

## **Infrared film\***

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Infra-red photography uses films that are sensitive to both the light we can see and some of the longer length (above 700 nm) infra-red radiation. The film is also sensitive in the UV region (below 400 nm). In the case of the Kodak HIE film it is sensitive to near-infrared radiation out to 1000 nm wavelength (1 micron) roughly. There are scientific uses for such films but here the main use is to expand our range of picture making media.

Some people just try IR once as a novelty others get hooked on the effects and exploit it as their main film, especially Kodak's High Speed Infra-Red black and white film.

### **Subjects**

Everything looks odd on colour IR film. The following remarks relate to black and white IR film.

Vegetation and sky look very different from normal therefore incorporating either or both into your pictures will take advantage of the effect of IR film. Vegetation comes out bright, clear sky comes out dark - clouds stay light.

Skin also looks different on IR film (it reveals veins under human skin) which can be used for interesting portraits.

Topics suggested are:

Graveyard shots - grass will go almost white leaving the tombstone floating in an eerie space, similarly for standing stones.

Derelict buildings covered in creepers - again the contrast of stone and vegetation

People on the beach - sky and skin, water reflecting sky

Nudes in a landscape - skin and vegetation and/or sky

Haze reduction - only reduces blue haze, but try it

Hot houses - vegetation

People with sunglasses - it is sometimes possible to see the eyes behind seemingly opaque sunglasses.

### **Hints**

There is more IR about when there is bright sunlight. This doesn't mean you should avoid using IR film in other conditions but that the effects are stronger when the sun is out.

Biggest amount of IR: the hours after sunrise and before sunset (due to the angle of the sunlight through the atmosphere), the effect is most dramatic (i.e deep black sky): back against the sun.

A flash will increase the amount of IR as well as visible light.

### **What about heat?**

Thermal radiation will not show up; IR films are not sensitive to a long enough wavelength to show such things as heat patterns.

Heat sources from things like engines put out most of their radiated energy in the far-infrared, in the wavelength range of 10-100 microns or so. To detect this you need special infrared sensors, and generally they have to be cooled with liquid nitrogen or other temperature regulators that can get you well below 0 C. (Just as the inside of a camera has to be dark, the body of an IR detector intended to detect heat has to be cool ...)

Another way to look at this is:

if in a dark kitchen you turn your electric stove element onto high and heat it up to the point just before it begins glowing red hot, that is when you finally have enough IR waves being produced in the right wavelength to make a photograph.

On the other hand, according an ancient copy of the Kodak “Infrared and Ultraviolet Photography” book (1961), IR can be used to photograph self-luminant objects as cool as 250 degrees C. I think I am going to try to photograph hot car parts (exhaust system, brakes). Heat will however tend to increase the fogging of the film. Keep film as cool as possible and avoid leaving in hot places like in a car on a hot day.

### Which IR films? - the options

There are four black and white IR films from Agfa, Ilford, Kodak and Konica. There is one colour IR slide film from Kodak.

#### Kodak High Speed Infra-Red black and white film (HIE 135-36)

This is available in 35mm (36 exposures), 70mm and 4x5” sheet. It seems to be more commonly available than the other IR films. It is grainy, sensitive to IR down to approximately 1000 nm. and is the most used IR film. It has no anti-halation layer thus increasing the need for care when loading and unloading to avoid fogging.

Process using ordinary black and white developers.

Temp in Deg C	18.5	20	21	22	24
Developer					
D76 1+1	13	11	10	9.5	8
HC110 1+7	7	6	6	5.5	5

#### Konica Infrared 750 Black & White

This is available in 35mm (24 exposures) and 120 formats. It is not so grainy as the Kodak film, though still grainy. It is less sensitive to IR so the effects are less exaggerated.

According to Konica’s technical bulletin No. Tech 015 “Konica Infra-Red 750 has a sensitivity range from 640 to 820 nm in addition to the intrinsic sensitivity range of AgBr 400- 500nm. The peak sensitivity is 750 nm hence it’s name”. However it is also less prone to fogging from stray-light whilst loading not only because it has an anti-halation layer but also because of a better light trap. Kodak’s felt trap is considerably more transparent to infrared. Its latency is greater thus get better results if it is not possible to develop immediately.

#### Some suggested film speeds are:-

No filter	32 (daylight)	50 (Tungsten)
No. 25 or 89B	15 “	30 “
No. 87	5 “	20 “

#### Iford SFX 200 Black & White

Available only in 35mm (36 exp.).

