# Leica R-Lenses

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Chapter 4: 28 mm and 35 mm lenses

__ LEICA SUMMILUX-R 35 mm f/1.4
__ LEICA SUMMICRON-R 35 mm f/2
__ LEICA ELMARIT-R 28 mm f/2.8

## __Introduction

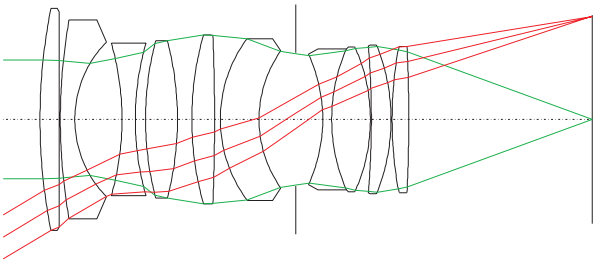
It is well known that the thirties and the fifties were the great classical periods of the Leica rangefinder camera. The next period of 1965 to 1985 was the era of the mechanical SLR, forever immortalized in the famous movie "Blow Up" by Antonioni. In those days it was generally believed that the 35mm SLR could evolve into the most universal photographic instrument ever designed. Mechanical functions were replaced by electro-mechanical and electronic ones, more and more functions were added and the lens range covered lenses from extreme fish-eye to very long telephoto lenses with focal lengths of 2000mm and more. And every company wanted to cover as wide a spectrum as possible. Leica started the SLR-era with the Leicaflex-series. This was an attempt to translate the best principles of the rangefinder camera into the world of the single lens reflex. The first Leicaflex cameraswere totally mechanical designswith a great deal of innovative details that filled their bodies to the brim and did not leave enough free space for additional electro-mechanical components. The next camera, the R3, developed in cooperation with Minolta had a radically different construction, was built in Portugal and is in fact much better than its reputation. The professional market was a bit disappointed by the size of the R3 and Leica reacted a few years later with a new camera series beginning with several versions of the R4 and later the R5. With these models, Leitz tried to compete head on with the Japanese professional camera systems. Optically there was no problem, but the versatility of the R-system was impaired by some important gaps, especially it lacked fish-eye lenses and long focal length zoom lenses.. About 150.000 cameras of the R4/5 series were sold. The camera was perfectly capable of withstanding the heavy-duty demands of the working professional, but it was not bakked by a universal system like themain manufacturers' models, i.e. the Canon F1 or Nikon F2. The main German manufacturers, Zeiss and Leitz, could not support these camera systems with the universal appeal of a very versatile system and concentrated on the optical side of the system. This approach was quite understandable as German optical designers had a certain view of the level of performance a high quality lens should have. There was a long tradition of optical design theories and correction of the aberrations and an abundance of knowledge about the practical and theoretical limits of design, optically as well as mechanically had been acquired. And there was naturally a strong sense of pride about the high level that had been reached by generations of designers. That is why there was an unwillingness to lower the high standards. The German lenses of the seventies were masterpieces of engineering, mechanical construction, glass manufacture and optical calculations.
The Japanese, on the other hand, knowing they could not compete with the German designs in terms of quality, chose a different approach. They tried to provide the photographer with a range of lenses that expanded the photographic possibilities into realms that were not explored in the past. An example is the Nikkor 43-86mm zoom lens that was optically very bad, but offered the user a new way of visual expression.
One would be tempted to think that the lenses of Zeiss and Leitz were made with the goal to provide the photographer with the best possible image quality and not with the goal to deliver tools that were needed to do the required job. In this respect the Japanese companies were far ahead.
The Japanese lenses did not deliver the ultimate in optical and mechanical performance, but the practical characteristics (weight and compactness, or very wide angle or very wide zoom range or very long telephoto lenses with high speeds) could impress the working photographer in his daily applications. Zeiss and Leitz used the same strategy. They would not compromise the ultimate in image quality for a lens with more exciting specifications. It was not a lack of innovative capabilities that restricted the Leitz designers, but a conscious decision to deliver only the best lenses they could design. In the archives of the old Leitz optical department one can find quite exciting designs, but they did not pass the critical requirements that Leitz had set for themselves. In retrospect, we may be very happy that Leitz invested that much energy in advancing the state of the art of lens design. We can admire the results in our current photographic experience, picture for picture.
Leitz's optical experience did not include the retrofocus design initially, and they had some difficulties mastering the principles and intricacies. The first Summicron-R35mm f/2 from 1970 (Zeiss introduced a 2/35 in 1963) had a performance level about equal to that of the then current M-lens 2/35mm. But the construction was very complicated with nine lens elements in seven groups. Fifteen years later they succeeded in creating a 1.4/35 design with the same effort. The first version of the 2.0/35 had a length of 61mm and was specifically designed for the photo-reportage. Contrast in the center of the image was quite high, but dropped significantly in the outer zones. In those days, the SLR was used for every photographic assignment and also for the reportage style of photography. For this type of photography the outer zones are of less importance for the impact of the image. The second and current version of the Summicron-R 35mm f/2 features a more even performance at full stop and a significantly improved handling .

