# The R8 of riflescopes


Blaser

# Blaser Riflescope

## Everything at a glance

### Precise

- Reticle in the first focal plane: always same point of impact
- Operating elements made of sturdy metal (consistently reliable repeat accuracy)
- Thinnest reticle structrues for precise shooting

### Brillant

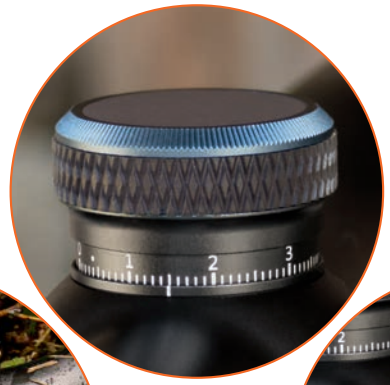
- Fluoride glass for superior sharpness of detail and contrast
- 7% additional light yield*
- 20x magnification to safely identify game

### Robust

- Extremly durable body and functional components
- Operating elements made of sturdy metal
- Handy fish-scale chequering
- Parallax compensation lockable
- QDC lockable in two positions

### Fully equipped

- QDC - Quick Distance Control
- Rail mounted
- Parallax compensation
- iC - Illumination Control
- IVD - Intelligent Variable Dot**





* with the 4-20x58 iC compared to other riflesscopes with 56mm objective lenses
** with the 1-7x28 iC

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## Why Blaser offers their own Optics

As a major weapon manufacturer, Blaser draws from **extensive experience with the practical use of hunting rifles** and a wide variety of optics. This knowledge and experience allows Blaser  the unique position of being tune their scopes in a special way to Blaser rifles. For Blaser, hunting is not just one topic among many in its product range, it is the clear focus of the business.

Located in Wetzlar, the **German Sports Optics (GSO)** was established as a company within the Blaser Group to develop the competence to engineer and manufacture the Blaser optics. Wetzlar being the "optics capital" of Germany, GSO was able to assemble a design and manufacturing team from specialists with professional backgrounds at other well-known optics manufacturers located in the area. Although optics are a relatively new product area for Blaser as a brand, there is a wealth of experience within the firm, and the competence of Blaser in the field of rifles and hunting complements the extensive industry experience in the GSO optics division.

For Blaser, the scopes are a logical first step to broadening the product range and just the beginning in terms of creating **synergies** between rifle and optics.

The tailoring of the riflescopes to Blaser rifles starts with the mounting rail, which on Blaser scopes is a standard feature and not the usual add-on that comes at an extra cost. This, together with the Blaser saddle mount, results in a simple, rugged and elegant mounting system. Furthermore, the **iC function** allows the reticle illumination to be switched on via the R8 and K95 cocking slide; considerably simplifying handling during the hunt. Last, but not least, the visual design of the rifle scopes was matched to the rifles.

None of this limits the use of Blaser scopes on another manufacturer's rifles. There are many mounting options for the Z-rail on almost any firearm and the reticle illumination is equipped with position and motion-activated shutdown functions that switch the illumination off and on in a practical manner.

Similar to the Blaser R8, it is not a single prominent feature, but the practical combination of several important features that make up the practicality of Blaser riflescopes:

Accuracy

- Optical Quality
- First Focal Plane reticle design principle

Safety

- Rugged Construction
- Repeatable Mechanics
- User interface concept helps to avoid mistakes

Ergonomics

- iC-Function, Synergy with Blaser R8/K95 and R93
- Controls on right side

Modularity

- Inner rail as standard, easy and damage-free installation possible, mounts for a wide variety of rifles available

Design

- Matched to Blaser Rifles

Versatility

- QDC – elevation adjustment turret; parallax adjustment
- Large adjustment range

## Three models, optimized for their respective applications

As probably the only premium manufacturer with a non-modular approach, Blaser does not rely on a so-called modular system for the different models of its riflescope line. Modular systems use the same components for the erector system and eyepiece throughout a line of scopes. The individual models are created by using objective systems with different focal lengths and diameters. This is recognizable by the fact that the different models of a series look the same from the eyepiece to the adjustment knobs.

