Leica R lenses

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Chapter 11: 21-35 mm lens

LEICA VARIO-ELMAR-R 21-35 mm f/3.5-4 ASPH.

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__General considerations

The zoomlens may be considered as the standard type of lens construction since a decade or two.

Photographers and cinematographers have always wanted to change focal lengths quickly and easily. The step from the thread mount to the bayonet mount was the first method in this direction. The turret with two or three different focal lengths was the next step and this was even offered for the Leica M camera. But a smooth change of focal lengths became only a possibility with the zoomlens. This type of lens is now the norm. The lens line up of one of the best known names in 35 mm camera production consists for over 50% of zoom lens designs. The Leica R lens catalogue shows that about 20% of the current lenses is of zoom lens design.

In cinematography and video cameras the zoomlens with large focal length ratio is ubiquietous. And the current crop of digital cameras is almost invariably equipped with a zoomlens with a ratio above 1:10. The optical performance of the first zoomlenses in the late fifties and early sixties of the previous century was quite mediocre. For a long time it was widely assumed that this design could never challenge the image quality of the prime lenses with fixed focal length. When you study the current lens designs, you may indeed wonder how it is possible that a single lens with 9 elements can cover the range of focal lengths between 21 and 35 mm, where the prime lenses need from 6 to 9 elements to cover one single focal length.

The answer is not so difficult to provide: better knowledge of the design problems, new glasses with special properties and/or with high refractive indices and the insight into the possibilities of aspherical surfaces allow the designer to create zoomlenses with great performance. The major factor for the good quality of the zoomlens is of course the relatively low speed of the lens. Doubling the speed of a lens implies a hefty increase in the impact of the optical aberrations. And any lens designer will tell you that it is not possible to reduce all these aberrations to a level that they are inconsequential in normal photography. You may comment that the new generation of digital cameras have zoomlenses that combine high speed and a large zoomratio. That is true, but to paraphrase a famous remark by Bill Clinton: it is the format, stupid! When the image area is small (16 mm movie film, APS format, 6x8 mm sensors), a high speed lens is less difficult to create, compared to the relatively large 35 mm picture size. Designing really high quality zoomlenses for the 35 mm format is not easy and when you add the requirement for high speed, it becomes quite a daunting challenge. Not only optically, but also mechanically. Increase the speed and the zoom range simultaneously and you are stuck with a very big lens that is not convenient to handle.

When you look at the lens diagrams of modern zoomlenses, you may feel impressed: many lenses have a very high number of lens elements, from 15 to over 20. And if you care to glance into other areas, the zoomlenses for videocameras may have more than 30 elements. The basic zoomlens however can be designed with only two elements. The focal length is changed by increasing or decreasing the variable air space between the elements. Then you shift the whole system to keep it in focus.That is not convenient and a second moveable element was added.

One element moves to provide the shift in magnification (focal length) and the second element moves to hold the focus. The relative movement of both elements is very non-linear and that causes he elaborate mechanical linkage of the moving elements. This is the basic principle of he mechanically compensated zoomlens. In a real lens, you do want not only to change the focal length and hold the focus, but also to correct the aberrations. The basic layout consists of a primary lens group that corrects the aberrations and a zoom group that is responsible for the other actions. The zoomgroup is often designed in the classical plus-minus-plus configuration. The original Cooke triplet is indeed a seminal design. The front lens element is used for focusing, the middle element for changing the focal length and the third element is the mechanically linked compensator for the focus position during the zooming action. This layout can be seen very clearly in the LEICA APO-ELMARIT-R 70-180 mm f/2.8. But in the more recent designs the construction is more elaborate and the relative movements of the lens groups are more interlinked. Here we see a natural evolution of knowledge and experience. It is not too difficult to create a lens with the current optical design programs. The optimization algorithms are very powerful and the manufacture of lenses is often highly automated. But the number of lens elements does increase often beyond necessity. The prime directive of the current generation of Leica designers is simplicity of design, based on a true understanding of the problems involved in a lens design. It is the basic principle of Lothar Kölsch, the former head of the optical department, that it does not make sense to try to optimize a lens, without a very good grasp of the inherent problem areas of a design. Pencil and paper are still the starting tools of the Leica designers as is creative understanding of the optical configurations. The quest for a design with minimal elements also supports that other goal of the Solms designs: every lens element must be mounted without any deviation from the intended location. The drive to assemble a lens without the slightest amount of decentring may be seen sometimes as obsessive, but it is this seamless integration of optical perfection and mechanical excellence that provide the fingerprint of current Leica lenses. The other side of the coin is a lens, that offers less features than can be found with the competition.

