B&H PHOTO - VIDEO - PRO AUDIO

The ProfessionalPhoto SourceBook

Section4

LargeFormatLenses

LARGE FORMAT LENSES

INTRODUCTION

All large format camera lenses are designed to be used with all photographic films.

Image Circle

The size of the circular image that lenses project is called the image circle. It is large enough to surround, or cover, the frame of the final image on the film. If you take a lens intended for 35mm film and use it with a larger-sized film, its covering power will not be extensive enough. As a result, vignetting, which is the darkening of the image's corners, will occur. In a situation in which the covering power is extremely inadequate, a darkened circle appears around the image. Conversely, using a lens from a large-format camera on a smaller camera works, because there is more than enough coverage. (This is what happened when you visualize a 90mm lens covering both 4x5″ and 35mm film).

Photographers who use 35mm or medium-format lenses are not very concerned with covering power, because they almost always shoot with lenses designed specifically for their cameras, or at least the same camera format. As such, ample coverage is built-in. With cameras that call for larger sheet-film sizes, however, the situation is quite different. Because mounting large-format lenses on any large-format camera is relatively easy, the lenses might be required to cover 4x5″ film with one camera and 8x10″ film, which obviously is twice as big, with another. Consequently, photographers must know if a particular lens has enough covering power. Manufacturer specifications, which include a lens' angle of coverage and image circle and are based on the lens being set at f/16 or f/22 and focused at infinity, indicate whether or not the lens has enough covering power to actually project an image over a specific film size. (Also, see Lens Table for diagonal millimeter, for minimum image circle required without any movement.)

Angle of Coverage

This is a measure of the entire image circle of the lens. Do not confuse this with the angle of view. The angle of coverage simply refers to the image-forming cone of a lens. This tends to be similar for a number of different focal lengths that are made from the same basic lens design. Take, for example, the Schneider Super

Angulon series. Almost every lens in this group has an angle of coverage of either 100° or 105° and focal lengths ranging from 65mm to 210mm. All of these lenses are considered wide-angle, and each focal length is designed for a specific format. The 65mm lens is intended for use with 4x5″ film; the 210mm lens, with 8x10″ film. These lens-and-film format combinations provide wide angles of view of approximately 86° and 61°, respectively.

As mentioned earlier, the image circle refers to the area that produces sharp images. Once again, the size of the image circle is determined by the specific lens design. Furthermore, each film format has its own minimum requirement for coverage. For example, 4x5″ film needs 161mm, and, fittingly enough, 8x10″ calls for twice as much, or 323mm. But these are just minimal figures, required when the lens axis is aligned with the center of the film, as with 35mm and medium-format cameras.

Large-format cameras, however, are designed to move their lenses and film in relation to one another. This feature enables photographers to correct for the various apparent distortions which are produced when they take photographs from certain angles or perspectives. As a result, when the lens is moved off-axis from the center of the film plane, a larger circle is needed to cover the film. Consequently, a 150mm lens, which is considered a normal focal length for the 4x5″ format, has an image circle approximately between 210mm and 225mm. This is much larger than the minimum of 150mm high-modulation, or extended coverage. Lenses have even larger image circles, ranging from 150mm to 255mm for extreme camera movements.

Normal Lens

The term "normal lens" applies to all cameras and formats, and means that the lens is neither wide-angle nor telephoto, but has a "normal angle of view". The usual way of determining the normal focal length for a given format is to measure the diagonal of the negative.

The choice of focal length is largely a matter of personal preference. One photographer may prefer a 210mm lens for a portrait, another photographer may use a 300mm lens for the same kind of photograph.

The choice of focal length can be determined by the desired photographic effect. For instance, there is no law that says a wide-angle lens must be used for architecture only. Excellent still life photographs can be made with short focal length lenses to force perspective and give the illusion of extreme depth.

Longer focal length lenses require more bellows extension to focus than shorter focal length lenses. A bellows extension, the same focal length as the lens, is needed to focus at infinity (exception: telephoto formula lenses).

An excellent general purpose focal length for 4x5˝ view cameras is 210mm, because it will allow complete camera movements and can be used for most portrait, commercial and still life applications.

Basic guide to 4x5˝ view camera focal lengths:	
GENERAL PURPOSE:	180mm, 210mm, 240mm
PORTRAITURE:	240mm, 300mm
PRODUCT AND STILL LIFE:	210mm, 240mm, 300mm
ARCHITECTURAL INTERIORS, EXTERIORS AND WIDE ANGLE:	90mm, 75mm, 65mm
SHORT FOCAL LENGTH SEMI WIDE-ANGLE:	150mm, 135mm

Leaf Shutter of Large Format Lenses

Since large-format cameras use lenses of various makes, they generally do not come equipped with shutters of their own. Consequently, since the shutter is limited to the type of shutter which can be used inside of a lens, leaf shutters are generally used.

Types of Leaf Shutters

Mechanical Shutter

This type is generally used in large format cameras, and all parts are mechanically operated. They are usually operated in the following manner:

1. Set the shutter release.
2. Check the focus by pressing the focus lever to open the shutter leaves.
3. Close the shutter, and press the shutter release button.

Electronic Shutter

Electronic shutters operate in the same manner as mechanical shutters. However, with these, the shutter speed is controlled electronically, and for this reason, high precision shutter response is needed, especially for long exposures. They are consequently equipped with long shutter speeds of up to 32 seconds.

Press Shutter

This is a mechanically operated shutter. However, since there is no need to set the shutter release, it offers excellent operability. Unfortunately, these shutters do not have fast shutter speeds and are, therefore, not very effective for photographing fast moving subjects. Also, since the lens cannot be stopped down when the shutter is open, there is a problem with photographing commercial subjects, as it is impossible to check the depth of field. For these reasons, its main uses are in photographic equipment (CRT cameras, etc.) used in measuring instruments.

Leaf Shutter Categories By Size

In order to provide mounting adaptability and matching to the specific lens sizes, leaf shutters are made available in various sizes. The standards for size are determined by the maximum diameter of the shutter. The shutters presently available in large format lenses are listed below.

