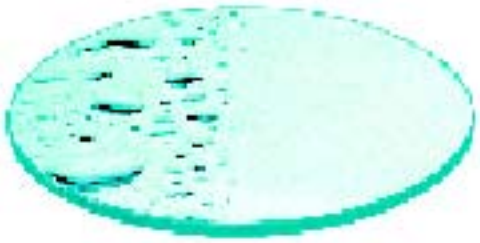
FILTER HANDBOOK

B+W FILTERS

Computer-controlled manufacturing processes safeguard the high level of B+W quality

Only the best optically homogeneous optical glasses are used in B+W filters

B+W employs cutting edge vacuum coating equipment for coating its filters



Quality filters from B+W: Tradition & Innovation "Made in Germany"

Strict controls at all stages of production from design to the final checkout ensure full performance for optimal imaging quality

The B+W filter manufacturing company was founded in Berlin in 1947 by business partners Biermann and Weber. In 1985 the merger with the Jos. Schneider Optical Works in Bad Kreuznach expanded the B+W line of products with optical filters for science and technology. It also generated significant progress in multi-layer coating systems (MC). As a result, B+W became the first manufacturer of filters in the world to offer the innovative water- and dirt repelling MRC multi-layer coating process, which, in addition to its reflection-preventing qualities is also regarded as being especially scratch-resistant.

Filters solve a great variety of tasks in photography. They match the illumination to the type of color film; they enhance contrast and colors; they attenuate the amount of incoming light; they can make the structures invisible to our eyes visible to the film; and they offer numerous optical effects for creative composition or for abstractions. Filters make it possible to achieve photographs that simply could not be made without them, and many of them could not be accomplished with subsequent digital image manipulation! The same applies to direct digital photography. B+W therefore provides digital imaging filters in diameters and designs suitable for lenses on most current digital cameras and camcorders.

In order to deliver optimal image quality and to safeguard the high demands of lens/camera manufacturers, B+W glass filters are manufactured virtually exclusively from glass supplied by the German Schott Group.

In Bad Kreuznach, the most modern fabrication machines produce highly precise filters in an impressive variety of types and diameters. Quality controls are integrated at all key stages of the production process, and a final inspection of every individual filter ensures the renowned high B+W quality standard. At B+W, our commitment to our guarantee and service are taken seriously. Continuous improvements and new developments enable users to achieve their best possible images. By comparison, a cheap filter can reduce the imaging performance of a high-quality lens quite dramatically! Therefore, consider the quality of a filter as seriously as you would consider the choice of your lenses – look for the B+W brand, because the quality of the image depends upon what is in front of the lens!

Our Range of Products

(Some products may not be available in your country)

B+W Filters
The leading brand for demanding professionals and amateur photographers for creative imaging with optimal quality. Choose from correction and effect filters for color and black-and-white photography; Käsemann polarizing filters; close-up lenses; special-effect- and trick lenses; filters with SLIM mounts for vignetting-free exposures with wide-angle zoom- and fixed focal length lenses.

Photo Optics
Absolutely state of the art taking and enlarging lenses for all fields of application of professional analog and digital photography, from 35 mm to large format.

CCTV/Machine Vision/OEM
Specialty lenses corrected for the infrared range, high-resolution C-mount lenses and macro systems for image processing and for non-contact measurement technology as well as customer-specified design and fabrication of optical and mechanical components.

Cine Projection
High-performance motion picture projection lenses for 16 mm, 35 mm and 70 mm films, anamorphic projection attachments, wide-angle projection lenses for 70 mm films with 8 or 10 perforations per frame, test films for 35 mm projection.

Digital Projection
New Cine-Digital line of projection lenses in a large variety of closely stepped fixed focal lengths for digital high-performance projectors and anamorphic attachments, with guaranteed high contrast and sharp detail rendition. Their fields of application range from digital cinemas to fixed installations in front and rear projection, all the way to rental and staging applications.

Ophthalmic Optics
Glass- and plastic lenses for eyeglasses; single- and multiple strength lenses, gradient lenses of high-refractive materials with special glass geometry for better appearance and greater wearing comfort.

Servo Hydraulics
Electro-hydraulic and electro-pneumatic servo valves with high-grade electronic control units for precise positioning-, speed-, power- and pressure controls in mechanical engineering.

LIGHT, COLOR, FILTER EFFECTS

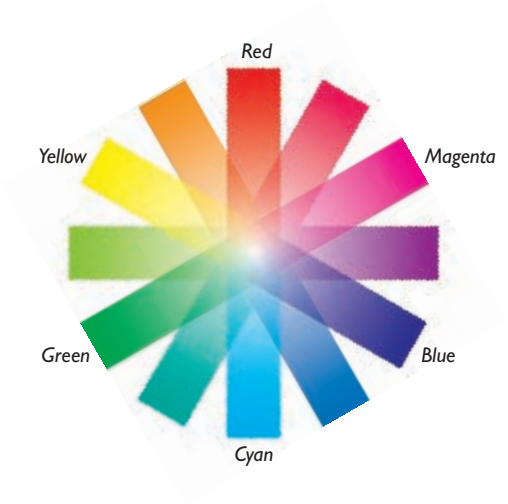
Light, wavelength and color

Light is an electromagnetic phenomenon with many facets. It travels with unimaginable high speed and it transports energy – even through completely empty space. Light can traverse "transparent" materials and in the process be diverted from its straight path, be reflected diffusely or directly, be absorbed and a blend of frequencies can be altered through absorption yielding a new balance of color. Light has fascinated generations of physicists and enabled astronomers to discover the secrets of outer space at distances that are far beyond our reach and our capacity of imagination. Light is the medium with which we "create ourselves a picture".

The nature of light is so complex that we require two different physical models in order to explain its qualities that sometimes appear to be contradictory. When reacting with matter, light can behave as if it consisted of tiny particles ("photons") that zip through space and which upon impact produce a "photo effect" reaction, which is the basis of the function of an exposure meter or digital camera sensor. However, it also behaves like a wave phenomenon that spreads in space in a spherical manner, consisting of interwoven electrical and magnetic fields that vibrate at right angles to each other. The number of these vibrations per second (on the order of 600,000,000,000,000) is just as unimaginable as the spreading speed of light (nearly 300,000 km or 186,411 miles per second). We are able to visualize the wavelengths of these vibrations: circa 380 nm to 750 nm (nanometers), or approximately 1/2000 of a millimeter. We perceive the different wavelengths as different colors: the shortest ones as violet, then blue, green, yellow, orange, red and the longest wavelengths as purple-red. And white light is nothing more than an even mixture of all these colors in the same proportion as we receive it from the sun.

Reflection properties define the color of an object

An object that is struck by light can reflect that light (nearly) completely, partially or (nearly) not at all. If it reflects all the wavelengths, i.e. colors, uniformly and nearly completely, the object appears to us as white. If it reflects them uniformly but only partially, the object will appear to us as gray under white light, and when it reflects hardly anything, we perceive it as being black. Most objects, however, do not reflect all colors uniformly, some of them are reflected more strongly, others less strongly or not at all. The surface of the object will then no longer appear to us as being white or neutral gray, but colored, usually in a "mixed color".



Additive and subtractive color mixig

A spread of the various component colors of white (or any) light is called its spectrum. In nature, we can see a spectrum in the form of a rainbow. Rainbow colors are pure colors, because each color can be defined by a specific wavelength. On the other hand, an object that appears green, for example, does not necessarily reflect just one wavelength or of a narrow band of wavelengths. It also may absorb a variety of frequencies, significantly blue and red. It reflects the remaining spectral colors, this mixture of which is perceived by us as that shade of green. If we replenish this mixture of colors with the missing shade of magenta, we will once again see white. Such opposite colors, when combined form white, are called complementary colors. Other examples are yellow and blue or red and cyan.

When light of one color is added to light of another color, this is called "additive color mixing". As an example, this is the case when a red spotlight and a green spotlight illuminate a stage and we see yellow light as the combined (= added) color where the two spotlights overlap. But if we mix colored pigments, or if we paint or print colors over each other, something different happens: each colored pigment absorbs the part that is complementary to its own col-

B+W FILTER TECHNOLOGY

or. In other words, it takes away something from white light, so that less light is reflected than it would be by each color individually. Therefore this kind of color mixing is called "subtractive color mixing". If we once again mix red and green, but in the "subtractive" manner just mentioned, for instance with watercolors, the resulting mixture will not be brighter than each individual color and yellow as it was with the spotlights, but darker and brown-black.

The effect of color filters

Colored filter glass absorbs a certain portion of its complementary color from the incoming light and lets the rest pass through. A yellow photographic filter, for example, absorbs part of the blue component of light and lets the rest, which is a mixture of all the other colors, appear as yellowish. For certain technical applications, however, there are special "yellow" filters (narrow band pass filters) that absorb not only a portion of the blue light, but all colors other than yellow. When colored light instead of white light passes through a yellow filter for black-and-white photography, a portion of the blue component of the colorful mixture is absorbed and its brightness is altered. Photographed through a yellow filter, a blue sky is rendered noticeably darker, the gray values of green foliage and grass with low blue component are hardly changed at all, yellow- or orange-colored blossoms without a blue component do not lose any brightness, so that they appear lighter in relation to other colors that have been reproduced in darker shades. A filter in front of a lens therefore reduces the overall brightness in proportion to its density. This is taken into account and corrected automatically by TTL exposure metering.

B+W continues to maintain the cutting edge coating technology

Optical and mechanical quality

Because photographic filters are positioned in the image-forming optical light path, they should only have the labeled absorption characteristics and no other optical effects in order not to diminish picture quality. The surfaces must be precisely plano-parallel (without bulges and tapering), with perfect smoothness (irregularities lead to stray light and a soft focus effect), their glass must be optically homogeneous and completely clear (no striae or cloudiness), and their surfaces must be as free of reflections as possible (to avoid stray light and double-/ghost images).

The top priority of B+W is the utilizing the highest possible optical quality glass, as well as the highest quality filter mount

The most modern manufacturing technology

That is why professionals and photographic enthusiasts around the world insist on B+W quality filters. B+W has been manufacturing filters for the most diverse applications for more than 50 years. This extensive experience has produced a unique know-how in glass and optical anti-reflection coatings. This, in conjunction with Schott optical glasses, state-of-the-art finishing machines and continuous quality control lead to top products for the world market.

B+W FOR FILM & DIGITAL

Correction- and creative filters with a great variety of accessories for analog and digital photography

Filters are indispensable for serious photography. They can tailor the color temperature of the light to the type of film to correct color casts; increase color saturation and penetrate veils of haze; block sharpness-reducing as well as color shifting ultraviolet and infrared radiation; control the rendition of colors in terms of shades of gray on black-and-white films; reduce or increase contrast; eliminate or attenuate unwanted reflections or even enhance them if needed, and much more, as described on the pages that follow.

Dioptric lenses for close-up shots down to the range of macro photography; a great variety of trick- and special effects attachments; rigid and folding lens hoods; protective covers, adapter rings, special mounts for individual applications, filter cases and micro-fiber cleaning cloths complement the line of B+W filters.

The range of applications of B+W filters and accessories includes all analog and digital photography: rangefinder- and single lens reflex cameras, digital cameras; camcorders, and broadcast video; and cinematography.

B+W uses the very best glass and filter mounts, and machines them with CNC-controlled fabrication machines to make sure that filters, supplementary lenses, and special effects attachments perform their functions optimally without jeopardizing the image quality. This provides the tightest possible tolerances with stringent quality control at every stage of production.

B+W is especially proud of its modern coating technology: The MRC (Multi Resistant Coating) MRC technology that we've developed exclusively is not only an enhanced process that assures virtually complete elimination of surface reflections on both sides of each filter and thus leads to a maximization of light transmission. In addition, its extraordinary hardness minimizes scratching and its water- and dirt repelling surfaces facilitate the care of filters.

Many effects that can be achieved during the original exposure cannot be achieved by subsequent digital imaging manipulation

A special line of B+W filters for the increasingly popular digital cameras

In digital photography, filters are also important tools for enhancing picture quality. In spite of the effects that can be applied with imaging control programs that allow subsequent corrections not possible with traditional photography, the basic rule is still valid: Picture information that is not present in the original photograph cannot be reconstructed later with a computer – unless they are "painted in", which is not authentic. When UV- or IR radiation have caused a haze and lack of sharpness, it would be only remedially possible to counter this deterioration by bending the gradation curve (increasing contrast) and by artificial sharpness correction (unsharp masking). This method cannot efficiently duplicate the brilliance and detailed sharpness that a UV-/IR blocking filter in front of the lens would have preserved. If reflections on a pane of glass block the view of things behind it, even the most sophisticated image manipulation program cannot magically recreate information that's been lost, whereas a polarizing filter would have eliminated most of the reflections. And enhancing filters add specific enhancements that are unique and not duplicated in post-production imaging control.

The mount sizes and the design of DIGITAL-PRO filters from B+W are tailored specifically to digital cameras and camcorders. Their exterior chrome finish harmonizes perfectly with the trendy light colors of digital cameras and their optical quality is tailored to the high-resolution digital lenses.

Check to see if the digital camera that you are considering has a filter thread. If so, you will later be able to use high-grade filters to make corrections and to add creative effects.

CONTENTS

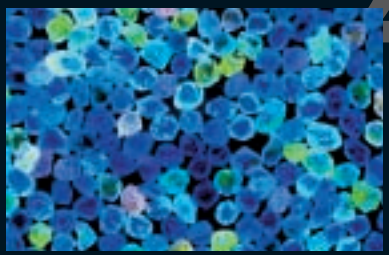
THE B+W LINE OF FILTERS

8

46

12

24



16

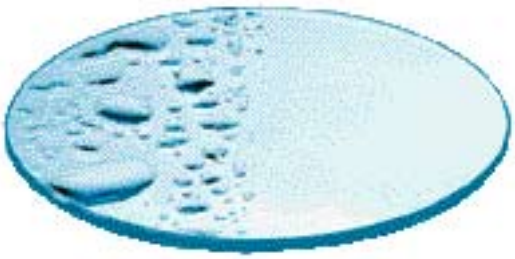
UV-/ PROTECTION

B+W UV Filter UV 010 [GG 375] DIGITAL-PRO SLIM MRC

This UV Filter blocks the invisible UV component of light from the sky, which can cause blur and to which many color films react with a blue cast. These filters should be called UV-Blocking Filters, because there are filters for technical applications that pass UV radiation and block all the other wavelengths. Nevertheless, the short term "UV Filter" has become established among photographers. UV Filters are ideal for photography in high altitudes (in the mountains), by the sea and in regions with very clean air. The pictures gain brilliance and disturbing blue casts are avoided. Because the glass is colorless, color rendition is not altered, aside from the elimination of the unwanted blue cast, and no increase in exposure is required. That makes a UV Filter very suitable as protection of the front element of the taking lens against dust, flying sand, sea water spray and the like, and it can be kept on the lens at all times. It is recommended for analog color- and black-and-white- as well as digital photography. UV Filters from B+W are also available in SLIM mounts for wide-angle photography without vignetting. Other UV-blocking filters with special characteristics please find on page 27.

B+W Skylight Filter KR 1.5 (≈ 1 A) SLIM MRC

This filter also blocks UV radiation, however it also has a delicate reddish-yellow tone designed to counter-act the high blue cast in the shadow portions of color photographs caused by light coming from a blue sky. It produces a warmer image tone and reduces the haze in distant scenes. The exposure factor amounts to only 1.1, so for practical purposes it can be ignored. Because of its very faint color, a Skylight Filter can be kept on a lens constantly for protection, as long as a slightly warmer color rendition is desired, as it would be with color reversal films that tend to produce cooler colors.



The extremely hard, water- and dirt-repelling MRC coating augments the protective effect of these B+W filters

FILTERS

Filters as lens protection

Good lenses are far more expensive than filters, therefore it makes good sense to attach a filter to protect the lens' sensitive front element. In order for this lens protection not to add a permanent filter effect, the protective filter should consist of clear, completely colorless glass with the highest possible transparency. These are precisely the characteristics of the B+W UV 010 Filter, which furthermore also blocks the detrimental effects of ultraviolet radiation. The extremely hard MRC coating with its water- and dirt-repelling capability optimizes the protective effect and facilitates cleaning in case of accidental fingerprints or when the surface becomes soiled. This, by the way, is all the more important with digital cameras, whose picture quality, because of the shorter focal length of their lenses, is much more sensitive to dirt on the front element of a lens!

Care of B+W Filters

Only clean B+W Filters will guarantee that the very high quality of materials and fabrication will contribute to perfect image quality. The hard, water- and dirt-repelling MRC coating helps you to keep your B+W Filters free of scratches and lint. If dust, water or dirt has to be removed in spite of all the precautions, please take the following rules to heart:

Never rub dry dirt or dust off the surface, because they may contain miniscule quartz particles that are much harder than glass and that can scratch the latter nearly as badly as diamonds can. First gently whisk the dust off with a very soft brush before breathing on the surface and then using a soft cloth, preferably the B+W "Photoclear" microfiber cleaning cloth and extremely gentle pressure to wipe the surface clean. When the dirt is very hard to remove, a bit of saliva is the best solution – always available, guaranteed free of abrasive materials, oil and aggressive chemical substances.

Never use a paper tissue for cleaning because it leaves too much lint, and paper fibers cling to glass because of electrostatic charges.

Without a neutral density filter, a small aperture renders an excessively large depth of field

With Neutral Density Filter 103, the lens aperture can be opened up in order to emphasize an important detail

ND FILTERS

Without a neutral density filter, a fast shutter speed virtually freezes the surging surf

A B+W 106 Neutral Density Filter permits to use a shutter speed that makes the surging water appear to flow again

Without a neutral density filter, the camera produces a snapshot of the moving scene

A B+W 110 Neutral Density Filter blurs movement, making it virtually invisible

Charming selective sharpness

Modern high-speed lenses produce bright viewfinder images in reflex cameras and make fast shutter speeds possible in all types of cameras, even with slow-speed films or under poor light conditions. But their large apertures can also be used as an interesting creative element:

At wide apertures the depth of field is reduced so much that eventually only the main subject will be rendered sharply, whereas the fore- and background will be unsharp. This also focuses the attention on the main subject in a creative sense, it draws the attention of the viewer as if by magic, relegating everything else into the background. In intense brightness, however, with high-speed film or a short focal length (with correspondingly higher depth of field), using a large aperture to achieve the desired selective sharpness effect may not be possible without incurring over-exposure. This is when B+W neutral density filters provide the solution.

When the shutter speed is reduced by two or three steps instead opening the aperture, for instance, a neutral density filter can be used for equally creative blur effects with moving subjects.

B+W Neutral Density Filter 101 DIGITAL-PRO SLIM MRC

The lightest B+W Neutral Density Filter attenuates the light by one f-stop (log density 0.3), which can be beneficial, for instance, for the correct exposure of high-speed films when the brightness of the subject is still too high for the fastest shutter speed and the smallest aperture. It is recommended especially as a complement to B+W Neutral Density Filter 102 for fine adjustments. The filter factor is 2x.

B+W Neutral Density Filter 102 DIGITAL-PRO SLIM MRC

This B+W Neutral Density Filter reduces the light by two f-stops (log density 0.6), and it is the most popular ND filter in photographic work. It offers many benefits, for instance f/4 instead of f/8 for selective sharpness instead of a great depth of field, or 1/15 s instead of 1/60 s for a flowing instead of a "frozen" waterfall. It has excellent color neutrality, costs less than the denser filters, and is recommended as part of a basic outfit. The filter factor is 4x.

B+W Neutral Density Filter 103 DIGITAL-PRO SLIM

Somewhat more difficult to manufacture and thus a little costlier, this B+W Neutral Density Filter reduces the light intensity by three f-stops (log density 0.9). It still features very good color neutrality. This ND filter is especially appropriate for use on video cameras when the lens cannot be stopped down sufficiently in great brightness or when a deliberately low depth of field is desired. The filter factor is 8x.

B+W Neutral Density Filter 106

This B+W Neutral Density Filter reduces the light by six f-stops. With this filter and without changing the f-stop, a shutter speed of 1/60 s is changed to a full second, thus requiring the use of a tripod. Flowing water is rendered as flowing in the photo, and people moving in streets are dissolved in unsharpness or become invisible. Because of its higher transmission in the red beyond 660 nm, this filter brings a slightly warm tone to color photographs. If this effect is undesirable, a B+W UV-/IR-Blocking Filter 486 in front of the neutral density filter (not behind it!) remedies that situation. The filter factor is 64x.