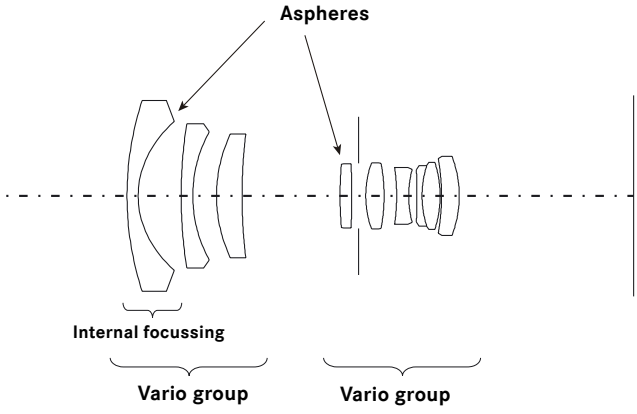
These considerations may be read as background information when discussing in general the philosophy of the Leica R zoomlenses. Compared to other well-known manufacturers and certainly when compared to the independent makers of zoomlenses, the specifications of the Leica zoomlenses seem quite modest. A lens however is the result of a series of conflicting demands: specifically a small size is very difficult to combine with excellent optical performance. And a compromise is then unavoidable.

Leica will never soften their focus on optical excellence, even if this implies that a lens may have specifications that are not up to what the competition does offer.

And the Leica users will have to accept this fact. One of the very charming consequences of this approach is the fact that every lens will perform in identical fashion.

__Optical considerations

The LEICA VARIO-ELMAR-R 21-35 mm f/3.5-4 ASPH. is a good example of this philosophy.

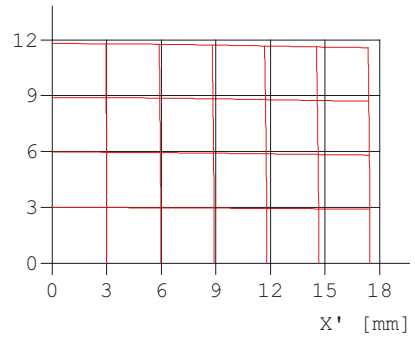


The lens has nine elements in eight groups and has two aspherical surfaces, both located before the aperture stop. The LEICA ELMARIT-R 24 mm f/2.8 has nine elements too, but is much less versatile and does not offer more image quality.

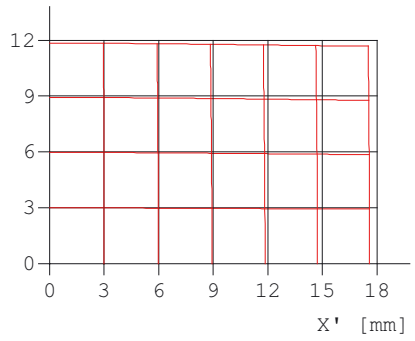
The design goal of the LEICA VARIO-ELMAR-R 21-35 mm f/3.5-4 was to provide a very compact lens with excellent performance over the whole focal range. One of the most pressing problems in a zoomlens is the distortion, which cannot be eliminated, but only distributed over the whole system. Here we have a part of the argument why Leica did not extend the zoomrange to 17 or 18mm on the wide angle side.

If we look at the distortion figures, we see that at 21mm the distortion is -3.5%, which is quite visible in architectural work and when there are straight lines at the outer zones and the horizontal edges of the picture. The distortion diminishes when changing the focal length to 35mm, where it is -1% (at 28mm it is -2%).

