

Equipment

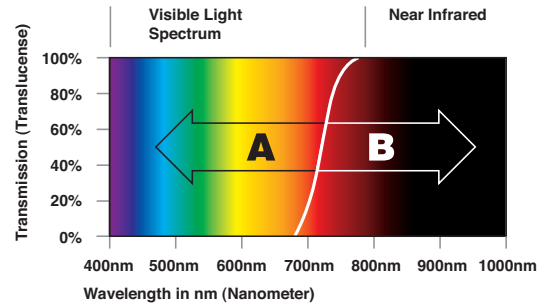
# Cameras, Filters, and Accessories

The two most important questions for the novice infrared photographer are most likely, “What camera and accessories do I need?” and “Can I simply use my existing camera?”

In general, modern digital cameras are suitable for infrared photography. Their sensitivity extends outside the bounds of visible light, and ranges from about 370 nm in the ultraviolet range to about 1000 nm in the infrared range. However, camera models vary greatly. In analog infrared photography, light sensitivity is mostly a function of the film we use. But in digital infrared photography, light sensitivity is solely a matter of camera design. Camera manufacturers make use of filters to prevent the sensors from picking up too much ultraviolet and infrared light. These filters are usually placed on the chip itself. Because every camera model has different filters, each type of camera differs in its degree of infrared sensitivity, which results in differences in the required shutter speed.

## Infrared Test

A simple test can determine your camera’s suitability for infrared photography. Hold a regular remote control (for example, for your stereo system) and, while facing it toward your camera’s lens, hold down any button. If your camera has a live liquid crystal



▲ *Infrared filters block a large portion of the visible light spectrum (A) and let only electromagnetic radiation of wavelengths close to near infrared pass (B).*

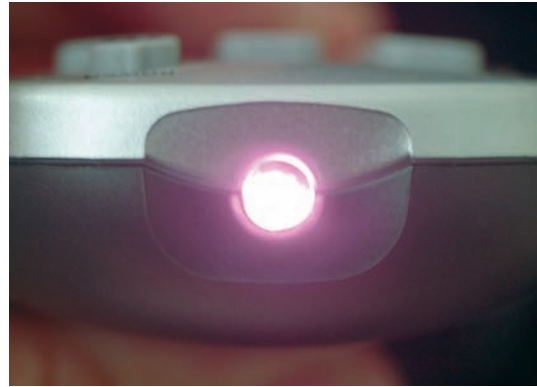
display (LCD) screen, look at it; or, if your camera does not have an LCD screen (for example, some digital SLR cameras), select a long exposure time and take a picture of your remote control (while continuing to press one of the buttons). If the remote control’s light-emitting diode (LED) shows up as a bright dot of light (either on the camera display or on the resulting picture), then you are in luck.

## Compact and Bridge Cameras

In order to convert a camera to infrared capability, a basic requirement is that there must be a way to attach an infrared filter to your camera. Many bridge

cameras have a threaded ring around the front lens, which will hold filters directly. Some compact cameras can accept filters through a special adapter tube, which allows the zoom lens to expand and withdraw freely within the tube. If none of these options work, you might try to attach filter foils to cameras without threading, but this is not very practical. The problem is that the connection must seal properly, and it must be stable enough to remain in place without becoming loose. In addition to the ability to hold a filter, your camera should have the option to be controlled manually, because its various automatic settings are not designed for infrared light and can be fooled too easily. Most likely, your pictures will come out over- or underexposed.

Digital compact and bridge cameras display the picture on an integrated screen. This usually works just the same even with an attached infrared filter. Compared to SLR cameras without a display, this is a major advantage for the purposes of selecting and framing the subject – and for judging the focus. However, when it comes to suitability for infrared photography, there are tremendous differences among the various camera models. Examples of popular “infrared” cameras are the early Canon Powershot models (series G1 to G3). Their internal



▲ A regular remote control can be used to test whether your camera is capable of infrared photography.



