cleaning

- Do not use any unsuitable cleaning agents, chemicals or techniques for cleaning.
- Never use chemicals to clean colored surfaces or accessories with rubberized parts. This could damage the surfaces, and specimens could be contaminated by abraded particles.
- In most cases, we can provide special solutions on request. Some products can be modified, and we can offer other accessories for use in clean rooms.

Servicing

- Repairs may only be carried out by Leica Microsystems-trained service technicians. Only original Leica Microsystems spare parts may be used.

Responsibilities of person in charge of instrument

- Ensure that the Leica stereo microscope is operated, maintained and repaired by authorized and trained personnel only.

Important Safety Notes

User manual

User manuals and updates are available for you to download and print from our website www.leica-microsystems.com. Keep it in a safe place, and readily accessible to the user.

This user manual describes the special functions of the Leica stereo microscopes (S series) and contains important instructions for their operational safety, maintenance, and accessories.

The "Safety Concept" booklet contains additional safety information regarding the service work, requirements and the handling of the stereo microscope, accessories and electrical accessories as well as general safety instructions.

You can combine individual system articles with articles from external suppliers (e.g. cold light sources, etc.). Please read the user manual and the safety requirements of the supplier.

Before installing, operating or using the instruments, read the user manuals listed above. In particular, please observe 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.

Symbols Used

Warning of a danger



This symbol indicates especially important information that is mandatory to read and observe.

Failure to comply can cause the following:

- Hazards to personnel
- Functional disturbances or damaged instruments

Warning of hazardous electrical voltage



This symbol indicates especially important information that is mandatory to read and observe.

Failure to comply can cause the following:

- Hazards to personnel
- Functional disturbances or 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.

Explanatory notes

- This symbol within the text stands for additional information and explanations.

Figures

- (1) Numbers in parentheses within the descriptions relate to the figures and the items within those figures.

Safety Instructions

Description

The individual modules fulfill the highest requirements for observation and documentation of Leica stereo microscopes of the S series.

Intended use

- Refer to "Safety Concept" booklet

Non-intended use

- Refer to "Safety Concept" booklet

Never use S series microscopes or their components for surgical procedures (e.g. on the eye) unless they are specifically intended for that purpose.

The devices and accessories described in this User Manual have been tested with regard to potential hazards. The responsible Leica affiliate must be consulted whenever the instrument is altered, modified or used in conjunction with non-Leica components that are outside of the scope of this manual!

Unauthorized alterations to the instrument or noncompliant use shall void all rights to any warranty claims!

Place of use

- Refer to "Safety Concept" booklet
- Electrical components must be placed at least 10 cm away from the wall and from flammable substances.
- Avoid large temperature fluctuations, direct sunlight and vibrations. These conditions can distort measurements and micrographic images.
- In warm and warm-damp climatic zones, the individual components require special care in order to prevent the build-up of fungus.

Responsibilities of person in charge of instrument

- Refer to "Safety Concept" booklet

Ensure that:

- The S series stereo microscopes and accessories are operated, maintained and repaired by authorized and trained personnel only.
- All operators have read, understood and observe this User Manual, and particularly the safety instructions.

Safety Instructions (Continued)

Repairs, service work

- Refer to "Safety Concept" booklet
- Only original Leica Microsystems spare parts may be used.
- Before opening the instruments, switch off the power and unplug the power cable.



Touching the live circuit can cause injury.

Transport

- Use the original packaging for shipping or transporting the individual modules of the Leica S stereo microscopes and the accessory components.
- In order to prevent damage from vibrations, all moving parts that (according to the user manual) can be assembled and disassembled by the customer should be disassembled and packed separately.

Integration in third-party products

- Refer to "Safety Concept" booklet

Disposal

- Refer to "Safety Concept" booklet

Legal regulations

- Refer to "Safety Concept" booklet

EC Declaration of Conformity

- Refer to "Safety Concept" booklet

Safety Instructions (Continued)

Health risks



Workplaces with stereo microscopes 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 organizational aspects.

- The ergonomic optical design and construction of the Leica S stereo microscopes are intended to reduce the exertion of the user to a minimum.



Direct contact with eyepieces is a potential transmission method for bacterial and viral infections of the eye.

The risk can be kept to a minimum by using personal eyepieces for each individual or detachable eyecups.

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Congratulations!

