IR 820c
IR 820c AURA

Representative of a New Generation of B&W Infrared Films

Photo: © 2002 Marcus Schwier

Convincing Characteristics!

- Very high infrared sensitisation up to 820 nm
- Excellent tonality
- Very sharp and fine-grained
- Halo effects with IR 820 AURA
- Simple processing, no specialised chemistry required

MACO
PHOTO PRODUCTS

Photo: © 2004 Karel Novotny, Melnik

Karel Novotny was born in the Czech Republic in 1972. He studied at the Bohemian Technical University to become a construction engineer. Already when he was a small child, at the tender age of 5, his grandfather taught him the basics of photography and kindled his love for it. In his free time, Karel Novotny photographs the Czech countryside (see the images in this brochure), still lives and nudes. In his own darkroom, he makes impressive prints. His preferred cameras are a Mamiya 23 Press (6 x 9 cm), a Globica sheet film camera (18 x 24 cm), and Nikon Fm and F80 cameras for the studio. Karel Novotny is also open to digital photography, for which he uses a Fuji S2 Pro camera. In the past, he kept using Czech-made FOMA films, but through friends and contacts in the West he became acquainted with, and grew to love, MACO films. Karel Novotny found his way to work with MACO IR 820c without any additional information. As a result, we see impressive images reflecting his love for nature. Based on the excellent quality of his work and the self-taught background knowledge, he published a comprehensive technical article in a Czech photography journal in 2003.

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01_Characteristics and Application

MACO IR 820c and MACO AURA are medium-speed black-and-white films with panchromatic sensitisation and infrared sensitisation up to 850 nm. This infrared (IR) sensitisation, reaching far beyond the visible range, allows for strong IR effects (black sky, Wood effect). The basic me-dium-speed emulsion makes for fine grain and excellent gradation as well as high resolving power. While MACO IR 820c is provided with an anti-halation (AH) backing that effectively re-duces light scattering in the emulsion and im-proves sharpness, this AH backing was omitted in the MACO AURA in order to create halos (or auras) which are often desired in IR photography.
MACO IR 820c and MACO AURA lend them-selves to all kinds of pictorial applications, such as architecture, landscape, portrait, to name just a few. These films can be processed in all types of black-and-white developers. The clear base allows application as black-and-white slide film. The polyester base used for medium-format and cut sheet film offers the highest standard in terms of archival stability.

02_Available Formats

35-mm film	135-36	
MF roll film	120	
Cut sheet film	4 x 5 in	25 sheets
	8 x 10 in	25 sheets

03_Technical Data

Sensitisation
panchromatic, approx. 380 nm to 820 nm

Speed
depending on developer
ISO 100/21° to ISO 200/24° for daylight
ISO 50/18° to ISO 100/21° for tungsten light

Base material
- 35 mm (135) film: Cellulose triacetate, clear, 130 µm
- 120 roll film: Polyester, clear, 100 µm
- Cut sheet film: Polyester, clear, 175 µm

Resolving power
110 Lp/mm at a contrast of 1:1 000

Processing
in complete darkness

04_Storage of Film Material

The sensitisation dyes used in IR films are not as stable as those used in panchromatic films, the life of the dyes being the shorter the longer the cut-off wavelength. Consequently, storage under unfavourable conditions can result in a slow, continuous loss of the IR sensitisation. For intermediate to long-term storage of IR films, storage at a temperature of no more than 4 °C (39 °F) is recommended. Films can be deep-frozen at -18 °C (0 °F; *** section of household refrigerators or freezers).
Films that were stored under refrigeration should be allowed to reach thermal equilibrium with the environment before being taken from the storage container. When the film is considerably colder than the ambient air, condensate may form on its surface.

05_Loading of Camera

120 roll film should be loaded into the camera or camera back *under subdued light*.
Complete darkness is required when loading 35-mm cartridges into cameras and when loading cut sheet film backs.

It is technically impossible to seal the felt trap of a 35-mm cartridge against IR radiation. Also, the film base will act as an optical waveguide for IR radiation. It is because of these facts that MACO IR 820c and MACO AURA 35-mm films must be taken from the storage container and loaded into the camera in complete darkness (i.e. in a changing bag or in a darkroom). Films taken from the container under light (daylight or artificial) can be expected to be fogged up to about half the film length (frame 12 to 18).