B+W Neutral Density Filter 110

With a light intensity reduction of ten f-stops, this B+W Neutral Density Filter has a slightly stronger warm tone than the ND 106. Its principal field of application is the observation and documentation of industrial processes with extreme brightness, such as steel furnaces, incinerators, glowing filaments in halogen- and other bulbs. The filter factor is 1000x.

B+W Neutral Density Filter 113

With its light reducing capability of 13 f-stops, this B+W Neutral Density Filter is used in astronomy for photographs of the sun and for recording the relative movements of heavenly bodies as light traces in extremely long exposure times. For photographs of the sun, this filter must be positioned in front of the lens and under no circumstances should it be located near the primary focus in front of, or behind the eyepiece because of the intense heat at those locations. It must not be used for observation of the sun (danger of blindness!) due to its greater transmission in the infrared range. The filter factor is 10000x.

B+W Neutral Density Filter 120

With its light reduction capability of 20 f-stops, this B+W ND Filter is used for the same astro-photographic applications as ND filter 113 when an even greater light attenuation is required. In spite of its much higher density, this filter too, must not be used for visual observation because of its transmission in the infrared range. The filter factor is 1000000x.

POLARIZERS/

With B+W polarizing filters, reflections on glass, lacquer, on nearly all plastic materials and other electrically non-conducting surfaces can often be reduced or even eliminated. B+W Polarizing Filters provide you the control over how much reflection you wish to remain because the light reflected at an angle of about 40° to 70° by these surfaces is strongly polarized. Its transmission can be reduced, blocked or even enhanced (!) in relation to the remaining unpolarized light, depending on the rotation of the filter. Thus a clear view is made possible through plates of glass, of goldfish below the surface of the water, or of writing or pictures behind a glossy layer of lacquer.

Every object outdoors reflects light from the sky more or less diffusely and largely polarized, some objects, such as green plants and red roof tiles are covered by a bluish-gray veil that can make them appear pale and dirty. B+W Polarizing Filters can remove this polarized veil and thus increase the saturation of the true color. Because the blue light from the sky, especially at an angle approximately perpendicular to the sun is strongly polarized, a polarizing filter can be used to render the sky with a more saturated color, so that white clouds will stand out more dramatically. Using a polarizer for black-and-white film, reflections can be accentuated or reduced, and can have higher image contrast.

REDHANCER

12
13

© Photo: Peter Lebeda

Reflection and blue haze without a polarizing filter

Reflection with the blue cast removed by a B+W Polarizing Filter

Even more saturated colors with a B+W Polarizing Filter and a Redhancer

A polarizing filter makes the clouds stand out, but on this very wide-angle lens it cannot darken the sky evenly

With a warm tone polarizing filter, shadow areas are rendered with the correct colors, without the clouds taking on a reddish cast

POL

B+W Polarizer Tip: Blue Sky

Photographs taken approximately rectangular to the direction of the sun achieve the strongest intensification of a blue sky for a more dramatic rendition of clouds.

Experiment with colors

Many transparent plastic materials, such as plastic rulers and crumpled cellophane film show interesting colors when placed between two polarizing filters or two polarizing sheets. These colors change when the polarizing filters (or sheets) are rotated in relation to each other. This method can also be used to visualize internal stresses in plastic replicas of mechanical parts as patterns.

RED

Decorative cabbage photographed without a filter

… and with stronger reds using a Redhancer

B+W "Käsemann" Polarizing Filters DIGITAL-PRO SLIM MRC

The "high-end" polarizing foils of the Käsemann-type filters are neutral in color, they have a higher efficiency than conventional polarizing foils and they are cemented between high-grade plano-parallel optical glass. The resulting sandwich is then precision-polished again to achieve highly accurate plano-parallel surfaces. Subsequently they are edge-sealed to protect the foil against humidity. Brass mounts made on CNC-controlled machines ensure precise seating on the lens. Discriminating photographers regard the B+W Käsemann-Type Polarizing Filter to be the very best of all polarizing filters. They are well suited for applications that require the highest possible imaging quality, especially with high-speed telephoto lenses and apochromatic lenses. They are available as **linear** and **circular polarizing filters**, mostly with MRC and also with SLIM- or oversized wide-angle mounts.

B+W Circular Polarizing Filter DIGITAL-PRO SLIM MRC

Highly efficient standard circular polarizing filter for all cameras with beam splitters in the light paths of their TTL exposure meter and with autofocus lenses. Circular polarization has the same pictorial effect as linear polarization, but allows for proper exposure metering and/or autofocus distance settings. B+W Polarizing Filters are available uncoated and with B+W's proprietary MRC coating.

B+W Top-Pol Linear Polarizing Filter MRC

Linear polarization filter for SLRs and rangefinder cameras without beam splitters in their light paths. High-quality optical glass ensures excellent pictorial quality. B+W Top-Pol Polarizing Filters are available uncoated and with B+W's proprietary MRC coating.

B+W Warm Tone Polarizing Filters

These filters are special versions of the B+W Linear- and Circular Polarizing Filters with an KR 1.5 correction filter or an 81 A warm tone filter as protection glass (KR 3 or 81 B on request). This combines the optical qualities of both filters in a single filter.

B+W Polarizing Foil

Polarizing filter foil placed in front of a light source produces polarized illumination. With a second polarizing filter in front of the lens, disturbing reflections on metallic, on strongly curved or structured surfaces (lime oil paintings) can be eliminated. Caution: Do not let the foil become hotter than 70° C (158° F)! In other words, keep the foil at safe distance from the bulb. Available in square formats with 100, 150, 250 or 500 mm sizes (appr. 4, 6, 10 or 20 inches).

Better view with cementing

Unlike some other polarizing filters, B+W Polarizing Filters do not consist of a plastic polarizing foil loosely sandwiched between two protective glass discs. Instead, the polarizing foil is cemented to both glass discs for much better optical quality. Even the tiniest surface irregularities on plastic polarizing foils, which can not be produced as smoothly and as evenly as polished glass, are evened out by this process. The number of reflective glass-to-air or foil-to-air surfaces is reduced from six to only two. B+W Polarizing Filters are distinguished by their higher light transmission, brilliance, and yield excellent detail even in the shadow areas. This preserves the full image-quality of the lens.

Polarizers are multi-talented

Experienced photographers consider polarizing filters to be the most important filters. Their ability to reduce or eliminate reflections is probably their best-known feature, but it is not the only one. They enhance the color purity of the subject (increased color saturation) by blocking the blue veil of light from the sky, They increase the contrast in black-and-white photographs, reduce haze, and make white clouds stand out dramatically from an intensely blue sky. When the filter is rotated by 90° from its normal reflection-reducing position, it can even appear to increase the relative intensity of reflections on water, glass, lacquer and plastic materials up to a factor of 2.

B+W Redhancer 491 SLIM MRC

The B+W Redhancer, made from didymium glass, is a filter with very special transmission characteristics. Designed to strengthen the reddish components of orange, near red or brown subjects, it is very popular for use in nature- and landscape photography. It is particularly effective in conjunction with a polarizing filter, controlling a potentially bluish-gray veil and for increasing color saturation, e.g. to capture fabulously vivid scenery during the colorful autumn season. The use of color reversal film is recommended, because the automatic correction applied by printers to color negatives can erroneously interpret the desired effect as a color cast and reduce it by filtering it out.

LB- (LIGHT BALANCING-) / CONVERSION FILTERS • CC (COLOR CORRECTION) FILTERS

B+W CORREC

The color of daylight varies from morning, to noon, and to evening. It also does so differently in winter, with an overcast sky, or in the fog. Color differences are even more pronounced between various sources

TION FILTERS

of artificial light. Arc lights appear to us as bluish-white, halogen bulbs yellowish, normal tungsten bulbs even more yellowish, candlelight warm orange. But our perception adapts to changed colors after only a short time, so that after a few minutes we perceive practically any light as "white" again. But color films react quite differently – they faithfully register every deviation of color, be it ever so small, from the "norm" as determined by their color sensitization. Daylight films want to see a spectromatically correct white light with a color temperature of 5600 K if they are to reproduce the original colors of the subject faithfully. Films balanced for artificial light (Tungsten) require 3200 K light (typically incandescent) for that purpose. But nature and light bulbs often vary, so that LB- or conversion filters (LB = Light Balancing) become necessary for neutral color rendition.

B+W filters comprise an extensive line of correction filters optimal for every situation, tailoring the color of the light source to the color balance of the film. This includes the correction of color casts (CC = Color Correction or Color Compensating) that may result from reflections of colored walls, from reciprocity failure with long exposure times, or from irregular processing conditions.

KB 12

Reddish evening light before sunset

Moonlight effect with Conversion Filter KB 6

Halogen illumination with daylight film

Neutralized with Conversion Filter KB 12

MIRED

B+W Tip: Compute with Mired

Color temperatures in Kelvin must not be numerically added or subtracted because they do not behave linearly. Sums or differences calculated in this manner lead to false results. With a simple formula, however, Kelvin values can be converted into Mired values, which can then be added or subtracted from the Mired values of the filters:

- Mired value = 1000000 : Kelvin value
- Kelvin value = 1000000 : Mired value

For 5600 K daylight color film, the Mired value is 1000000 : 5600 = 178.6.
For 3000 K artificial light, the Mired value is 1000000 : 3000 = 333.3.

The difference between the Mired value of the film and the Mired value of the light is the Mired value of the correction filter that correctly tailors the light to the film:
178.6 Mired - 333.3 Mired = -154.7 Mired, or -15 Decamired. A positive value indicates a reddish KR filter, a negative value indicates a bluish KB filter. Thus the filter required to adapt the 3000 K halogen light (the slightly low value results from the mains voltage being lower than its nominal voltage) to a 5600 K daylight color film is a blue KB 15 B+W Conversion Filter.

A diagram for Kelvin/Mired conversion, and for the determining the correct filtration for photographs can be found on page 65.

B+W Conversion Filter KB 1.5 (82 A) SLIM MRC

The conversion filter with the most delicate shade of blue attenuates the slightly higher red, orange and yellow components in order to produce a neutral color rendition. It can also be used for subjects that are to be shown with a cooler coloring. In addition, they adapt the color temperature of the very bright photoflood lamps to color films balanced for halogen light of 3200 K. Its filter factor is approximately 1.1.

B+W Conversion Filter KB 3 (82 C) SLIM MRC

With about twice the correcting effect of the previous filter, this conversion filter removes the orange-red color cast that appears on photographs made on tungsten reversal film with artificial light using 100 to 200 W light bulbs, or from aged photoflood lamps. Therefore this filter is ideal for neutral color reproduction with appropriate illumination. Its filter factor is approximately 1.2.

B+W Conversion Filter KB 6 (80 D) SLIM MRC

This nearly medium blue conversion filter neutralizes the strong red tendency of light at sunrise or sunset out in the open when the original colors of the subject are wanted instead of a warm morning- or evening mood. In addition, the KB 6 filter is ideal for "under-corrected" filtering of artificial light photographs on color negative films. When filtration is performed only later during printing, there is a visible color shift, and full correction leads to a higher loss of light. Its filter factor is approximately 1.5.

B+W Conversion Filter KB 12 (80 B) SLIM MRC

The deep blue filter KB 12 blocks so much red, orange and yellow that it increases the color temperature of very bright halogen and special photoflood lamps (of around 3400 K) to that of daylight. With that kind of illumination, and with daylight color reversal film, the subjects will be reproduced in their original colors. With weaker halogen bulbs or stronger incandescent bulbs in conjunction with this filter and with daylight reversal film, a residue of "warmth" will be retained for an optimal mood in interior photographs. Its filter factor is approximately 2.

B+W Conversion Filter KB 15 (80 A) SLIM MRC

The slightly denser KB 15 filter is recommended for daylight color reversal film with artificial light from the popular 60 to 100 watt halogen bulbs commonly used in lights aimed at the ceiling. With weaker incandescent bulbs, there will again be that pleasant warm tone for moody interior photographs. Its filter factor is approximately 2.2.

Color temperature and Mired

A "Color temperature" of 5600 K (Kelvin) is assigned to the "white" light of the sun, because the temperature of the surface of the sun is approximately 5600 Kelvin. The Kelvin scale corresponds to the Celsius scale (°C or degree centigrade), except that it does not begin with zero as the freezing temperature of water, but with the absolute zero (-273.16 °C).

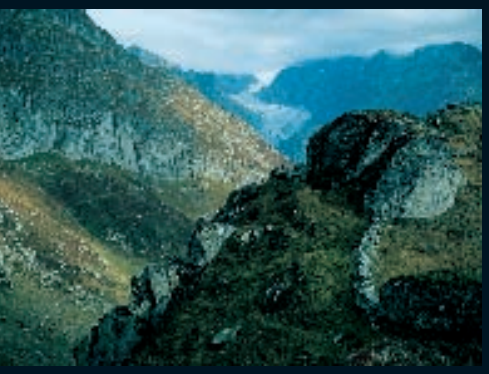
Because the incandescent filament of a halogen bulb must not reach the melting temperature of tungsten (the most heat-resistant metal) which melts at 3653 K and which becomes soft before reaching that temperature, halogen bulbs can only be used up to 3400 K. At this temperature the blue component is much smaller than that of sunlight, so that this light appears in the complementary color orange. The incandescent filament of a conventional light bulb only reaches about 2700 K, its light appears even redder, in other words, more orange-red.

Daylight color reversal films are balanced for 5600 K and they record every color cast that our eyes perceive as much weaker, because our brain performs a corrective "white balance".

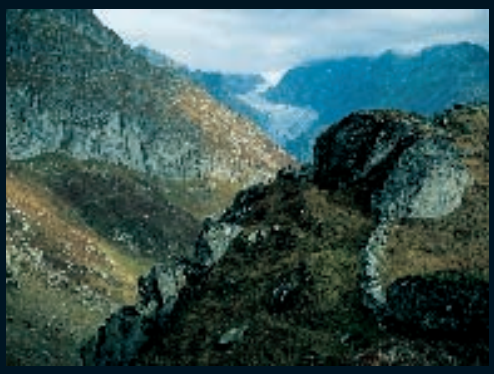
Mired values make it much easier to calculate needed filter densities, because the same differences in Mired values, e.g. between the mired value of the light source and that of the film, correspond to the needed filter value. The number in the designation of the filter is the value of the filter measured in Dekamired (1 Dekamired = 10 Mired). In blue filters, this value is negative, i.e. in calculations it has to be used with a minus sign.

B+W Conversion Filter KB 20 SLIM MRC

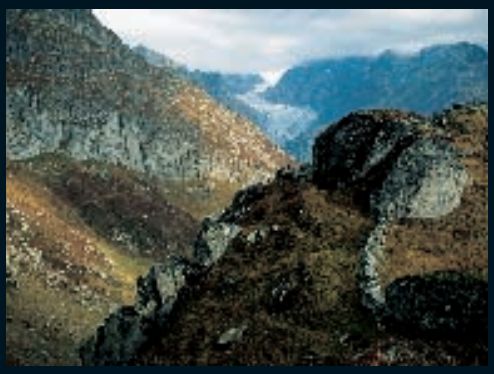
This is the correct filter when the illumination is provided by 40 to 150 Watt household incandescent bulbs, and the transparencies are to show the subject in its original colors (e.g., technical interior, architectural photographs, or reproductions). It should not, however, be used for moody interior pictures because unlike the KB 15 and KB 12 filters, the KB 20 filter corrects the light to a neutral balance, eliminating the warmth that we might intuitively expect from bulbs. Its filter factor is approximately 2.7.



Atmospheric haze causes a blue cast



Partial color correction with KR 1.5



Warm autumn vegetation with KR 6

81 A

Without a filter, a noticeable blue cast occurs on the walls in the shade

An 81 A filter neutralizes this blue cast without adding a reddish tone to the clouds

KR 3

The large blue component of light from the sky requires the stronger filtration of a KR 3 Conversion Filter for rendition with neutral colors

B+W Conversion Filter KR 1.5 Skylight SLIM MRC

This most delicate reddish-yellow conversion filter absorbs violet and some blue plus a minimal amount of green, but it passes yellow and red undiminished; the color of the light becomes "warmer" by 15 Mired. That is mostly the optimal amount for correcting the light blue cast in the shadows under a blue sky. It also absorbs UV radiation and hence it provides better sharpness. With color films and/or developing processes that generally yield results that are too "cool", this filter can be kept on the lens at all times. With this filter, skin tones in particular will be rendered more naturally. Its filter factor is approximately 1.1.

B+W Conversion Filter KR 3 (≈ 81 C) SLIM MRC

With approximately twice the strength of the KR 1.5, the KR 3 filter reduces blue and green. Even the strong blue cast of a high standing sun in a cloudless azure-blue sky, in regions with especially clear air, or the haze in distant views is removed very effectively. This filter also blocks disturbing UV radiation completely. Its filter factor is approximately 1.2.

B+W Conversion Filter KR 6 (≈ 81 EF) SLIM MRC

With double the strength of the KR 3, the KR 6 filter leads to neutral color rendition in strong haze, or in mountains above 2500 m (8200 feet) when transparencies are not to show "blue mountains" (which can also be attractive, depending on the individual case). It should not be used for photographs of typically foggy landscapes! Another field of application would be interior photographs on daylight reversal film when only blue light from the sky and no direct sunlight is coming through the window, and no fill-in flash is being used. In combination with tungsten reversal film, the KR 6 filter imparts the warmth of normal incandescent bulbs to the light emitted by halogen bulbs, which would appear neutral white without a filter. Its filter factor is approximately 1.4.

B+W Conversion Filter KR 12 (≈ 85) SLIM MRC

This reddish-brown filter allows the use of a tungsten-balanced film in daylight without a strong blue cast. It effectively absorbs the excess of daylight blue that is otherwise superimposed on all the colors. But the KR 12 filter is useful not only as a "savior in cases of need", or for making good use of an otherwise useless remnant of film, because it can also be used effectively for overcoming extreme contrasts that are greater than a daylight reversal film can handle. A reversal film balanced for tungsten light has a flatter gradation curve, adding a possible high contrast control. Its filter factor is approximately 2.

What is under-correction?

For neutral color rendition, one of the conversion filters listed in the adjacent descriptions is recommended when the color of the light is not appropriate for the film. But an absolutely faithful color rendition is not always desirable. Using a filter not normally indicated by mired conversions can help create a "mood". While a portrait in the light from a standing lamp ("Grandma sitting in an armchair, reading") would have neutral colors when a KB 20 filter is used for removing the orange-yellow color cast, it would look like the scene had been illuminated by a halogen stage spotlight. In order to preserve the splendor of a red evening glow, no filter at all could be used. In order not to drench the lamplight portrait in orange colored light, yet not make it appear as cold, a remnant of warmth might be retained. This can be accomplished by under-filtering, for instance, by using a KB 12 filter instead of a KB 20 filter. A good guide is 2/3 of the neutral filtering.

B+W Conversion Filter 81 A SLIM MRC

This conversion filter has an effect similar to that of Kodak Wratten 81 A gelatine filter. Its strength of 18 Mired makes it approximately similar to the KR 1.5 conversion filter, except that it is less reddish as it absorbs a little bit red. It can be used like the KR 1.5 filter, especially with films that tend to a reddish rendition inherent to their emulsion or to the developing process. The 81 A conversion filter is also ideal for landscape photographs at noontime and for flash exposures on daylight reversal film when the light emitted by a compact flash unit has too high a color temperature (and thus an excessive blue component). Its filter factor is approximately 1.2.

B+W Conversion Filter 81 B SLIM MRC

This B+W conversion filter is also similar in effect to a Kodak Wratten filter and its strength of 27 Mired makes it comparable to the KR 3 conversion filter. Like the 81 A it is recommended for color films that have an inherent reddish tone. This filter is popular as it leads to very pleasing skin tones in portraits. In addition, the 81 B conversion filter is ideal for compact flash units with color temperatures higher than 6000 K. Its filter factor is approximately 1.2.

COLOR CORRECTION

B+W Color Cast-Correction Filters (CC Filters)

CC filters (Color Correction or Color Compensation) act specifically on relatively narrow bands of color. That is why they do not come in two color variants (bluish and reddish) like conversion filters do. Instead, they come in the three primary additive colors and their three secondary colors (which can be interpreted as the primary colors of subtractive mixing) – see below – each color in practical density steps. B+W Color-Cast-Correction- or CC Filters distinguish themselves from gelatin- or acetate filter foils, in that gel or acetate must be inserted in filter holders. B+W CC filters consist of high-grade but very sensitive original Kodak foils cemented between precisely fabricated plano-parallel optical glass discs that are edge-sealed for protection against humidity and immun from finger prints, scratches and dirt.