Congratulations on obtaining your new Leica stereo microscope from the S series. We are convinced it will exceed your expectations, as this instrument embodies all the qualities you associate with Leica Microsystems: excellent objectives, high-quality engineering, and reliability. Furthermore, the modular design ensures that the Leica stereo microscope adapts perfectly to your needs – no matter which accessories you require for your tasks.

Thanks to the parfocal system with simultaneously large working distances and object fields, you can always view your microscopic specimens accurately – from the complete image to the finest detail.

Though the reliability and robustness of Leica stereo microscopes is world-renowned, like any high-tech product, the Leica S series requires a certain degree of care and attention. Therefore, we recommend that you read this manual. It contains all the information you need regarding operation, safety and maintenance. Simply observing a few guidelines will ensure that even after years of intensive use, your stereo microscope will continue to work as smoothly and reliably as on the very first day.

We wish you the best of success in your work! after all, you are now equipped with the best tool!

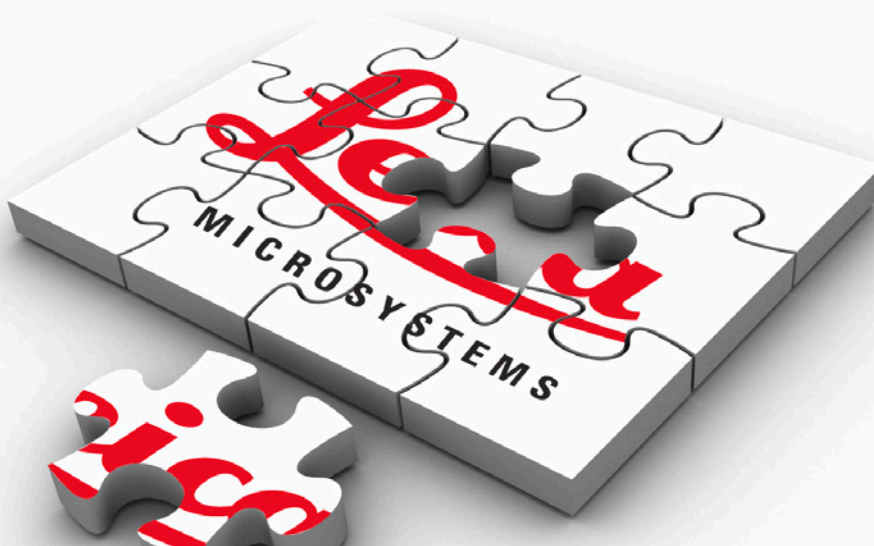
The Modular Design: Everything is Possible

The Leica S series provides a high degree of flexibility in choosing equipment, thanks primarily to the modular configuration and the compatibility that Leica has painstakingly maintained for decades. The optics carriers, eyepieces, stands, and more can be combined in any way you choose, allowing you to create the stereo microscope that best suits your needs.

Despite this, you will notice that the controls and individual components do not differ significantly. Whichever configuration you choose, you will quickly feel right at home with your new stereo microscope.

Have a special request? Let us know!

Leica Microsystems enjoys an exceptional reputation when it comes to devising customer-specific solutions. If you have a special request that cannot be met with standard parts, contact your Leica consultant. They have a solution for every application.



What Your Stereo Microscope has to Offer you

The optical system of the S series stereo microscopes consists of two beam paths converging at 10°. The objective pairs of each optical path are positioned close together, so the stereo microscopes can be of very "slender" design, especially towards the base of the instrument. The advantage: The advantages of this design are that it has a small space requirement for use on bonders and in machine applications, unobstructed access to specimens, plenty of space for tools and a completely clear view of the object field.

The Greenough system enables cost-effective correction of aberrations such as chromasia, image field curvature, and distortion with minimal effort. In all S series microscopes the optimum corrected center of the objective ensures high image quality. This provides superior optical performance with large, level and undistorted fields of view and chromatically optimized, high-contrast images.

Patented FusionOptics Technology

The S7 E features the Leica patented FusionOptics technology and delivers you finest details in 3D. While the right channel delivers you a high-resolution image at the largest possible numerical aperture, the left channel presents an image with high depth of field. This results in an image perception with outstanding richness of details and exceptional depth of field at the same time.

