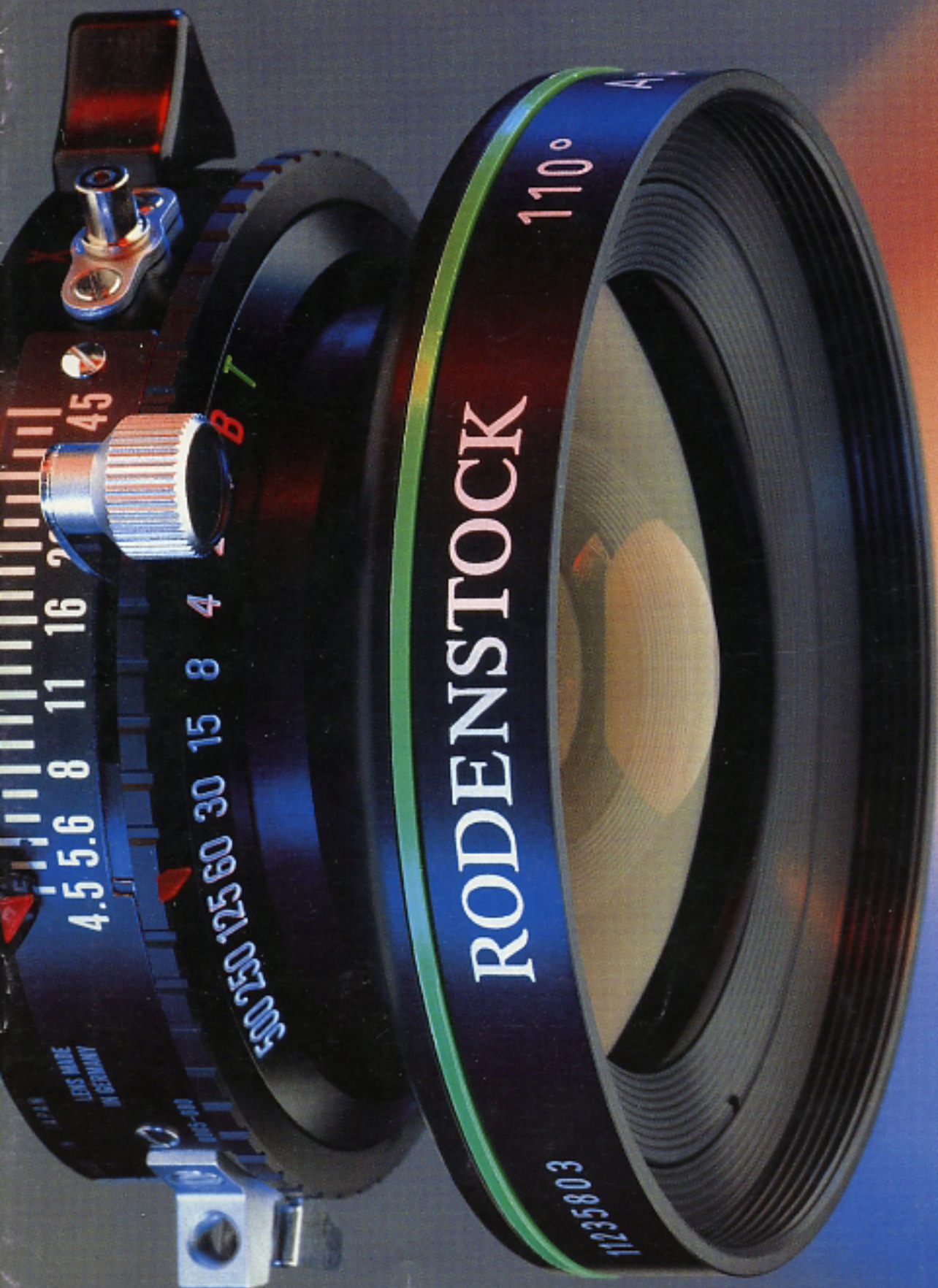




RODENSTOCK

Lenses for
Large Format Cameras



Valuable information on large format lenses.

A range that meets all requirements.

Large film formats retain their pre-eminence in advertising, product shots, and architectural photography. Three main reasons are:

First, the large format offers unsurpassed sharpness and superior detail reproduction.

Second, large format cameras allow perspective corrections (elimination of converging verticals) and sharpness distribution ("Scheimpflug" condition). Features which can only be partially performed, if at all, with 35 mm or medium format cameras.

Third, large transparencies are simply more impressive in any presentation.

In the various fields of large format photography there are many different optical requirements demanding special characteristics and features of lenses. The Rodenstock range, therefore, comprises different lens types, all of which are offered in convenient sequences of focal lengths.

The standard lens should provide a medium to large field angle, high image quality and speed as well as the greatest sophistication possible. These demands are met by the **Apo-Sironar**, available in 3 versions (N, S and W). As a standard lens it is used with a focal length which corresponds to or is a little longer than the format diagonal.

For large imaging scales between around 1:5 and 3:1 the special lenses **Apo-Macro-Sironar** and **Macro-Sironar-N** are available. Both lenses feature high speed and large image circles.

The **Apo-Ronar** offers superb image reproduction from a scale of 1:1 to infinity. This is the classical process lens, but it has also more than proved its value as a "long focal length" lens with clear quality advantages over tele-constructions.

Whenever small rooms, wide spaces or short taking distances (architecture) make large field angles necessary, the lenses of first choice are the **Apo-Grandagon** and the **Grandagon-N** with field angles of up to 110°.

A special feature lens is the **Imagon**, a soft focus lens for dream-like portraits or also for romantic landscapes.

How the image circle influences the movement range of your camera.

In order to make optimum use of the decisive advantage of a large format camera, i. e. its wide range of movements, you need lenses with a large image circle and first-class image reproduction quality right up to the edge of the image circle.

The most important camera movement is the parallel adjustment to eliminate or reduce converging verticals. Especially for architectural photographs or product shots it may be necessary to reduce convergence considerably. For this, the lens must have an image circle far beyond the size of the taking format. On the following double page is a chart on the right-hand side which shows the recommended adjustments for a focusing distance of infinity and a working aperture of $f/22$. For shorter distances (e. g. for product shots), the image circle diameter will increase so that even larger adjustments are required.

Depth of field versus diffraction – The optimum working aperture.

