

***Motic***<sup>®</sup>

Instruction Manual

SMZ-140/143

Stereo Zoom Microscopes

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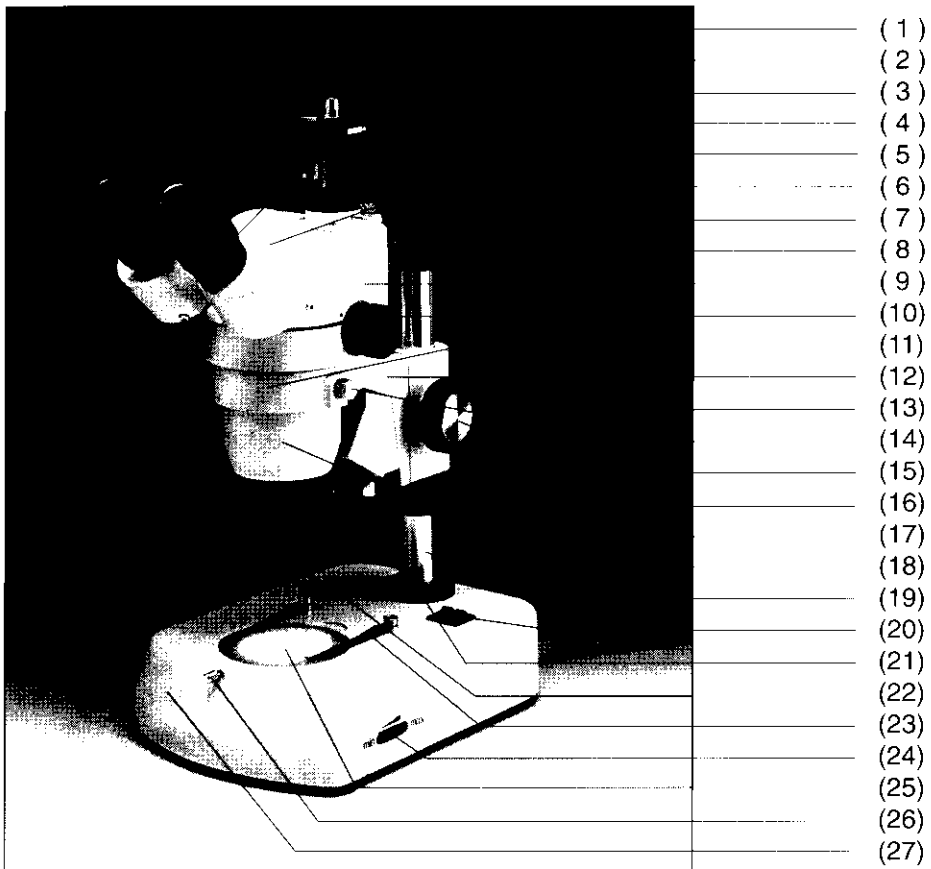
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# 1. Introduction

The Motic zoom stereo microscopes SMZ-140 and SMZ-143 are high performance Greenough stereo microscopes with continuous zoom system 1:4. Total magnification varies from 2.5x to 120x depending on the eyepieces and auxiliary objectives used. It is the best equipment to examine all types of gross materials in three dimensions for industrial, biological and educational applications.

With the bilateral zoom knob, the user can change the magnification in a factor of 4 with **perfect parfocality** (focus is always maintained during the change of magnification) and parcentering (magnification changes in a concentric pattern).

There are, at the moment, two models in the series: **SMZ-140** has zoom factor 1:4 with binocular system, and **SMZ-143** has zoom factor 1:4 with trinocular system (beam splitting ratio 100 - 100%) allowing the use of CCTV- and photo-attachment.



(Fig 1)

## 2. Unpacking and Assembling of the Microscope

### 2.1 Unpacking the Microscope

The components for SMZ-140/143 stereo microscopes are shipped detached for protection. Open the styrofoam packing with care and do not leave any components attached to the packing being removed. Do not discard any of the packing materials until all components have been located. If damage occurs during transit, contact both the carrier and your supplier immediately.