ESD protection

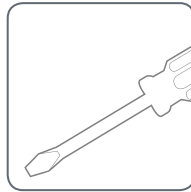
The Leica S7 E including its cold light source and stand, are made from a highly conductive material with surface resistivity of 2×10^{11} Ohm/square, with a discharge time of <2 seconds, 1,000 V to 100 V.

On We Go

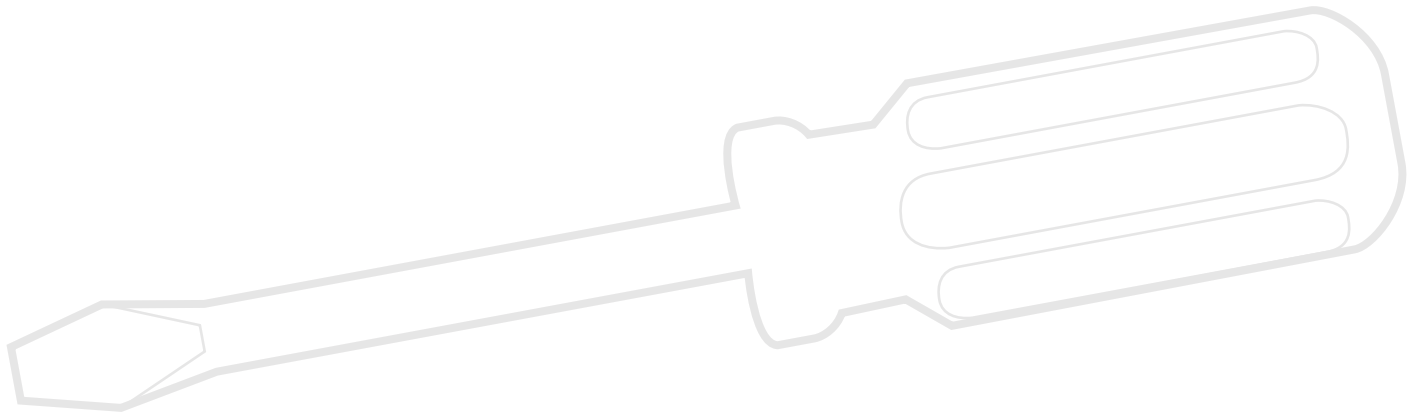
If your new stereo microscope has already been assembled and commissioned by your Leica consultant, click [here](#) to skip through the installation instructions and go directly to the Quick Start Guide on [page 22](#).



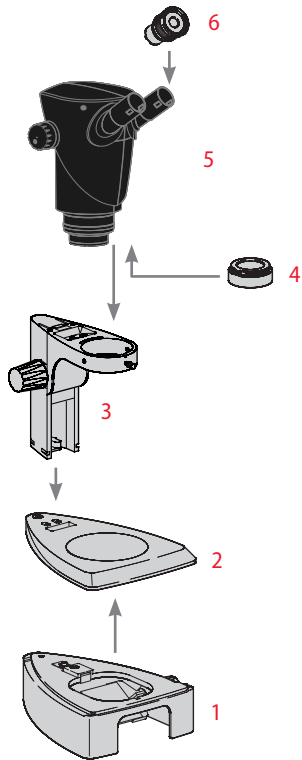
If, on the other hand, you are assembling the stereo microscope yourself, continue with the "Assembly" chapter, which begins on [page 14](#).



Assembly



Installing the Basic Equipment (Overview)



1. Sub-base for transmitted light with glass stage plate
2. Incident light base with stage plate
3. Focusing column with microscope carrier
4. Additional objective, optional
5. Optics carrier
6. Eyepieces, fixed and/or adjustable

Focusing Column



Never unscrew the 3 screws on the right side of the focusing column.



Focusing column on the incident light base

1. Remove the stage plate.



2. Route the 3 hollow screws from below through the base plate and screw these securely into the focusing column.



3. Insert the stage plate back into place.

Disclaimer:

Illustrations on this page show the optics carrier of an S9 stereo microscope with same proportion as the S7 E featured in this user manual.

Sub-base for Transmitted Light and Cold Light Source

1. Remove the glass stage plate.

2. Pull the locking mechanism forward.



4. Press the locking mechanism backward. The incident light base and the sub-base for transmitted light are now connected.



3. Set the incident-light stand to the sub-base for transmitted light and engage it with the connection screw.




5. Insert the glass stage plate.



6. Insert the universal light guide in the opening at the rear.



 Additional information can be found in the user manual for cold-light source Leica KL300 LED.