The Summilux-R 35mm f/1.4 is an excellent design, introduced in 1984 and still state of the art in terms of performance. A high speed lens for an SLR has two goals: More light for the film plane and for the focusing screen. Specifically when objects are moving fast and in situations with scarce illumination a bright image on the screen with good contrast is necessary. In many situations the 35mm's angle of view (64 degrees) is a bit too narrow, especially if you want to relate your subject to the surrounding environment. Then the 28mm (76 degrees) will be of interest and Leitz already offered such a lens in 1970 with the "standard" speed of 2.8. It was a very

lightweight lens in the R-range with only 300 grams. The optical performance was very good with medium overall contrast and commendably good definition of fine structural details in the outer zones. It stayed in production for almost 25 years, an indication of its popularity. As a side thought I might say that this lens has a hint of Japanese design philosophy: quite sufficient performance in a lightweight mount.
SLR-cameras are well suited for the near-focus range, as there is no parallax to take care of. But a lens can only be optimized for one distance or magnification. Normally one has to accept that the near-focus range is always of lesser quality than the infinity position. In the past this was acceptable. But what was an acceptable image quality in the past, may not be tolerable in later times. That is the course of evolution. Not only optical designers, but also users set the standards higher every time.
The solution was to introduce a lens element that was moved independently from the other parts of the optics during focusing. Designated as 'floating elements', they help to improve the optical system. With a floating element you can change the space between certain lens elements when you focus into the close range. The mechanism of 'floating elements' is not the same as the mechanism of 'internal focusing'. With 'internal focusing" a whole lens group will move over the full distance range. The practical advantages of internal focusing are less bulky lenses whose weight balance hardly changes and whose front mountsdo not rotate during focusing, which is an advantage when using polarizing filters. With the normal focusing method the complete optics are moved back and forth, which usually results in the lenses' whole front barrel is moving in and out and rotating when you focus. In most cases internal focusing and floating elements are used to accomplish different goals. But Leica designers found a way to combine both methods. Internal focusing can also be utilized to improve the performance in the near-focus range. In 1994, Leica introduced a new Elmarit-R 28mm f/2.8 with a floating element, much improved image quality and optimized ergonomics.
In the area of ergonomics, Leica has progressed quite substantially, compared to was the norm in the past.
In one area however, Leica has not changed the old traditions: the mechanical quality of the lens mounts is still unsurpassed.

## __Optical considerations

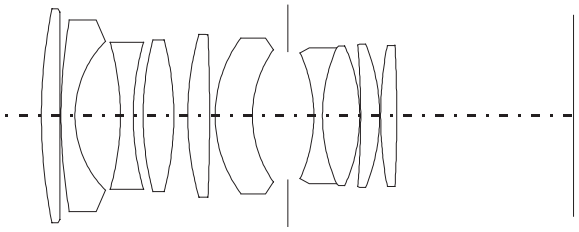
The main topics in optical discussions may be the glass types, the number of elements and the type of lens (retrofocus, telephoto lens or Gauss-design), the really decisive parameters are to be found elsewhere. An optical designer can create the best lens in the world, but when it is too big, too expensive or too complex it will not go into production. And to be quite honest: a lens is made to generate a profit. With retrofocus lenses the volume is a big problem. A retrofocus lens has a large size from the start because of the long back focus. You cannot build a shorter lens, and when the speed is to be increased the volume grows beyond what is acceptable for handling. A wide angle lens with a very wide diameter cannot be handled and in the past there was no other solution but to settle for a lens whose size could be tolerated and to accept a higher level of distortion or vignetting. The solution is simple: you must design a longer lens with a smaller diameter. When you need to transport the light photons through a long pipe, you must use more lens elements. We know that aberrations are caused by the steep angle of the rays incident on the lens surface. In the center of a lens the rays pass through without being refracted. Without refraction, there are no aberrations to take care of.. This is a lesson for the design in general. If you can design a lens with minimal changes in direction from lens surface to surface, the total amount of aberrations will be minimized.

