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Lenses for Digital Professional Photography

Digital photography may be superior to conventional photography if the end-product is a printed image: digital photography is faster, cheaper for high photo quantities, it makes re-touching easier, allows more effective manipulation and often has a higher quality. However, it makes much higher demands on the image reproduction quality of the lens because of the special technical requirements of the sensors (e.g. regular pixel grid, planar sensor surface and a 2 mm thick protective and filter glass plate in front of it) if the theoretically possible quality increase is to be realized in practice.

Lenses for adjustable technical cameras must offer really large image angles for perspective controls and lens swing and tilt and must ensure the very best imaging quality right up to their image circle margin. The resolving power and the contrast must be at their optimum even at high apertures (f-stop 8 to 11, when used with the relatively small area sensors even from 5.6) to ensure that diffraction and color noise do not impair sharpness. Furthermore, the correction of curvature of field has to meet the highest demands because of the virtually perfectly planar sensor surface, and the lenses may not generate any color fringes or any visible distortion. All these demands are met by the Rodenstock Apo-Sironar digital, the Apo-Macro-Sironar digital and the Apo-Sironar digital HR lenses.

- Both lens series Apo-Sironar digital and Apo-Macro-Sironar digital (the latter is optimized for large scales) provide large image circles for use with digital scan backs as well as with chip backs having larger area sensors or being used in the macro-scan mode for larger formats by stitching multiple shots made with laterally shifted back from one shot to the next. So they allow substantial camera movements. Resolving power is designed for pixel grid widths down to 9 μm .
- The Apo-Sironar digital HR lenses provide extremely high resolution already from open aperture (optimum: f-stop 4 to 5.6), perfectly corrected image curvature and a correction for the thickness of the sensor's protective glass. They are the best lenses for smaller sensors with pixel grid widths below 12 μm down to 5 μm .



**Rodenstock lenses provide you with best sharpness
for highest resolution line and area sensors
in order to get the full potential from this technology**

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Lenses for Digital Professional Photography

Apo-Sironar digital / Apo-Macro-Sironar digital

This line of Rodenstock lenses provides the photographer with an exhaustive spectrum of focal lengths for digital shots in the very highest imaging quality with adjustable professional cameras. The fine gradation of focal lengths meets the demands of every motif and all chip or scan back formats. Focal lengths from 35 mm mean that real wide-angle shots are possible, even with the smaller area sensor sizes, while still allowing large movements. All Apo-Sironar digital lenses are characterized by excellent sharpness and brilliance together with total freedom from color fringes in real apo quality.

Due to the small formats on the one hand (which are sensitive to higher diffraction!) and the high illumination requirements of the CCD image sensor on the other, digital photography does not allow the lenses to be stopped down as much as in conventional large-format photography. As a result, these lenses have been optimized for a working aperture of 8 to 11. Because both the surface of the area sensors and the area scanned by the CCD line sensors have greater planarity than conventional roll and sheet films, special attention was given to the correction of the curvature of field. The freedom from distortion, which is so important for product and building photography, and the uniformity of illumination are also excellent.

The Apo-Macro-Sironar digital provides a special macro lens at the same superb performance level of the Rodenstock Apo-Sironar digital series for high-resolution digital photos at reproduction scales from 1:5 to 2:1.

Apo-Sironar digital	Max. recommended format
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35 mm f/4.5	46×58 mm
45 mm f/4.5	72×96 mm
55 mm f/4.5	72×96 mm
90 mm f/5.6	72×96 mm
105 mm f/5.6	72×96 mm
135 mm f/5.6	72×96 mm
150 mm f/5.6	72×96 mm
180 mm f/5.6	72×96 mm

Apo-Macro-Sironar digital	Max. recommended format
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120 mm f/5.6	72×96 mm
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Data sheets

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**Apo-Sironar digital: sharp and brilliant,
with the best flatness of field,
free from color fringes and from distortion**

Apo-Sironar digital / Apo-Macro-Sironar digital

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Formats, shutter sizes, dimensions, weight