Shutter Data

Shutter Type	Size	Shutter Speeds	Manual Cocking Shutter	Self Cocking Shutter	Mechanical Speed Control	Electronic Speed Control	x-synced Speed Control	Screw Thread	Lensboard Open
Copal 0	0	B, T, 1/500 s...1s	√	-	√	-	√	32.5x0.5mm	34.8mm
Copal 1	1	B, T, 1/500 s...1s	√	-	√	-	√	39x0.75mm	41.8mm
Copal 3	3	B, T, 1/200 s...1s	√	-	√	-	√	62x0.75mm	65.3mm
Compur 0	0	B, 1/500 s...1s	√	-	√	-	√	32.5x0.5mm	34.8mm
Compur 1	1	B, 1/500 s...1s	√	-	√	-	√	39x0.75mm	41.8mm
Compur 3	3	B, 1/250 s...1s	√	-	√	-	√	62x0.75mm	65.3mm
Prontor Pro 01S	0	B, 1/250 s...1s	-	√	√	-	√	39x0.75mm	41.8mm
Prontor Pro 1S	1	B, 1/250 s...1s	-	√	√	-	√	39x0.75mm	41.8mm
Prontor Pro 3	3	B, 1/125 s...1s	-	√	√	-	√	62x0.75mm	65.3mm

Types of Shutter Retaining Rings

A shutter retaining ring is used on the back of the shutter in order to use large-format lenses with cameras of different brands, and boards are available for using large-format cameras with lenses of various types and brands. Consequently, the shutter retaining ring is needed to affix the lens to the lens board. The shutter retaining ring is selected on the basis of shutter size (#0, #1, etc.) and is affixed to the shutter when the lens is purchased. The ring is always attached to the shutter of the lens.

Retaining Ring

View cameras, press cameras and field cameras almost always feature metal or wood lens boards. These can be attached by the retaining ring provided on lenses.

Types of Lens Boards

Lens boards are available so that various types of lenses can be fitted to different makes of large-format cameras. These lens boards are available in different types, depending on the camera size, its functional capability, structure and lens shutter size.

Lenses Listed

In the following pages, we have lenses listed with the most common copal mechanical shutter supplied by the lens manufacturer. Lenses in Prontor Professional can be special ordered.

Comparative Table of Format Size and Focal Length

Format	Diagonal	Focal Length (mm)																		
35mm	43mm	18	21	22	25	28	32	37	43	45	52	60	65	73	85	90	105	120	135	150
6x6cm (2¼ x 2¼″)	80mm	33	39	41	46	54	58	67	75	80	95	110	120	135	150	165	190	220	240	270
6x7cm (2¼ x ¼″)	90mm	37	43	45	50	60	65	75	85	90	105	120	135	150	165	180	210	240	270	300
6x9cm (2¼ x 3¾″)	100mm	42	48	52	58	65	75	90	100	105	120	135	150	170	180	210	240	270	300	340
6x12cm (2¼ x 4¼″)	125mm	53	60	65	75	85	90	105	120	135	150	180	195	210	240	260	300	340	380	430
4x5″	150mm	65	75	80	90	105	120	135	150	165	180	210	240	260	300	320	370	420	470	530
5x7″	210mm	90	105	110	125	150	160	180	210	240	260	300	330	350	400	440	500	570	640	720
8x10″	300mm	130	150	160	180	210	240	270	300	330	360	420	480	520	600	640	740	850	940	1050

Example: A 180mm lens used on a 4x5″ format is the equivalent to a 52mm on a 35mm format

NIKON

SW SERIES in Copal Shutter

Features wide covering power and a wide image circle. Maximum apertures of f/4 and f/4.5 assure fast and pin-point focusing and bright images, corner to corner. Covering power can be extended to 105°/106° by stopping the lens down. SW series lenses deliver high contrast and resolution, reduced flare and excellent color rendition, due to Nikon Integrated Coating and strict control of aberrations. SW series lenses with a maximum aperture of f/8 are compact and well compensated for distortion.

Nikkor SW 65mm f/4 (1341)
Item # NI654SW **1,069.95**

Nikkor SW 75mm f/4.5 (1343)
Item # NI7545SW **1,219.95**

Nikkor SW 90mm f/4.5 (1345)
Item # NI9045SW **1,319.95**

Nikkor SW 90mm f/8 (1344)
Item # NI908SW **839.95**

Nikkor SW 90mm f/4.5 (1345)

Nikkor SW 120mm f/8 (1346)
Item # NI1208SW **1,119.95**

Nikkor SW 150mm f/8 (1351)
Item # NI1508SW **2,199.95**

SPECIFICATIONS OF SW SERIES LENSES

Lens	65mm	75mm	90mm	90mm	120mm	150mm
Aperture Range f	4-45	4.5-4.5	4.5-4.5	8-64	8-64	8-64
Shutter Type	Copal 0	Copal 0	Copal 0	Copal 0	Copal 0	Copal 1
Maximum Recommended Film Format (In.)	4x5	4x5	5x7	5x7	8x10	10x12
Angle of Coverage	105° (f/16)	106° (f/16)	105° (f/16)	105° (f/22)	105° (f/22)	106° (f/22)
Image Circle	170mm (f/16)	200mm (f/16)	235mm (f/16)	235mm (f/22)	213mm (f/22)	400mm (f/22)
Filter Size Ø	67mm	67mm	82mm	67mm	77mm	95mm

Subject to change without notice

W SERIES in Copal Shutter

Covering power of the W series Nikkors is an ample 70-73° when stopped down. Lens construction of six elements in four groups in the series gives these lenses an outstanding degree of freedom from distortion, field curvature and chromatic aberration. And Nikon Integrated Coating assures high contrast and overall faithful color rendition. The W series lenses are recommended for a variety of subjects, including landscapes, portraiture, architecture and table-top photography.

Nikkor W 105mm f/5.6 (1309)
Item # NI10556W **499.95**

Nikkor W 135mm f/5.6 (1312)
Item # NI13556W **579.95**

Nikkor W 150 f/5.6 (1314)
Item # NI15056W **549.95**

Nikkor W 180mm f/5.6 (1316)
Item # NI18056W **634.95**

Nikkor W 210mm f/5.6 (1318)
Item # NI21056W **674.95**

Nikkor W 240mm f/5.6 (1319)
Item # NI24056W **1,199.95**

Nikkor W 300mm f/5.6 (1320)
Item # NI30056W **1,559.95**

Nikkor W 360mm f/6.5 (1327)
Item # NI36065W **1,659.95**

SPECIFICATIONS OF W SERIES LENSES

Lens	105mm	135mm	150mm	180mm	210mm	240mm	300mm	360mm
Aperture Range f	5.-45	5.6-64	5.6-64	5.6-64	5.6-64	5.6-64	5.6-64	6.5-64
Shutter Type	Copal 0	Copal 0	Copal 0	Copal 1	Copal 1	Copal 3	Copal 3	Copal 3
Maximum Recommended Film Format (In.)	4x5	4x5	5x7	5x7	6½x8½	8x10	10x12	11x14
Angle of Coverage at f/22	73°	73°	70°	70°	70°	70°	70°	69°
Image Circle at f/22	155mm	200mm	210mm	253mm	295mm	336mm	420mm	494mm
Filter Size Ø	52mm	52mm	52mm	67mm	67mm	82mm	95mm	95mm

Subject to change without notice

T SERIES ED in Copal Shutter

Lenses in the T-series are telephoto-type lenses which do not require long-length camera bellows. To maximize correction of chromatic aberration inherent in long focal length lenses, Nikon's performance-proven ED (extra-low dispersion) glass was used for the first time for lenses for large-format cameras. Image distortion and curvature are also extremely minimized. Combined with Nikon Integrated Coating, the result is outstandingly sharp images, free from flare and ghosts. Lens magnification can be changed with replacement of the rear element.