Subtractive color mixing occurs when filters are placed in the light path on top each other. Each filter absorbs its complementary color (thus a yellow filter absorbs or reduces blue light). Because "absorbing" or "reducing" is the same as "subtracting", this type of color mixing is called "subtractive color mixing". **Cyan** (a greenish-blue color), **Magenta** (purple) and **Yellow**, sometimes collectively referred to as CMY, are the colors used in subtractive color mixing. Nearly all the filter colors needed for the correction of color casts can be generated with just these three CMY filter colors.

Additive color mixing occurs when several light sources, each with a filter of a different color, illuminate the very same object. Each light source "adds" more light to the light that already exists, which is why this kind of color mixing is called additive. **Red**, **Green** and **Blue** (RGB) are the primary colors in additive color mixing. Even though colors of several filter layers are mixed subtractively, these "additive" filter colors are helpful: Otherwise red, green and blue would have to be simulated by overlaying two subtractive primary colors, e.g., red by combining a magenta and a yellow filter. With these filters the photographer can reduce the number of filters placed in the light path.

CC-Density	05	10	20	40	05	10	20	40
	Filter Factor for Daylight				**and for Tungsten Light**			
Cyan	1.1	1.1	1.3	1.4	1.1	1.2	1.4	1.5
Magenta	1.2	1.3	1.5	1.9	1.1	1.2	1.3	1.5
Yellow	1.1	1.1	1.2	1.4	1.1	1.1	1.2	1.3
Red	1.2	1.3	1.5	2.1	1.1	1.2	1.4	1.9
Green	1.1	1.2	1.3	1.5	1.1	1.2	1.3	1.5
Blue	1.2	1.3	1.6	2.1	1.2	1.3	1.7	2.4

LB Filters versus CC Filters

In order to understand the differences between LB (Light Balancing) or Conversion Filters and CC (Color Correction) Filters, one has to divide white light into its spectrum of violet, blue, blue-green, green, yellow, orange and red. When white sunlight reaches earth after passing through the layer of air that envelopes the earth, it has approximately the same intensity (energy distribution) across its entire spectrum.

Like the sun, incandescent bulbs are "thermal radiators", but their filaments have a much lower surface temperature (e.g. 2700 K) than the sun (5600 K). Therefore, in accordance with the laws of physics, they emit far fewer short wavelength light than long wave light, in other words, less blue than red.

This imbalance can be corrected with ***LB- or conversion filters:*** *Blue conversion filters for photographs on film balanced for daylight exposures absorb little green, more yellow and even more red. In other words, the absorption increases as the wavelengths increase, until the even distribution is reached that is necessary for correct color rendition on daylight-type color reversal films. Reddish conversion filters, on the other hand, absorb light in the short wavelength portion of the spectrum. In other words, little green, more yellow and even more blue, so that, for instance, white daylight will be changed to have a spectral energy distribution like that of red-rich tungsten light.*

CC- or color correcting filters*, on the other hand, act selectively on narrow ranges of color. While they do not correct overall color temperature, they do specifically eliminate the mostly monochromatic color deviations caused by colored reflections, reciprocity failure with long time exposures, and color casts that are inherent to certain emulsions and developing processes. These filters can even be used to eliminate the strongly different color casts of different types of fluorescent tubes. Professional photographers use 3-color color temperature meters that not only indicate Kelvin and Mired values, but necessary CC filter values as well.*


B+W SPECIAL

What photographer wouldn't love to leave the beaten path and create pictures that stand out, fascinate, perhaps even take one's breath away? To show objects or landscapes as no eye would see them in

FILTERS

nature is an irresistible challenge. A large selection of B+W Special Filters can help you to take on this challenge and master it with perfection.

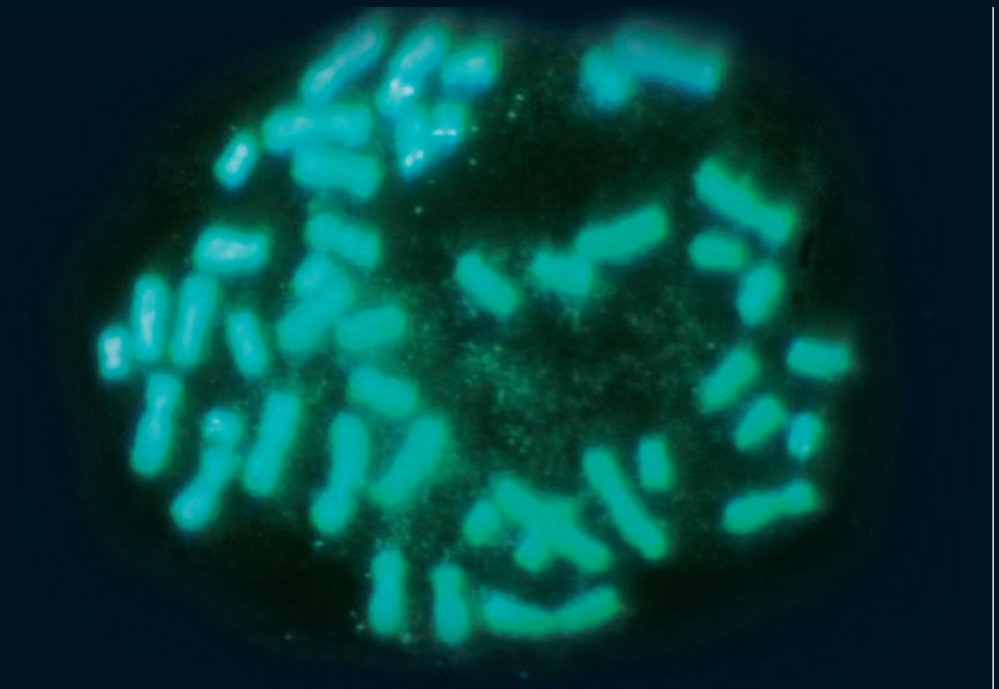
B+W filters that transmit ultraviolet or infrared light, but which block or severely limit the visible spectrum can reveal otherwise hidden worlds, when used in conjunction with appropriately sensitized films.

On the other hand, different B+W Special Filters prevent disturbing light and radiation that distorts the pictorial impression from passing through the lens and reaching the film. The B+W Special Filter FL-Day should be an indispensable accessory for every photographer, because it suppresses the green hue of the light emitted by fluorescent tubes. While inconspicuous to our eyes, it can cause an unpleasant green cast in color photographs.

Fluorescent tubes produce a disturbing green cast

B+W Filter F-Day produces pictures with neutral colors

F-DAY



Fluorescence photomicrograph of human chromosomes with UV illumination and a B+W UV-Blocking Filter 420

DIGITAL

B+W Filter Tip: Available Light

Nearly every color cast can be corrected by means of a B+W (Special) Filter on the lens – provided that a uniform kind of light illuminates the subject.

Things become problematic, however, in mixed light sources, such as electronic flash used in addition to fluorescent light illumination, e.g. in an office shot or in a shop. Because a B+W Filter F-Day will not only eliminate the green cast of fluorescent light – it will, of course, also filter the daylight color of flash illumination that would otherwise produce neutral colors on color film!

There are two solutions for such problems: 1. Strongly reduce the intensity of the flash (by about two to three f-stops), so that there will only be a subtle fill-in effect in the shadows, and its differing color will not be conspicuous. 2. Eliminate the flash altogether and expose only with available light. Fill-in shadows with a bouncer (white cardboard, sheet or foam plate) if possible.

B+W Fluorescent Light Filter 499 F-Day SLIM MRC

This B+W Special Filter eliminates the green cast that occurs when daylight-type color film is in fluorescent lighting. Examples are interior photographs made in offices, reception areas, factory halls, subway stations and swimming pool halls, as well as nighttime photographs of office buildings whose windows would appear green because their interiors are usually illuminated with fluorescent tubes. The abbreviation F-Day stands for "Fluorescent Light - Daylight", which reflects the fact that these filters are designed for the most commonly used type of fluorescent tube, which emit light of a color that, as mentioned above, resembles daylight. Because fluorescent tubes are not "thermal radiators", they do not produce a continuous spectrum like those of the sun and incandescent bulbs. Instead, they emit a sharply defined line spectrum that has high intensity spikes in the green region. Our eyes barely perceive this special green, so the fluorescent light appears to us as nearly neutral in color. However, most color films are especially sensitive to those wavelengths and they react with a strong pronounced cast. Photographers using color temperature meters for three color metering (simple meters that measure only two colors are not suitable for this purpose) can also undertake the correct filtering with of a combination of LB- and CC filters (see pages 17 - 23). With this method, they can also correct the light emitted by other types of fluorescent tubes, such as Warm Tone, Standard Light, White Light, etc. But for hobby photographers who do not wish to make a large investment in such an instrument and who do not care to carry along a selection of LB- and CC filters, the B+W F-Day Filter is far less expensive and much more practical. Its filter factor is approximately 2.

B+W UV Black Filter 403 [UG 1]

Not to be confused with UV-blocking filters that photographers normally refer to as "UV Filters", this one passes UV A radiation (320 to 385 nm), but blocks visible light and looks pitch-black to our eyes. It is used with appropriately sensitized films in such applications as ultraviolet reflection photography in forensics or in materials research, but also as filters on UV-emitters for fluorescence photography. Depending on the illumination and on the film's sensitization, its filter factor is in the range of 8 to 20.

B+W Special Filters with Schott Glass types BG 18, BG 12, BG 38, BG 39 and VG 9 are **available on special order**. Upon request they are also available with other types of Schott Glass.

B+W UV-Blocking Filter 415 (≈ 2 B) [GG 400]

This sharp-cutting, nearly colorless B+W filter blocks UV radiation up to the limit of visible light. It is used in ultraviolet fluorescence photography for the prevention of unsharpness caused by the intense UV illumination (which is due to chromatic aberration in the UV range). It can also prevent the fluorescence that may occur in the cement between lens elements. Because of the usually rather colorful fluorescent subjects, the delicate yellow cast in color photographs is negligible. Its filter factor is 1.

B+W UV-Blocking Filter 420 (≈ 2 A) [GG 420]

This even more stringent UV-blocking filter behaves like the filter 415 described above, except that its filtering slope completely blocks the UV radiation all the way into the visible violet region. As a result, it has a noticeably yellow tint. It is used for fluorescence photography on black-and-white film, where it is even more effective. Its filter factor is 1.2.

B+W Digital UV-/IR-Blocking Filter 486 DIGITAL-PRO SLIM

This B+W Interference Filter has a completely colorless glass carrier coated with a number of extremely thin, partially reflecting layers with precisely computed thicknesses, similar to MC coating. The B+W Filter 486 does not block by means of absorption, but by interference of the unwanted UV- and IR radiation that is repeatedly reflected between these layers, affecting the wavelengths on both sides of the visible spectrum with a steep cut-off. It is used mainly on digital- and video cameras with CCD sensors without an integrated IR protection filter, because the IR sensitivity of the CCD sensor would otherwise cause color changes and unsharpness. That unsharpness results from the chromatic aberration of the lenses that are only corrected for visible light. In the visible range, the transmission curve is very high and straight. This filter is completely clear and it requires no increase in exposure. Its filter factor is 1.

B+W Infrared-Blocking Filter 489 [KG 3]

This IR-blocking filter must not be confused with heat-resisting protection filters for projectors or spotlights. Instead, it is intended for use as protection for IR-sensitive CCD sensors or in the light path of illumination devices with low thermal characteristics. It suppresses infrared radiation ≥ 780 nm. Because it gradually begins to absorb infrared radiation at 600 nm, long-wave red light is slightly weakened, so that this filter has a subtle green tint. But in CCD applications, this can be readily corrected electronically. Its filter factor is approximately 1.2.

Photographed on black-and-white film, without a filter

Infrared black-and-white film with B+W Filter 093

Photographed on infrared color film, without a filter

Suppression of the blue cast with B+W Filter 099

INFRARED

B+W Tip: Digital IR Photographs

CCD sensors in digital cameras are very sensitive to infrared radiation, which can generate false colors and blur. This is why a filter layer on the sensor customarily suppresses it. However, it is designed only to suppress enough of the infrared that would grossly affect color. Sometimes additional filtration is needed in critical applications. With the use of a B+W Infrared Filter 092 or 093, the residual infrared sensitivity can be used to create interesting infrared photographs. These will look similar to photographs taken on conventional black-and-white Infrared film. Because of the underexposure that would occur when using a manual exposure camera, an increase in exposure by at least one aperture stop is recommended, plus automatic tonal value correction in Photoshop®.

Color abstraction by means of an exposure on infrared color film with B+W Infrared Filter 099

B+W Infrared Filter 092 (≈ 89 B) [RG 695]

The nearly opaque B+W Infrared Filter 092, which looks dark purplish red when held in front of a light source, blocks visible light up to 650 nm, and passes only 50 % of the radiation just below 700 nm (thus the dark red color). From 730 nm to 2000 nm, transmission is greater than 90 %. This makes photographs of pure red and infrared images possible with the best utilization of the relatively low sensitivity of infrared films. As the sensitization of infrared black-and-white films barely extends beyond 1000 nm, the red portion that is transmitted still makes a relevant contribution to the exposure. That is why this filter is the preferred filter for pictorial photography on IR black-and-white film. Its filter factor is 20 to 40.

B+W Infrared Filter 093 (≈ 87 C) [RG 830]

This B+W Infrared Filter blocks the entire visible spectrum, so to our eyes it looks completely opaque. Unlike the infrared filter described above, it makes pure infrared photographs possible without the visible red component. Its transmission only begins to exceed 1 % at 800 nm, rising to 88 % at 900 nm, and remains that high far beyond the upper limit of sensitization covered by infrared films. This filter is used less frequently in pictorial photography because of the dramatic loss of effective ISO. But in the scientific field, materials research and forensics, the limitation to a strictly infrared range is often important. The filter factor is very dependent on the illumination and on the characteristics of the film.

B+W Infrared Filter 099 (≈ 16) [OG 550]

The orange-colored B+W Infrared Filter 099 is the ideal filter for photography with infrared color film, which is also referred to as “False Color Film” because of its charming abstract color reproduction. It blocks large portions of short-wave radiation, up to 520 nm (blue, blue-green) and reaches its full transmission near 600 nm, which it retains far beyond the sensitization range of these films. This avoids the blue cast that is caused by the heightened sensitivity in this spectral range, and it leads to a better differentiation of colors. The charm of these infrared color photographs is partly due to the orange to red rendition of green vegetation, which is due in turn to the high infrared reflectivity of the chlorophyll in plants. The filter factor is highly dependent on the film and on the degree of infrared reflection of the subject.

B+W Infrared Filters are also **available on special order** with Schott glass types OG 590, RG 610, RG 630, RG 645, RG 665, RG 715, RG 780 or RG 9.

Invisible infrared radiation

The spectral range that is visible to the human eye ends at a wavelength of approximately 750 nm. This is where infrared radiation begins (only certain birds can see portions of infrared radiation that better penetrates haze). Most films parallel the spectral response of our eyes. But there are special infrared-sensitive films for color- and black-and-white photographs which, depending on their sensitization, react to 850 nm, 900 nm or nearly 1000 nm radiation. Like other films, these are also very sensitive to visible light. If we wish to image only in the infrared, filters must be used to suppress the visible, or to attenuate it strongly, so that the (weak) image produced by the infrared radiation will be sufficiently prominent.

Infrared photographs are attractive in many ways: Because of the nearly white reproduction of the chlorophyll green of vegetation, infrared black-and-white photographs render landscapes as if they were self illuminating, or immersed in an extraterrestrial light (the moonlight effect). Infrared color photographs have a fairy-tale effect because colors are reversed. The film renders highly infrared-reflecting plants in orange to purple-red tones, while filters suppress the blue and green components that are also present. In any case, the pictorial results are difficult to predict, therefore they are always good for experimentation and surprises.

Because there are no exposure meters that are sensitive exclusively to the sensitivity range of these infrared films, it is difficult to calculate exact exposures and conversions by means of filter factors. This is due to the fact that two subjects that are equally bright in normal (visible) light might reflect infrared radiation at significantly different rates. In other words, they can have very different “brightnesses” as far as the infrared film is concerned. Therefore it is always advisable to make a series of three to five different exposures. Don’t be stingy with film, because once it is out of the refrigerator, it is only good for a few months anyway, so use it up quickly!


BLACK & WH

ITE FILTERS

Because early black-and-white films did not render colors in the gray tones that corresponded to the brightness perception of human eyes, the use of yellow- and yellow-green filters was simply indispensable. Today's panchromatically sensitized black-and-white films no longer require such a correction, at least not in daylight. In artificial light, however, the increased red component can distort the rendition in gray tones in critical cases by rendering blue tones too darkly and red tones too brightly. This can be remedied by the use of a light blue filter with halogen light or a medium blue filter with incandescent illumination.

Yellow- and yellow-green filters can bring more brilliance to landscape photographs and create better differentiation of green tones in vegetation. Yellow- and orange filters can magically transform cloudlets into clouds and cloud formations, and red filters can even raise them to dramatic thunderstorm strength or create moonlight effects.

A very simple rule can be used to determine which filter should be used: To lighten a subject color, use a filter of the same color. To darken a subject color, use a filter of a complementary color. When two objects with different colors but with the same effective brightness are to be better differentiated in a black-and-white photograph, use the filter of the same color as the color that is to be rendered lighter in the photograph.

CLOUDS

Black-and-white photograph taken without a filter; the original colors are shown in the color photographs on page 20

023

With yellow filter 023, the yellow façade is brightened, but the sky could do with a little more darkening

041

With orange filter 041, the façade remains bright, but the clouds are rendered more prominently

B+W Light Yellow Filter 021 (2 E) [GG 455] SLIM MRC

This filter suppresses violet and attenuates blue. On the other hand, green, yellow, orange and red are reproduced in lighter shades. It is ideal for landscape photographs, since white clouds will contrast more against the darker blue sky, and the shades of green on plants are more differentiated. Freckles and skin blemishes in portraits can be attenuated, tans can be rendered lighter. Its filter factor is approximately 1.5.

B+W Medium Yellow Filter 022 (8) [GG 495] SLIM MRC

With stronger blue suppression, which extends into the blue-green, the effects described above are slightly stronger in the same types of applications. Clouds in the sky look very natural, but not yet dramatic. Distant views with light haze become clearer. An ideal filter, especially for landscape- and plant photographs. Its filter factor is approximately 2.

B+W Dark Yellow Filter 023 (15) [SCHOTT OG 530] SLIM MRC

The even greater blue suppression and the attenuation into the blue-green range leads to a further increase in the effects described above. Interesting for snow scenes under a blue sky, because the darkened blue shadows in the snow make the shapes of the landscape look more dimensional. Freckles and skin blemishes are diminished strongly, but lips are rendered more pale (to compensate for you may use a dark lipstick!). Its filter factor is approximately 3.

B+W Yellow-Orange Filter 040 (16) [OG 550] SLIM MRC

The effect of this filter is quite powerful. It darkens violet and blue very strongly, green strongly, it even darkens yellow-green a bit. Landscape- and architectural photographs have an increased, virtually "graphic" contrast, clouds in the sky already look dramatic. Because skin tones are strongly lightened in relation to the green tones of plants, this is a favored filter for nude photography outdoors, because it raises the contrast between the lighter bodies and darker landscapes. Its filter factor is approximately 4.

B+W Red-Orange Filter 041 (22) [OG 570] SLIM MRC

The intensified effect of this filter borders on the abstract. It darkens a blue sky with clouds to resemble the mood of an impending thunderstorm. Architectural photographs gain clarity and drama. This filter is also interesting for many black-and-white close-up photographs of flowers, when dark yellow, orange or red blossoms have almost the same brightness as the surrounding greenery: This filter is used to render the flowers in lighter shades of gray. Depending on the subject, its filter factor is 4 to 5.

Colors become gray shades

Black-and-white films should render all colors in shades of gray in such a way that their brightness values look natural. Older photographers can still remember that in earlier days yellow filters were a must for landscape photographs and for portraits. Even films that were sensitized "panchromatically", ostensibly to match human brightness perception, still rendered blues too lightly and reds too darkly. Even though today's black-and-white films no longer have that shortcoming, filters are still necessary for controlling the photographer's translation of colors into shades of gray.