06_Exposure and Speed

Infrared (IR) radiation with wavelengths in excess of a little more than 700 nm is not visible to the human eye.
For daylight (5400 K) MACO IR 820c and MACO AURA have a speed of ISO 100/21° (ISO 200/24°) in special speed-increasing developers. As the sensitivity to light at longer wavelengths (red light) is higher than in conventional panchromatic films (see sensitisation curves at annex) it is recommended to use a somewhat higher effective speed under tungsten light, and also when the sun is low above the horizon.
When no exposure meter is available, the following values may be used for guidance. In this case, it is recommended to bracket from one f-stop below the value given in the table to one f-stop above.

Sunshine in mountains	1/125, f/22
Beach or snowy landscape in bright sun	1/125, f/22
Bright sun (so-called »Sunny 16 Rule«)	1/125, f/16
Sunshine and haze	1/125, f/11
Cloudy, sun shining	1/125, f/5,6
Cloudy, open shade	1/125, f/5,6

MACO IR 820c, no filter Photo: © Valsasnini

MACO IR 820c, Heliopan RG 715 filter Photo: © Valsasnini

07_Exposure Metering

What Does the Film »See«?

The term »light« or »visible light« denotes that range of electromagnetic radiation, which can be used for imaging by the human eye. Electromagnetic radiation exhibits wave-like behaviour, its physics is described in terms of wavelengths. Humans can see light with wavelengths ranging between approximately 400 nm up to a little more than 700 nm. Light with a certain wavelength produces the impression of a specific colour. So the visible spectrum extends from violet (400 nm) via indigo, blue, green, yellow, and orange to red (700 nm). The range with wavelengths below 400 nm is called ultraviolet (UV, beyond violet), the one with wavelengths above 700 nm is called infrared (IR, below red). Strictly speaking, UV and IR »light« is not really light, but electromagnetic (EM) radiation, because the eye is blind to these »colours«. So if only UV- and/or IR radiation are present, the eye will »see« complete darkness. (MACO IR 820c and MACO AURA, however, will still »see«.)
Like all IR films, MACO IR 820c and MACO AURA are also sensitive to visible light. The sensitivity to visible light being higher than that for IR radiation, and radiation being less abundant, no significant IR effect will be observable in daylight or artificial-light shots as the image generated by visible light is much stronger than that generated by IR radation. So, in order to obtain images exhibiting the typical »IR effect«, i.e. dark or black skies and brilliant white foliage, it is necessary to block out most of the visible light by means of filters. Filters for use in IR photography typically block all light with a wavelength below a specified »cut-off wavelength« while being practically completely transparent for light at longer wavelengths. The choice of the cut-off wavelength allows to control the amount of visible light contributing to image formation, which means it controls the effect afforded by the filter. The following filters typically used in IR photography are sorted in order of increasing cut-off wavelength:

- Gelb (Kodak Wratten #8 und #15)
- Yellow (Kodak Wratten #8 and #15)
- Orange (Kodak Wratten #21 and #22)
- Red (Kodak Wratten #25 and #29)
- RG 645
- RG 665
- RG 695 (Kodak Wratten 89B)
- RG 715 (Kodak Wratten 88A)
- Kodak Wratten #87

The RG 695 (89B) filter allows so little visible light to pass that viewing a scene through such a filter, the human eye will only see a very dim, deep red image. Filters RG 715 (88A) and above are completely opaque for most humans. The cut-off wavelength of even stronger filters such as 87C (cutting off at about 830 nm) lies so high that these filters are also opaque for MACO IR 820c and MACO AURA. Such filters are therefore not suitable for use with these films.

Measurement and Interpretation of Measured Data

Exposure meters are calibrated for visible light and may not react in a standardized way when exposed to IR radiation. While some meters are »blind« to IR radiation, others will measure it without problems. This means that every user will have to establish their own empirical data. It also implies that the data given below is to be understood as being uncertain to some degree. It should be used for guidance only. If no empirical data exists concerning the measurement of IR radiation with a given meter, it is recommended to bracket extensively around the reference values given below. This method will initially cost some film, but will give you the experience that will later allow you to evaluate the lighting situation with a high degree of certainty. It is convenient to keep detailed records of the lighting situation (such as season; position of sun: high/low, direction; cloud coverage) for evaluation together with the negatives.

