Mikroskop Technik Rathenow

Stereo Microscope SMT 4

Stereo - Zoom - Microscope SMC 4

User Manual

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1. Safety Instructions

CAUTION! Please read the following information carefully before using the unit and its supplementary equipment!

This unit was constructed and checked according to the safety regulations for electronic measuring devices, and was delivered securely. This User Manual contains information and warning notices that should be heeded by the user.

The unit is a light microscope, drafted according to the newest scientific and technical knowledge for the visual, micro photographic and video-technical investigation of microscopic objects. The unit should only be used for the designed purpose. All other uses (also the insertion of single components which were not designed by the manufacturer) constitute a misuse of the product. We are not liable for any damages caused by this misuse.

This unit is not meant for unattended continuous operation.

The microscope does not have any special safeguards against samples with caustic toxic, radioactive or other hazardous materials. The allowed sample amount may not be exceeded.

The unit may only be operated on the voltages indicated on the unit. Please heed the instructions in the user manual! We are not liable for any damages caused by the disregard of these instructions.

If the unit is connected to voltage, contact clamps can lead to dangerous voltages and opening the coverings or removing parts can uncover a piece under a dangerous voltage. The unit must be disconnected from power before it can be opened for adjustments, replacements, servicing or repairs.

Existing ventilation slits should not be obstructed. This also applies for ventilation slits on the bottom of the unit. No tools, loose objects or liquids should enter the unit through ventilation slits or other openings in the unit.

Only fuses with the required nominal current may be used as substitutes for the prescribed use. It is prohibited to use makeshift fuses or short-circuit the fuse support.

If safety is endangered , the unit must be removed from use and secured against unattended operation. The unit should then be sent to the production factory or a competent service technician.

Before switching on the unit, set the controller for the illumination intensity to the left catch in order to prevent blinding.

1.1. Characteristics and Applications

The microscope is a unit equipped with high quality optics, which delivers largely flat, distortion-free pictures with next-to-no colour errors.

There are a lot of supplemental equipment with which the microscope can be varied and extended to fit a specific use. The most varied uses are made possible: the observation and processing of flat, high reflecting objects, the investigation of bored holes and inner walls and so on. For a better analysis of these investigations it is possible to photograph the microscopic picture or to present the image on a monitor or a computer

Additionally, various ergonomic arrangements and a high operating comfort allows a non-fatiguing work with the microscope.

1.2. Assembly and Operation SMT 4

The SMT 4 have an objective that continually corrects the picture distance and has both path of rays in common. The object being viewed is located in the front focal plane.

While the axes of both of the partial bundles encompass an angle of 12.5° in front of the objective, they run parallel behind the objective. This enables the installation of an 5 step enlargement changer in form of a controller with two telescope systems from type Galilei (factor 1,6x and factor 3,2x). This system is interspersed forward and also backward (factor 0,63x and factor 0,32x) or also switched off (factor 1,0x). There are five possible magnifications.

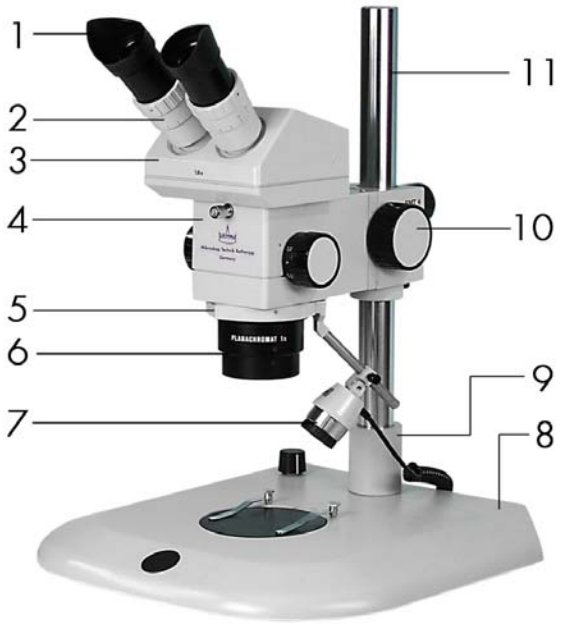
Two separate pictures are designed in the tube system, which are arranged in every path of rays behind the enlargement changer, and are observed with two separate eyepieces. One mirror system for the obtainment of vertical and horizontal pictures and one for the deviation of the path of rays at 45° lie between the tube system and the eyepiece.

The objective is screwed onto the middle part of the microscope. A binocular tube is attached , in whose braces an eyepiece pair is inserted. The eyepieces braces of the binocular eyepiece can be swivelled in order to fit them to the individual optic distance of the observer and are equipped with dioptre rings for compensating the individual accommodation and ametropia. The corresponding eyepieces are inserted in them.

The drive is located at the backside of the microscope body. The whole microscope can be clamped with a screw at the column.

A clamp ring (additional part), which will be assembled directly under the drive at the column is useful to avoid a unintended slipping of the microscope. The unit is completed with a 3W-LED incident light illumination which will be clamped at the lamp holder or at a special articulated arm (additional part) and a large stand with column (367mm) and built-in power supply for 3W-LED illumination, adjustable or the right transformer.

Stereo - Microscope SMT 4



Picture 1: Overview SMT 4

1	Eyecup with eyepiece
2	Eyepiece cone with dioptre rings
3	Tube 45°
4	Middle part of microscope
5	Luminance ring, rotatable
6	Objective
7	3W-LED Incident light illuminator
8	Stand base
9	Column holder
10	Drive mechanism
11	Column

Various easily exchangeable adapters and eyepieces enable an extension of the enlargement range of from 1,6x ... 250x. Additionally, the working distance can be varied between 26mm ... 210mm via various adapters.

1.3. Technical Data SMT 4

Standard configuration

Objective: Planachromat					1 x
Working distance					100 mm
Eyepiece					GF- PW 10x/ 20
Tube					Factor 1,6x
Factors at magnification changer					
	0,32x	0,63x	1x	1,6x	3,2x
Total magnification $V_t = V_{obj} \times V_{eyepiece} \times V_{tube} \times V_{changer}$					
	5x	10x	16x	25x	50x
Object field (mm)					
	40	20	12,5	8	4
Depth of field (mm)					
	5,1	1,3	0,5	0,25	0,1
Adjustable range of coarse drive					45 mm
Max. High of objects					140 mm
Interpupillary adjustment					55...80 mm
Adjustment ametropia					+/- 6 dpt
Dimension in mm (W x D x H)					320 x 320 x 380
Weight					6,6 kg

1.4. Assembly and Operation SMC 4

The SMC 4 has an objective that continually corrects the picture distance and has both path of rays in common. The object being viewed is located in the front focal plane.