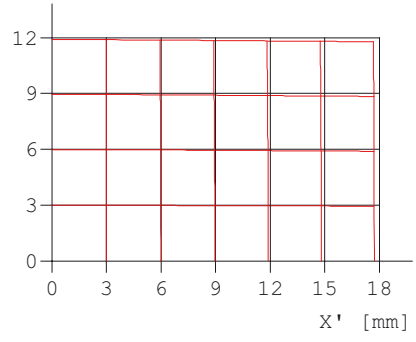
Effective Distortion
21 mm



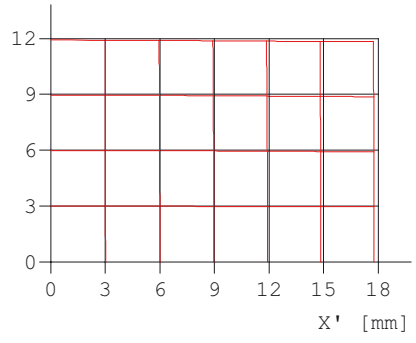
Effective Distortion
24 mm



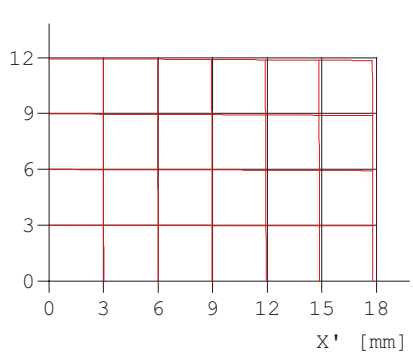
Effective Distortion
28 mm



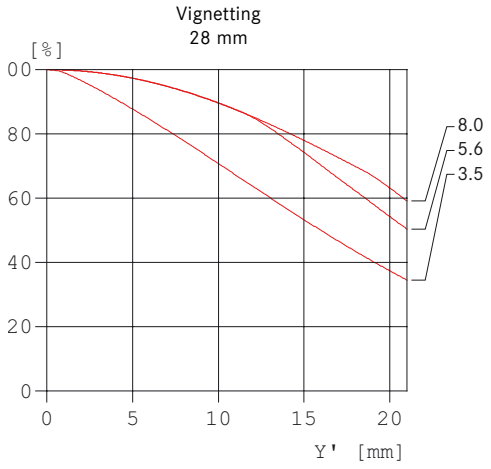
Effective Distortion
31 mm

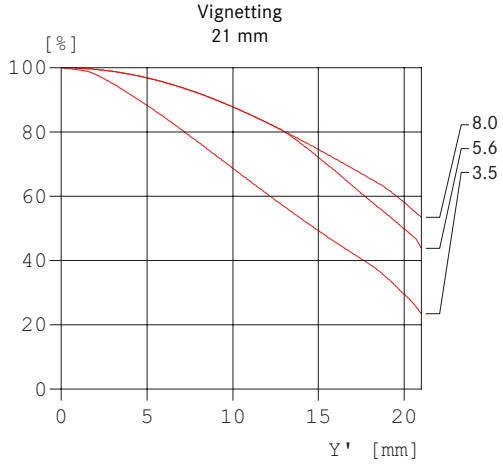


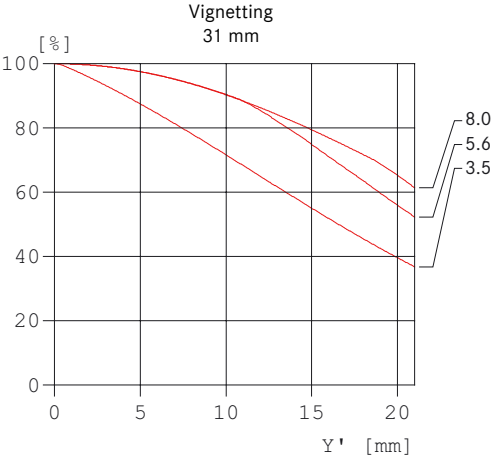
Effective Distortion
35 mm

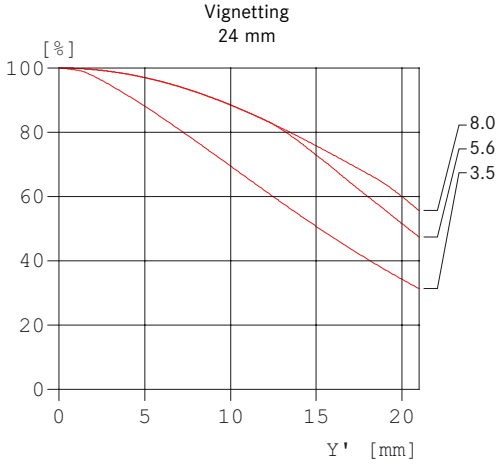


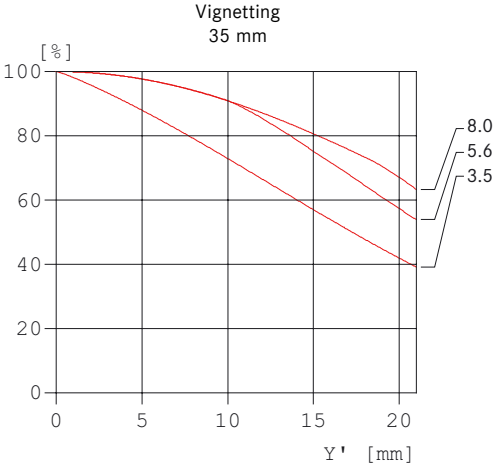
Vignetting varies from two stops at 21 mm to about one stop at the 35 mm position. Many persons are a bit amazed that the values for vignetting should be so high. In fact they are not. We may study current and older lens designs form Leica and note that in most cases the wide angle lenses have vignetting form around one to two stops at the wider apertures. This is not a typical defect in Leica lenses, but is the consequence of the cosine-to-the-fourth law. Total vignetting is the sum of artificial (mechanical) vignetting and natural (physical) vignetting. The mechanical vignetting can be reduced by using large lens diameters, but the natural vignetting is based on a physical law. It can be explained as follows. When we have a pocket torch and point it directly (with a straight angle) to a wall, we see a circular patch of light that uniformly illuminates that part of the wall. When we point at the wall from the same position, but with an oblique angle, the illuminated area is much bigger, but the illumination itself is less, because the distance has increased. Vignetting with wide angle lenses is a fact of life. It is at times very annoying and can spoil your picture, but you cannot eliminate the effect, only take care of the consequences.











The relatively low number of nine glass elements are one of the reasons for the excellent clarity of the pictures at full aperture. Careful treatment of the glass surfaces and very effective coating techniques are other reasons for a picture quality that surpasses the comparable fixed focal length lenses. Of course you cannot compare directly a 4/35 mm lens with a 1.4/35 mm. The design parameters are too different. But at comparable apertures the zoomlens has definitely the edge, especially in the outer zones of the picture. This is a general characteristic of the LEICA VARIO-ELMAR-R 21-35 mm f/3.5-4 ASPH. in comparison with the fixed focal lengths: the improved quality in the outer zones of the image. When you study the MTF graphs, you may notice two characteristics of the newer zoomlens: the tangential and sagittal curves are close together and the drop in quality at the edges is quite limited. Astigmatism and curvature of field are very well controlled and this should please most users, as they can use the full picture area without expecting a loss of quality. The Leica users who like smooth unsharpness gradients and picturesque background shapes (the bo-ke effects) may be slightly disappointed: the new LEICA VARIO-ELMAR-R 21-35 mm f/3.5-4 ASPH. does not produce harsh and brittle shapes in the unsharpness zones, but is does produce somewhat rough shapes.