> It is also recommended to include one unfiltered shot in each bracketed series in order to be able to rule out processing errors as the source of error where unexpected results are obtained. For this shot, expose the film as you would expose panchromatic film with a speed of ISO 100/21°.

For exposures with filters, various methods of measurement are available.

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Incident-light Metering

Incident light is measured at a point within the subject, or at a point receiving similar lighting, while pointing the exposure meter towards the camera. It aims at measuring all light incident upon the subject. For details of performing incident-light measurements using your exposure meter, please refer to the manual of your exposure meter. For this type of measurements, set your exposure meter to an effective film speed in which the filter factor has been taken into account.

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Reflected-light Metering Without Filter

When the light reflected by the subject is measured, the reflectivity of the subject will influence the measurement. This type of measurements can be performed using hand-held or built-in camera exposure meters. For details of performing reflected-light measurements using your exposure meter, please refer to the manual of your exposure meter or camera. For this type of measurements, when using TTL (i.e. through-the-lens metering) make sure that no filter is mounted on the lens while metering. Set your exposure meter to an effective film speed in which the filter factor has been taken into account.

Heliopan opaque 715 Photo: © 2004 Marcus Schwier

Hoya HMC filter, red #25A Photo: © 2004 Marcus Schwier

Hoya HMC filter, orange G Photo: © 2004 Marcus Schwier

Hoya HMC filter, yellow K2 Photo: © 2004 Marcus Schwier

TTL Metering With Filter

Filters that are still fairly transparent to visible light, such as yellow, orange, and red filters, allow for TTL metering with the filter placed on the lens. In this case, set your camera meter to the film's nominal speed (i.e. ISO 100/21°). A correction of the measured values is not usually needed.
When measuring using a hand-held exposure meter, the indicated exposures must be multiplied by the factors listed in the table below. Alternatively, the diaphragm must be opened by the number of f-stops given. (In brackets: Kodak Wratten designation.)

Filter	Multiply exposure time by this factor	Open f-stop by this number of stops
Yellow (#8)	1,5 to 2	½ to 1
Dark yellow (#15)	2	1
Yellow/green (#11)	3 bis 4	1 bis 2
Orange (#21)	3 bis 4	1 bis 2
Red (#25)	4 bis 8	2 bis 3
Dark red (#29)	4 bis 16	3 bis 4
RG 645	16	4
RG 665	16	4
RG 695 (#89B)	16	4
RG 715 (#88A)	32	5
RG 780 (#87)	32	5
RG 830 (#87C) and higher	not recommended	

These values apply to daylight exposures. Tungsten light contains more red light than daylight. Consequently, yellow, orange, and red filters block out a slightly smaller portion of it.
Reducing the extension factors for the exposure times by 0,2 to 0,5 or reducing the f-stop correction by ⅓ to ½ stop is recommended in such cases.

Effective Film Speed

The following speeds are intended as guidance for your own experimentation. Different exposure meters tend to react differently to IR radiation. It will therefore be necessary to modify these values based on experience gathered during your first own exposures. The values given in the table below apply to measurements without filter, and exposures with filter. The exposure recommended by the exposure meter is then used without further adjustments. (In brackets: Kodak Wratten designation.)

Filter	Set exposure meter to this speed
Yellow (#8)	ISO 64/19° to ISO 50/18°
Dark yellow (#15)	ISO 50/18°
Yellow/green (#11)	ISO 50/18° to ISO 25/15°
Orange (#21)	ISO 50/18° to ISO 25/15°
Red (#25)	ISO 25/15° to ISO 12/12°
Dark red (#29)	ISO 25/15° to ISO 6/9°
RG 645	ISO 6/9°
RG 665	ISO 6/9°
RG 695 (#89B)	ISO 6/9°
RG 715 (#88A)	ISO 6/9° to ISO 3/6°
RG 780 (#87)	ISO 6/9° to ISO 3/6°
RG 830 (#87C) and higher	not recommended