With rifles such as the Blaser R8, a modular system can offer significant benefits for the customer by allowing the user to switch various components and reconfigure a rifle for different uses. Here, with the same basic components, a variety of combinations of calibers, barrel lengths and thicknesses, stock configurations, etc. are possible and offer flexibly for the customer. Unlike this

"customer reconfigurable" modular system, a "manufacturer's" modular system is only beneficial for the manufacturer and the finished product offers no additional benefit for the customer. The finished scope is not reconfigurable by the customer, it either has properties that are optimized and tailored to the application or not.

A modular system is cheaper for the manufacturer because of many common parts in construction and manufacturing, but can lead to compromises in the individual models when it comes to properties that are desirable for the customer.

Blaser is the only premium manufacturer to take a different approach and offers **three models as completely independent optical constructions with optimized properties for the respective field of application**. This requires more effort in terms of optical calculation due to three completely independent systems and in production due to significantly fewer common parts in terms of mechanics and optics.

This approach is apparent by looking at the three scope models in comparison and by their different proportions, with the rear part of the main tube between the ocular and the adjustment turret differing in length. This is because of the different range of movement of the erector lenses that are responsible for the variable magnification and that are optimized in a specific way for each model.

## Blaser 4-20x58 iC – Powerful low light performance

It was possible to design the 4-20x58 iC with a relatively short erector system because it has a **5x zoom ratio** and a **long objective focal length**. A short erector system allows for a relatively **compact design** despite the objective focal length chosen for **maximum image quality**. A long objective focal length produces a large internal image in the first focal plane, which only needs to be magnified 5x times by the erector system to reach the final magnification of 20x. Like in photography, where a large film format provides a better quality of the finished image because the negative has to be enlarged less; compared to using a smaller format, this allows for better image quality than using a short objective focal length and an erector system with a higher magnification in order to achieve the same final magnification of the image.

## Blaser 1-7x28 iC – Everything in Sight

For the 1-7x28 iC, on the other hand, the unique combination of image quality, **very large field of view**, and extremely **easy sight picture acquisition** at a **true 1x magnification** combined with the **high zoom ratio of 7x** and the large objective diameter of 28mm requires a relatively long erector system with larger movement range of the erector system lenses.

## Blaser 2.8-20x50 iC – Highest performance - compact package

The 2.8-20x50 iC also has a high **7x zoom factor**, but without the requirements which result from the 1x magnification, the erector system could still be designed relatively short, resulting in very high image quality in an **extremely compact riflescope** with a high maximum magnification of 20x.

## First focal plane reticle

Historical development of the reticle technology

- European premium riflescopes were originally built with reticles in the first focal plane
- With the advent of daylight bright reticles, switching the reticle placement to the second focal plane became necessary and this was marketed as a feature
- Today, very fine reticle structures with daylight bright illumination in the first image plane are possible
- When entering the market, Blaser was not restricted by compromises resulting from historical developments but rather able to make full use of the advanced state of technology
- This is why Blaser chose to combine the advantage of inherently higher mechnaical reliability with daylight bright illumination technology
- The target image and the reticle are combined internally before the variable magnification of the erector system
- A shift in point of impact when changing magnification is excluded by this design principle

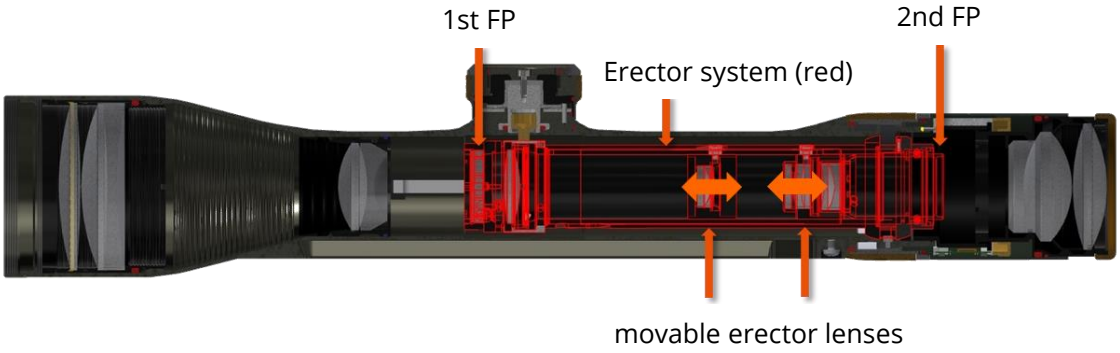
The reticle in the second image plane, which is widely used by other manufacturers today, is a relatively new phenomenon in the premium sector and represents a technical detour rather than a consistent overall solution according to the current state of the art. Thanks to its relatively late market entry, the Blaser rifle scopes were not bound by historical compromises, but could combine various advantages in a line of riflescopes designed from the ground up according to the state of technology.