### 2.2 Assembling the Microscope

2.2.1 When handling the components, especially all the optical parts, avoid touching any lens surface with naked hand or fingers. Any fingerprints or grease stains will have adverse effect on the image quality.

2.2.2 After unpacking the stand, put it on a stable and flat table. Loosen the lock screw (1-13) of the focusing carrier (1-12), adjust the height of the focusing carrier and lock the lock screw again. Make sure that the support collar (1-17) is secured firmly below the focusing carrier along the vertical post(1-19). This is important as this collar can avoid the accidental falling of the microscope along the column.

**2.2.3 *The focusing carrier (1-12) should rest on the support collar and both the focusing carrier lock screw (1-13) and the lock screw of the collar should be tightened.***

2.2.4 Put the stereobody (1-18) onto the focusing carrier and lock it by the lock screw (1-14) on the right hand side of the focusing carrier. To maintain the best stability, you are advised to lock the screw on the left hand side of the focusing carrier.

2.2.5 After removing the wrapping papers and packing materials around the eyepieces and other optical parts (avoid touching the lens surface), carefully place the eyepieces (1-2) into the eyepiece tubes, and lock the eyepieces by the lock screw (1-1). If necessary, release the lock screw (1-1) before putting in the eyepiece.

- 2.2.6 For N2TG/ N2TF stands, before turning on the power, the operator has to plug the electrical connection of light source (1-8) to the socket at the top of the vertical post (1-19) of the stand. Plug the electrical connection of the stand or light source to the electrical supply. **Before plugging and turning on the power, make sure that the operation voltage of the microscope does match with the voltage supply.**

### **3. Alignment and Operation of the Microscope**

#### **3.1 Interpupillary Distance**

- 3.1.1 Move the two eyepiece tubes (1-6) until only one circular field can be seen through the two eyepieces. If two circles appear, the interpupillary distance is too big, and if 2 overlapped circles appear, the interpupillary distance is too small.

#### **3.2 Focusing the Microscope**

- 3.2.1 Try to focus the sample at the highest magnification with the focusing knob. If it cannot be done, adjust the height of the microscope along the vertical post. **Remember to tighten the lock screw (1-13) and support collar (1-17) after aligning the height of the microscope.**
- 3.2.2 Turn the zoom to the highest magnification. By turning the focusing knob (1-15), focus the sample until the image is clear and sharp.
- 3.2.3 Turn the zoom down to the lowest magnification. Adjust the dioptre focusing knob of the right eyepiece (1-3) until the image of the right eyepiece is clear and sharp.
- 3.2.4 Repeat the procedure for the left eyepiece. Then, check the focus of the image for the whole zoom range. It should now be **perfectly parfocal**.

#### **3.3 Magnification and Working Distance**

- 3.3.1 Select the desired magnification by adjusting the zoom knob (1-10). Change the eyepieces and/or add an appropriate magnifying objective lens if necessary.

3.3.2 Total magnification used can be calculated by the following equation:

$$\text{Total magnification} = \text{Eyepiece magnification} \times \text{Zoom magnification} \times \text{Objective lens magnification}$$

3.3.3 Working distance varies from 135mm (if 0.5x objective lens is used) to 39mm (if 1.5x objective lens is used). Normal working distance for the standard configuration (1x objective lens) is 80mm.

## 3.4 Changing the light bulb

3.4.1 Before changing the light bulb, **make sure that the power is switched off and the power cord has been disconnected from the main power supply.**

3.4.2 For incident light, unscrew the lamp collector piece (1-21) out, remove the old light bulb from the socket, and carefully plug the new light bulb in, screw the collector piece back after changing the light bulb.

3.4.3 For transmitted light, turn the microscope by 90° so that the bottom plate of the stand face towards the user, remove the bottom plate by unscrewing the four rubber feet, remove the old light bulb from the socket and carefully plug the new light bulb in, and finally, firmly lock the bottom plate after changing the light bulb. Same procedure apply to the fluorescent tube for "N2TF" stand.

3.4.4 **Never touch the glass surface of the light bulb with naked hand**, any grease stain brought onto the light bulb by the naked hand will negatively affect the heat dissipation, and thus, greatly shorten the life span of the light bulb. Clean the light bulb surface with alcohol and tissue if the user has touched the light bulb surface accidentally.