Nikkor T 270mm f/6.3 ED (1352)
Item # NI27063EDT .**1,469.95**

Nikkor T 360mm f/8 ED (1353)
Item # NI3608EDT ...**1,899.95**

Nikkor T 500mm f/11 ED (1354)
Item # NI50011EDT .**1,969.95**

Nikkor T 600mm f/9 ED (1355)
Item # NI6009EDT ...**2,499.95**

Nikkor T 720mm f/16 ED (1357)
Item # NI72016EDT .**2,109.95**

Nikkor T 800mm f/12 ED (1356)
Item # NI80012EDT .**2,929.95**

Nikkor T 1200mm f/18 ED (1364)
Item # NI120018EDT...**3,099.95**

Nikkor T 800mm f/12 ED (1356)

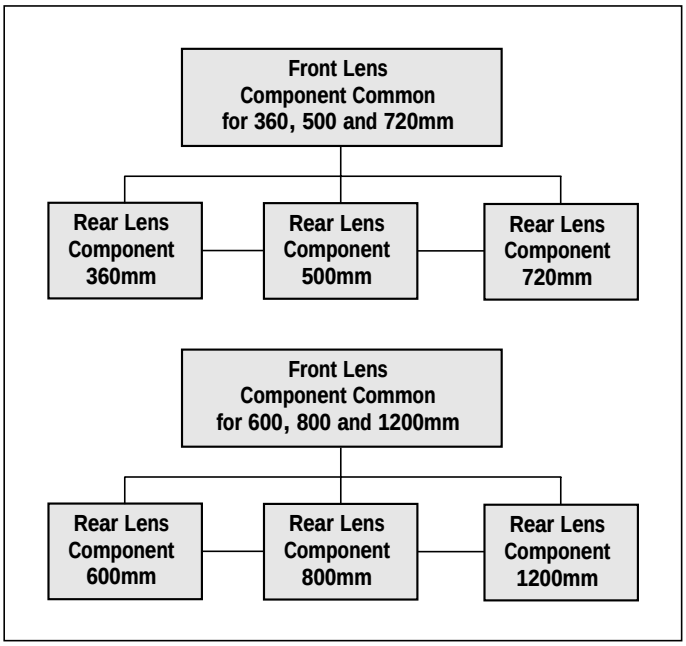
SPECIFICATIONS OF T SERIES LENSES

Lens	270mm	360mm	500mm	600mm	720mm	800mm	1200mm
Aperture Range f	6.3-64	8-64	11-64	9-64	16-64	12-64	18-64
Shutter Type	Copal 1	Copal 1	Copal 1	Copal 3	Copal 1	Copal 3	Copal 3
Maximum Recommended Film Format (In.)	4x5	5x7	5x7	8x10	5x7	8x10	8x10
Angle of Coverage	33°	33°	24°	29°	17°	22°	15°
Image Circle	160mm	210mm	210mm	310mm	210mm	310mm	310mm
Filter Size Ø	67mm	67mm	67mm	95mm	67mm	95mm	95mm

Subject to change without notice

T SERIES Rear Elements

Because the rear lens component is interchangeable between the 300mm, 500mm and 720mm; and between the 600mm, 800mm and 1200mm, existing lenses can be converted by just purchasing a rear lens unit and mounting it in place of existing rear lens, with superb cost savings. (See diagram.)



Rear Lens Unit 360mm T ED (1358)
Item # NIRLU360.....**489.95**

Rear Lens Unit 500mm T ED (1359)
Item # NIRLU500.....**569.95**

Rear Lens Unit 600mm T ED (1360)
Item # NIRLU600.....**639.95**

Rear Lens Unit 720mm T ED (1362)
Item # NIRLU720.....**709.95**

Rear Lens Unit 800mm T ED (1361)
Item # NIRLU800.....**739.95**

Rear Lens Unit 1200mm T ED (1363)
Item # NIRLU1200.....**949.95**

APO MACRO SERIES ED in Copal Shutter

The AM (Apo Macro) lenses are exclusively designed for macro photography and provide outstanding performance at 1:1 reproduction. ED (Extra-low Dispersion) glass reduces chromatic aberration at all settings, and completely symmetrical lens construction ensures that the lens is 100% free of distortion and lateral chromatic aberration at 1:1 magnification.

Nikkor AM 120mm f/5.6 ED (1325)
Item # NI12056EDAM..**1,079.95**

Nikkor AM 210mm f/5.6 ED (1326)
Item # NI21056EDAM..**2,299.95**

SPECIFICATIONS OF MACRO ED SERIES LENSES

Lens	120mm	210mm
Aperture Range f/	5.6-45	5.6-64
Shutter Type	Copal 0	Copal 1
Maximum Recommended Film Format (In.)	5x7	10x12
Angle of Coverage at f/22	55°	51°
Image Circle at f/22	250mm	400mm (1:1)
Filter Size Ø	52mm	67mm

Subject to change without notice

M SERIES in Copal Shutter

The M Series lenses are characterized by standard covering power and faithful reproduction of subtle variations in color and shading. They are versatile enough to provide consistent performance from close distance to infinity. Chromatic aberration is virtually eliminated over the entire visible portion of the spectrum, and other aberrations are corrected. Integrated coating is applied to each M Series lens to assure high resolution and contrast.