While the axes of both of the partial bundles encompass an angle of 12.5° in front of the objective, they run parallel behind the objective. This enables the installation of an enlargement changer in form of a pancrat.

Two separate pictures are designed in the tube system, which are arranged in every path of rays behind the enlargement changer, and are observed with two separate eyepieces. One mirror system for the obtainment of vertical and horizontal pictures and one for the deviation of the path of rays at 45° is lying between the tube system and the eyepiece.

The unit is comprised of the microscope middle part, which contains the enlargement changer (Zoom-objective). This can be operated right or left with a turning knob, from which the activated magnification of the pancrat can be read.

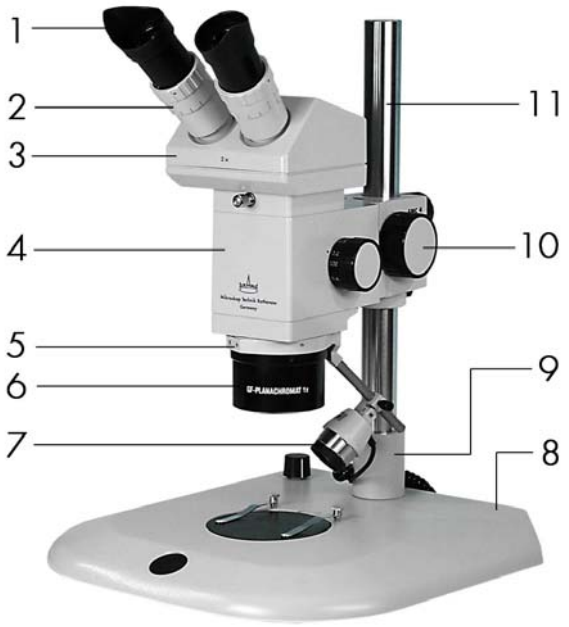
The objective is screwed onto the middle part of the microscope. A binocular tube is attached, in whose braces an eyepiece pair is inserted. The eyepieces braces of the binocular eyepiece can be swivelled in order to fit them to the individual optic distance of the observer and are equipped with dioptre rings for compensating the individual accommodation and ametropia. The corresponding eyepieces are inserted in them.

The drive is located at the backside of the microscope body. The whole microscope can be clamped with a screw at the column.

A clamp ring (additional part), which will be assembled directly under the drive at the column is useful to avoid a unintended slipping of the microscope.

The unit is completed with a 3W-LED incident light illumination and a large stand with column (367mm) and built-in power supply for 3W-LED illumination, adjustable or the right transformer.

Stereo - Zoom - Microscope SMC 4



Picture 2: Overview SMC 4

1	Eyecup with eyepiece
2	Eyepiece cone with dioptre rings
3	Tube 45°
4	Middle part of the microscope
5	Luminance ring, rotatable
6	Objective
7	3W-LED incident light illuminator
8	Stand base
9	Holder for column
10	Drive mechanism
11	Column

A built-in zoom objective allows an alteration of the enlargement with factor 10:1 without a change of the eyepieces or of the objectives.

Various easily exchangeable adapters and eyepieces enable an extension of the enlargement range of from 1x ... 320x. Additionally, the working distance can be varied between 26mm ... 210mm via various adapters.

For a better analysis of investigations it is possible to photograph the microscopic picture with a digital camera or digital video camera (over the trinocular tube)

1.5. Technical Data SMC 4

Standard configuration

Objective: GF - Planachromat Working distance	1x 100 mm
Eyepiece	GF- Pw 10x /20
Tube factor	2x
Zoom - Objective	Zoom 10:1
Selected factors at magnification changer	0,32x ... 3,2x
Total magnification $V_t = V_{obj} \times V_{eyepiece} \times V_{tube} \times V_{changer}$	6,3x ... 63x
Object field (mm)	32 ... 3,2
Depth of field (mm)	5,1 ... 0,08
Adjustable range of coarse drive	45mm
Max. High of objects	135 mm
Interpupillary adjustment	55...80 mm
Adjustment ametropia	+/- 6 dpt
Dimension in mm (W x D x H)	320 x 320 x 415
Weight	7 kg

2. Starting Operations

2.1. Assembly

Please open carefully the packaging of the microscope.

At first the microscope stand (8) and the column (11) has to be taken out of the packaging and has to be put on a plan subsoil. The column has to be set into the holder for the column (9). After you have done this, you have to fix the clamp ring for column at the column (additional part).

After you have taken the middle part of the microscope (4) from the packaging, this part has to be assembled directly at the column (11). Fix it with help of the screw on the backside of the drive mechanism (10).

The objective (6) is screwed onto the center of the middle part of the microscope. Please do not touch the surfaces of the optical parts of the (GF-) Planachromat. Before the tube 45° (3) can be assembled to the middle part of the microscope, all other supplementary modules and tubes has to be assembled before.

Following the dust cover will be removed from the eyepiece cone (2) and the eyepieces (1) has to be assembled into the cone.

The lamp holder will be tighten at the luminance ring (5). After that the 3W-LED incident light illuminator (7) can be clamped at the lamp holder in the right position and can be moved in the right direction. By rotating the collector socket, the size of the illuminated field will be changed. The incident light illuminator has to be assembled at the power supply at the stand base (8) or at a 3W-LED transformer. Now the brightness can be adjusted by a voltage regulator which is built-in into the base (8) or directly by the controller at the transformer.

Furthermore the object plate can be done into the base stand with either the black or white side face-up according to the colour of the objects itself. Insert the stage springs, which will later be used for fastening objects.

Please note: There might be other instructions to assembly other bases or stands.

2.2. Adjusting the Sharpness

The microscope can be adjusted so that a sharp image at all levels of enlargement results.
You can achieve this in the following way:

The distance of the eyepieces has to be adjusted by screwing up the eyepiece cone (2) to the individual interpupillary distance

Both dioptre rings has to be set to 0.