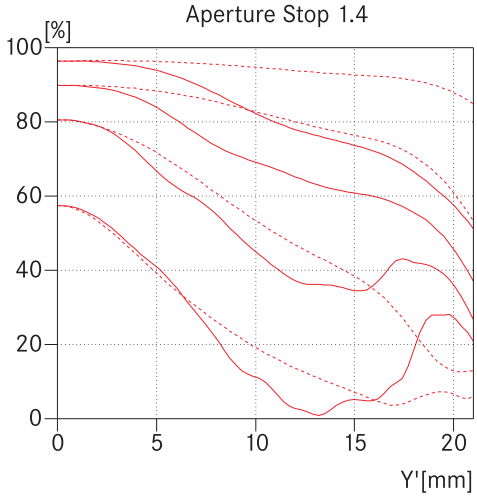


The drawing of the Summilux-R 35mm f/1.4 shows the path of the rays through the lens elements. You see that the angles of refraction at the surfaces are quite small. But the price is a higher number of elements. A higher number of elements should normally be avoided as much as possible, but with the current methods of anti-reflection coatings, the loss of contrast can be minimized. And this high number of elements allows the designer to manipulate the central section of the lens in such a way that the front lens diameter can be reduced. Note that in the drawing all lens elements have the same diameter, which also helps to smoothly guide the rays through the lens. The classical retrofocus designs have a much larger front lens than is being used with the Summilux. As comparison: the Summicron-R 35 f/2 has a front lens diameter of 63mm and a length of 54mm. That is a proportion of 1:1,17. The Summilux-R 35mm f/1.4 has 75mm, resp. 76mm, thus 1:0,99. The older Summicron 2/35mm had 68mm, resp. 61mm, therefore 1:1.11.
Often the question is asked why the wide angle lenses of the R-system do not have aspherical elements. A part of the explanation lies in the fact that in the past only the so-called blank-pressed versions were available, and this production method restricted the possible diameters as well as the glass selection. Another part of the explanation can be found in the gains achieved by using aspherics: They are commonly needed to realize a high quality design in a small volume (as with the M-lenses). The R-lenses with their on average somewhat larger volume cannot profit as much in this respect by the use of aspherics as is the case with smaller lenses (like the M-series).

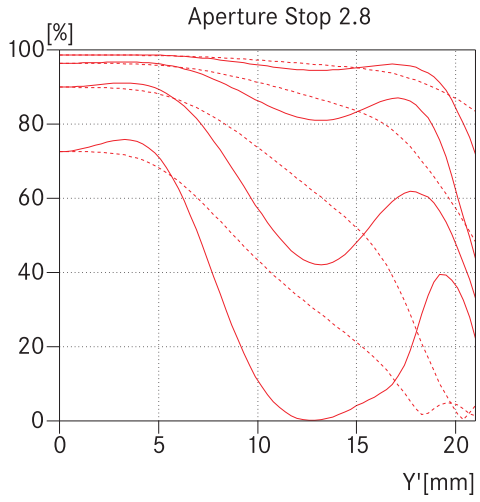

## __ LEICA SUMMILUX-R 35 mm f/1.4

Together with the Summilux 80mm and Summilux 50mm this Summilux belongs to the class of very high speed lenses for the R-system. The performance wide open (f/1.4) is much better than that of the first Summilux-M from 1961, as can be expected. There is a twenty year span between both designs. But also compared to the current Summilux-M 35mm f/1.4 ASPH. the performance attainable in practise is almost equal. The M-version shows somewhat better definition and the very fine structural details only at the outer zones . The overall contrast is high, but the major subject outlines have softer edges.