Black-and-white photographs often lack impact because colors that are well differentiated in nature be equivalently luminous in shades of gray. For example, the red tiles on a roof and the green of nearby vegetation. But this can be managed: The color of the filter and its related colors are transmitted virtually undiminished, whereas their complementary colors are attenuated, so that they will appear darker in the photograph. When that loss of brightness is compensated in accordance with the filter factor, the result will be a correctly exposed picture that shows the colors related to the color of the filter as lighter shades of gray. Complementary colors (those that are opposite each other in the color star on page 4) will appear as darker tones.

Filters with TTL metering

Today nearly all SLR cameras feature TTL (Through the Lens) exposure metering, which means through an attached filter as well. This metering method takes into account the loss of light absorbed by the filter, so that filter factors usually need not be applied. However, when the exposure is measured with a separate exposure meter, then the filter factor has to be taken into consideration. Still, with darker filters (very dense colors), exposure bracketing of ±1/2 to ±1 aperture stops is recommended, even with TTL exposure metering, because the spectral sensitivity of the metering cell can be significantly different from that of the film.

These colors are to be translated by black-and-white film into well-differentiated shades of gray

Without a filter, black-and-white film renders red and green with little contrast in nearly equal shades of gray

B+W Red Filter 090 brightens red and darkens green

B+W Green Filter 060 darkens red and lightens green

CONTRAST

B+W Yellow-Green Filter 060 (11) [GG 10] SLIM MRC

This filter has an effect similar to that of the medium yellow filter, but it also darkens red colors. Clouds in the sky gain more contrast, a red roof and red flowers are rendered darker in relation to plant greens (as they would not with a purely yellow filter). The yellow-green filter accentuates the delicate springtime green in nature, it makes portraits more dramatic. Its filter factor is approximately 2.

B+W Green Filter 061 (13) [VG 5] SLIM MRC

This filter differs from the above yellow-green filter primarily because of its increased red attenuation. A red roof or red flowers will become even darker, as will red lips and a dark tan and, unfortunately, so will skin blemishes. This filter is ideal for nature photography. In object photography, it is good for darker reds and lighter greens. Its filter factor is appr. 3.

B+W Light Blue Filter 080 [BG 26] SLIM

This filter renders blue tones lighter, but yellow, orange and especially red darker. "Aerial perspective" caused by haze and fog is increased, the sky will be rendered lighter. It is favored for tonal separation in object photography (darker reds, lighter blues), and also for the correction of excessively light gray values of orange and red colors under artificial illumination. Its filter factor is approximately 1.5.

B+W Blue Filter 081 [BG 23] SLIM

This filter produces the same results as the 080 Light Blue Filter, only more intensely. Therefore it has the same application. Its stronger effect make it a mood-creating filter when photographing in fog or when aerial perspective is to be accentuated. Tonal separation in the photography of objects is also increased. Its filter factor is approximately 2.

B+W Light Red Filter 090 (25) [OG 590] SLIM MRC

This is the classic filter for architectural photography. White façades glow brightly, the blue sky is darkened dramatically and clouds become more impressive. It is also excellent for spectacular landscape photographs with greatly improved distant views. Its filter factor is approximately 5.

B+W Red Filter 091 (29) [RG 630] SLIM MRC

Compared to the lighter red filter described above, this one even darkens the reds near the yellow tones in the spectrum, as its transparency only begins in the orange-red region. It produces dramatic effects and extreme tonal separation for graphic effects. That accounts for the large filter factor of appr. 8.

More differentiated greens

Why does the use of a yellow-green filter lead to a much better differentiation of green tones in nature- and landscape photography? Here is the answer: Green can be a spectrally relatively pure green, but it can also be a blue-green & yellow-green mixture. Whereas pure green is readily transmitted by a yellow-green filter, an equally bright mixed-color green will have its blue-green component reduced, so that it will appear darker in a black-and-white print, darker than the gray tone generated by pure green.

Brightness- vs. color contrast

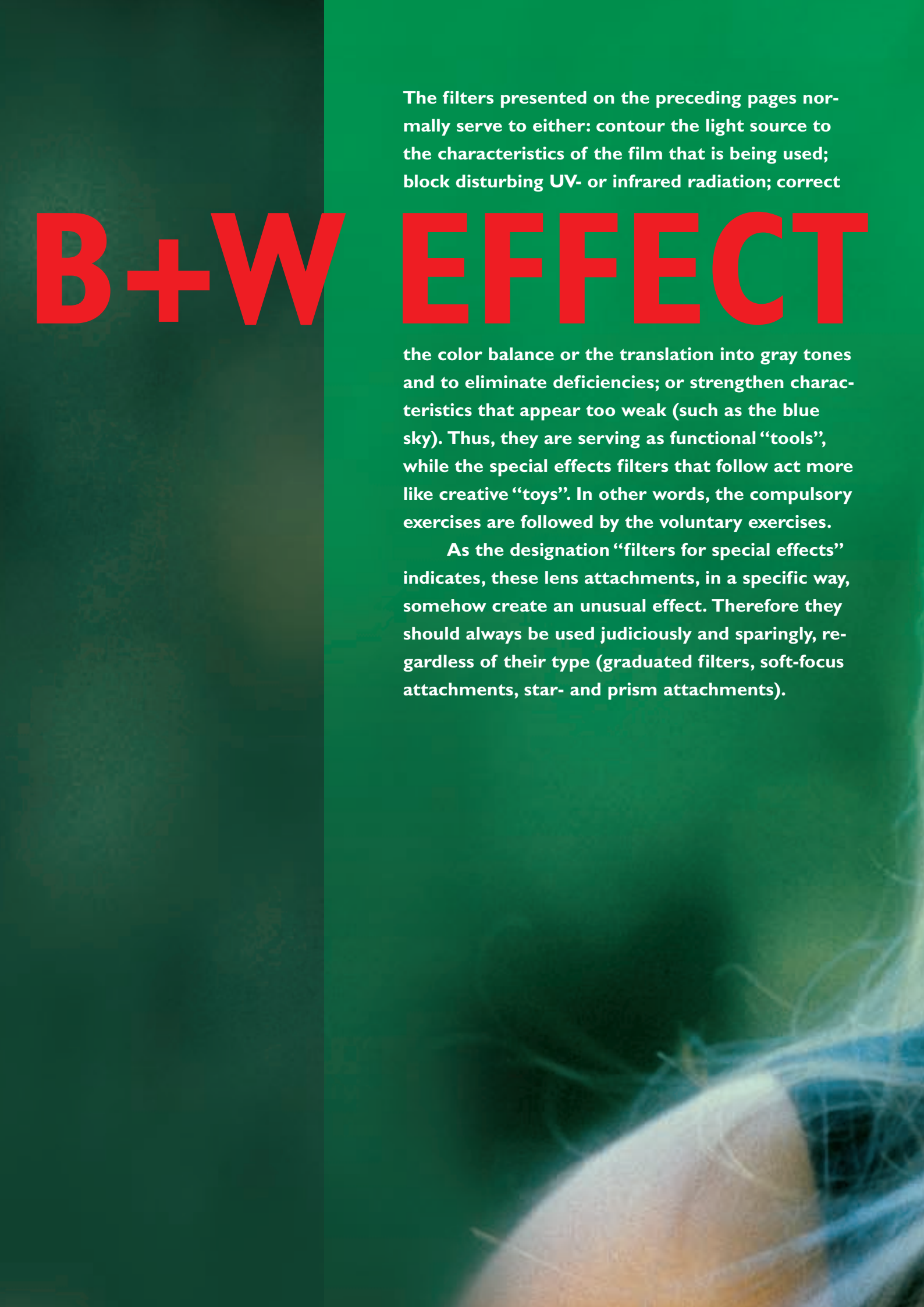
Unlike color photographs, black-and-white photographs only have brightness contrast, no color contrast. That is why in the photography of objects, for example, things that have different colors but the same brightness will have similar gray values. For instance, when there is a blue toy in the foreground and red dress with the same brightness in the background, they will be reproduced with the same gray values. This is referred to as insufficient tonal separation.

Colored filters are helpful in such situations. First the photographer must decide which object is to be rendered lighter and which one is to be rendered darker. Then he can select a filter color that 1) is similar to the color of the object that is to be shown lighter and that 2) is as complementary as possible to the object that is to be rendered darker. If the two colors are already nearly complementary, like blue and orange, he selects a filter color that is similar to that of the object that is to be rendered lighter. If the two main colors are not complementary, like blue and red, a compromise can be used: A blue filter lightens the blue color, but it also darkens the red color a little. But a green filter could also be used. While it would only lighten the related blue color a little, it would darken the red color more strongly than the blue filter would. The photographer would have achieved his objective in either case: a good tonal separation with the lighter gray of the toy and a darker gray for the dress.

B+W EFFECT

The filters presented on the preceding pages normally serve to either: contour the light source to the characteristics of the film that is being used; block disturbing UV- or infrared radiation; correct the color balance or the translation into gray tones and to eliminate deficiencies; or strengthen characteristics that appear too weak (such as the blue sky). Thus, they are serving as functional "tools", while the special effects filters that follow act more like creative "toys". In other words, the compulsory exercises are followed by the voluntary exercises.

As the designation "filters for special effects" indicates, these lens attachments, in a specific way, somehow create an unusual effect. Therefore they should always be used judiciously and sparingly, regardless of their type (graduated filters, soft-focus attachments, star- and prism attachments).



GRADUATED FILTERS • SOFT FOCUS FILTERS • STAR FILTERS • PRISM ATTACHMENTS • TRICK FILTERS • SPECTRA FILTERS

FILTERS

GRADUATED FILTERS

The very bright sky would be over-exposed without a filter, but it gains structure by means of a B+W Graduated Filter Gray 501

The clouds in the upper half still look heavy, but they gain a summery lightness with the use of a B+W Graduated Filter Blue 581

B+W Tip: Black-and-White Film

B+W graduated color filters are primarily intended for color photography and are used mostly for photography on color transparency film (the effects described on the right). When color negative films are used, the processing laboratory should be informed, so it won't "correct" the effects from the image.

But all B+W graduated color filters can, of course, also be used with black-and-white films, often with very interesting effects.

With black-and-white film, the two graduated gray filters will have the same effect as they would have with color film. And with the graduated color filters you can estimate the effects on the respective half of the image by checking the effects of filters of the same or similar color listed on pages 33/35.

The field takes on autumn colors with the use of an opposing combination of B+W Graduated Filters Blue 581 and Tabac 550

Correct exposure metering

When only a single graduated filter is used, it is nearly always for darkening (an excessively) bright sky. Exposure metering should be performed without a graduated filter, with the camera's meter (or a separate manual exposure meter) measuring the foreground that is to be exposed correctly. The sky will then nearly always show the desired effect.

With the combination of two graduated filters (one of them upside down in relation to the other), for instance a red one for the sky and a green one for the foreground, take the measurement through both filters. For a more dramatic effect, a slight under-exposure, perhaps by half an f-stop, is often desirable.

Rotating filter mounts

The mounts of graduated filters can be rotated, so that the line of transition between the colored and the clear half of the filter can be adjusted in relation to the subject without appearing unnatural.

B+W Graduated Filter Gray 501

The neutral gray half of this filter transmits 50% of the incoming light, so that it darkens the respective portion of the subject by one f-stop without altering its colors. For example, when the sky is too bright in relation to the landscape, this is an ideal amount for good detail rendition in the clouds and for preventing the sky from being "washed out" by over-exposure.

B+W Graduated Filter Dark Gray 502

Because it attenuates the light twice as much as the previous filter, i.e. by two aperture stops (it transmits 25% of the incoming light), this graduated filter already produces quite dramatic effects. Because of the increased difference in brightness, it is even more important for the horizon line not to be positioned too far from the center of the image.

B+W Graduated Filter Red 590

This graduated filter is often referred to as the "sunset filter", because it can simulate a missing red sky in the evening or in the morning or to enhance one that is too pale when the line of sight is towards the sun. By the sea or by a lake, the horizon line should be positioned high enough for the red portion of the filter also to cover the reflection in the water.

B+W Graduated Filter Orange 524

The somewhat more delicate coloring of this graduated filter is recommended when the correction of the sunset mood is not to be too pronounced, or when a certain amount of red coloring is already present, so that only a small enhancement would be sufficient. With heavy gray thunderstorm clouds it can produce a nearly awesome storm mood.

B+W Graduated Filter Violet 543

With grazing light and a sparse exposure, this graduated filter with its somewhat unnatural color can produce a ghostly, macabre moonlight effect. So it is more suitable for abstractions rather than enhancements of natural moods. An interesting effect can be achieved by using it in combination with the graduated green filter 561 for the lower half of the image.

B+W Graduated Filter Tabac 550

Those who have experienced a sandstorm in the desert will never forget that mood. With this graduated filter, one can approximate that mood: slightly threatening, yet still pleasantly "warm". The tobacco color is discreet, not overly colorful, so that it never appears gross nor overlay the existing colors as much as the other more intense graduated colors.

B+W Graduated Filter Green 561

Because of its vegetation color, this graduated filter is especially suitable for the lower half of an image when used in combinations with other graduated filters that are being used to darken or to alter the color of the sky. With such filter combinations, the TTL exposure metering should be performed with the filters in position on the lens.

B+W Graduated Filter Blue 581

This is an excellent solution when the sky isn't blue enough. It can be used effectively in combination with another graduated filter for the lower half of the image, so that in such a combination the sky will not be rendered too brightly or too pale. Example: sand dunes by the sea; using a graduated B+W Tabac Filter for the lower half and a graduated Blue Filter for the upper half of the image.

Additional graduated color filter variants that are available:

Yellow-Green 560

Purple 585

Increase the exposure only modestly for in the dense portion of the graduated filters, so that the effect of the filters won't be reduced too much.

Harsh sharpness without attachments

Flattering soft focus with Soft Pro

Noticeably softer with B+W Soft Image

FOG

Full image sharpness without attachments

Reduced contrast with fog attachment Fog 1

Pleasing soft focus with Softar 1

Considerably softer and flattering with Softar 2

SOFTAR

B+W Soft Focus Tip: f/4

The type of soft effect filter will determine what level that the effect of aperture conveys to the image. The aperture should be chosen judiciously and according to the following rules:

1. The aperture should not be smaller than an f-stop number that is approximately 1/5 of the focal length of the lens in mm. For example: on a normal 50 mm lens on a 35 mm camera, the smallest f-stop should be f/11; on a 28 mm lens it should be f/5.6. This restriction is not as critical with telephoto lenses. Stopping the lens down more can make the soft focus structure of the attachment become visible as a pattern.

2. The intentional choice of the depth of field for use of a soft focus effect can become a creative interplay between sharpness and unsharpness, so that the effect of a skillful combination of both can be enhanced even further. To achieve the most dramatic soft effect, use a larger aperture.

3. One of the most important applications of soft focus attachments is in portraiture. The ideal focal length for a lens on a 35 mm camera is between 85 and 135 mm, and in conjunction with an aperture of f/4.

B+W Soft Focus Attachment Soft Pro SLIM

The effect of this B+W soft focus attachment is created by fine lenticular protrusions that have been applied to a high-grade plano-parallel plate of glass in a random pattern. The light passing through between these protrusions creates a sharp core image for accurate focusing and great detail. This is an important feature for photographers using AF reflex cameras. The light diverted from its regular direction by the mini-lenses, coats the image with a diffuse halo of light for a delightful softness. This soft focus attachment is as ideal for feminine portraits, especially with highlights in blond hair. You can also use this attachment to create dreamy landscapes.

B+W Soft Focus Attachment Soft Image

Subject contours "flow" markedly softer with the Soft Image attachment on the lens than they do with the B+W Soft Pro. Prominent halos form around light sources and reflections, and bright parts of the subject acquire a noticeable veil of light. This effect is maintained even when the lens is stopped down. It is recommended for portraits and for backlit situations (however, it may be too soft for some landscapes).

B+W SF Attachments Original Zeiss Softar 1 and 2

This soft focus attachment has a large number of mini-lenses of varying sizes distributed on its surface in a random pattern, which deliberately defocuses the light that is passing through. This creates a soft, unsharp image around a sharp core image (which is advantageous for reliable manual or automatic focusing). The soft focus effect is largely independent of the chosen aperture setting, so that the depth of field can be controlled for the most part with only very modest concern for the degree of the soft focus effect. For a delicate soft focus effect, there is the Softar 1, and for a more pronounced soft focus effect, there is the Softar 2 attachment.

B+W Fog Attachments Fog 1 and Fog 2

The effect of the Fog 1 and Fog 2 attachments is quite different from that of the soft focus attachments as descibed above. The subject appears to be behind a delicate, bright veil of fog, which, unlike the effect created in corresponding pictures by soft focus attachments, also noticeably lightens large dark portions of the picture. All colors are strongly whitened and desaturated. By slightly over-exposing by approximately half an aperture stop, the romanticizing soft effect can often be enhanced even further. The two strengths that are available serve for tailoring the effect to the subject.

Soft does not mean unsharp

In spite of the fact that the effect of soft focus attachment is related to unsharpness, it should not be equated with it. That is because good soft focus attachments only "coat" a so-called core image that remains very sharp with a subtle veil of unsharpness, so that soft-focus photos can be rich in details. It is exactly this delicate combination of approximately 70 % to 90 % sharp with only 10 % to 30 % of an unsharp blend that creates its pleasant charm.

In some types of soft effect filters, there is a noticable reduction of contrast that results partly from refraction and partly from light scattering by the structure of the surface. This can make a contribution to the soft focus effect that is at least equal to that of the finely coated veil of unsharpness.

It's better to over-expose

In descriptions of the effects of soft focus attachments, reference is frequently made to flare, light fringes or halos. That implies that the subject is bathed in light. The friendly effect of such soft focus photographs also has something to do with our fondness for just the right amount of pleasing light.

That amount of light can only appear authentic if the picture's light-colored portions are really bright. That in turn means that the original exposure should not be too dark, but preferably a bit over (by approximately +1/3 to +1/2 of an aperture stop).

B+W Softspot

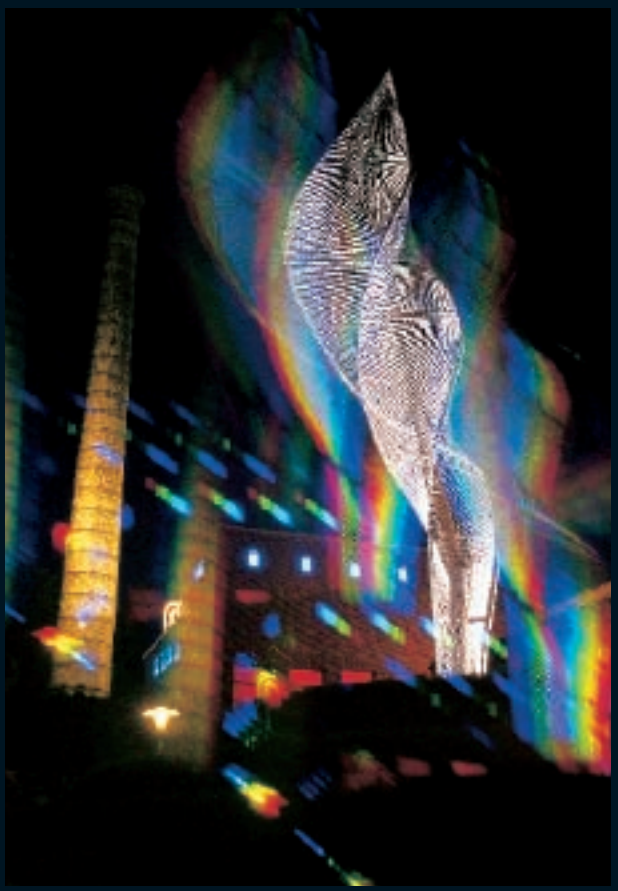
The Softspot attachment consists of a clear circular opening in the center, surrounded by a structured surface that "coats" the outer portions of the image with a whitening unsharp softness in a vignette-like fashion: the center of the image is clearly emphasized and surrounded by a wide frame. At large apertures (small f-stop number), the transition from sharpness to whitened unsharpness is very gradual, whereas it is almost abrupt when the lens is stopped down. It is advisable to use the preview lever on cameras (that are equipped with one) to determine the optimal aperture for this effect prior to the exposure.

SPECTRA

Arched spectral light ribbons with Spectra Spot at the light sources outside the central image region

Without an effect filter

With 8x Star Cross Screen



Spectra 2 produces two rays to the top left and the bottom right with the colors of the respective spectrum fanned out

B+W Tip: Use the effects sparingly

B+W Attachments make extraordinary, striking photos possible. Some shots only develop their true values with these attachments, while others are given that extra kick. However, as with all unusual effects, if they are overused, they lose power and appeal and can even have the reverse effect and just look contrived.

