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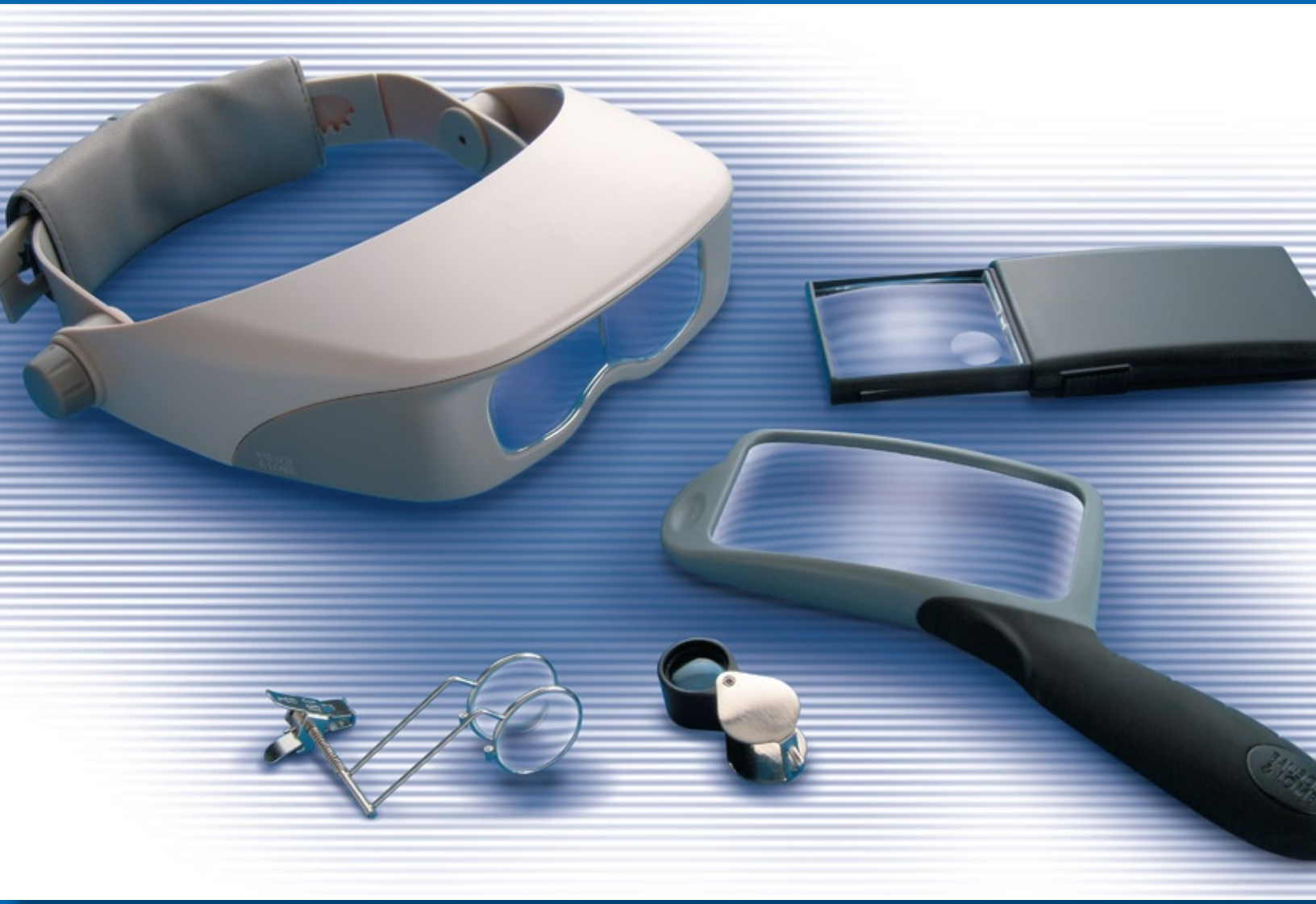
MAGNIFIERS

WORK • HOME • HOBBIES



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What Is a Magnifier?

A magnifier is a lens that increases the apparent size of objects seen through it. It may be a single lens, thicker at the center than at its edge, or it may be a compound lens made of several lenses mounted or cemented together.

By moving closer to an object we are able to see it in more detail. But the focusing power of our eyes is limited and we are able to see clearly only down to about 10 inches. A magnifier, in effect, adds focusing power to the eye, enabling us to move closer than 10 inches to the object and to see more detail. We see the effect as an increase in the image size.