Lens	Maximum format	Shutter size	Push-on mount Ø	Filter thread	Rear barrel Ø	Flange foc. length ¹⁾	Flange to lens end	Overall length	Weight w/Copal
35 mm f/4.5	46×56 mm	0	70 mm	M 67 × 0.75	60.0 mm	43.2 mm	24.7 mm	58.8 mm	220 g
45 mm f/4.5	72×96 mm	0	70 mm	M 67 × 0.75	60.0 mm	55.5 mm	30.0 mm	70.5 mm	350 g
55 mm f/4.5	72×96 mm	0	70 mm	M 67 × 0.75	60.0 mm	67.6 mm	32.0 mm	73.8 mm	400 g
90 mm f/5.6	72×96 mm	0	70 mm	M 67 × 0.75	60.0 mm	93.1 mm	33.2 mm	82.0 mm	460 g
105 mm f/5.6	72×96 mm	0	51 mm	M 49 × 0.75	31.5 mm	100.0 mm	13.8 mm	48.6 mm	170 g
135 mm f/5.6	72×96 mm	0	51 mm	M 49 × 0.75	48.0 mm	132.0 mm	19.0 mm	53.6 mm	240 g
150 mm f/5.6	72×96 mm	0	51 mm	M 49 × 0.75	51.0 mm	147.0 mm	22.0 mm	57.4 mm	250 g
180 mm f/5.6	72×96 mm	1	70 mm	M 67 × 0.75	60.0 mm	177.0 mm	25.5 mm	65.2 mm	410 g
120 mm f/5.6	72×96 mm	0	51 mm	M 49 × 0.75	40.5 mm	236.0 mm	16.1 mm	49.8 mm	220 g

¹⁾ With Copal shutter for scale 1:∞, Apo-Macro-Sironar digital 120 mm f/5.6 for scale 1:1

Shutter data

Shutter type and size	Shutter speeds range	Manual cocking	Self cocking	Mechanical	Electronic	X-synchronized	Smallest f-stop increments	Screw thread	Lens board opening	Lens board thickness	Accessories required
Copal 0	B, T, 1/500 s ... 1 s	•	•	•	•	•		M 32.5 × 0.5	34.8 mm	1.5 ... 4.0 mm	
Copal 1	B, T, 1/400 s ... 1 s	•	•	•	•	•		M 39 × 0.75	41.8 mm	1.5 ... 3.0 mm	
Copal Press 0	B, 1/125 s ... 1 s		•	•	•	•		M 32.5 × 0.5	34.8 mm	1.5 ... 3.0 mm	
Copal Press 1	B, 1/125 s ... 1 s		•	•	•	•		M 39 × 0.75	41.8 mm	1.5 ... 2.0 mm	
Rollei Electron. 0	B, 1/500 s ... 30 s				•	•	1/10	M 39 × 0.75	41.8 mm	1.5 ... 3.0 mm	Control Unit
Rollei Electron. 1	B, 1/300 s ... 30 s				•	•	1/10	M 39 × 0.75	41.8 mm	1.5 ... 3.0 mm	Control Unit