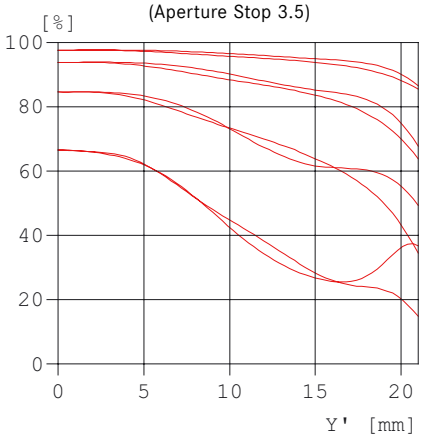
Colour fidelity is very good and colours are reproduced with natural hues. Even when using slide films with a warm balance, the colours are very pleasing.

Flare and secondary reflections are hardly visible, as is coma. With this lens, you can stop worrying about unpleasant surprises when shooting in demanding conditions and the choice of aperture and focal length is purely a matter of artistic consideration.

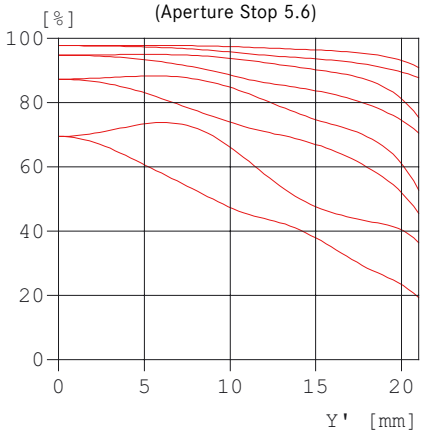
The high level of optical correction has pushed the residual errors to the margin as can be seen from the behaviour of the MTF graphs. There is a tendency in the internet user groups to diminish the information value of the MTF curves as being irrelevant to real picture taking, drawing a parallel to the resolution figures as a yardstick for image quality. It would be a pity if this approach to MTF graphs would become wide spread. Studying these curves is very informative: it will tell you at once that at all focal lengths, stopping down the lens has hardly any effect on the quality of the image. As example one may care to analyse the graphs of the 31 mm position.

There is a high contrast image at full aperture, as can be seen in the closeness of the graphs for the 5, 10 and 20 lp/mm and the fact that all three graphs are above 9% contrast transfer. Micro contrast is excellent too as can be seen from the shape and location of the graph for the 40 lp/mm. At 5.6 very fine detail in the outer zones becomes quite crisp and edge contrast is very good too. There is no colour fringing at the edge of black-white borders. At 8.0 we note a slight reduction in overall contrast and some residual colour errors.

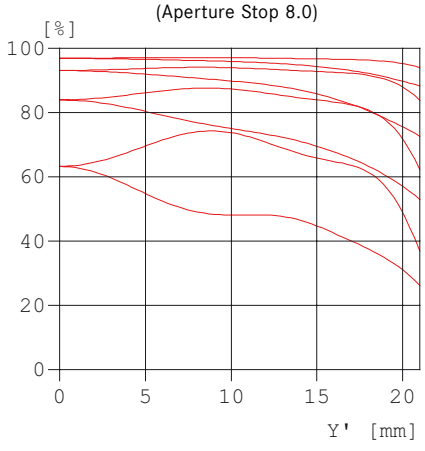
MTF - 31 mm
(Aperture Stop 3.5)



MTF - 31 mm
(Aperture Stop 5.6)

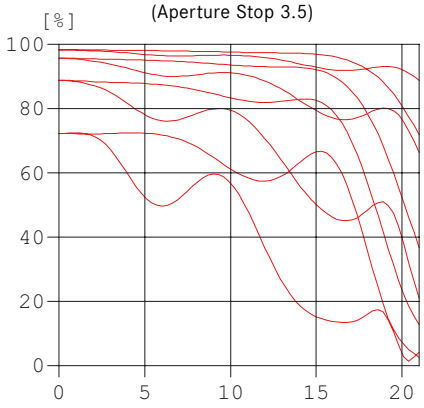


MTF - 31 mm
(Aperture Stop 8.0)