Depending on its power, a magnifier makes it possible to see an object clearly as close as one-half inch from the eye.

Why So Many Different Magnifiers?

Basically, the purpose of a magnifier is to enlarge the image of an object so that its details may be seen more clearly. This is a function of the power of the magnifier. However, three other factors affect the performance of a magnifier and its suitability for certain jobs: field of view, depth of field and working distance (focal length). The four factors are interdependent; if the power is increased, the other three become smaller, and so forth. In selecting a magnifier, you should consider all four factors.

Power of Magnification

The power of magnification refers to the capacity in the lens to increase the image size. X, the symbol used with a number in denoting the power of a magnifier, is quite simply the multiplication sign, "times." Thus, a 2X magnifier creates an image size twice as large as that which the unaided eye sees at 10 inches. A 3X magnifier triples the image size, and so on.

Focal Length (Working Distance)

Focal length is the distance at which a magnifier must be held away from an object to achieve clear focus and maximum magnification. In a 2X magnifier the focal length is approximately 5 inches (the lens thickness is a factor); in a 5X magnifier it is 2 inches; and in a 20X magnifier it is 1/2 inch.

Field of View

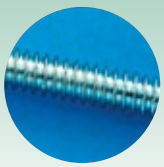
Field of view is the size of the area that can be seen at any one time. In a magnifier, a number of things influence the field of view: the diameter of the lens for instance. However, the power of magnification primarily determines the size of the field of view—the higher the power the smaller the field of view.

Depth of Field

Depth of field is the distance that you can move a magnifier toward or away from an object and still have the object in focus. It also refers to the depth of the area in front of or behind the viewed object that can be seen clearly. Like the field of view, the depth of field has an inverse relationship with the power of magnification—the higher the power the shorter the depth of field.

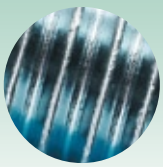
Field of View

The Higher the Power, the Smaller the Field of View



2X

Here is a 6-32 button-head machine screw, 1-1/2" long, as seen through a 2X magnifier. Working distance is about 5 inches.



10X

With a 10X glass only a few of the screw threads are visible. Here the lens must be held less than an inch away.

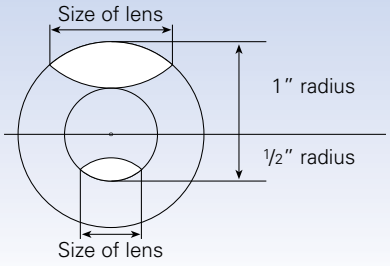
20X

Field of view with a 20X lens is very restricted. Working distance now is only about 1/2 inch. Notice, too, that the depth of field decreases as the power increases.

Size in a Magnifier

The Stronger the Power, the Smaller the Lens

Although the refractive index (light-bending power) of the glass or plastic is a factor, it is primarily the curves of the lens that determine the power of the magnifier. And the radius of the strongest curve physically limits the width of the lens. Low-powered lenses have shallower curves with longer radii than high-powered lenses, and consequently can be larger. As is evident in the diagram, it is possible to have a much wider lens in a magnifier with a one-inch radius curve than in one with a half-inch radius curve.



Hastings Triplet Magnifiers

Truly the finest magnifiers Bausch & Lomb has to offer, Hastings Triplet Magnifiers incorporate three separate glass lenses, bonded together to form a compound lens to provide sharp, very distinct magnified images without distortion—even under 14 and 20 power magnification. A swing-away, nickel-plated case protects the lens and serves as a handle.

• Protective storage pouch included

Description	Order No.	Focal Distance	Power	Lens Diameter
Hastings Triplet 7X	816168	1.5" (3.9 cm)	7X	19.8 mm
Hastings Triplet 10X	816171	1" (2.5 cm)	10X	15.8 mm
Hastings Triplet 14X	816175	.8" (2.0 cm)	14X	12.5 mm
Hastings Triplet 20X	816181	.5" (1.3 cm)	20X	8.3 mm

Coddington Magnifiers

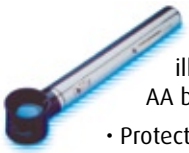
In terms of performance, both the Hastings and the Coddington Magnifiers are second to none. Correction in the Coddington magnifiers is achieved through the use of a single thick glass lens with a central groove diaphragm. This provides for sharp, crisp images. Like the Hastings Triplets, the Coddington Magnifiers have a swing-away, nickel-plated case.