Optics Carrier and Additional Objective

Optics carrier

1. Insert the optics carrier carefully in the microscope carrier and fasten it in the desired position with the clamping screw.



Additional objective (optional)

1. Screw the desired objective counter clockwise into the optics carrier.



Protective objective glass (optional)

1. Screw the objective protective glass directly onto the objective.



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Available Graticules




The optional graticules enable measurement and, in addition, provide valuable information when comparing and capturing still images of the specimens. Insert the graticule before you set the eyepiece in place.


Available Graticules

The following graticules and objective micrometers for calibrating may be ordered:

- Graticule 10 mm/0.1 mm
- Graticule 5 mm/0.1 mm
- Graticule 5 mm/0.05 mm
- Graticule 100 Div./0.002"
- Graticule 100 Div./0.001"
- Graticule 150 Div./0.0005"
- Crosshairs
- Stage micrometer 50 mm, 0.1/0.01/ mm graduation
- Stage micrometer 1", 0.001" graduation

Inserting Graticules

 Graticules can be inserted in the adjustable eyepieces and the in the eyepieces for eyeglass wearers.

 The procedure for taking measurements is described in the "Measuring" user manual.

Inserting graticule(s)

1. Use the stereo microscope to determine the side on which the scale is inscribed. The scale must not appear reversed.
2. Remove the insert from the bottom of the eyepiece and place it on the bench with the knurled side down.




3. Hold the graticule by the edges to avoid leaving fingerprints, and push it into the holder from the side.



4. Replace the insert in the eyepiece and press it firmly into place.
5. Insert the eyepiece in the tube and turn the eyepiece in the tube to align the graticule correctly.



Eyepieces

 You can use your S series stereo microscope together with a fixed or adjustable eyepiece. For models in which a graticule is included in an eyepiece for measurement or photography, two eyepieces are necessary. We recommend that you also equip the high-powered S APO with two adjustable eyepieces.


Inserting the eyepieces

1. Push eyepieces as far as they will go into the tubes.




2. Check that the eyepieces are seated firmly and precisely in place.

Risk of infection

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

Leica LED Illumination

 Leica Microsystems offers a broad spectrum of different LED illuminators for incident and transmitted light applications. The combination of a high performance optical system and optimized illumination gives you the best imaging results.

The Leica LED3000 RL ring light, shown on the image to the right, guarantees bright, uniform illumination of the specimen over a large object field at a constant color temperatures.

For more information on LED illumination visit the [Leica Microsystems homepage](#).



Quick Start Guide




Overview: S7 E Stereo Microscope

1. Magnification changer, right drive knob with magnification scale
2. Focusing drive
3. Fixing screw for optics carrier in the microscope carrier
4. Adjustable tube: Interpupillary distance adjustable from 50 to 76 mm
5. Eyepieces
6. Threads for fastening the light arm (both sides and rear)
7. Illumination Leica LED3000 SLI
8. Illumination Leica LED3000 RL




Using the Eyepieces

 The eyepieces form the connection between the tube and the eye of the observer. Simply push them into the tube and they are ready to use.



What does "parfocal" mean?

 "Parfocal" means that a specimen continues to remain exactly in focus, even if the magnification on the stereo microscope is modified. All stereo microscopes from Leica Microsystems are parfocally matched. However, the parfocality requires a personal dioptric correction for the user.


Dioptric correction

In order to parfocally match the stereo microscope, at least one eyepiece with dioptric correction is necessary. The setup is described on the following pages:


- With one adjustable and one fixed eyepiece: from [page 30](#).
- With two adjustable eyepieces: from [page 33](#).

If you do not wear glasses:

Depending on the preferences of the observer, eyecups can be used.


 To avoid eye infections, we recommend that every user uses his or her own pair of eyecups.

If you wear glasses:

 Eyeglass wearers must remove or fold back the eyecups (Fig. below left), as otherwise they cannot see the entire field of view.




The Correct Interpupillary Distance

 The interpupillary distance is correctly set if you see a single circular image field when looking at a specimen.

If you are still a novice microscope user, you may need a short time to become accustomed to this. Not to worry – after a little while, it will become automatic.

Reference value

The interpupillary distance can be set between 50 and 76 mm.