## 4. Knowing your Microscope

### 4.1 Stereo Body with Binocular or Trinocular Head

For Stereomicroscopes SMZ-140/143, the binocular or trinocular tube (1-9) is built together with the stereo body (1-18) to form a single piece named "Stereo-head". For SMZ-140 (Fig 2), it is installed with a binocular tube while SMZ-143 (Fig 1) is installed with a trinocular tube.

#### 4.1.1 Stereo body

4.1.1.1 The Stereo body (1-18) is the key part of the microscope which includes the Greenough stereo-zoom system 1:4. This system includes two telescopic zoom optics working for the left and the right eyepiece tube separately.

4.1.1.2 With this system, the user can enjoy excellent depth of field and stereo effect. With the help of the precision optics from Motic, perfect parfocality can be maintained throughout the whole zoom range.

4.1.1.3 Zoom knob (1-10) is located bilaterally on both sides of the microscope and scales are printed on knob to show the zoom magnification used. Adjust this knob for changing the magnification of the image. **If the microscope is properly aligned, the image focus should always be maintained when zoom magnification is changed (parfocal).** For alignment procedures, please refer to section 3.2 of this manual.

4.1.1.4 The stereo body is mounted onto the circular mount (1-11) of the focusing carrier (1-12), and is locked by the lock screw on the right hand side of the carrier (1-14). During the operation of the microscope, this lock screw should always be locked to maintain utmost stability.

#### 4.1.2 Binocular tube for SMZ-140

4.1.2.1 The interpupillary distance can be adjusted by turning the two eyepiece tubes. For proper alignment of the interpupillary distance, please refer to section 3.1 of the manual.

4.1.2.2 The eyepiece can be locked onto the eyepiece tube by a small screw (1-1). This is important for easy alignment of the diopter of the eyepiece.

#### 4.1.3 Trinocular tube for SMZ-143

4.1.3.1 Concerning the interpupillary distance adjustment and eyepiece lock, the design of the trinocular tube is the same as the binocular tube.

- 4.1.3.2 By pulling out the slide at the back of the trinocular tube (1-7), all the light from the right eyepiece tube will be deflected into the phototube for TV or photography. At the same time, no light will enter into the right eyepiece tube for observation.
- 4.1.3.3 At the top of the trinocular tube, 2 locking screws, located 90° to each other (1-5), are used to lock the adapter for TV or photo-attachment. After fitting the adapter, these two locking screws should be locked.

## **4.2 Stand**

- 4.2.1 Focusing carrier (1-12) comes with the stand.
- 4.2.2 To focus the sample, focusing knob (1-15) is located bilaterally on both sides of the focusing carrier. By turning this knob, the microscope can be moved up or down for a certain distance to focus the sample. This movement is brought about by "rack and pinion" mechanism. The tension of the focusing knob can be adjusted by the tension knob (1-16) located at the inner region of the focusing knob (1-15) on the right.
- 4.2.3 If sharp focus cannot be achieved with this knob, the user should release the lock screw (1-13) and support collar (1-17), and move the whole microscope up or down. Please refer to section 2.2.2-3 of the manual for details.
- 4.2.4 Three different stands are available for SMZ-140/143
- N2TG (Fig 1)
- The focusing carrier can be freely moved along the vertical post and can be removed totally from the stand. The diameter of the post is 25 mm.
  - This stand is installed with a built-in transmitted light (halogen 12V /10W) and an incident light (12V /10W) illuminators.
  - To turn on the power of the stand, main switch (1-22, located on the left hand side) should be turned on.
  - Separated power switch for transmitted and incident lights is located on the right hand side (1-20). The user can select transmitted or incident light or both by turning on these two power switches.
  - The light intensity can be adjusted continuously by the knob at the bottom of the stand on the right hand side (1-24). This knob governs the light intensity for both the transmitted and incident lights.