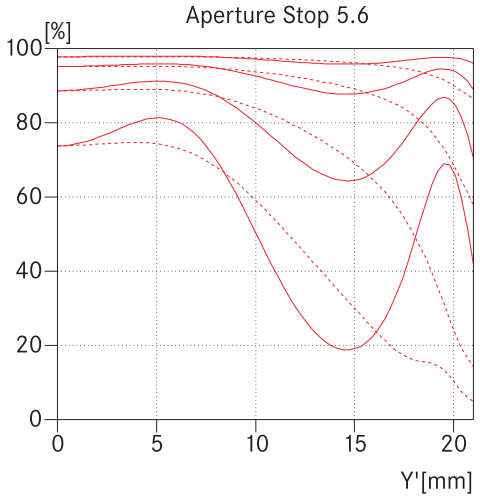





The MTF graph at 1.4 shows a relative low set of lines for the 40 lp/mm. And even the 20 lp/mm seem to be on the low side at first sight. However, one should not overrate the MTF graphs and try to evaluate all lenses according to the same criteria. With a 180mm lens the 40 lp/mm are very important. With a high speed wide angle lens the situation is different. In this case the performance at 40 lp/mm usually has less influence on the final and overall image appearance and lower values are of less importance. It is of more practical value to note that secondary reflections and veiling glare are very well reduced, but may be visible when light sources point directly into the front lens. Coma is only existent at a very low level as can be seen from the sagittal and tangential lines that are close together.

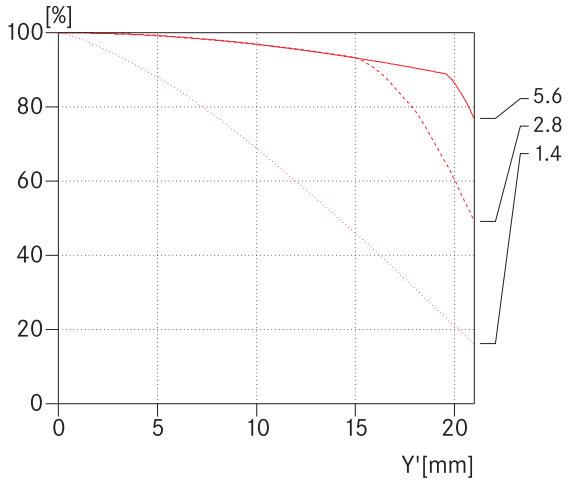



At aperture 2.8 the overall contrast is visibly improved as is the quality in the outer zones of the image. The very fine detail however has a softer definition.

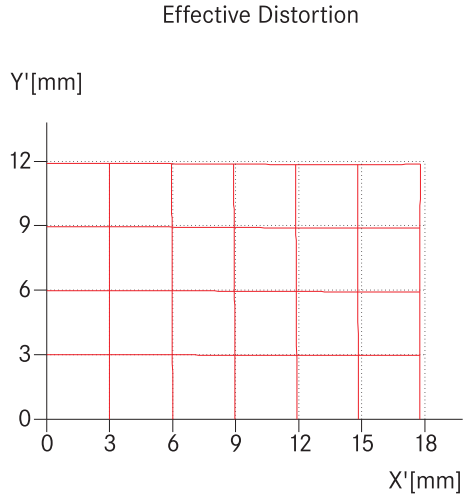



At aperture 4 the optimum is reached and we can expect an excellent overall quality. Especially in the important main center part of the image the performance is outstanding. This quality is also available at smaller apertures.

The maximum amount of vignetting at full aperture is 2.4 stops and this is rather high. But again, this figure must be interpreted in the correct way. Partly it is system related (the length of the lens) and often the type of pictures you will make at full stop are not negatively influenced by the vignetting.

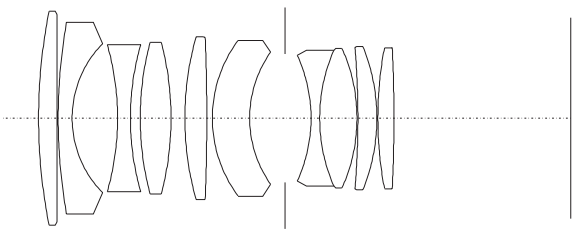



One should evaluate a lens according to sensible criteria and not compared to a theoretical ideal. Wide angle lenses have their own set of characteristics.




