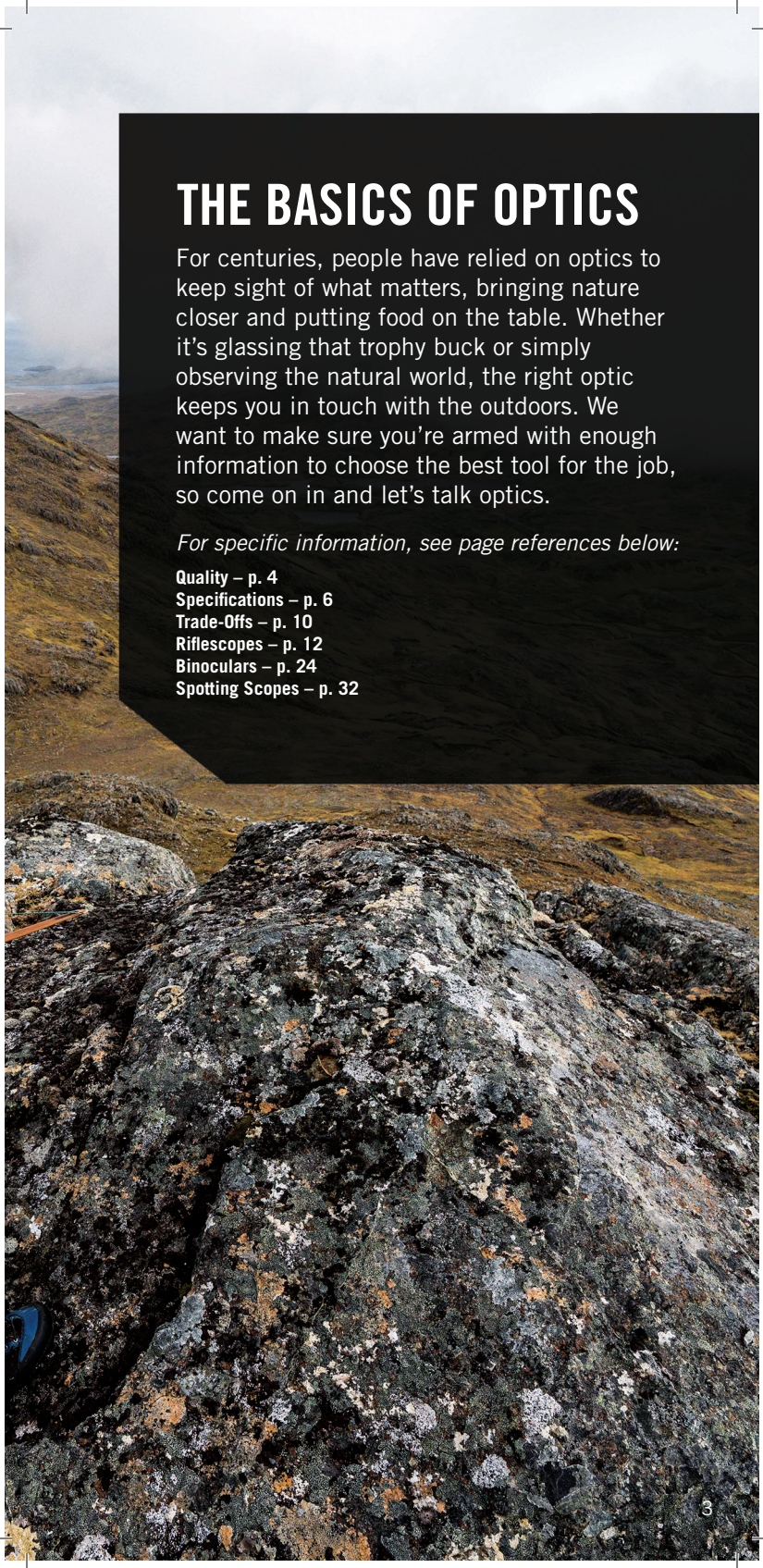

VORTEX®
ALL ABOUT OPTICS



THE BASICS OF OPTICS

For centuries, people have relied on optics to keep sight of what matters, bringing nature closer and putting food on the table. Whether it's glassing that trophy buck or simply observing the natural world, the right optic keeps you in touch with the outdoors. We want to make sure you're armed with enough information to choose the best tool for the job, so come on in and let's talk optics.

For specific information, see page references below:

DETERMINING QUALITY

Quality optics use dense optical glass that is painstakingly designed, shaped, and polished to eliminate flaws. When a product features more sophisticated optical design techniques and glass, the results are better images. The quality of the optical glass will make a difference in how bright, sharp, and colorful a view will be.

CONSTRUCTION

You may pay more for products using higher quality materials, more sophisticated designs, and stricter tolerances, but this leads to greater reliability in the field.

> **Waterproof / Fogproof** binoculars are sealed with o-rings to inhibit moisture, dust, and debris. The inside of the binocular is then purged of atmospheric air and filled with an inert gas (such as nitrogen or argon) with no moisture content. This prevents internal fogging from high humidity, altitude, and temperature changes.