• Protective storage pouch included

Description	Order No	Focal Distance	Power	Lens Diameter
Coddington 10X	816131	1" (2.5 cm)	10X	19.8 mm
Coddington 14X	816135	.8" (2.0 cm)	14X	15.8 mm
Coddington 20X	816141	.5" (1.3 cm)	20X	12.5 mm

Illuminated Coddington

A problem often encountered in using a high-power magnifier is the lack of sufficient light on the object. The Illuminated Coddington Magnifier eliminates this problem. A bulb inserted in the groove of the Coddington glass lens illuminates the object being examined. Requires two AA batteries (not included).



• Protective storage pouch included

Description	Order No	Focal Distance	Power	Lens Diameter
Illuminated Coddington 10X	813434	1" (2.5 cm)	10X	19.8 mm

Lenscope® Magnifiers

The Bausch & Lomb Lenscope® Magnifier is a precision inspection tool. It provides a clear, distortion-free image and can be used for virtually any kind of close inspection or measurement application. This versatile magnifier offers a choice of interchangeable Hastings Triplet glass lenses (7X or 10X). The Lenscope® Magnifier features an ergonomic plastic body, and two angled illumination lamps (45° or 90° from the viewing angle). Requires two AA batteries (not included).

• Protective storage pouch included

(See Hastings Specialty Magnifiers for add-on scales information.)

Description	Order No	Focal Distance	Power	Lens Diameter
Glass Lenscope® 10X	813442	2.5 cm	10X	15.8 mm
Lens Only – 10X	813444	2.5 cm	10X	15.8 mm

Measuring Magnifiers

Hastings Triplet Measuring Magnifier

The Hastings Triplet Measuring Magnifier is a valuable tool whenever and wherever precision work is performed. The Hastings glass lens is adjustable for individual focus and provides a flat, distortion-free image. The transparent body allows illumination to fall on the magnified area. Available in either 7X or 10X magnification. Protective case keeps the magnifier safe and damage-free, even in harsh work environments.

Measuring Scales (Glass) *Sold Separately*

General Purpose Scale measures radii from 1/16" to 3/8", angles in single degrees to 90°, 0.005" and 0.1 mm scales, and line widths of .001", .002" and .003".

Inch Scale measures 3/4" in 0.005" intervals.

Metric Scale measures 20 mm in 0.1 mm intervals.

Protractor Scale measures 360° in single degrees.

• Protective storage pouch included

Description	Order No	Focal Distance	Power	Lens Diameter
Magnifier 7X	813435	1.5" (3.9 cm)	7X	19.8 mm
Lens only-7X	813445		7X	19.8 mm
Magnifier 10X	813433	1.0" (2.5 cm)	10X	15.8 mm
Lens only-10X	813444		10X	15.8 mm
General Purpose Scale	813436			
Inch Scale	813437			
Metric Scale	813438			
Protractor Scale	813439			

Double Lens Magnifier

Originally designed for the exacting work of hand-tooling photo-engraved printing plates, the Double Lens Magnifier provides 3.5X magnification and offers near-universal application in precision work. The magnifier uses two plano-convex glass lenses for a "corrected" wide, flat field.

• Protective storage pouch included

Description	Order No	Focal Distance	Power	Lens Diameter
Double Lens Magnifier	813476	3" (7.3 cm)	3.5X	1-5/8"

Aspheric 5X Magnifier

Excellent, high-powered magnifier.
2" 5X aspheric glass lens assures optimum edge-to-edge clarity.

• Protective storage pouch included

Description	Order No	Focal Distance	Power	Lens Diameter
Aspheric 5X Magnifier	813122	2" (5.1 cm)	5X	50.0 mm

Packette® Magnifier 1.7" x 2"

The Bausch & Lomb Packette® Magnifier is a smart, contemporary design that fits easily in the palm of your hand. The hard plastic cover snaps open and clicks shut. 5X aspheric acrylic lens provides a sharp and precise focus over the entire 2" viewing area.

• Protective storage pouch included

Attached Case Magnifier

This handy 2X magnifier has a glass lens. The case on the magnifier not only protects the lens but serves as a handle as well.

• Protective storage pouch included

Description	Order No	Focal Distance	Power	Lens Diameter
Packette® Magnifier	813133	2" (5.1 cm)	5X	36.0 mm
Attached Case	812605	127.0 mm	2X	50.0mm

Classic Metal™ Eyeglass Loupes

Made with precision optical glass, and designed for a secure fit, these eyeglass loupes are ideal for any kind of detail work.