The distortion of the Summilux-R is visible with 2%.

There is an additional phenomenon that I will discuss later on in the next paragraph. The Summilux-R has a floating element and the performance in the near focus range is excellent, especially after stopping down several stops. Very close to the object one cannot evade some distortion, but this is not a lens for reproduction stands.



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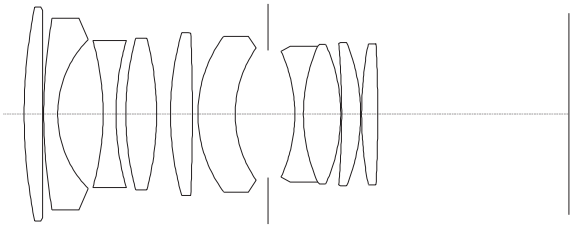

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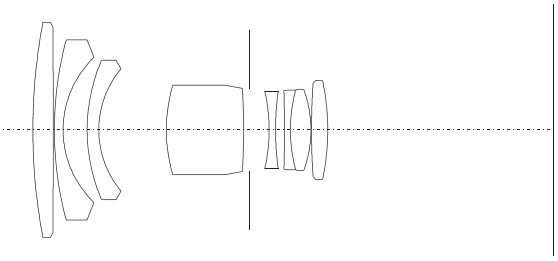
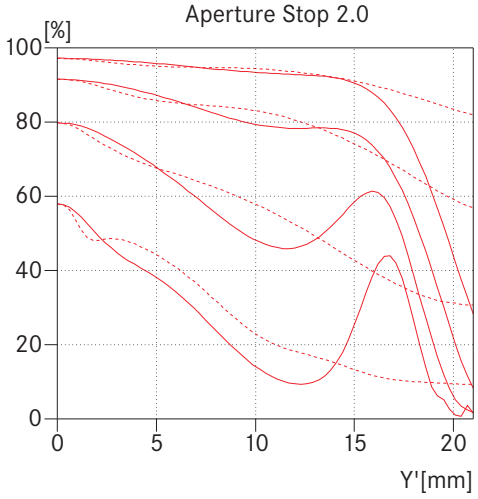
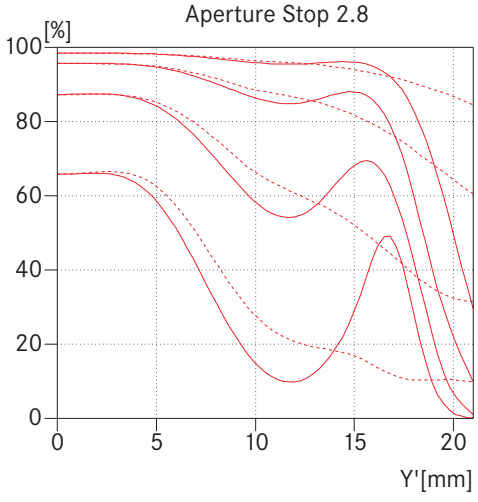
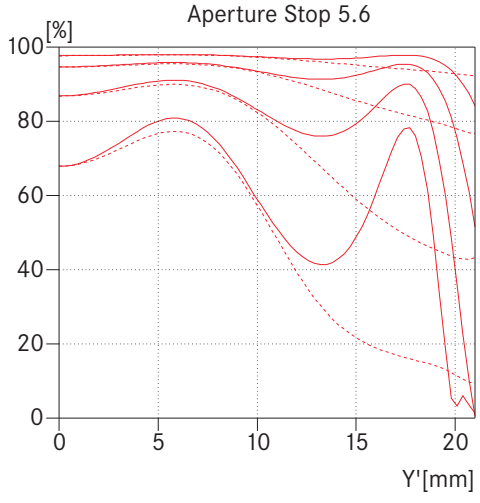
## __ LEICA SUMMICRON-R 35 mm f/2

The Summicron-R is a design from Midland, Canada and was introduced in 1977. It is a six element lens with a characteristic thick central element as field flattener (flattening of the image plane). The first element is a negative lens with a plane first surface. As with the Summilux-R the central section of the lens elements are important for the design concept. Wide open the contrast is medium-high and in the central part of the image fine details can be recorded with some softness at the outlines. Stopping down to f/2.8 delivers good contrast and lets the small amount of stray light in the lens disappear altogether, and the image quality is competitive.

