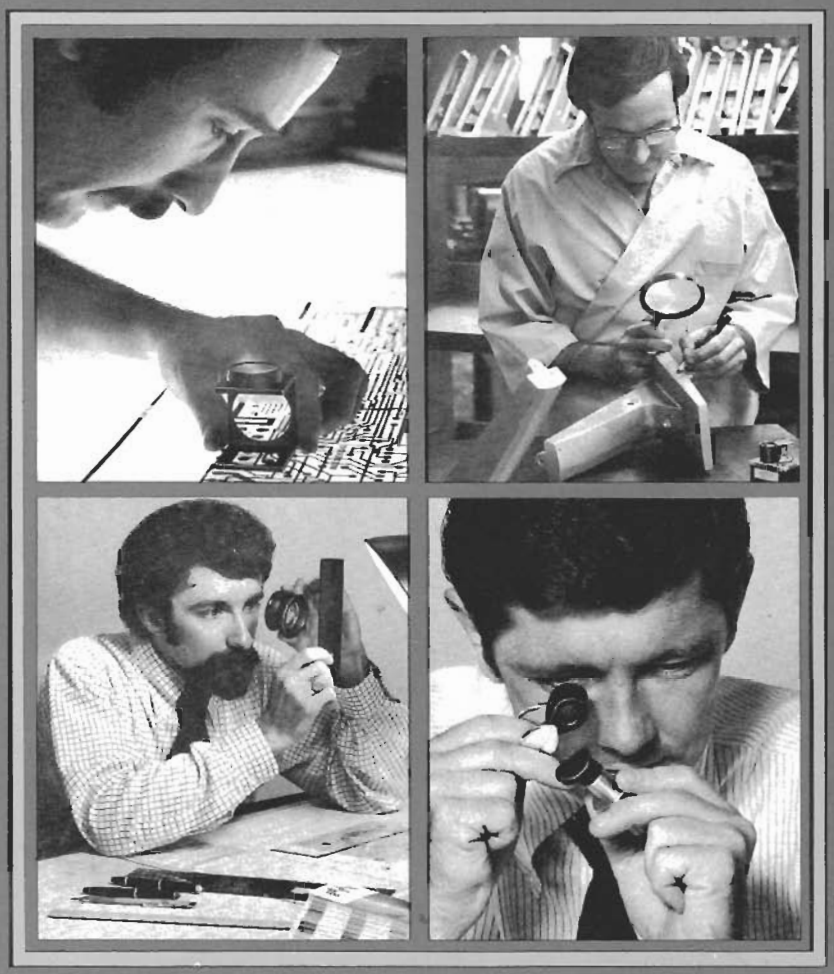
BAUSCH & LOMB

INDUSTRIAL AND TECHNICAL MAGNIFIERS



principles · selection · use

Magnifiers are important tools of industry. There are many instances in which magnifiers *must* be used because the critical detail is too small for the unaided eye. There are many more in which the enhancement of vision results in more accurate setting of machines and controls, more certain detection of defects, or of just making the job more comfortable. All of which add up to direct dollar savings.

There are different sizes and kinds of wrenches, of saws, of screwdrivers, of micrometers. One makes a poor substitute for the other. As with other tools, there are considerable differences in magnifiers. This book will acquaint you with the variety available and will help you to understand and select magnifiers.

MAGNIFIER CHARACTERISTICS

WHAT IS A MAGNIFIER?

A lens which increases the apparent size of objects seen through it is a magnifier. 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 ten inches. A magnifier, in effect, adds focusing power to the eye, enabling us to move closer than ten inches to the object and to see more detail. We see the effect as an increase in the image size.

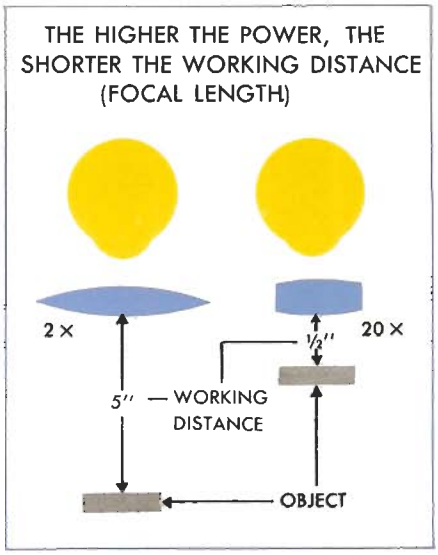
You probably are holding this page about 12 to 15 inches from you. Move the page closer and the printed matter will become blurred until finally it will be impossible to read. A magnifying lens placed between your eye and this page would make it possible to see the print clearly again. Depending on its 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). Each of these is 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. ×, the symbol used with a number in denoting the power of a magnifier, is, quite simply, the multiplication sign, "times." Thus, a 2× magnifier creates an image size twice as large as that which the unaided eye sees at 10 inches. A 3× magnifier triples the image size and so on.