Strictly speaking, sharp focusing is only possible in the subject plane; in front of or behind this plane, the sharpness is less. The area in which unsharpness is not yet recognizable as such is called "depth of field". The longer the focal length of a lens, the shallower the depth of field; but the more the lens is stopped down, the larger this again becomes.

Because large taking formats require long focal lengths, large format lenses have to be stopped down quite a lot in order to provide sufficient depth of field.

A certain amount of stopping down is also normally required to suppress the residual aberration which can never be corrected 100%.



The right lens for every application.

What the designation "Apo" means for the quality of your pictures.

But at low apertures diffraction – an unavoidable physical effect – increases so that the sharpness is visibly reduced. For this reason, you should never stop down any more than is absolutely necessary.

Under optimum circumstances most large format lenses should be stopped down to $f/22$; smaller apertures may be permissible with larger formats (see chart on the right). If a great deal of depth of field is required, the aperture can be stopped down by one more number without any substantial loss in the image sharpness.

The quality designation "Apo" comes from graphic arts technology and is the abbreviation for "apochromatically corrected". In graphic arts this means that the lens will provide three identical colour separation negatives.

Generally, however, an Apo lens is understood to be one which has exceptionally good colour correction – which has nothing to do with the colour reproduction, but everything with the elimination of irritating colour fringes. Colour fringing is a typical problem of lenses with a long focal length. The fringes increase with the image field and are strongest at the edge of the picture.

The prefix "Apo" on Rodenstock lenses stands for the best possible correction of chromatic error and guarantees photos without colour fringes.

Basic data for the comparison of the different film sizes.

When comparing different taking formats, the different focal lengths, the different depths of field and the different diffraction must be taken into account if the comparison is to be correct.

focal length) which have corresponding diagonal field angles and which have been rounded to standard values in comparison with standard focal lengths for 35 mm photography.

Taking Format	Analogue focal lengths [mm]							Best Aperture
	Short		Normal	Long				
35 mm	18	24	28	35	50	85	135	5.6
6x6 cm	30	40	50	65	90	150	250	11
6x7 cm	35	50	60	75	100	180	280	11-16
6x9 cm	45	55	65	105	135	210	360	16
9x12 cm/4x5"	55	75	90	115	180	300	480	16-22
13x18 cm/5x7"	90	115	155	200	240	420	600	22-32
18x24 cm/8x10"	115	155	200	240	360	600	900	32-45

Because the different taking formats have different "width to height" ratios, the corresponding format diagonal is used as the reference value.

The chart shows focal lengths (from super wide-angle to long

The last column shows the corresponding optimum aperture values with regard to depth of field and diffraction; the reference value here is aperture $f/5.6$ for 35 mm. These recommended values should only be exceeded in the interest of best possible sharpness when the depth of field is much more important than good sharpness.



