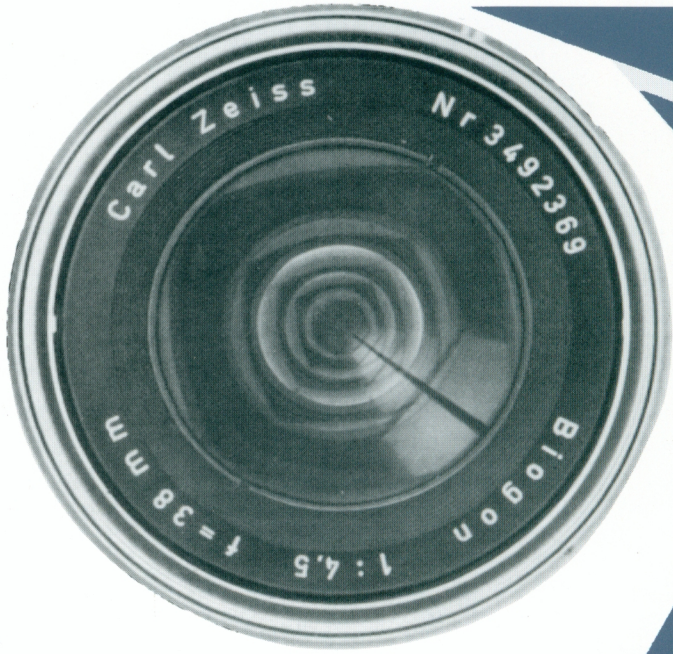
CARL ZEISS

ZEISS Objectives



PHOTOGRAPHY – Artistic? Professional? Fun?

You have the choice! Photography is the one medium which has an unrestricted application. The artist and professional photographer find it a versatile and satisfying means of expression, and even the uninitiated can achieve excellent results. It is the most accurate form of documentation and the most powerful means of bringing back those cherished moments of pleasure and excitement.

Photos are a universal language. Daily, they are transmitted by mail or wire from one part of our globe to another, and they are meaningful to anyone anywhere – connecting man to man, and nation to nation.

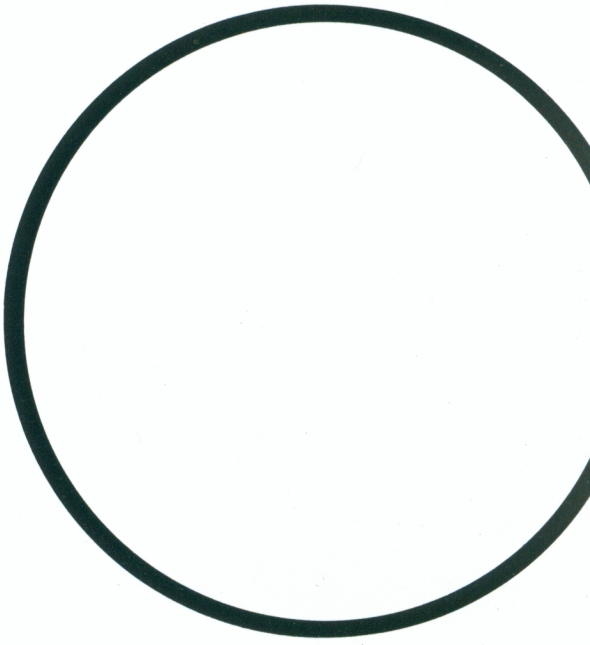
Photography is more than a hobby. The unlimited possibilities of photographic composition lead continually to new ideas and new perspectives, and their successful realization depends largely on the quality of the lens.

Actors Ingrid Stenn and Christian Wolf
Photograph taken by Harry Dittner

The Key to Good Pictures

An indispensable prerequisite for good pictures is an efficient lens.

A good photographic lens has to meet the following basic requirements:
crisp sharpness, which means that the lens has to have high resolving power and good contrast, uniform illumination of the entire image field right into the corners.
Furthermore it has to be free from distortion, an important detail for architectural photographs.
It is important that these characteristics should be well balanced without emphasis on one or the other correction. This is the only way to obtain maximum performance of a truly universal lens.

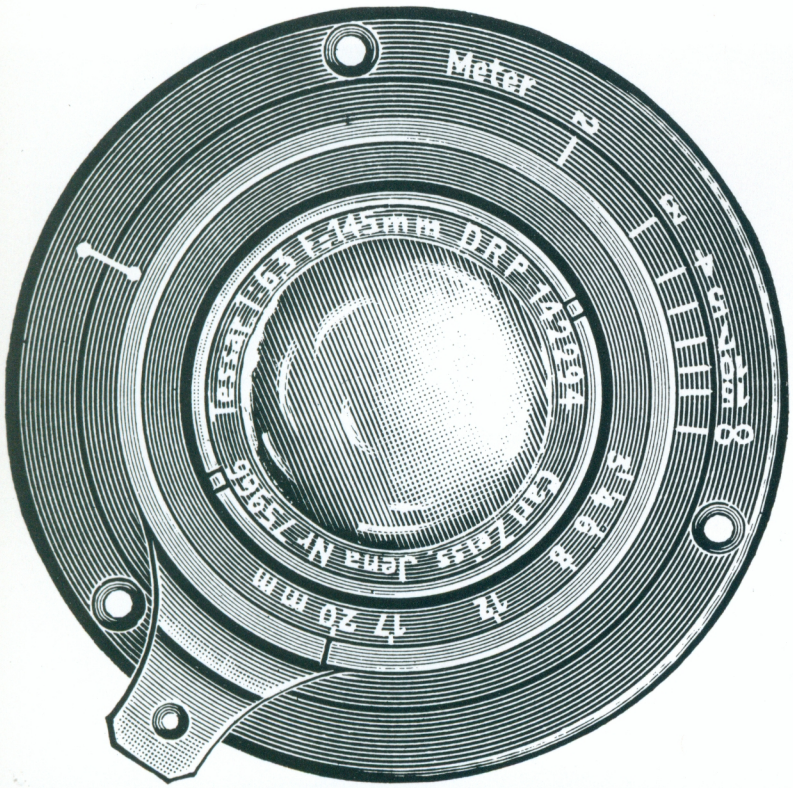


However, these outstanding characteristics do not always satisfy the demands of an exacting photographer who needs special lenses for individual requirements such as:
A rapid lens to take photographs in poor light,
A long focal length lens for vivid portraits,
A wide-angle lens for unusual perspectives or
A telephoto lens for fine details.

A wide range of photographic lenses rendering excellent performance is the reliable means for artistic composition and outstanding photography.

Advertising photograph taken by Franz Lazi Jnr. (GDL)

Why Choose a ZEISS Lens?



The selection of a lens involves many of the considerations normally given to the selection of a quality item. The assurance of quality is directly related to the reputation of the maker. Good reputations are only achieved by consistently good results.

ZEISS lenses have been famous for their outstanding quality since the turn of the century. They are the result of the creative ideas of its scientists, the high precision of workmanship, experience gained over the years, and exacting quality control of all optical and mechanical parts.