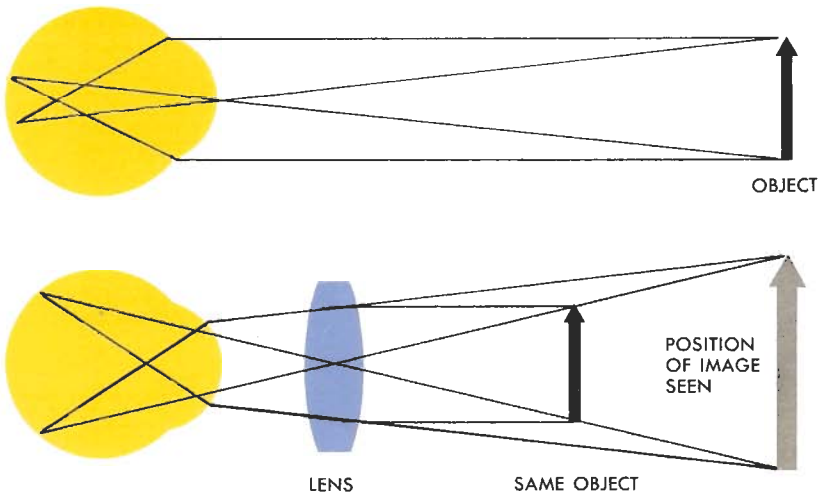
FOCAL LENGTH

(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. (A magnifier might be held closer than the focal length with the viewed object clearly in focus; however, the magnification would be somewhat less than the maximum.) In a 2× magnifier the

POWER OF MAGNIFICATION

The curved surface of a magnifying lens bends the light rays to produce an image of the object that appears larger than the object itself. The amount the light is bent and, therefore, the degree of magnification is determined by the curvature of the lens surface.



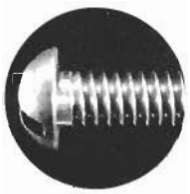
focal length is approximately 5 inches (the lens thickness is a factor); in a 5× magnifier it is 2 inches and in a 20× magnifier it is ½ inch.

Working distance relates directly to the focal length of the magnifier. It is the amount of space that is available between the magnifier and the object for working with your hands or tools.

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. A 20× magnifier has a very limited field of view; a 2× magnifier could have a field of view ten or more times larger.

THE HIGHER THE POWER, THE SMALLER THE FIELD OF VIEW



2×. Here is a 6-32 Button-head machine screw, 1½" long, as seen through a 2× magnifier. Working distance is about 5 inches.

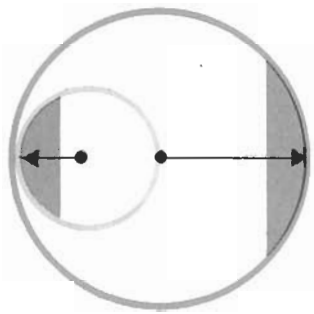
10×. With a 10× glass only a few of the threads are visible. Here the lens must be held less than an inch away.

20×. Field of view with a 20× lens is very restricted. Working distance now is only about ½ inch.

Notice, too, that the depth of field decreases as the power increases.

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.



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 size (width) of the lens. Low powered lenses have shallower curves with longer radii than high powered lenses, and consequently, can be larger.

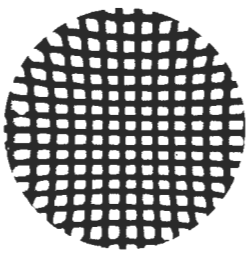
As is evident in the diagram, it is possible to have a much wider lens in a magnifier with a one inch radius curve than in one with a half inch radius curve.