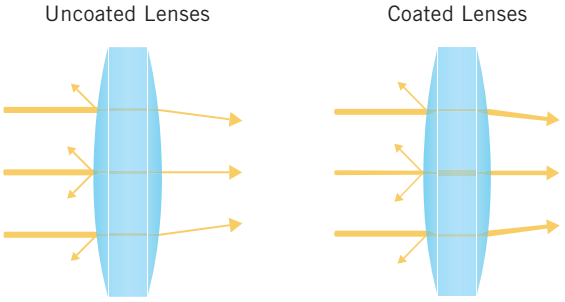
☑**TIP** Investing in higher quality optics yields better optical performance and greater reliability when it counts.

ANTI-REFLECTIVE LENS COATINGS

Anti-reflective coatings increase the amount of light that passes through the optical system so more light gets to your eye.

Metallic compounds, such as magnesium fluoride, are vaporized and applied to the optical glass in extremely thin layers to reduce internal reflections, light scattering, and glare. The result of adding more layers of an anti-reflective lens coating to a greater number of glass surfaces is an improvement in image brightness, sharpness, and contrast in low light scenarios.

Each time light strikes an uncoated glass surface about 4-5 percent of the light is reflected. Without lens coatings, almost 50 percent of the light could be lost as it passes through the multiple air-to-glass surfaces of a standard binocular or spotting scope.



☑**TIP** The application of more coatings results in an increase of light transmission, resolution, contrast, and color fidelity.

SPECIFICATIONS

It's important to know what features you need based on your optic's application. What follows is an explanation of basic features and specifications to help you select optics that will perform to the level you need when in the field.

EYE RELIEF

Eye relief refers to the distance between the ocular lens and where the image comes into focus, displaying the entire field of view. Proper eye relief is important for safe, comfortable viewing.

Riflescopes: A minimum distance of three inches or more provides safe eye relief.

Binoculars & Spotting Scopes: Proper eye relief is important to people who wear eyeglasses or sunglasses while looking through optics. However, anyone planning to view for long stretches of time will also benefit from optics with longer eye relief.

Twist-Style Eyecups

Fold-Style Eyecups

Adjustable eyecups allow for the best viewing if you wear eyeglasses. Eyecups that twist up or fold back are common styles that are easily adjusted to accommodate eyeglasses or sunglasses.

CLOSE FOCUS

This is the minimum distance to which you can focus an optic on your subject. Close focus is more important for some applications than others. For example, many binoculars will focus down to ten feet or less—a feature that's especially important for watching butterflies, insects, and birds.

FIELD OF VIEW

Another important measurement is the field of view. When looking through an optic, you'll see the field of view as the area between the left and right edges of the image. The field of view can be measured either in linear feet or in angular degrees. (One degree equals 52.5 feet at 1000 yards.)

Riflescopes: Measured in feet @ 100 yards

Binoculars: Measured in feet @ 1,000 yards

Spotting Scopes: Measured in feet @ 1,000 yards

Field of View

A wide field of view has advantages when following fast-moving action or scanning dense habitats. When comparing optics with the same size objective lenses, higher magnifications will generally have a narrower field of view.

EXIT PUPIL

This is the beam of light that exits each eyepiece and enters the user's eyes. You'll want to have an exit pupil that's adequate for your lighting situation. A person's pupil can dilate from roughly 2mm to 8mm, depending on the person's age and the lighting situation.

> **In bright light** the pupil will dilate to about 2mm–3mm.
>
> **At dawn or dusk** the pupil will dilate to about 4mm–5mm.
>
> **At night** the pupil will dilate to about 7mm–8mm.

A larger exit pupil will deliver brighter images—especially under low light conditions.

Exit Pupil

Look for the exit pupil by holding the optics a short distance from your face—seen here as clear circles in the center of the eyepiece.

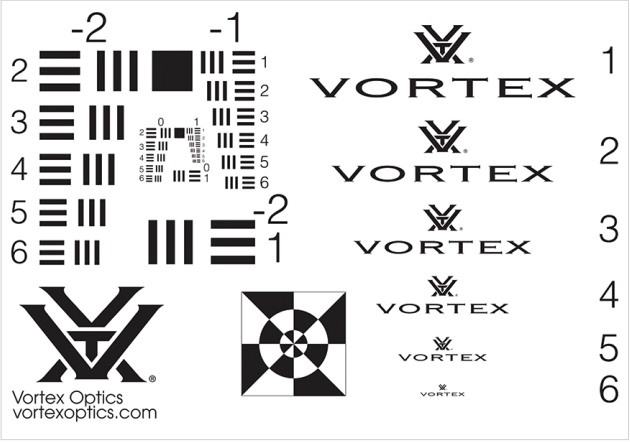
☑**TIP** Calculate the exit pupil by dividing the objective lens by the magnification.

Example: 10x42 Binocular
42 ÷ 10 = 4.2mm

RESOLUTION

Resolution refers an optic's ability to distinguish details. A resolution chart contains groups of lines set in a series with progressively smaller spacing—a design used to ascertain the limiting number of lines per millimeter that optics can resolve.

Resolution Chart



☑**TIP** Use a resolution chart to determine how well a binocular, spotting scope, or riflescope can resolve fine details.