Technical Data of the Lenses

The right lens for every application

Lens Data			Shutters (smallest aperture)									Mechanical Data							
			Copal 0	Compur 0	Premont. prot. 0.1 S	Copal 1	Compur 1	Premont. prot. 1 S	Copal 3	Compur 3	Premont. prot. 3	Standard mount	Push-on mount diameter	Filter thread	Rear mount diameter	Optical register 1:∞	Overall length	Weight incl. Copal/Compur shutter	
Lens	Max. recommended film size	Image circle Ø at 1:∞ and f/22																	
Apo-Sironar-N																			
100 mm f/5.6	6x9 cm	151 mm	45	45	45									42 mm	M 40.5x0.5	31.5 mm	100 mm	38 mm	170 g
135 mm f/5.6	9x12 cm/4x5"	200 mm	64	45	45									42 mm	M 40.5x0.5	40.5 mm	130 mm	43.5 mm	210 g
150 mm f/5.6	9x12 cm/4x5"	214 mm	64	45	64									51 mm	M 49x0.75	42 mm	142 mm	51 mm	220 g
180 mm f/5.6	13x18 cm/5x7"	262 mm				64	64	64						80 mm	M 58x0.75	51 mm	173 mm	57 mm	400 g
210 mm f/5.6	13x18 cm/5x7"	301 mm				64	64	64						70 mm	M 67x0.75	60 mm	200 mm	68 mm	440 g
240 mm f/5.6	13x18 cm/5x7"	350 mm							64	64	64			80 mm	M 77x0.75	70 mm	231 mm	77 mm	780 g
300 mm f/5.6	18x24 cm/8x10"	425 mm							64	64	64			90 mm	M 86x1	80 mm	282 mm	84 mm	1040 g
360 mm f/5.8	18x24 cm/8x10"	435 mm							64	64	64			110 mm	M 105x1	80 mm	333 mm	116.5 mm	1560 g
480 mm f/8.4	18x24 cm/8x10"	500 mm							90					115 mm	M 112x1.5	95 mm	452 mm	147 mm	2300 g
480 mm f/9.0	18x24 cm/8x10"	500 mm							90	90				115 mm	M 112x1.5	95 mm	452 mm	147 mm	2300 g
Apo-Sironar-S																			
135 mm f/5.6	9x12 cm/4x5"	208 mm	64	45	64									51 mm	M 49x0.75	48 mm	132 mm	47.5 mm	240 g
150 mm f/5.6	9x12 cm/4x5"	231 mm	64	45	64									51 mm	M 49x0.75	51 mm	147 mm	51.5 mm	250 g
180 mm f/5.6	13x18 cm/5x7"	276 mm				64	64	64						70 mm	M 67x0.75	60 mm	177 mm	60.5 mm	410 g
210 mm f/5.6	13x18 cm/5x7"	316 mm				64	64	64						75 mm	M 72x0.75	65 mm	202 mm	69.5 mm	490 g
240 mm f/5.6	13x18 cm/5x7"	372 mm							64	64	64			90 mm	M 86x1	80 mm	230 mm	82 mm	960 g
300 mm f/5.6	18x24 cm/8x10"	448 mm							64	64	64			105 mm	M 100x1	80 mm	277 mm	96.5 mm	1210 g
360 mm f/5.8	18x24 cm/8x10"	488 mm							64	64	64			117 mm	M 112x1.5	80 mm	330 mm	120 mm	1560 g
Apo-Sironar-W																			
150 mm f/5.6	13x18 cm/5x7"	252 mm				45	64	64						75 mm	M 72x0.75	57 mm	141 mm	56 mm	360 g
210 mm f/5.6	18x24 cm/8x10"	352 mm							64	64	64			105 mm	M 100x1	76.5 mm	191 mm	77.5 mm	950 g
300 mm f/5.6	18x24 cm/8x10"	490 mm							64	64	64			132 mm	M 127x1	105 mm	280 mm	105.5 mm	1610 g
Apo-Macro-Sironar																			
180 mm f/5.6	13x18 cm/5x7"	415 mm 1:1				64	64	64						70 mm	M 67x0.75	54 mm	176 mm	61.2 mm	410 g
Macro-Sironar-N																			
300 mm f/5.6	18x24 cm/8x10"	550 mm 1:1							64	64	64			80 mm	M 77x0.75	80 mm	280 mm	93 mm	1060 g
Apo-Grandagon																			
45 mm f/4.5	6x9 cm/6x12 cm	131 mm	32		32									60 mm	M 58x0.75	60 mm	55.5 mm	65.3 mm	350 g
55 mm f/4.5	9x12 cm/4x5"	163 mm	45	45	45									70 mm	M 67x0.75	60 mm	67.6 mm	69.8 mm	400 g
Grandagon-N																			
65 mm f/4.5	9x12 cm/4x5"	170 mm	45	45	45									60 mm	M 58x0.75	51 mm	70 mm	63.5 mm	330 g
75 mm f/4.5	9x12 cm/4x5"	195 mm	45	45	45									70 mm	M 67x0.75	60 mm	82 mm	73.5 mm	440 g
75 mm f/5.8	9x12 cm/4x5"	187 mm	45	45	45									80 mm	M 58x0.75	54 mm	79 mm	65 mm	340 g
90 mm f/4.5	13x18 cm/5x7"	236 mm				45	45	45						95 mm	M 82x0.75	70 mm	98 mm	88.5 mm	700 g
90 mm f/5.8	9x12 cm/4x5"	221 mm	45	45	45									70 mm	M 67x0.75	60 mm	94 mm	78.5 mm	460 g
115 mm f/5.8	13x18 cm/5x7"	291 mm				45	45	45						95 mm	M 82x0.75	70 mm	121 mm	93 mm	740 g
155 mm f/5.8	18x24 cm/8x10"	382 mm				45	45	64						110 mm	M 105x1	90 mm	169 mm	133.5 mm	1460 g
200 mm f/5.8	18x24 cm/8x10"	495 mm							64	64	64			140 mm	M 135x1	115 mm	215 mm	172 mm	2500 g
Apo-Ronar																			
150 mm f/9.0	6x9 cm	135 mm	64	45	64									42 mm	M 40.5x0.5	31.5 mm	149 mm	35.5 mm	150 g
240 mm f/9.0	9x12 cm/4x5"	212 mm				90	64	90						51 mm	M 49x0.75	37.5 mm	235 mm	41.5 mm	260 g
300 mm f/9.0	13x18 cm/5x7"	264 mm				90	90	90						51 mm	M 49x0.75	37.5 mm	296 mm	47.5 mm	270 g
360 mm f/9.0	13x18 cm/5x7"	318 mm							90	90	90			60 mm	M 58x0.75	58 mm	351 mm	59 mm	550 g
480 mm f/9.0	18x24 cm/8x10"	396 mm												70 mm	M 67x0.75	60 mm	463 mm	67 mm	850 g
480 mm f/11.0	18x24 cm/8x10"	396 mm												70 mm	M 67x0.75	60 mm	463 mm	67 mm	850 g
Imagon																			
200 mm H 5.8	6x9 cm													55 mm	-	60 mm	216 mm	78 mm	510 g
250 mm H 5.8	9x12 cm/4x5"													55 mm	-	60 mm	276 mm	84.5 mm	520 g
300 mm H 6.8	13x18 cm/5x7"													55 mm	-	60 mm	332 mm	91 mm	540 g

Data sheets on the Horseman-ISS, Noble-Prestor and Copal-Press shutters can be obtained from your dealer or directly from Rodenstock.