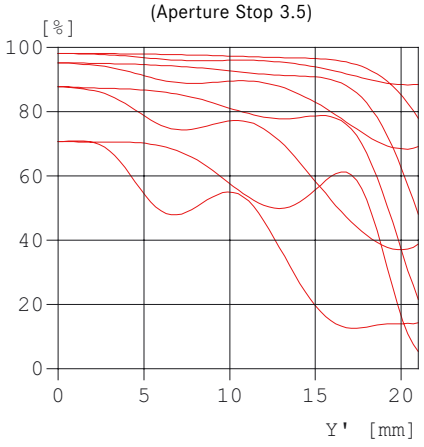


The best performance can be found at the focal positions from 28 to 31 mm. The 21 mm focal length is slightly softer overall and should be stopped down to 5.6 for best quality. This is especially true when making pictures in the near focus range.
A comparison of the MTF graphs at the various focal lengths and at full aperture indicate the evenness of image quality. The Leica broschure has a value of 1:3.5 attached to the full aperture at every focal length: in reality there is a progression from 21 mm (1:3.5) to 28 mm (1:3.7) and to 31 and 35 mm (1:4). The half stop difference is however not a problem in normal situations.

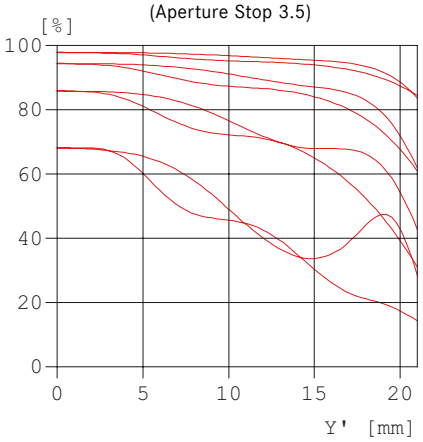
MTF - 21 mm
(Aperture Stop 3.5)



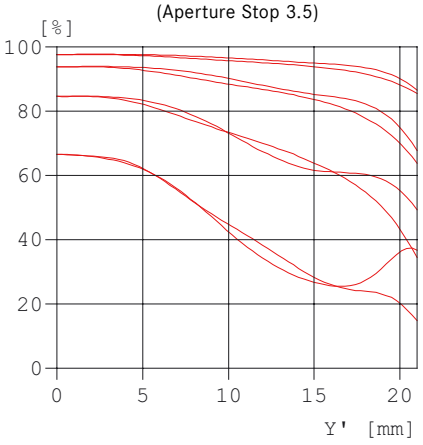
MTF - 24 mm
(Aperture Stop 3.5)



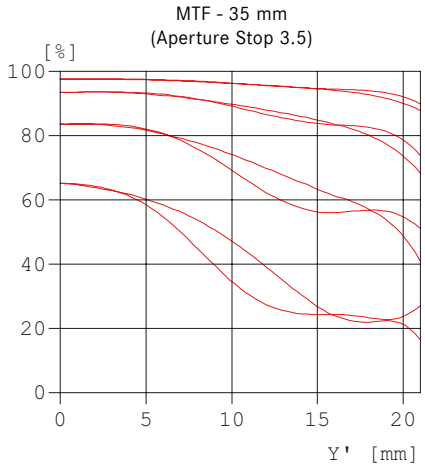
MTF - 28 mm
(Aperture Stop 3.5)



MTF - 31 mm
(Aperture Stop 3.5)



LEICA VARIO-ELMAR-R 21-35 mm f/3.5-4 ASPH.
Photography: Oliver Richter



Resolution figures, for whom it may concern, do vary from 70 lp/mm to 150 lp/mm, with the exception of the far corners, where we find values around 20 to 40 lp/mm.

__Handling considerations

A compact lens with very smooth handling characteristics and relatively low weight, can not be constructed without the use of thin aluminium tubes for the focusing mount. A thick metal wall would increase the lens diameter and make the focusing less smooth. Compare the ease of handling of this 21-35 mm with the 70-180 mm vario lens.