Focusing

The glass used to make lenses refracts light at different wavelenghts to different extents. The focal length of a lens is longer for red light than for blue light. This is called longitudinal chromatic aberration (LCA). Lens manufacturers try to correct this aberration by combining different sorts of glass in multi-lens systems in such a way as to focus all visible light in one focal point, if possible. However, lenses are primarily corrected for visible light. The corrected range is widest for so-called apochromatic lenses, but even in these the correction is a priori only valid for visible light. It is not to be taken for granted that it also holds for IR radiation.
Most lenses have an "IR" mark in addition to the usual focusing mark on their focusing ring. Using this mark is recommended if the image is indeed dominated by IR radiation, i.e. when using visually opaque filters (RG 695/89B and higher). If your lens does not bear an "IR" mark (as is the case in many modern autofocus lenses), the proper focus adjustment must be found empirically. For your first experiments, use the innermost mark on the depth of field scale of your lens. When focusing for IR radiation, focus to a slightly closer distance than for visible light.
Where the image on the film is created by a mixture containing significant amounts of visible light (i.e. when using one of the visibly transparent yellow, orange, or red filters), an adjustment is not usually needed. This is particularly true if shooting at large apertures and large focal lengths is avoided. When short focal lengths are used (35 mm and shorter for 35-mm film) a focus adjustment is not usually necessary due to the depth of field.

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Reciprocity Error

The reciprocity law, stating that the exposure will remain the same when the shutter speed is doubled and the aperture closed by one f-stop, is only true for films where shutter speeds are neither too short nor too long, typically between 1/2 s and 1/1 000 s. Whenever exposure times are very long, the so-called reciprocity error, or Schwarzschild effect, is encountered. Where the exposure meter indicates an exposure time of, e.g. 4 s, the time actually needed can be assumed to lie between 8 and 10 s. The following corrections may be used for guidance.

Time measured [s]	Time actually required [s]
1	1 to 2
2	3 to 4
4	8
8	24
15	60
30	180

In case of important images, the photographer should expose one frame at the selected f-stop and the corrected exposure time, and two more frames at the same exposure time, one each with the aperture closed and opened by one f-stop with respect to the first frame. Bracketing by adjusting the aperture has the advantage of not requiring a new calculation of exposure time.
Reciprocity error will result in increased contrast as the corrections for highlights are less than those for shadows. Films with long exposure times will therefore often profit from compensating development, as, e.g., with LP-SUPERGRAIN.

07_Known Problems (and Myths)

IR LEDs for Frame Counting

Some modern cameras, like certain Canon EOS and Nikon models, do not use mechanical means to control film advance, but count IR-emitting LEDs. For some camera models such as the Hasselblad XPan, the manufacturer even offers modifications of the camera to enable the use with IR film. The IR radiation emitted by these LEDs lies in a range where conventional, panchromatic films are »blind«. IR films, however, can be fogged by it. Please contact the manufacturer of your camera, enquiring whether or not your specific camera model uses such a frame-counting device.

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Film Windows in Camera Backs

Due to the lack of an anti-halation backing in MACO AURA, it is possible that light penetrating the film and being reflected by the pressure plate exposes the film. In general, this will only be a problem if the pressure plate has features like a pattern of dimples, windows for printing data, etc. It has proven useful in such cases to cover the pressure plate with a thin and smooth black material, like the protective paper of a 120 roll film. However, in some cases, this may increase the drag to be overcome for film advance.
The effect can also be exploited creatively. Covering the pressure plate with reflective material, e.g. aluminium foil, will enhance halation, especially in the highlights, and slightly increases contrast.

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Bellows

Intact bellows of modern medium- or large-format cameras are IR-safe. Leakage problems may arise with thin bellows of antique cameras.

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Film Pressure Plate

Due to the lack of an anti-halation backing in MACO AURA, it is possible that light penetrating the film and being reflected by the pressure plate exposes the film. In general, this will only be a problem if the pressure plate has features like a pattern of dimples, windows for printing data, etc. It has proven useful in such cases to cover the pressure plate with a thin and smooth black material, like the protective paper of a 120 roll film. However, in some cases, this may increase the drag to be overcome for film advance.
The effect can also be exploited creatively. Covering the pressure plate with reflective material, e.g. aluminium foil, will enhance halation, especially in the highlights, and slightly increases contrast.

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Plastic Cameras and Development Tanks

Reports that cameras with bodies made of plastics are not IR-safed have not been substantiated to date. It could be shown, however, that the bodies of, e.g., Minox 35 cameras (thin makrolon) and the Russian panoramic camera Horizon 202 are perfectly suitable for use with IR film. The same holds for development tanks.
All steel tanks are suitable for developing IR films. The same could be shown for the development tanks of JOBO, which are made of makrolon. Problems with other brands are not anticipated. Should you fear that your tank is not IR-safe, it is recommended [1] that you wrap it in aluminum foil.