Image Circles and Shift limits

Lens	Image circle Ø at 1:∞ and f/22	field angle at f/22	Shift limits in mm at 1:∞ with f/22, landscape format													
			6x7 cm	6x9 cm	6x12 cm	9x12 cm	4x5"	13x18 cm	5x7"	18x24 cm	8x10"					
Apo-Sironar-N	100 mm f/5.6	151 mm	72°	↑39 36	↑33 26	↑22 13	↑8 6									
	135 mm f/5.6	200 mm	72°	↑65 62	↑62 52	↑54 39	↑41 34	↑32 25								
	150 mm f/5.6	214 mm	72°	↑73 69	↑70 59	↑63 45	↑49 42	↑41 35	↑3 2	↑4 3						
	190 mm f/5.6	262 mm	72°	↑98 94	↑95 84	↑90 71	↑75 67	↑68 62	↑38 30	↑30 31						
	210 mm f/5.6	301 mm	72°	↑119 114	↑116 104	↑111 91	↑98 88	↑90 83	↑63 52	↑64 53	↑11 8					
	240 mm f/5.6	350 mm	72°			↑137 116	↑124 113	↑116 108	↑92 79	↑92 79	↑46 37	↑28 23				
	300 mm f/5.6	425 mm	72°						↑134 118	↑134 119	↑93 79	↑77 67				
	350 mm f/6.8	435 mm	64°						↑139 123	↑140 124	↑99 84	↑83 72				
	480 mm f/8.4	500 mm	56°								↑136 113	↑121 108				
	480 mm f/9.0	500 mm	56°								↑136 113	↑121 108				
Apo-Sironar-S	135 mm f/5.6	208 mm	75°	↑70 66	↑66 55	↑59 43	↑45 38	↑37 32								
	150 mm f/5.6	231 mm	75°	↑82 78	↑79 68	↑72 56	↑59 51	↑50 45	↑16 12	↑17 13						
	180 mm f/5.6	276 mm	75°	↑105 101	↑103 91	↑97 78	↑84 74	↑76 69	↑47 38	↑48 39						
	210 mm f/5.6	316 mm	75°	↑126 121	↑124 112	↑120 99	↑106 96	↑98 91	↑72 60	↑73 61	↑23 18	↑3 2				
	240 mm f/5.6	372 mm	75°			↑149 127	↑135 124	↑128 120	↑104 90	↑105 91	↑60 50	↑43 36				
	300 mm f/5.6	448 mm	75°						↑146 130	↑147 131	↑106 92	↑91 79				
	350 mm f/5.8	468 mm	68°						↑157 140	↑158 141	↑118 102	↑102 90				
Apo-Sironar-W	150 mm f/5.6	252 mm	80°	↑93 89	↑90 79	↑84 66	↑71 62	↑63 56	↑32 25	↑33 26						
	210 mm f/5.6	352 mm	80°			↑139 117	↑125 114	↑117 109	↑93 80	↑94 80	↑47 38	↑29 24				
	300 mm f/5.6	490 mm	80°				↑197 184	↑190 180	↑169 152	↑169 152	↑131 114	↑115 102				
Apo-Grandagon	45 mm f/4.5	131 mm	110°	↑28 25	↑20 15	↑4 2										
	55 mm f/4.5	163 mm	110°	↑45 42	↑40 32	↑30 19	↑16 13	↑7 5								
Grandagon-N	65 mm f/4.5	170 mm	105°	↑50 46	↑45 35	↑35 23	↑22 17	↑12 10								
	75 mm f/4.5	195 mm	105°	↑63 59	↑59 49	↑51 36	↑38 31	↑29 25								
	75 mm f/6.8	187 mm	102°	↑59 55	↑55 45	↑46 32	↑33 27	↑24 20								
	90 mm f/4.5	236 mm	105°	↑85 80	↑81 71	↑75 58	↑60 53	↑54 48	↑20 16	↑21 16						
	90 mm f/6.8	221 mm	102°	↑77 73	↑73 63	↑67 50	↑53 45	↑45 40	↑9 7	↑10 7						
	115 mm f/6.8	291 mm	104°	↑113 109	↑111 99	↑108 86	↑92 82	↑85 77	↑57 47	↑58 47	↑3 2					
	155 mm f/6.8	382 mm	102°			↑154 132	↑141 129	↑133 125	↑110 95	↑111 95	↑67 56	↑50 42				
200 mm f/6.8	495 mm	102°								↑130 117	↑118 105					
Apo-Ronar	150 mm f/9.0	135 mm	46°	↑30 27	↑23 17	↑8 4										
	240 mm f/9.0	212 mm	46°	↑72 68	↑66 58	↑61 45	↑48 41	↑39 35								
	300 mm f/9.0	264 mm	46°	↑99 95	↑95 85	↑91 72	↑78 68	↑70 63	↑40 32	↑40 32						
	350 mm f/9.0	318 mm	46°	↑127 122	↑125 113	↑120 100	↑107 96	↑99 92	↑73 61	↑74 62	↑24 19	↑4 3				
	480 mm f/9.0	396 mm	46°			↑162 139	↑148 137	↑141 132	↑118 103	↑118 104	↑75 63	↑59 50				
	480 mm f/11.0	396 mm	46°			↑162 139	↑148 137	↑141 132	↑118 103	↑118 104	↑75 63	↑59 50				
	Scale		Shift limits in mm for close-up work with f/22, landscape format													
Apo-Macro-Sironar	1:5 302 mm	70°	↑119 114	↑116 104	↑112 91	↑98 88	↑90 83	↑63 52	↑64 53	↑11 9						
	1:1 415 mm	60°	↑177 171	↑174 161	↑171 145	↑158 146	↑150 142	↑128 113	↑129 115	↑87 73	↑70 61					
	2:1 562 mm	55°	↑250 245	↑249 235	↑247 222	↑233 220	↑226 216	↑206 188	↑207 189	↑170 152	↑155 141					
Macro-Sironar-N	1:1 360 mm	50°				↑130 110	↑99 85	↑54 44	↑123 115	↑99 85	↑36 30					
	1:1 550 mm					↑224 212	↑197 180	↑161 143	↑217 206	↑198 180	↑146 132					

The right lens for every application.

Apo-Sironar-N, the photographer's "workhorse".



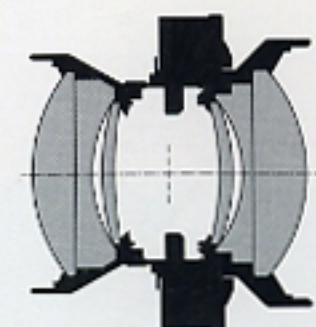
Apo-Sironar-N 300 mm f/5.6
in the Prontor Professional 3
self-cocking shutter

The Apo-Sironar-N is the all-round lens for the professional photographer. Typical applications: Product shots of every kind, industrial subjects, landscape and city photography.

The Apo-Sironar-N equally provides an ideal longer focus lens with smaller formats. Monorail view cameras permit almost unlimited extension (especially with extension bellows). As a result optically problematic tele lens designs are no longer needed; their short construction length only provides advantages for fixed cameras. For example, focal lengths of 210 to 300 mm have proved particularly useful for product shots with 9 x 12 cm (4 x 5") cameras. The six-element Apo-Sironar-N bears the "Apo" designation without restriction despite its very advantageous price. The field angle is 72°.

The image circle diameter exceeds the diagonal of the recommended format by around 45 %; this gives the photographer considerable edge quality together with abundant shift and swing possibilities.

Note: The lower maximum aperture of 6.8 for the 360 mm lens and 8.4 for 480 mm is due to the restricted maximum opening of the size 3 shutter.



Optical design: 6 elements/4 groups

Apo-Sironar-N	Recommended film size
100 mm f/5.6	6x9 cm
135 mm f/5.6	9x12 cm / 4x5"
150 mm f/5.6	9x12 cm / 4x5"
180 mm f/5.6	9x12 cm / 4x5"
210 mm f/5.6	13x18 cm / 5x7"
240 mm f/5.6	13x18 cm / 5x7"
300 mm f/5.6	18x24 cm / 8x10"
360 mm f/6.8	18x24 cm / 8x10"
480 mm f/8.4	18x24 cm / 8x10"



Apo-Sironar-S 240 mm f/5.6
in the Copal 3 shutter

Apo-Sironar-S, the ultimate lens with extensive adjustment reserves.

The Apo-Sironar-S is a lens for universal use which has been modified to provide the highest image reproduction quality. Like the Apo-Sironar-N its applications are practically limitless. Its special strengths can be seen when complex, fine structures in the adjustment range have to be reproduced.