The great variety of B+W Attachments for special effects are always at your disposal, but should be used sparingly and only when they really do create that surprise effect.

B+W Tip: Rotate the effect filter slowly during video shots

All B+W Attachments for special effects can naturally also be used for video shots and should also be used sparingly and with care in these cases. The effects can be increased even further with videos by slowly rotating the attachments during shots.

Ideal: point light sources

Both the Spectra prism attachments, as well as the "radiating attachments" direct a little light from every bright image point in the direction provided by the respective attachment (which can be rotated). This always results in a minimal amount of soft focus when the point source of light is not very bright. Therefore these attachments should not be used with subjects that have normal contrast. Instead, they are most effective with dark subjects (the soft focus effect remains invisible with such subjects) that include very bright, point-shaped light sources, which lead to pronounced star-/radiating effects.

B+W Attachment Spectra 2 (2 directions)

The microprism structure of this attachment produces arrow-like rays emanating from light sources or reflections in opposite directions, with the colors of the respective spectrum fanned out. The effect is most dramatic with a dark background. The rotating mount makes it possible to select the optimal direction of the two colored rays in the picture.

B+W Attachment Spectra 8 (8 directions)

With this special effects attachment, eight colorful rays, emanate from every strong light source like two crosses superimposed at a rotational angle of 45°. This produces a romantic effect in nighttime city scenes, such as streetlights, automobile headlights, spots in display windows or on stages and around all bright reflections.

B+W Attachment Spectra 48 (48 directions)

The 48 colorful rays produced by this attachment diverge by only 7.5° from one another, and this density creates a circular pattern of multi-colored light rays surrounding each light source. Because of the large number of light rays, the subject should contain only a few very bright light sources with a dark background in order to avoid an overly busy image.

B+W Attachment Spectra 72 (72 directions)

The increased concentration of 72 colorful rays with an angular separation of only 5° emphasizes the circular shape of the array of light rays even more. Here, it is even more important that there should only be very few dominating light sources; preferably one, two or three within the picture area, and the background should be as simple as possible.

B+W Attachment Spectra Spot

The circular clear spot in the center of this attachment leaves the central portion of the image largely free from spectral effects and surrounds it with colorful patterns of light rays around the light sources similar to the effect produced by 48-ray Spectra attachment. It is most effective on lenses with short focal lengths or with apertures of f/8 or smaller.

B+W Spectra Attachments have a very fine microprism structure that is barely visible to the human eye. They stretch out the light sources in the form of rays that are divided into their spectral color components.

B+W "Star" Cross Screens have fine grating structures on the surface of high-grade optical glass that produce the ray effects by means of diffraction.

B+W Attachment 4x Cross Screen

The star patterns created around light sources by star screens are not spread out as colorfully as those created by Spectra attachments. Instead, their colors are less pronounced. The rays begin right at the light sources, they are very long and they are most effective when they are not vertical and horizontal, but at an angle of approximately 45° to the vertical axis.

B+W Attachment 6x Cross Screen

The star pattern produced by this screen is similar to that of the previous one, except that it generates 6 beams from light sources and reflections at an angle of 60° to one another. Here too the light rays emanate right at the light sources, whereas there is a small separation when Spectra attachments are used (as descibed on the left hand side of this page).

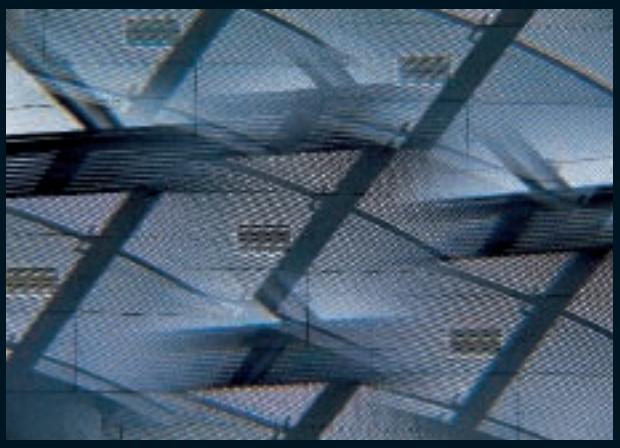
B+W Attachment 8x Cross Screen

Like two 4-beam star screens superimposed at a rotational angle of 45°, this star screen generates eight star beams. Therefore, as is the case with multi-beam Spectra attachments, there should only be a few light sources within the image area and the background should have large dark areas in order for the star beams to remain recognizable.

B+W Star Effect Attachment Double Sunny

A very fine diffraction grating generates a 16-beam star around every light source. The fine beams are subtly divided into their spectral colors, and they gradually dissipate towards their extremities. This effect is especially dramatic in backlight situations in sunlight, or with a different single but very bright light source within the image area.

Natural architectural information by means of true reproduction without a prism attachment



The 6x multi-prism repeats the realistic central portion of the image five times, creating a graphic pattern

The slightly rotated 6x parallel prism repeats a portion of the image to the right six times

The 3x multi-prism can emphasize an architectural pattern and exaggerate it to a maximum

PRISMS

In this example, a close-up prism has almost amortized itself through wondrous money accumulation

B+W tip: Dark surroundings

For the adjoining image repetitions to flow into one another softly, the focal length of the lens that is being used should not be too short and its aperture not too small. On a 35 mm camera, the ideal parameters are a focal length between 50 and 100 mm and an aperture between f/4 and f/8.

Because the colors of neighboring portions of the image blend in the overlapping area, this causes paler colors and lower contrast. For that reason, subjects with dark backgrounds or dark surroundings are recommended for this type of photography in order to retain pure colors and clear shapes.

B+W 3x Multi-Image Prism

The three wedges of equal size that meet at the center of this prism attachment are made of high-grade optical glass, and they deflect the light in such a way that the lens looks at the same subject in three directions. The lens should have an approximately normal focal length, i.e. 50 mm on a 35 mm camera or 80 mm on a 6×6 cm medium-format camera. The result will be a triple image with pleasingly merging contours. The positioning of the images can be varied by rotating the mount of the attachment.

B+W 5x Multi-Image Prism

Four prism wedges around a square plano-parallel center correspondingly generate five nearly identical images: one in the center and four around the periphery, all with softly merging contours. Here too, the most suitable lens is one with a normal focal length, in order for the outer four repeated images to be the same as the central one. The 5x prism can also be rotated for the best arrangement of the outer images, and is very popular for use on video cameras.

B+W 6x Multi-Image Prism

In this prism attachment, the central plano-parallel section is surrounded by five wedges, so that the final picture will consist of a central image repeated five times around the perimeter, a total of six images with softly merging edges. Like the other attachments, this one should be used on a lens of approximately normal focal length. It can also be rotated.

B+W 3x Parallel Prism

The circular area of this prism attachment is divided into three parallel strips. The central strip is a plano-parallel plate that does not alter the picture. The two outer strips are wedges that become thicker along their long edges towards the central strip. The lens therefore sees the image on the central strip repeated twice: once on the left strip and once on the right strip. Depending on the rotation of the attachment, the triple repetition of the image can be arranged horizontally, vertically, or diagonally.

B+W 6x Parallel Prism

One half of this attachment is a plano-parallel plate through which the image will be recorded quite normally. The other half consists of five parallel wedges of equal widths whose angle of inclination of the front surface increases from the center towards the outside, thus repeating the main image five times in parallel, with gently merging contours. This attachment can also be rotated.

Use medium focal lengths

Wedge-shaped prisms attached to the front of the lens deflect the incoming light, so that prisms with appropriate wedges and positioning lead to a multiple reproduction of the same portion of the subject in different locations on the image. Because the effect of these attachments is affected by the focal length of the lens that is being used, the shape of the wedges on B+W prism attachments is tailored to medium focal lengths (normal to short telephoto lenses or zoom settings within that range). Another reason why lenses with short focal lengths are not ideal for use in combination with prism attachments is the fact that their greater depth of field makes the various repeated picture sections appear more sharply distinct from one an other, instead of letting them overlap softly. And telephoto lenses are not appropriate either, because they no longer separate the picture portions formed by the prism attachments at all, imaging them nearly on top of each other instead, similar to an accidental multiple exposure.

The optimal positioning of the partial images, and the ideal aperture, can be judged by rotating the mount of the attachment and using the preview lever or button. When used with video cameras, eye-catching effects can be achieved by rotating the prism attachment during the exposure and/or zooming.

B+W Close-up Prism

The B+W close-up prism attachment has the effect of a +7 diopter close-up, and because its two halves are two wedges whose thickness increases towards the center, it produces two images. Like the other prism attachments, it is recommended for use with a normal lens. It produces a sharp image at a distance of approximately 14 cm (5 1/2 inches) with the lens focused at infinity. The reproduction ratio is slightly greater than 1:3. With the lens focused at the closest distance, the subject distance can be reduced to approximately 11 cm (4 3/8 inches) and the reproduction ratio will be increased to nearly 1:2. The two identical images can be arranged side-by side or above one another or even adjacent diagonally, depending on the rotational orientation of the attachment.


B+W CLOSE

-UP LENSES

To explore certain domains photographically, to make things become visible in a way and with a richness in details that is almost imperceptible to our bare eyes can be incredibly exciting. Those who believe that one needs specialized equipment to achieve that should take a closer look at B+W Close-Up Lenses. With these inexpensive accessories that take up hardly any space in the gadget bag, the range of applications, especially of lenses with normal or short telephoto focal lengths, can be expanded dramatically.

Compared to extension tubes, close-up lenses can be more desirable, not only because of their lower prices, weights and volumes, but also because of the clearly better image quality that can be achieved at reproduction ratios of up to approximately 1:2.5. The extremely strong B+W Macro Lens can even be used to reproduce subjects in the macro range at nearly 1:1, if a small reduction of sharpness in the corners of the frame is acceptable (because of the very shallow depth of field, the background in most macro photographs is completely unsharp anyway).

Closest focusing distance with a 50 mm lens

B+W Tip: Ratio and subject size

The maximal reproduction ratios that can be attained with close-up lenses depend on the focal length and on the closest focus distance for which the lens can be set. They also depend on the optical and mechanical design of the lens (nodal point separation and distance of the close-up lens from the subject-side nodal point). Thus, the reproduction ratio indications can only be used as guidelines. The exact reproduction ratios must be determined individually for every lens. The frame-filling subject size can be calculated by multiplying the film format by the reciprocal of the reproduction ratio. For example: the standard 24×36 mm format on 35 mm film with a reproduction ratio of 1:4 will cover a subject size of 96×144 mm.

CLOSE-UP

Frame-filling image with an attached B+W Close-Up Lens NL 1 (this size can also be attained with an NL 2 close-up lens)

A little larger still with B+W Close-Up Lens NL 2 when focused at the closest distance

Approaching the macro range with B+L Close-Up Lens NL 3

A true macro photograph with the B+W Macro Lens

B+W Close-Up Lens NL 1

With +1 diopter, it is ideal for telephoto and zoom lenses with a near focusing distance of approximately 1 m (3 1/4 feet), resulting in a focusing range without a gap. With the 35 mm format, it is ideal for lenses with focal lengths between 85 mm (up to approximately 1:5) and 200 mm (up to approximately 1:3). On a 50 mm lens, start with the NL 2 close-up lens!

B+W Close-Up Lens NL 2

The +2 diopters of this close-up lens focus at a distance of 0.5 m (1 5/8 feet) with the lens focused at infinity. For the normal lens it is a stepless extension of its close-up range up to approximately 1:4.5. On short to medium telephoto lenses it extends the NL 1 close-up range seamlessly (with an 85 mm lens to appr. 1:3.5 and with a 135 mm lens to appr. 1:2.5).

B+W Close-Up Lens NL 3

With its +3 diopters, the near-focusing distance of this close-up lens begins at 33 cm (13 inches) from the front rim, regardless of the focal length of the main lens. When close-ups have to be taken because of the wide-angle effect of a 35 mm lens, the NL 3 close-up lens is ideal for a seamless extension of the normal close-up range up to approximately 1:5.5.

B+W Close-Up Lens NL 4

The +4 diopters of this close-up lens are the right power for closer focusing with a 50 mm lens (up to approximately 1:3) when you have reached the limit with the NL 2 lens. With 85 mm (up to appr. 1:2.1) and 100 mm (up to appr. 1:1.9) telephoto lenses, it is the highest power, and it should be used with the main lens stopped down to at least f/8.

B+W Close-Up Lens NL 5

With +5 diopters, the NL 5 serves for the seamless extension of the range provided by the NL 3 close-up lens on a 35 mm main lens (up to appr. 1:3.5). If you can tolerate a small gap after the NL 2 close-up lens on a 50 mm main lens (appr. 1:4.4 to 1:4), then you enter a little further into the macro range with the NL 5 instead of the NL 4 (up to appr. 1:2.6).

B+W Macro Lens (suitable for digital photography)

The +10 diopter power makes it possible to explore true macro ranges without the need for an expensive special lens, in order to reproduce tiny subjects at enormous proportions (appr. 1:2 to 1:1.5). Apertures of f/8 or f/11 are recommended for good corner-to-corner sharpness. Because of its great power, it is also suitable for use with digital cameras.

Superior close-up lenses!

The best image quality in extreme close-up photographs is achieved with macro lenses. But such lenses are expensive. If you only take occasional close-up pictures, such an expense might not be justified. An alternative approach is to use close-up lenses or extension rings. Not only are close-up lenses the less expensive solution, they can yield better quality at reproduction ratios of up to appr. 1:2.5 (i.e. at the smallest frame-filling object size of 6x9 cm or 2 3/8x3 inches) as they adapt the "farsighted" main lens to the close-up range. And they have the additional advantage that they do not cause a reduction of effective light, so that the selected aperture remains practically identical with the effective aperture. Extension rings strongly reduce the effective aperture, thus darkening the viewfinder image and requiring exposure corrections.

Therefore, there is no reason to regard close-up lenses as less desirable emergency solutions as long as the power of the chosen close-up lens is not too high, and the aperture is stopped down sufficiently which is customary because of the shallow depth of field for close-ups.

Scale ratio or distance?

The shortest possible focusing distance for lenses, close-up and macro accessories is usually cited as a performance criterion for their macro capability. This value does not, however, reveal much about the image size of the subject. A more relevant parameter is the reproduction ratio that can be achieved (i.e. the ratio of image size to object size) or the smallest frame-filling subject size. For example, a 35 mm lens equipped with a B+W NL 2 close-up lens (= +2 diopters), when set at 0.3 m (11 3/4 in.) on its focusing scale, at a distance of ***14 cm (5 1/2 in.)*** *will cover an object size of approximately 11x16 cm (4 3/8x6 1/4 in.) at a reproduction ratio of 1:4.5, whereas a 100 mm lens with the same close-up attachment set for 1 m (3 1/4 feet) on its focusing scale, at a distance of* ***35 cm (13 3/4 in.)*** *fills the frame with an even smaller object size of 8x12 cm (3 1/8x4 3/4 in.) at a scale ratio of 1:3.3.*


B+W-AC

CESSORIES

If you wish to consistently experience the gratifying joy of successful photography, the best way is to avail yourself of high-quality, reliable equipment. Attention should be paid not only to cameras and lenses, but also to small things that are sometimes overlooked as seemingly irrelevant. That is why we supplemented the line of B+W filters with additional accessories that are necessary or useful when used in combination with filters.

For safe and dustproof storage of filters we offer a choice of rigid cases or soft padded pouches. When, in spite of all precautions, filters or lenses become soiled with dust, fingerprints or water spray, the lint-free and washable B+W high-tech microfiber cleansing cloth will quickly restore the surfaces to impeccable conditions.

To protect the exposed front element of a lens from mechanical damage while at the same time shielding it from contrast-reducing stray light, we offer metal- and collapsible rubber lens hoods that are specifically optimized for wide-angle-, standard- and telephoto lenses.

And our adapter rings make it possible to adapt a single filter size to various lenses with different filter threads, so that it won't be necessary to acquire complete filter sets for every lens.

B+W Photo Clear Micro-Fiber Cleansing Cloth

There is not a better cleansing- and care cloth for filters, lenses and other sensitive optical equipment (like binoculars, spotting scopes and eyeglass lenses) and even slide cover glasses than the B+W high-tech microfiber cleansing cloth. It is free of chemicals and lint, it cleans well but gently and it can be washed in an environmentally safe manner. Available in two sizes, each with a protective plastic envelope: appr. 36×29 cm (14×11 3/8 in.) and 17×17 cm (6 1/2×6 1/2 in.).

B+W Plastic Filter Case BH, D and E

Thanks to their transparent lids, these handy flat filter cases, made of impact-resistant plastic material, let you see right away which filter is stored inside. A foam rubber insert keeps filters from rattling. A filter contained in such a case can be carried in a pocket without any problems. These B+W filter cases are available for the following filter thread sizes:

Size BH	For filters and and special effects attachments up to	52 E
	Matching step-down inserts up to	48 E
Size D	For filters up to	82 E
	Matching step-down inserts up to	62 E
Size E	For filters up to	105 E

B+W Plastic Case for Four Filters

The material and features of this filter case are the same as those of the cases described above, except that it has an insert that holds four filters. Recesses in that insert keep the filters from touching or rubbing against each other. Finger indentations permit the easy removal of filters from their recesses. The four-filter case is available with a choice of an insert for filter sizes 49 E, 52 E, 55 E or 58 E.

B+W Filter Pouch B 6

This folding, padded filter pouch is made of a flexible plastic material with snap fasteners. Its see-through pockets shelter six filters or close-up lenses in sizes up to 62 E. It easily fits in any gadget bag, for instance readily accessible in a front compartment. It has proven to be a convenient and safe carrier for the most important filters and attachments.

B+W Nylon Fabric Filter Pouches E 1, E 2 and E 3

These filter pouches are made of padded, water- and abrasion-resisting Nylon fabric with practical Velcro closures and a white space for identification. They are available in the following sizes:

E 1	11.5×11.5 cm	for filters up to	77 E
E 2	14.5×14.5 cm	for filters up to	105 E
E 3	20.0×20.0 cm	for filters greater than	105 E

B+W Collapsible Lens Hood 900

This collapsible lens hood is made of high-grade rubber and its angle of view is tailored to standard- or short telephoto lenses. Its inner ribbed surface enhances the light-absorbing effect of the flat black surface. In the collapsed state, for example in filter thread sizes up to 77 mm, it increases the length of a lens by approximately 10 mm.

B+W Collapsible Wide-Angle Lens Hood 920

This collapsible lens hood is designed for wide-angle (zoom) lenses with angles of view up to 70°. With shortest focal lengths it should be used without filters in order to avoid vignetting.

B+W Collapsible Telephoto Lens Hood 930

In spite of its large effective length, this collapsible hood for telephoto lenses only increases the length of a lens by appr. 26 mm (about 1 inch) in the case of filter thread sizes up to 58 mm, thus conserving space in the gadget bag.

B+W Metal Lens Hood 950

A good looking and sturdy lens hood for standard lenses, made of black-anodized aluminum with light-absorbing flat black ribs on the inside. Space-saving short design.

B+W Metal Wide-Angle Lens Hood 970

A shorter sturdy lens hood for wide-angle lenses with angles of view up to more than 70°, made of black-anodized aluminum with light-absorbing flat black ribs on the inside.

B+W Metal Lens Hood for the 28 mm f/2.8 PC lens

Special wide-angle lens hood for the Schneider 28 mm f/2.8 PC Super-Angulon lens, on which only this particular lens hood can be used (also see B+W Round Filters, Page 59).

B+W Metal Telephoto Lens Hood 960

A sturdy lens hood for all telephoto lenses is made of black-anodized aluminum with light-absorbing flat black ribs on the inside. Thanks to its large length, it is very effective.

B+W Collapsible and Metal Lens Hoods

Lens hoods obstruct light rays from outside the imaging angle of view that strike the lens, yet do not contribute anything to the structure of the image. Hoods prevent unnecessary light rays from being reflected diffusely or directly by lens surfaces, rims, inside the lens mount and even inside der camera body. Because such stray light, especially light rays entering obliquely from the front, can veil the image or super-impose light spots and ghost images, it can lower contrast. This results in a loss of definition, too. Lens hoods thus can significantly improve image quality. Examples include a very bright background just outside of the angle of view; a bright, hazy or cloudy sky; photographs on a white background or on a backlit background (light table!).