*Adapter tubes may make it possible to attach infrared filters even to compact cameras.*



▲ *Monastery and Castle Bebenhausen near the German city of Tuebingen. Sparse spring foliage produces a light*

*and airy mood. Nikon D70S, 50 mm, aperture 8, 2 sec., ISO 200, Heliopan RG780.*

infrared filter allows relatively high levels of infrared light to pass through. This means that these cameras work even with moderate exposure speeds. However, with these a tripod will be necessary.

### **Digital Single Lens Reflex (DSLR) Cameras**

As a result of the light path in digital SLR cameras, their viewfinder image will darken as soon as an infrared filter is attached, making it necessary to set up the shot before adding the infrared filter. As a result, infrared SLR photography is a bit tricky. For these cameras, a tripod is absolutely necessary; otherwise, the shot's framing could not be maintained while attaching the filter. But there are also advantages: SLRs offer superior image quality, and because of their larger sensors, longer exposures are not afflicted by as much "noise". The Nikon models D70 and D70S, in particular, have proven to be excellent choices for infrared photography due to an internal filter that allows a fair amount of infrared light to pass through. Practically speaking, this means exposure times of 1 to 2 seconds, at ISO 200, an aperture of 8, and the use of an RG780 filter.

Other cameras, such as the Canon 30D or the Fuji S3 Pro, may require exposure times of 30 seconds at the same parameters. It becomes clear that for all intents and purposes, infrared photography deals with long exposures. The only exceptions to long exposures would be with cameras that have been especially designed for infrared photography, or cameras that have been modified accordingly. All this is explained in the section on "Specialty Cameras". (See pages 24-34)

*A high-quality ball mount, a solid and stable tripod, and a lens hood are basic equipment for infrared photography.*





▲ *High-quality lenses with a fixed focal length are excellent choices for infrared photography. The infrared marking in this example (the tiny dot to the left of the central focus mark) allows for the easy correction of focal aberrations, which are typical of lenses without apochromatic qualities.*

### Suitable Lenses

In general, lenses of all focal lengths may be used for infrared photography. However, shorter focal lengths are more useful, because landscape photography is a major application of infrared techniques.

Zoom lenses may also be used. Even older lenses that are not compatible with the camera's automatic metering can be dusted off and put to work. (In infrared photography, aperture and shutter speed are almost always selected manually anyway.) Nor do autofocus functions or a high light throughput play an important role. Only the optical quality of the lens itself matters. In this way, an optically excellent manual lens, which may be too inconvenient for everyday use, may be revived for infrared photography. In many cases such older lenses even have an advantage, as many of them have infrared markings that can be used to correct the focal aberrations produced by achromatic lenses. Because of the longer wavelength of infrared light, a regular lens focused in visible light will focus infrared light behind the camera's sensor. Such "achromatic" lenses have not been "corrected" to counteract this effect in all wavelengths. This problem is avoided with apochromatically corrected lenses, in which special kinds of glass brings infrared wavelengths into focus as well. Such lenses produce sharp infrared images even when focusing in visible light.

The cost of filters should not be underestimated. One determining cost factor is the filter's diameter, which depends on the lens on which it will be used.

For comparison: an infrared filter for the Sigma 20 mm 1.8 EX DG (filter diameter: 82 mm) costs about twice as much as a filter for the AF Nikkor 20 mm 1:2.8 D (same focal length, but the filter diameter is only 62 mm).

### Infrared Filters

We want only near infrared light to reach the camera's sensor, so we need a filter to block out all or most of the visible light. Most filters are marked with a number telling us which wavelengths can pass through the filter. For instance, if a filter is marked RG665, we know that it will be translucent to wavelengths above 665 nm. Its translucence extends into the visible red part of the spectrum, which borders on infrared light. Therefore, this kind of filter makes a wonderful accessory for creative coloring experiments. Another example would be a filter marked RG780, which will only be translucent to wavelengths above 780 nm, and therefore will block just about all visible light. This type of filter is ideal for rendering black and white images.