Features:

- Mount easily to either side of eyeglasses
- Includes Side Shield Adapter Kit for use with safety eyewear
- Custom-fit storage case included

Description	Order No	Focal Distance	Power	Lens Diameter
Classic Metal Eyeglass Loupe 3x	814117	3.3" (8.4 cm)	10X	24.0 mm
Classic Metal Eyeglass Loupe 4x	814127	2.5" (6.4 cm)	7X	24.0 mm
Classic Metal Eyeglass Loupe 7x	814147	1.5" (3.8 cm)	7X	24.0 mm
Classic Metal Eyeglass Loupe 4X-7X	814178	2.5" (6.4 cm) & 1.5" (3.8 cm)	4x and 4x (7x combined)	24.0 mm (2)
Classic Metal Eyeglass Loupe 3x-5X	814179	3.3" (8.4 cm) & 2" (5.1 cm)	3x and 3x (5x combined)	24.0 mm (2)
Replacement Side Shield Adapter Kit	814100	Includes: one side-shield adapter, one wraparound adapter, three adhesive pads		

Watchmaker's Loupes & Accessories

Bausch & Lomb Watchmaker's Loupes have long been the industry standard. These lightweight glass lens magnifiers are available in a complete range of powers. All Bausch & Lomb Watchmaker's Loupes are manufactured for headband attachment if appropriate.

- Protective storage pouch included

Description	Order No	Focal Distance	Power	Lens Diameter
8X-17X	814108	1.25" (3.2 cm) .5" (1.3 cm) .5" (1.3 cm)	8X 13X 17X	22.2 mm 12.5 mm
10X Hastings	814113	1" (2.5 cm)	10X	15.8 mm
1" Lens 10X	814170	1" (2.5 cm)	10X	25.4 mm
7X	814171	1.5" (3.8 cm)	7X	25.4 mm
5X	814172	2" (5.1 cm)	5X	25.4 mm
4X	814173	2.5" (6.4 cm)	4X	25.4 mm
Headband	814114			

Folding Pocket Magnifiers

The Folding Pocket Magnifiers are available in a wide range of powers from 3X to 20X with several styles offering two or three lenses providing varying focal lengths and magnification powers. By combining lenses, three different powers are available with the two-lens model and seven different powers with the three-lens model. The glass lenses used in all folding pocket magnifiers provide durability for long life. The durable plastic swing-away case not only provides a protective cover for the lenses, but serves as a handle as well.

- Protective storage pouch included

Order No	Focal Distance	Power	Number of Lenses	Lens Diameter
812354	2.5"	4X	1	36.0 mm
812364	2.5" to 1.1"	4X to 9X	2	23.0 mm
812365	2.0" to .8"	5X to 12X	2	20.3 mm
812367	2.0" to .5"	5X to 20X	3	20.3 mm (2) 15.2 mm (1)

Pouch shown above is included with some items as indicated

Illuminated Magnifiers

Illuminated Stand Magnifier

This magnifier offers versatility across a number of different applications including industry, schools, office, laboratory and hobbies. Both the lens and the light are adjustable. Simply tilt the lens and small hand-held objects can be worked on or inspected. Or with the lens parallel to the work surface, lay the object directly beneath the lens and it's in focus. The acrylic lens is 2" x 4" and uses a UL approved low-voltage wall transformer.

Order No	Power	Lens Size	Inset Power
813480	2X	2" x 4"	5X

Round & Rectangular Magnifiers

Only Bausch & Lomb magnifiers incorporate precision optics and ergonomic properties for increased clarity and comfort during use. Engineered with the same quality and care that have made Bausch & Lomb optical products the premium choice for more than a century. Great for reading, hobbies and close-up work.