Working apertures, image angles, image circles and movement ranges

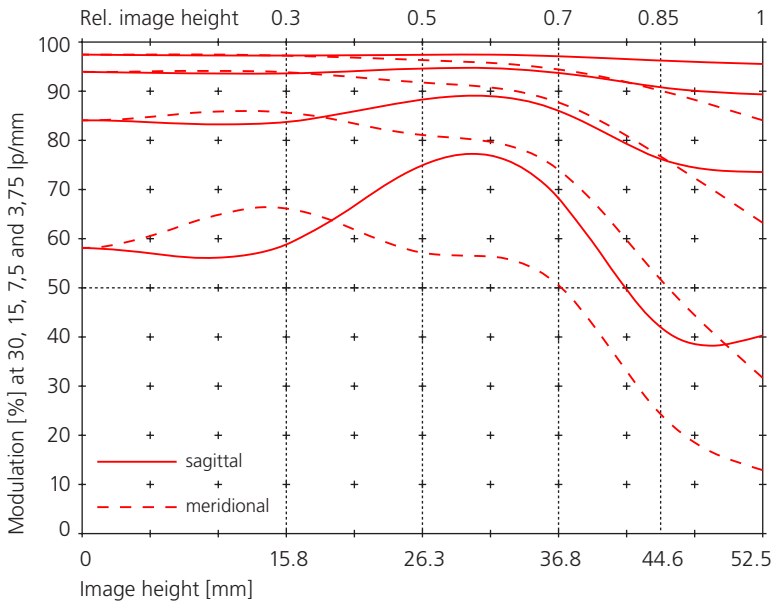
Lens	Image scale	Working f-stop	Image angle	Image circle diameter	Movement range [mm] ²⁾ vertical/horizontal (landscape format)					
					24×36 mm	37×37 mm	37×49 mm	46×58 mm	72×88 mm	72×96 mm
35 mm f/4.5	1:∞	8-11	111°	105 mm	37 / 33	31 / 31	29 / 25	21 / 18		
45 mm f/4.5	1:∞	8-11	107°	125 mm	48 / 43	41 / 41	40 / 36	32 / 29	8 / 7	4 / 3
55 mm f/4.5	1:∞	8-11	95°	125 mm	48 / 43	41 / 41	40 / 36	32 / 29	8 / 7	4 / 3
90 mm f/5.6	1:∞	8-11	70°	125 mm	48 / 43	41 / 41	40 / 36	32 / 29	8 / 7	4 / 3
105 mm f/5.6	1:∞	8-11	62°	125 mm	48 / 43	41 / 41	40 / 36	32 / 29	8 / 7	4 / 3
135 mm f/5.6	1:∞	8-11	58°	150 mm	61 / 56	54 / 54	53 / 49	46 / 42	25 / 22	21 / 18
150 mm f/5.6	1:∞	8-11	53°	150 mm	61 / 56	54 / 54	53 / 49	46 / 42	25 / 22	21 / 18
180 mm f/5.6	1:∞	8-11	45°	150 mm	61 / 56	54 / 54	53 / 49	46 / 42	25 / 22	21 / 18
120 mm f/5.6	1:5 - 2:1	8-11	55° - 24°	150 mm	61 / 56	54 / 54	53 / 49	46 / 42	25 / 22	21 / 18

²⁾ These values apply to the recommended working aperture at the given scale; with increasing scale, image circle and movement ranges increase

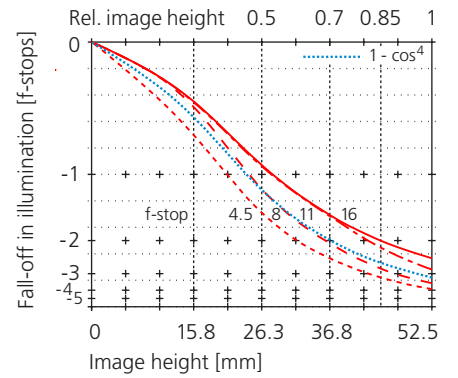
Apo-Sironar digital 35 mm f/4.5

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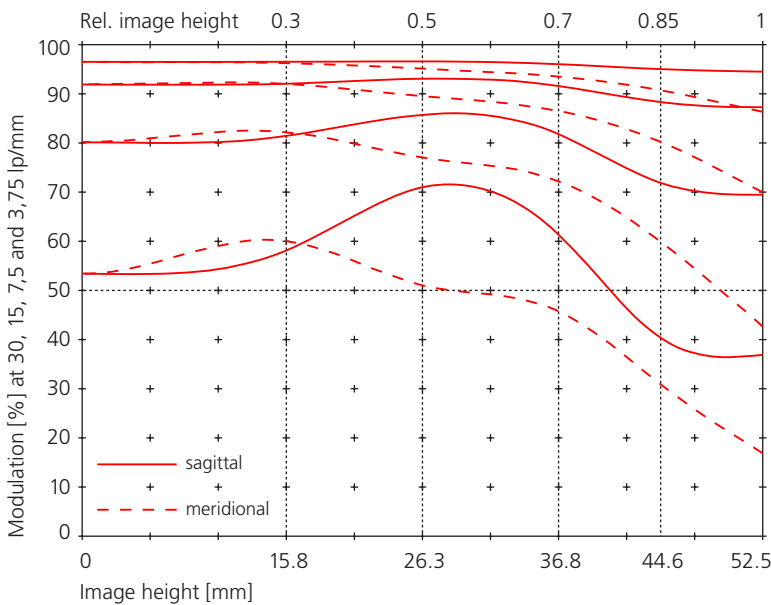
Modulation transfer function Scale 0.02x f-stop 8