With a lens hood that is properly tailored to the angle of view, a medium-quality lens used in a situation with strong obliquely incoming light can possibly produce more brilliant pictorial results than a high-grade, far more expensive lens used without a lens hood. That is so because the contrast achieved in the fine image structures is relevant to the impression of sharpness, and that contrast can be significantly enhanced by the use of an appropriate lens hood (or in other words: the contrast can be significantly reduced by the avoidable flare).

Because the cost of a good lens hood is but a fraction of the additional cost of a super-lens, nobody should neglect this very useful accessory. This applies all the more to owners of expensive lenses, whose performance capability is not nearly fully exploited without a proper lens hood.

Lens hoods also provide effective mechanical protection against raindrops, accidental touching (fingerprints reduce the contrast significantly!) and occasional strong impacts on the exposed front element of a lens. In this regard, the collapsible lens hoods made of elastic rubber are particularly effective because of their impact-absorbing properties.

A collapsible lens hood can remain on the lens permanently, because it only lengthens the lens minutely in its collapsed state, requiring hardly any additional space in the gadget bag. This in turn increases the chances that the lens hood will already be in place in hectic situations, avoiding lost time screwing sturdy hoods into the front of the lens barrel or removing them.

B+W Adapter Rings for various filter sizes

Adapter rings serve to accommodate filters, close-up lenses and other attachments to lenses with different filter thread sizes. For example, with a camera outfit that includes lenses with 49 mm and 52 mm filter threads, adapter rings make it possible to use 52 mm filters on both types of lenses. Not only does this save money that can be invested in a greater selection of filter types, it also saves space and weight in the gadget bag. Caution: When a smaller filter is adapted to a lens with a larger filter thread, there is the probability of vignetting!

B+W Adapter Rings listed according to their filter-side thread sizes

Thread on the filter	Filter thread or bayonet on the lens	Adapter number
105 x 1.0	100 x 0.75	0
	100 x 1.0	00
82 x 0.75	77 x 0.75	101
	72 x 0.75	100
77 x 0.75	Rollei Bayonet VI	0 c
	72 x 0.75	1 a
	67 x 0.75	1
	62 x 0.75	1 b
72 x 0.75	Rollei Bayonet VI	0 b
	77 x 0.75	21 a
	67 x 0.75	1 c
	62 x 0.75	1 d
	58 x 0.75	1 e
67 x 0.75	Hasselblad Bayonet 60	–
	Rollei Bayonet VI	0 a
	62 x 0.75	2
	60 x 0.75	2 a
	58 x 0.75	2 b
	55 x 0.75	2 c
	52 x 0.75	2 d
	49 x 0.75	2 f
62 x 0.75	67 x 0.75	22
	60 x 0.75	3 e
	58 x 0.75	3
	55 x 0.75	3 a
	52 x 0.75	3 b
	49 x 0.75	3 c
60 x 0.75	55 x 0.75	4 b
58 x 0.75	Hasselblad Bayonet 50	–
	55 x 0.75	5
	52 x 0.75	5 b
	49 x 0.75	5 c
	43 x 0.75	5 g
	40.5 x 0.5	5 h
	39 x 0.5	5 i
55 x 0.75	58 x 0.75	25
	54 x 0.75	6 d
	52 x 0.75	6
	49 x 0.75	6 a
	48 x 0.75	6 b
52 x 0.75	Hasselblad Bayonet 50	–
	60 x 0.75	23
	58 x 0.75	25 b
	55 x 0.75	26
	49 x 0.75	8
	48 x 0.75	8 a
	46 x 0.75	8 b
	43 x 0.75	8 c
	40.5 x 0.5	8 e
	37 x 0.75	8 i
	35.5 x 0.5	8 f
49 x 0.75	58 x 0.75	25 c
	55 x 0.75	26 a
	52 x 0.75	28
	48 x 0.75	9 c
	46 x 0.75	9 e
	45 x 0.5	9 f
	43 x 0.75	9 g
	41 x 0.5	9 h
	40.5 x 0.5	9 i
	37 x 0.75	9 m
	36.5 x 05	9 k
	35.5 x 0.5	9 l
48 x 0.75	55 x 0.75	26 b
46 x 0.75	55 x 0.75	26 c
	43 x 0.75	11 b
	41 x 0.5	11
	40.5 x 0.5	11 a
	37 x 0.75	11 c
40.5 x 0.5	39 x 0.5	15
	35.5 x 0.5	15 a
39 x 0.5	30.5 x 0.5	16 a
37 x 0.75	35.5 x 0.5	17 d
	30.5 x 0.5	17 c
	30 x 0.75	16 c
	28 x 0.75	17 b
30.5 x 0.5	28 x 0.75	17 a

B+W Front Lens Snap-Cap 310

Protective lens cap with two spring-loaded plastic claws opposite each other that engage the female filter thread of the lens or the front thread of an attached filter. That permits a fast and secure seating of the lens cap without the need of time-consuming screwing. To remove the Snap-Cap, simply press the two opposing spring-loaded keys together and lift the cap off. Available in the following sizes: 46 E, 48 E, 49 E, 52 E, 55 E, 58 E, 62 E, 72 E and 77 E.

B+W Slip-On Front Lens Cap 300

Protective lens cap made of flexible plastic material that slips over the outer front rim of the lens or the rim of an attached filter. It may also be used for some binoculars. It remains in place by means of friction of the slip-proof plastic material. This lens cap can also be used on an attached filter that has no inner front thread. Available for lenses or filters with the following front rim diameters: 27, 30, 32, 37, 42, 51, 54, 57, 60, 65 and 70 mm.

B+W SLIM Front Lens Cap 305

A flatter slip-on lens cap made of flexible plastic material. It has all the features of the previously described slip-on lens cap except for its thickness. Its thickness is tailored to that of the B+W SLIM filter mounts (but it can also be used on other filters). Therefore this lens cap is especially advantageous when the diameter of the front rim of the lens is slightly greater than that of the SLIM filter, so that a normal lens cap could not be slipped on completely. Available for the following SLIM filter mounts: 49 E, 52 E, 55 E, 58 E, 60 E, 62 E, 67 E, 72 E, 77 E and 82 E, or for the corresponding outer filter diameters 52, 55, 58, 61, 62, 65, 70, 75, 80 and 85 mm.

B+W Rear Lens Caps 330 to 335

Protective cover for the camera-side rear bayonet or thread of the lens. Available for the following bayonet mounts: Canon FD (330), Minolta MD (331), Nikon (332), Olympus OM (333), Pentax K (334) and M-42 thread (335).

B+W Camera Body Covers 320 to 325

Protective covers for the bayonet- or thread lens mounts on camera bodies. Available for SLR cameras with the following lens mounts: Canon FD (320), Minolta MD (321), Nikon (322), Olympus OM (323), Pentax K (324) and for M-42 thread mounts. These covers can also be used as front protective covers on corresponding tele-converters, provided their optical systems are sufficiently recessed in their mounts.

Protect your lens with a cap!

Quite a few photographers assume that their lenses are adequately protected against dust, dirt and damage inside their gadget bags and therefore they dispense with the protective lens caps, because they think that the latter are superfluous. The very same photographers should not be surprised that every few weeks they have to use a camel hair brush, an air bulb and a cleaning cloth to remove the dust deposits, lint and fingerprints that accumulated since the previous cleaning.

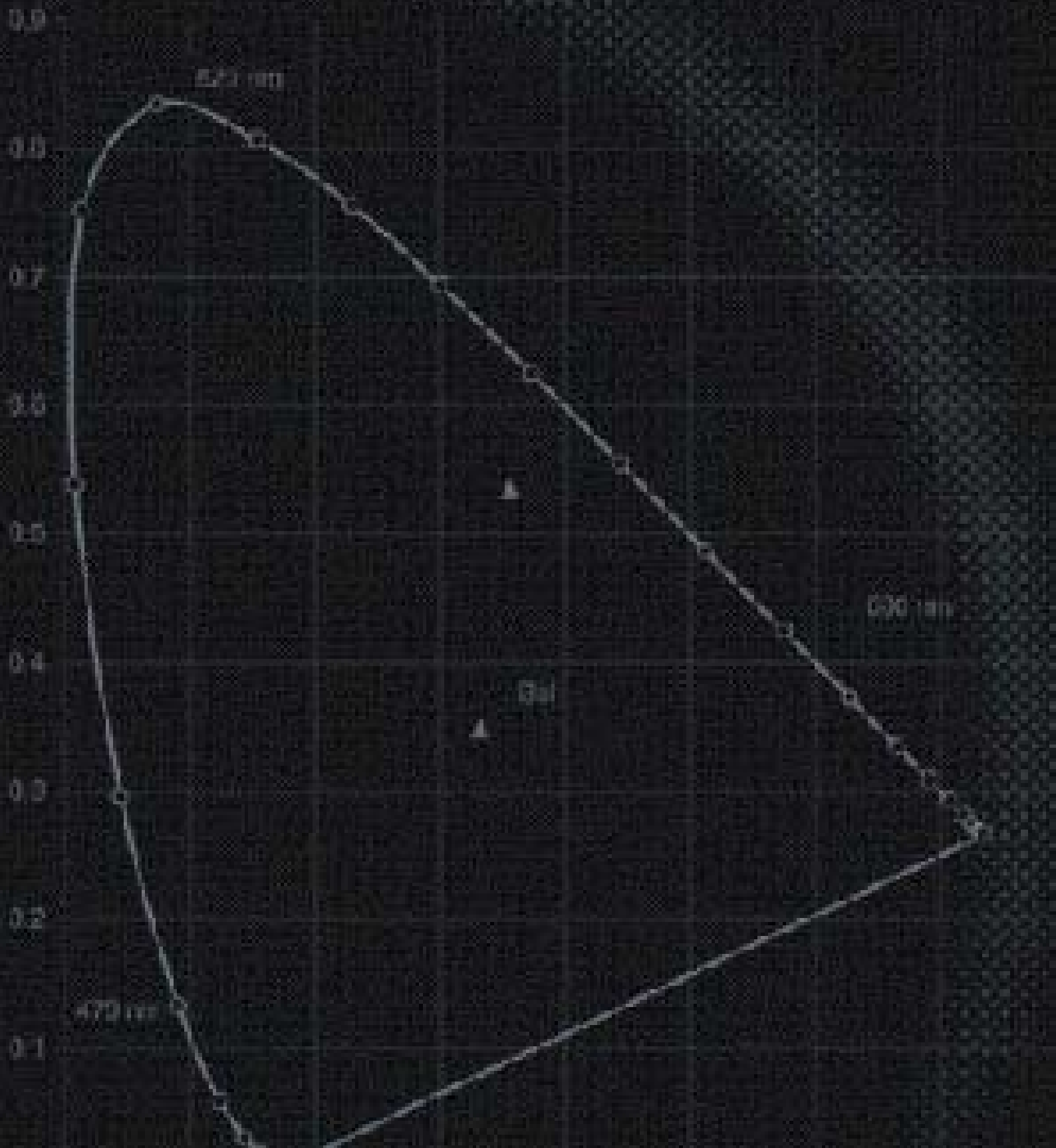
But those who take the precaution of attaching protective covers to all the lenses in their gadget bags probably will only have to use a brush and a cleaning cloth on those lenses twice a year (before and after the great vacation trip), unless an unusual situation makes an unscheduled cleaning necessary. It is not a matter of avoiding extra work or gaining time, but to protect the lenses, because every soiling and every cleaning involves the unnecessary potential of dangerous damage to the sensitive surfaces and coatings of the glass, which should be avoided.

When aggressive substances reach the lens or filter surfaces, or when fine dust contains tiny quartz particles (which is the major component of sand), even a slight pressure during the cleaning process can cause damage as quartz crystal is much harder than glass and readily scratches it like a diamond.

Thus the recommendation clearly has to be that the use of a front lens cap and, when the lens is not attached to the camera, a rear cap should be a matter of course. The front lens cap should only be removed just before the lens is to be used for an exposure. And as soon as the camera is no longer needed to be ready for photography, or when the lens is removed and stored in the gadget bag, the protective caps should be re-attached!

Those who follow these rules will always have clear front and rear lens elements, the best guarantee for their expensive lenses to render their very best performance; in terms of brilliant images with high contrast, impressive detail sharpness and rich shadow details.

TECHNICAL DATA/ TYPES OF MOUNTS



Coatings

At first glance, the coating of filters may not seem particularly important, because unlike photographic lenses, they have only two glass-air surfaces that can lead to reflections that reduce the transmission of light. This also applies to B+W Polarizing Filters, because their polarizing foils are cemented between two glass discs.

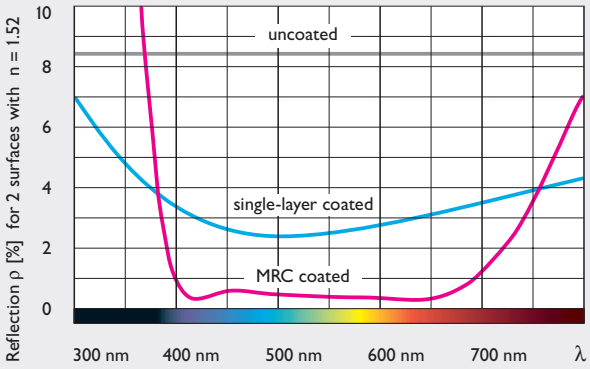
The coating of the front surface seems even less important, because the first reflection is directed away from the lens. In other words, it cannot generate stray light or ghost images. Does coating even have any relevance at all, considering the fact that the transmission loss for both uncoated surfaces together amounts to only 8 % (or 1/9 of an aperture stop)? Closer examination shows that high-grade coating does indeed enhance image quality significantly, especially with high-contrast subjects and when a light source (like the sun or a light bulb) is visible in the picture.

Once again, with normal single-layer coatings the loss of transmission for both surfaces on average amounts to only approximately 3 %, whereas with more complex multiple coatings (MC) it amounts to a mere 0.5 %. A more significant aspect than the gain in light transmission is the reduction of reflections and ghost images to about 1/3 with simple coatings, and to less than 1/16 with MC coatings. Coating is even more important when two filters are used in combination. Not only will the losses in transmission and the reflections be doubled with such combinations, but also multiple reflections are possible between the filters, which may cause disturbing double images when there are light sources included in the image area. Single coatings reduce the occurrence of double images to approximately 1/8, whereas MC coatings reduce it to approximately 1/70!

MRC coating (Multi-Resistant Coating) by B+W is not only an extraordinarily effective multiple layer coating, it is also harder than glass, so that it protects filters from scratches (for instance when cleaning the filters), and it is also water- and dirt repellent, thus facilitating filter maintenance.

The diagram that follows shows the combined amount of reflection of the two surfaces in the visible range of the spectrum for uncoated surfaces, for surfaces with a single-layer coating and for surfaces with MRC multi-layer coatings.

All B+W color filters for color- and black-and-white photography, as well as the neutral density filters 101, 102 and 103 normally have single-layer coatings, and



most of these filters are also available with MRC multi-layer coatings. B+W polarizing filters have different coatings, depending on the kind and on the glass diameter. The overview tables for all B+W filters on pages 62 to 64 show the kind of coating for each type and size of filter.

Filter mounts

When purchasing a filter, you should take into account both the quality of the optical glass and the coatings as well. However, don't overlook the quality of the filter mount, as it is also very important.

The mount must have sufficient strength to protect the breakable glass, hold it without mechanical tension, but also without play. It should provide a good grip, and have precisely fabricated threads for easy attachment to and removal from the lens. It should not be "long" enough (ring height) to cause vignetting. It should have a clearly legible and descriptive engraving. Its inside surfaces should be as reflection-free as possible, preferably matte black.

B+W filter mounts meet these requirements to perfection. As a rule, they are made of sturdy brass on highly accurate CNC machines. The filter glass is kept securely in place by a threaded retaining ring that is fabricated with equal accuracy. The mount surfaces have a black chrome finish, the labeling is clearly legible, the inside surface is matte black. The standard mounts are already designed to be thin enough so as not to cause vignetting on moderate wide-angle lenses. There are B+W SLIM mounts for wide-angle lenses with shorter focal lengths, and there are also "oversized" mounts for extreme wide-angle lenses (see table on page 64). Special mounts with bayonets for Rollei- and Hasselblad lenses round out the B+W line of filters.

All the available types of B+W mounts as well as the unmounted sheet filters are described in detail and illustrated on the double-page spread that follows.

B+W Standard Filter Mount F-Pro

Compared to the earlier B+W standard filter mount, the B+W Standard Filter Mount F-Pro has been improved considerably.

While maintaining the excellent quality of materials, fabrication, and high mechanical stability, the new F-Pro mount has become thinner, so that now it can also be used on many wide-angle lenses without the danger of vignetting. An exact focal length limitation cannot be stated, because vignetting depends not only on the height of the filter mount, but also on the design of the front of the lens. Nevertheless, the following can serve as a guide: The B+W standard filter mount F-Pro can be used without vignetting on 35 mm camera lenses with focal lengths of 35 mm, most 28 mm lenses, and in many cases even on 24 mm lenses.

Another advantage of the new F-Pro filter mount is its modified retaining ring, which is no longer threaded in from the front, but holds the filter glass in place from the back. This prevents the retaining ring from being accidentally loosened during the removal of an additional filter or a lens hood that has been screwed in too tightly.

B+W SLIM Wide-Angle Filters

With the trend for keeping dimensions and weight of their lenses as compact as possible, many lens manufacturers are supplying their wide-angle lenses with filter thread diameters that are so tight that a filter with normal thickness might vignette.

To solve that problem, B+W has introduced the thinner line of B+W "SLIM" wide-angle filters without a front thread that are a mere 3 mm thick, designed for super wide-angle lenses that are prone to vignetting. Because "SLIM" polarizing filters have not one, but two glass discs with the polarizing foil cemented between them, they are 5 mm thick.

In most cases, "SLIM" filters permit exposures even with extreme wide-angle lenses with focal lengths as short as 17 mm without vignetting caused by the filter mount.

B+W SLIM wide-angle filters distinguish themselves from filters available from other manufacturers by their outstanding mechanical execution, with retaining rings that guarantee an absolute, lasting, rigid assembly. The unique B+W Polarizing Filters according to Käsemann are now available in super-flat, 5 mm thick SLIM mounts for vignetting-free wide-angle photographs.

B+W Wide-Angle Filters with oversized mounts

Compared to normal filter mounts that have about the same outer diameter as the lens mounts, the diameter of the front portion of an "oversized" filter mount is much larger than its thread that is screwed into the lens, and it has a correspondingly larger filter glass. The advantage of this design is that it offers a larger "window", so that the image periphery will not be obstructed, meaning that there will be no vignetting (darkening) of the corners of the image.

For extreme wide-angle lenses with angles of view of 110° or even 120°, especially those with a generous image circle for adjustable large format cameras, these filters are a must.

Because wide-angle lenses by nature already have the unavoidable brightness reduction near their edges due to the laws of physics (the $\cos^4$ law), additional vignetting caused by thick filter mounts would be all the more conspicuous.

Oversized B+W filters, which are available in the most popular sizes (see the tables on pages 62 to 64) have a very flat mount and should be used without a lens hood, because the latter may still introduce some vignetting.

B+W Polarizing Filters according to Käsemann

Polarizing filters are thicker because they have two glass discs with a polarizing foil cemented between them, so that with normal ring thickness, they may shade the corners of the image when used on wide-angle lenses. B+W polarizing filters, which are 5 mm thick, are also available in the Käsemann version, and they are suitable for vignetting-free use on most wide-angle lenses. In the case of lenses for 35 mm cameras, they can be used with focal lengths down to 28 mm and often even down to 24 mm. For wide-angle lenses with an even larger angle of view and especially for wide-angle lenses for large format cameras, B+W has created special polarizing filters. The latter have an "oversized" mount with larger filter discs (see above) and they are equipped with the particularly high-grade linear- and circular polarizing foil according to Käsemann. After the cementing process, these filters are re-ground and polished to ensure precise plano-parallelism and then they are edge-sealed. The advantages of polarizing filters according to Käsemann are described on page 15.

B+W Special Polarizing Filters are also available in the 67 E size that fits the 28 mm f/2.8 Schneider PC Super-Angulon lens. The mount of this filter was designed so that it will not interfere with the movement of the front floating element group while the 28 mm PC Super-Angulon lens is being focused.

B+W Sheet Filters (unmounted glass filter squares)

Bellows, universal filter holders and special lens hoods that can hold unmounted glass filter squares are used primarily on medium- and large format cameras. Because the highest image quality is a major priority in professional photography, B+W offers key filters in the square 75×75 mm and 100×100 mm sizes. These are ground and polished plates of high-grade optical glass that are superior to the familiar plastic filters with regards to homogeneity, plano-parallelism and surface quality.