The highest magnification factor will be adjusted by the help of the magnification changer, a stopper is clearly noticeable.

The picture will be focussed by the drive mechanism (10), whereas you have to look through only one eyepiece. If that isn't possible, the microscope body (4) has to move along the column (11) till you see a picture, clamp the body again. Following the picture has to be focussed by the drive.

At least you have to choose the lowest magnification factor and try to adjust the sharpness by rotating the dedicated dioptre ring. Please note: You don't need to change the drive knob!

After the microscope has been set, the object being viewed will be sharply portrayed at all levels of enlargement.

In case there are objects with different high, then it is only necessary to focus the object again (by changing the drive at highest magnification factor).

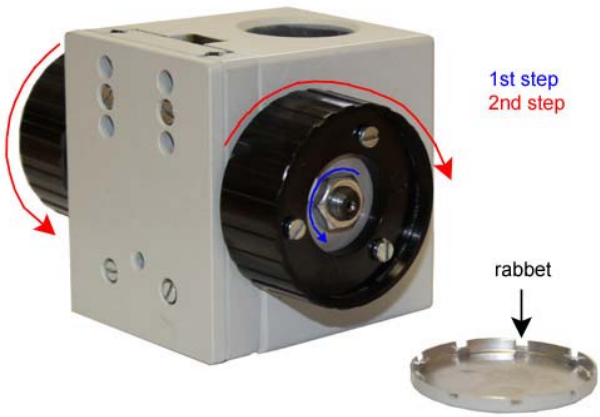
A new readjustment is only necessary if another person is using the microscope.

2.3. General Operating Instructions

2.3.1. *Adjusting the Height of the Microscope:*

In general you can adjust the height with the help of the slow –motion tangent screw. If this doesn't suffice push the unit to the column by loosening the knurled knob on the back side of the unit until the height is adjusted. Once this is complete, retighten the knob. When doing this watch out for the clamp ring (additional accessories), which should prevent the unit from inadvertently slipping. It should be reattached after the unit has been pushed.

2.3.2. The *stiff motion of the drive* (drive mechanism with ball-bearing slide 50mm) can be changed by removing the gray lacquered cap and by loosening the locknut.



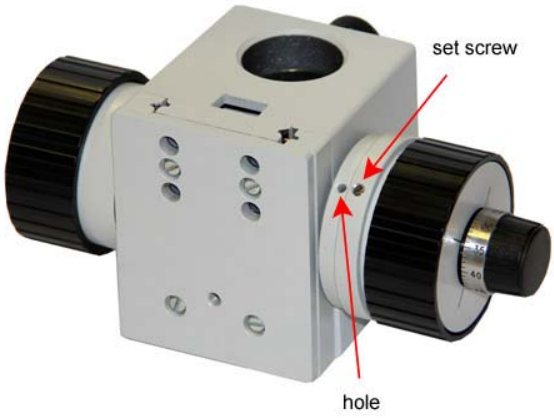
Picture 3:
Adjustment of the stiff motion at the drive 50 mm

You have to put a little screwdriver into one of the lateral rabbet to remove the cap. The cap can be carefully levered up after this. Subsequently the knobs have to twist in opposite ways. Even this process has to carry out carefully and evenly until the necessary *stiff motion of the drive* is reached. The locknut has to be countered again after this process (Picture 3).

You can adjust the *stiff motion of the drive with coaxial gross and fine drive* in two different ways.

How to adjust the *coarse adjustment* (drive):

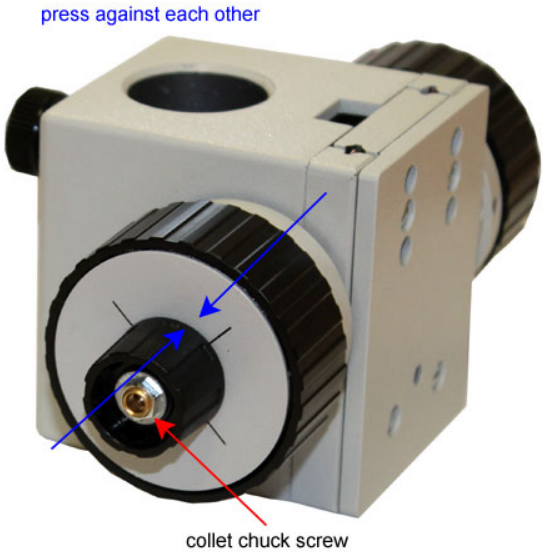
You have to loosen the set screw at first. Now the clamp ring will be twisted against the knurled knob with help of a wrench. For this the wrench has to be inserted into the adjacent hole beside the set screw. The set screw can be tightened again if you have reached the stiff motion you would like to have (Picture 3.1).



Picture 3.1:
Adjustment of the stiff motion of the drive with coaxial gross and fine drive (coarse drive)

How to adjust the *fine drive*:

Please remove the cap at the left fine drive knob (without scale) with help of a small screwdriver. You have to loosen now the visible collet chuck screw. Subsequently the knobs of the drive have to be pressed against each other and the collet chuck screw has to be fixed again. Insert the cap again at the fine drive knob (Picture 3.2).



Picture 3.2:
Adjustment of the stiff motion of the drive with coaxial gross and fine drive (fine drive)

2.3.3. To *assemble the stages* (see also chapter 9: Stages and stands) it is necessary to remove the springs and the object plate from the column base, set up the stage in such a way that both screws catch the corresponding grooves in the base. Now fasten the stage with one of the screws on the front edge of the column base.

There are separate instructions to assemble the mechanical stage K 150 and K 200 !

2.3.4. All *binocular and intermediate tubes* are changed in the same way.

Loosen the knurled screw underneath the tube, lift the front of the tube and remove it diagonally from above. Now insert the back edge of the new tube. When doing this, make sure that the guiding screw on the back of the tube mount catches the nut on the tube. Now tighten the knurled screw again.

If necessary, the tube can also be attached when turned at 180°. The same use of two or more intermediate tubes is also possible, but it depends from the used eyepieces and the used magnification factor. Light shadowing might be on the edge of the field of view only appears during investigations that are executed at factor 0.32x or with eyepieces PW 6.3x(25) or GF-PW 10x(25).