ZEISS has a number of research departments engaged in research work in the various fields of technical optics, ranging from the microscopic objective with a focal length of under 2 mm. and a numerical aperture which corresponds to nearly f/0.5, to lenses for aero-topography with an extremely high correction of distortion, and, last but not least, astronomical telescopes with focal lengths of 20 m. (60 feet). At ZEISS, knowledge and experience gained in the various specialized fields give impetus to the improvement and further development of optics. High precision measuring instruments, manufactured in the scientific instruments division serve in carrying out the exacting quality control tests to which each individual lens is subjected before leaving the plant.

Photographs of Children – yesterday (August Sander) and today (laenderpress)

TESSAR

Perhaps the best-known lens in photographic optics is the ZEISS TESSAR. This lens was created by Dr. P. Rudolph in 1902. The exceptional image quality of this four-element lens was immediately recognized. Its reputation has continued to grow as technological developments in lens computation and progress in melting new optical glasses have been utilized to bring continued improvement to this fine product. Improved manufacturing methods and refined testing procedures have gone hand in hand with this development.

The outstanding performance of the TESSAR lenses is shown in pictures of keen definition, high brilliance, perfectly even illumination over the entire image field, and excellent correction of distortion. As with all ZEISS lenses, the TESSAR is highly color corrected. In fact, the introduction of color film did not necessitate a recomputation of this lens for the elimination of chromatic aberration.

The TESSAR is available in a wide range of focal lengths suitable for the various formats from the smallest miniature cameras to the large size cameras. It is a universal lens of great versatility, and is used for landscapes, architectural pictures, portraits, and close-ups. It is a favorite of the news photographer, and is also suitable for enlarging and reproduction work.

The Convertible TESSAR

The convertible TESSAR is a special design which permits to decrease or increase the focal length by replacing the front element with the corresponding PRO-TESSAR component lens. In this convertible lens system the iris diaphragm and shutter leaves remain in the optically correct plane and are protected at all times by surrounding lens elements. Highly corrected photographic objectives with focal lengths ranging from 35 mm. to 115 mm. as well as a special lens for reproduction scale 1:1 are obtained by substituting PRO-TESSAR component lenses for the front element.

Community of Drackenstein (Württemberg)
Photograph taken by Peter Keetman (GDL)

SONNAR

The SONNAR f/1.5 and f/2, 50 mm. focal length lenses were designed over 30 years ago. These lenses, with their high speed and unexcelled optical performance, contributed decisively to the rise of 35 mm. photography. The short overall length and short back focal length of the SONNAR lenses were of special importance for the 35 mm. rangefinder camera newly developed at that time.

Within a short period, a series of new SONNAR lenses was produced. These proved the excellent qualification of this lens formula for longer focal lengths and larger formats, and also for short focal lengths, such as the P-SONNAR lenses, with increased speed for 8 mm. projectors.

Additions and improvements have been made to the SONNAR family of lenses. High speed, sharp definition, brilliance and even illumination over the entire image field are the main characteristics of these lenses.
As special lenses with long focal lengths, they are highly valued by professional and amateur photographers, particularly for portraits and telephoto pictures, for press, sports, stage, and technical photography.

Stage photograph O. E. Hasse and Peter Mosbacher
Photograph taken by Winfried Zellmann

PLANAR

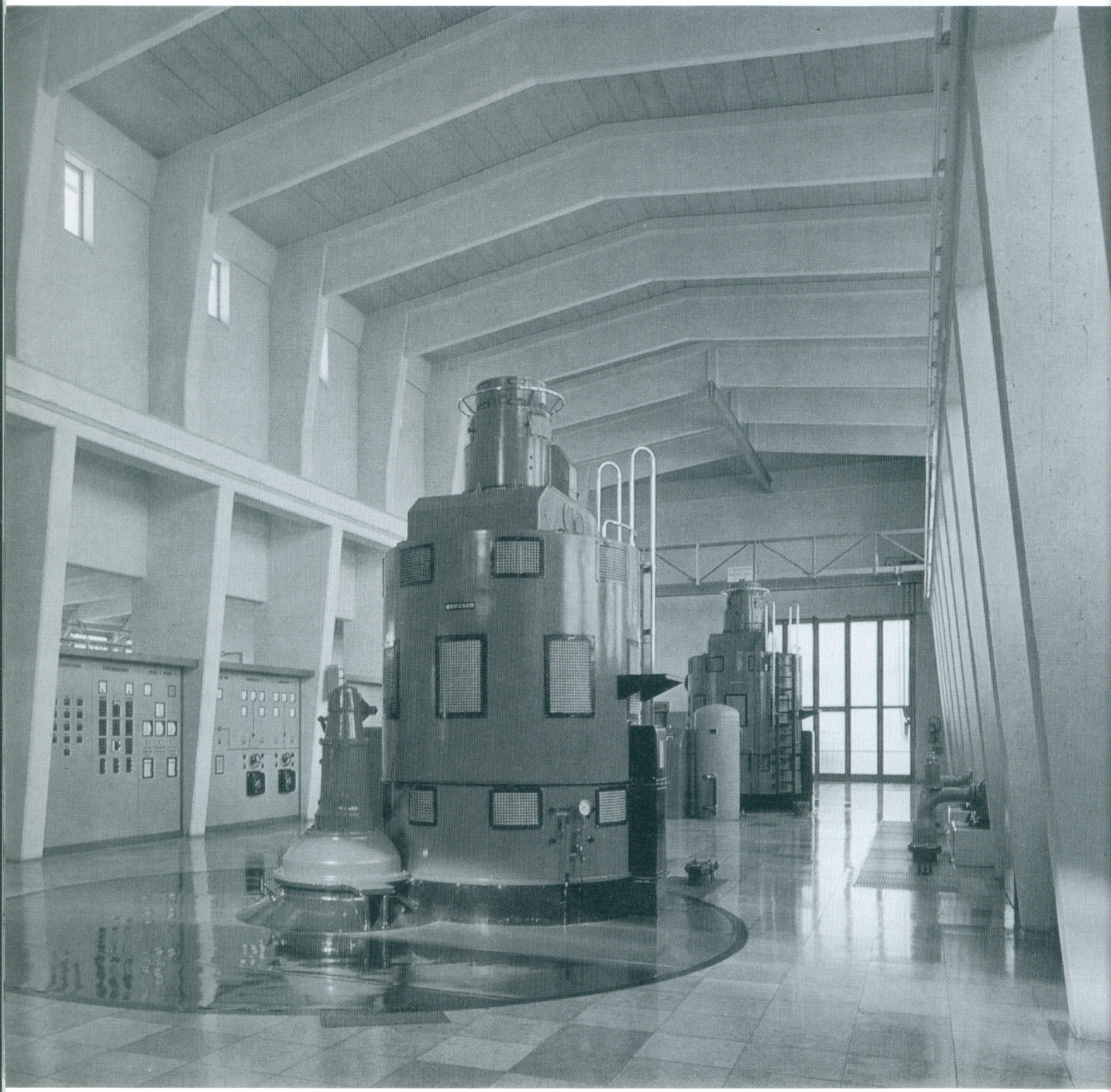
In 1896, Dr. P. Rudolph of ZEISS, designed the PLANAR lens. This represented a turning point in the development of photographic objectives. Here, for the first time, was a lens with excellent correction for spherical aberration at a relatively large lens aperture, at the same time producing outstanding flatness of the image field with excellent possibilities for the correction of chromatic aberration.