Originally, the mechanically more reliable design with the reticle in the first focal plane was standard on European premium riflescopes and still remains so on long range tactical riflescopes. Only with emergence of the bright reticle illumination for daylight use a change took place and manufacturers changed to the second focal plane. This change was not driven by practical considerations related to the

use of the scope, but was a technical compromise, in order to be able to offer the customer an economical “daylight bright illumination” feature.

Meanwhile, however, reticle technology has evolved, so that Blaser during the construction of its riflescopes had the opportunity to **combine the inherent advantage of excluding changes in point of impact caused by magnification changes with daylight bright illumination**, and with reticle subtensions that are purely chosen for practical considerations and not driven by technological limitations.

The cutaway drawing below shows the different focal planes. The first focal plane is where the first internal image, formed by the objective, is located. If this is combined with the image of the reticle at this point, the two images are inseparably connected. If the reticle is located in the second focal plane, minimal mechanical deviations when moving the two erector lenses can lead to a minimal shift of the image of the target in the second focal plane.




If a riflescope is only used at maximum magnification for very precise shots, the mechanical inaccuracies due to the reticle position in the second image plane are less significant because the point of impact shift is generally repeatable, meaning that the point of impact will be the same if the magnification is turned to the maximum setting again.

However, riflescopes with a large zoom range and high maximum magnification may be used for very accurate shots at both 10x and 20x magnification, so here it is even more important that there is **no shift in point of impact** throughout the relevant magnification range. This way, the magnification can be chosen purely based on the requirements of the shooting situation without compromising accuracy.

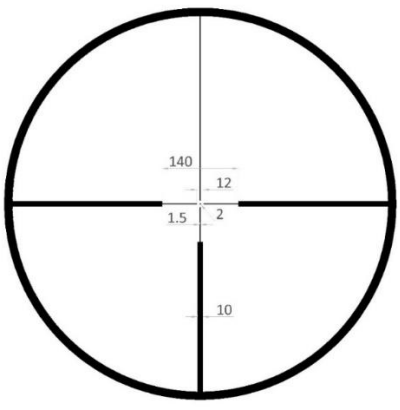
It is necessary to point out that the possible deviations are based on individual tolerances and that no general statement can be made about a specific scope

model. High quality models are on average better than lower quality designs, but no manufacturer can minimize the deviations to zero, and a single scope with negligible deviation does not mean that other copies of the same model will show the same behavior.

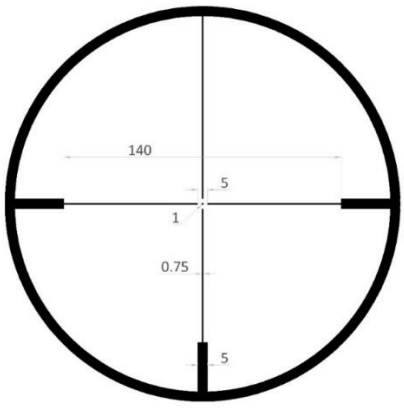
A similar **engineering principle that avoids error sources by design** can be found in Blaser rifles. **The Blaser saddle mount always directly attaches to the barrel of the rifle.** Only one mechanical interface needs to be controlled, the one between the Blaser saddle mount and the mounting interface on the barrel. There is no additional mechanical interface between a receiver and a removable barrel, and a non-existent interface cannot cause any problems whatsoever.

With the riflescopes, Blaser has also opted for this approach that has been part of the success of the Blaser rifles for a long time – using design principles that inherently increase reliability.