SPECIFICATIONS OF M SERIES LENSES

Lens	200mm	300mm	450mm
Aperture Range f/	8-64	9-128	9-128
Shutter Type	Copal 0	Copal 1	Copal 3
Maximum Recommended Film Format (In.)	5x7	8x10	10x12
Angle of Coverage at f/22	55°	57°	52°°
Image Circle at f/22	210mm	325mm	440mm
Filter Size Ø	52mm	52mm	67mm

Subject to change without notice

Nikkor M 200mm f/8 (1322)
Item # NI2008M.....**609.95**

Nikkor M 300mm f/9 (1321)
Item # NI3009M.....**689.95**

Nikkor M 450mm f/9 (1323)
Item # NI4509M.....**1,199.95**

Nikkor M 200mm f/8 (1322)

Nikkor M 450mm f/9 (1323)

Lens Caps

Slip-On Lens Cap 31.5mm (1337)
Replacement.
Item # NILC31.5.....**9.50**

Slip-On Lens Cap 42mm (1330)
Item # NILC42.....**7.50**

Slip-On Lens Cap 54mm (1331)
Replacement.
Item # NILC54.....**7.50**

Slip-On Lens Cap 60mm (1332)
Replacement.
Item # NILC60.....**8.95**

Screw-On Lens Cap 58mm (1339)
For rear lens unit. Replacement.
Item # NILC58RLU.....**24.95**

Slip-On Lens Cap 70mm (1333)
Replacement.
Item # NILC70.....**8.95**

Slip-On Lens Cap 80mm (1334)
Replacement.
Item # NILC80.....**9.95**

Slip-On Lens Cap 85mm (1335)
Replacement.
Item # NILC85.....**9.95**

Slip-On Lens Cap 100mm (1336)
Replacement.
Item # NILC100.....**14.50**

RODENSTOCK

APO AND GRANDAGON N *in Copal Shutter*

The Grandagon N, with its super wide angle of coverage, becomes useful when covering extensive interiors in cramped conditions, in architectural and panoramic photography. Distortion is reduced, the light all-off towards the edges is substantially eliminated and the design assures that high definition is accomplished. There are 6 elements in 4 groups on 6.8 lenses, and 8 elements in 4 groups on the 4.5 lenses.

APO Grandagon N 35mm f/4.5 (160300)
Item # RO3545AG.....**1429.95**

APO Grandagon N 45mm f/4.5 (160301)
Item # RO4545AG.....**1,169.95**

APO Grandagon N 55mm f/4.5 (160302)
Item # RO5545AG.....**1,269.95**

Grandagon N 65mm f/4.5 (160499)
Item # RO6545GN.....**1,199.00**

Grandagon N 75mm f/4.5 (160502)
Item # RO7545GN.....**1,295.00**

Grandagon N 75mm f/6.8 (160501)
Item # RO7568GN.....**849.00**

Grandagon N 90mm f/4.5 (160504)
Item # RO9045GN.....**1,539.00**

Grandagon N 90mm f/6.8 (160503)
Item # RO9068GN.....**919.00**

Grandagon N 115mm f/6.8 (160505)
Item # RO11568GN.....**1,595.00**

Grandagon N 155mm f/6.8 (160506)
Item # RO15568GN.....**3,299.00**

Grandagon N 200mm f/6.8 (160507)
Item # RO20068GN.....**4,499.00**

SPECIFICATIONS OF GRANDAGON N SERIES LENSES

Lens	35mm	45mm	55mm	65mm	75mm	75mm	90mm	90mm	115mm	155mm	200mm
Aperture Range f/	4.5-22	4.5-32	4.5-45	4.5-45	4.5-45	6.8-45	4.5-45	6.8-45	6.8-45	6.8-45	6.8-64
Shutter Type	Copal 0	Copal 0	Copal 0	Copal 0	Copal 0	Copal 0	Copal 1	Copal 0	Copal 1	Copal 1	Copal 3
Maximum Recommended Film Format (In.)	4x5″	4x5″	4x5″	4x5″	4x5″	4x5″	5x7″	4x5″	5x7″	8x10″	8x10″
Angle of Coverage at f/22:	120°	110°	110°	105°	105°	102°	105°	102°	104°	102°	102°
Image Circle at f/22:	125mm	131mm	163mm	170mm	195mm	187mm	236mm	221mm	291mm	382mm	495mm
Filter Size Ø	67mm	58mm	67mm	58mm	67mm	58mm	82mm	67mm	82mm	105mm	135mm

Subject to change without notice

APO SIRONAR N *in Copal Shutter*

The APO-Sironar-N, with 6 elements in 4 groups, is an all-around lens. Good for product shots, industrial subjects, landscape and city photography, it provides a longer focus lens with smaller formats. Monorail view cameras permit almost unlimited extension (especially with extension bellows). Therefore, optically problematic tele lenses are no longer needed; their short construction length only provides advantages for fixed cameras. The image circle diameter exceeds the diagonal of the recommended format by around 45%, allowing abundant shift and swing possibilities.

APO Sironar N 100mm f/5.6 (160601)
Item # RO10056ASN....**499.00**

APO Sironar N 135mm f/5.6 (160602)
Item # RO13556ASN....**539.00**

APO Sironar N 150mm f/5.6 (160603)
Item # RO15056ASN....**559.00**

APO Sironar N 180mm f/5.6 (160604)
Item # RO18056ASN....**739.00**

APO Sironar N 210mm f/5.6 (160605)
Item # RO21056ASN.....**829.00**

APO Sironar N 240mm f/5.6 (160606)
Item # RO24056ASN..**1,349.00**

APO Sironar N 300mm f/5.6 (160607)
Item # RO30056ASN..**1,849.00**

APO Sironar N 360mm f/6.8 (160608)
Item # RO36068ASN..**2,195.00**

APO Sironar N 480mm f/8.4 (160609)
Item # RO48084ASN..**3,164.50**

SPECIFICATIONS OF APO SIRONAR N LENSES

Lens	100mm	135mm	150mm	180mm	210mm	240mm	300mm	360mm	480mm
Aperture Range f/:	5.6-64	5.6-64	5.6-64	5.6-64	5.6-64	5.6-64	5.6-64	6.8-64	8.4-90
Shutter Type	Copal 0	Copal 0	Copal 0	Copal 1	Copal 1	Copal 3	Copal 3	Copal 3	Copal 3
Maximum Recommended Film Format (In.)	2¼x3¼″	4x5″	5x7″	5x7″	5x7″	8x10″	8x10″	8x10″	8x10″
Angle of Coverage at f/22:	72°	72°	72°	72°	72°	72°	72°	64°	56°
Image Circle at f/22:	151mm	200mm	214mm	262mm	301mm	350mm	425mm	435mm	500mm
Filter Size Ø	40.5mm	40.5mm	49mm	58mm	67mm	77mm	86mm	105mm	112mm

Subject to change without notice

All items are complete with all accessories as supplied by the manufacturer

APO SIRONAR S *in Copal Shutter*

The APO-Sironar-S, a universal lens with 6 elements in 4 groups, is constructed with ED (extra-low dispersion) glass, which has been modified to provide the highest image reproduction quality. Like the APO-Sironar-N, its applications are practically limitless. The angle of view has been increased to 75° to permit more shift, which permits applications that require large parallel shifts to correct the perspective optical design.