It’s what you might call a “mildly infrared” film. It is panchromatic with sensitivity extending a short distance into the infrared, to about 800 nm. You can use a deep red filter with it and get dramatic infrared-like effects, BUT you can still handle it like an ordinary film -- it does not require loading in total darkness, and it is generally not sensitive to the infrared-only light leaks that plague users of other infrared films.

Summary:

- Grain rather fine.
- Easy to work with. Good pictures of clouds in blue sky with red filter.
- Severe reciprocity failure; not useful in astronomy (10-minute exposures).

### **Agfa APX 200S black and white**

Spectral sensitivity: the curve starts below 400nm, peaks at 725nm and extends to 775nm.

Exposure index: ISO 200/24, with red flash ISO 400/27, push development up to ISO 800/30, limit at ISO 6400/39.

### **Kodak Ektachrome Infrared IE (Colour Infra-Red Slide film)**

This is available in 35mm only.

When used with an yellow filter this films shifts the colours. Blue is rendered as black, green as blue, red as green and infra-red as red. The film is sensitive up to 900 nm radiation.

This is processed using E4 . There are very few labs which still offer this old method.

You can also process it at home using an E4 kit, Tetenal make one.

### **Buying and storing**

Buy only from places that keep the film refrigerated (or frozen). [Kodak advises keeping the B&W film at 13 celsius or less.] Keep your own film cold until needed. Allow to warm up to room temperature before loading (to avoid condensation).

If you cannot process immediately return the film to the fridge/freezer.

### **Loading**

The general advice is to load in total darkness, especially the Kodak high-speed IR black & white film. Unload in similar conditions. Return the film to its original container until processing.

### **Exposing - filters, rating**

All IR film is sensitive to both some IR and visible light. To increase the IR effect one reduces the amount of blue and green light reaching the film, or you can block all visible light and record only IR.

On the black and white films use a red filter. Which red filter you use will effect the amount of non-IR light that is also recorded.

Visible light ranges from 400 nanometers (violet) to 700 nm (red). Here is a table with the absorption limits for several filters (I chose the first wavelength for which the absorption is less than 50%).

Wratten #25	600
Wratten #29	620
Wratten #70	680
Wratten #89B	720
Wratten #88A	750
Wratten #87	800
Wratten #87C	850
Wratten #87B	940

On colour IR film use a deep yellow filter to reduce the amount of blue - otherwise the results will have a strong blue cast. or even experiment with a (light) orange filter.

Film Filter Nominal ISO/ASA  
non-TTL TTL\*

Konica filters and ratings

Kodak B & W Without filter 80

Wratten #25	50	400 **
Wratten #29	50	
Wratten #70	50	
Wratten #89B	50	
(opaques to visible light)		
Wratten #88A	25	
Wratten #87	25	
Wratten #87C	10	
R2	50	

### **Kodak colour**

Whichever filter you use it is worth bracketing as more than one exposure can give you interesting effects - you may end up with several usable results from the same scene. Some people recommend bracketing over 5 stops.

Another reason for bracketing is that the level of IR radiation is not exactly proportional to visible light thus one's exposure meter can only give an approximation. The amount of IR that reaches your camera is also effected by the distance that it travels through the atmosphere. Thus the distance of your subject will also alter your exposure, follow the guidelines on the enclosed data sheet.

### **Focusing**

The exact point of focus will depend on which filter you use as this dictates which wavelengths are most prominent in your image. Most people move towards or to the red infra-red mark on most lenses. If your lens is missing this mark then nudge it to a slightly closer focus.

Since the Konica film sensitivity is nearer visible light than the Kodak, IR marks for the Konica film are about halfway between the standard IR mark on your lens and normal.

To improve apparent sharpness use a small aperture to increase depth of field.

Infrared Ektachrome focuses normally. Given the fact that Ektachrome IR records from yellow/orange till the IR region, this is no surprise; it is a compromise between focus of the visible and of the IR. Unlike the b&w IR films, you can't choose to only record IR (and hence focus for IR only).

### **Flash**

Flash emits IR along with visible light. You should calibrate your flash for IR film through test exposures. You can use a filter over the flash to reduce or eliminate the visible light output.

### **Developing**

Process as soon as possible. This is good advice for any film but especially for IR film which seems to be more prone to fogging and more forgetful than other films!

Take even more care than usual when loading the film onto a spiral.

Develop as appropriate to your film (see under description of film).

### **Printing**

Choose your basic printing exposure to bring out the characteristics you were using - keep vegetation light and skies dark. This can lead to high-key light portraits, dark moody landscapes and ethereal vegetation. Experiment with your negs!