Motic SwiftLine M18 Series
Compound Microscope

Use and Care Manual

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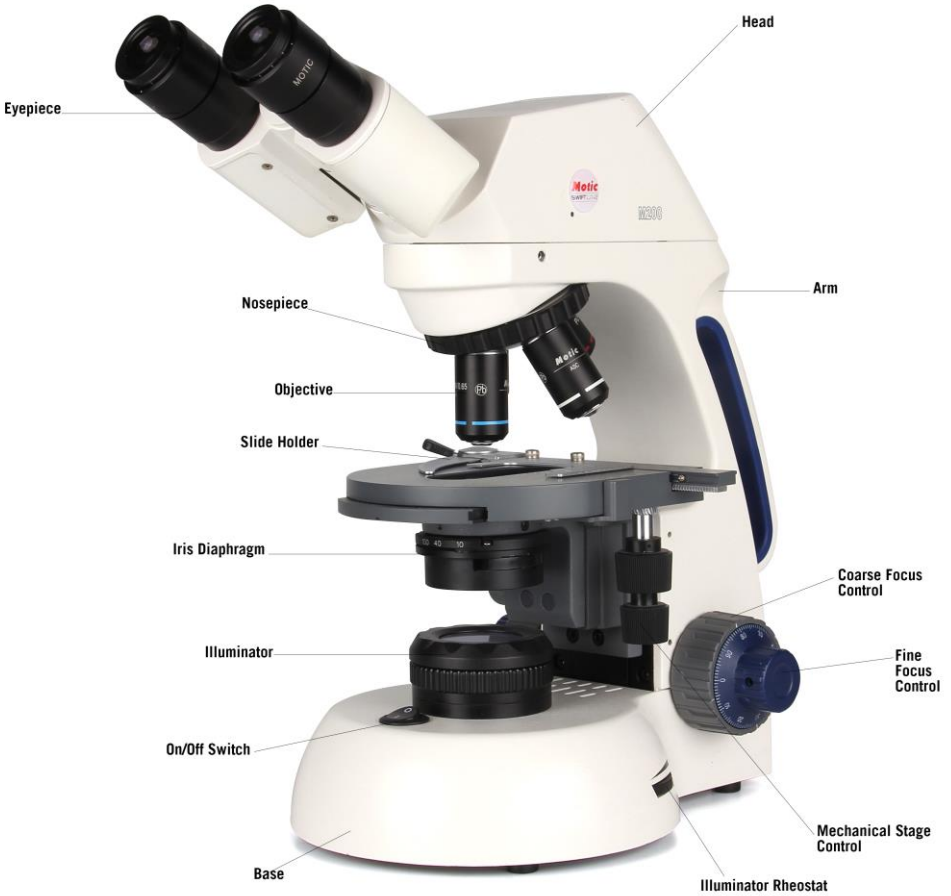
MOTIC SWIFTLINE M18

Your M18 microscope is an instrument of precision, both optically and mechanically and will last a lifetime with a minimum amount of maintenance. It is built to the highest and most rigid optical and mechanical standards and has many built-in features to insure durability and high performance in the hands of both student and professional users.



COMPONENTS OF THE MICROSCOPE

ARM – the vertical column (attached to the base) which supports the stage and contains the coarse and fine adjusting knobs and mechanism.

BASE – the housing and platform of the instrument to which the arm is attached. The base stands on rubber feet and contains the Koehler illuminator assembly.

COARSE FOCUS – the larger, outside knob of the focus control which facilitates rapid and heavy movement of the focusing mechanism. In order to prevent gear damage, the focus control is equipped with an upper limit stopper that protects the high magnification objectives and slides.

COAXIAL CONTROLS – the focusing mechanism moves the stage up and down to bring the specimen into focus. The coaxial focusing system combines both the coarse and fine focus into one knob located on both sides of the microscope. The control is designed for a continuous operation over the range of the stage movement. The system is also furnished with a tension control to prevent "stage drift".

CONDENSER – the function of the condenser is to provide full illumination to the specimen plane and to enhance the resolution and contrast of the object being viewed. The standard condenser of the M18 Series has a numerical aperture of 1.25 with filter carrier and iris diaphragm. It is mounted in a sub–stage focusing assembly that can be raised or lowered for precise light control.

