

## Glossary of Microscope Terms

**Abbe Condenser:** A lens that is specially designed to mount under the stage and which typically, moves in a vertical direction. An adjustable iris controls the diameter of the beam of light entering the lens system. Both by changing the size of this iris and by moving the lens toward or away from the stage, the diameter and focal point of the cone of light that goes through the specimen can be controlled. Abbe condensers are useful at magnifications above 400X where the condenser lens has a numerical aperture equal to or greater than the N.A. of the objective lens being used.

**Achromatic Lens:** A lens that helps to correct the misalignment of light that occurs when it is refracted through a prism or lens. Since different color light refracts at different angles, an achromatic lens is made of different types of glass with varying indices of refraction. As a result, an improved color alignment is achieved although not as good as is achieved with plan or semi-plan objective lens. Most microscopes use achromatic lens with more exacting applications requiring plan or semi-plan objectives.

**Arm:** The part of the microscope that connects the eyepiece tube to the base.

**Articulated Arm:** Part of a boom microscope stand, an articulated arm has one or more joints to enable a greater variety of movement of the microscope head and, as a result, more versatile range of viewing options.

**Base:** A microscope is typically composed of a head or body and a base. The base is the support mechanism.

**Binocular Microscope:** A microscope with a head that has two eyepiece lens. Nowadays, binocular is typically used to refer to compound or high power microscopes where the two eyepieces view through a single objective lens. A stereo (or low power microscope) may also have two eyepieces, but since each eyepiece views through a separate objective lens, the specimen appears in stereo (3-Dimensional). In order to distinguish from monocular or trinocular microscopes, we have included both types of binocular microscopes in our Binocular Microscope category.

**Body:** Often referred to as the head, the body is the upper part of a microscope including, eyepieces and objectives. Most modern microscopes are modular in the sense that the same body can be used with different bases and vice versa.

**Boom Stand (Universal Boom Stand):** A microscope base that incorporates an adjustable arm or boom and enables the body to be aligned in a variety of different positions. Used in commercial inspection applications.

**Calibration:** The mathematical process of determining true distance when using a reticle.

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**Camera Adapter:** An adapter kit designed to enable a camera to fit on to the trinocular port of a microscope (23mm or 30mm port diameter). The camera connects to a step ring (or T-Mount) and then to the camera adapter.

**CamAdapter:** A trademark name for our CAS39 universal camera adapter kit sold only by The Microscope Store, LLC.

**Clamp Base:** A clamp that replaces the traditional base on the bottom of a boom microscope and enables the pole to be clamped on to the side of a work bench or table.

**C-Mount:** This is an adapter with a standard thread for mounting a lens to a camera. It fits into a trinocular port. The mechanical standard is 1 diameter, 32 TPI (threads per inch), male on the lens and female on the camera. The optical standard is that the image reaches the focal plane at 17.5mm past the edge of the lens mounting threads.

**Coarse Focus:** This is the knob on the side of the microscope that moves the objective lens up and down. It is used in conjunction with the fine focus.

**Coaxial Focus:** A focusing system with both the coarse and fine focusing knobs mounted on the same axis. The coarse focus is typically the larger, outside knob and vice versa. On some coaxial systems, the fine adjustment is calibrated, allowing differential measurements to be recorded.

**Comparison Microscope:** A microscope that enables side-by-side viewing of two different specimens. The microscope has two sets of objectives with a single set of eyepieces (monocular or binocular), often used in forensic science.

**Compound Microscope:** Originally used to describe a microscope with more than one objective lens, a compound microscope is now generally understood to be a high power microscope with multiple, selectable objective lens of varied magnifications. See stereo/low power.

**Condenser:** A lens that concentrates the light on a specimen and increases the resolution. Found in or below the stage on compound microscopes, only.

**Contrast Plate:** Found only on stereo microscopes, one side is white and one black. Either side can be used depending on your specimen.

**Cover Slip:** A thin, square piece of glass or plastic placed over the specimen on a microscope slide. It flattens out liquid samples and helps single plane focusing.

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**Darkfield Microscopy:** a technique used to enhance the contrast in unstained specimens. It works on the principle of illuminating the sample with light that will not be collected by the objective lens, so not form part of the image. This produces the classic appearance of a dark, almost black, background with bright objects on it.