- The illuminating angle of the incident light can be adjusted by the screw behind the illuminator.
  - Besides the black and white stage plate, a frosted glass is provided for transmitted light. This plate can be locked by the screw at the bottom front of the stand (1-26).
- N2TF
- The same stand as "N2TG" except that fluorescent tube (5W) is used instead of halogen bulb for transmitted light. It delivers almost no heat to the sample. It is ideal for biological application.
  - As it is using a fluorescent tube, light intensity cannot be adjusted. The user can only adjust the light intensity of the incident light if this stand is used.
- N4TG  
(Fig 2)
- The same stand as "N2TG" except with fixed arm instead of a pole.
  - Ideal for educational purpose as no electrical wire is exposed.
- "1105"  
(Fig 5)
- This industrial stand allows extreme flexibility in positioning. It includes a heavy base to maintain good stability.
  - After loosening the safety ring (5-1), the focusing carrier can be hooked onto the tiltable vertical post (5-2). Lock the lock screw and install the safety ring afterwards.
  - Tilting angle can be adjusted after loosening the lock joint (5-3).
  - Rotation and moving of the counter-balanced horizontal arm (5-4) can be made after loosening the control joint (5-5).

### **4.3 External Illuminator**

- 4.3.1 All kinds of external illuminator can be used as incident illuminations ranging from simple desk lamp to dedicated ring illuminator.
- 4.3.2 The specially designed cold light source is recommended. This employs 12V/150W halogen illuminator as light source. A 2-arm goose neck fibre optics is used for directing the light onto the sample. The fibre optics is flexible in nature and the operator can bend the arm to get the best illumination. With the help of heat reflection filters and the long fibre optics, no heat will be delivered to the sample. For this reason, it is ideal for biological and dissecting applications.
- 4.3.3 Desk top illuminator for Motic M-series stereo-microscopes can also be used.

## 4.4 Eyepieces and Auxiliary Objectives

- 4.4.1 There are eyepieces of different magnifications for choices including 5x, 10x, 15x and 20x. The standard equipment goes with a pair of 10x eyepieces.
- 4.4.2 To change the eyepieces, unscrew the lock screw (1-1), remove the original eyepieces, replace the new pair of eyepieces and, finally lock the eyepieces by the lock screw.
- 4.4.3 There are additional objectives of different magnifications for choices including 0.5x, 0.75x and 1.5x (Fig 4). The user is recommended to use additional objectives depending on their requirements on working distance and magnification. Please refer to the appendix (I) for details.
- 4.4.4 To add an additional objective onto the microscope, after screwing off the protective ring at the bottom part of the stereo-head, the user can simply screw the additional objective onto the stereo-head. The height of the microscope has to be re-adjusted as the working distance is changed when additional objective is used. For details, please refer to section 2.2.3 of the manual.

## 4.5 Other Accessories

- 4.5.1 For SMZ-140/143, there are other accessories designed to serve different special applications.

- Darkfield condenser
- It has to be used with transmitted light.
  - By putting this accessory onto the transmitted light outlet (with the frosted glass or stage plate removed), it creates the darkfield effect.
  - It is especially useful in jewellery or gem study and special techniques in Bio-Med applications including "In-situ silver gain staining" and embryo observation.
- Polarizing Kit
- It has to be used with transmitted light.
  - Simply put this kit onto the transmitted light outlet (with the stage plate removed). The sample can be put into the sample house between the polarizer and analyzer for Pol observation.

- It is useful for jewellery and gem study, and is useful for the study of sectioned rock and synthetic fibre.
- Jewellery Clamp  
(Fig 3)
- Photo adapter T-2
- Designed for holding gem or jewellery to be observed under the microscope.
  - With this accessory fitting onto the trinocular head, SLR camera of any brand can be hooked onto the microscope for photo-taking.
  - T-2 adapter for the selected camera has to be screwed onto the adapter before hooking the camera. This T-2 adapter can be obtained from any photo-shop in your region.
  - It can only be used with SMZ-143
- TV-adapter C-mount  
or CS-mount
- With this accessory fitting onto the trinocular head, CCTV can be screwed into the trinocular for TV observation. C-mount or CS-mount should be used depending on the CCTV camera.
  - It can only be used with SMZ-143.
- Universal TV-adapter
- Free focusable TV-adapter which can fit both C-mount and CS-mount camera.
  - Still in preparation.