DIOPTER ADJUSTMENT – located on the left eyepiece of the binocular head and is designed to help compensate the difference between the user's eyes.

EYEPIECES – the upper optical element that further magnifies the primary image of the specimen and brings the light rays in focus at the eye-point.

FINE FOCUS – the smaller inner knobs of the focus control which allows for slow and subtle focusing movement to bring the specimen into sharp focus.

HEAD – the upper portion of the microscope which contains the refracting prisms and the eyepiece tubes which hold the eyepieces.

- M18B-P – Binocular Microscope
- M18T-P – Trinocular Microscope

ILLUMINATION – the built-in Koehler light source which provides the optical system with light. The M18 Series uses a variable intensity 3W LED.

IRIS DIAPHRAGM – a multi-leaf round shaped device which is controlled by a lever. It is similar to a camera shutter and is installed under the condenser. By moving the lever back and forth, the iris diaphragm opens and closes, increasing and decreasing the contrast of the specimen. If the image is "washed out" the iris diaphragm is opened too wide. If the image is too dark the iris is not open wide enough.

NOSEPIECE – the revolving turret that holds the objective lenses, permitting changes in magnification by rotating different powered objective lenses into the optical path. The nosepiece must "click" into place for the objectives to be in proper alignment.

OBJECTIVES – the infinity plan optical system which magnifies the primary image of the instrument. Magnifications are typically 4X, 10X, 40X and 100X.

SIEDENTOPF – a binocular head design where the interpupillary adjustment (increasing or decreasing the distance between the eyepieces) is achieved by twisting the eyepiece tubes in an up and down arc motion similar to binoculars.

STAGE – the table of the microscope where the slide is placed for viewing. This component moves upward and downward when the focusing knobs are turned. The stage of the M18 has a built-in mechanical stage with a below-stage ergonomic "X" and "Y" axis controls. A finger clip holds the slide securely and is designed to be a slow return holder to provide protection to the specimen.

IMPORTANT TERMINOLOGY

"COATED" LENS – in attempting to transmit light through glass, much of the light is lost through reflection. Coating a lens increases the light transmission by reducing or eliminating reflection, thus allowing more light to pass through.

COMPOUND MICROSCOPE – a microscope having a primary magnifier (the objective) and a second (the eyepiece) to both conduct light, amplify magnification and convert the image into a field of view easily seen by the human eye.

COVER GLASS – thin glass cut in circles, rectangles, or squares, for covering the specimen (usually a thickness of 0.15 to 0.17mm). The

majority of specimens should be protected by a cover glass, and must be covered when using 40XRD or 100XRD objectives.

DEPTH OF FOCUS – the ability of a lens to furnish a distinct image above and below the focal plane. Depth of focus decreases with the increase of numerical aperture or with the increase of magnification.

EYE POINT or EYE RELIEF – the distance from the eye lens of the eyepiece to your eye where a full field of view is seen.

FIELD OF VIEW – the area of the object that is seen when the image is observed. It may range in diameter from several millimeters to less than 0.1mm.

FOCAL LENGTH – parallel rays of light after refraction through a lens will be brought to a focus at the focal point. The distance from the optical center of the lens to the focal point is the focal length.

NUMERICAL APERTURE (NA) – a measure of an objective's light gathering capabilities. The concept may be compared to the F-valve in photographic lenses. Generally speaking, N.A. values of less than 1.00 are "Dry" objectives. Values of 1.00 or greater require oil as a medium. Please note that condensers are part of the optical system and are also assigned an N.A. value. That value must be at least as high as that of the highest objective used.

PARFOCAL – a term applied to objectives and eyepieces when practically no change in focus is needed when changing objectives. The objectives on your microscope are parfocaled at the factory so that only a slight adjustment of the fine focus knob is needed to maintain focus when switching magnification.

RESOLUTION or RESOLVING POWER – the ability of a lens to define the details of the specimen at a maximum magnification. This is governed by the NA (Numerical Aperture) of the lens. For example, a 40X objective with NA 0.65 has a maximum resolving power of 650X, equal to 1000 times the NA. This rule of NA x 1000 is true of all achromatic objectives.

WORKING DISTANCE – the distance from the lens of the objective to the cover slip on the slide, when the specimen is in focus.