*Reticle subtensions*




1-7x28 iC




2.8-20x50 iC und 4-20x58 iC

## Phase grating technology and Intelligent Variable Dot

The reticle of the Blaser riflescopes is a glass reticle and based on what is known as phase grating technology. The light of an LED is focused and directed to the eye of the shooter by diffraction on a nanostructure on the reticle.

Reticles in the first focal plane must be finer by the zoom factor compared to a reticle with the same coverage in the second focal plane in order to achieve the same coverage on the target.

With for example a 7x zoom factor, the structure on the actual glass reticle needs to be 7x finer than it would be in the second focal plane. Achieving daylight level illumination brightness with these fine structures is a technical challenge that has been overcome by sophisticated illumination technology.

The reticle of the Blaser riflescopes is a **glass reticle**. On the glass plate there are two different types of structures. The first one is the black structure that is visible when the illumination is switched off (a thin chrome layer on the glass surface).

The **illuminated dot** consists of a second structure applied to the glass surface. This is a very fine stripe pattern with line widths in the nanometer range, a so-called phase grating.

Located at the edge of the glass reticle there is an LED, whose light is focused on the phase grating structure and is directed towards the eye using a physical effect called diffraction.

The most important feature of this technology for the customer is the **high intensity illumination while using very fine reticle structures**.

Two other special properties of this illumination technology are the possibility of producing two independently illuminated structures and the possibility of making the illuminated structure almost completely transparent. As a result, in the 1-7x28 iC, in addition to the central, fine illuminated dot, **a second, significantly larger illuminated dot can be activated**, but it is transparent when switched off. The second larger illuminated dot is activated automatically when changing the magnification. When the magnification is set below 4,5x and the brightness is adjusted for daytime use, the big dot is automatically switched on – optimal for running shots under bright light conditions. At low illumination brightness, only the central fine dot is active over the entire magnification range and allows very precise aiming even at dusk. We call this system the Intelligent Variable Dot (IVD).

## Features and practicality

The Blaser riflescopes offer features that extend the range of application, such as the high maximum magnification, the focus knob/parallax adjustment that is required to make full use of the high magnification, and the QDC quick adjustment turret that comes standard with the 50mm and 58mm models.

With all these features, care has been taken to ensure that they do not interfere in standard hunting situations where they are not necessarily needed.

### 20x maximum magnification with two models

The 20x maximum magnification for both the 2.8-20x50 iC and the 4-20x58 iC was chosen deliberately. This relatively high magnification offers much better detail recognition compared to binoculars. If you use 8x or 10x binoculars for glassing, you can be sure that when looking through the scope you will be able to **identify your target with much greater ease**, even at longer ranges. It also helps that is much easier to hold the scope steady together with the rifle.

Many lesser variable riflescopes show a noticeable drop in image quality at the higher magnification settings. In particular, color fringes can increase greatly and make it difficult to recognize fine details. Also, the stray light sensitivity often increases at higher magnification, so that when turning up the magnification the image may become washed out. Both limit the actual usability of the existing magnification range.

With the Blaser riflescopes, the **very high image quality** is maintained over the entire magnification range and **stray light is very effectively suppressed**, so that e.g. the bright sky over the dark forest edge hardly affects the picture. The high magnification is therefore usable in practice without restrictions and offers real practical benefits.

### Generous eye box – easy sight picture acquisition

Beyond image quality, there are other qualities that are important for hunting optics that cannot be read from a data sheet. Particular mention should be made here of the so-called eye box, which describes **the tolerance for the positioning**

**of the eye** before the image blacks out at the edges due to imperfect centering of the eye behind the scope or inappropriate eye relief.

The overall impression of having a "comfortable view" or "easy sight picture acquisition" is a result of several technical characteristics.

- Low vignetting: Rays at the edge of the image are not cut off by insufficient internal lens diameters (the **34mm main tube** helps here, leaving enough space for the optics). Vignetting causes the image to shade if the centering of the eye in the exit pupil is not exactly right.
- Eye relief kept as constant as possible over the magnification range
- Eye relief is not a fixed value, but a range from an upper to a lower limit
- Generous upper and lower limits of the eye relief result in greater tolerance in eye placement
- Small changes in the exit pupil distance over the image field. If the optical system is not carefully optimized, the optimal eye relief for viewing the image center may be different from the optimal eye relief for viewing the edge of the field of view. This manifests itself in the unpleasant overall impression of never being able to find the right eye relief for relaxed viewing of the entire image

In designing the Blaser optics, great emphasis has been placed on optimizing these aspects which are often neglected but very important for customer satisfaction in practical use.