APO Sironar S 135mm f/5.6 (160701)
Item # RO13556ASS **699.00**

APO Sironar S 240mm f/5.6 (160705)

APO Sironar S 150mm f/5.6 (160702)
Item # RO15056ASS **749.00**

APO Sironar S 180mm f/5.6 (160703)
Item # RO18056ASS **879.00**

APO Sironar S 210mm f/5.6 (160704)
Item # RO21056ASS **989.00**

APO Sironar S 240mm f/5.6 (160705)
Item # RO24056ASS **1,729.00**

APO Sironar S 300mm f/5.6 (160706)
Item # RO30056ASS **2,389.00**

APO Sironar S 360mm f/6.8 (160707)
Item # RO36068ASS **3,094.50**

SPECIFICATIONS OF APO SIRONAR S LENSES

Lens	135mm	150mm	180mm	210mm	240mm	300mm	360mm
Aperture Range f/	5.6-64	5.6-64	5.6-64	5.6-64	5.6-64	5.6-64	6.8-64
Shutter Type	Copal 0	Copal 0	Copal 1	Copal 1	Copal 3	Copal 3	Copal 3
Maximum Recommended Film Format (In.)	4x5″	4x5″	5x7″	5x7″	5x7″	8x10″	8x10″
Angle of Coverage at f/22:	75°	75°	75°	75°	75°	75°	68°
Image Circle at f/22:	208mm	231mm	276mm	316mm	372mm	448mm	468mm
Filter Size Ø	49mm	49mm	62mm	72mm	86mm	100mm	112mm

Subject to change without notice

APO SIRONAR W *in Copal Shutter*

The APO Sironar-W, with 7 elements in 5 groups, has an 80° angle of view and can also be used as a wide-angle. Image reproduction has been improved, particularly at the edge with the ED (extra-low dispersion) glass material. Exceptionally low distortion is another feature particularly beneficent for the architectural or product photographer.

SPECIFICATIONS OF APO SIRONAR W LENSES

Lens	150mm	210mm	300mm
Aperture Range f/	5.6-45	5.6-64	5.6-64
Shutter Type	Copal 1	Copal 3	Copal 3
Maximum Recommended Film Format (In.)	5x7″	8x10″	8x10″
Angle of Coverage at f/22	80°	80°	80°
Image Circle at f/22	252mm	352mm	490mm
Filter Size Ø	70mm	100mm	127mm

Subject to change without notice

APO Sironar W 210mm f/5.6 (160811)

APO Sironar W 210mm f/5.6 (160811)
Item # RO21056ASW **1,799.00**

APO Sironar W 300mm f/5.6 (160812)
Item # RO30056ASW **3,499.00**

RODENSTOCK

APO MAKRO SIRONAR N *LENSES in Copal Shutter*

The image quality of lenses designed for long distances drops visibly at close range for scales of around 1:1. Compared with the performance of top lenses at medium to long distances, there are noticeable shortcomings from around 1:3 onwards. This is where the special Makro-Sironar-N with an optical design of 6 elements in 4 groups, fits in. The front and rear components are removable and interchangeable. In its normal configuration, the lens yields excellent definition at reproduction scales between about 1:3 and 1:1. With the elements interchanged, the optical system yields the same optimum definition in the range from 1:1 and 3:1. Memory and symbols on each side of the mount indicate the scale range for each configuration.

Makro Sironar
120mm f/5.6 (160425)
Item # RO12056AMS.....**1204.50**

APO Makro Sironar
180mm f/5.6 (160430)
Item # RO18056AMS.....**1,469.00**

SPECIFICATIONS OF APO MAKRO SIRONAR N LENSES

Lens	120	180mm
Aperture Range f/	5.6-64	5.6-64
Shutter Type	Copal 0	Copal 1
Maximum Recommended Film Format (In.)	4x5″	5x7″
Angle of Coverage at f/22 at 1:1	60°	—
Image Circle at f/22 at 1:1	277mm	415mm
Filter Size *(both elements)* Ø	49mm	67mm

Subject to change without notice

APO Makro Sironar 180mm f/5.6 (160430)

APO Makro Sironar 120mm f/5.6 (160425)

APO RONAR *in Copal Shutter*

The scope of these Classic Process, 4 elements in 4 group lenses, with their outstanding definition, goes far beyond processing and product shots. With an image circle of 48°, they are first class long focal telephoto lenses. These lenses can also be used for close-ups. Though ideally corrected for 1:1 reproduction, the Apo-Ronar lenses maintains their image quality, even at high reductions (distance range) or magnification. The apo-chromatic correction keeps even high contrast outlines free from color fringing.

Apo Ronar 240mm f/9 (160451)

Apo Ronar 360mm f/9 (160453)

Apo Ronar 150mm f/9 (160450)
Item # RO1509AR.....**669.00**

Apo Ronar 240mm f/9 (160451)
Item # RO2409AR....**1,129.95**

Apo Ronar 300mm f/9 (160452)
Item # RO3009AR....**1,231.95**

Apo Ronar 360mm f/9 (160453)
Item # RO3609AR....**1,499.00**

Apo Ronar 480mm f/9 (160454)
Item # RO4809AR....**2,236.50**

SPECIFICATIONS OF APO RONAR LENSES

Lens	150mm	240mm	300mm	360mm	480mm
Aperture Range f/	9-64	9-90	9-90	9-90	9-90
Shutter Type	Copal 0	Copal 1	Copal 1	Copal 3	Copal 3
Maximum Recommended Film Format (In.)	2½x2¾″	4x5″	5x7″	5x7″	8x10″
Angle of Coverage at f/22:	48°	48°	48°	48°	46°
Image Circle at f/22:	135mm	212mm	264mm	318mm	396mm
Filter Size Ø	40.5mm	49mm	49mm	58mm	67mm

Subject to change without notice

IMAGON SOFT FOCUS *in Copal Shutter*

High quality lenses yield sharp, crisp images. In portraiture, a softer shot is desired. The Imagon lenses do not produce the blurred images known from 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. Optical design: 2 elements in one group.