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Textile Shutter Curtains

Literature sometimes advises owners of cameras with focal-plane shutters with textile curtains to change lenses in subdued light. However, reports of problems could not be substantiated.

[1] Rudolf Hillebrand, *Infrarot — Fotografie auf anderer Wellenlänge*
ISBN 3-7231-0019-8

08_X-ray Baggage Check at Airports

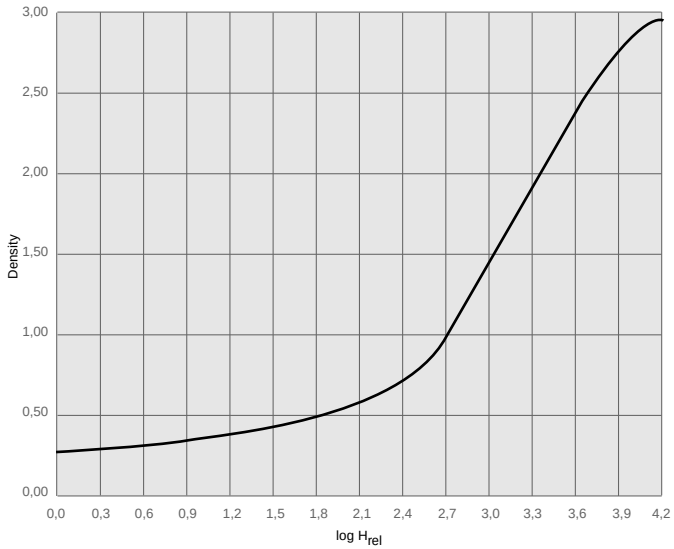
X-ray machines at airports, when labelled »filmsafe«, could be shown not to have any detrimental effect on films, even in case of multiple exposures (up to 5 times). Fogging during manual checking is much more likely, though, as the film is taken out of the canister and exposed to light (see Clause 5). Problems must also be expected when films are transported in checked baggage. The intensity used to x-ray this piece of luggage will be increased automatically if it contains any object that is not easily penetrated by low-intensity x-rays (such as a.c. adaptors of electronic devices). The higher dose used in this case may not be film-safe any more. It is therefore recommended to transport films in your cabin luggage.

Development times chart

Unless otherwise specified, the recommendations apply to a processing temperature of 20 °C and one inversion every 30 s.

Developer	Developing Time [min]
LP-DOCUFINE LC 1+4	8
LP-SUPERGRAIN 1+7	5
LP-CUBE XS 1+4	14 (24°C) (Speed ISO 50/18°)
Ilford ID 11 Stock	7
Ilford Microphen Stock	7 (Speed ISO 200/24°)
Ilford Perceptol Stock	9 (Speed ISO 50/18°)
Kodak D-76 Stock	7
Kodak HC-110 Dil. B	5
Kodak T-max 1+4	6
Kodak Xtol 1+2	16
Tetenal Ultrafin 1+10	7 (invert every 3 s)
Tetenal Ultrafin 1+20	9 (invert every 3 s)

Characteristic Curve



09_Processing

Loading of the Film into the Development Tank

As was mentioned in Clause 5, the 35-mm film cartridge must never be exposed to light. This also applies to the light emitted by darkroom safelights. Only open the film canister in a completely dark darkroom or changing bag.

120 roll film and sheet film must be processed in complete darkness.

Prewashing/presoaking

MACO IR 820c has a clear base and a water-soluble anti-halation (AH) backing. In order to remove this backing, for higher actual speed, and for more uniform development, it is recommended to presoak films for 30 s in tap water prior to development. Agitation should not be excessive (Invert once every 2,5 to 3 s.), and use water at approximately the same temperature as that intended for subsequent processing steps.

Note: Having resolved the water-soluble AH backing, the wash water will be deep blue when poured out of the tank. This is normal. One washing cycle, as described above, is sufficient. It is not required to wash until the wash water does not show any more signs of dyes.

10_Developers and Developing Times

The development times given below are approximate starting values for optimisation by the user. They were determined for a gamma of 0,65 as considered convenient for enlargers with diffuse lighting systems. The particular way in which the user develops may require these values to be modified.