- Stabilizing edge for two-hand positioning
- ErgoTouch® grip is molded to fit your hand
- Extra-wide field of vision
- Precision acrylic lens
- High-power inset lenses for detailed view

Description	Order No	Power	Inset Power	Lens Size
Round 5" Glass	813405	2X	N/A	5"

Hand-Held Magnifiers

2" x 4" Rectangle Magnifier

- 2X with 6X inset
- Durable, acrylic, one-piece molded construction

3-1/4" Round Magnifier

- 2X with 6X inset
- Durable, acrylic, one-piece molded construction

Mini-Lite® Illuminated Magnifier

- Powerful 3X magnification
- Compact and convenient—5" x 1½"
- Requires 2 AAA batteries (not included)
- Acrylic lens

Magna-Thin® Magnifier

- Powerful 2X magnification
- Compact and convenient—carry in purse or wallet
- Protective case included
- Acrylic lens

Magna-Page®

- Full-page magnifier
- Specially designed molded fresnel lens
- Acrylic lens

Description	Order No	Power	Inset Power	Lens Size
Magna-Page® 2X	819007	2X	N/A	8 1/4" x 10 3/4"

Magna-Bar® & Magna-Rule® Magnifiers

These acrylic bar magnifiers lie flat on the page, doubling the height of letters while magnifying two lines of type at a time without any need to focus.

Magna-Bar®

The 5¼" Magna-Bar® easily covers the full-page width of most books.

- Overall length 6 3/16"

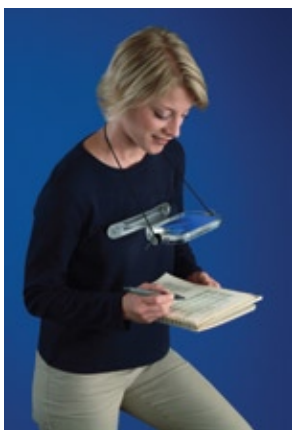
Description	Order No	Power
MagnaBar®	812617	2X

Hands-Free Magnifier

Hands-Free Magnifier

Offers the convenience of magnification yet leaves both hands free to hold a book or to perform the delicate work of hobby or craft. The large 4" x 5" lens provides a super-large viewing area that covers most book page widths...two newspaper columns... full work areas. Made of optical-grade acrylic plastic. The support cord is easily adjusted for comfortable positioning.

Description	Order No	Power	Lens Size
Hands-Free Magnifier	813390	5X	4" x 5"



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Glossary

aberration—The failure of a lens to bring all the rays of light to exact focus, causing a blue-red image.

achromatic—A lens which corrects for chromatic aberration; transmits light that forms images practically free from prismatic colors.

aplanatic—A lens which corrects for spherical aberration and coma.

astigmatism—A defect in which the lens fails to unite rays of light from an external point at a single image point, thus giving an imperfect image or vision.

chromatic aberration—The inability of a lens to focus light of different colors at a simple point.

Coddington—A corrected lens, named after its British inventor, Henry Coddington.

coma—The blurred appearance or hazy border surrounding an object viewed through a lens which is not free from spherical aberration.

concave—Describes a lens surface which is hollowed; interior of a curved surface.

convex—Describes a lens surface that curves or is rounded outward.

corrected—A lens or lens system which corrects for aberrations; remedies deviations of light rays from object to eye to produce a clear, sharp image.

crown glass—Optical alkali-lime glass having a low dispersion and usually a low index of refraction.

curvature of field—When a plane field is not imaged as a plane, or the outer part of the field is not imaged in the same plane as the center and therefore appears out of focus; as opposed to flatness of field.

curvature of lens—The amount of sharpness of curve in a lens surface.

diopter—The amount of power in a lens needed to focus parallel light at one meter.

dispersion—The separation of light into its component colors, as in passing through a prism.

distortion—That defect of a lens whereby the images of straight lines appear curved.

double lens magnifier—A magnifier composed of two single lenses.

flatness of field—Appearance of the image to be flat; a plane in the object will be imaged as a plane as opposed to curvature of field.

flint glass—A heavy, brilliant glass containing lead and having a high dispersion and usually a high index of refraction.

focus—The point at which light rays through a lens intersect to form an image.

Hastings Triplet—A highly corrected magnifier composed of three simple lens elements cemented together to form a single lens.

highly corrected—A magnifier or lens in which virtually all aberration is eliminated.

image—The likeness or picture formed by a lens; the optical counterpart of an object.

meniscus—A crescent-shaped lens—one which is concave on one surface, convex on the other. It may be converging or diverging.

plano—Pertaining to flat; a plano lens surface has no curve.

plano-concave—A lens with one surface flat, the other curved inward. (See concave)

plano-convex—A lens with one surface flat, the other curved outward. (See convex)

refractive index—The ration of speed of light in a vacuum, or in a given medium to its speed in a different medium.

semi-corrected—A magnifier or lens in which only part of the aberration is eliminated.

spherical aberration—A defect in a lens which causes marginal and central rays to focus at different distances from the lens, producing an image which lacks contrast.

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