USING THE MOTIC SWIFTLINE M18 MICROSCOPE

Once you have learned the terminology and purpose of each component of the microscope, use of the microscope is simple. By following these steps, you will be able to begin studying the specimen quickly and easily.

1. Open the slide holder of the mechanical stage and carefully place the slide against the fixed side and back edge of the mechanical stage. Now slowly release the slide holder lever to hold the slide in place.

2. Align the specimen under the objective lens by using the adjustment knobs under the mechanical stage. The bottom knob moves the slide from right/left while the top knob adjusts the slide from front/back. These knobs allow for precise movement and scanning of the slide.

3. Rotate the nosepiece to place the lowest power objective (4XD) over the specimen. Be sure the objective “clicks” into position.

4. Adjust the interpupillary distance of the Siedentopf binocular head for a comfortable view. Align the eyepiece tubes of the binocular head to create one perfect circle, by moving the eyepiece tubes in an arc motion.

5. While viewing through the eyepiece, rotate the coarse focus knob to bring the specimen into focus. This should be done slowly and carefully.

6. To adjust the contrast of the specimen, open the iris diaphragm to its largest aperture. If additional contrast is required to permit accurate viewing of the specimen, the diaphragm should be slowly closed until the details of the specimen are sharply defined. Be careful not to close the aperture too much. Although you may be achieving a higher contrast, the fine structure of the image maybe destroyed. Reducing the aperture increases the contrast and depth of focus, but it also reduces resolution and introduces diffraction. The aperture must be adjusted for each objective.

   NA 0.25 for 10XD
   NA 0.65 for 40XRD
   NA 1.25 for 100XRD

   The iris diaphragm is not intended to control the brightness of the illumination, but induce contrast of the specimen by diffracting light rays.

7. Use the fine focus control to complete the focus and produce the sharpest image.

8. For additional clarity, use the left eye diopter adjustment to correct the differences between the user's eyes. Set the adjustable left eye diopter at zero. Then focus with the coaxial focusing knob, using your right eye only (close your left eye). Now using your left eye only, adjust the diopter ring until a clear image is seen (close your right eye). The diopter adjustment is now set to the user's eyes and will not need to be adjusted again until a different user uses the microscope.

9. Now you can rotate the nosepiece to higher magnification objectives. The objectives are parfocaled so that once the lowest objective (4XD) is focused, only a slight turn of the fine focusing knob is required when changing to 10XD, 40XRD and 100XRD objectives.

CENTERING THE CONDENSER

1. Fully open the field of view diaphragm and condenser aperture diaphragm.
2. Set the specimen on the stage with the cover glass facing up.
3. Bring the specimen image into focus, using the 10X objective.
4. Close the field of view diaphragm to its minimum setting by means of the field diaphragm ring.
5. Turn the condenser focus knob to bring the field diaphragm image into focus on the specimen plane.
6. Adjust the condenser centering screws so that the image of the field diaphragm appears at the centre of the field of view. At this time, stopping the field diaphragm image, just short of the maximum field of view, may be convenient for centering.
7. Adjust and centre the field diaphragm so that it is just outside the field of view for each magnification change.

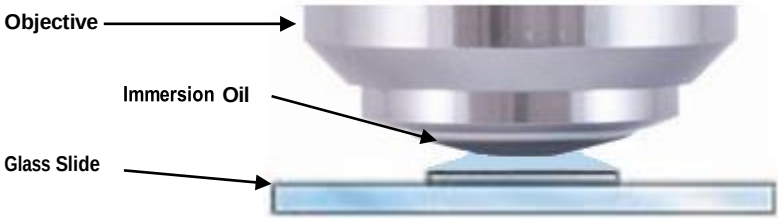
USE OF FIELD DIAPHRAGM

1. The field diaphragm determines the illuminated area on the specimen. Rotating the field diaphragm ring changes the size of the field diaphragm. For normal observation, the diaphragm is set slightly larger than the field of view. If a larger than required area is illuminated, extraneous light will enter the field of view. This will create a flare in the image and lower the contrast.
2. The thickness of the glass slide must be 1.7mm or less, otherwise the field diaphragm may not be focused on the specimen plane.
3. The diaphragm does not have any effect when the condenser top lens is swung out of the optical path in the Swing-out type condenser. Fully open the field diaphragm, as the N.A. of the illuminating system will be reduced if the diaphragm is excessively stopped down.