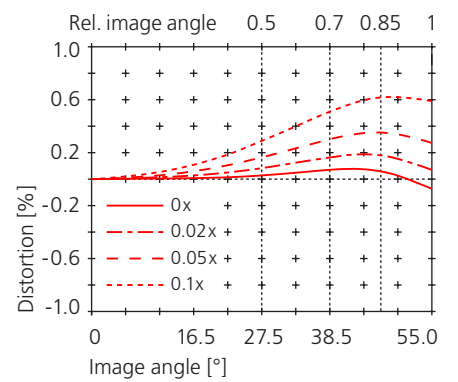
Fall-off in illumination Scale 0.02x



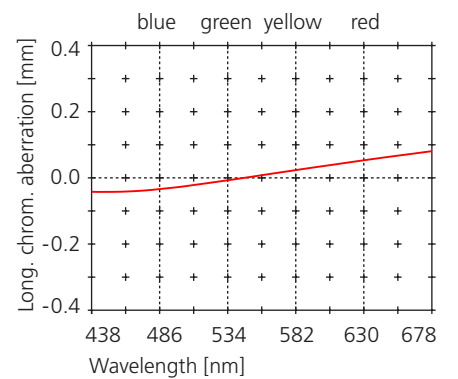
Modulation transfer function Scale 0.02x f-stop 11



Distortion Scale 0x ... 0.1x



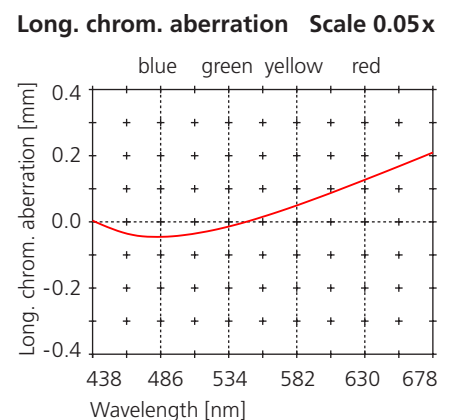
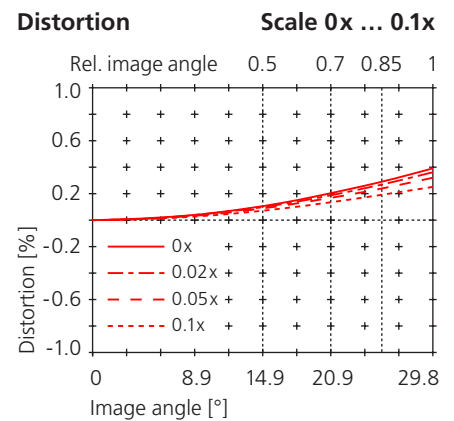
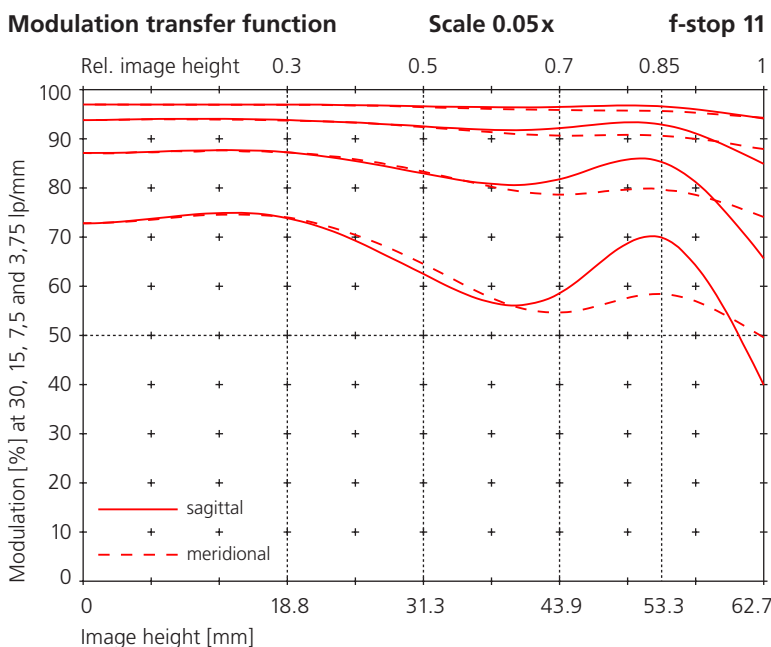
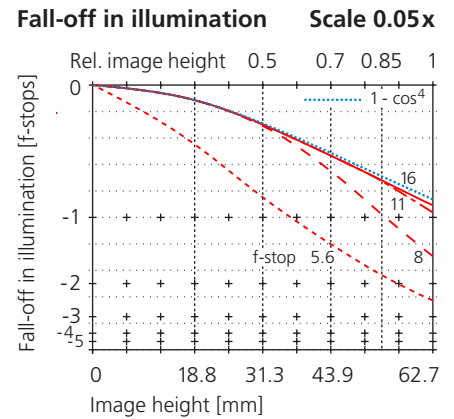
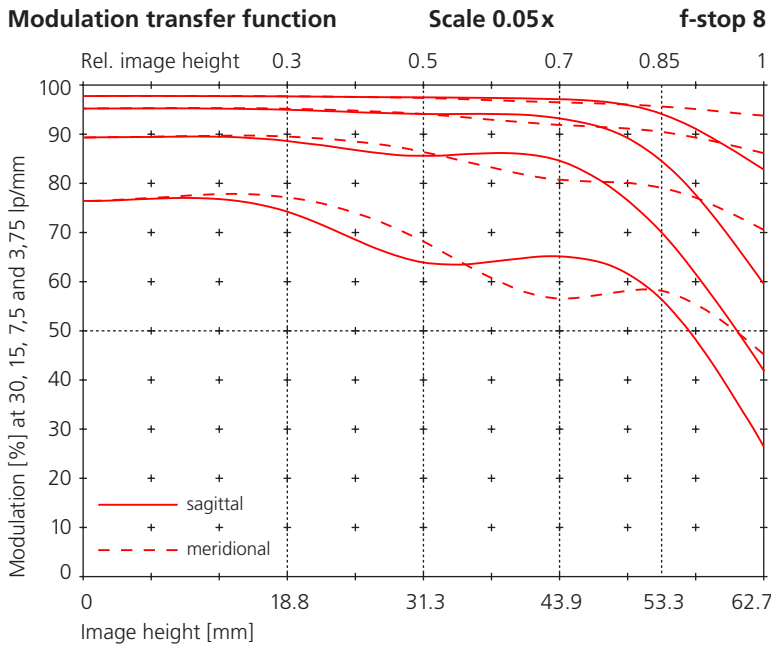
Long. chrom. aberration Scale 0.02x