2.3.5. An exchange of all *supplementary lenses* is the same because all lenses are coming with a standard right-hand thread. Please be careful with the optical parts to avoid scratches or other damages.

2.3.6. All *fixed and adjustable eyepieces* of the GF-PW and PW- series can be used with the microscopes SMT 4 and SMC 4. Insert the eyepieces into the eyepiece cone until the arrester.

2.3.7. You can *order* the microscope body with or without any stands or any other supplementary equipment after a clearance with Mikroskop Technik Rathenow GmbH. In this way you can use your own existing apparatuses.

3. Maintenance and Service

The Stereo-Microscope SMT 4 and the Stereo-Zoom Microscope SMC 4 and its supplemental equipment are service-free over a long period of time, assuming normal use. In the case of continual use (shift operation) and especially in the case of unfavourable environment conditions (dust, etc.), the unit should be serviced when needed in the following ways.

Before any servicing of the equipment, the power supply should be disconnected.

Please be carefully with all optical parts. A damage of theese part will cause aberrations or not sharpen images.

All loose parts, e.g. preparations, filter or so on have to be removed from the microscope.

3.1. Changing the illumination

3.1.1. You can't change the light emitting diode (LED) by yourself at the *LED illuminations*. LED illuminations have a longer livespan than normal halogen bulbs. Only the manufacturer of the LED illumination is able to change the LED.

3.1.2. A change of the illumination at the *base for transmitted and incident light* will be done over the bottom of the base. Tip the base on the side to change the lamps. Loosen the screw in the flap of the lamp case, snap out the flap with the lamp mount and change the lamp. Subsequently shut the flap again.

3.1.3. At the *transmitted light – dark-field devise* the screws underneath the equipment has to be loosen to change the lamps. Remove and rotate the ground plate and exchange the old halogen lamp against a new halogen lamp 6V/10W. Subsequently mount the transmitted light – dark-field device in the reverse order.

Before you use the microscope the first time and after each change of the illumination the bulb has to be recentered again. To do that, you have to take a sheet of paper or a frosted glass. Put it on the dark field device. By changing the screws you can adjust a uniform of the illumination.

3.1.4. Please read the user manual of the *cold light device* how has to change the bulb.

3.2. Changing the fuse

Warning: Do not adjust inadvertently the mark of the main voltage!

3.2.1. It is possible to change the fuse on the *transformer* when the unit is closed. The fuse box is located directly above the connection jack for the power cable on the backside of the unit. Press the clamps right and left of the box towards the center and remove the covering with the fuses. A fuse with the blow-power 250mA 250V is required for the setting 220/240V and the blow-power 500mA 250V is required for the setting 115V.

3.2.2. *The base for transmitted or incident light (T/I base)* can be opened. A box whose upper part can be removed after both screws are loosened is located in the lower plate. Remove the fuse and insert a new one (for voltage 220/240V – blow-power 250mA and for 110/127V – blow-power 500mA). Then close the base again in the reverse order.

3.2.3 Please read the user manual of the *cold light device* how has to change the fuse.

3.3. Care of components

3.3.1. The drive mechanism has to lubricated evenly in this way, that between the pinion gear and the rack and also at the ball path a thin grease film will be applied there. Please use a grease of middle consistency.

3.3.2. The *dioptre rings* are unscrewed, those threads easily greased and by repeated and movement of the dioptre rings it is all greased evenly. When mounting the rings, ensure that their marks agree with the index lines on the eyepiece connecting piece.

3.3.3. We recommend to use antifriction bearing grease of middle consistency for lubricating the slide faces of the gliding stage. Lightly lubricate both faces in regular time intervals with this grease. Before doing this, carefully remove the old grease with a grease dissolver.

3.3.4. *Eyepieces and attachment lenses* should be cleaned regularly with a soft hair brush. In addition these parts should be removed from the equipment and all accessible optical parts should be carefully cleaned. Each attempt to disassemble the objective will cause a complete adjustment error of the objective. Optics and lenses can be cleaned by a cleaning tissue for optics. Medical alcohol is recommend as cleaner.

In case the *microscope* isn't in use you should cover the microscope with the delivered protective cover.

4. Supplementary equipment

4.1. Eyepieces

4.1.1. *Fixed eyepieces* are available for different magnifications (first number) and with different field of view numbers (second number). With its assistance the total magnification can be changed beyond the range of the magnification changer, without the work distance is affected. All eyepieces are equipped with eyecups. The eyepieces GF-PW 6,3x/25, GF-PW 10x/20, GF-PW 10x/25 and GF-PW 12,5x/20 are usable as eyeglass (spectacles) wearer eyepieces (eyeglass symbol,) .

4.1.2. *Adjustable eyepieces* will be offered for simple measurements or for counting and can be fitted with various reticles.
The fixed eyepiece will be removed and the adjustable eyepiece will be inserted. By setting the eye lens the adjustable eyepiece will be focused on the reticle.

4.2. Binocular tubes

4.2.1. A *binocular diagonal tube* is part of the standard equipment of the microscopes SMT 4 and SMC 4. The enlargement factor for the microscope SMT 4 is 1,6x and the enlargement factor for the microscope SMC 4 is 2x. Both tubes offer a diagonal observation of 45°. All eyepieces are changeable.

4.2.2. The *Tilting eyepiece tube 2x (Multifunction tube)* offers a fatigue-proof working in a lower and effortless increased attitude to work. With the viewing angle of 10° to 55° you will get a variability in high of 45mm. By rotating the braces of the eyepieces you will get a variability in high of 50mm. As result you have a viewing high of 90mm as difference.

Picture 4: Tilting eyepiece tube 2x (Multifunction tube)

4.3. Attachment lenses and objectives

When another range of magnification or another range of working distance is necessary at the microscope SMT 4, then it is possible to use different attachment lenses (magnification factor/ working distance: 0,5x / 164 mm; 0,63x / 112 mm; 2x / 30 mm).

The lenses will be clamped directly at the Planachromat 1x by a screw. Furthermore the standard objective of the microscope SMT 4 can be changed by a GF-Planachromat or by another Achromat. Please note: These objectives can't be combined with any other attachment lenses.

There are different achromatic objectives and GF-Planachromat available to have another range of magnification and a different working distance for the microscope SMC 4.