Its field angle has been increased to 75° and so permit even more generous shifts. Therefore is the Apo-Sironar-S also the ideal standard lens for applications which require particularly large parallel shifts to correct the perspective. For instance, the Apo-Sironar-S 150 mm f/5.6 in the format 9 x 12 cm permits up to 10 mm more vertical or lateral shift than the equivalent Apo-Sironar-N lens.

As a result of the elimination of the secondary spectrum thanks to the use of ED glass materials with anomalous dispersion (ED = extra low dispersion), no visible colour fringing occurs even at edges with extreme contrast. In addition, the light fall-off towards the edge has been reduced for a more uniform illumination.

Thanks to this high optical performance in the edges of the field, the six-element Apo-Sironar-S can use f/stop 16 as its working aperture – a special advantage for outdoor shots due to the shorter exposure time this allows.

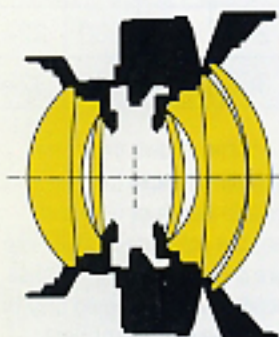


Optical design: 6 elements/4 groups

Apo-Sironar-S	Recommended film size
135 mm f/5.6	9x12 cm / 4x5"
150 mm f/5.6	9x12 cm / 4x5"
180 mm f/5.6	9x12 cm / 4x5"
210 mm f/5.6	13x18 cm / 5x7"
240 mm f/5.6	13x18 cm / 5x7"
300 mm f/5.6	18x24 cm / 8x10"
360 mm f/6.8	18x24 cm / 8x10"



Apo-Sironar-W 210 mm f/5.6
in a Copal 3 shutter



Optical design: 7 elements/5 groups

**Apo-Sironar-W,
the exceptional
universal lens with
the large field angle.**

The Apo-Sironar-W with its larger field angle of 80° offers such a large image circle diameter that the lens can serve as a medium wide angle for the next larger film format and still permit reasonable shifts.

To ensure that the wide shift range or the larger film size can be used without qualms, the image reproduction quality has been improved, particularly at the edge of the image circle. One example: The use of ED (ED = extra low dispersion) glass materials. You not only gain even better sharpness at the edges, you also see a clear reduction in light fall-off.

A further advantage is the exceptionally low distortion, a feature of particular benefit for architectural or product shots.

The brilliant reproduction within such a large image circle makes the seven-element Apo-Sironar-W the unsurpassed universal wide-angle lens for the most demanding photographers.

As it is primarily intended for studio use, performance has been optimized for a 1:10 scale of reproduction, but with no noticeable loss at infinity, either.



Apo-Macro-Sironar 180 mm f/5.6
in Copal 1 shutter



Optical design: 6 elements/4 groups

**Apo-Macro-Sironar,
Macro-Sironar-N,
lenses for great
little pictures.**

In the near area – at scales of around 1:1, the quality of lenses optimised for larger distances falls visibly from the usual standard of performance. And it is here that the Apo-Macro-Sironar and Macro-Sironar-N come into their own for imaging scales of 1:5 and greater.

Incidentally, imaging scales of 1:5 or larger are required even in conventional table-top photography or studio photography: for example, 1:3 at a film size of 13 x 18 cm means the full format image reproduction of a lens of approximately 40 x 50 cm in size.

In addition to their outstanding imaging quality, both lenses naturally offer the extensive movements required for large format photography.

The Apo-Macro-Sironar provides excellent results without any colour fringes and without any individual scale adaption in the scale range from 1:5 to 2:1. The focal length of 180 mm allows work with most cameras without any base tube extension even at a scale of 2:1.

The Macro-Sironar-N is adapted to the scale range needed in each case by adjustment of the front and rear elements.

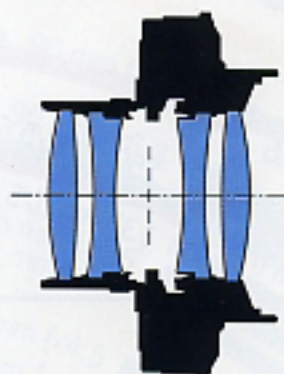
Apo-Sironar-W	Recommended film size
150 mm f/5.6	9x12 cm / 4x5"
210 mm f/5.6	13x18 cm / 5x7"
300 mm f/5.6	18x24 cm / 8x10"

Apo-Macro-Sironar	Recommended film size
180 mm f/5.6	13x18 cm / 5x7"
Macro-Sironar-N	Recommended film size
300 mm f/5.6	18x24 cm / 8x10"

**Apo-Ronar,
world-famous for
extreme sharpness.**



Apo-Ronar 300 mm f/9
in the Prontor Professional 15
self-cocking shutter



Optical design: 4 elements/4 groups

The Apo-Ronar is the classic process lens. But the scope of this lens, with its outstanding definition, goes far beyond process and product shots. With a field angle of around 48° it is a first-class long focal length lens for all formats whose long side is not larger than half the focal length. A lens which is light, compact, attractively priced and still superior in sharpness and field angle to tele lens designs.

As the image circle increases with camera extension, the Apo-Ronar can also be used for larger formats in the close-up and macro range.

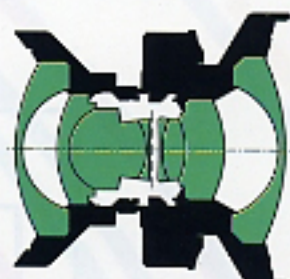
Though ideally corrected for 1:1 reproduction, the four-element Apo-Ronar maintains its image quality even at high reductions (distance range) or magnifications. The contrast transfer will always be near the physical limit. The apo-chromatic correction keeps even high contrast outlines free from colour fringing.

The Apo-Ronar is also available without a shutter (e. g. for process cameras). In this version focal length of up to 1200 mm are available for special applications.

Apo-Ronar	Recommended film size
150 mm f/9.0	6x9 cm
240 mm f/9.0	9x12 cm / 4x5"
300 mm f/9.0	13x18 cm / 5x7"
360 mm f/9.0	13x18 cm / 5x7"
480 mm f/9.0	18x24 cm / 8x10"



Apo-Grandagon 55 mm f/4.5
in shutter Copal 0



Optical design: 8 elements/4 groups

**Apo-Grandagon
freedom for architecture,
landscape and studio.**

Roll film formats for large format require shorter focal length lenses. With focal lengths of 45 and 55 mm, photography in close spaces on roll film or up to a format of 4x5" becomes "dynamic enjoyment".