Neutral Density 101 (ND 0.3 / 1 f-stop)
Neutral Desnity 102 (ND 0.6 / 2 f-stops)

Linear Polarizing Filter according to Käsemann, uncoated, thickness = 3.5 mm ±0.2 mm

Conversion Filter KB 1.5 (82 A) *
Conversion Filter KR 1.5 (1 A) *
Conversion Filter KR 12 (85) *

Fluorescent Light Filter 499 F-Day *

Yellow Filter Light 021 (2 E) *
Red-Orange Filter 041 (22) *
Yellow-Green Filter 060 (11) *
Red Filter Dark 091 (29) *

Grey-/Graduated Filters, uncoated, ≈ 3 mm thick, Sizes 75×75 mm, 100×100 mm and 100×150 mm:
Graduated Filter Gray 50% 501
Graduated Filter Gray 25% 502
Graduated Filter Orange 524
Graduated Filter Violet 543
Graduated Filter Tabac 550
Graduated Filter Yellow-Green 560
Graduated Filter Green 561
Graduated Filter Purple 585
Graduated Filter Red 590

* Filters marked with an asterisc are available on request

Matching Containers:
75×75 mm Filters: Nylon Filter Case Size E 1
Plastic Filter Box Size D
100×100 mm Filters: Nylon Filter Case Size E 2
Plastic Filter Box Size E

B+W Round Filters for the 28 mm f/2.8 PC lens

A special lens hood that accepts interchangeable 74 mm diameter glass filter discs (see page 53) was designed for the 28 mm f/2.8 Schneider PC Super-Angulon. This lens has an extremely large angle of view, and shift capability utilized for the correction of converging lines. The glass filter discs are available as UV-blocking filters, Skylight filters, LB- and CC filters, Neutral Density filters, color filters for black-and-white photography and infrared filters. For the B+W Special Polarizing Filter according to Käsemann see the adjacent page on the left.

58
59

B+W Filters for Rollei- and Hasselblad bayonets

Various lenses for Rollei and Hasselblad medium-format cameras are equipped with bayonets for the attachment of filters and lens hoods. Bayonets have an advantage over threaded filters (threads may also be provided by some of these lenses) for quick attachment and removal. The line of B+W filters also includes a series of color- and polarizing filters in mounts that fit Rollei bayonets I, II, III and IV as well as Hasselblad bayonets 50, 60, 70 and 93.
Original Zeiss Softar- and Proxar attachments are distributed directly by Rollei and Hasselblad and are not available directly from B+W.

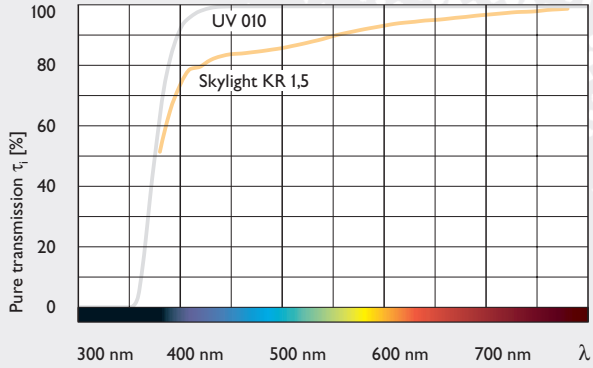
B+W Filters for Astronomical Applications

Filters are also used in astro-photography and in visual astro-observation. They serve to enhance contrast, for instance color- and polarizing filters for observing and photographing the moon and the planets; to emphasize or to attenuate certain spectral ranges, for instance color- and band filters for emphasizing faint gas nebulae in a sky that is "polluted" by city lights; and to add neutral density filters for moon- and, **only in combination with an additional lens filter or Herschel prism, for sun observation** and photography. They also serve for improving image sharpness and reducing color (yellow filters for the suppression of the violet color fringes of Fraunhofer achromats). UV-/IR-blocking filters are needed for astrophotography with certain CCD cameras.
B+W Astro Filters have M 28.5 x 0.5 or M 48 x 0.75 threads (see table on page 63, 4th and 5th column from the right), so that they can be screwed into the inside threads of the attachment tubes of 1.25" or 2" eyepieces or mirror- or prism diagonals or into filter revolvers. The first-class optical quality (homogeneity, plano-parallelism and surface quality of the filter glasses) of these B+W filters is particularly effective when they are positioned, for instance in binocular observation, well ahead of the primary focus.

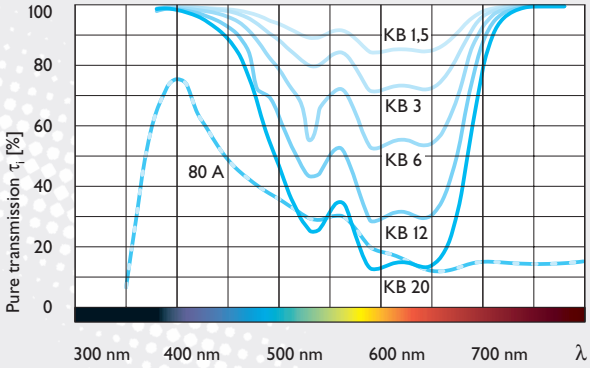
Transmission

The technical term "Transmission", in reference to an optical system, describes the percentage of incoming light (= 100 %) that is actually transmitted. When the transmission is stated for each wavelength, the percentage values can be graphed in the form of a curve that accurately characterizes every color filter. This is not only important in technical applications, but also in any photography where the light source is not a

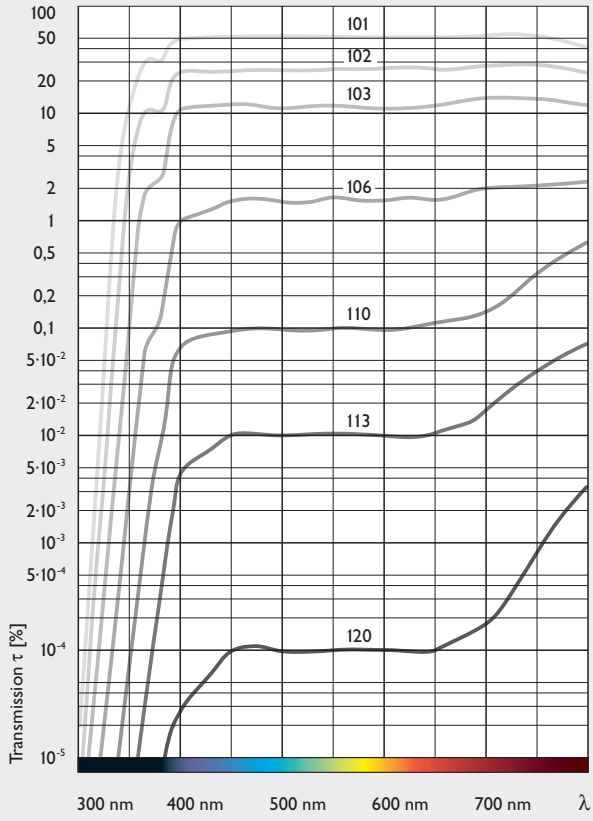
UV 010, Skylight Filter KR 1.5 — Page 9



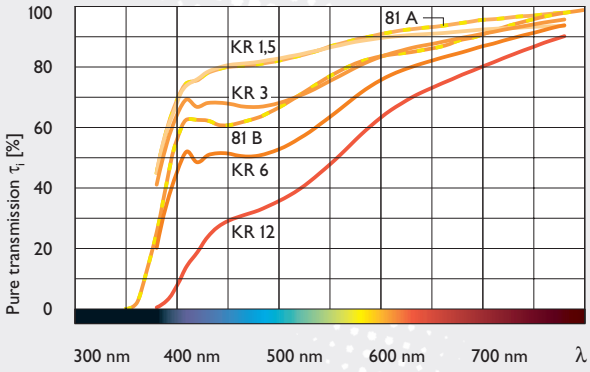
Conversion Filters KB 1.5, 3, 6, 12, 15 (80 A), 20 — P. 19



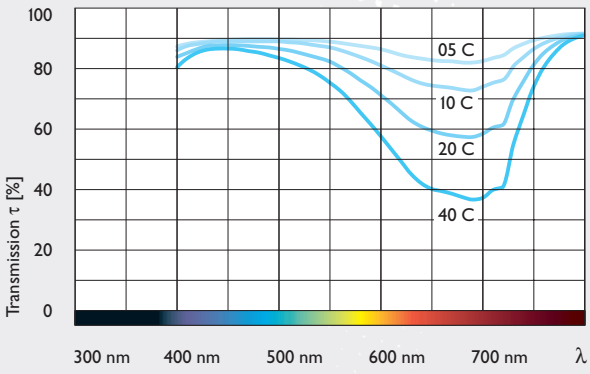
ND Filters 101, 102, 103, 106, 110, 113, 120 — Page 11



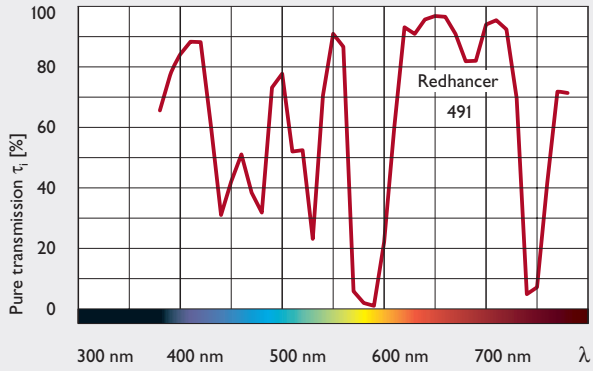
Conversion Filters KR 1.5, 3, 6, 12, 81 A, 81 B — Page 21



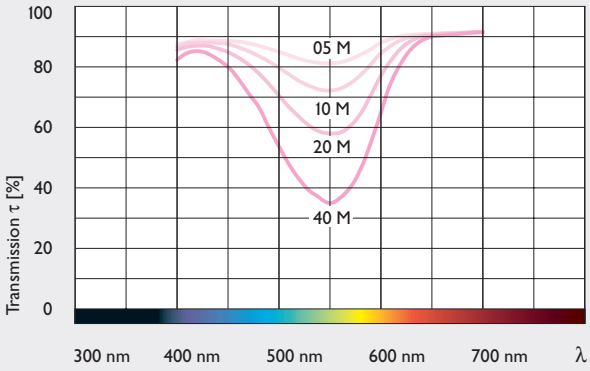
CC Filters Cyan (blue-green) 05, 10, 20, 40 — Page 23



Redhancer 491 — Page 15

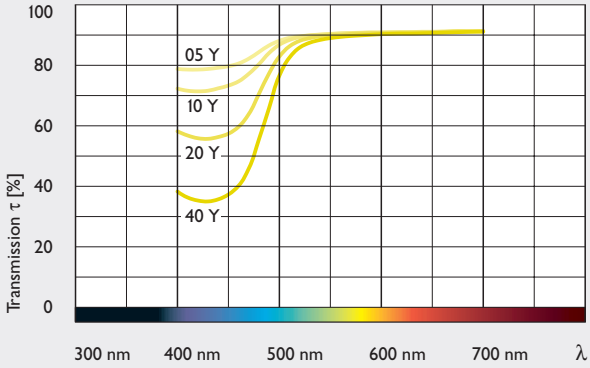


CC Filters Magenta (purple) 05, 10, 20, 40 — Page 23

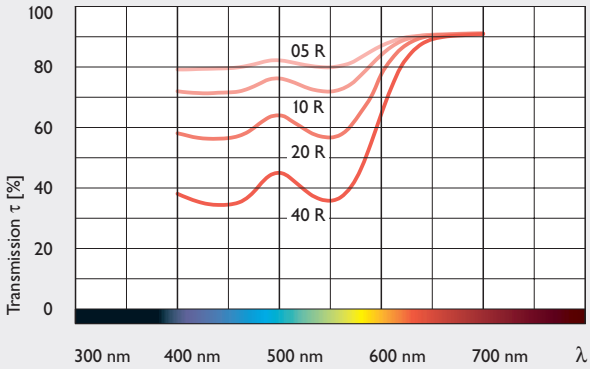


"thermal radiator" (like the sun or halogen- or incandescent bulbs) but has a discontinuous spectrum with an irregular spectral intensity distribution, or when a color is not pure but mixed with other color components. Yellow Filter 022, for example, as its transmission curve shows, would transmit pure yellow (around 580 nm wavelength) without affecting it, but it would change a mixture of green (around 510 nm) and red (around 640 nm) to orange because of the attenuation of only the green portion.

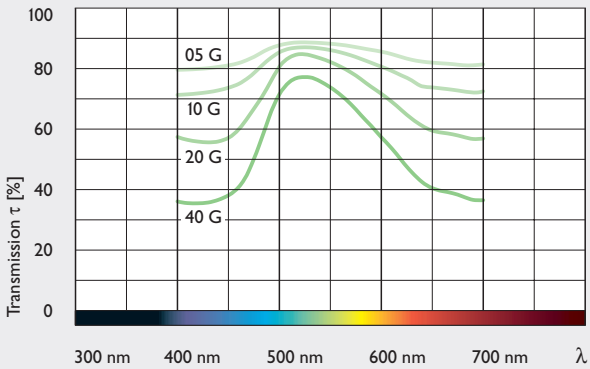
CC Filters Yellow 05, 10, 20, 40 Page 23



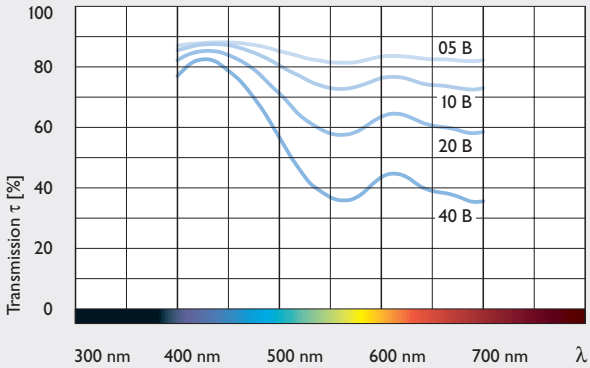
CC Filters Red 05, 10, 20, 40 Page 23



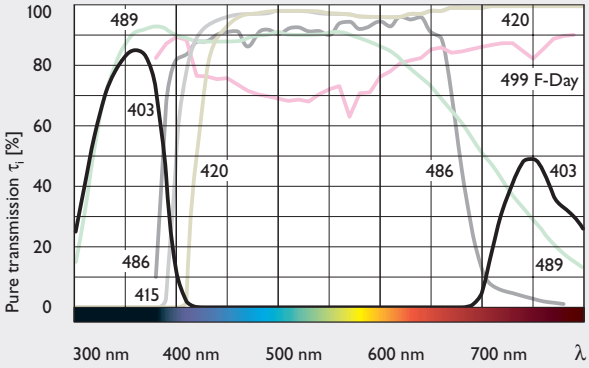
CC Filters Green 05, 10, 20, 40 Page 23



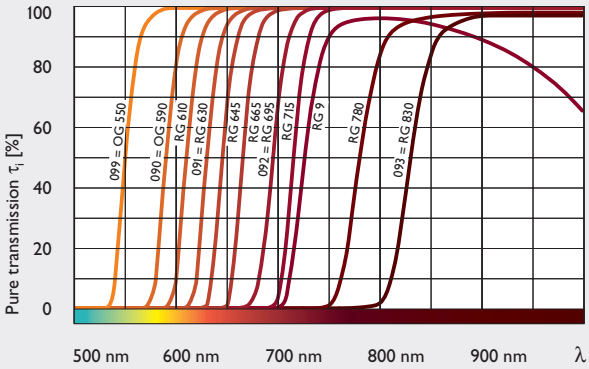
CC Filters Blue 05, 10, 20, 40 Page 23



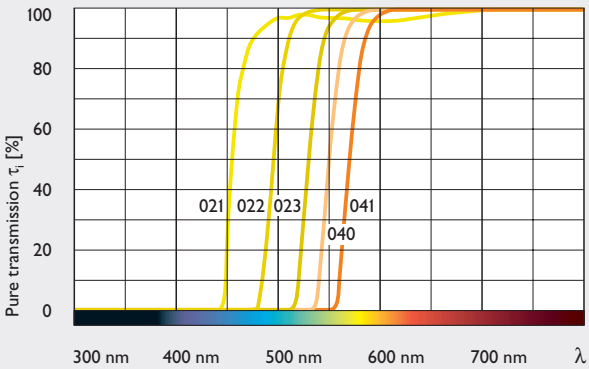
Special Filters F-Day, 403, 415, 420, 486, 489 P. 27



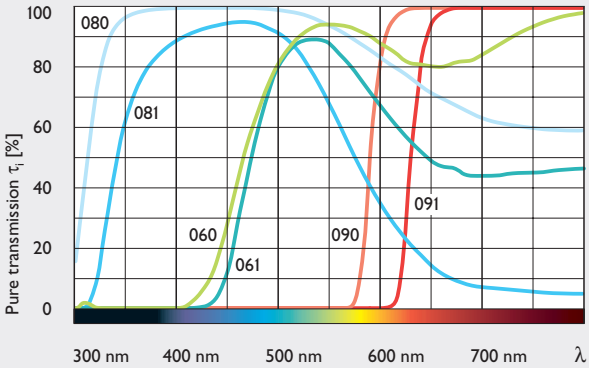
Infrared Filters 092, 093, 099, IR Special Filters P. 29



Black & White Filters 021, 022, 023, 040, 041 P. 33



B & W Filters 060, 061, 080, 081, 090, 091 Page 35



Standard filters / Lens hoods

Explanation of Symbols:
- Standard mount for thicker filters/prisms/close-up lenses
- Standard mount F-Pro
- SLIM wide-angle mount, see page 64
- Oversized wide-angle mount, see page 64
- Unmounted glass filter squares
- Single-layer coating
- MRC multi-layer coating
- Single-layer- and MRC multi-layer coatings are available

Page		M 19.0 x 0.5	M 24.0 x 0.5	M 25.5 x 0.5 + DIGITAL-PRO	M 27.0 x 0.5	M 27.0 x 0.75 + DIGITAL-PRO	M 28.0 x 0.75 + DIGITAL-PRO	M 28.5 x 0.5	M 30.0 x 0.75 DIGITAL-PRO	M 30.5 x 0.5 + DIGITAL-PRO	M 34.0 x 0.5	M 35.0 x 0.5	M 35.5 x 0.5 + DIGITAL-PRO	M 37.0 x 0.5	M 37.0 x 0.75 + DIGITAL-PRO	M 37.5 x 0.5 + DIGITAL-PRO	M 38.0 x 0.75	M 39.0 x 0.5 + DIGITAL-PRO	M 40.0 x 0.5	M 40.5 x 0.5 + DIGITAL-PRO	M 41.0 x 0.5
9	UV-Blocking Filter UV 010	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
	Skylight Filter KR 1.5	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
11	Neutral Density Filter 101, 102	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
	Neutral Density Filter 103	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
	Neutral Density Filter 106, 110, 113, 120	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
15	Polarizing Filter according to Käsemann (linear)				○		○		○	○			○	○	○			○		○	
	Polarizing Filter according to Käsemann (circular)				◐		◐		◐	◐			◐	◐	◐			◐		◐	
	Circular Polarizing Filter				◐		◐		◐	◐			◐	◐	◐			◐		◐	
	Linear Polarizing Filter Top-Pol				◐		◐		◐	◐			◐	◐	◐			◐		◐	
	Warm-Tone Polarizing Filter (linear, circular)				○		○		○	○			○	○	○			○		○	
	Redhancer 491	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
19	Convers. Filters (LB Filters) KB 1.5, KB 3, KB 6, KB 12, KB 20	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
	Conversion Filter (LB Filter) KB 15	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
21	Conversion Filters (LB Filters) KR 1.5, KR 3, KR 6, KR 12	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
	Conversion Filters (LB Filters) 81A, 81B	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
23	Color Correction Filters (CC-Filters)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
27	Fluorescent Light Filter 499 F-Day	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
	UV Black Filter 403; UV-Blocking Filters 415, 420	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Digital UV-/IR-Blocking Filter 486	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Infrared-Blocking Filter 489	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
29	Infrared Filters 092, 093, 099	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
33	Filters for black-and-white film 021, 022, 023, 040, 041	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
35	Filters for black-and-white film 060, 061, 090, 091	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
	Filters for black-and-white film 080, 081	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐
39	Grad. Filters 501, 502, 524, 543, 550, 560, 561, 581, 585, 590	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
41	Soft focus attachment Soft Pro	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Soft focus attachment Soft Image	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Soft focus attachment Original Zeiss Softar 1, 2																				
	Fog attachments Fog 1, 2; Softspot	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
43	Special effects attachments Spectra 2, 8, 48, 72; Spectra Spot	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Cross Screens 4x, 6x, 8x; Star effect attachm. Double Sunny	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
45	Multi-Image Prisms 3x, 5x, 6x; Parallel Pr. 3x, 6x, Close-up Pr.																				
49	Close-up Lenses NL 1, NL 2, NL 3, NL 4														◎	◎	◎	◎	◎	◎	◎
	Close-up Lens NL 5																				
	Macro Lens														◎						
53	Collapsible Lens Hood 900									●			●		●			●		●	
	Collapsible Wide-Angle Lens Hood 920																				
	Collapsible Telephoto Lens Hood 930																				
	Metal Lens Hood 950																				
	Metal Wide-Angle Lens Hood 970																				
	Metal Lens Hood for 28 mm f/2.8 PC Super-Angulon lens																				
	Metal Telephoto Lens Hood 960																				