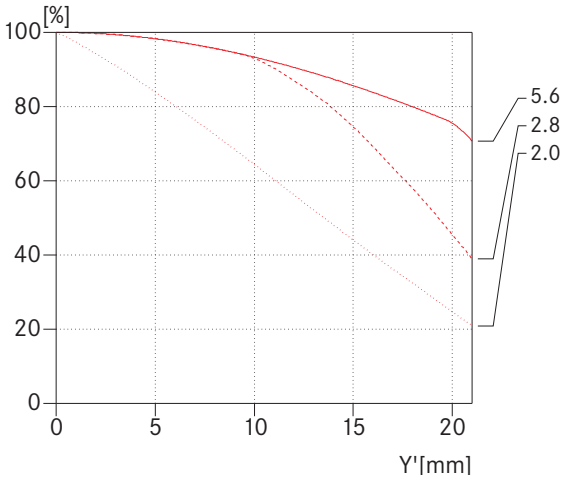




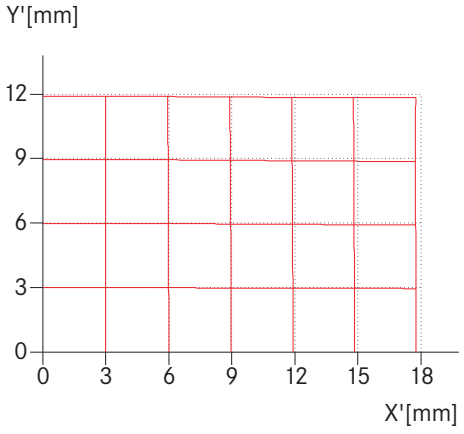




At apertures 4 and 5.6 the optimum is reached. The graphs of the 20 lp/mm and the 40 lp/mm are a bit wavy. At an image height of 12mm there is a weaker zone, the result of aberration compensation. The improvement beyond an image height of 18mm is the influence of the vignetting. The vignetting is acceptable with two stops and will only be detected at the edge of the negative when larger areas with the same brightness are recorded.




As with the Summilux-R the design goal was to achieve a very good performance in the central part of the image as this will benefit the intended type of pictures with this lens.

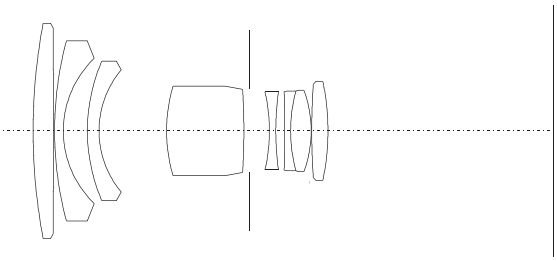
Effective Distortion

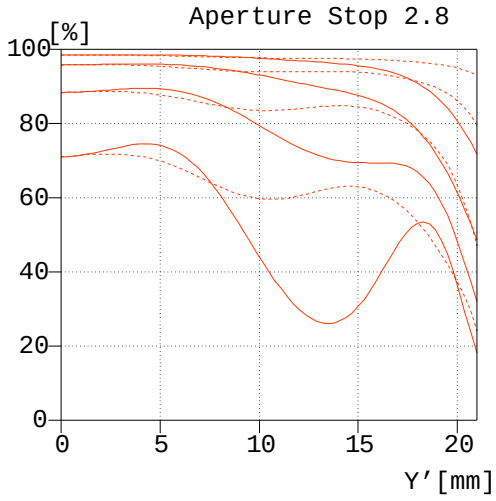


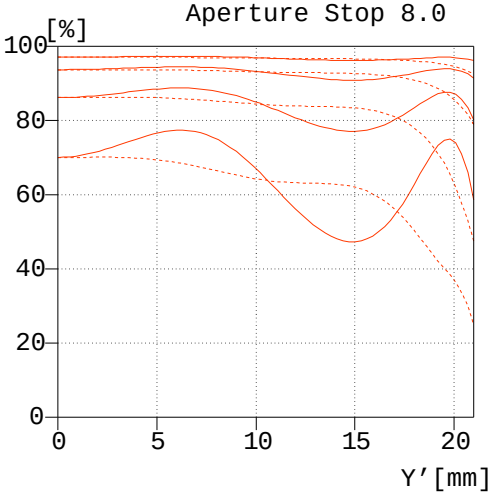

Distortion is on the same level as the Summilux-R with 2% .