All spatial frequencies [line pairs/mm],
image heights [mm] and scales
are related to the film or sensor side

Apo-Sironar digital 105 mm f/5.6

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All spatial frequencies [line pairs/mm],
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Lenses for Digital Professional Photography

Apo-Sironar digital HR

The Rodenstock Apo-Sironar digital HR lens series was developed for special applications with extremely high resolution CCD chip backs with pixel sizes even smaller than 10 μm such as can only be realized with smaller digital camera formats. These lenses utilize every technological possibility to get as close as possible to the absolute limit of diffraction-determined resolution. Among other things, even the optical properties and the thickness of the CCD protective glass were taken into the equation of the optical correction.

The resolving power and lateral chromatic aberration have been optimized to ensure that the resulting lack of sharpness or the color fringes do not amount to any more than a tiny fraction of the pixel size (which can no longer be resolved). As a result, even when the digital photos taken with the lens are enlarged to a maximum on the screen, absolutely no color fringes are visible, unless color fringes are added by the pixel structure of a one-shot back used or due to interpolation.

The resolving power of the Apo-Sironar digital HR is not only a little better for the working apertures of 8 to 11 recommended for other high-performance lenses. You can rather see an increase in performance even with a higher aperture right up to the maximum f-stop 4. This increase is reflected in the very high brilliance and detail reproduction. To ensure that this fantastic quality is not impaired by diffraction, HR lenses should always be stopped down as little as possible. This means that the depth of field should be increased for motifs extended in depth by using an optimum lens tilt for an overall sharp focus.

The advantageous larger apertures also reduce color noise in the shadows.