The standard equipment of the microscope SMT 4 comes with a Planachromat 1x, the standard equipment of the microscope SMC 4 comes with a GF-Planachromat 1x.

Picture 5: Attachment lenses and objectives

4.4. Illumination system

4.4.1. The standard illumination of both microscopes is the *3W-LED incident light illuminator*. The illuminator can be mount directly on the microscope body or at an articulated arm. With help of the articulated arm (also available as flexible arm) the illuminator can be moved easily in each position.

The size of the illuminated field can be changed by rotating the socket of the light collector.

Picture 6: 3W-LED incident light illuminator at articulated arm

Alternate regarding the 3W-LED incident light illumination there is also available a 6V/10W or 6V/20W halogen illumination with the right transformer.

4.4.2. *LED –ring light illumination* will be used for different working distances in combination with or without attachment lenses. The characteristic of this kind of illumination is a uniform, shadow free illumination of objects in all directions.

The assembly will be done with a special adapter. The adapter has to screw directly onto the objective of the microscope.

The power connection will be over the built-in power supply of the large stand or over the transformer.

Picture 7: LED- ring light illumination

4.4.3. A *transformer* will be needed to use a 3W-LED incident light illuminator, a LED ring light illumination, an illuminator 6V/10W, a illuminator 6V/20W or the dark-field device.

Please note: LED illuminators and halogen illuminators need their own transformer. A confound of the transformers will caused a damage of the transformer and/or of the illuminator!

Picture 8: Transformer

4.5. Colour filter

A blue matted glass with a diameter = 32 mm can be done into a filter holder, so that the light becomes daylight similar (if halogen light illumination is in use). In order to change generally the colour of the lighting, colour filters are used, which are in a similar holder like the blue matted glass.

4.6. Cold-light illuminator

The use of a cold-light source is recommended for challenging illumination tasks which depend on a high and constant illumination strength as well as a specimen-gentle, variable type of illumination.

Picture 9: Cold-light device

4.6.1. A *Semi-fixed light guide* can be connected to the cold light source, if necessary with focus adapters or other filters. The position has to be choose in this way, that there is an optimal illumination level of the objects. The Semi-fixed light guide is self-supporting and therefore no base is needed. Along with insert filter –formed colour filters, neutral filters and conversation filters the following filters are available and may be directly placed in front of the Semi-fixed light guide.

Picture 10: Semi-fixed light guide with focussing attachment

4.6.2. For a uniform, shadow-free illumination of objects, the semi-fixed light guide or the flexible light guide can be substituted by a *ring light illuminator* (four-point ring illuminator or split ring illuminator), that is attached in front of the microscope body with the help of the adaptation for ring illuminators with inner diameter of ∅=66mm. The adaptation has to be screwed by two screws at the microscope boy. The ring illuminator is pushed onto the adaptation and firmly fastened with the help of its knurled screws.

There are a screwable ring-shaped polarizer and an analyser specially for the split ring illuminator.

Picture 11: Split ring illuminator

4.7. Vertical illuminator

In order to generate vertical incident light, attach the vertical illuminator to the objective (Planachromat 1x, Plan-Apochromat 1x, GF-Planachromat 1x or the different attachments) and stop it with a knurled screw. There is a special adapter necessary for the Planachromat 1x, Plan- Apochromat 1x and for the other attachments.

Both illuminations 6V/20W or 3W-LED are suited as light sources. Both lights should be infinity focused before being inserted in the mount of the vertical illuminator. The light is secured with a soft turn to the right in the mount.

Picture 12: Vertical illuminator

Infinity focusing (only halogen bulb):

Turn the lights to face a wall at least two meters away and set them so that the lamp filament is portrayed on this wall. By turning the collector mount (6V/10W halogen) or by pushing the lamp mount in the case (6V/20W halogen)

4.8. Bright-field Incident light illumination

Install the bright-field incident illuminator to observe flat, regularly reflecting objects in a "real" brightfield. It is used like an intermediate tube and will be set between the middle part of the microscope and the binocular tube.

When the standard equipment of the SMT 4 (Planachromat 1x, eyepiece GF-PW 10x/20) and of the SMC 4 (GF – Planachromat 1x, eyepieces GF-PW 10x/20) is used, the entire field of vision lights up for the large factors of the magnification changer. When dealing with small factors, the brightfield is only a cross-shaped range within the field of vision. (When other equipment of the SMT 4 / SMC 4 is used, the size of the lit field varies depending upon the used eyepieces and objectives)

4.8.1. The use of a *cold-light device* is recommended for challenging illuminations tasks which depend on a high and constant illumination strength as well as a specimen-gentle, variable type of illumination (flat, high-reflecting objects).

Picture 13: Bright-field incident light illumination, cold light device

Two supports for both arms of the flexible light guide are on the base plate of the brightfield incident light illumination equipment. The supports allow the use of light guides whose end pieces have an outer diameter of ∅=6 mm or ∅=10 mm. In the last case, the plug-in sockets must be removed from the supports, the knurled screws must be unscrewed.

The light guides are inserted in the side openings of the supports. Under observation, the object level is positioned at the magnification factor 0.32x, so that this is lit in uniform brightness. The light guides are fixed here with the knurled screws.

Please note that every path of the light beams is set separately. Position the right light guide while looking through the left eyepiece and vice versa.

4.8.2. The LED illumination in the bright-field incident light illumination is characterised that there is no need to do the focusing of the light guides. Furthermore the power-supply can be done over the built-in power supply of the stand or via a transformer 3W-LED.

The complex assembly of the cold-light device and its light guides is cancelled.

Picture 14: Bright-field incident light illumination – LED

4.9. Incident light polarization

4.9.1. A *Polarization filter* in a plug-in socket, which is plugged in front of the collector of the 3W-LED incident light illuminator, exactly like the colour filter, serves as the polarizer. In case of using a cold light illumination the polarization filter can be mounted directly on the focussing attachment of the semi fixed light guide.

Picture 15: Polarizer

4.9.2. There are several variants for the *analyzer*

I. A rotating analyzer is set in front of the objective and is fastened with a knurled screw.

Picture 16: Rotatable Analyzer

II. A filter pusher formed like an intermediate tube includes two parallel-aligned polarization filters, which can be pushed to the left side in the path of the light beam with the help of one of the two knobs. The microscope must not be refocused when observing with or without a polarization filter.