The classic form of the PLANAR consists of two strongly curved meniscus-shaped divergent groups of lenses enclosed by two convergent lens groups. Each half of the objective has the characteristics of a Gauss telescopic objective. Consequently, this type of lens, which has been widely adopted through the years by many other optical manufacturers, is frequently referred to as Gauss-type.

In the twenties, high speed lenses of this type were developed by the ZEISS factory. These were given the name of BIOTAR. Largest apertures were f/2 and f/1.4 for 35 mm. and movie cameras. An f/0.85 was also developed for fluoroscopic screen photography.
Today new PLANAR lenses of apertures f/1.4, f/2, f/2.8 and f/3.5 are available. These incorporate important improvements to make the modern PLANAR an outstanding performer.

The PLANAR produces excellent and even sharpness over the entire image field and is most suitable as a universal lens under full utilization of its largest aperture. This holds particularly true for "custom-made" lens designs in high-grade, large-size cameras and also in mirror reflex cameras, which require a relatively long back focal length.

Monument Valley (U.S.A.)
Photograph taken by Andre de Dienes



DISTAGON

The development of the DISTAGON lens provides a good example of the progressive optical engineering carried out at ZEISS. A problem arose when an attempt was made to use conventional wide-angle lenses on a single-lens reflex camera. The short focal length brought the rear element of the lens too close to the film to permit the mirror to swing. The DISTAGON lens developed by ZEISS overcomes this problem by using a design whereby the back focal length (distance from the vertex of the rear lens to the focal plane) is longer than the focal length of the lens.

Lens designs of 7, 8, and even 9 elements have been produced to obtain the extraordinary speed of f/2 or an extreme angle of view of 75° and 80° with high speed.

Despite its unusual technical features such as high speed, wide angle of view, and long back focal length, the DISTAGON achieves excellent optical performance coupled with remarkably good correction of all image errors. Indicative of the success of this design is the excellent sharpness maintained at full aperture and the fact that there is no shift of the image plane with various diaphragm openings. Once the camera is focused, the proper focus will be maintained regardless of change in f stop.

Engine Room. Photograph by Dr. Hans Baerend

BIOGON

The BIOGON f/2.8 of 35 mm. focal length, was designed in 1932 and represents a further development of the SONNAR lens. The BIOGON provided a high-speed wide-angle lens for 35 mm. cameras. It consisted of four lens components containing a total of 6 lens elements. In 1952 it was replaced by a 7 element lens which further improved the unusually even illumination of the previous design and also achieved a notable reduction of distortion errors.

The name BIOGON since then has become synonymous with wide-angle lenses distinguished by high speed and exceptionally even image field illumination. These qualities apply also to the BIOGON f/4.5. This lens consists of 5 components containing a total of 8 lens elements. It has an angle of view of more than 90°.

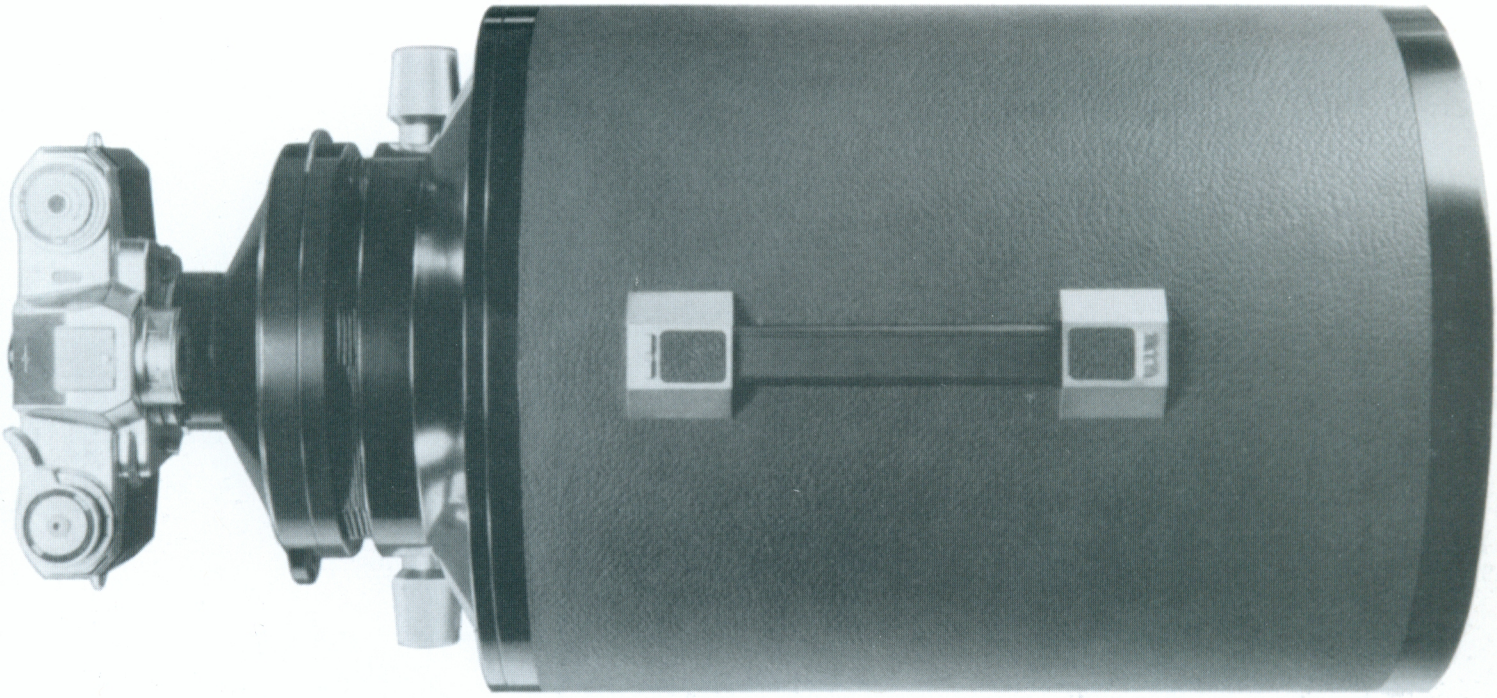
Considering that the focal length of the BIOGON is only half the size of the diagonal of the covered picture field, it is amazing that, even at full aperture, extreme definition and brilliance is retained over the entire image field without vignetting or noticeable distortion.

Even under average lighting conditions it is possible to take handheld pictures with the BIOGON at fast shutter speed either on black-and-white or color film. Owing to the great depth of field of the BIOGON, it is often possible to use a fixed focus setting. It is especially well suited for architectural and model pictures, photographs of small or large machinery, interiors, and the recording of technical processes where space limitations do not permit larger camera distance.