Apo-Sironar digital HR	Max. recommended format
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35 mm f/4	37×49 mm
60 mm f/4	37×49 mm
100 mm f/4	37×49 mm



Data sheets

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Apo-Sironar digital HR: the optimum with a superior reserve in sharpness for high resolution digital backs

Apo-Sironar digital HR

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Formats, shutter sizes, dimensions, weight

Lens	Maximum format	Shutter size	Push-on mount Ø	Filter thread	Rear barrel Ø	Flange foc. length ¹⁾	Flange to lens end	Overall length	Weight w/Copal
35 mm f/4	37×49 mm	0	70 mm	M 67 × 0.75	48.0 mm	53.0 mm	29.2 mm	80.4 mm	480 g
60 mm f/4	37×49 mm	0	51 mm	M 49 × 0.75	42.0 mm	64.3 mm	24.0 mm	57.6 mm	240 g
100 mm f/4	37×49 mm	0	60 mm	M 58 × 0.75	42.0 mm	99.4 mm	73.4 mm	22.1 mm	370 g

¹⁾ With Copal shutter for scale 1:∞

Shutter data

Shutter type and size	Shutter speeds range	Manual cocking	Self cocking	Mechanical	Electronic	X-synchronized	Smallest f-stop increments	Screw thread	Lens board opening	Lens board thickness	Accessories required
Copal 0	B, T, 1/500 s ... 1 s	•	•	•	•	•		M 32.5 × 0.5	34.8 mm	1.5 ... 4.0 mm	
Copal Press 0	B, 1/125 s ... 1 s		•	•	•	•		M 32.5 × 0.5	34.8 mm	1.5 ... 3.0 mm	
Rollei Electron. 0	B, 1/500 s ... 30 s				•	•	1/10	M 39 × 0.75	41.8 mm	1.5 ... 3.0 mm	Control Unit

Working apertures, image angles, image circles and movement ranges

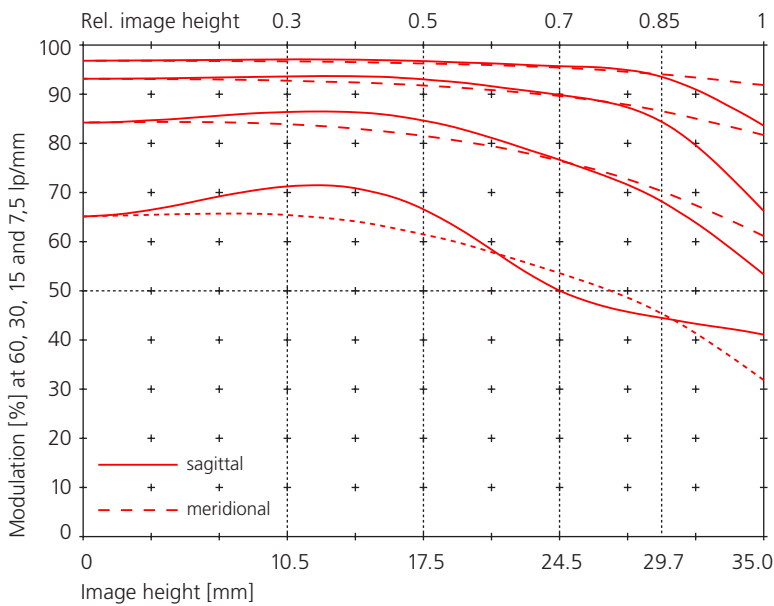
Lens	Image scale	Working f-stop	Image angle	Image circle diameter	Movement range [mm] ²⁾ vertical/horizontal (landscape format)					
					24×36 mm	37×37 mm	37×49 mm	46×58 mm	72×88 mm	72×96 mm
35 mm f/4	1:∞	5.6-8	90°	70 mm	18 / 15	11 / 11	6 / 5			
60 mm f/4	1:∞	5.6-8	60°	70 mm	18 / 15	11 / 11	6 / 5			
100 mm f/4	1:∞	5.6-8	39°	70 mm	18 / 15	11 / 11	6 / 5			

²⁾ These values apply to the recommended working aperture at the given scale; with increasing scale, image circle and movement ranges increase

