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10 years of MRC coating: The perfect protection for front lenses and filters

A scratch-resistant, water and dirt repelling special coating

The lens elements of high-quality lenses and the plano surfaces of filters require a perfect shape and smoothness to achieve the best optical quality. Dirt, greasy fingerprints, water marks or scratches reduce the image contrast and the sharpness, result in blooming at lights and can generally have an effect similar to a soft-focus lens. Clean front lenses and glass filter surfaces are therefore an absolut pre-requisite for demanding photographers.

SCHNEIDER-KREUZNACH developed the MRC special coating more then ten years ago and has since used it on the exposed front and rear surface of all the B+W filters marked with "MRC" and on the unique B+W clear glass protective filter 007 Clear. The coating has a dual-action to keep surfaces clean and smooth: The MRC ("multi-resistant coating") coating is an extremely highly resistant multi-layer broadband coating with two key features in addition to the reduction of reflections and an increase in transmission over the total visible spectral range:

- first, a hydrophobic (water-repellent) and incredibly smooth surface which makes water roll off instead of wetting the lens element or filter and so also keeps most of the dirt off; and
- second, extreme hardness which provides mechanical protection against scratching in the rough and tumble conditions of everyday photography or when cleaning the lens elements or filters.

10 years of MRC = 10 whole years in advance of everyone else with a solution proven in practice

This year saw some competitors introduce their first lenses or filters with a water and dirt repellent coating said to be based on the "lotus effect". In actual fact, however, neither the MRC coating of SCHNEIDER-KREUZNACH nor the coatings of our competitors introduced a good ten years later offer a "lotus effect" (named after the water-repellent lotus flower). This effect is based on a submicroscopically finely structured surface which – like the greasy pelt or feathers of some animals – does not allow water droplets to penetrate into the intermediate spaces, but causes them to float on them as spheres and then roll off. However, a surface structure in the order of nanometers would be mechanically extremely sensitive, if it could be manufactured at all with the required precision. Its cavities could fill up with very fine particles and their peaks could break off or be worn off so that the water-repelling effect is cancelled out there. SCHNEIDER-KREUZNACH therefore does not use this incorrect "lotus" designation, but explains the effect of the MRC coating correctly as follows:

A plasma-assisted evaporation coating method generates a top coat with low surface tension

The MRC coating is first and foremost a broadband anti-reflection coating. This means that its reflection-reducing effect, which is thus also a transmission-increasing effect, i.e. one which suppresses scattered light and ghost images and transmits more light, has a broadband action over the full spectrum. In contrast, the (almost always blue) single-layer coating only has a high effect in the medium wavelength range around yellow and yellow-green where the eye is most sensitive to light, while its effect is greatly reduced toward the blue-violet and purple-red end regions of the visible spectrum. With the MRC coating, this blue, violet and red to deep-red light cannot produce any contrast-

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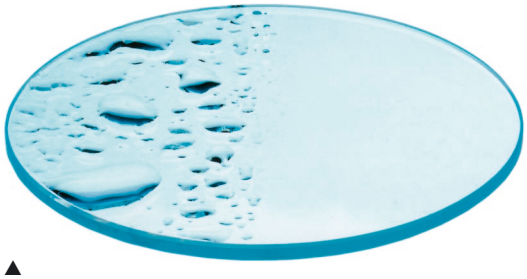
reducing scattered light, spotty reflections or ghost images. A broadband effect can only be achieved with a multilayer coating which requires a much higher effort and a precision in the order of nanometers (1 nm = 1/1000 µm = 1/1,000,000 mm) because unevenness and irregularities of the individual layers build up on one another and amplify one another. SCHNEIDER-KREUZNACH therefore uses a plasma-assisted evaporation coating process in which inert gas ions accelerated in an electrical field compact the material (thin dielectric films which are each only 10 to 100 nm thin) deposited on the lens surface in the vacuum chamber. It thus becomes more resistant, just like hammered steel. However, the key feature of the MRC coating is its top coat of fluorinated siloxane. It has a thickness of only a few nanometers; it is therefore much thinner than the other layers and so does not impair the reflection-reducing optical properties (based on "destructive interference") of the underlying layers. However, the siloxane also has a very low surface tension and so produces very low adhesion and thus results in a regular "rejection" of water droplets. While wetting water droplets on normal glass or conventional coatings form a mini-hilltop with a relatively shallow slope, a high wetting angle of approximately 120° is formed on the fluorinated siloxane which shapes the droplets to a sphere in a similar manner to mercury and causes them to roll off.

MRC coating remains clean longer, can be wiped clean a lot easier and is resistant to scratching

The advantage of the MRC coating on the front lens elements of SCHNEIDER-KREUZNACH lenses and on filters from B+W for users is, first, that their lenses or filters remain free of dirt longer so that they do not have to be cleaned so often. If this does become necessary from time to time, it is a lot easier to wipe off the dirt, because it does not stick on so strongly and can therefore frequently be removed with a blower brush. This also reduces the risk of micro-scratches which can occur during cleaning. Photographers who keep their lenses and filters in tip-top condition and so clean them more frequently than others particularly suffer from this problem which is further reduced by the extreme hardness of this MRC coating.

All these beneficial properties of the MRC coating, which is now celebrating its "10th anniversary" were the reason why SCHNEIDER-KREUZNACH also provided its B+W clear glass protective filter 007 Clear with the MRC coating as the perfect mechanical front lens protection some years ago. It is available in all commercial thread sizes from 19 mm to 86 mm and can thus be used with tiny digital cameras or large field scopes.



▲ *The left half of this filter glass plate has a conventional coating. The water has wet the surface. The right half has an MRC coating and lets the water run off.*

The water spheres are very visible here which are caused by the low surface tension of the fluorinated siloxane layer. ▶