M 43.0 x 0.5	M 43.0 x 0.75 + DIGITAL-PRO	M 46.0 x 0.75 + DIGITAL-PRO	M 48.0 x 0.75	M 49.0 x 0.75 + DIGITAL-PRO	M 52.0 x 0.75 + DIGITAL-PRO	M 55.0 x 0.75 + DIGITAL-PRO	M 58.0 x 0.75 + DIGITAL-PRO	M 60.0 x 0.75 + DIGITAL-PRO	M 62.0 x 0.75 + DIGITAL-PRO	M 67.0 x 0.75	M 72.0 x 0.75	M 77.0 x 0.75	M 82.0 x 0.75	M 86.0 x 1.0	M 95.0 x 1.0	M 105 x 1.0	M 110 x 1.0	M 112 x 1.5	M 122 x 1.0	74 Ø for 28 mm f/2.8 PC	Rollei Bayonet I	Rollei Bayonet II	Rollei Bayonet III	Rollei Bayonet VI	Hasselblad Bayonet 50	Hasselblad Bayonet 60	Hasselblad Bayonet 70	Hasselblad Series 93 (9 A)	Astro filters M 28.5 x 0.5	Astro filters M 48 x 0.75	Glass filters 75 x 75	Glass filters 100 x 100
◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐				
◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐				
◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	■	■
◍	◍	◍	◍	◍	◍	◍	◍	◍	◍	◍	◍	◍								◍	◍	◍	◍	◍	◍	◍	◍		◍	◍		
○	○	○	○	○	○	○	○	○	○	○	○	○								○	○	○	○	○	○	○	○		○	○		
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	①	○	○	○	○	○	○	○	②		○	□	□
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	①	●	●	●	●	●	●	●	②		●		
	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑																		◑		
	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑	◑	○	○	○	○														◑		
	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○														○		
◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐								◐	◐	◐	◐	◐	◐	◐	◐		◐	◐		
◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	[3]	[3]
◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐								◐	◐	◐	◐	◐	◐	◐	◐		◐	◐		
◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	[3]	[3]
◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐								◐	◐	◐	◐	◐	◐	◐	◐		◐	◐		
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○							○	○	○	○	○	○	○		○	○		
◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐			[4]	[4]
○	○	○	○	○	○	○	○	○	○	○	○	○	○							○	○	○	○	○	○	○	○					
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○					○	○	○	○	○	○	○	○	○		○		
○	○	○	○	○	○	○	○	○	○	○	○	○								○	○	○	○	○	○	○	○					
○	○	○	○	○	○	○	○	○	○	○	○	○								○	○	○	○	○	○	○	○					
◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	[3]	[3]
◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	[3]	[3]
◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐	◐								◐	◐	◐	◐	◐	◐	◐	◐		◐	◐		
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○						①	○	○	○	○	○	○	○				□	□
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○				○	○	○	○	○	○	○	○	○				
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○				
				○	○	○	○		○	○	○	○	○																			
○	○	○	○	○	○	○	○	○	○	○	○	○	○							○	○	○	○	○	○	○	○	○				
○	○	○	○	○	○	○	○	○	○	○	○	○	○							①	○	○	○	○	○	○	○					
○	○	○	○	○	○	○	○	○	○	○	○	○	○							①	○	○	○	○	○	○	○					
				◎	◎	◎	◎		◎	◎	◎	◎																				
◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉									◉	◉	◉									
◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉																				
				◎	◎	◎	◎																									
	•	•		•	•	•	•		•	•	•	•	•	•																		
				•	•	•	•		•	•	•	•																				
				•	•	•	•																									
		•		•	•	•	•		•																							
				•	•	•	•		•	•	•	•	•	•		•																
										•																						
				•	•	•	•		•	•	•	•	•		•																	

① = only oversized filter M 67 x 0.75 on p. 64 can be used

② = only oversized filter M 86 x 1.0 on p. 64 can be used (partially a special Hasselblad adapter ring is required)

[3] = on request (reduced range of filter types, see page 59)

[4] = on request

SLIM- and oversized wide-angle filters

Explanation of Symbols:
- Standard mount, see pages 62 and 63
- SLIM wide-angle mount
- Oversized wide-angle mount
- Unmounted glass filter squares, see pages 62 and 63
- Single-layer coating
- MRC multi-layer coating
- Single-layer- and MRC multi-layer coatings are available

Page		M 49.0 x 0.75	M 52.0 x 0.75	M 55.0 x 0.75	M 58.0 x 0.75	M 60.0 x 0.75	M 62.0 x 0.75	M 67.0 x 0.75	M 72.0 x 0.75	M 77.0 x 0.75	M 82.0 x 0.75	M 86.0 x 1.0	M 95.0 x 1.0	M 105 x 1.0	M 110 x 1.0	M 112 x 1.5	M 127 x 0.75
9	UV-Blocking Filter UV 010	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◎	◎	◐
	Skylight Filter KR 1.5	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◎	◎	
11	Neutral Density Filters 101, 102	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◎	◎	
	Neutral Density Filter 103	● ◎	● ◎	● ◎	● ◎	●	● ◎	●	●								
	Neutral Density Filters 106, 110, 113, 120	○ ◎	○ ◎	○ ◎	○ ◎	○	○ ◎	○	○								
15	Polarizing Filter according to Käsemann (linear)				◎		◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	
	Polarizing Filter according to Käsemann (circular)	○	○	○	○ ◐		○ ◐	○ ◐	○ ◐	○ ◐	○ ◐	◎	◎	◎	◎	◎	
	Circular Polarizing Filter	◑	◑	◑	◑		◑	◑	◑	◑	◑						
	Warm-Tone Polarizing Filter (linear, circular)				◎		◎	◎	◎	◎	◎	◎					
	Redhancer 491	● ◎	● ◎	● ◎	● ◎	●	● ◎	●	●								
19	Conversion Filters (LB Filters) KB 1.5, KB 3, KB 6, KB 12, KB 20	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◎	◎	
	Conversion Filter (LB Filters) KB 15	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐	◐ ◎	◐	◐								
21	Conversion Filters (LB Filters) KR 1.5, KR 3, KR 6, KR 12	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◎	◎	
	Conversion Filters (LB Filters) 81 A, 81 B	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐	◐ ◎	◐	◐								
23	Color Correction Filters (CC-Filters)	◎	◎	◎	◎		◎	◎									
27	Fluorescent Light Filter 499 F-Day	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◎	◎	
	UV Black Filter 403; UV-Blocking Filter 415, 420	○ ◎	○ ◎	○ ◎	○ ◎	○	○ ◎	○	○								
	Digital UV-/IR-Blocking Filter 486	○ ◎	○ ◎	○ ◎	○ ◎	○	○ ◎	○ ◎	○ ◎	○ ◎	○ ◎	○	○				
27/29	Infrared-Blocking Filter 489; Infrared Filters 092, 093, 099	○ ◎	○ ◎	○ ◎	○ ◎	○	○ ◎	○	○								
33/35	Filters for b & w films 021, 022, 023, 040, 041, 060, 061, 090, 091	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◎	◎	
	Filters for black-and-white films 080, 081	◐ ◎	◐ ◎	◐ ◎	◐ ◎	◐	◐ ◎	◐	◐								
39	Graduated Filters 501, 502, 524, 543, 550, 560, 561, 581, 585, 590	◎	◎	◎	◎		◎	◎									
41	Soft focus attachment Soft Pro	○ ◎	○ ◎	○ ◎	○ ◎	○	○ ◎	○ ◎	○ ◎	○ ◎	○ ◎	○	○				
	Soft focus attachment Soft Image	○ ◎	○ ◎	○ ◎	○ ◎	○	○ ◎	○ ◎	○ ◎	○ ◎	○ ◎	○ ◎	○ ◎	○ ◎	◎	◎	
	Fog attachments Fog 1, 2; Softspot	○ ◎	○ ◎	○ ◎	○ ◎	○	○ ◎	○	○	○							
43	Special effects attachments Spectra 2, 8, 48, 72; Spectra Spot	◎	◎	◎	◎		◎										
	Cross Screens 4x, 6x, 8x	◎	◎	◎	◎		◎										
	Star effect attachment Double Sunny	◎	◎	◎	◎		◎										
49	Close-up Lenses NL 1, NL 2, NL 3, NL 4, NL 5	◎	◎	◎	◎		◎										

Filter factors

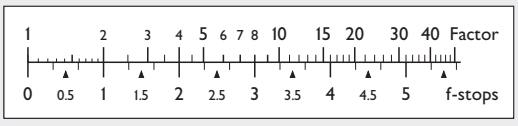
The transmission curves on the preceding spread on the pages 60 and 61 show the result of absorption or reflection (the latter in the case of interference filters) of different portions of the incoming light that vary in accordance with their wavelengths. In other words, a filter doesn't add light, but rather withholds light from the lens. A yellow filter, for example, does not add the color yellow as the name might suggest – instead it attenuates or blocks the complementary color blue.

This removal of portions of light also results in the reduction of the amount of illumination that reaches the film, which has to be compensated by means of an increase in exposure. With TTL (through-the-lens) exposure metering, this is taken into account automatically, so that in most cases the photographer does not need to compensate any further. However, not every camera offers TTL metering. Also, TTL may not be accurate when strong or narrow pass filters are being used, such as orange filters and dense red filters. Furthermore, TTL is highly unreliable with UV- and infrared filters because the spectral sensitivity of the metering cells does not match that of the films with sufficient accuracy.

That is the reason why the descriptions of B+W filters always include a filter factor by which the exposures of average subjects have to be increased. Thus a 2x filter factor means that the exposure time has to be doubled to compensate for the loss of light that results from the effect of the filter. The filter factor always applies to the exposure time (or shutter speed), not to the aperture value!

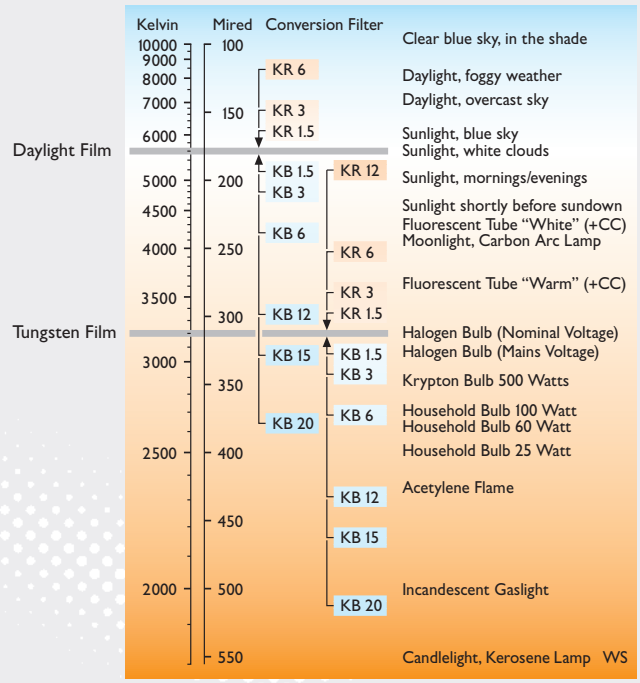
However, because the shutter speeds on most cameras can only be changed in full exposure steps (in accordance with factors 2, 4, 8, 16, 32, …), and filter factors often have uneven intermediate values, in practice corrections are seldom made by means of the shutter speed, but by the aperture.

The table below shows what filter factor corresponds to how many aperture stops. Intermediate values can be rounded up or down, because small deviations are absorbed by the exposure latitude of the film without a noticeable effect on the picture. Corrections can also be made with shutter speeds and f-stops provided the correction is shared by both parameters.



Mired diagram

Mired and Decamired (= 10 Mired) are units used for describing the corrective effect of LB- or conversion filters (pages 18 to 21). These units are convenient because identical differences between Kelvin values, like those of light and film, require much smaller corrections at high color temperatures than they do at low color temperatures, whereas identical Mired differences always correspond to identical effects. That is why it is practical to convert the Kelvin values of light and color film into Mired values for finding the right filter strength, as described on page 18. Those who prefer an easier method rather than performing computations can use the following table to find the Kelvin- and Mired values for various light conditions and the correct filters for the color reversal film that is being used (note the direction of the arrow).



Imprint

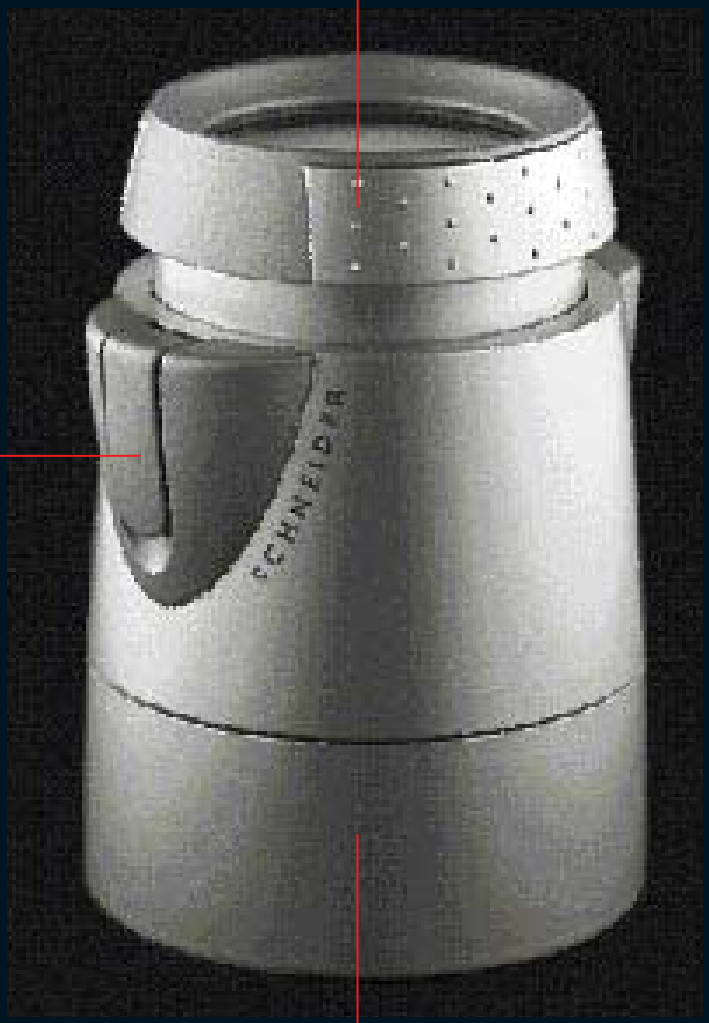
Publisher **Jos. Schneider Optische Werke GmbH**, Business Unit B+W Filters
D-55543 Bad Kreuznach, Ringstr. 132, Phone +49 (0)671 601-125
Text **Walter E. Schön** DGPh, D-81673 Munich (incl. tables, diagrams)
Product photos **Peter Lebeda**, Jos. Schneider Optische Werke GmbH
Sample photos **Martin Blume** (mb), **Konrad Götz** (kg)
Peter Lebeda (pl), Jos. Schneider Optische Werke GmbH
Thorsten Meywald (tm), Jos. Schneider Optische Werke GmbH
Page 2 pl (2), tm (2); Page 5 pl (1), tm (3); Page 8 tm (1); Page 10 tm (6); Pages 12/13 pl (1); Page 14 tm (7); Pages 16/17 tm (1); Page 18 tm (2), pl (1); Page 20 tm (6); Pages 24/25 kg (1); Page 26 tm (3); Page 28 pl (2), tm (2); Pages 30/31 mb (1); Page 32 pl (2); Page 34 pl (4); S. 36/37 tm (1); Page 38 tm (3); Page 40 tm (7);Page 42 tm (4); Page 44 tm (5); Pages 46/47 pl (1); Page 48 pl (5); Pages 50/51 tm (1)
Layout, Design **Digital Design Borgers GmbH**, D-65510 Hünstetten-Wallrabenstein
Printing **Druckerei Gras & Jung GmbH & Co. KG**, D-55543 Bad Kreuznach

MAGNIFIERS

Optical perfection with a modern design

Large lens diameter and ample diopter compensation permit comfortable, effortless viewing as well as a large field of view for eyeglass wearers

A sophisticated quick fastening device permits fast attachment or removal of the gently elastic neck strap



The 3x, 4x and 6x magnifiers are supplied with interchangeable opaque and transparent bases (skirts) for viewing reflection copy and transparencies

3x

Large field of view for 6x7 cm

The generously proportioned optical system covers an area of 7x7 cm with outstanding imaging performance. Ideal for examining roll films and large format sheet films. Interchangeable bases (skirts) for viewing reflection copy or transparencies.

4x

Universal magnifier

A highly versatile magnifier with brilliant, high-resolution optics. Eyeglass wearers can see the entire image comfortably, all the way into the corners, for fatigue-free working. Distortion-free, even at greater eye relief. Interchangeable bases (skirts) for viewing reflection copy or transparencies.

6x ASPH

Maximal magnification

Stronger magnification for the most critical evaluation of sharpness while still covering the full 35 mm format! An aspherical surface assures the best performance. Ideal for transparency-, negative- or ground glass evaluation. Interchangeable bases (skirts) for viewing reflection copy or transparencies.

10x

Detail sharpness

Ideal for examining the very finest details with highest resolution. Equipped with a high-grade optical system for brilliant imaging quality of practically microscopic resolution. Comfortable viewing for fatigue-free working.

L 10x

Illuminating magnifier

Optically identical to the 10x magnifier, but equipped with white-light-LEDs for bright incident illumination with minimal energy consumption. The button cell can easily be replaced.

Critical evaluation of your photographs is worthwhile

The photographers that are successful and who's work is admired for excellent image quality are diligent in their critical evaluation of all of their photographs, and the rejection of those that do not meet his or her very strict criteria.

Though a photograph might bring back pleasant memories to its author (or represent a particularly difficult photographic situation) it might not necessarily appeal to others. Those who wish to present their photographs successfully, be it in exhibitions, publications, or slide shows, should set themselves the most stringent standards for the aesthetic and technical quality of their pictures. It is far better to show 80 first-class and perfectly sharp slides, rather than 200 that may be informative but mediocre images.

Magnifier – a lens for the eye

If you place high demands on picture quality, you should not cut corners on the lens. If you want to evaluate an image critically, you should not skimp on the magnifier. The simple single-lens "magnifying glass" from the flea market should at best evoke youthful joys of discovery in the playroom.

A high-grade magnifier that covers the full slide- or negative format of your 35 mm or roll film camera at high magnification and that also permits the examination of the finest details is indispensable for critical evaluation.

The most important characteristic of a magnifier is a first-class optical system that renders a sharp image with rich contrast, has minimal distortion, and that permits eyeglass wearers to view the full image all the way into its corners.

A matte, translucent base that provides uniform, largely shadow-free illumination of the picture is very helpful. For the evaluation of transparencies or negatives on a light table, however, the magnifier base should be opaque and matte black on the inside.

Therefore the ideal magnifiers are supplied with interchangeable bases (skirts) for both types of viewing.

Jos. Schneider Optische Werke GmbH
Business Unit: Photo
Ringstr. 132 · D-55543 Bad Kreuznach
Phone +49 671 60 11 25
Fax +49 671 60 13 02
filter@schneiderkreuznach.com
www.schneiderkreuznach.com