IMAGON LENSES ARE ALSO AVAILABLE IN BARREL FOR USE WITH ROLLEI, MAMIYA, PENTAX AND BRONICA TL CAMERAS

Imagon H 200mm f/5.8 (160480)
With 3 adjustable soft focus discs, 4x neutral density filter and lens shade.
Item # RO20058IH....**1,659.95**

Imagon H 250mm f/5.8 (160481)
With 3 adjustable soft focus discs, 4x neutral density filter and lens shade.
Item # RO25058IH....**1,729.95**

Imagon H 300mm f/6.8 (160482)
With 3 adjustable soft focus discs, 4x neutral density filter and lens shade.
Item # RO30068IH.....**1,696.95**

SPECIFICATIONS OF IMAGON SOFT FOCUS LENSES

Lens	200mm	250mm	300mm
Aperture Range with discs	5.8-11.5	5.8-11.5	6.8-11.5
Shutter Type	Copal 3	Copal 3	Copal 3
Maximum Recommended Film Format (In.)	2¼x2¾″	4x5″	5x7″
Image Circle at 11.5:	150mm	180mm	220mm
Filter Size Ø	55mm slip-on	55mm slip-on	55mm slip-on

Subject to change without notice

CENTER FILTERS *for Grandagon N*

Center Filter for Uniform Image Field Illumination

Center filters are neutral gray, concentric graduated filters which have high density at the center and are transparent at the rim. The course of the density is selected so that the light fall-off of the image circle will be compensated at f/16. As a result of the working aperture, you will have a uniform image field illumination. They require an exposure correction of 2 f-stops.
For critical shots, the geometric light fall-off toward the edges can be eliminated with the Center filters which are available for all Grandagon-N lenses.

58mm Center Filter (170001)
Item # ROCF58 ...**359.95**

67mm Center Filter (170002)
Item # ROCF67 .....**529.95**

For more center filters, see Heliopan on page 232.

67mm Center Filter 4x (170000)
For APO Grandagon.
Item # ROCF67AG.....**529.95**

82mmCenter Filter (170003)
Item # ROCF82 .....**799.00**

105mm Center Filter (170004)
Item # ROCF105 .....**1,039.00**

135mm Center Filter (170005)
Item # ROCF135 .....**1,269.00**

SCHNEIDER

SUPER ANGULON

Wide-angle lenses for interiors, small rooms or tall buildings. Multi- coated, 105°-100° angle of coverage features large image circle. Optical design on maximum f/5.6 lenses is 8 elements in 4 groups, and 6 elements in 4 groups on f/8 lenses.

Super Angulon
47mm f/5.6 (02037130)
Item # SC4756SAC.....**982.00**

Super Angulon
75mm f/5.6 (02013848)
Item # SC7556SAC.....**1,269.00**

Super Angulon
90mm f/8 (02010913)
Item # SC908SAC.....**949.00**

Super Angulon
165mm f/8 (02014116)
Item # SC1658SAC.....**3,234.00**

Super Angulon
65mm f/5.6 (02013844)
Item # SC6556SAC.....**1,199.00**

Super Angulon
90mm f/5.6 (02018921)
Item # SC9056SAC.....**1,409.00**

Super Angulon
120mm f/8 (02010907)
Item # SC1208SAC.....**1,386.00**

Super Angulon
210mm f/8 (02010371)
Item # SC2108SAC.....**5,195.00**

SPECIFICATIONS OF SUPER ANGULON LENSES

Lens	47mm	65mm	75mm	90mm	90mm	120mm	165mm	210mm
Aperture Range f/	5.6-32	5.6-45	5.6-45	5.6-45	8-45	8-64	8-64	8-90
Shutter Type	Copal 0	Copal 0	Copal 0	Copal 0	Copal 0	Copal 0	Copal 3	Copal 3
Maximum Recommended Film Format (In.)	2½x3½″	4x5″	4x5″	5x7″	5x7″	5x7″	10x12″	11x14″
Angle of Coverage at f/22:	105°	105°	105°	105°	100°	100°	100°	100°
Image Circle at f/22:	123mm	170mm	198mm	235mm	216mm	288mm	395mm	500mm
Filter Size Ø	52mm EW	67mm EW	67mm EW	82mm EW	67mm EW	82mm EW	110mm EW	127mm EW

Subject to change without notice

Please note: EW=Extra Wide

SUPER ANGULON XL

An architectural photographer's dream that offers flexibility with its minimum 110° angle of coverage, high resolution and contrast. Optical design: 8 elements in 4 groups.

Super Angulon XL
47mm f/5.6 (02025044)
Item # SC4756SAXLC.....**1,328.00**

Super Angulon XL
72mm f/5.6 (02025587)
Item # SC7256SAXLC.....**1,444.00**

Super Angulon XL 58mm f/5.6 (02016819)
Item # SC5856SAXLC.....**1,144.00**

Super Angulon XL 90mm f/5.6 (02016823)
Item # SC9056SAXLC.....**1,559.00**

SPECIFICATIONS OF SUPER ANGULON XL LENSES

Lens	47mm	58mm	72mm	90mm
Aperture Range f/	5.6-32	5.6-32	5.6-45	5.6-45
Shutter Type	Copal 0	Copal 0	Copal 0	Copal 0
Maximum Recommended Film Format (In.)	4x5″	4x5″	5x7″	5x7″
Angle of Coverage at f/22:	120°	110°	115°	110°
Image Circle at f/22:	166mm	166mm	226mm	259mm
Filter Size Ø	67mm EW	67mm EW	95mm EW	95mm EW

Subject to change without notice

SUPER SYMMAR HM LENSES

Designed for wide-angle, with 80° at f/22, optimized at infinity. Shorter than normal focal length lenses, with adequate covering power. Optical design: 8 elements in 6 groups.

Super Symmar-HM 120mm f/5.6 (01039771)
Item # SC12056SSHMC....**1,269.00**

Super Symmar-HM 150mm f/5.6 (01039520)
Item # SC15056SSHMC..**1,652.00**

Super Symmar-HM 210mm f/5.6 (01039522)
Item # SC21056SSHMC..**2,656.00**

SPECIFICATIONS OF SUPER SYMMAR HM LENSES

Lens	120mm	150mm	210mm
Aperture Range f/ with discs	5.6-64	5.6-64	5.6-64
Shutter Type	Copal 0	Copal 1	Copal 3
Maximum Recommended Film Format (In.)	4x5″	5x7″	8x10″
Angle of Coverage at f/22:	82°	80°	80°
Image Circle at f/22:	211mm	254mm	356mm
Filter Size Ø	67mm EW	77mm EW	100mm EW

Subject to change without notice

APO SYMMAR LENSES

A true apo-chromatic line of lenses, optimized for 1:10 to infinity reproduction. By use of special type of glass, a reduction of the secondary spectrum is achieved, leading to clear improvement in image quality. These lenses are for serious tabletop, portrait and landscape photographers. Optical design: 6 elements in 4 groups.