## 5. Cleaning and Caring of the Microscope

To take good care of the microscope, the user should avoid the attack of **dust and water**. If dust and water come to the microscope, sooner or later, **fungus** will grow and kill the microscope. Please notice that once fungus is grown, even after cleaning, the microscope will have a good chance to be re-infected again. Moreover, **grease stain** and **fingerprints** will distort the image, which should be avoided.

### 5.1 Protection against Dust

When the instrument is not used for a long period of time, cover it with the enclosed dust cover. Never leave the eyepiece tube open without any covers. Either leave the eyepiece in the tube (recommended if the microscope is used very frequently) or cover it with wrapping paper or covering cap. Eyepieces and other optical accessories, when not in use, are recommended to be kept in a dry box to protect them against dust and water.

## 5.2 Protection against Water

The instrument should be kept away from water source, pipeline or water sink. Humidity in the room where the instrument located should be as low as possible (relative humidity should be kept below 70%). All the optical accessories are recommended to be kept in a dry box when not in use. The use of dehumidifier and 24-hours air conditioning is highly recommended if the surrounding is too humid.

## 5.3 Cleaning

- 5.3.1 If dust is found on the optical surface, try to remove by air blower or compress air.
- 5.3.2 For fingerprint, grease stain or dust which cannot be removed by the air blower, 2 possible methods are recommended:
  - 5.3.2.1 To breathe lightly on the glass surface and wipe with a clean piece of cloth, lens paper or cotton swab. Please notice that small cotton fibre may be left onto the lens surface if cotton swab is used.
  - 5.3.2.2 Use a cotton swab or lens paper, dip with a small amount of absolute alcohol, and clean the lens surface carefully. No other aggressive solvents should be used.

**In no circumstances should the user clean any lens surface with dry cotton swab, cloth or lens paper. This will scratch the lens surface causing irreparable damage. Water is not recommended for cleaning of lens as it will leave some water stain on the lens surface and if water residue is left on the lens, fungus can grow causing irreparable damage.**

## 5.4 Moving the Microscope

- 5.4.1 microscope should not be moved around whenever it is possible.
- 5.4.2 If moving is necessary, the user should ensure that the eyepieces are firmly locked in the eyepiece tube, the microscope is firmly locked onto the vertical post and the support collar is firmly locked before moving.

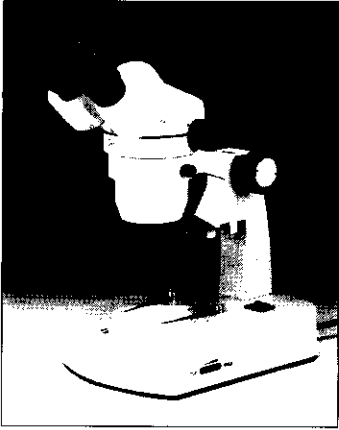
- 5.4.3 When moving the microscope, users should use both hands, one hand holding the bottom of the stand, and the other hand holding the top of the vertical post or the focusing carrier of the microscope.
- 5.4.4 The microscope should always be kept vertical throughout the process of moving.

## **5.5 Electrical Parts of the Microscope**

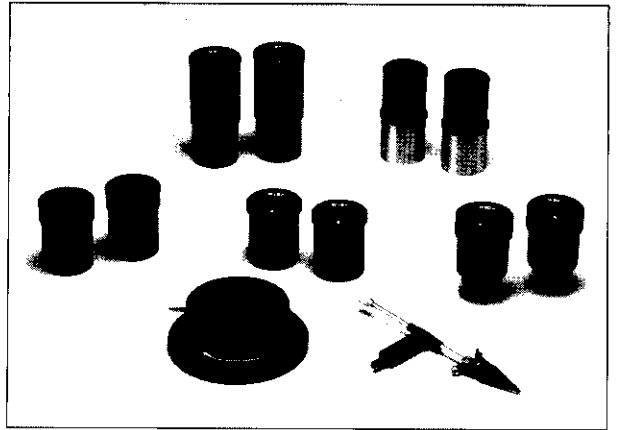
- 5.5.1 Before plugging in the power cord to power supply, make sure that the supplying voltage matches with the operation voltage of the equipment.
- 5.5.2 Turn off the equipment before plugging in the power cord with power supply.
- 5.5.3 It is the best practice to turn down the voltage to the lowest level before turning off the equipment.
- 5.5.4 Do not turn the power on again immediately right after power is turning off. It will shorten the life span of the light bulb and it may cause damage to the electrical system.
- 5.5.5 Users should observe all safety regulations of the region. The equipment has acquired the CE safety label. However, users do have full responsibility to use this equipment safely.