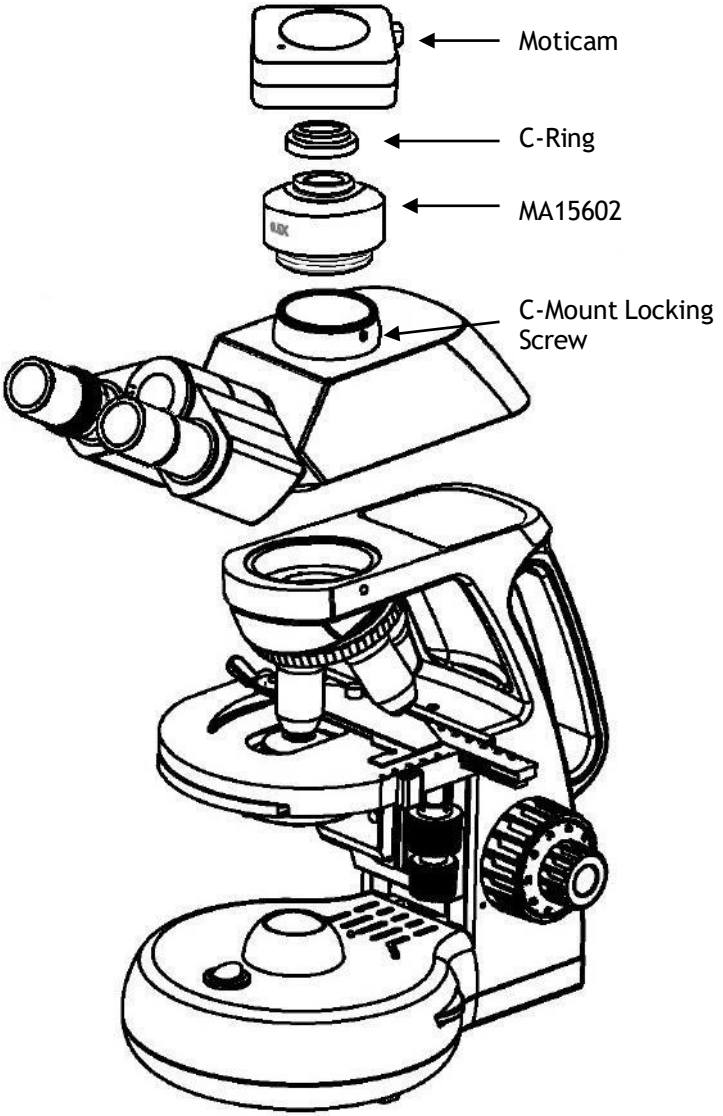
OIL IMMERSION

It is desirable to use immersion oil with the 100XRD objective. Oil generates a fine resolution and brightness of the image viewed through the microscope. Drop a tiny amount of oil (1 drop) onto the slide prior to focusing with the 100XRD objective (between the slide and the objective tip). It is essential to thoroughly clean the objective tip after use.

IMPORTANT: The focal distance of the 100XRD and 40XRD objective to the slide surface is very close and only the 100XRD objective is sealed to prevent immersion oil contamination, it is a good practice to avoid dragging the 40XRD objective through an oiled slide.



Please note: Purchase of C-Mount Lens is necessary for camera attachment*



*C-Mount: Swift Part Number MA15602

COMMON PROBLEMS IN MICROSCOPY

If you have a problem, you may be able to correct it yourself. Here are a few common problems and easy solutions you may want to try before calling for service.

CAUTION – Never disassemble electrical, mechanical or optical components. This servicing should only be done by an authorized Motic SwiftLine technician. The Limited Lifetime Warranty will be null and void if disassembled by a non-Motic SwiftLine dealer.

A. **PROBLEM -** Image appears “washed out” or weak

CORRECTION -

1. Slowly close the iris diaphragm.
2. Objective lens is dirty. See “Care and Cleaning” Section
3. Eyepiece is dirty. See “Care and Cleaning” Section

B. **PROBLEM -** Hairs or dust seem to be moving in the image

CORRECTION - The iris diaphragm is not open wide enough. Slowly open the iris diaphragm to increase the size of the opening allowing for additional illumination.