## __ LEICA ELMARIT-R 28 mm f/2.8

This Elmarit-R lens from 1994 is an improvement over the predecessor from 1970 by two stops. That is a quantum leap. The design is clearly retrofocus with a negative front element and the thick central element. When you want to study the design it is best to compare it with a symmetrical wide angle lens and note that the central group has the same role and function.

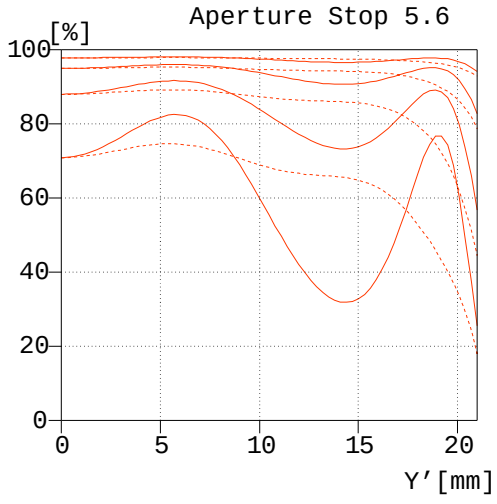


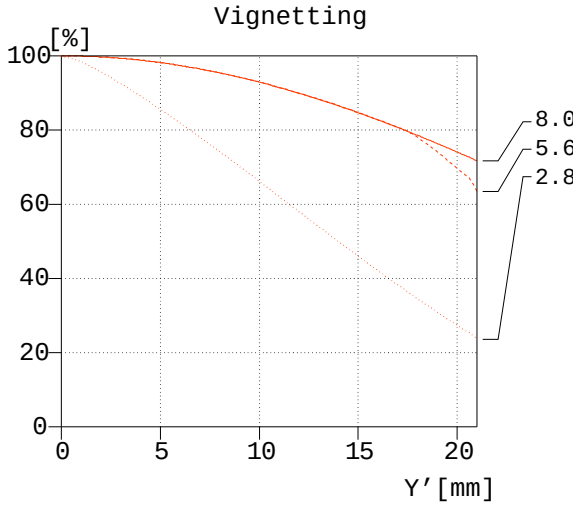


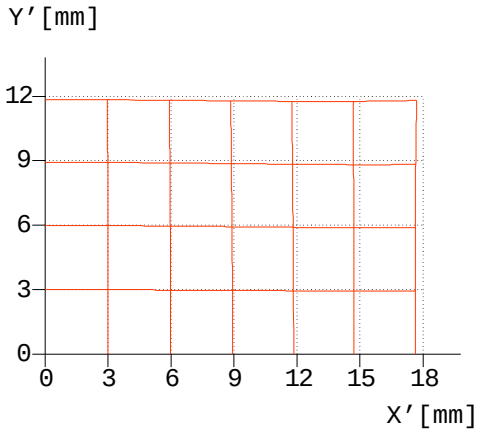

At aperture 2.8 the overall contrast is high and the image quality very even from center to edge. The sagittal and tangential lines in the MTF are close together and very fine differences in gradation in small subject areas will be clearly recorded. The Leica-typical dip in the zonal performance at image height of 12mm can be seen in the curves. It can be case that the well-known smoothness of the unsharpness gradient for which many Leica lenses are famous can be attributed to this characteristic.

Stopped down to 5.6 and especially to 8 the Elmarit-R improves to a very high level of definition of very fine detail and a even performance over the whole image area. At aperture 8 there is already a small loss in contrast due to the influence of the diffraction effects. This lens is in the very front rank of the worlds best lenses of this specification.



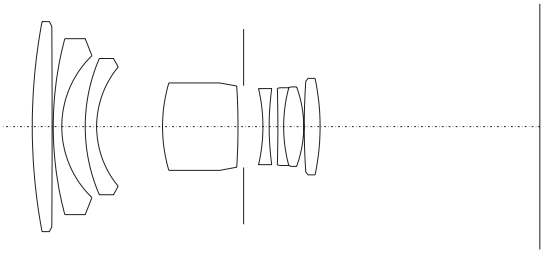




Vignetting is acceptable with 1.8 stops and will not be disturbing in most cases.