Wieskirche
Photograph taken by Peter Keetman (GDL)

View of Salzburg
Photograph taken by Paul Damm (GDL)

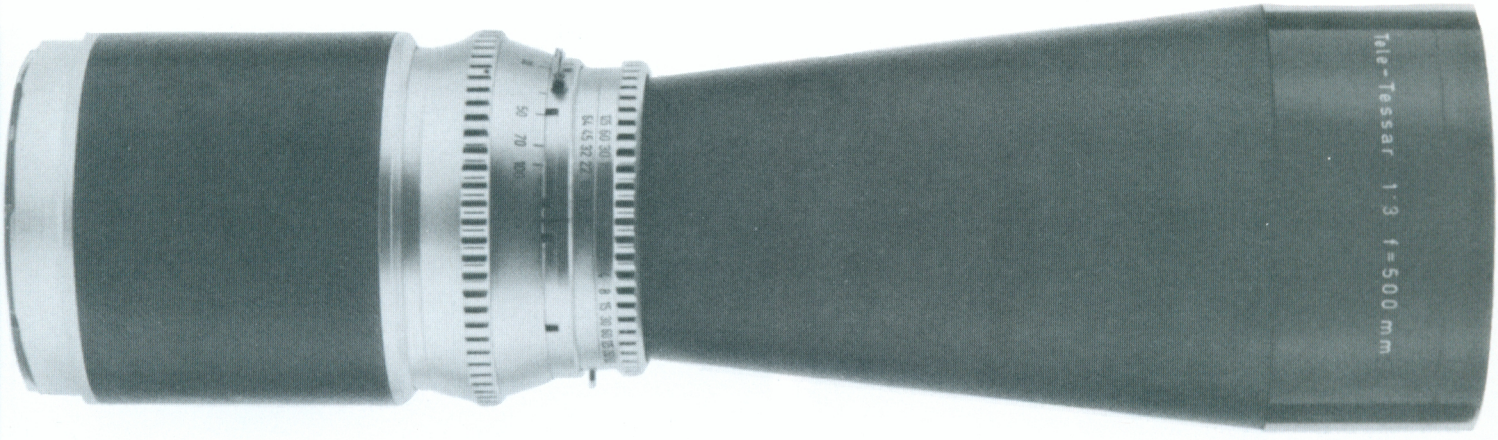
MIROTAR



The MIROTAR is a fast mirror-type telephoto lens of extremely long focal length. Conventional long focal length telephoto lenses which do not embody mirrors show considerable chromatic aberration at apertures larger than f/8. In the MIROTAR, however, the images rendered by the mirrors are completely free from chromatic aberration.
The additional lens elements incorporated in the mirror lens of the MIROTAR for correction of other lens errors are in themselves also corrected for chromatic aberration; hence, there is, throughout the entire photographic spectrum, no chromatic deviation in focusing. This holds true even for photography with infra-red light, so that it is unnecessary to change the focus once it has been set visually.
The basic design of the MIROTAR is similar in many ways to one of the designs frequently used in astronomical telescopes.
It consists of a collecting main mirror with a central opening and a diverging secondary mirror, supplemented by two sets of two lens elements, one set in front and one behind the mirrors.
The additional lens elements reduce the image errors caused by the mirrors to an absolute minimum.
Due to the fact that the path of the light rays is folded i. e. reversed twice by the mirrors, the overall length is much shorter than for a conventional telephoto lens of the same focal length.
The lens is always used at its largest relative aperture as an iris diaphragm cannot be used in a mirror lens system. Exposure is controlled by shutter speed or by the built-in neutral density filters.
When focusing, the MIROTAR remains stationary and the camera is moved. The focusing range is much greater than on other lenses of extremely long focal length and close-up pictures at a distance of a few meters are possible.
Image quality of the MIROTAR is excellent over the entire image field. This has been achieved not only through excellent design but also by maintaining extremely fine tolerances during the manufacture of the mirrors, the lenses, and the mounting parts.
Distant objects are reproduced at greatly magnified scale with the finest detail and excellent sharpness. It is therefore possible to considerably enlarge pictures taken with the MIROTAR.
The high speed of the MIROTAR greatly extends the possible applications of telephoto photography. Press and wildlife photography can be carried out even under unfavourable lighting conditions.

Taken from the same standpoint
(left-hand side) with Standard Lens PLANAR f/2, 50 mm. and
(right-hand side) with MIROTAR f/4.5, 500 mm.
Photographs taken by Ruth Sorber

TELE-TESSAR



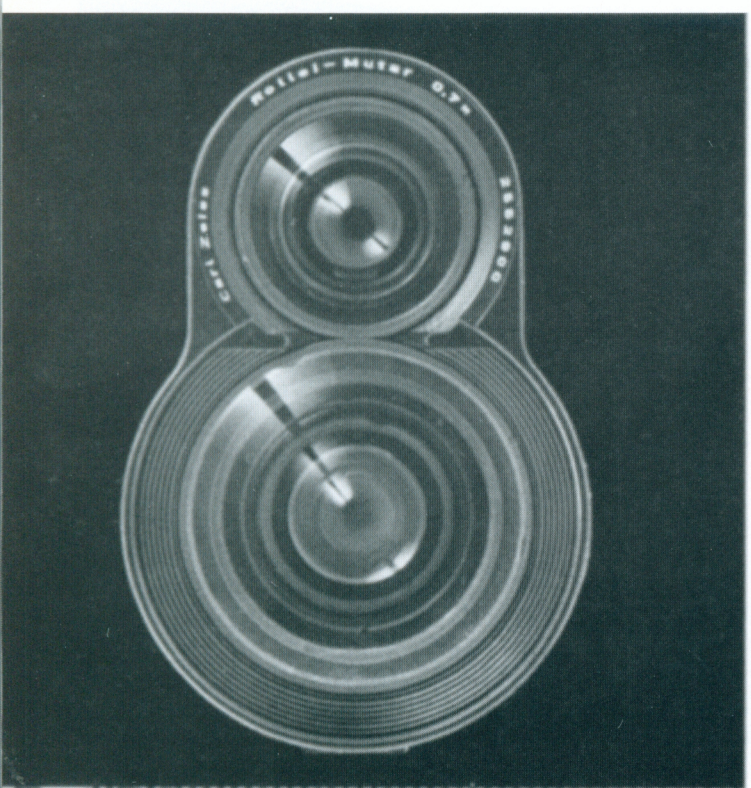
The TELE-TESSAR f/8, 500 mm. is a telephoto lens designed for 6×6 cm. (2¼ × 2¼ in.) cameras. The focal length is six times as long as the diagonal of the image field. The narrow angle of view (9°) makes objects to be photographed appear in the viewfinder of the single lens reflex camera as if they were viewed through a telescope.