C. **PROBLEM -** Unable to bring specimen into focus with any objective

CORRECTION - Eye lens of the eyepiece is partially unscrewed. Remove the eyepiece and screw the two sections together.

D. **PROBLEM -** Image of the specimen goes out of the focus all by itself.

CORRECTION – Increase the focus tension by turning the tension knob found next to the left coarse focus knob.

E. **PROBLEM** – Focusing knobs turn with difficulty even with tension knob loosened.

CORRECTION - Microscope should be disassembled by qualified, authorized repairman, cleaned and re-lubricated.

CLEANING YOUR MICROSCOPE

Motic SwiftLine microscopes are designed to function with minimal maintenance, but certain components should be cleaned frequently to ensure ease of viewing. The power switch should be turned off or the microscope should be unplugged when not in use.

Do not disassemble your microscope

Disassembly may significantly affect the performance of the instrument and may result in electric shock or injury and will void the terms of the warranty.
Never attempt to dismantle any parts other than the ones described below. If you notice any malfunction, contact your nearest Motic SwiftLine supplier.

Optics

Keeping the optics of your microscope clean is essential for obtaining clear images.
Choosing the best cleaning method depends on the nature of the optical surface and type of dirt.

Dirtiness on the image may be caused by the following variables:

- Dirt on the outer or inner eyepiece lens.
- Dirt on the front lens of the objective.
- Dirt on the upper lens of the condenser**.**
- Dirt on the surface of the sample slide glass.
- Dirt on the upper lens of illuminator.
- Dirt on other optical components of the microscope such as mirrors, lamps, filters, intermediate lenses, etc.

  In the case of microscopes with a camera attached to it:
- Dirt on the camera adapter.
- Dirt on the protection filter of the camera sensor.

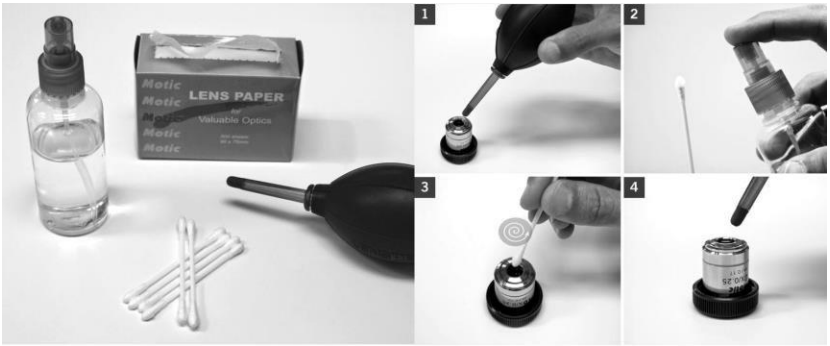
  For Eyepieces with reticules:
- Dirt on the outer or inner reticle glass.

Objectives are the optical component of the microscope that require the most maintenance. Because for their actual use, they can get dirty easily.

For objectives that work without oil (dry): The first step is to carefully unscrew the objective from the nosepiece.

In order to make things easier and safer, screw the objective onto one of the objective cases supplied with microscope. By doing it this way, the objective will be in a stable position avoiding possible falls.

(1) Proceed by cleaning it using pressurized dry air - or an air gun if available – and, if after this is done we still observe spots of dust or dirt, **(2)** Clean with a cotton swab dampened with a low graduation of alcohol 70% or with a mixture of alcohol and ether (ratio alcohol: 3 to ether: 7). **(3)** With a spiral movement (starting from the center of the lens) we will then clean the surface of the lens. **(4)** Dry its surface by using pressurized dry air and check that the lens is clean either with the help of a magnifying glass or by screwing the lens back on the revolving nosepiece of the microscope.



For objectives that work with immersion oil it is essential to clean them after each observation session. To clean use a cleaning cloth for lenses slightly dampened with a low graduation of alcohol. Proceed by cleaning the frontal objective lens (normally 100X-Oil). It is important for those objectives that work at a very close distance to the sample.

For optical components such as eyepieces, condensers, filters, etc. we recommend using the same cleaning method. First cleaning it with pressurized dry air, then cleaning it with a cotton swab or a cleaning cloth for lenses (slightly moistened with a low graduation of alcohol) and finally drying it with pressurized dry air. Once the cleaning process is finalized if the image is still not clear, you can either contact us or you can contact your Motic SwiftLine supplier.