Picture 17: Analyser in an intermediate tube

III. The use of the cold light device allows a further variant. A polarizer or analyser which is mounted in front of the split ring light illuminator allows observations with polarization at uniform illuminated objects.

4.10. Transmitted light polarization

There are different variants of investigation for polarization in transmitted light illumination analogue to incident light illumination for the analyser for the variants I and II.

A filter pusher formed like an intermediate tube includes two parallel-aligned polarization filters, which can be pushed to the left side in the path of the light beam with the help of one of the two knobs. The microscope must not be refocused when observing with or without a polarization filter. It is possible to insert compensators for the determination of path differences on double-refracting materials or of rotations of the polarization level. According to intended use, a tipping or rotating compensator inside the two guides on the right side of the filter pusher can be inserted diagonally to one of the polarizers.

4.10.1. A *polarization filter* insertable in the turntable serves as a polarizer. Screw this into the turntable so that the markings on it agree with those on the turntable. When using it in combination with the filter pusher, align it to the darkening while looking through the binocular tube and fasten it with both screws.

Picture 18: Turntable with Polarizer

4.10.2. When using it in combination with the filter pusher, align it to the darkening while looking through the binocular tube and fasten it with both screws. Alignment is meaningless when using the analyser set in front of the objective, since the analyser is rotatable and can therefore be adjusted afterwards.

4.11. Incident Light Fluorescence

A filter kit for blue, green and blue-violet stimulation is available for fluorescent investigations. Fluorescent stimulation results via one of the plug-in stimulation filters in front of the collector of the 6V/20W illuminator or the 3W-LED illuminator.

4.11.1. The *excitation filters* in the plug-in socket can be exchanged. To do this, press out the filter combination with a non-fuzzy cloth and lay the desired stimulation filter combination into the socket. Set in the binding ring and carefully press against the filter.

4.11.2. The *blocking filters* are in a filter pusher formed like an intermediate tube. The tube will be assembled between the middle part of the microscope and the binocular tube.

Picture 19: Fluorescence device

Attach the filters to the left side in the path of the light beam with the aid of one of the two push knobs. If you need other fluorescent blocking filters other than those supplied with the standard equipment, they can be traded before the assembly of the filter pusher. This can be only done in the factory.

4.11.3. When using a *cold light device* you can set the corresponding stimulation filters directly in front of the light guide outlet by unscrewing the focusing adapter. The right blocking filter has to be done again into the filter pusher.

4.12. Transmitted light -Dark-field device

The transmitted light – dark field device is used for observing and investigating transparent objects whose structures are not easily recognizable in the brightfield.

Their contours only contrast and streaks and surface damages are only visible in the dark-field. After the object plate has been removed, set this equipment into the incident light stand like a stage. The equipment can be used in the T/I base only with a special adapter.

Picture 20: Transmitted light – Dark-field device

4.13. Transmitted light base

The SMT 4 and SMC 4 can be converted for transmitted and mixed light illumination with the transmitted light base.

Please note: The transmitted light base can't be used in combination with the large stand!

Place the incident light stand on the top of the transmitted light base, which should then be screwed on to the base with both knurled screws. Exchange the insertion plate in the base of the stand with the glass insertion plate. Plug the light 3W-LED or 6V/20W into the mount on the back of the transmitted light base. The frosted side of the mirror must be turned towards the light. Correct the mirror position by turning the left or right adjusting knob while looking through the microscope and adjust the light field size by focusing the light.

Please note: The image has the most contrast if the light field size is the same as the field of vision.

A second light illuminator and a second power source is required for mixed light. The light for incident light illuminations remains on the microscope.

Picture 21: Transmitted light base

4.14. Base for transmitted or incident light

The T/I base presents a more comfortable variation for investigations in transmitted light, which reaches an especially uniform illumination of the object field and is suited for frequent changes of transmitted and incident light.

It contains the total transmitted light units including an illumination source and the electrical components as well as connection possibilities for an incident light illumination.

The column will set on the base and screwed tightly. After that the T/I base has to be connected to the power source. The network voltage must agree with the voltage type indicated on the bottom of the base. It is possible to change the existing column against a column with more length.

Attach the microscope analogue to the incident light stand on the column of the T/I base , fasten it with the knurled screw and secure it with the clamp ring.

Picture 22: Base for transmitted or incident light (T/I)

Switch on the T/I base with a pressure switch on the front side. The push switch allows the choice between transmitted or incident light. For this, an incident light illuminator must be assembled to the microscope and has to be connected to the right power source.

An infinitely variable alteration of the brightness of the corresponding illumination equipment is possible with the control unit on the left front side of the T/I base.

The incident light equipment can be connected to an additional series unit if investigations in mixed light are necessary.

Focus the transmitted light illuminator by pushing the bar on the back of the T/I base.

5. Measuring instruments

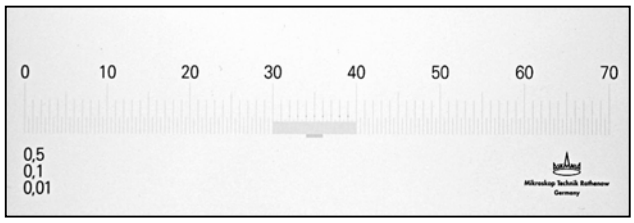
5.1. Eyepiece measuring plate

The eyepiece measuring plates are provided and a measuring scale is inserted into a adjustable eyepiece, how it will be described in point 4.1.2. . The eyepiece - cross-line divides the field of view into 4 quadrants and marks the field of views centre. To use the eyepiece measuring plates the eyepiece - line disk version is unscrewed, and the line plate is inserted in such a way into these that the engraving points downward to the object. When connecting, the screen is again screwed in.
The eyepiece measuring plate has to align vertical to avoid measuring errors because of the oblique viewing onto the object (parallax)

Picture 23: Eyepiece measuring plate

5.2. Object measuring plate

The Object measuring plate serves for the calibration of the measuring software for normal and as well as for microscopic linear measurements. The division is on the top side of the plate. For calibrating, the division is turned to the objective. For direct linear measurement of even objects these are placed on the object measuring plate with the division downward on the object surface.