CORRECTED MAGNIFIERS

Until now we have been discussing simple lenses only. The quality and performance of these lenses depends on the relationship of the surfaces, the accuracy of the surface curves, and the quality of the glass or plastic used. But no matter how well these features in a single lens magnifier are developed, optical errors will be present which will degrade the image, especially around the edges. In a low power magnifier these errors are usually not noticeable or bothersome. But in high power magnifiers, they become evident and may seriously affect the suitability of a magnifier for a job requiring critical inspection.

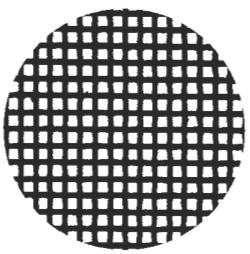
As a result of these optical errors, images are degraded in several ways. They may appear curved inward or outward, or fuzzy, without contrast, or with color rings or flares.

Corrected magnifiers are those in which the errors have been reduced or effectively eliminated. Normally, this is accomplished by arranging a number of lenses of different types of glass and/or different curves into a series. They may be mounted or cemented together to form a compound lens. Each lens in the series is designed to interact with the others, each contributing to the elimination or reduction of errors by offsetting the errors of the others.

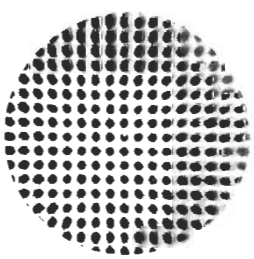


DISTORTION

Here is an example of "pin-cushion" distortion. This is a picture of a wire screen, 80-mesh, in which the "straight lines" curve toward the center.

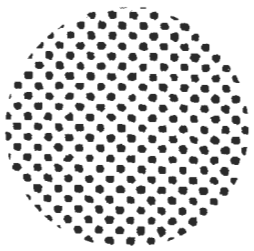


Here is the screen viewed through a corrected lens. All points in the image are in correct relation to one another.



CHROMATIC AND SPHERICAL ABERRATION

In a view of a photo engraver's halftone printing plate through an uncorrected glass the individual surface dots which make dark and light shadings are almost impossible to study.



With a corrected lens, it is easy to study the quality of the dots to determine if the plate has been properly etched. There are no color fringes. All parts of the field of view are clear and sharp.

STANDARD MAGNIFIER LENS SYSTEMS

SPACED DOUBLET
Achieves limited correction. Consists of 2 plano-convex lenses with air space between.

CEMENTED DOUBLET
A double convex lens cemented to a plano-concave or meniscus lens, one of crown, the other of flint glass.

CODDINGTON
This is a single lens with a groove diaphragm around its circumference. The thickness of the lens aids correction.

SPACED TRIPLET
Combines cemented doublet of plano-concave or meniscus and double convex elements with a single meniscus lens.

CEMENTED TRIPLET
Two meniscus concave elements cemented to a double convex element. Two kinds of glass are used.

SELECTING A MAGNIFIER

A magnifier is essentially a tool, and like any tool it should be suited to the job for which it will be used. Therefore, in selecting a magnifier for a particular job all the factors which affect the performance of a magnifier should be weighed against the requirements of that job.