**Darkfield Plate:** A circular iris that sits on the base of the microscope above the light source and reflects the light horizontally to the specimen, thereby achieving lateral illumination.

**Digital Microscope:** A microscope with a built in digital camera that enables direct feed to a PC, TV or printer.

**DIN:** *Deutsches Institut für Normung*, or in English, the *German Institute for Standardization*, is an international standards organization that determines the "standard" for a wide variety of different types of technology. "DIN standard" microscope objective lenses use a 20mm diameter attachment thread and are usually interchangeable between microscope manufacturers.

**Dissecting Microscope:** Typically interchangeable with stereo microscope, a dissecting microscope is a stereo microscope used in laboratory work.

**Doublet Lens:** A lens with two different lenses "welded" together. Used in widefield eyepieces to obtain improved color performance.

**Dual-View:** A monocular microscope that has a second, vertical viewing port. Often used by teachers. It can also be used for photographic applications.

**Electron Microscope:** A type of microscope that uses electrons rather than light to create an image of the target. It has much higher magnification or resolving power than a normal light microscope, up to two million times, allowing it to see smaller objects and details.

**Eyepiece:** Otherwise referred to as an ocular, the eyepiece is the lens nearest to your eye. Total magnification of a microscope is determined by the sum of the eyepiece magnification multiplied by that of the objective lens.

**Eyepiece Tube:** The tube in which the eyepiece lens is situated.

**Fine Focus:** A knob used to fine tune the focus of a specimen in conjunction with the coarse focus.

**Field of View:** The diameter of the circle of light seen through a microscope.

**Focus:** The ability to achieve a clear image, typically achieved by moving either the eyepiece tubes or the stage.



Chongqing MIC Technology Co., Ltd  
Website: [www.chinamicroscope.com](http://www.chinamicroscope.com)  
Email: [info@chinamicroscope.com](mailto:info@chinamicroscope.com)

TEL: +86-13436078184; FAX: +86-23-63913139

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**Gem/Jeweler's Microscope:** A stereo microscope designed for viewing gems and jewelry, typically incorporating an inclined pole, powerful zoom, darkfield plate and intense, variable lighting.

**Head:** Often referred to as the body, it is the upper part of the microscope that includes the eyepiece tubes and prisms.

**Illumination System:** The light source on light microscopes, typically mounted under the stage except on inverted microscopes.

**Immersion Oil:** A special oil used with the 100X objective in order to concentrate the light and increase the resolution of the image. A drop of oil is placed on the cover slip and the objective is lowered until it touches the oil. There are two primary types of immersion oil: Type A and Type B; Type B is more viscous.

**Interpupillary Distance:** The distance between the two eyepieces, usually adjustable to fit individual users. **Inverted Microscope:** A microscope designed with the objectives under the stage and the light source above. Used for viewing larger specimens, often in containers.

**Iris Diaphragm:** Found on high power microscopes under the stage, the diaphragm is, typically, a five hole-disc with each hole having a different diameter. It is used to vary the light that passes through the stage opening and helps to adjust both the contrast and resolution of a specimen. It is particularly useful at higher powers.

**Jeweler's Clip:** A special clip that attaches to the stage and is designed to hold precious stones and jewelry for easier viewing.

**Koehler Illumination:** A method of illumination named after August Koehler, the man who invented it. It is also known as double diaphragm illumination because it employs both a field and an aperture iris diaphragm to control the illumination. If the light path is adjusted properly, it is possible to enjoy the advantages of an evenly illuminated field, a bright image without glare and minimum heating of the specimen.

**Light Microscopes:** Any microscope that uses a source of light to create an image of the specimen and, essentially includes all compound and stereo microscopes.

**Magnification:** The essence of a microscope is its ability to magnify a specimen. Total magnification of a microscope is determined by multiplying the magnification capability of the eyepiece lens by that of the objective lens.

**Mechanical Stage:** A flat mechanism that sits on top of the stage and allows the viewer to move a specimen small distances - a task that is otherwise difficult at higher magnifications. Most

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mechanical stages are equipped with an X and Y axis so the viewer can see how far the slide has moved.

**Monocular Microscope:** A compound microscope with a single eyepiece.

**Nosepiece:** The upper part of a compound microscope that holds the objective lens. Also called a revolving nosepiece or turret.