Both lenses give you the freedom to find new and appealing views in product photography. But new standards in freedom of movement are also offered by the Apo-Grandagon super wide-angle lenses with a useful field angle of 110° in architectural and industrial photography. Even photographs of, for example, wide open spaces on 4x5" flat film is possible with the Apo-Grandagon 55 mm f/4.5.

New glass combinations in conjunction with ED glasses make possible apochromatic correction of super wide-angle lenses for the first time. This ensures there will be no colour fringes even on high contrast building silhouettes. With values of less than 0.5 % distortion can be neglected.

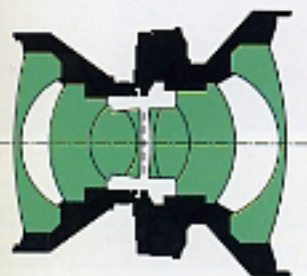
The high maximum aperture makes adjustment easy. The working aperture of 11 – 16 allows advantageous, shorter exposure times for outdoor motifs (moving) or a lower flash power in the studio. The use of colour-neutral, vignetting-free Rodenstock Center Filters is recommended.

With the Rodenstock Focus-Mount, both lenses can be fitted to cameras without bellows – a feature which makes large format photography mobile!

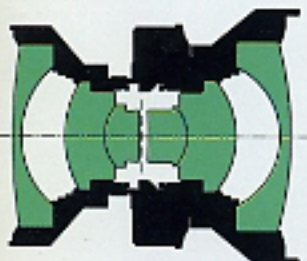
Apo-Grandagon	Recommended film size
45 mm f/4.5	6x9 cm / 6x12 cm
55 mm f/4.5	9x12 cm / 4x5"



Grandagon-N 90 mm f/6.8
in Copal 0



Optical design:
Grandagon-N 1/4.5: 8 elements/4 groups



Optical design:
Grandagon N 1/6.8: 6 elements/4 groups

**Grandagon-N,
the "space expander"
for situations where
space is at a premium.**

The Grandagon-N with its field angle of up to 105° can really display its strengths in wide photos in close conditions, for example in architecture or industrial photography or in panorama views.

With the Grandagon-N all the problems which occur in connection with large field angles have been ideally taken care of: The distortion has been reduced to a small residual value; the light fall-off at the edge has been greatly reduced thanks to an optical trick ("pupil distortion" = the pupil diameter increases when viewing at an angle); the sharpness sets standards for this class of lens. –

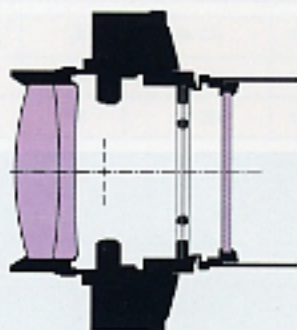
The Grandagon-N is available in two versions: With the maximum aperture 4.5 in focal lengths 65 to 90 mm it has 8 elements and with the maximum aperture 6.8 in focal length 75 to 200 mm it has 6 elements.

The eight element lenses offer not only a high maximum aperture, but also a field angle of 109°, an even more uniform illumination and distortion values of less than 1%.

The use of neutral grey, vignetting-free Center Filters is recommended for critical motifs and to make best use of the image circle.



Imagon 200 mm H 5.8
in a Compur 3 shutter
with fitted perforated diaphragm



Optical design: 2 elements/1 group

**Imagon,
soft focus for
romantic portraits
with ethereal light.**

High-quality lenses are normally expected to yield sharp, crisp images. For some applications, however, – for example in portrait shots – a softer luminous rendering is preferred over faithful detail sharpness. The Imagon lens with the focal lengths of 200 mm, 250 mm and 300 mm meets this need for film sizes up to 13 x 18 cm (5 x 7") in a very special way.

It does not produce the blurred images typical of incorrect focusing or poor quality lenses. It rather overlays a clearly defined image core with delicate diffusion controlled by adjustable push-on perforated diaphragms. By spreading highlight outlines into the shadows, the Imagon softens the hard definition, yielding portrait or landscape effects that range from a slightly flattering rendering to dreamy, romantic moods.

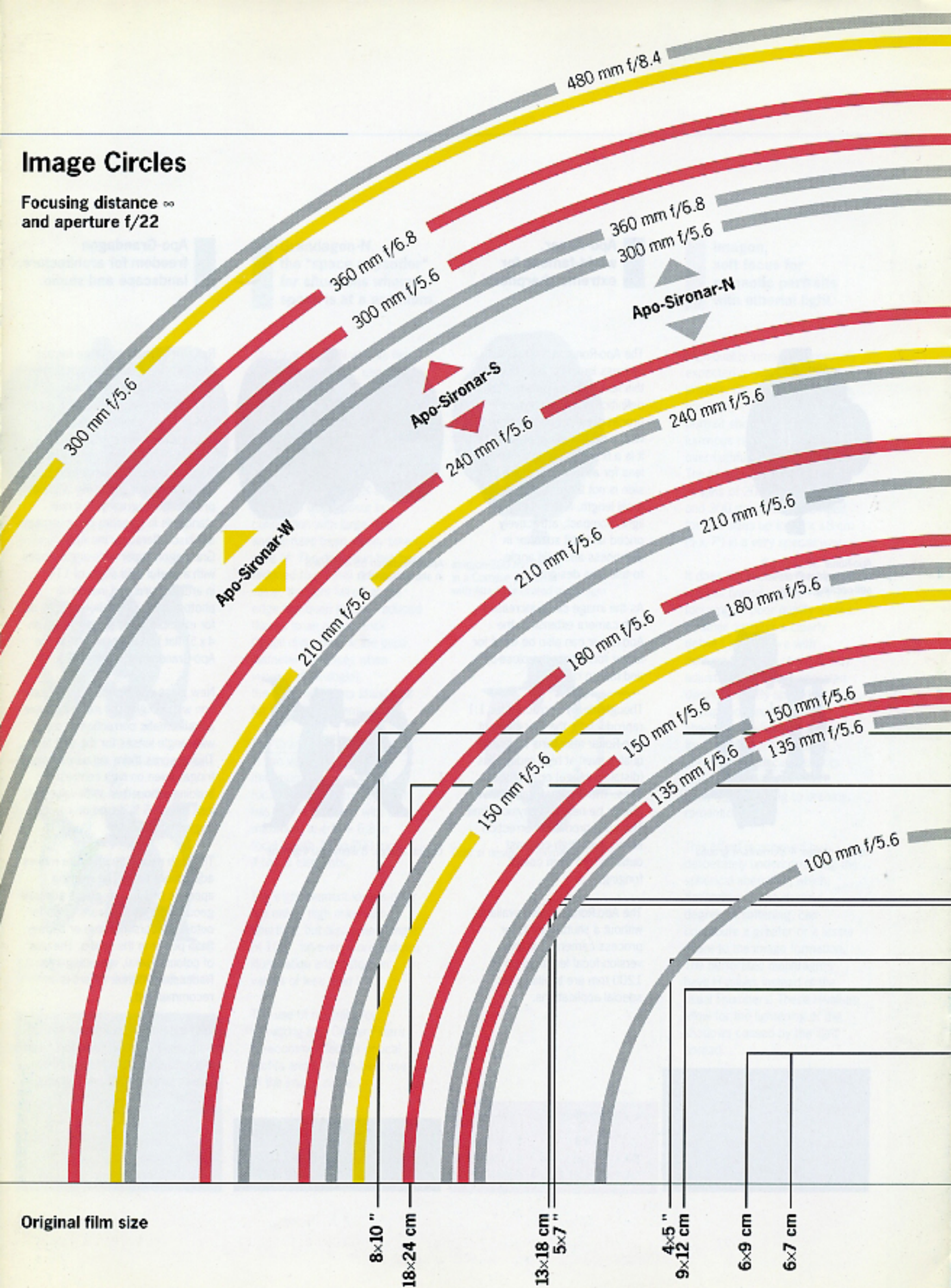
This effect is achieved by deliberately undercorrecting the spherical aberration which, depending on the desired degree of softening, can contribute a greater or a lesser share to the image formation. The perforated diaphragms have H-values instead of the usual f-numbers. These H-values allow for the lightening of the shadows caused by the light spread.