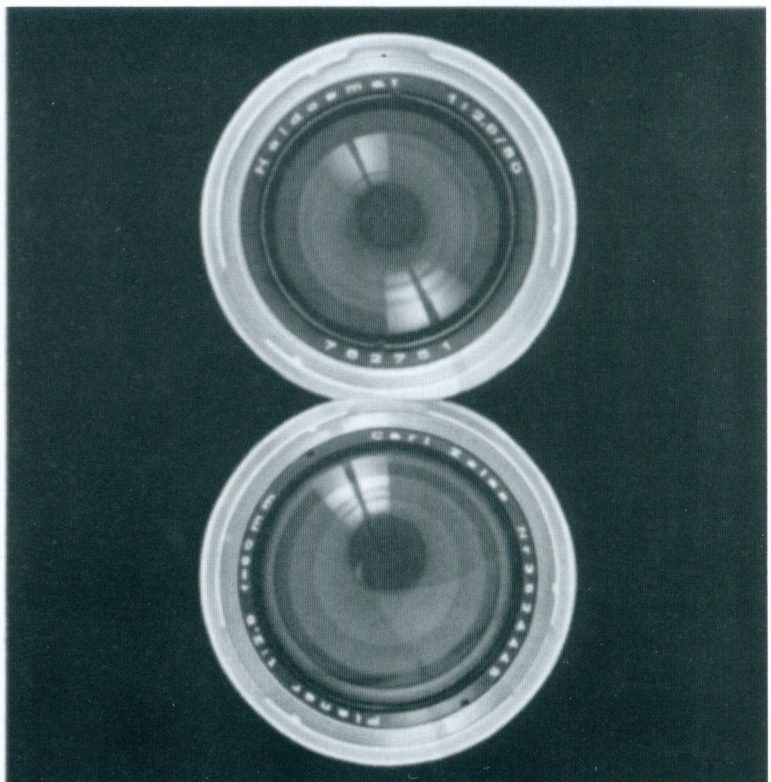
The TELE-TESSAR contains 5 lens elements, three of which are grouped before the diaphragm and two behind it. The overall length, measured from the vertex of the front lens to the focal plane, amounts to only ¾ of the focal length. Its weight of 1.9 kg. (67 ounces) permits handheld pictures. A convenient feature, incorporated for the first time in such a lens, is an automatic preset diaphragm.

The TELE-TESSAR produces high image quality even at its largest aperture. The entire image field is sharp right into the corners for black-and-white as well as color photography.

The ability of the TELE-TESSAR to take high quality pictures at great distance makes it particularly valuable for such applications as press, wildlife, exhibition, and documentary photography.

Bear catching a Salmon. Photograph taken by Sven Gillsäter


Rollei-Mutar 6,3x6
Carl Zeiss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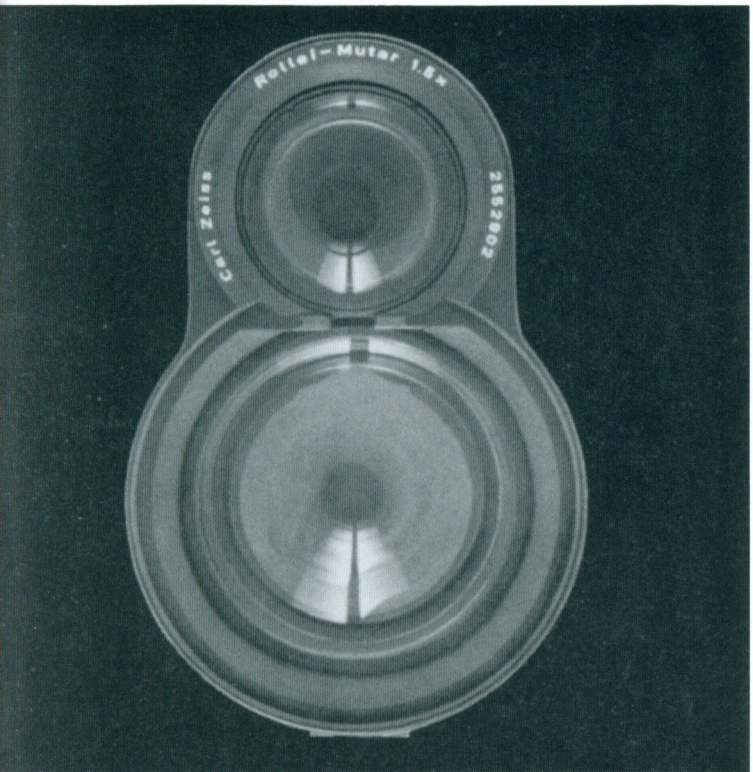
MUTAR



The MUTAR lenses are precision supplementary lens systems, which, when placed in front of a photographic lens, shorten or increase its focal length so as to have the same effect as a wide-angle or telephoto lens. As regards illumination and sharpness, the result obtained for the MUTARS exceed what could be expected on the basis of previous experience.

MUTAR lenses are engraved with a factor, for instance 0.7× with which the focal length of the taking lens must be multiplied in order to obtain the new focal length of the lens combination.

Twin-MUTAR lenses have been designed for the ROLLEIFLEX twin-lens reflex camera. Combined in one mount is one MUTAR for the viewing lens and another MUTAR for the taking lens.

Two twin-lens attachments are available:

ROLLEI-MUTAR 0.7× and the
ROLLEI-MUTAR 1.5×.

With these attachments the viewfinder serves as usual for focusing and shows the full size of the picture as produced by the taking-lens combination.

ZEISS Monocular Telescope 8 x 30 B

Another possibility of increasing the standard focal length is offered by the Monocular 8×30 B. It can be used both as monocular telescope for visual observation and as an attachment for the standard focal length lenses (50 mm.). This combination increases the standard focal length 8× resulting in a focal length of 400 mm.

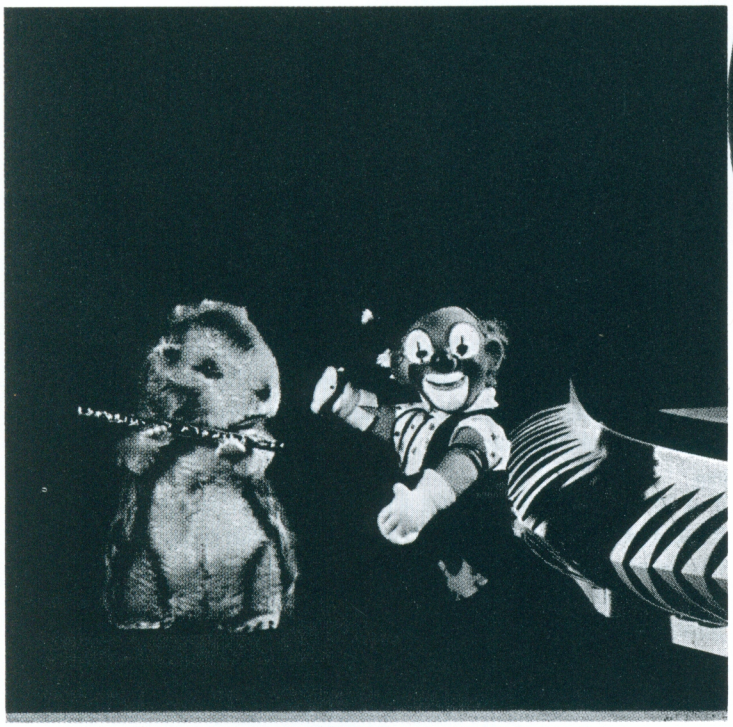
Its design has recently been changed in such a way that focusing is effected by moving the objective of the telescope thus reaching distances as close as 4.3 feet. Additional close-up lenses of 1, 2, 3, 5, and 8 diopters can be used in order to enter the interesting field of macro-photography.
The letter "B" signifies that the monocular 8×30 B is especially adapted for use by spectacle wearers.