WARRANTY

A manufacturer's warranty ought to be considered a feature of the optic—especially when you'll be using the optic outdoors where anything can happen. Most warranties are limited only to initial defects with no protection from accidental damage or regular wear and tear. Progressive warranties cover optics in any situation, no matter what happens or who is at fault.

☑**TIP** The Vortex VIP warranty is an unconditional, unlimited, lifetime warranty that offers the ultimate in customer service and protection for your optics.

TRADE-OFFS TO CONSIDER

OBJECTIVE LENS SIZE

Objective lens size is the main trade-off to consider. A larger objective lens will deliver brighter images, especially under low-light conditions, but it will be heavier and bulkier than a smaller lens. Think about how much you want to carry!

OPTICAL GLASS QUALITY

Optical glass changes in weight as quality increases. Vortex offsets the extra weight of high-quality glass components by using rugged, yet lightweight, housing materials.

MAGNIFICATION

Choosing the higher magnification option has benefits, but it may not always be the best choice.

> **Binoculars:** As the magnification increases, you'll see a shallower depth of field, a diminished field of view, a darker image, and you'll have a greater chance of image shake.
>
> **Spotting Scopes:** As the magnification increases, you'll see a reduction in image brightness.

CLOSE FOCUS AND DEPTH OF FIELD

In general, optics with a tight close focus will have a shallow depth of field.

MORE OPTICS TERMS

Alignment or Collimation: All elements (lenses or prisms) are in line along the optical axis. The misalignment of elements results in diminished performance and can cause eye strain and fatigue.

Astigmatism: Because the lenses in a binocular or spotting scope usually have a curved shape, the light rays passing through the lens will not all converge on the same focal plane. If this physical reality isn't remedied in the overall optical design, images will either be in focus in the center area or at the edge, but not in both areas at the same time. Astigmatism cannot be eliminated completely, but it can be kept to a minimum. Avoid optics that exhibit too much astigmatism.

Chromatic Aberrations: Diminished resolution and color fidelity display as green or purple fringing. Different colors move at different wavelengths and will have different focal lengths when passing through optical glass. The XD and ED glass types reduce or eliminate this inherent problem.

Contrast: This refers to differences in brightness between the light and dark areas of an image. Because we see much of the color spectrum, contrast also refers to differences in the dimensions of hue, saturation, brightness, or lightness. Optics with superior contrast transmit colors that appear very dense and well-saturated.

Edge Distortion: This is the inability of an optical system to deliver an image that is a true-to-scale reproduction of an object. There are two types of distortion: barrel and pincushion. In either case, the distortion is due to a poor or compromised optical design. Any binocular or scope that exhibits distortion should be avoided.

Barrel Distortion: Image bows outward and looks bulged.

Pincushion Distortion: Image bends inward.

Light Transmission: This is the percentage of light that passes through the binocular, spotting scope, or riflescope to reach the user's eyes. Light transmission will be higher through more expensive optics than through modestly priced optics due to better optical designs, glass quality, and improved optical coatings.

Resolution: Essentially the same as image sharpness, resolution is the ability of an optic to separate and distinguish image detail.


VORTEX
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THE ORIGINAL

RIFLESCOPES

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Shoot near, far, and everywhere in between: Riflescopes and their features are as varied as the firearms they sit atop. From long-distance bolt guns to close-quarters carbines, the rifle, and its intended application, dictates which scope makes the best fit. Understanding a few basics will bring your best choice into focus.

UNDERSTANDING THE CONTROLS

Riflescopes have several adjustable features. When broken down to the basics, many are commonly shared and relatively simple. Once you understand basic terms and their functions, you'll be able to select the right riflescope with pinpoint accuracy.

TUBE DIAMETER

Riflescope main tubes come in several diameters, including 1", 30mm, 34mm, and 35mm rings. Larger diameter tubes can provide increased travel ranges for windage and elevation adjustments, as well as stronger housing. Being aware of tube diameter is also very important when selecting rings.

☑**TIP** A common misconception about tube diameter is that a larger tube provides a brighter image. This is not usually the case.

OCULAR FOCUS

Use the ocular focus to tune the reticle image for maximum sharpness. This adjustment will be slightly different for every shooter, and only needs to be set one time. To adjust, begin by backing out the focus ring until the the reticle is fuzzy. Adjust your optic to the highest magnification, and set your parallax to infinity (if adjustable). Look at a white wall or a clear blue sky while taking short, quick looks through the scope, turning the focus ring in until the reticle image is sharp and crisp immediately upon viewing. Do NOT use this focus to adjust the target image.

Adjusting Ocular Focus

MAGNIFICATION ADJUSTMENT

Use the magnification adjustment to change the "power" level of the riflescope. Adjust from low to high magnification depending on the shooter's preference.

> **Lower Magnifications** provide brighter images and wider fields of view which can be helpful in low-light, close-range shooting, and with moving targets.
>
> **Higher Magnifications** have narrower fields of view and dimmer images, but are better at shooting smaller targets at longer ranges.