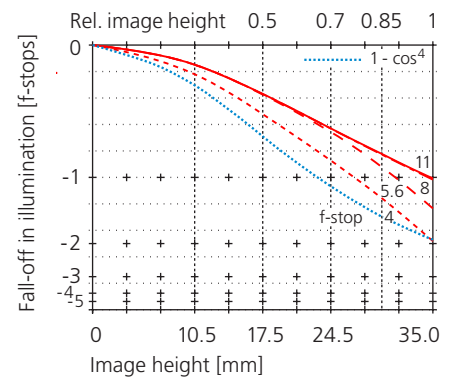
Apo-Sironar digital HR 35 mm f/4

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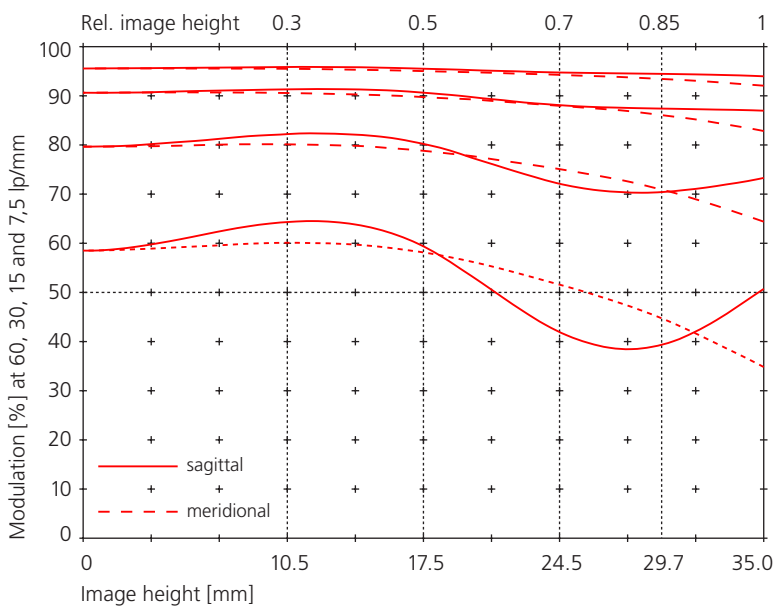
Modulation transfer function Scale 0.02x f-stop 5.6



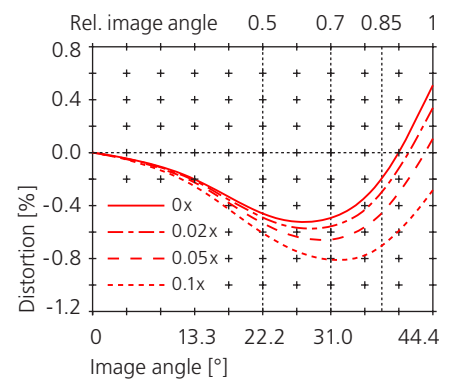
Fall-off in illumination Scale 0.02x



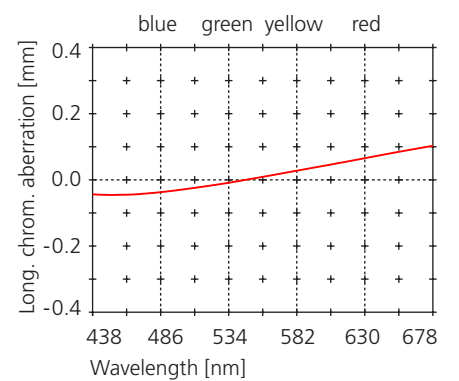
Modulation transfer function Scale 0.02x f-stop 8