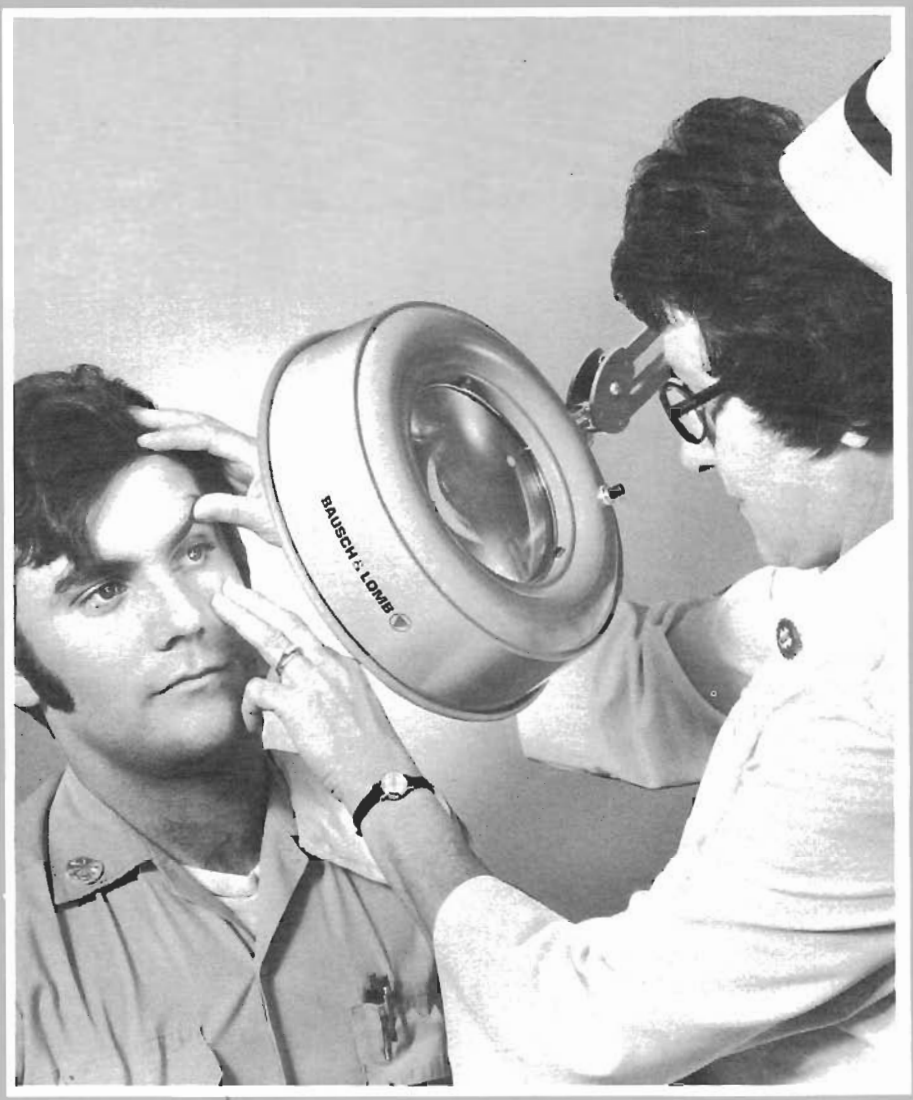
Obviously a magnifier is used for its magnification and just as obviously it should provide sufficient magnification for examination without any visual strain. But, as a general rule, just sufficient is sufficient. Surplus magnifying power will only cut down on the field of view, reduce depth of focus and working distance and perhaps will introduce optical errors at a disturbing level.

For certain purposes, two magnifiers might be needed. For instance, in examining a large casting for flaws, a low power magnifier with a wide field of view would be used to look for suspect areas. Then a higher powered magnifier would be used for closer examination of those areas.

Generally, because optical errors are more evident in higher powers, "corrected" magnifiers should be selected for jobs requiring strong magnification, especially when critical examination is necessary. "Corrected" magnifiers will produce a sharp, undistorted image over the entire field of view.

The level of illumination, too, often affects magnifier performance and should be considered in evaluating the job requirements for a magnifier. Several Bausch & Lomb magnifiers have self-contained illumination systems which put light right where it is needed.

Finally, one more factor to consider. Motion of the lens or the object. A lens magnifies speed in the same proportion that it magnifies size. With a 20× lens, for example, the magnified speed of an object on a conveyor belt would carry it in and out of view before it could be examined. Where extremely high powers are required, the object and lens both should be held in a fixed position.



COATING MAGNIFIER LENSES NOT NECESSARY

We are sometimes asked why we do not treat our quality magnifier lenses with famous Balcote anti-reflection surfacing. To do so would simply increase their cost without appreciably improving their quality. Only when a lens system contains a number of air-to-glass surfaces such as in binoculars, telescopes, and other complex optical systems, is Balcote anti-reflection surfacing employed to reduce reflection and increase light transmission.

HOW TO MEASURE WITH YOUR MAGNIFIER

Occasionally we get requests for a scale etched or otherwise indicated on the lens of a magnifier so that the user may measure objects he is viewing. A moment's reflection reveals this to be impossible, since the lens is held close to the eye and the scale is not magnified along with the object. Such measurement may be made only when the scale is in focus. We suggest using an engraved glass scale placed directly over the object. (See page 8.)

HOW TO CLEAN YOUR MAGNIFIER

Outer lens surfaces of your magnifier are bound to gather grease and dust. Dust contains hard, gritty particles which will scratch the lens surface if not removed carefully.

The first thing to do is blow dust and gritty particles from the lens surface. Then if grease or other matter still remains wipe lens surfaces with a clean soft cloth or a good quality of disposable tissue. If grease or other matter persists, use a clean, soft cloth *dampened* with water and a small amount of soap or other detergent. Then wipe clean. Always use a gentle wiping action.