Adjust the Magnification

ELEVATION AND WINDAGE TURRETS

Turrets are used to adjust the bullet's point of impact and are marked in either MOA or MRAD scales. Turrets come in several styles to account for individual user preferences.

Exposed, target-style turrets are used by long-range shooters who routinely "dial" elevation corrections for bullet drop at long range.

Capped-style turrets are often used by shorter-range shooters and hunters who prefer more security and a lower profile.
Note: Shown with caps removed for clarity.

ARC MEASUREMENTS

Riflescopes will use one of two arc measurements: Milliradians (MRAD) or Minute of Angle (MOA). The arc measurements apply to both the turret adjustments and the reticle subtensions (or hashmarks).

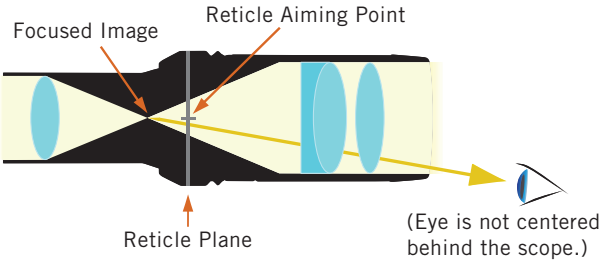
Milliradians (MRAD) arc measurements are based on the concept of the radian. When a section of the circumference of a circle is equal to its radius, the resulting angle is a radian. By dividing that angle into 1000 equal sections, the result is a milliradian. An MRAD is 1/1000th of any unit of measure.

Minute-of-Angle (MOA) arc measurements are based on the concept of a degree. Minute refers to 1/60th, and angle refers to 360 degrees of a circle. So, a Minute of Angle is 1/60th of one degree. One MOA will always subtend 1.05" for each 100 yds. of distance, or 3 cm for each 100 m of distance.

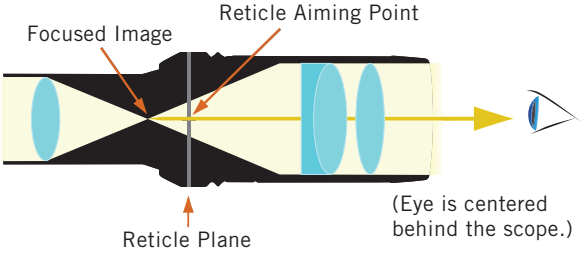
PARALLAX

WHAT IS PARALLAX?

Parallax is a phenomenon that results when the target image does not quite fall on the same optical plane as the reticle within the scope. This can cause an apparent movement of the reticle in relation to the target if the shooter's eye is off-center. When the target image is not focused on the reticle plane and your eye is off-center behind the scope, parallax occurs. This is because the line of sight from the eye to the focused target image does not coincide with the reticle aiming point.



When the target image is not focused on the reticle plane and your eye is centered directly behind the scope, no parallax occurs. This is because the line of sight from the eye to the focused target image coincides with the reticle aiming point.



☑**TIP** Correctly focus the target image so it falls on the same optical plane as the reticle within the riflescope.

When the target image is focused on the reticle plane, parallax cannot occur, even if your eye is not centered behind the scope. This is because the line of sight from the eye to the focused target image always coincides with the reticle aiming point no matter where you position your eye.

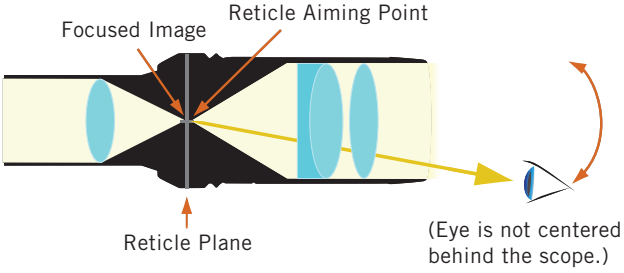


IMAGE SHARPNESS/ PARALLAX ADJUSTMENT

Some riflescope models feature an adjustment that allows you to tune the target image for maximum sharpness and remove any parallax. This adjustment may be on the objective lens or near the turrets on the riflescope's side.

Adjustable Objective Lens Focus: This adjustment dial is marked with approximate yardages to aid in initial setting and should be matched to the target distance. Final focus setting should be checked by moving your head back and forth slightly, watching for any shift of the reticle on the target (parallax). If shift is observed, the dial should be adjusted slightly until shift is removed. Once this focus is correctly set, shooting errors due to parallax will be eliminated.

Adjustable Objective Lens Focus

Side Focus Adjustment: This adjustment serves the exact same purpose as an adjustable objective, but is more conveniently located on the left side of the riflescope.

Adjustable Side Focus

RETICLE ILLUMINATION ADJUSTMENT

Some riflescopes are equipped with an illuminated reticle. Reticle illumination adjustment "lights up" all or a portion of the reticle allowing it to be more easily seen against a dark background. The intensity level can usually be adjusted and is commonly placed on the ocular or left side of the scope, though it can be located in other positions. Illumination is normally powered by a small battery.