 An "exit pupil distance" is the distance between eye and eyepiece. With the 10×/23B wide-field eyepiece for eyeglass wearers, it is approx. 22 mm. For those who do not use the eyepiece for eyeglass wearers, it is 12 mm.

Setting the eye distance


1. Bring the eyes slowly to the eyepieces.
2. Push the tubes together or apart with both hands until you see a single round, circular image field without shadows with both eyes.




Disclaimer:

Illustrations on this page show the optics carrier of an S9 stereo microscope with same proportion as the S7 E featured in this user manual.

Focusing

 Focusing raises and lowers the stereo microscope using the focusing drive. The specimen detail is brought into sharp focus as soon as it is in the focal point of the objective.




 The focusing drive can be operated either left- or right-handed.

Focusing

1. Align the specimen under the objective.



2. Set the lowest magnification level.

 At the lowest magnification, the desired specimen detail can be easier to localize due to the large field of view.

3. Look into the eyepieces and insert the desired specimen detail in the center.


4. Focus on the specimen with the drive knob.




Disclaimer:

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Changing Magnification (Zooming)

 All stereo microscopes of the S series allow a continuous magnification change. The magnification changer can be operated with the left and the right hand. The image scale is shown on the right drive knob.

 The basis for the calculation of the total magnification and the field of view can be found on [page 41](#).

Changing magnification

1. Look into the eyepieces.
2. Focus on the object (see [page 26](#)).
3. Rotate the magnification changer until the desired magnification is configured.



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Illustrations on this page show the optics carrier of an S9 stereo microscope with same proportion as the S7 E featured in this user manual.

Regulating the Resistance of the Focusing Drive

Adjusting the resistance

Is the focusing drive too loose or too tight?
Does the equipment tend to slide downwards?
The resistance can be adjusted individually depending on the equipment weight and personal preferences as follows:


1. Grip the outer drive knobs with both hands and turn them towards each other until the desired resistance is reached during focusing.



Disclaimer:

Illustrations on this page show the optics carrier of an S9 stereo microscope with same proportion as the S7 E featured in this user manual.

Changing the Position of the Optics Carrier

 The optics carrier can be turned sideways in the microscope carrier if the user wants to work from the side.

Changing position

1. Unscrew the clamping screw.



2. Turn the optics carrier laterally to the desired position.





3. Carefully tighten the clamping screw.

Disclaimer:


Illustrations on this page show the optics carrier of an S9 stereo microscope with same proportion as the S7 E featured in this user manual.

Diopter Settings and Parfocality: 1 Adjustable & 1 Fixed Eyepiece

 If you set the diopters on the adjustable eyepiece exactly as described, the image will remain equally sharp and constant (parfocal) from the lowest to the highest magnification. This means you do not have to refocus when changing magnification. The focus needs to be readjusted only if you want to view a specimen detail that is located higher or lower. Use this advantage as often as possible, it is not available on all stereo microscopes.

 The diopters can be set between +5 and -5.



 The following adjustments have to be carried out only once by each user. Using reticules leads to slightly deviated settings, which are described in the user manuals on the reticules (measurement).

Adjusting the diopter settings

1. Turn the dioptic correction on the adjustable eyepiece to the center position.

Continued on next page



Diopter Settings and Parfocality: 1 Adjustable & 1 Fixed Eyepiece (Continued)

2. Place a flat specimen under the objective.
3. Set the lowest magnification level.



4. Observe the specimen through the eyepieces and bring it into sharp focus with the focusing drive.

5. Set the highest magnification level.
6. Optimize the focusing with the focusing drive.



7. Set the lowest magnification level.

8. Turn the eyelens of the eyepiece as far as it will go in the "+" direction, without looking into the eyepieces while doing so.
9. Close your eye on the fixed eyepiece and look with the other eye into the adjustable eyepiece.
10. Rotate the eyelens of the eyepiece slowly in the "-" direction until the eye can see the specimen sharply.

Continued on next page

Diopter Settings and Parfocality: 1 Adjustable & 1 Fixed Eyepiece (Continued)

Checking parfocality

1. Select the highest magnification level.
2. Monitor the specimen; if necessary, refocus it slightly.
3. Change from the highest to the lowest magnification. The sharpness should be constant (parfocal). If this is not the case, repeat this procedure.