## Focus knob (parallax adjustment)

Parallax adjustment is required with riflescopes with a maximum magnification of about 10x to get the target image in focus at different distances. Optically, the objective is focused on the first focal plane in order to obtain a sharp image for different distances. At lower magnifications, a focus fixed at 100m is sufficient, as the depth of field at low magnification and the user's eye adaptability will overcome depth of field considerations.

At higher magnifications, this no longer works because the depth of field decreases sharply. Similarly with binoculars, 8x magnification required less refocusing compared to 10x binoculars. The same is true of parallax adjustment, which optically fulfills the same function as the focusing mechanism of a pair of

binoculars. With correct focus of the objective image on the first focal plane, the parallax error is also eliminated at the same time.

The parallax adjustment thus serves to be able to **make full use of the high magnifications**. For standard hunting situations and low magnifications, a setting of 100m is very practical. Therefore, the parallax adjustment on the Blaser riflescopes is **self-locking at the 100m setting**. Turning the parallax adjustment will automatically lock it, so the standard setting can be restored after a long range shot and can also easily be checked for by the locked adjustment ring. This follows the principle that additional features that extend the use of the riflescopes should not become sources of error in everyday hunting scenarios.

## Operational elements on the right side

Unlike most other riflescopes, the Blaser riflescopes have the windage adjustment on the left side of the tube body, as viewed from the shooter, and the parallax/illumination unit on the right side. There are two reasons for this:

- **Optimal view of the target when shooting with both eyes open** - the lower windage adjustment turret does not obscure the target for the left eye.
- The higher **turrets face away from the body just like the bolt handle** – the parallax/illumination unit interferes less with the typical way of carrying the rifle over the left shoulder or when laying it down on a flat surface.

## QDC – Quick Distance Control

The demand for an elevation adjustment turret that allows quick adjustment for long distances is so widespread today that Blaser has decided to offer the QDC as a **standard feature** on the 2.8-20x50 iC and 4-20x58 iC models. The QDC is so **low profile** that in the locked state it is barely distinguishable from the screw caps of the windage adjustment.

The QDC, like the focus knob, is **lockable** for standard hunting situations, either at "0" (100m sight in distance) or "4 clicks high" (most recommended distance). The rifle can therefore be sighted in very accurately at the 100m standard setting. For hunting, the turret can simply be turned to the “4 clicks high” field zero setting

and locked in this position. If the hunting rifle is used e.g. for target shooting, the turret can be set to the 100m setting again at any time.

The click scale on the adjusting cap is hidden when the turret is locked. As a result, the locked state is clearly visible. When the turret is locked, the hunter knows immediately that a field zero is chosen. This is a considerable advantage in practical application, since a turret that has not been turned back to zero after a long range shot can lead to a miss or wounding the animal.

The design of the QDC

- **helps to avoid mistakes in stressful situations**
- has a **robust** and generously dimensioned **all-metal construction** made of stainless steel, brass, aluminum
- Uses design principles inherited from long range scopes, adapted to the needs of the hunter, and is designed from the ground up for **repeatability in long-term use**
- has a proven and space-saving mechanism for zeroing using two setscrews

## iC-Funktion

The iC function **allows the illumination to be activated automatically when the rifle is cocked**. Sensors in the eyepiece of the scope detect the cocked position of the rifle utilizing a magnet in the cocking slide.

So that the electronics in the riflescope can distinguish the cocked from the uncocked state, the electronics must be "trained" or coupled for the individual mounting position. This is done by a switching sequence of the illumination switch and cocking the rifle (for exact procedure see the manual). The reason for this switching sequence is to avoid that in use, by adjusting the illumination brightness, the coupling process is started by mistake.