Illumination Adjustment Knob

ZERO STOP ADJUSTMENT

Some riflescopes are equipped with a zero stop, which provides a reliable return to the original zero when long distance shots have been dialed. This feature is particularly useful when dialing large, multi-revolution elevation corrections. Without this feature, the shooter must pay very careful attention when dialing these large corrections. If the shooter loses track of the number of revolutions, the original zero point may become lost when returning the adjustment. The zero stop allows the elevation turret to be quickly spun back to original zero without having to carefully count revolutions or clicks.

Adjusting the Zero Point

THE NUMBERS

THE RIFLESCOPE CONFIGURATION

Magnification is indicated by the first set of numbers on the scope. For example, the magnification on a 4-16x50 riflescope ranges from 4x to 16x. Some riflescopes do not have a zoom eyepiece and use a single number to indicate a fixed magnification, like a 2x20 scope.

Objective Lens Size is indicated by the last number on the scope. Returning to the 4-16x50 example, the 50 refers to the diameter of the scope's objective lens in millimeters. If all other things are equal, larger objectives can yield brighter images at high magnifications. This is an advantage for hunting at dusk and dawn, when animals are most active.

EYE RELIEF

With proper eye relief, there will be a gap between the shooter's eye and the ocular lens to protect your eye from the firearm's recoil. Keep in mind eye relief typically decreases as magnification increases.

UNDERSTANDING RETICLES

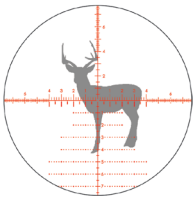
From a simple crosshair to first focal plane, hashmark-based, reticles with wind dot references—every reticle shines under the right conditions when paired with an appropriate firearm.

FIRST AND SECOND FOCAL PLANE RETICLES

All reticles will be termed either first (FFP) or second (SFP) focal plane, depending on their location within the riflescope.

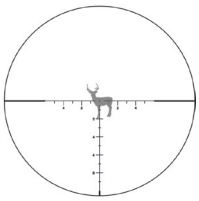
FFP: This style of reticle grows and shrinks as magnification is changed. Its main advantage is the reticle subtensions used for ranging, bullet drop compensation, and wind drift corrections are always accurate at any magnification.

Low Magnification

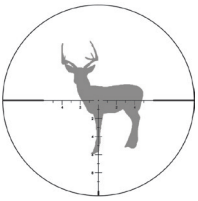


High Magnification

SFP: This style of reticle does not change size when magnification is changed. The advantage to this style of reticle is that it always maintains the same ideal visual appearance and will not appear “too fine” at low magnification or “too heavy” at high magnifications.



Low Magnification

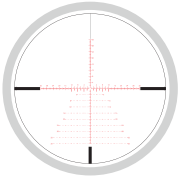


High Magnification

DIFFERENT RETICLE TYPES

TACTICAL RETICLES

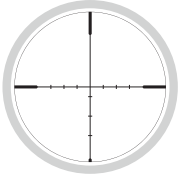
Designed to maximize long-distance shooting and ranging capabilities, tactical reticles use a variety of hashmark type patterns with MOA- or MRAD-based subtension lines for ranging, holdover, and windage corrections. These reticle designs can range from relatively simple to very elaborate. Most scopes using tactical style reticles will offer illumination for low-light use.



EBR-7C

BDC RETICLES

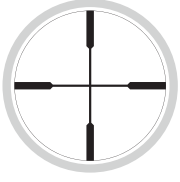
Typically used for hunting, these reticles are designed to minimize the need for guessing bullet holdover at longer distances. (In fact, BDC stands for Bullet Drop Compensation.) By selecting the appropriate reticle hashmark, a shooter has a reliable bullet drop reference for distances in approximately 100 yard increments. BDC reticles can be used effectively with a variety of firearms including high-powered rifles, rimfire rifles, black powder rifles, and slug shotguns. These reticles also provide reference marks, which can be used to compensate for bullet drift, which can be used to compensate for wind corrections, or when ranging distances.



Dead-Hold BDC

PLEX RETICLES

Simple and easy to use, plex reticles work for a wide variety of shooting activities. These designs are a two stage modified crosshair using heavier outer reticle lines for good low light visibility, along with finer inner lines for precision aiming. Some versions, such as the V-Brite, will incorporate an illuminated center dot for improved low light performance.



V-Plex

BINOCULARS

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What makes you want to see farther? After all, someone scouring a vast western landscape has different needs than one immersed in a stand of Midwest hardwoods. Today's binoculars are feature rich, with plenty of options to choose from. Let's make sure the next time you head into the field, you're carrying an optic that's easy on the eyes.

BINOCULAR DESIGN

The main binocular designs are Roof prism and Porro prism. These designs come in a variety of weights and sizes.

ROOF PRISM

Named for the roof-like appearance of the prisms, the roof prism binocular has objective lenses and eyepieces positioned in a straight line, and is appreciated for a streamlined, durable chassis. Phase correction coatings on the prism glass keep the light in correct color phases, enhancing the resolution, contrast, and color fidelity.

Abbe-Koenig Prism The Abbe-Koenig prism is named after Ernst Abbe and Albert Koenig, and is one type of roof prism. These are a larger prism system that has a longer optical path length. The prism is actually two glass prisms cemented together that form a symmetric "V" shape. This prism design provides a sharper image resolution, cuts chromatic aberration, and has an improved edge-to-edge clarity over the standard roof-prism style binoculars. To fit the larger prisms the overall body must be larger.