## Appendix I : Technical data for SMZ-140 and SMZ-143

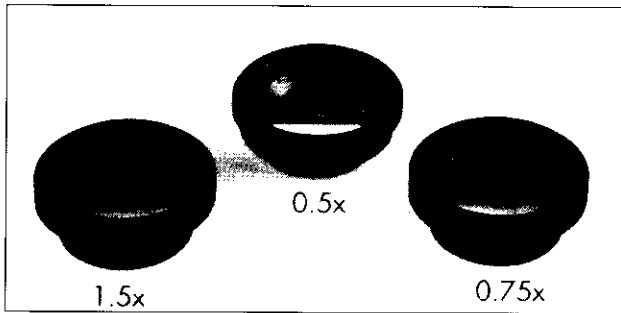
Eyepieces	Objective							
	1x w/o additional objective		0.5x additional objective		0.75x additional objective			
	Working distance 80mm	Working distance 135mm	Working distance 95mm	Working distance 39mm	Working distance 95mm	Working distance 39mm		
	Magnification	Field diameter (mm)	Magnification	Field diameter (mm)	Magnification	Field diameter (mm)		
5x/22	5x	22	2.5x	44	3.75x	29.3	7.5x	14.7
	10x	11	5x	22	7.5x	14.6	15x	7.3
	15x	7.3	7.5x	14.6	11.25x	9.7	22.5x	4.9
	20x	5.5	10x	11	15x	7.3	30x	3.7
10x/22	10x	20	5x	40	7.5x	26.6	15x	13
	20x	10	10x	20	15x	13.3	30x	6.7
	30x	6.7	15x	13.4	22.5x	8.9	45x	4.5
	40x	5	20x	10	30x	6.7	60x	3.3
15x/13	15x	13	7.5x	26	11.25x	17.3	22.5x	8.7
	30x	6.5	15x	13	22.5x	8.7	45x	4.3
	45x	4.3	22.5x	8.6	33.75x	5.8	67.5x	2.9
	60x	3.2	30x	6.4	45x	4.3	90x	2.1
20x/13	20x	13	10x	26	15x	17.3	30x	8.7
	40x	6.5	20x	13	30x	8.7	60x	4.3
	60x	4.3	30x	8.6	45x	5.7	90x	2.9
	80x	3.2	40x	6.4	60x	4.3	120x	2.1



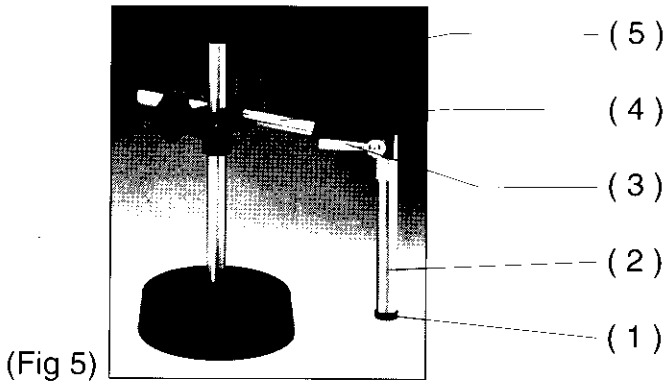
(Fig 2)



(Fig 3)



(Fig 4)



(Fig 5)

SHOULD YOU HAVE ANY PROBLEMS CONCERNING THE USE OF THE MICROSCOPE, PLEASE CONTACT YOUR AGENT IMMEDIATELY. WE ARE READY TO HELP IN ALL ASPECTS.

BECAUSE OF TECHNOLOGICAL ADVANCEMENT, THE CONTENTS OF THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT PRIOR NOTICE AND OBLIGATION.



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