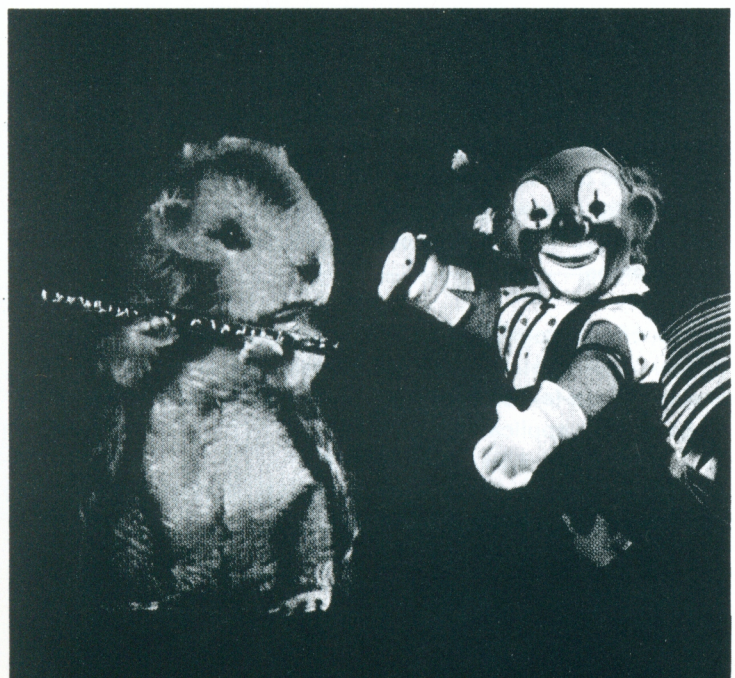
VARIO-SONNAR

Lens with a continuously variable focal length
(Zoom lens)

The VARIO-SONNAR f/1.9 of 7.5 to 30 mm. focal length is designed for use on an 8 mm. movie camera. It is equipped with a mirror reflex finder and rangefinder. The focal length can be varied continuously from 7.5 mm. to 30 mm. to change the magnification factor from 1 to 4. This corresponds to a variation of the angle of view from 43° to 11°. The taking lens consists of 12 lens elements and the reflex finder system of 9 lens elements. In order to vary the focal length, the optical components are moved by an electrically controlled and powered transmission in such a way that the best sharpness is always in the film plane.

The reflex finder shows a parallax-free bright image in natural size at a medium focal length setting of the taking lens. The reflecting of the image is achieved by means of 2 circular-shaped mirror surfaces, placed outside the optical axis, which simultaneously permit focusing with the aid of a split-image rangefinder.



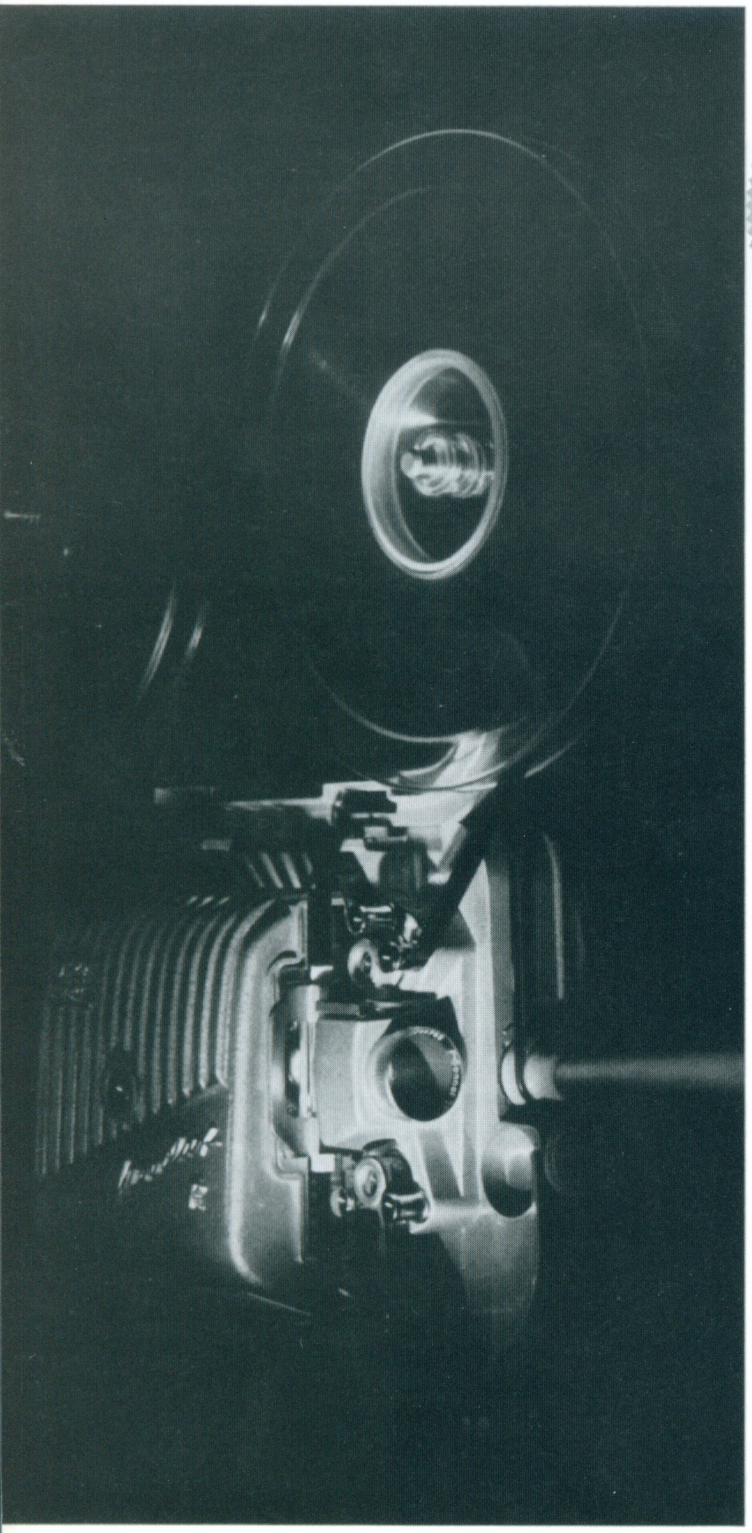


The VARIO-SONNAR f/2 of 12.5 to 75 mm. focal length is designed for use on a 16 mm. movie camera. The focal length can be varied continuously from 12.5 to 75 mm. At 12.5 mm. the angle of view corresponds to that of a true wide-angle lens with an angle of view of 52°. At the 75 mm. setting the angle of view corresponds to that of a telephoto lens with an angle of view of 9.5°. The zooming range is from 1 to 6.

The VARIO-SONNAR consists of 12 components containing a total of 15 lens elements. The high precision achieved in centering lens elements, characteristic of all ZEISS lenses, is also maintained in this VARIO-SONNAR lens with its movable lens groups. By means of a newly developed mechanical design, the movable components are guided without play and without danger of wear and tear.