Picture 24: ASKANIA – Object measuring plate

The object - measuring plate 70/0.5 10/0.1 2/0.01 orders a calibration of 0.5mm and in the centre a division length of 10 mm with a calibration of 0.1 mm on a division length of 70mm. Moreover it orders a division of 2.0mm with a calibration of 0.01mm additionally in the centre of this division.

5.3. Measuring software

Objects can be captured with a video- or photo camera which is mounted directly on a microscope. These captured objects can be stored in digital form. After a calibration of the whole microscope system (with help of a measuring plate) it is possible to measure this objects.

Several measuring programs are available. For the use of these programs it is necessary to equip a computer with digital camera like a digital USB camera or a digital D-SLR camera to the microscope (over the Photo-/TV tube).

The measuring programs will be describe separately in the manual of the manufacturer of the software (the manual is not part of this manual).

6. Documentation

6.1. Photography over the Trinocular tube

If visual observation and photographic photographs without changes are to be made, then the use of the Photo-/TV tube offers itself (additional accessories).

Picture 25: Trinocular tube

A photo adjustment and the type of camera appropriate T2 – adapter is needed. There are different photo adjustments available: 1x; 1,6x and 3,2x.

It is better to insert into the adjustable eyepiece a cross-line plate to see which part of the object (picture) will be shown on the film and to suppress the individual accommodation.

The trinocular tube will be assembled between the middle part of the microscope and the binocular tube. The photo adapter has to mounted at the rear exit. The camera objective has to be disassembled and instead of the objective the T2-adapter has to be placed.

The photo adjustment cannot be adjusted, because it is so balanced that after the normal alignment of the microscope also the picture appears sharp on the film level.

6.2. Digital photography

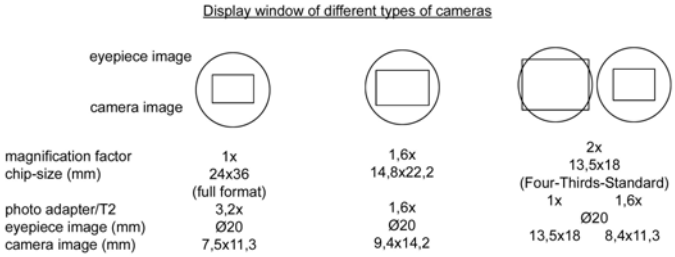
Special adapters are needed, in order to connect digital compact cameras to microscopes.

But different versions are available for their respective intended purposes. For the digital photography over the tube, an eyepiece adjustment is used, which is screwed to the objective thread of a digital camera.

This eyepiece adjustment replaces an eyepiece in the tube. The adjustments for the eyepiece diameter is 30mm.

A further adapter (photo adjustment) is necessary for using the trinocular exit. The appropriate T2-adapter will be mounted directly on the objective connection of the digital camera itself and on the photo tube 1.6x. The whole equipment will be set now directly on the trinocular exit of the microscope.

Picture 26: Photo – Adaptations
(3,2x; 1,6x; 1,0x)



6.3. Sliding Objective

The sliding objective has to be used if it is necessary to have microscopic pictures without parallax errors (when you would like to take a photo of the object). The sliding objective allows distortion-free photos.

Stereoscopic investigations can be done when the sliding objective is set in the mid position (you will notice a detent). The sliding objective can be moved to the left or to the right so that the left or right light beam can be used to take photos.

Picture 27: Sliding objective

Please note: The sliding objective can be assembled only in the factory. A later assembly isn't possible by yourself.

7. TV – Transfer

7.1. TV – Transfer over the Trinocular exit

For the TV transfer is only a TV-adapter and a TV with camera and a monitor adjustment are needed.

The TV-adapter will be assembled directly on the trinocular exit. Furthermore the TV-camera (USB camera, CCD camera) has to be mounted on the TV-adapter (in most cases c-mount).

7.1.1. For the right adaptation of the image detail of the camera in comparison to the image in the eyepiece there are six different TV-adapter available with magnification factor 0,3x ; 0,4x ; 0,4x WF ; 0,63x ; 1x and 1,6x (dovetail ring Ø40/ c-mount).

Picture 28: TV – adapter

All TV-adapter will be aligned factory-made at the delivery. In normal case you don't have to change nothing. In case you don't have a clear picture you have to follow the instructions below:

The TV-adapter 1x comes in two parts which will be clamped with two screws. The lower part will be set directly on the trinocular exit, the upper part will be set on the thread of the camera (in most cases the thread comes as c-mount). Both parts will be add together and will be adjust against each other at a good aligned microscope with smallest magnification factor until there is a clear and sharpen picture on the monitor. Now you have to align the camera itself (left and right side of a picture) and the screws will be tighten. You have to do the same steps for the TV-adapter 0,3x ; 0,4x ; 0,4x WF; 0,63x and 1,6x (analogous in comparison to the TV-adapter 1x)

Picture 29: SMT 4 with TV-adapter 0,63x and USB camera

8. Intermediate tubes

For an assembly of all intermediate tubes it is necessary to remove the binocular tube from the middle part of the microscope first.

Loosen the knurled screw at the middle part of the microscope, lift the front of the binocular tube and remove it diagonally from above. Now insert the back edge of the right tube. When doing this, make sure that the guiding screw on the back of the tube mount catches the nut on the tube. Now tighten the knurled screw again. After that the binocular tube can be assembled on the intermediate tube in the same wise.

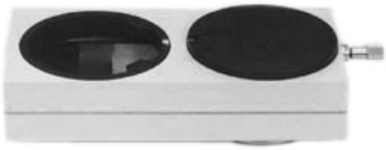
8.1. Intermediate tube for 0°/90° or 30°/60° observation

Use these intermediate tubes if the observation angle of 45° should be altered. The observation can be exactly horizontally or vertically formed with the intermediate tube 0°/90°. Accordingly the intermediate tube 30°/60° enables an observation angle of 30° or 60°.
The corresponding intermediate tube is set up normally or turned at 180 between the microscope middle part and the binocular tube according to the desired observation angle.

Picture 30: Intermediate tubes

8.2. Intermediate tube 50/50

The trinocular tube 50/50 is placed between the middle part of the microscope and the binocular tube. The trinocular tube is designed like an intermediate tube. It defracts 50% of the light from every path of the light beam, in order to utilize this light for other purposes (e.g. photography and TV). Parallel to this, a stereoscopic observation is possible, for which the remaining 50% of the light is used (over a binocular tube). Up to two identical or different accessory components can be built onto the trinocular tube 50/50.