The developer will also affect film speed. Deviations from the nominal speed of ISO 100/21° are noted.

11_The Effect of Temperature on Processing Time

Generally, where a high degree of reproducibility is required, it is recommended to process all films at the same temperature, usually 20 °C (68 °F). Where other temperatures must be used, the following corrections are recommended. Starting from the time at 20 °C (68 °F; grey column), seek the corrected time in the column for the actual processing temperature. (All values are given in minutes.)

18°C	19°C	20°C	21°C	22°C	24°C
5	4 ½	4	3 ½	3 ¼	2 ½
5 ½	5	4 ½	4	3 ¾	3
6	5 ½	5	4 ½	4	3 ¼
6 ½	6	5 ½	5	4 ½	3 ½
7 ¼	6 ½	6	5 ½	5	4
8	7 ¼	6 ½	6	5 ¼	4 ½
8 ¾	7 ¾	7	6 ½	5 ¾	5
9 ¼	8 ¼	7 ½	6 ¾	6	5 ¼
9 ¾	8 ¾	8	7 ¼	6 ½	5 ½
10 ½	9 ½	8 ½	7 ¾	7	6
11 ¼	10	9	8	7 ¼	6 ¼
11 ¾	10 ½	9 ½	8 ½	7 ¾	6 ¼
12 ½	11 ¼	10	9	8	7
13	11 ¾	10 ½	9 ½	8 ½	7 ¼
13 ¾	12 ¼	11	10	9	7 ½
14 ¼	12 ¾	11 ½	10 ½	9 ¼	8
14 ¾	13 ¼	12	10 ¾	9 ¾	8 ¼
15 ¼	13 ¾	12 ½	11 ¼	10	8 ¾
16	14 ½	13	11 ¾	10 ½	9
16 ¾	15	13 ½	12	11	9 ¼
17 ¼	15 ½	14	12 ½	11 ¼	9 ¾
17 ¾	16	14 ½	13	11 ¾	10
18 ½	16 ¾	15	13 ½	12 ¼	10 ½
19 ¼	17 ¼	15 ½	14	12 ¾	10 ¾
19 ¾	17 ¾	16	14 ½	13	11
20 ½	18 ½	16 ½	14 ¾	13 ½	11 ½
21	19	17	15 ¼	13 ¾	11 ¾
21 ¾	19 ½	17 ½	15 ¾	14 ¼	12
22 ¼	20	18	16 ¼	14 ½	12 ½
22 ¾	20 ½	18 ½	16 ¾	15	12 ¾
23 ½	21	19	17 ¼	15 ½	13 ¼
24 ¼	21 ¾	19 ½	17 ½	16	13 ½
24 ¾	22 ¼	20	18	16 ¼	13 ¾

12_Stop Bath

The stop bath primarily serves to neutralise any alkalinity retained by the film in order to prevent a loss of fixing-bath activity due to increasing pH values. An acid stop bath between alkaline developer and acid fixing bath is not mandatory when processing films.
The following recommendations can be given for the use of stop baths.

Stop Bath		Time [min]
LP-CITRIN	1+19	1
LP-Citrodur	1+16	1
LP-ECOSTOP	1+7	1

Where a stop bath is not used, two intermediate washing cycles of 30 s each, at 20 °C (68 °F) and permanent agitation, are recommended to avoid the carryover of developer into the fixing bath.

13_Fixing

As the silver content of MACO PO 100c is high, a modern high-speed fixing bath based on ammonium thiosulphate is recommended, e.g. LP-FIX SUPRA 1+7 to 1+9. When using a fixing bath not formulated for films with high silver content, a residual pink stain may be observed even after washing. This stain does not affect printing, but does indicate insufficient fixing. In general the stain will disappear when the film is exposed to sunlight for a brief time, or when exposing it to the radiation of an IR heating lamp.
Testing the clearing time of the fixer prior to fixing the film is recommended. To this end, use an unprocessed piece of film (like the film leader) and stop the time between its immersion in the fixing bath and the moment when it turns completely clear. Three times this time is the fixing time. If fixing baths are re-used, the clearing time will increase with each subsequent film processed. The bath should be discarded when the clearing time reaches twice the time measured with a fresh bath.
Fixing is most effective when the two-bath method is used. This method consists in preparing two identical fixing solutions which are stored in separate containers. The film is first fixed for half the fixing time determined as described above. The first fixing bath is then poured back into its container, and the film is fixed for the second half of the fixing time in the second bath. When the determination of the clearing time shows that the first bath has reached its usable capacity, discard the first bath, replacing it by the second one, and prepare a new second bath. This method allows to make good use of fixer capacity while still ensuring safe fixing.
Where clearing time is not measured, fixing for three minutes as 20 °C (68 °F) is recommended.