The back focal length of this VARIO-SONNAR is almost twice as long as its shortest focal length. In mirror reflex movie cameras this feature permits the insertion of a mirror reflex shutter which reflects the light to the viewfinder lens system. The VARIO-SONNAR shows excellent image quality over the entire zooming range. Performance compares favourably with that of a set of corresponding wide-angle and telephoto lenses. In addition, it offers the convenience of optical zooming.

Projection Lenses for 8 mm. Film



The letter "P" in front of the name of a ZEISS lens indicates that it was specially developed for projection. The P-SONNAR lenses for 8 mm. projection are high-grade fast optical systems consisting of 5 elements.

The VARIO-P-SONNAR f/1.4 of 15 to 25 mm. focal length is an 8 element projection lens (Zoom) of variable focal length. The image size may be changed without moving the projector or the screen. This Zoom projection lens is of the same outstanding quality as the P-SONNAR lenses.

Special Photographic Lenses

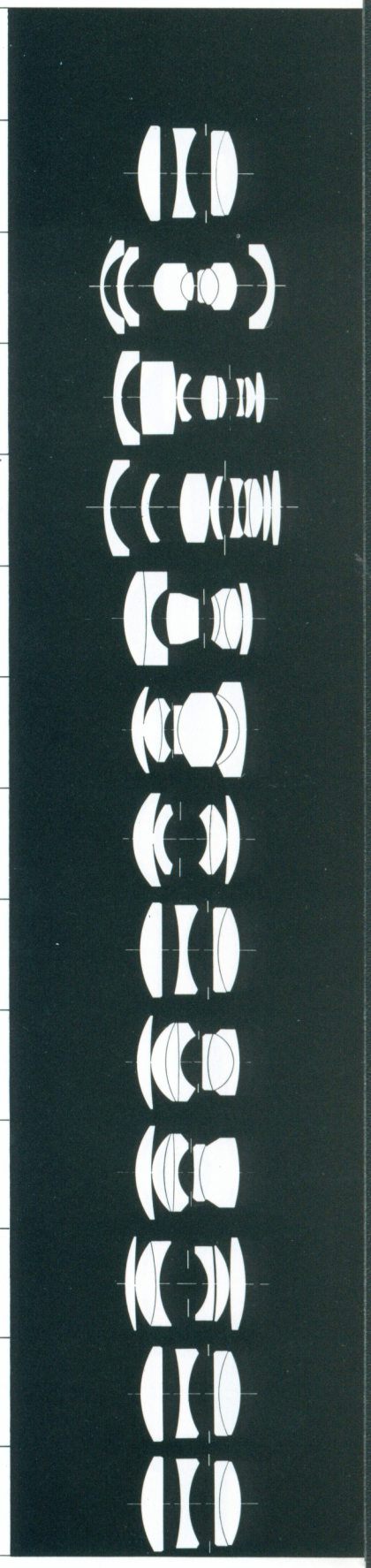
Photographic lenses are usually corrected – in line with their main applications – for great object distances, amounting to many times their focal lengths. They can be used with success for close-up photography as well because stopping down the lens is always necessary to obtain sufficient depth of field for close ranges.

For special photographic work such as reproduction, enlarging, optical copying, etc., ZEISS has developed a group of special lenses. These lenses have their optimal correction at the taking range of their application.

The names of these lenses are: LUMINAR, S-TESSAR, S-SONNAR, S-PLANAR, R-SONNAR.

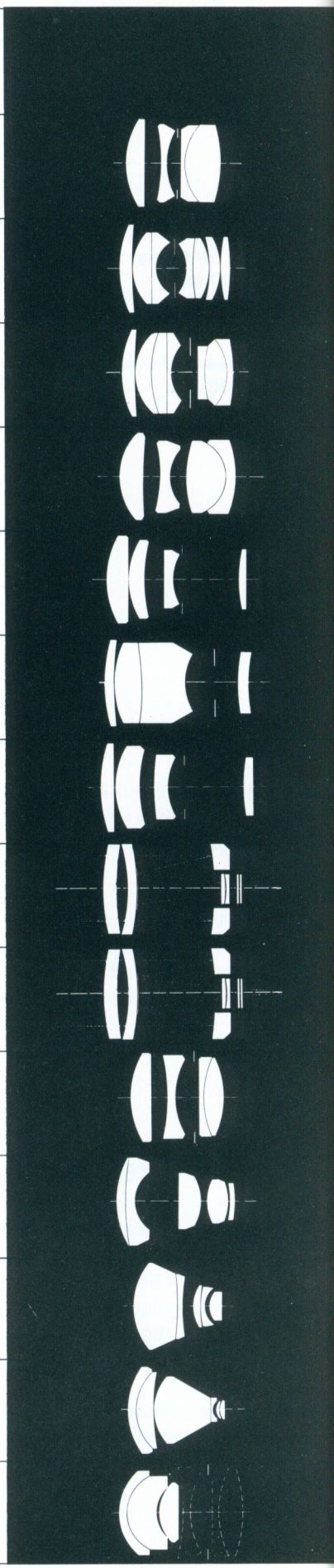
Summary of Lenses

	Lens	Largest aperture	Focal length mm.	Angle of view	Shutter	Remarks
Lens for format 12×17 mm.	**TESSAR**	f/2.8	25	45°	special shutter	
Lenses for format 24×36 mm.	**BIOGON**	f/4.5	21	90°	none	with click-stops
	DISTAGON	f/2.8	25	80°	none	with fully automatic pre-set diaphragm and automatic exposure correction of the diaphragm for close-ups
	DISTAGON	f/2	35	63°	none	with fully automatic pre-set diaphragm and automatic exposure correction of the diaphragm for close-ups
	DISTAGON	f/4	35	63°	none	with fully automatic pre-set diaphragm and automatic exposure correction of the diaphragm for close-ups
	BIOGON	f/2.8	35	63°	none	
	PLANAR	f/3.5	35	63°	none	
	TESSAR	f/2.8	45	51°	Reflex-Compur 00	with fully automatic pre-set diaphragm
	SONNAR	f/1.5	50	45°	none	
	SONNAR	f/2	50	45°	none	
	PLANAR	f/2	50	45°	none	with fully automatic pre-set diaphragm and automatic exposure correction of the diaphragm for close-ups
	TESSAR	f/2.8	50	45°	none	with fully automatic pre-set diaphragm and automatic exposure correction of the diaphragm for close-ups
	TESSAR	f/2.8	50	45°	Pronto 00	