Picture 31: intermediate tube 50/50

There is a Photo-/ TV- adapter 1.6x with a tube length of 160mm and a dovetail ring d=40mm available for photography or TV transfer. All photo-/ or TV-adapter with dovetail ring can be used at this place.

8.3. Aperture diaphragm

It is possible to decrease the aperture of both paths of light beams to increase the sharpness depth of the picture with this aperture diaphragm, designed as an intermediate tube. This is especially beneficial for photographic and TV reproduction. The diaphragm can be operated via a bar on the right side of the aperture diaphragm

Picture 32: Aperture diaphragm

9. Stages and stands

9.1. Incident light stand (Large stand)

The incident light stand is the most used standard stand for the microscopes from our product sort. It comes with the base and the column. There is a hollow in the base for the insertion plate or, if the plate is removed, for the various stages. Two stage springs prevent the object from slipping.

There are different variants of this stand:

- Large stand
- Large stand with built-in power supply
- Large stand with LED transmitted light illumination and built-in power supply

The column is only extendable to the red mark. In case the length (high) of the column isn't enough, we can offer different length of columns (245mm, 367mm, 600mm).

Picture 33: Large stand with column 367 mm, LED transmitted light illumination and built-in power supply

9.2. Column stand (Universal stand)

The Column stand is suited for investigations and observations of large-surface, bulky objects.
It allows a working radius of maximum 280 mm and a working high of maximum 570 mm.

It is equipped with a stable round base or a stage clamp for holding stage leaves of 18 … 50 mm thickness.

A security ring, a wrench and an articulated column complete the stand. The articulated column should be assembled in such a way that the long end of the column is inserted in the wrench and the wrench with the articulated column is set upon the vertical column. The microscope is set upon the short column end and is fastened with the knurled screw. The microscope, with the articulated column, can be horizontally pushed at 190 mm after the knurled screw has been loosened.

Warning! Always hold the microscope tightly when the knurled screw is loosened!

Picture 34: Assembled SMT 4 at column stand

9.3. Turntable

The Turntable is equipped with a 360° division for reproducible torsion of the object, as well as with table springs for holding the object being examined. With the centering screws, the table can be adjusted so that the rotating center aligns with the middle of the object to be observed.

Whereas a glass insertion plate is used for the turntable during transmitted light investigations, a black/white insertion plate is designated for incident light examinations.

The turntable can be upgraded by a polarizer.

Picture 35: Turntable

9.4. Spherical stage

The Spherical stage enables the leaning of objects at up to 20° in an optional direction as well as their rotation at 360°.

It can be used on the standard incident light stand as well as on the T/I base, is suited for incident and transmitted light investigations, and must be correspondingly equipped with the black/white or glass insertion plate.

It is recommend to use a longer column to compensate the high of the spherical stage itself so that is possible to use the whole range of the drive.

There are stage clips to fix flat objects at the spherical stage.

Picture 36: Spherical stage

9.5. Gliding stage

With the Gliding stage, the object under investigation can be quickly pushed and turned without its position on the object stage being changed.

Two clip stages prevent the specimen from sliding off the stage. The gliding stage can be used for investigations in incident, transmitted or mixed light and should be accordingly equipped with the black/white or the glass insertion plate.

Picture 37: Gliding stage

Before using the gliding stage, make sure that the glide faces of the upper and lower parts are cleaned and oiled.

9.6. Measuring stage 50 x 50

The Measuring stage 50x50 is for measuring objects. It can be inserted into the standard incident light stand as well as in T/I base, and is suitable for investigations in both incident and transmitted light.

Its adjustment range amounts to 50mm in both the X and Y direction. The measuring calibrated device can be implemented with similar and/or digital announcement. Those digital measuring calibrated device (micrometer spindle) offers a reading precision of 0.001 mm and the analogue measuring calibrated device a reading off accuracy of 0.01 mm.

Picture 38: Measuring stage 50 x 50 with micrometer spindle

9.7. Mechanical stage 80 x 80

The Mechanical Stage 80x80 serves for the systematic scrutinizing and the sensitive adjustment of objects.

It can be inserted in the standard incident light stand as well as in the T/I base, and is suited for investigations in both incident and transmitted light. Its adjustment range amounts to 80 mm in both the X and Y directions.

Grip the specimen in the object holder and move it with the coaxial slow-motion tangent screw.
The object holder can be easily changed with a turntable (accessory) to combine a linear and rotary movement.

Picture 39: Mechanical stage 80 x 80

9.8. Mechanical stage K 150 and K 200

The Mechanical stages K 150 and K 200 are used for the systematic scrutinizing of large objects up to 150 mm or 200 mm edge length. The Mechanical stage K 200 is to be used solely for incident light investigations and can be used only with a special incident light base.

The standard incident light stand can't be used to adapt the K 150 or K 200.

9.8.1. You have to follow the instructions below to *assemble the K 150 and K 200* on the base for transmitted and incident light (T/I):

The base for transmitted and incident light has to be disconnected from the power supply and the column has to dismounted. The column will mounted on the mike boom. Now the mike boom has to be mounted with 3 screws on the mechanical stage (the glass plate has to be removed before).

The pre-assembled mechanical stage K 150 or K 200 will fixed with two screws on the base for transmitted and incident light. The glass plate can be inserted again and the clamp ring and the microscope can be assembled at the column.

At usage of the base of transmitted and incident light the assembly has to be in the same wise.

8.8.2. For a fast and coarse alignment of objects a handhold (1) can be found on the right site of the stage. The mechanical stage can be adjusted sensitive in x –y direction with the help of the coaxial stage drive (2). Objects can be looked line by line by using the clamping (3) without changing the y- direction.

Picture 42: Mechanical stage K 150

10. Complaints, Warranty

Obvious defects must be notified in writing without delay, but at the latest within one week of receipt of the goods, together with a declaration of what was found. Failure to inspect the goods counts as an unreserved acceptance of their compliance with the conditions. The warranty period is 2 years.

We reserve the right for the product to differ from our brochures as a result of any improvements or alternations for other reasons. Such alternations do not oblige us to make a special announcement. No liability is accepted for printing errors.

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