Apo -Symmar 100mm f/5.6 (01010187)
Item # SC10056ASC.....**624.00**

Apo-Symmar 120mm f/5.6 (01014490)
Item # SC12056ASC.....**652.00**

Apo-Symmar 135mm f/5.6 (01010199)
Item # SC13556ASC.....**669.00**

Apo-Symmar 150mm f/5.6 (01037880)
Item # SC15056ASC.....**669.00**

Apo-Symmar 180mm f/5.6 (01010210)
Item # SC18056ASC.....**866.00**

Apo-Symmar 210mm f/5.6 (01039835)
Item # SC21056ASC.....**949.00**

Apo-Symmar 240mm f/5.6 (01010222)
Item # SC24056ASC.....**1,559.00**

Apo-Symmar 300mm f/5.6 (01010231)
Item # SC30056ASC.....**2,069.00**

Apo-Symmar 360mm f/6.8 (01010238)
Item # SC36068ASC.....**2,299.00**

Apo-Symmar 480mm f/8.4 (01010738)
Item # SC48084ASC.....**2,889.00**

SPECIFICATIONS OF APO SYMMAR LENSES

Lens	100mm	120mm	135mm	150mm	180mm	210mm	240mm	300mm	360mm	480mm
Aperture Range f/ with discs	5.6-64	5.6-64	5.6-64	5.6-64	5.6-64	5.6-64	5.6-64	6.8-64	8.4-64	8.4-64
Shutter Type	Copal 0	Copal 0	Copal 0	Copal 0	Copal 0	Copal 0	Copal 3	Copal 3	Copal 3	Copal 3
Maximum Recommended Film Format (In.)	2½x3½″	4x5″	4x5″	4x5″	5x7″	5x7″	8x10″	8x10″	11x14	11x14
Angle of Coverage at f/22:	72°	72°	72°	72°	72°	72°	72°	72°	70°	56°
Image Circle at f/22:	145mm	179mm	195mm	220mm	263mm	305mm	352mm	425mm	491mm	500mm
Filter Size Ø	40.5mm	49mm	49mm	58mm	58mm	72mm	77mm	105mm	112mm	105mm

Subject to change without notice

SCHNEIDER

G CLARON LENSES

For tabletop or macro photography. They offer apo-chromatic correction and flat field design. Optical design: 6 elements in 4 groups.

G Claron 150mm f/9 (34039011)
Item # SC1509GCC.....**519.00**

G Claron 210mm f/9 (34010403)
Item # SC2109GCC.....**711.00**

G Claron 240mm f/9 (34037941)
Item # SC2409GCC.....**764.00**

G Claron 270mm f/9 (34039067)
Item # SC2709GCC.....**954.00**

G Claron 305mm f/9 (34037940)
Item # SC3059GCC.....**954.00**

G Claron 355mm f/9 (34039006)
Item # SC3559GCC **1,499.00**

SPECIFICATIONS OF G CLARON LENSES						
Lens	**150mm**	**210mm**	**240mm**	**270mm**	**305mm**	**355mm**
Aperture Range f/	9-64	9-64	9-64	9-64	9-64	9-64
Shutter Type	Copal 0	Copal 1	Copal 1	Copal 1	Copal 1	Copal 3
Maximum Recommended Film Format (In.)	4x5″	5x7″	5x7″	8x10″	8x10″	11x14″
Angle of Coverage at f/22:	64°	64°	64°	64°	64°	64°
Image Circle at f/22:	189mm	260mm	298mm	335mm	381mm	444mm
Filter Size ø	35.5mm	49mm	52mm	58mm	67mm	77mm
SPECIFICATIONS OF G CLARON LENSES AT 1:1						
Film Format (In.)	8x10″	11x14″	14x17″	16x20″	16x20″	20x24″
Image Circle at f/22:	385mm	520mm	598mm	669mm	763mm	887mm

Subject to change without notice

HELIOPAN CENTER FILTERS

*To order, insert filter diameter (***FILTER SIZE** *in chart below) after the item number of filter desired.*

GRADUATED NEUTRAL DENSITY CENTER FILTER SPECIFICATIONS					
FILTER	**FRONT ACCESSORY SIZE**	**INCREASE MAXIMUM F-STOP**	**MFG #**	**ITEM #**	**PRICE**
49mm ND Center Filter 3x	67mm	1 1/2	704951	HECF349	164.95
52mm ND Center Filter 3x	67mm	1 1/2	705251	HECF352	164.95
58mm ND Center Filter 3x	77mm	1 1/2	705251	HECF358	249.95
67mm ND Center Filter 3x	86mm	1 1/2	706751	HECF367	252.95
77mm ND Center Filter 3x	105mm	1 1/2	707751	HECF377	319.95
82mm ND Center Filter 3x	105mm	1 1/2	708251	HECF382	319.95
95mm ND Center Filter 3x	105mm	1 1/2	709551	HECF395	367.95
49mm ND Center Filter 8x	67mm	3	704952	HECF849	164.95
52mm ND Center Filter 8x	67mm	3	705252	HHECF852	164.95
67mm ND Center Filter 8x	86mm	3	706752	HECF867	252.95
77mm ND Center Filter 8x	105mm	3	707752	HECF877	319.95
95mm ND Center Filter 8x	105mm	3	709552	HECF895	367.95

Subject to change without notice

SUPER SYMMAR HM LENSES

Designed for wide-angle, with 80° at f/22, optimized at infinity. Shorter than normal focal length lenses, with adequate covering power. Optical design: 8 elements in 6 groups.

Super Symmar-HM 120mm f/5.6 (01039771)
Item # SC12056SSHMC.....**1,269.00**

Super Symmar-HM 150mm f/5.6 (01039520)
Item # SC15056SSHMC.....**1,652.00**

Super Symmar-HM 210mm f/5.6 (01039522)
Item # SC21056SSHMC.....**2,656.00**

SPECIFICATIONS OF SUPER SYMMAR HM LENSES

Lens	120mm	180mm	210mm
Aperture Range f/	5.6-64	5.6-64	5.6-64
Shutter Type	Copal 0	Copal 1	Copal 3
Maximum Recommended Film Format (in.)	4x5″	5x7″	8x10″
Angle of Coverage at f/22	82°	80°	80°
Image Circle at f/22	211mm	254mm	356mm
Filter Size Ø	67mm EW	77mm EW	100mm EW

Subject to change without notice

TELE-ARTON and APO-TELE XENAR HM LENSES

For limited bellows draw, Apo-Tele Xenar offers the finest optical quality 5-element air spaced design, with a minimum focus of 6½ feet.