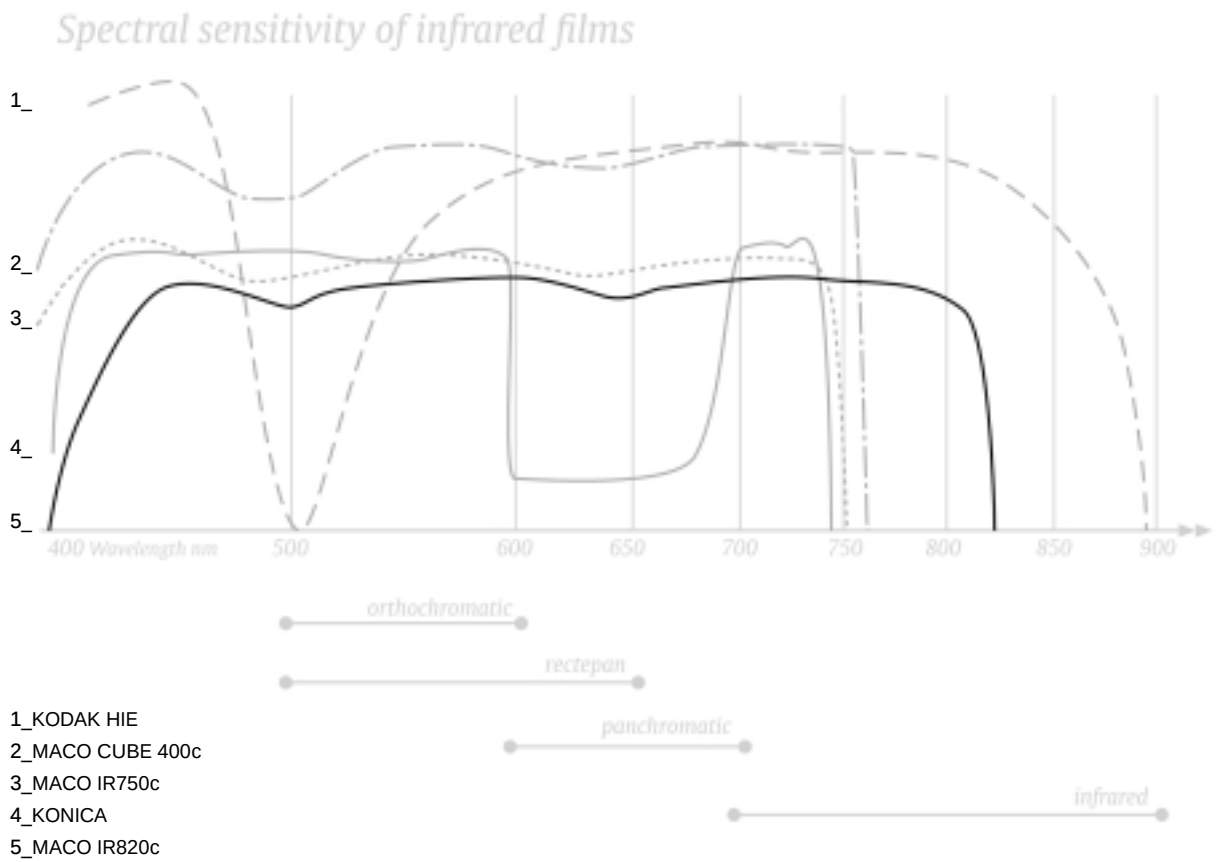
14_Washing

Washing with running tap water can only be recommended where a supply temperature of approximately 20 °C (68 °F) can be ensured. This is not usually the case in common household systems. In such cases, cascade washing in a fixed volume of water at 20 °C (68 °F) is safer and saves water. The following procedure is recommended:

1_ Fill tank with water at 20 °C (68 °F) , invert five times, allow to sit for 5 min.
2_ Change water, invert 10 times, allow to sit for 5 min.
3_ Change water, invert 20 times, allow to sit for 5 min.
4_ Pour out water, finish by applying wetting-agent bath.