Dioptric Correction With two Adjustable Eyepieces

i If you set the diopters on the adjustable eyepiece exactly as described, the image will remain equally sharp and constant (parfocal) from the lowest to the highest magnification. This means you do not have to refocus when changing magnification. The focus needs to be readjusted only if you want to view a specimen detail that is located higher or lower. Use this advantage as often as possible, it is not available on all stereo microscopes.

i The diopters can be set between +5 and -5.



i The following adjustments have to be carried out only once by each user. Using reticules leads to slightly deviated settings, which are described in the user manuals on the reticules (measurement).

Adjusting the diopter settings

1. Turn the dioptic correction on both eyepieces to the center position.

Continued on next page



Dioptric Correction With two Adjustable Eyepieces (Continued)

2. Place a flat specimen under the objective.
3. Set the lowest magnification level.



4. Observe the specimen through the eyepieces and bring it into sharp focus with the focusing drive.

5. Set the highest magnification level.
6. Optimize the focusing with the focusing drive.



7. Set the lowest magnification level.

8. Turn the eyelens of the eyepiece as far as it will go in the "+" direction, without looking into the eyepieces while doing so.
9. Look through the eyepieces and close one eye.
10. With the other eye, monitor the specimen and turn the eyelens of the eyepiece slowly in the "-" direction, until this eye sees the specimen sharply.
11. Repeat steps 10 and 11 with the other eye.

Continued on next page

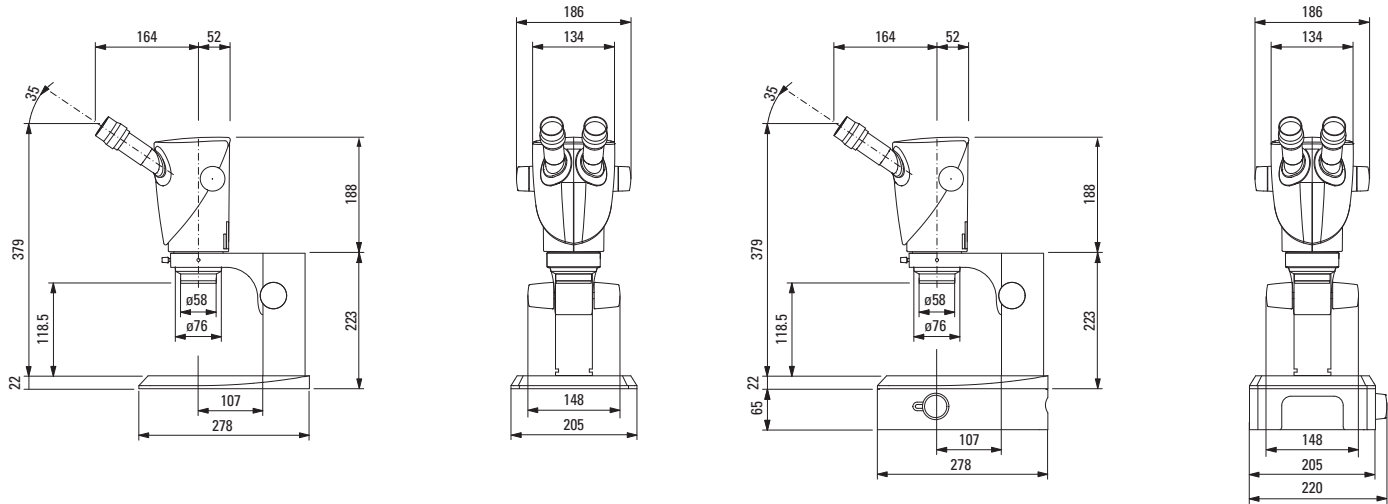
Dioptric Correction With two Adjustable Eyepieces (Continued)

Checking parfocality

1. Select the highest magnification level.
2. Monitor the specimen; if necessary, refocus it slightly.
3. Change from the highest to the lowest magnification. The sharpness should be constant (parfocal). If this is not the case, repeat this procedure.

Dimensional Drawings in mm

Leica S7 E With Incident Light Base & Transmitted Light Base



Measurements shown in millimeters.