Sometimes you may hear a complaint that the focusing mount can be distorted when putting a strong pressure on it, as when you lift the lens out of the camera bag with a strong grip on the front part of the lens. The mount cannot be distorted, it is too strong for that, but you can change the smooth movement by pressing hard on the mount and so increasing the friction. Some see this behaviour as a lowering of the manufacturing quality of the Solms products when compared with the rock solid mounts of the older Leica lenses with fixed focal length. This conclusion would be wrong: it is not a question of manufacturing quality, but of ergonomics and a more complicated combination of demands. The focusing movement of a zoomlens is very different from that of a fixed focal length lens. And the handling requirements of a zoomlens must be taken into consideration.

This said, we might notice that the LEICA VARIO-ELMAR-R 21-35 mm f/3.5-4 ASPH. is a delightful lens to use, with the solid smoothness of movement and positive clickstops we expect from Leica. When using the lens at the 21 mm position during street photography and group photography, you should try to avoid having persons at the edge of the filed, as they will be stretched horizontally to inelegant proportions. This is not the effect of the distortion mentioned above, but the result of the wide angle characteristics as explained in the chapters on the 15 mm and 19 mm lenses.
The comments made in the earlier chapters from 19 to 35 mm about the artistic considerations (perspective, relative size, and depth of field) apply for this lens too and should not be rehearsed here.

LEICA VARIO-ELMAR-R 21-35 mm f/3.5-4 ASPH.
Photography: Oliver Richter

__Conclusion

The LEICA VARIO-ELMAR-R 21-35 mm f/3.5-4 ASPH. has an optical performance that equals and in many cases surpasses the comparable fixed focal lengths and delivers very punchy images.

The 19 mm and the 28mm fixed focal lengths have an aperture of 2.8 and somewhat better performance and indicate that there is room for dedicated lenses. The LEICA SUMMILUX-R 35 mm f/1.4 is obviously the champion in low ambient light, but in other areas shows its age, as does the LEICA SUMMICRON-R 35 mm f/2. The older 21 design is of significantly lower contrast and the 24mm design can only compete on axis with the performance of the 21 position of the Vario-Elmar-R.
The focal range of 1:1.7 seems a bit on the low side and looks more limited on paper than it is in daily use. The range from 21 mm to 35 mm covers a very interesting range and should be able to help you create very potent pictures in the wider angle range from 90 degrees to 63 degrees. Especially if you are looking for close contact pictures with a sense of tightness and immediacy, this lens is very versatile and useful. You need to adjust to the lens characteristics in real photography and do not judge solely from first experiences or from paper specs.
The maximum aperture of 1:3.5 does seem to limit the deployment possibilities a bit, especially when using slow speed slide film. I am not so impressed with this type of argumentation. If you choose a film and a lens carefully, you do so with a specific goal in mind. And then the speed limitations are obvious, but can be countered by flash and/or a tripod.

Only when scrolling around on the search for a suitable subject, you may find yourself in a position where the speed of the lens and the speed of the film are at a mismatch. But then the human quality of improvising may be honed.
My only problem with the aperture of 1:3.5 is the brightness of the focusing screen, which makes accurate focusing sometimes difficult. In this respect Leica has to reconsider their technique of the focusing screens.
It is customary to designate this lens for landscape or reportage photography as the preferred areas, but this is too limited a view. Situational portraits, human interest scenes in close and tight quarters and everything that can be imagined by the photographer to benefit from a wider perspective at close distances can be captured with this lens. It is the photographer not the lens that defines the subject.

The LEICA VARIO-ELMAR-R 21-35 mm f/3.5-4 ASPH. is very pleasant to use, compares favourably to companion lenses of fixed focal length, has excellent to outstanding overall performance and gives the user a new range of creative possibilities. It is one the few lenses that has no weak points in performance or handling.

LEICA VARIO-ELMAR-R 21-35 mm f/3.5-4 ASPH.
Photography: Oliver Richter