Unfortunately, the various manufacturers don't follow a uniform convention when it comes to marking

*You can make an improvised infrared filter out of unexposed, but developed slide film. This will allow you to make your first infrared shots without much of a financial investment.*



▲ *The photographic results using unexposed slide film as a filter are similar to those using an RG715, except for the reduced image sharpness.*



their products. Sometimes this leads to confusion among novices. For instance, another common classification is the Kodak Wratten system.

In the Kodak Wratten system, 89B is the equivalent of an RG695, and 88A corresponds to an RG715; 87 is the same as an RG780, and 87C is like an RG830. And that's not all! A 091 from the manufacturer B+W is the same as an RG630; a 092 is like an RG695, and a 093 is the equivalent of an RG830. In other words: it is best not to rely on the manufacturer's product code, but to look at the translucency instead.

There is also a way to construct a provisional infrared filter. All it takes is an unexposed piece of slide film that has been developed, which would make it completely black. Just cut it so it fits into an old filter housing or between two glass sheets or UV filters, making sure to avoid light leaks at the edges.

Although the image quality achievable with this type of contraption does not approach the quality possible with a commercially available filter, it allows us to experiment and make test shots for little or no cost. Owners of a Canon EOS have yet another option. The German manufacturer Astronomik offers its "Clip Filter System", which has been specifically designed for this camera. (See page 30.)

### **Useful Accessories**

A stable tripod is essential in order to hold the camera steady during the long exposure times of infrared photography. Ideally, this should be combined with a high-quality ball mount or tilt and pan mechanism. No expense should be spared on these items. Also useful are wired or wireless remote controls for the camera, which are beneficial in avoiding camera shake. However, they do not help with another problem: a long time exposure's lack of focus because the subject is in motion while the exposure is taking place. Infrared photography is predominately a playing field for wide-angle lenses, which have a short focal length. Therefore, a fitting lens hood is very helpful to prevent sunlight from hitting the lens from the side.

*The usual long exposure times mean a greater chance of focus loss caused by camera shake. To counteract this, wired or wireless remote controls are extremely helpful.*





▲ With SLR cameras, an attachable, external viewfinder makes it possible to frame the picture even with an infrared filter attached to the main lens.

When using SLR cameras, having to attach and detach the filter several times to set up a shot can become annoying. With luck, you might find a used external viewfinder in a photo store: some models can even simulate various focal lengths by means of attachable masks. This allows an exact framing of the shot even while the infrared filter remains on the camera's front lens mounting ring. After at test shot, fine corrections can be made by checking the camera display.



▲ Because most infrared photography will involve sunlight, a shade screen protecting the camera's display is also helpful.

In bright sunlight, the camera's display screen is difficult to see. This makes it impossible to verify if the image is in focus and whether it has the qualities we are looking for. Under these conditions, a pop-up screen shade can be of tremendous help. Another useful little item is a lint-free, soft microfiber cloth and cleaning fluid. Most opticians will stock these items for eyeglasses. Be careful! Never put cleaning fluid on filters made from slide film, because this could dissolve the film's outer layers. Instead, just use a dry, soft cloth.



◀ *Infrared photography does not always have to include foliage to display the Wood Effect. The dark rendering of the blue sky, combined with cloud structures and an interestingly shaped object in the foreground, can yield very appealing infrared shots. Nikon D70S, 24 mm, aperture 7.1, 2 sec., ISO 200, Heliopan RG715.*

► *The lantern's underside is lit by reflections from the building's front lawn. Nikon D70S, 28 mm, aperture 8, 6 sec., ISO 200, Heliopan RG780.*





▲ Ruins of Heisterbach Castle. Nikon D70S, 28 mm, aperture 8, 4 sec., ISO 200, Heliopan RG 850. Manual white balance.



▲ Ancient ruins of Hohenurach. Infrared photography is possible even when the sky is overcast, but the shutter speed must be slowed down accordingly. In this picture,

the cloud cover produces an image reminiscent of a winter wonderland. Nikon D70S, 28 mm, aperture 8, 8 sec., ISO 200, Heliopan RG850, manual white balance.