HOW TO HOLD YOUR MAGNIFIER

To get the best possible performance from your magnifier it should always be held as close to your eye as comfortably possible. This permits the fullest number of rays from the object to enter your eye and cuts down the reflected light striking the surfaces of the lens. Thus you minimize reflection and glare.

Always see that the plane of the lens is parallel to the plane of the object. If you are examining a horizontal surface, the lens should be in a horizontal position. Otherwise, part of the image will be out of focus. This, of course, is less critical in low power lenses, more critical in high power lenses where focal lengths are shorter and depth of focus is less.

The only exception to these foregoing rules occurs in the use of big lens types such as readers. The reading glass has purposely been designed to be used with *both* eyes and should be held far enough away to permit this.

WRONG
Surface of the object should always be parallel to the plane of the lens. Otherwise points of image are out of focus.

RIGHT
In this sketch lens plane and focal plane correspond with plane of surface of object. All points are in focus.

WRONG
Lens held too far from eye prevents many of the rays from entering eye. Excessive light floods lens causing bothersome reflections.

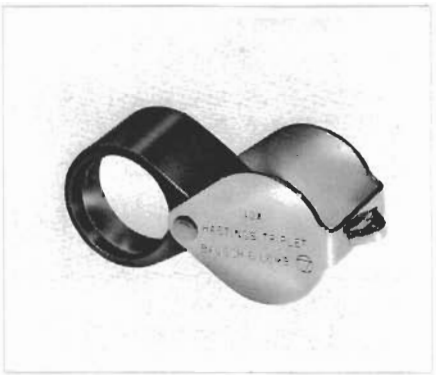
RIGHT
Magnifier is up close to eye, but in this case lens is of high power, working distance is therefore short so object is brought up toward the lens until it comes into "focus" at a very near point.

RIGHT
Large lens types such as readers are designed to be held away from the eye. Powers are low.

CATALOG OF BAUSCH & LOMB MAGNIFIERS

HASTINGS TRIPLETS

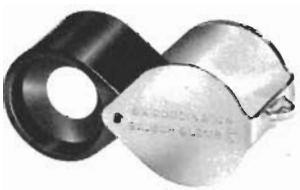
The Hastings lens consists of three separate lenses made of different types of glass each ground and polished to instrument quality standards and cemented together. The next step up in image quality beyond this magnifier is a microscope.



Catalog No.	Focus	Power
81-61-68	1½″	7×
81-61-71	1″	10×
81-61-75	¾″	14×
81-61-81	½″	20×

CODDINGTONS

These magnifiers achieve their correction through the use of a single thick lens with a central groove diaphragm. The two lens surfaces are held to instrument tolerances. The image quality of a Coddington is second only to a Hastings Triplet among magnifiers.



Catalog No.	Focus	Power
81-61-25	2″	5×
81-61-27	1½″	7×
81-61-31	1″	10×
81-61-35	¾″	14×
81-61-41	½″	20×

ILLUMINATED CODDINGTONS

The Coddington lens achieves its correction by being thick and having a deep groove in its body. A flashlight bulb can be inserted into this groove so that light is sent through the lens. In effect, the lens itself illuminates the object being examined. This eliminates one of the greatest drawbacks to using a high-power magnifier—the difficulty of getting enough light on the object. The instrument easily fits the pocket since the body is that of a penlight flashlight. (Batteries not furnished.) Available in two magnifications, 5× and 10× No. 81-34-34, 10× and No. 81-34-41, 5×.

MEASURING MAGNIFIER

An indispensable tool wherever precision work is performed. Allows easy measurements on flat objects of 0.005 inch, 0.1 millimeters, single degrees, etc. A flat, sharp image is provided by the 7× Hastings lens which is adjustable for individual focus. The transparent body allows adequate illumination. The four scales are quickly interchangeable.

81-34-35 Magnifier, leather case, no scale

81-34-36 General Purpose Scale for measuring radii from 1/16″ to ⅝″, angles in single degrees, 0.005″, 0.1 mm, line thickness of .001″, .002″, 003″

81-34-37 Inch Scale, ¾″ in 0.005″ intervals

81-34-38 Metric Scale, 20 mm in 0.1 mm intervals

81-34-39 Protractor Scale, 360° in single degrees

FOLDING POCKET MAGNIFIERS

The range of sizes and powers has made this style a favorite for decades. Also, the fact that one small unit can provide several different powers gives them great versatility. The two-lens models have three different magnifications, the three lens model, the 81-23-67, has seven. The cases and lens mounts are ebony plastic.