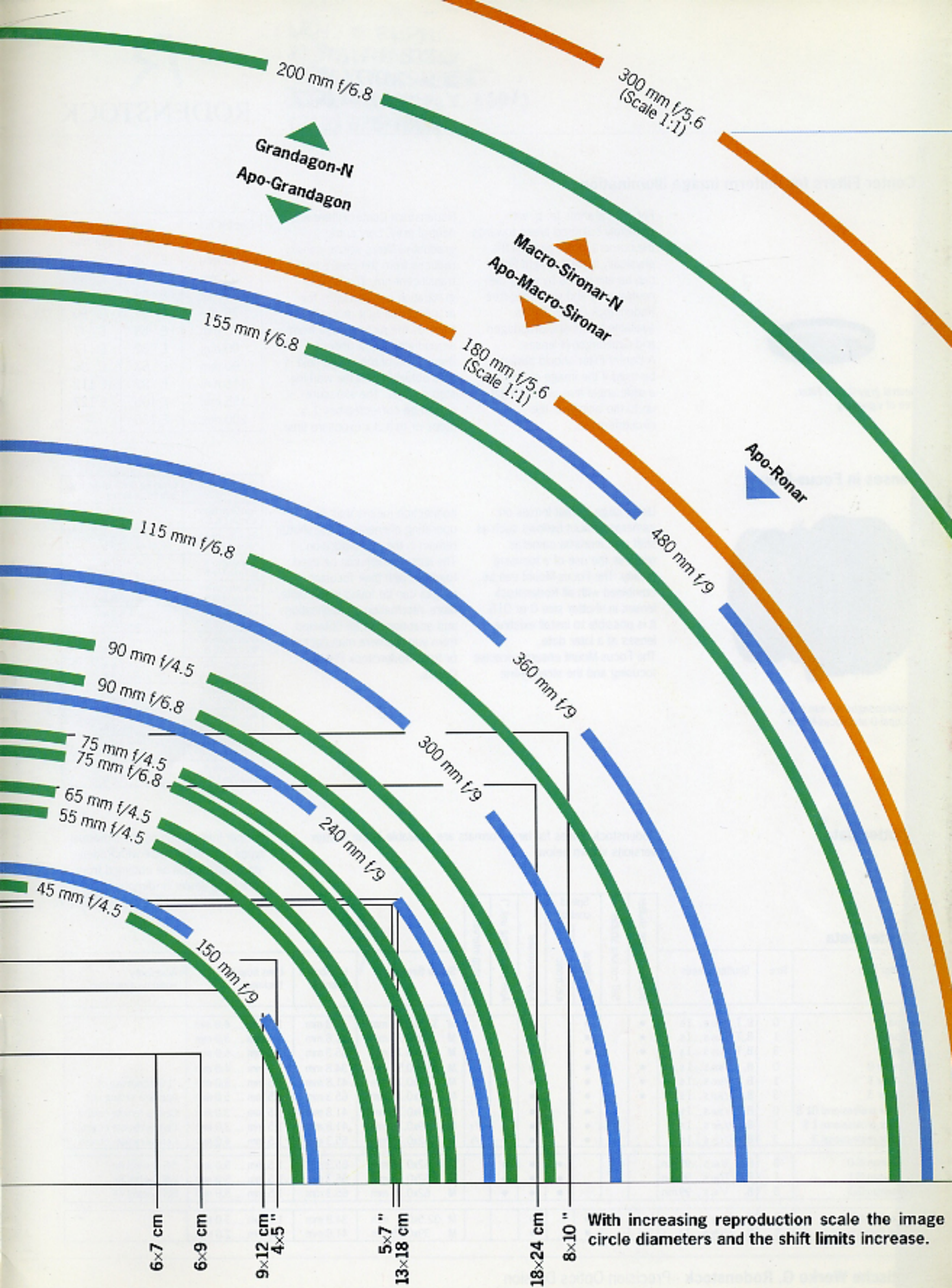
Grandagon-N	Recommended film size
65 mm 1/4.5	9x12 cm / 4x5"
75 mm 1/4.5	9x12 cm / 4x5"
75 mm 1/6.8	9x12 cm / 4x5"
90 mm 1/4.5	13x18 cm / 5x7"
90 mm 1/6.8	9x12 cm / 4x5"
115 mm 1/6.8	13x18 cm / 5x7"
155 mm 1/6.8	18x24 cm / 8x10"
200 mm 1/6.8	18x24 cm / 8x10"

Imagon	Recommended film size
200 mm H 5.8	6x9 cm
250 mm H 5.8	9x12 cm / 4x5"
300 mm H 6.8	13x18 cm / 5x7"

Image Circles

Focusing distance ∞
and aperture f/22





Center Filters for uniform image illumination



Neutral grey Center Filter,
free of vignetting

For critical shots (e. g. with uniformly coloured areas towards the corners of the picture) the physically inevitable light fall-off can be eliminated by using the neutral grey and vignetting-free Rodenstock Center Filters available for all Apo-Grandagon and Grandagon-N lenses. A Center Filter should always be used if the image circle of a wide angle lens is used right up to the vicinity of the circumference.