15_Wetting Agent

A final bath in demineralised, deionised, or distilled water (battery water) is recommended in order to avoid drying marks caused by water hardness and to reduce static charges. Static charges will cause the film to attract dust particles.
It is recommended to use LP-MASTERPROOF 1+200 to 1+100 for one minute, without agitation. (This will avoid the formation of foam, see below.)
Overdosing wetting agents must be avoided. Wetting-agent solutions can only be re-used if several films are processed in one session.
Foam tends to stick to the film surface and will hardly run off. Avoid foam formation when preparing wetting-agent solutions by adding the water slowly. It is convenient to prepare the wetting-agent solution along with the developer. Any foam produced when preparing the solution will then have time to decay before the solution is needed.



1_KODAK HIE
2_MACO CUBE 400c
3_MACO IR750c
4_KONICA
5_MACO IR820c

16_Drying

Squeegeeing films is not advised as there is a great chance of scratching negatives. Following the wetting-agent treatment, with the film still in the reels, try to shake off as much of the surface water as possible. Then remove the film from the reels and hang it to dry in a dust-free environment for several hours, e.g. over night. Particularly in the case of 120 roll films on polyester bases, it is important that a weighted clip is attached to the lower end of the film in order to improve flatness of the film when dry.

Background information: Common film bases made of cellulose triacetate tend to shrink (up to the point where the emulsion comes off the base) and deteriorate when stored under unfavourable conditions. The Image Permanence Institute has shown that severe damage may occur in as little as 5 years if film is stored in humid, warm environments. This danger does not occur with polyester-based films. Polyester is highly resistant to influences from the environment, dimensionally stable and offers greater mechanical stability than triacetate. However, polyester bases tend to retain the curvature imparted upon them in manufacture unless forced to lie flat by tensioning over several hours, optimally by using a weighted clip during drying. Using reasonable weights (up to several kilograms), there is no need to be concerned about tearing the film apart. Make sure that the film is suspended firmly at the top end. However, do not use perforating film clips as holes will tear too easily when the film is tensioned using a heavy weight. When drying films in a drying cabinet, it is recommended not to activate the heating.

Drying using a hairdryer is not recommended, as, lacking a particle filter, hairdryers will tend to blow dust particles onto the wet, and still sticky surface of the film. Particles adhering to the film like that are difficult to remove without afflicting damage to the film.

Photos: © 2004 Karel Novotny, Melnik

Photos: © 2004 Karel Novotny, Melnik

MACO Black-and-White Products

Negative Films
MACO UP 25p
MACO UP 100p
MACO UP 400p

Clear-base Negative Films
MACO IR 750c
MACO IR 820c + AURA
MACO CUBE 400c
MACO ORT 25c
MACO TP 64c
MACO PO 100c

Special-purpose Films
MACO GENIUS film (Lith film)
MACO GENIUS PRINT film (Line film)
MACO TSX 730c (Traffic surveillance film)
MACO PET 400c (Security camera film)
MACO EM + ES (Electron micrography film)

RC Papers
MACO Multispeed 1F + 2M
MACO Macospeed 1F
MACO Lithpaper RC-F
MACO expo Ag (Silver metallic)

Barytpapier
MACO expo RF (to be replaced by ORIENTAL New Seagull G)
MACO Multibrom F (to be replaced by ORIENTAL New Seagull VC-FB)
MACO Multibrom WA (to be replaced by ORIENTAL New Seagull VC-FB-WT)

IR 820c
IR 820c AURA

Representative of a New Generation of B&W Infrared Films

Photos: © 2002-2004 Marcus Schwier

Marcus Schwier

Marcus Schwier was born in 1964 in Düsseldorf, where he first studied architecture before enrolling at the Art Academy there. Since the year 2000 he has also taught architectural photography at the Düsseldorf University of Applied Science.

His own photographic work, which today can be found in both public and private collections, has been included in numerous exhibitions at home and abroad. In 1999 Marcus Schwier received the prestigious prize photography of the DG Banken, accompanied by an exhibition at the Sprengel Museum in Hannover.