Catalog No.	Lens Size (mm)	Power
81-23-44	23 (1 lens)	4 ×
81-23-45	23 (1 lens)	5 ×
81-23-53	35 (1 lens)	3 ×
81-23-54	35 (1 lens)	4 ×
81-23-63	35 (2 lens)	3 × to 7 ×
81-23-64	23 (2 lens)	4 × to 9 ×
81-23-65	20 (2 lens)	5 × to 12 ×
81-23-67	17, 20 (3 lens)	5 × to 20 ×

LINEN TESTER

This folding magnifier got its name originally from its use by textile men to count threads in fabric or analyze patterns. Today it is widely used throughout industry whenever a fixed-focused, easily-carried glass is desired. Precision-made of aluminum, it folds flat to vest-pocket size. Supplied with leather carrying case. Double-lens construction provides a wide, flat field at 5 power. No. 81-34-46.

DOUBLE LENS MAGNIFIER

This magnifier offers an unusually wide and flat field for 3.5 power magnification. Originally designed for the exacting work of hand tooling photo-engraved printing plates, it has found universal application in precision work. A special feature is the way it fits the curve of the hand between the thumb and index finger. Has two plano-convex lens 1⅝" diameter. The body is a tough, black plastic. Can be used with the Adjustable Stand by means of the adapter.

81-34-76 Double Lens Magnifier

81-34-72 Adjustable Stand Adapter

MAGNA-VISOR HEADBAND MAGNIFIER

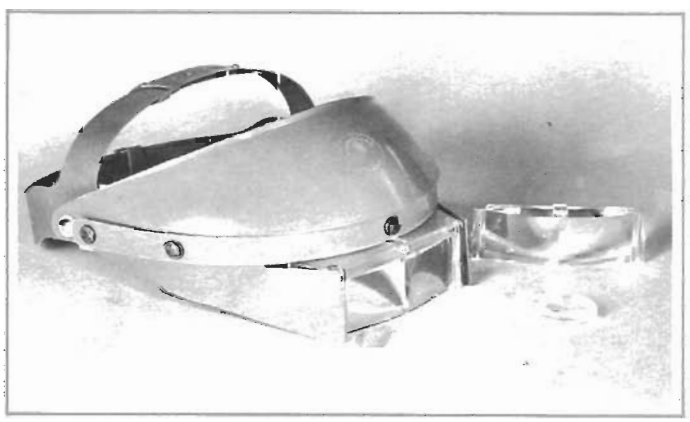
Because it permits normal use of both eyes, this comfortable headband magnifier improves accuracy and working ease of anyone doing "close" work. The top-quality lenses are made of optical-grade plastic and follow ophthalmic principles to eliminate eye strain and the annoying central dividing line. Lenses snap in and out for easy interchangeability.

The durable, feather-light headgear is completely adjustable for a firm, but not tight, fit. The forehead band has a foam plastic cushion. Visor and lens assembly can be tilted up out of the way. There is no interference with the wearing of corrective or safety glasses.

Opaque side shields, shown in the picture are removable for clear side vision. A swing-away auxiliary lens provides extra magnification for intermittent use over either eye.

81-42-10-01	Magna-Visor with 1½× lens
81-42-10-02	With 2¼× lens
81-42-10-03	With 3½× lens
81-42-10-10	With all 3 lenses
81-42-01	1½× lens only
81-42-02	2¼× lens only
81-42-03	3½× lens only
81-42-09	Auxiliary lens*
81-42-10	Magna-Visor less lens

*3.4× with 1½× lens, 4.1× with 2¼×, 5.2× with 3½× lens.



ILLUMINATED 5× HASTINGS

This lens was originally designed at the request of our Manager of Quality Control for certain critical inspections. It combines near perfect optical quality with a wide field and long working distance. The magnifier can be used as a lens cell in the fingers or by means of the detachable handle. Also, it can be snapped into a tripod holder or an illuminated housing available in either battery (2 flashlight cells) or 115 volt operated forms.