The distortion is 2% and visible in critical situations, but one should not confuse distortion with converging perspective lines.

The Elmarit-R 28mm f/2.8 features the floating element which has become a standard nowadays to significantly enhance the quality in the near-focus range.



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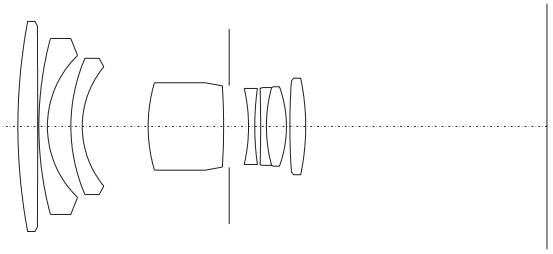

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## __Artistic considerations

For the 28mm and for the 35mm lens the well-known phrase by Robert Capa is valid: "If your picture isn't good enough, you weren't close enough. Often a wide angle lens is used just to get more information on the negative. But the problems with composition grow disproportionally. If you cram too much into the frame, it is difficult to get a clear and simple composition. And the subjects will become small details behind an empty foreground. The 35mm perspective is only efficient if the subject is almost touchable. With the 28mm this effect is even more pronounced. Here one should literally be close to the skin. Wide angle lenses are often employed for landscapes, interiors, and buildings. In these cases one should stop down to get very sharp pictures as it is the crispness of the details that tells the story. The true domain of the moderate wide angles is the reportage or documentary snapshot at closer distances. The large depth of field will help to cover up slight unsharpness due to errors in focusing. The photographic challenge is the figure-ground relationship and the size relation between back- and foreground subjects. The details in the background are very small and because there are so many details (due to the field angle) the background can be very distracting. It is simpler to take a good picture with a 90mm than with a 28mm. Therefore you should be close to the main subject and let the surroundings support your statement with good choice of detail and structure.

There are some additional considerations. If you take a picture from a distance of 20 to 30 meters from a row of houses (as example), the houses in the center of the image will appear much more prominent than intended for the eye of the observer. This is not distortion in the technical optical sense, but an effect of the wide angle view, where houses at the edges are at a larger distance from the camera than the houses in the middle of the picture and aretherefore recorded with a lower reproduction ratio, i.e. smaller. You can observe the same effect when makeing a picture of a group of people: You will note that the faces of the persons at the edge of the image are a bit distorted. If you take a picture of a series of circles with a very wide angle lens you will notice that the circles at the edges are horizontally elongated. This is the wide angle perspective that you should study. The phenomenon of widening and converging lines (as with rail road tracks) is not distortion in the technical sense but a visual effect. And converging street poles at the edge of the image are not an optical distortion, but simply the result of a camera that had not been held correctly. When composing a picture you should be aware of the several types of wide angle effects that can enhance your message.

## __Conclusion

These 28 and 35mm lenses are eminently suited for the spontaneous snapshot and for the more formal artistic pictures. In any case one should start with pictures of subjects not farther away from the camera than 3m. Close range photography is the best approach to start with. In this range you can learn to see and study the wide angle effects. In fact you can photograph almost everything with these lenses. The most important thing is the style of language of your photography. The play with the depth of field and the size relationships in fore- and bakkground are the decisive factors here for a good or bad image. The lenses can only be the means to an end. The Summicron-R 35mm f/2 is a fine compromise between all demands. The Summilux-R 35mm f/1.4 would be the first choice in this group. With a floating element and outstandingly good quality already at f/1.4 it is best suited for available light photography and stopped down it has all sharpness needed for the reproduction of fine detail in wider viewing angles. The Elmarit-R 28mm f/2.8 is a challenge for photographers who need the best possible definition in their style of photography. The lenses with focal lengths of 28mm and 35mm belong to the group of classical focal lengths of the 35mm-format's tradition. The Leica R photographer does not need to select subject matter. Every thing can be photographed in every style. The range extends from landscape pictures that are composed like a poem with carefully selected image elements to dramatic reportages about the human condition. Specifically with the new generation of ISO100 and ISO400 slide films the optical potential can be exploited with spectacular results.

LEICA SUMMICRON-R 35 mm f/2