Rodenstock Center Filters are neutral grey, concentric graduated filters whose density reduces from the centre to the translucent rim. The density graduation compensates for practically all light drop-off towards the picture edge from around stop 16. A uniform illumination of the image field is thus obtained with the working stop number. The exposure should be corrected by 1.5 stops or to a 3 x exposure time.

Center Filter	Screw thread	
	Lens	For filter
45 mm	E 58	E 77
55 mm	E 67	E 86
65 mm	E 58	E 77
75 mm	E 67	E 86
75 mm	E 58	E 77
90 mm	E 82	E 112
90 mm	E 67	E 86
115 mm	E 82	E 112
155 mm	E 105	E 127
200 mm	E 135	-

Lenses in Focus-Mount



Apo-Grandagon 45 mm f/4.5
in Copal 0 and FocusMount

Using large format lenses on cameras without bellows such as shift or panorama cameras requires the use of a focusing facility. The Focus-Mount can be combined with all Rodenstock lenses in shutter size 0 or 01S. It is possible to install existing lenses at a later date. The Focus-Mount ensures precise focusing and the straight-line

connection means that all operating elements of the shutter remain in the same position. The lenses which can be used together with their focusing ranges can be found in the table. More information on applications and adaption can be obtained from your camera manufacturer or from Rodenstock Photo-Optics.

Lens	Focusing range of the lens with FocusMount
Apo-Grandagon 45mm f/4.5	∞ - 0.4 m ∞ - 1.3 ft
Apo-Grandagon 55 mm f/4.5	∞ - 0.6 m ∞ - 2.0 ft
Grandagon-N 55 mm f/4.5	∞ - 0.7 m ∞ - 2.3 ft
Grandagon-N 75 mm f/4.5	∞ - 0.9 m ∞ - 3.0 ft
Grandagon-N 75 mm f/6.8	∞ - 0.9 m ∞ - 3.0 ft
Grandagon-N 90 mm f/6.8	∞ - 1.3 m ∞ - 4.3 ft
Apo-Sironar-N 100 mm f/5.6	∞ - 1.6 m ∞ - 5.3 ft
Apo-Sironar-N 135 mm f/5.6	∞ - 2.7 m ∞ - 8.9 ft
Apo-Sironar-S 135 mm f/5.6	∞ - 2.7 m ∞ - 8.9 ft
Apo-Sironar-N 150 mm f/5.6	∞ - 3.0 m ∞ - 9.8 ft
Apo-Sironar-S 150 mm f/5.6	∞ - 3.0 m ∞ - 9.8 ft

Shutter data

Rodenstock lenses for large formats are available in the shutter versions shown below.

Further information on the individual types and on their use with Rodenstock lenses can be obtained from your local dealer or directly from Rodenstock Photo-Optics.

Shutter data

Shutter type	Size	Shutter speeds	Manual cocking shutter		Speed control		X-synchronised	Aperture setting unit *)	Click stop intervals	Screw thread	Lensboard opening	Lens board thickness	Accessory equipment required
			Self cocking shutter	mechanical	electronic								
Copal 0	0	B, T, 1/600 s...1 s	•	•	•	•				M 32.5x0.5 mm	34.8 mm	1.5 mm ... 4.0 mm	
Copal 1	1	B, T, 1/400 s...1 s	•	•	•	•				M 39x0.75 mm	41.8 mm	1.5 mm ... 3.0 mm	
Copal 3	3	B, T, 1/125 s...1 s	•	•	•	•				M 62x0.75 mm	65.3 mm	1.5 mm ... 5.0 mm	
Compur 0	0	B, 1/600 s...1 s	•	•	•	•		1/2		M 32.5x0.5 mm	34.8 mm	1.5 mm ... 4.0 mm	
Compur 1	1	B, 1/600 s...1 s	•	•	•	•		1/3		M 39x0.75 mm	41.8 mm	1.5 mm ... 3.0 mm	*) Optional use of
Compur 3	3	B, 1/200 s...1 s	•	•	•	•		1/3		M 62x0.75 mm	65.3 mm	1.5 mm ... 5.0 mm	Aperture setting unit
Prontor professional 01 S	0	B, 1/250 s...1 s	•	•	•	•		1/3		M 39x0.75 mm	41.8 mm	1.5 mm ... 3.0 mm	Central remote control
Prontor professional 1 S	1	B, 1/250 s...1 s	•	•	•	•		1/3		M 39x0.75 mm	41.8 mm	1.5 mm ... 3.0 mm	Central remote control
Prontor professional 3	3	B, 1/125 s...1 s	•	•	•	•		1/3		M 62x0.75 mm	65.3 mm	1.5 mm ... 4.0 mm	Central remote control
Horseman IS-0	0	B, 1/60 s...99 min.			•	•	•			M 62x0.75 mm	65.3 mm	1.5 mm ... 5.0 mm	ISS Control Kit
Horseman IS-1	1	B, 1/60 s...99 min.			•	•	•			M 62x0.75 mm	65.3 mm	1.5 mm ... 5.0 mm	ISS Control Kit
Horseman IS-3	3	B, 1/60 s...99 min.			•	•	•			M 62x0.75 mm	65.3 mm	1.5 mm ... 5.0 mm	ISS Control Kit
Copal Press 0	0	B, 1/125 s...1 s			•	•				M 32.5x0.5 mm	34.8 mm	1.5 mm ... 3.0 mm	
Copal Press 1	1	B, 1/125 s...1 s			•	•				M 39x0.75 mm	41.8 mm	1.5 mm ... 2.0 mm	