For users that have a digital camera mounted on the microscope and whom observe dirt on the digital image, it is important that the first step is to proceed with objectives maintenance, as explained above. If the dirt persists, it must be determined if it is within the microscope or the camera. To check

this simply loosen the adapter and rotate the camera. If the dirt rotates while turning it, then it means that it is in the microscope. If it does not rotate, then it is either in the adapter or in the protection filter of the sensor. If the dirt is on the surface lens of the adapter then you can use the same cleaning method that we have explained above, but if the dirt is in the protection filter of the sensor then use pressurized dry air only. If the dirt persist you can either contact us or you can contact your Motic SwiftLine Optical supplier.

Mechanics
The mechanical components of the microscope require less maintenance than the optical components. Our first maintenance advice is to **use the dust cover** provided with the microscope, to avoid the accumulation of dust on the microscope.

To clean the stand or the specimen holder, Use a cleaning cloth moistened with soap diluted in distilled water. After this proceed drying the entire surface of the microscope. Take special care with the electrical components of the microscope such as the ON / OFF switch, the dimmer, the lamp holder.
If there are grease stains, use the same cloth moistened with a low graduation of alcohol.

If you face any problems related to the maintenance of your microscope, please contact us. Our technicians will gladly help you solve your maintenance issue/s.

CLEANING – The front lens of the objectives (particularly the 40XRD and 100XRD) should be cleaned after use. The lens surface may be gently cleaned with a soft camel hair brush, or blown off with clean, oil-free air to remove dust particles. Then wipe gently with a soft lens tissue, moistened with optical cleaner (eyeglass or camera lens) or clean water. Immediately dry with a clean lens paper.

CAUTION - Objectives should never be disassembled by the user. If repairs or internal cleaning should be necessary, this should only be done by qualified, authorized microscope technician. The eyepiece(s) may be cleaned in the same manner as the objectives, except in most cases optical cleaner will not be required. In most instances breathing on the eyepiece to moisten the lens and wiping dry with a clean lens tissue is sufficient to clean the surface. Lenses should never be wiped while dry as this will scratch or otherwise mar the surface of the glass.

The finish of the microscope is hard epoxy and is resistant to acids and reagents. Clean this surface with a damp cloth and mild detergent.

Periodically, the microscope should be disassembled, cleaned and lubricated. This should only be done by a qualified, authorized microscope technician.

DUST COVER AND STORAGE – All microscopes should be protected from dust by a dust cover when in storage or not in use. A dust cover is the most cost-effective microscope insurance you can buy. Ensure that the storage space is tall enough to allow the microscope to be placed into the cabinet or onto a shelf without making undue contact with the eyepieces. Never store microscopes in cabinets containing chemicals which may corrode your microscope. Also, be sure that the objectives are placed in the lowest possible position and the rotating head is turned inward and not protruding from the base. Microscopes with mechanical stages should be adjusted toward the center of the stage to prevent the moveable arms of the mechanical stage from being damaged during storage in the cabinet.

LED REPLACEMENT

The Motic Swift Line M18 series is equipped with a 3W LED illumination system. The life of the LED may vary depending on use and intensity. To prolong
the life of the LED, you should always turn off the unit when not in use. It is important that you only use a Motic SwiftLine replacement LED because it is integrated on to a circuit board. This LED has been tested and approved for life span, color temperature and brightness. Please call the Motic SwiftLine parts department at (877) 967-9438 for replacement part information.

Make sure the microscope is unplugged before replacing the LED.

1. Remove the head by loosening the 2mm hex set screw located on the right-hand side of the head just above the neck of the microscope. Set to the side.
2. Turn the microscope upside down, so that it rests flat, since the head is removed. Remove the 4 screws on the bottom of the microscope. Remove the base cover to access the LED.
3. The LED is integrated on to a circuit board. This LED circuit board is held into the illuminator housing by a black ring. Unscrew this black ring from the illuminator housing to remove the LED circuit board.
4. Unplug the LED's power wire from the circuit board attached to the base cover.
5. Reverse the steps listed above to install the new LED.

MOTIC SWIFTLINE LIMITED LIFETIME WARRANTY

Please see our website, www.swiftoptical.com, for complete warranty details and exclusions.

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www.swiftoptical.com