Distortion Scale 0x ... 0.1x



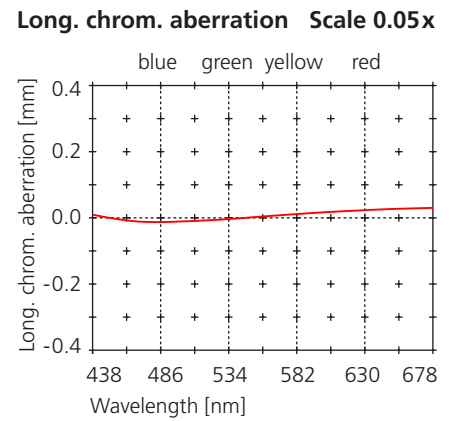
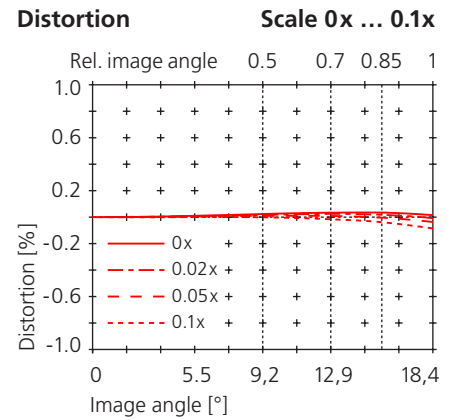
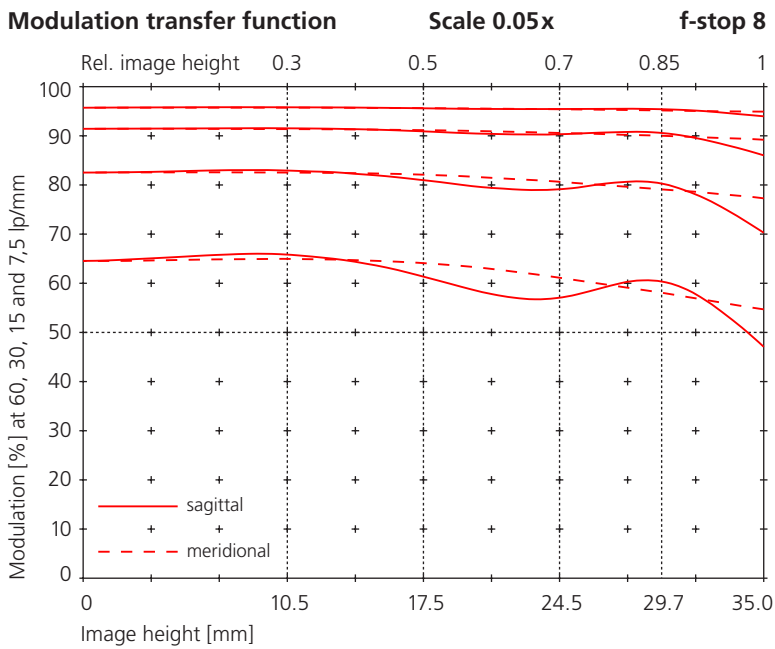
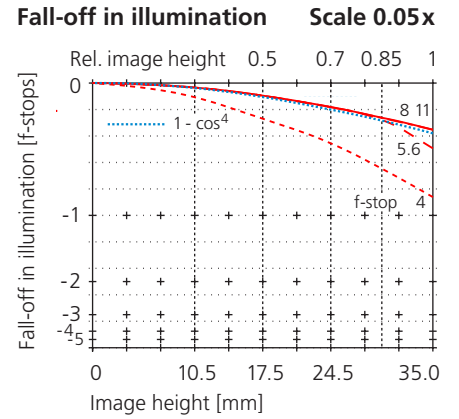
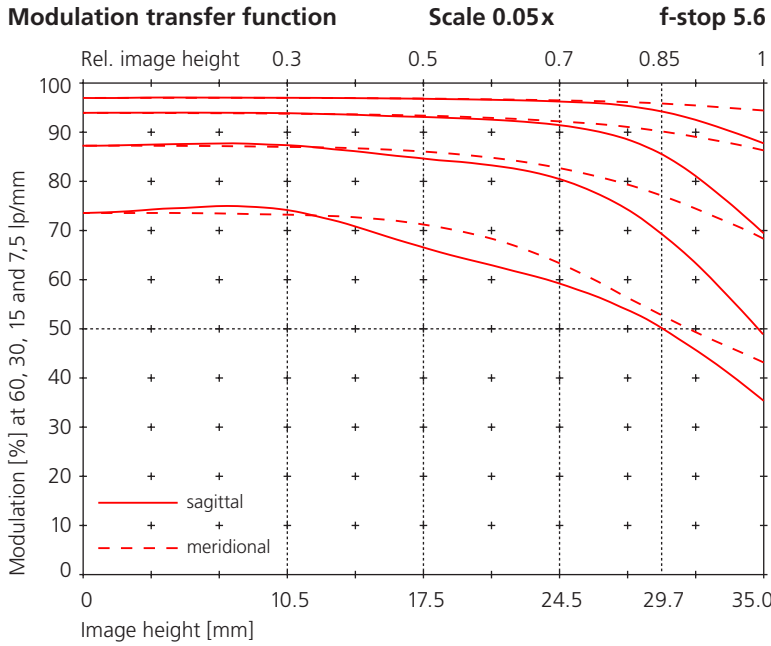
Long. chrom. aberration Scale 0.02x



All spatial frequencies [line pairs/mm],
image heights [mm] and scales
are related to the film or sensor side

Apo-Sironar digital HR 100 mm f/4

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All spatial frequencies [line pairs/mm],
image heights [mm] and scales
are related to the film or sensor side