Tele Arton 250mm f/5.6 (05014136)
Item # SC25056TA.....**1,386.00**

APO Tele Xenar HM 400mm f/5.6 (05010541)
Item # SC40056ATXHM.....**4,510.00**

APO Tele Xenar HM 800mm f/12 (05010543)
Item # SC80012ATXHM.....**7,590.00**

SPECIFICATIONS OF TELE-ARTON and APO-TELE XENAR HM LENSES

Lens	250mm	400mm	800mm
Aperture Range f/	9-90	9-90	11-128
Shutter Type	Copal 1	Copal 3	Copal 3
Maximum Recommended Film Format (In.)	4x5″	5x7″	11x14″
Angle of Coverage at f/22	35°	35°	35°
Image Circle at f/22	158mm	250mm	500mm
Filter Size Ø	67mm	100mm	135mm

Subject to change without notice

CENTER FILTERS FOR SUPER ANGULON LENSES

Center filters are neutral gray, concentric graduated filters which have high density at the center and are transparent at the rim. The course of the density is selected so that the light fall-off of the image circle will be compensated at f/16. As a result of the working aperture, you will have a uniform image field illumination. The Center filter requires an exposure correction of 2 f-stops.
For critical shots, the geometric light fall-off toward the edges can be eliminated with the Center filters which are available for all Super Angulon lenses. Additional filters can be screwed on in front of the center filter for greater effect.

49mm Center Filter (08039286)
For 47mm f/5.6.
(Size 2, old)
Item # SCCF47SA49.....**281.95**

52mm Center Filter (08016190)
For 47mm f/5.6. (Size 2)
Item # SCCF47SA52.....**281.95**

67mm Center Filter (08010598)
For 65mm f/5.6 and 75mm f/5.6. (Size 3)
Item # SCCF65SA.....**364.95**

67mm Center Filter (08010590)
For 58mm f/5.6 XL and 90mm f/8. (Size 3B)
Item # SCCF58SAXL.....**364.95**

67mm Center Filter (08025637)
For 47mm f/5.6 XL.
(Size 3C)
Item # SCCF47SAXL.....**364.95**

82mm Center Filter (08010599)
For 90mm f/5.6 and 120mm f/8.
(Size 4)
Item # SCCF90SA.....**474.95**

95mm Center Filter (08010591)
For 90mm f/5.6 XL. (Size 4A)
Item # SCCF90SAXL.....**499.95**

95mm Center Filter (08025638)
For 72mm f/5.6 XL. (Size 4B)
Item # SCCF72SAXL.....**499.95**

110mm Center Filter (08010592)
For 165mm f/8.
(Size 5)
Item # SCCF165SA.....**1,079.95**

127mm Center Filter (08010593)
For 210mm f/8.
(Size 6)
Item # SCCF210SA.....**1,139.95**

WISNER

CONVERTIBLE PLASMAT

The Wisner Plasmat is a convertible lens system consisting of six single lens cells manufactured by Schneider Corporation exclusively to Wisner's requirements. These six single cells may be used singly, or they may be combined to form up to nineteen different focal lengths, from 250mm to 600mm. Convertible Plasmat lenses are duplicates of lenses manufactured by Carl Zeiss and Bausch and Lomb who produced the famous Protar lens, and they offer the same flexibility convenience and economy as the original Protar sets.

A yellow #15 filter is required when using black and white film. With color film, the zero power corrector is required to correct distortions, coma and lateral color (color fringing at the edges).

Available with a non-cancelable 50% deposit only.
Allow 4-6 weeks for delivery

Plasmat 4x5 Set (5 Cells)
Consists of 2-250, 350, 400, 450, Copal #1 shutter marked in mm, and mahogany cell box engraved with focal length and f-stop table. 58mm filter size.
Item # WIPS45.....**3,239.00**

Plasmat 5x7 Set (5 Cells)
Consists of 250, 350, 400, 450, 500, Copal #1 shutter marked in mm, and mahogany cell box engraved with focal length and f-stop table. 58mm filter size.
Item # WIPS57.....**3,636.95**

Plasmat 8x10 Set (4 cells)
Consists of 350, 400, 450, 500, Copal #3 shutter marked in mm, and mahogany cell box engraved with focal length and f-stop table. 72mm filter size.
Item # WIPS810.....**4,106.95**

Plasmat Master Set (6 Cells)
Consists of 250, 350, 400, 450, 500, 600, Copal #3 shutter marked in mm, and mahogany cell box engraved with focal length and f-stop table. 72mm filter size.
Item # WIPMS.....**4,809.95**

Zero Power Corrector for Plasmat 4x5 set
Item # WIZPCP45.....**649.95**

Zero Power Corrector for Plasmat 5x7 set
Item # WIZPCP57.....**649.95**

Zero Power Corrector for Plasmat 8x10 set
Item # WIZPCP810.....**649.95**

Zero Power Corrector for Plasmat Master set.
Item # WIZPCPM.....**649.95**

Yellow Filter #15
For 4x5 and 5x7.
Item # WI15P45.....**84.95**

Yellow Filter #15
For 8x10 and Master Set.
Item # WI15P810.....**84.95**

SPECIFICATIONS OF PLASMAT LENSES

To Obtain Focal Length:	152mm	182mm	197mm	212mm	212mm	227mm	227mm	242mm
Use Front Plasmat	250	250	250	250	350	250	350	350
Use Rear Plasmat	250	350	400	450	350	500	400	450
Maximum Aperture f/	9.0	10.8	11.7	12.6	9.0	13.5	9.6	10.3
Angle of Coverage	64°	64°	64°	64°	64°	64°	64°	64°
Image Circle at f/22	215mm	258mm	280mm	301mm	301mm	323mm	323mm	344mm

To Obtain Focal Length:	242mm	250mm	258mm	258mm	273mm	273mm	288mm	288mm
Use Front Plasmat	400	—	350	400	400	450	350	450
Use Rear Plasmat	400	250	500	450	500	450	600	500
Maximum Aperture f/	9.0	13.0	10.9	9.6	10.1	9.0	12.2	9.5
Angle of Coverage	64°	60˝	64˝	64˝	64°	64°	64°	64°
Image Circle at f/22	344mm	200mm	366mm	366mm	387mm	387mm	409mm	409mm

To Obtain Focal Length:	303mm	303mm	318mm	333mm	350mm	364mm	400mm	450mm	500mm	600mm
Use Front Plasmat	400	500	450	500	—	600	—	—	—	—
Use Rear Plasmat	600	500	600	600	350	600	400	450	500	600
Maximum Aperture f/	11.3	9.0	10.5	9.9	13.0	9.0	13.0	13.0	13.0	13.0
Angle of Coverage	64°	64°	64°	64°	60°	64°	60°	60°	60°	60°
Image Circle at f/22	430mm	430mm	452mm	473mm	280mm	516mm	320mm	360mm	400mm	480mm

Subject to change without notice