81-34-05-10	5× Hastings Triplet with Handle and Tripod
81-34-05-12	5× Hastings Triplet with Battery Illuminator
81-34-05-14	5× Hastings Triplet with 115V Illuminator
81-34-08-12	Battery Illuminator only
81-34-08-14	115 Volt Illuminator only

VERNIER MAGNIFIER

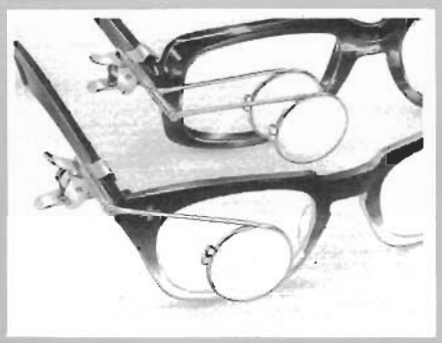
Vernier calipers, height gauges, or any metal rule can be read more easily and more accurately with this inexpensive 2× magnifier. The Vernier Magnifier provides a clear, undistorted view of scale lines and figures. The clear plastic body admits light from all directions. Permanent Alnico magnets affix it securely to any ferrous metal. No. 81-34-02.

LOUPES

Bausch & Lomb Loupes have been the standard for industry and watchmaking throughout the years. Lightweight, easy to wear, they are available in a complete range of powers from 2× through 18×.

EYEGLASS LOUPES

- Attaches to eyeglass temple
- Flips easily out of way
- 7 styles, powers 3× to 7×



Catalog Number	Working Distance in Inches	Magnification
81-41-17	3.3	3×
81-41-18	3	3.3×
81-41-27	2.5	4×
81-41-37	2	5×
81-41-47	1.5	7×
81-41-78	2.5, 1.5	4, 7×
81-41-79	3.3, 2	3, 5×

WATCHMAKER'S LOUPES

- Lightweight, sturdy plastic mount
- Available with head band or spectacle holder

Catalog Number	Working Distance in Inches	Magnification	Lens Dia.
Standard			
81-41-12	1	10×	⅜"
81-41-70	1	10×	1
81-41-71	1.5	7×	1
81-41-72	2	5×	1
81-41-73	2.5	4×	1
81-41-74	3	3.3×	1
81-41-75	3.5	3×	1
81-41-76	4	2.5×	1
81-41-77	5	2×	1
81-41-08	.5, 1¼	8, 18×	.5, 1
81-41-05	1.5, 2.5	4, 7×	.5, 1
Triple Aplanatic			
81-41-13	1	10×	.5
Standard, with headband			
81-41-06	1.5, 2.5	4, 7×	.5, 1
81-41-09	.5, 1¼	8, 18×	.5, 1
81-41-90	1	10×	1
81-41-91	1.5	7×	1
81-41-92	2	5×	1
81-41-93	2.5	4×	1
81-41-94	3	3.3×	1
81-41-95	3.5	3×	1
81-41-96	4	2.5×	1
81-41-97	5	2×	1
81-41-99 Loupe Holder for Spectacles			

RAY-BAN LOUPES

Work on highly-polished surfaces can be difficult due to glare which obscures detail and causes eyestrain. With a lens made of Ray-Ban glass, these loupes reduce glare to a comfortable level and increase contrast for better detail rendition.

Catalog Number	Working Distance in Inches	Magnification
Standard		
81-41-56*	1.5, 2.5	4, 7×
81-41-57*	2.5	4×
81-41-66	1.5, 2.5	4, 7×
81-41-67	2.5	4×
Eyeglass		
81-41-68	2.5	4×
81-41-69	1.5, 2.5	4, 7×

*With headband

STAND MAGNIFIERS

ILLUMINATED STAND MAGNIFIER

This magnifier has such a wide range of uses in industry, schools, office, laboratory and hobbies that it would be impractical to list them. Both the lens and light are adjustable. With the lens tilted, small hand-held objects can be worked on or inspected. With the lens parallel to the work surface anything laid beneath it is in focus.

The lens is 2″ x 4″ and the lamp is a 7-watt, 115-volt. The stand is chromium-plated steel rod. Lens mount and lamp housing are gray plastic. Plastic sleeves on the feet protect even highly finished working surfaces.

81-34-80 Illuminated Stand Magnifier

ADJUSTABLE STAND MAGNIFIER

These instruments find their greatest use in industry for small parts assembly and inspection. The rectangular lens is 2″ x 4″. For description of Double Lens Magnifier, see page 9.