The iC function initially has the advantage that the manual activation of the illuminated reticle is not necessary any more. Illumination brightness is set to the appropriate brightness at the beginning of the hunt and the illumination switch is pushed in and locked. The illumination system is now in the so-called automatic mode, meaning the illumination is switched off, but it is automatically activated immediately at the pre-set brightness by cocking the rifle. After uncocking, the reticle illumination turns off with a few seconds delay, so that the illumination does not switch off during reloading (and thus temporarily moving the bolt with the cocking slide away from the eyepiece of the scope).

Activating the reticle illumination via the iC function also offers the advantage that the **cocked state of the rifle is displayed via the illuminated dot**.

The iC feature is standard on all Blaser riflescopes. This does not limit its use on other rifle models. The reticle is equipped with position and motion-dependent shut-off functions, which turn the illumination off and on without using the iC function. However, if the iC function is used, it provides an override function and the illumination will also be on when the gun is pointing up or down or tilted to the side. Only the motion timer that shuts off the illumination after ten minutes without movement is still active when the rifle is cocked.

The iC cocking slide is standard on newly delivered R8 and K95 rifles. **Upgrading an R8 cocking slide is free when you purchase a Blaser scope.**

**Glass, coatings and Transmission**

Every optical system of binoculars or riflescopes consists of several lenses made of different types of glass with specific properties. The interaction of the geometry of the lenses (radii and spacing) and the types of glass used results in the imaging performance of the entire system. The design of a high quality optical system is a science in itself. It requires not only modern computer programs but also a high level of expertise and professional experience.

"Glass types" are materials with specific properties that can be combined to give the highest possible imaging performance in the overall system.

Although special types of glass, which are often highlighted in advertising, are not a guarantee for high image quality, they can be a necessary prerequisite for achieving certain characteristics. Particularly noteworthy here are **fluoride-containing glasses with anomalous partial dispersion** which, in combination with other special glasses, allow a very good correction of color fringes.

These and other specialty lenses are used extensively in Blaser optics to meet the **extremely high image quality requirements**. Blaser uses these types of glass just as naturally as other high-quality materials are used to achieve the desired performance.

The overall performance of an optical system, which is important for the user, can ultimately only be assessed on the finished product. Used materials can only give an indication that this is a particularly complex design.

When developing the Blaser optics, special attention was paid to **optimizing performance in areas that are important for hunting use**. For example, color fringes are specifically minimized in the area of blue light, which is particularly important for twilight and night vision. This results in a particularly good contrast of fine structures, especially under difficult lighting conditions, as color fringing ultimately involves loss of contrast in a specific wavelength range of the light. This **optimized "twilight contrast"** enables the recognition of fine details even under difficult conditions.

## Transmission

Transmission refers to the **percentage of the incoming light that passes through an optical system**. It describes the relationship between incoming and

outgoing light. The transmission says nothing about how much light contributes to the imaging of fine structures or to a high-contrast image.

Lens surfaces (glass/air surfaces), cement surfaces (glass/glass surfaces) and absorption in the glass (glass material and glass thickness) have an influence on the transmission losses.

High quality optical systems with high image quality contain more glass elements and special types of glass, which make it difficult to achieve high transmission. High-performance multi-layer coatings and glasses with a particularly high transmission can compensate for these effects.

**The published values of at least 90% are the night transmission values according to DIN ISO 14490-5.** The values for the day transmission are typically 92%.

If values in the range of 95-96% are published without further explanation (day or night value or without reference to DIN standard), one can assume that this is only a maximum value at a certain wavelength. Usually, this transmission maximum is in the green-yellow area, which is most important for **daytime vision**. Here, the Blaser riflescopes will also reach **values of over 95%**. However, since these maximum values are of little relevance in practice and a well-founded DIN standard exists, which provides **meaningful and comparable values**, Blaser confines itself to publishing the values measured under this provision.

## Coatings

All lens surfaces are coated with **high end multi-layer coatings** according to the current state of the art. These are each specially tailored to the types of glass used, since the requirements for the coatings vary depending on the glass type.

In the design of the coating not only achieving maximum transmission was taken into account, but also a particularly natural color rendition. We call the overall concept **Color Corrective Coating, for maximum image brightness and a color-neutral, natural image.**

The lens outer surfaces are coated with a **water and dirt-repellent protective coating** (Smart Lens Protection), which allows water droplets to roll off and facilitates the removal of dirt and dust.