PORRO PRISM

Many people will recognize the traditional binocular shape of a Porro prism by its offset barrels. Named after the Italian optical designer Ignazio Porro, this type of binocular has objective lenses spaced wider apart than the eyepieces. This design offers a rich depth of field, wide field of view, a three-dimensional image, and delivers good quality at a reasonable cost.

Reverse Porro Prism The reverse Porro prism is a compact version of the full-size Porro prism binocular with the eyepieces spaced wider apart than the objective lenses. These binoculars are the ultimate in on-the-go glassing, allowing for strong magnification in a durable, lightweight package.

THE NUMBERS

IDENTIFYING THE CONFIGURATION

When you look at your binocular, you'll notice numbers like 10x42 (read as "ten by forty two") printed on the focus ring.

10 x 42 Model

The first number (10x) refers to the magnification provided by the binocular (or how many times larger an object will appear than when viewed without magnification). Binoculars vary in magnification, but 8x and 10x are most common.

☑**TIP** As magnification increases, it may become difficult to keep your handheld binoculars steady. To minimize image shake at highly magnified distances, you may opt to use your binocular with a tripod. Additionally, increased magnification generally causes a decrease in image brightness. Magnification 7x or 8x is considered adequate for woodland settings, while 10x is preferred for viewing at greater distances.

The second number (42) refers to the diameter of the objective lens in millimeters. Objective lenses vary in size from 15mm to 56mm and beyond. The size of the objective lens determines how much light the binoculars can receive and how bright the resulting images will be. The objective lens' size also impacts the size of a binocular.

Exit pupil is especially important for viewing in low light conditions. If your primary time for viewing is during the bright light of day, then a binocular with a smaller exit pupil (less than 4mm) will do just fine. If you want the brightest possible image during near-dark conditions, you'll want to choose a binocular with an exit pupil greater than 5mm.

Wide field of view has advantages when following fast-moving action and scanning dense habitats. The field of view is measured in feet at 1,000 yards or degrees.

Example: 388 feet @ 1000 yards
6.0 degrees

Close-focus binoculars will focus down to ten feet or less. This feature is especially important for watching birds or insects.

BASIC ADJUSTMENTS

ADJUST THE INTERPUPILLARY DISTANCE

The interpupillary distance (IPD) is a measurement of the distance between the center of a person's left and right pupils. A binocular also has an IPD range and it can be adjusted to fit the viewer.

The hinged design of a binocular allows you to match the IPD of your eyes to the binoculars so you see a single image free of shading. If the IPD is not correctly adjusted, you may see shading over part of the image.

To adjust your binocular's IPD, simply rotate the barrels inward or outward to line up the ocular lenses with your eyes.

ADJUST THE EYECUPS

Adjusting the eyecups up or down allows the user to see a full field of view. This is important for people who wear eyeglasses or sunglasses. The two main styles of eyecup design are:

Twist eyecups twist up and down. Multi-position eyecups let you choose the most comfortable position.

Flexible eyecups fold back for maximum eye relief with eyeglasses.

Twist Eyecups

Fold-Style Eyecups

With Glasses: If you wear eyeglasses or sunglasses, rest the binocular's eyecups against your glasses with the eyecups folded back or twisted down. If the eyecups stay fully extended when wearing eyeglasses, images will appear as if you're looking at them through a tunnel. Generally, an eye relief of 15mm or greater is preferred for users with glasses.

Without Glasses: If you do not wear eyeglasses or sunglasses, extend the eyecups to provide the proper distance for seeing the full field of view. How far the eye cups must be extended will be determined by the facial structure of the user.

PROPERLY FOCUS THE BINOCULAR

For the best view, follow this two-step process to properly adjust the center focus and diopter. Choose an object about 20 yards away and stay in the same spot until you've adjusted the binocular for your eyes.

1. Adjust the center focus: Start by closing your right eye, or covering the right objective lens with your hand. Focus your left eye on the object and adjust the center focus wheel until the image is in focus. Leave the center focus in this position as you adjust the diopter.

Adjust the center focus.

2. Adjust the diopter: Next, close your left eye or cover the left objective lens with your hand. Look through your right eye and adjust the diopter ring (generally found on the right eyepiece) until the object is in focus. Make note of this diopter setting in case you need to set it again. From this point on, you'll only need to use the center focus wheel.

Adjust the diopter setting.

☑**TIP** Some models feature a diopter that locks the setting. If the diopter locks, lift the diopter ring (or follow manufacturer instructions) to unlock. Then, adjust the diopter until the object is in focus as described above and lock the diopter ring.