- Stable, heavy construction
- Ball and socket lens adjustment
- Durable wrinkled enamel finish
- Accessory illuminating lamp

Item	Catalog No.
Adjustable Stand with Rectangular Lens	81-34-66
Adjustable Stand with Double Lens Magnifier	81-34-62-76
Adjustable Stand with Ferrule only	81-34-62
Illuminating Attachment, 110-Volt complete	81-34-64-01
Extra Bulb for above	21-65-31

ILLUMINATED INDUSTRIAL MAGNIFIER

Enhanced vision for every worker engaged in small parts manufacture, assembly or inspection is certain to save money. Jobs go faster and easier and workers are more comfortable. This magnifier was designed to provide those benefits in the best possible way. It allows the natural use of both eyes and normal movement of the head. The top-quality 5-inch lens and the full-field, shadowless lighting provide maximum acuity and visual comfort. The lamp housing stays cool in prolonged use. Working distance between lens and object is 7 inches and there is a considerable depth of focus. The lens is easily adjusted by the user to the desired position where it will remain without clamping.

The unit is offered with either a 24-inch extension or a 36-inch extension arm. Both have the same lamp, lens and housing. The 24-inch can be used with any of the three bases shown; the portable circular base, the clamp-on or the permanent bench mount. The 36-inch arm does not use the portable base. Either arm can be mounted at the back of the bench or on the side, since the lens can be rotated 200 degrees. The bases allow the arms to turn through 360 degrees. The finish is a smooth light gray easily kept clean.

The lamp is a standard white fluorescent circline with a 7500 hour life (about 4 years) and can be replaced locally.

The 3-diopter, 5-inch lens is made of the same glass and to the same standard as the best eyeglass lenses. An auxiliary lens is offered which doubles the magnification.

81-75-02	Model IA, 36″ extension arm magnifier with clamp base, 3-wire cord	81-75-08	Model IVA, 24″ extension arm magnifier with clamp base, 3-wire cord
81-75-04	Model IIA, 36″ extension arm magnifier with permanent bench mount, 3-wire cord	81-75-10	Model VA, 24″ extension arm magnifier with permanent bench mount, 3-wire cord
81-75-06	Model IIIA, 24″ extension arm magnifier with portable base, 3-wire cord	81-75-12	Auxiliary Lens

READERS

As the name suggests, Readers are magnifiers designed to aid in reading such items as books, magazines and newspapers. However, this is not their only application. Readers are useful in any activity that requires comparatively low magnification with a large field of view. For example, in studying maps or plans, or for the preliminary scanning of a large area in order to select small areas for closer examination under high magnification.

ROUND READERS

These new contemporary-styled readers offer–

- Excellent human-engineered balance
- Protection against lens chipping

RECTANGULAR READERS

- 2″ x 4″ lens, 9″ focus
- Light weight, balanced design for long, tireless use

Color	Catalog No.
Ebony	81-33-76
Powder Blue	81-33-72

ILLUMINATED RECTANGULAR READER

All the advantages of the Rectangular Reader plus–

- Self-contained illumination. A miniature 110-volt bulb floods the reading area with light
- 2″ x 4″ lens, 9″ focus

Color	Catalog No.
Ebony	81-33-86
Bulb, pkg. of three	81-33-86-106

Item	Catalog No.	Diameter	Focus
Round Readers	81-33-02	2″	6″
	81-33-03	3″	8″
	81-33-04	4″	10″
	81-33-05	5″	13″

GLOSSARY

aberration—The failure of a lens to bring all the rays of light to exact focus.

achromatic—A lens which corrects for chromatic aberration; gives an image free from extraneous colors.

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

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

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

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

coma—A defect affecting points not in the center of a field caused by different magnifications in various zones of the lens, so named from the comet shaped image of a point formed by a lens exhibiting coma.

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

convex—Describes a lens surface which bulges; as the exterior of a sphere.

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

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.

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.

doublet—A pair of lenses cemented together to form a single lens element.

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

field of view—That area which can be seen through a magnifier lens when held at the proper distance from an object.

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.

focal length—The distance from a lens to the focus of light from a distant object.

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

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

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.

object—That at which one looks through a magnifier; the part, particle or surface being viewed.

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 ratio of the speed of light in air to its speed in another medium. This ratio determines the amount of bending of light rays.

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.