Technical Data

Technical Data

	S7 E
Optical system, lead-free	10° Greenough using best-corrected central part of the objective; complete apochromatically corrected microscope system
Zoom	7:1
Viewing angle	35°
ESD protection	$2 \times 10^{11} \Omega$ /square, antistatic
Specific surface resistivity	$2 \times 10^{11} \Omega$ / square, discharge time <2 seconds from 1,000 V to 100 V
Magnification range (basic outfit)	6.1x – 45x
Maximum resolution	450 lp / mm
Maximum numerical aperture	0.150
Working distance (basic outfit)	122 mm
Object field diameter	37.7 mm
Adjustable zoom limits	Click-stops 10x, 20x, 30x, and 40x
Standard objectives, lead-free	Apochromats 0.5x, 0.63x, 0.75x, 1.6x, 2.0x
Ergonomic eyepieces, fixed and adjustable, with cups	10x / 23, 16x / 16, 20x / 12
Ergonomic eyepieces for eyeglass wearers, adjustable, with eyecups	10x / 23, 16x / 15, 25x / 9.5, 40x / 6
Interpupillary distance	50 –76 mm

Appendix

Calculating the Total Magnification/Field of View Diameter

Parameter

M_O	Magnification of the additional objective
M_E	Magnification of eyepiece
z	Magnification changer position
N_{FOV}	Field number of the eyepiece. Field numbers are printed on the eyepieces: 10×/23, 16×/16, 20×/12, 10×/23B, 16×14B, 25×/9.5B, 40×6B.

Example

M_O	Additional objective 1.6×
M_E	20×/12 eyepiece
z	Zoom position 4.0

Magnification in the binocular tube

$$M_{TOT\ VIS} = M_O \times M_E \times z$$

or

$$1.6 \times 20 \times 4 = 128$$

Calculation example: Field of view diameter in the specimen

$$\varnothing OF: \frac{N_{FOV}}{M_O \times z} = \frac{12}{1.6 \times 4} = 1.9 \text{ mm}$$

Troubleshooting

The field of view is shadowed

- Adjusting the correct Interpupillary Distance ([page 25](#)).

The image goes out of focus

- Inserting the eyepieces correctly ([page 20](#)).
- Perform diopter correction exactly according to the instructions (from [page 33](#)).

The focusing drive gradually sinks on its own or is difficult to turn

- Regulate the ease of movement ([page 15](#)).

In the case of failures of electrically operated devices, always first check:

- Is the voltage selector set correctly?
- Is the main power switch switched on?
- Is the power cable connected correctly?
- Are all connecting cables attached correctly?
- Are the fuses intact?

Care, Maintenance, Contact Persons

We hope you enjoy using your stereo microscope. Leica devices are renowned for their robustness and long service life. Observing the following care and cleaning tips will ensure that even after years and decades, your Leica stereo microscope will continue to work as well as it did on the very first day.

Warranty benefits

The guarantee covers all faults in materials and manufacture. It does not, however, cover damage resulting from careless or improper handling.

Contact address

However, if your instrument should no longer function properly, contact your technician, your Leica representative or Leica Microsystems (Schweiz) AG, CH-9435 Heerbrugg.

E-mail contact:

stereo.service@leica-microsystems.com

Care

- Protect your stereo microscope from moisture, fumes and acids and from alkaline, caustic and corrosive materials and keep chemicals away from the instruments.
- Plugs, optical systems and mechanical parts must not be disassembled or replaced, unless doing so is specifically permitted and described in this manual.
- Protect your stereo microscope from oil and grease.
- Do not grease guide surfaces or mechanical parts.

Care, Maintenance, Contact Persons (Continued)

Protection from dirt

Dust and dirt will affect the quality of your results.

- Put a dust cover over the stereo microscope when it will not be used for a long time.
- Use dust caps to protect tube openings, tubes without eyepieces, and eyepieces.
- Keep accessories in a dust-free place when not in use.

Cleaning polymer components

Some components are made of polymer or are polymer-coated. They are, therefore, pleasant and convenient to handle. The use of unsuitable cleaning agents and techniques can damage polymers.

Permitted measures

- Clean the stereo microscope (or parts of it) using warm soapy water, then wipe using distilled water.
- For stubborn dirt, you can also use ethanol (industrial alcohol) or isopropanol. When doing so, follow the corresponding safety regulations.
- Remove dust with a pneumatic rubber bulb or with a soft brush.
- Clean objectives and eyepieces with special optic cleaning cloths and with pure alcohol.

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Leica Microsystems (Schweiz) AG · Max-Schmidheiny-Strasse 201 · 9435 Heerbrugg, Switzerland
T +41 71 726 34 34 · F +41 71 726 34 44

www.leica-microsystems.com



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