SPOTTING SCOPES

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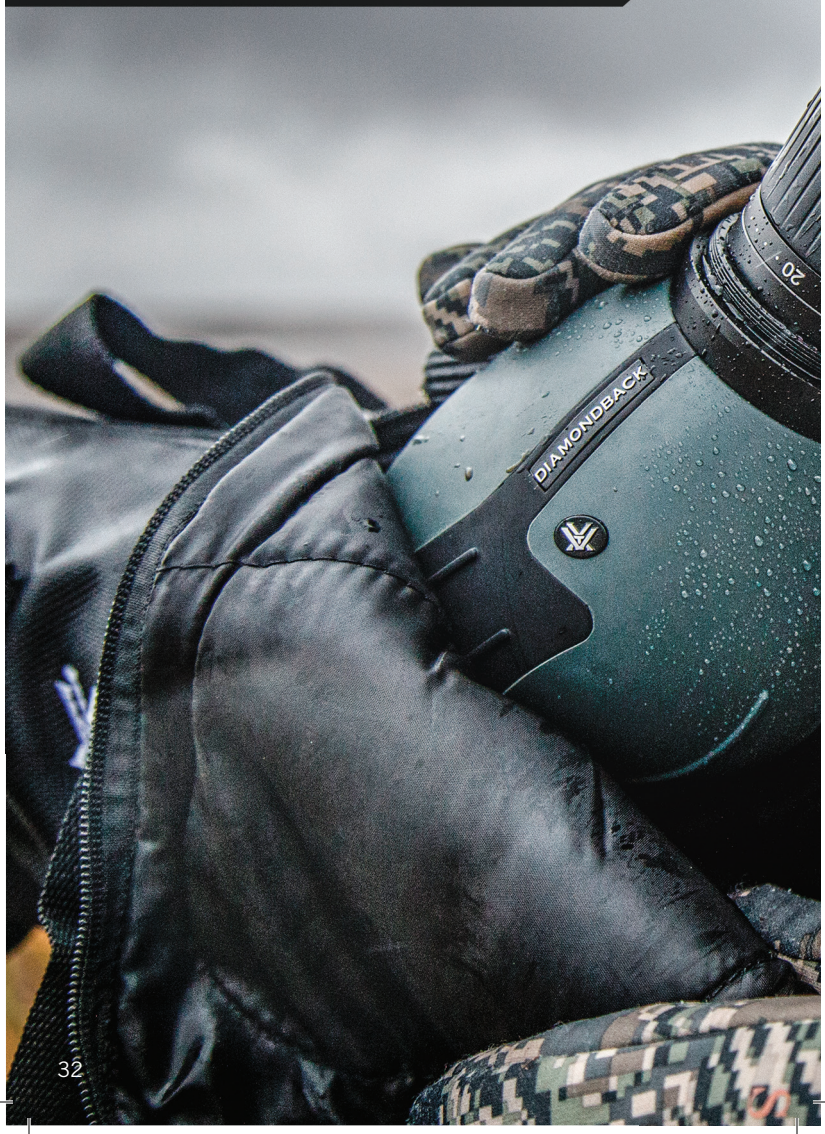
When true long-distance spotting and subject evaluation are the name of the game, it's time to break out a spotting scope. With modern spotting scopes, you don't have to choose between portability and clarity, but there are still some important decisions to make. Let's zoom in on the facts to make sure you find the right optic.



SPOTTING SCOPE DESIGN

Spotting scopes provide higher magnification than most binoculars, and are designed for viewing wildlife and landscapes at longer distances. In many cases, manufacturers make a spotting scope design available with both an angled and a straight body style. Though one design is not better than the other, each offers distinct advantages.

The angled body features an eyepiece set at a 45° angle. This style lets people of different heights share without adjusting the tripod. Because angled scopes can sit lower on a tripod, users benefit from added stability.

The straight body features an eyepiece in line with the objective lens. This natural line of sight works well with a car window mount, and allows for faster target acquisition..

THE NUMBERS

IDENTIFYING THE CONFIGURATION

A spotting scope's name includes a group of numbers such as 20–60x85. This range of numbers is called the configuration and indicates the magnification range and objective lens size.

The first set of numbers (20–60x) indicates the magnification range. Since spotting scopes feature high magnifications for long-distance viewing and large objective lenses, these optics must be mounted on a tripod.

☑**TIP** Some eyepieces vary in magnification and allow you to "zoom" from low to high power; other eyepieces are fixed at a single power. A fixed magnification eyepiece will generally yield different magnifications depending on the scope it is mounted to. For example, the same eyepiece that renders 18x on a 65mm scope will show that image at 23x on the 85mm version of the same scope.

The last number (85) indicates the size of the objective lens in millimeters. The size of the objective lens will directly impact the size and weight of the spotting scope.

☑**TIP** Spotting scopes with an objective lens 65mm or smaller allow for better packability. All other aspects held constant, a spotting scope with a larger objective lens, such as 85mm, will provide a brighter image with better image resolution especially at higher magnifications.

BASIC ADJUSTMENTS

ADJUST THE EYECUP

Spotting scopes typically feature an adjustable eyecup in one of two styles: twist or fold. Adjusting the eyecup up or down allows you to see a full field of view whether or not you wear eyeglasses.