**Numerical Aperture (N.A):** A measure of the diameter of the aperture compared to the focal length of a lens and ultimately, of the resolving power of a microscope. N.A. is equal to the index of refraction of the medium in which the object is placed multiplied by the sine of the angle made with the axis by the most oblique ray entering the instrument, the resolving power increasing as the product increases.

**Objective Lens:** The lens closest to the specimen that first receives the rays from the specimen (the object) and forms the image in the focal plane of the eyepiece.

**Oil Immersion Lens:** Typically, a 100X (or higher) objective lens designed to work with a drop of immersion oil.

**Parcentered:** When changing objectives, the image of the specimen stays centered. Most compound microscopes are parcentered.

**Parfocal:** When changing objectives, the image of the specimen stays in focus without needing to adjust the focusing knobs. Most compound microscopes are parfocal.

**Phase Contrast:** A contrast enhancing technique developed by Frits Zernike in 1953 for which he won the Nobel Prize in Physics. The technique shifts the light phase wavelength, thereby causing the light deviated by the specimen to appear dark on a light background. It is useful for viewing transparent specimens such as living tissue cells.

**Plan Lens:** The finest objective lens that "flattens" the image of the specimen and greatly enhances the resolution and clarity of the image.

**Portable Microscope:** A cordless or field microscope with a light source independent of 110/220V. Typically, includes a rechargeable LED light source so that it can be used in the field where 110/220V electric supply is unavailable.

**Pointer:** A piece of high tensile wire that sits in the eyepiece and enables a viewer to point at a specific area of a specimen.

**Pole Stand:** A microscope stand composed of a base with a single vertical pole (or post). Typically, the body can move up and down as well as rotate round the pole.



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Email: [info@chinamicroscope.com](mailto:info@chinamicroscope.com)

TEL: +86-13436078184; FAX: +86-23-63913139

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**Rack and Pinion Focusing Mechanism:** A metal rack and pinion used in better quality microscopes for focusing purposes and moving mechanical stages.

**Rack Stop:** A safety feature that prevents the viewer from allowing the objective lens to accidentally hit the stage and damage the specimen or slide.

**Resolution:** The ability of a lens to distinguish the fine details of the specimens being viewed.

**Reticle:** A small glass circle, etched by laser with fine measurements and placed within the eyepiece in order to enable actual measurements of the specimen to be taken.

**Revolving Nosepiece:** A nosepiece with multiple objectives that revolves in order to enable the viewer to use, typically, one of four different objectives.

**Ring Light:** An extraneous light source that connects to the microscope and emits a ring of light for enhanced lighting. Ring lights are LED, fluorescent, halogen or fiber optic and are typically, used on boom microscopes.

**Seidentopf Head:** A head design where the interpupillary adjustment is achieved by twisting the eyepieces in a vertical arc like binoculars.

**Semi-Plan Objectives:** Improve the clarity and resolution of an image compared to chromatic lens, by partially "flattening" the image of the specimen.

**Slide:** A flat, rectangular, glass plate on which a specimen may be placed.

**Slip Clutch:** A mechanical device on the focusing knob that allows the knob to "slip" if a viewer keeps turning the knob beyond its range of travel. Prevents damage from occurring to the focusing system.

**Stage:** The platform on which slides and specimens are placed for viewing.

**Stage Clips:** Clips that are attached to the stage and retain the slide.

**Stand:** Describes the connection between the body and base a stereo or low power microscope

**Stereo Microscope:** A low power microscope or dissecting microscope with a separate eyepiece and objective lens for each eye. These separate optical channels enable stereo or three-dimensional images of the specimen. See Compound Microscope.

**Sub-Stage:** The parts of the microscope below the stage, including the illumination system.

**T-Mount:** A standard adapter for mounting 35mm cameras to microscopes. Also known as a step-ring.



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Email: [info@chinamicroscope.com](mailto:info@chinamicroscope.com)

TEL: +86-13436078184; FAX: +86-23-63913139

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**Tension Adjustment:** A factory set adjustment to the focusing mechanism that ensures it is both, sufficiently easy to focus and sufficiently tight to ensure that the stage does not drift during the focusing process.

**Turret:** An alternative description for a nosepiece.

**Widefield Eyepiece:** An improved eyepiece lens with a broader diameter that enables a broader field of vision and greater ease of use.

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