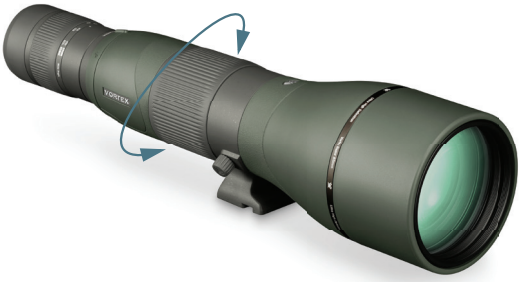
Twist Eyecup

ADJUST THE MAGNIFICATION

Change the magnification of your spotting scope by simply turning the magnification adjustment ring in a clockwise or counter-clockwise direction.

ADJUST THE FOCUS

After setting the magnification, some refocusing is usually required. To adjust the focus, rotate the focus dial until images become clear. Slowly turn the focus dial until the object is in focus.



ADJUST THE VIEWING ANGLE

Some spotting scopes provide a rotating tripod collar that allows you to rotate the spotting scope body for greater viewing flexibility.

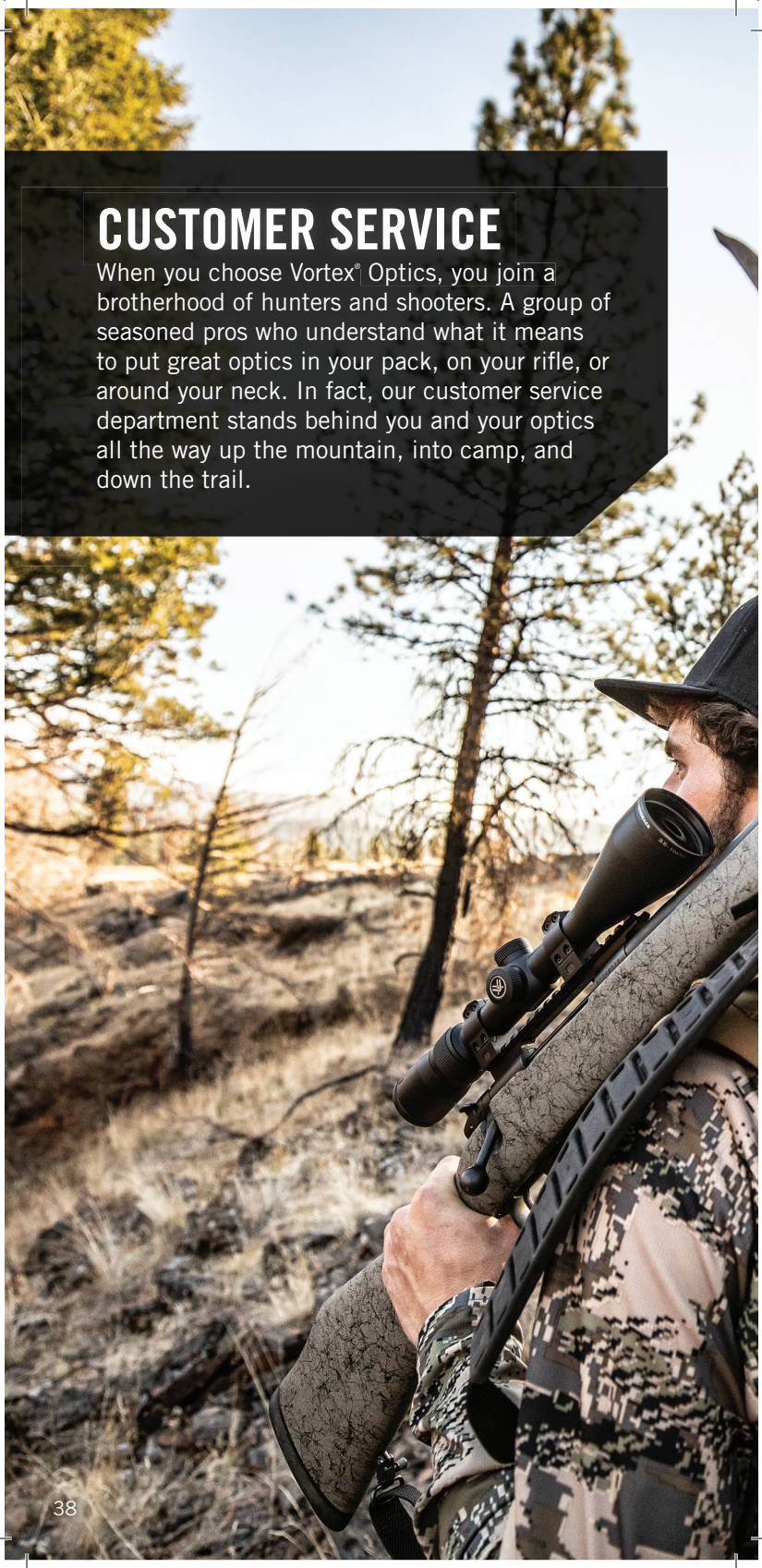
Rotating Tripod Collar

Rotate the spotting scope body for the most comfortable viewing.

ADJUST THE SUNSHADE

Some spotting scopes provide a built-in sunshade that extends to effectively block out stray light. The sunshade also shields the objective lens from mechanical damage and guards against soiling by fingerprints and precipitation.

This sunshade shield easily extends or retracts as needed.



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