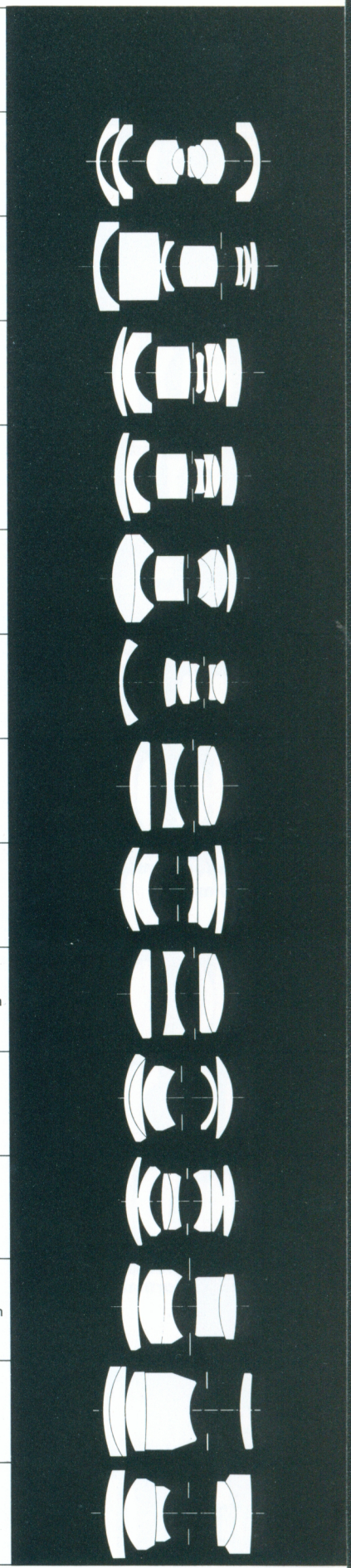
Lenses for format 24×36 mm.

Lens	Largest aperture	Focal length mm.	Angle of view	Shutter	Remarks
TESSAR	f/3.5	50	45°	none	
PLANAR	f/1.4	55	41°	none	with fully automatic pre-set diaphragm and automatic exposure correction of the diaphragm for close-ups
SONNAR	f/2	85	28°	none	with fully automatic pre-set diaphragm
TESSAR	f/3.5	115	21°	none	with pre-set spring diaphragm
SONNAR	f/2.8	135	18°	none	with fully automatic pre-set diaphragm
SONNAR	f/4	135	18°	none	with fully automatic pre-set diaphragm
SONNAR	f/4	250	10°	none	with fully automatic pre-set diaphragm
MIROTAR	f/4.5	500	5°	none	built-in grey filters corresponding to f/8 and f/11
MIROTAR	f/5.6	1000	2,5°	none	built-in grey filters corresponding to f/8 and f/11
Convertible TESSAR	f/2.8	50	45°	Reflex-Compur 00	with fully automatic pre-set diaphragm
PRO-TESSAR	f/3.2	35	61°	Reflex-Compur 00	with fully automatic pre-set diaphragm
PRO-TESSAR	f/3.2	85	28°	Reflex-Compur 00	with fully automatic pre-set diaphragm
PRO-TESSAR	f/4	115	22°	Reflex-Compur 00	with fully automatic pre-set diaphragm
PRO-TESSAR Scale 1:1	f/8	30		Reflex-Compur 00	with fully automatic pre-set diaphragm

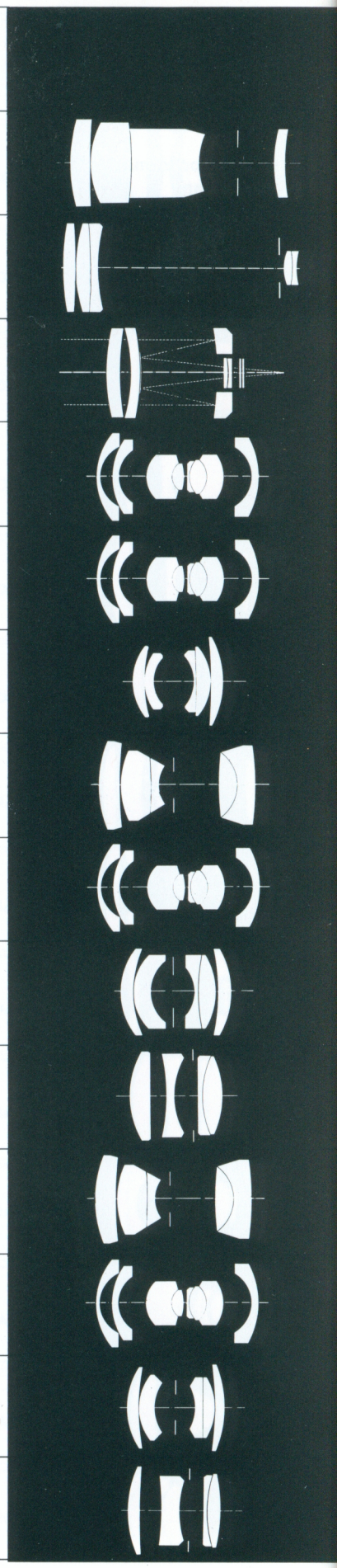


Lenses for format 60 × 60 mm.

Lens	Largest aperture	Focal length mm.	Angle of view	Shutter	Remarks
BIOGON	f/4.5	38	90°	Compur 0	with click-stops
DISTAGON	f/4	50	75°	Interchangeable Reflex-Compur 0	with fully automatic pre-set diaphragm
DISTAGON	f/4	55	71°	Compur 0	
DISTAGON	f/4	60	67°	Interchangeable Reflex-Compur 0	with fully automatic pre-set diaphragm
DISTAGON	f/5.6	60	67°	Interchangeable Reflex-Compur 0	with fully automatic pre-set diaphragm
DISTAGON	f/5.6	60	67°	none	with pre-set diaphragm
TESSAR	f/3.5	75	55°	Compur 00	
PLANAR	f/3.5	75	55°	Compur 00	
TESSAR	f/2.8	80	52°	none	with pre-set diaphragm
PLANAR	f/2.8	80	52°	Compur 0	
PLANAR	f/2.8	80	52°	Interchangeable Reflex-Compur 0	with fully automatic pre-set diaphragm
SONNAR	f/3.5	135	32°	none	with pre-set diaphragm
SONNAR	f/4	135	33°	Compur 0	
SONNAR	f/4	150	29°	Interchangeable Reflex-Compur 0	with fully automatic pre-set diaphragm



	Lens	Largest aperture	Focal length mm.	Angle of view	Shutter	Remarks
Lenses for format 60 × 60 mm.	**SONNAR**	f/5.6	250	18°	Interchangeable Reflex-Compur 0	with fully automatic pre-set diaphragm
	TELE-TESSAR	f/8	500	9°	Interchangeable Reflex-Compur 0	with fully automatic pre-set diaphragm
	MIROTAR	f/5.6	1000	4.5°	none	built-in grey filters corresponding to f/8 and f/11
Lenses for format 56 × 72 mm.	**BIOGON**	f/4.5	45	90°	special Compur 0	
	BIOGON	f/4.5	53	81°	special Compur 0	
	PLANAR	f/2.8	80	59°	special Compur 0	
	SONNAR	f/4.8	180	29°	special Compur 0	
Lenses for format 60 × 90 mm.	**BIOGON**	f/4.5	53	90°	Compur 0	with click-stops
	PLANAR	f/2.8	100	56°	Compur I	with click-stops
	TESSAR	f/3.5	105	53°	Compur 0	with click-stops
	SONNAR	f/4.8	180	31°	Compur 0	with click-stops
Lenses for format 90 × 120 mm.	**BIOGON**	f/4.5	75	90°	Compur 0	with click-stops
	PLANAR	f/3.5	135	58°	Compur I	with click-stops
	TESSAR	f/4.5	150	51°	Compur I	with click-stops

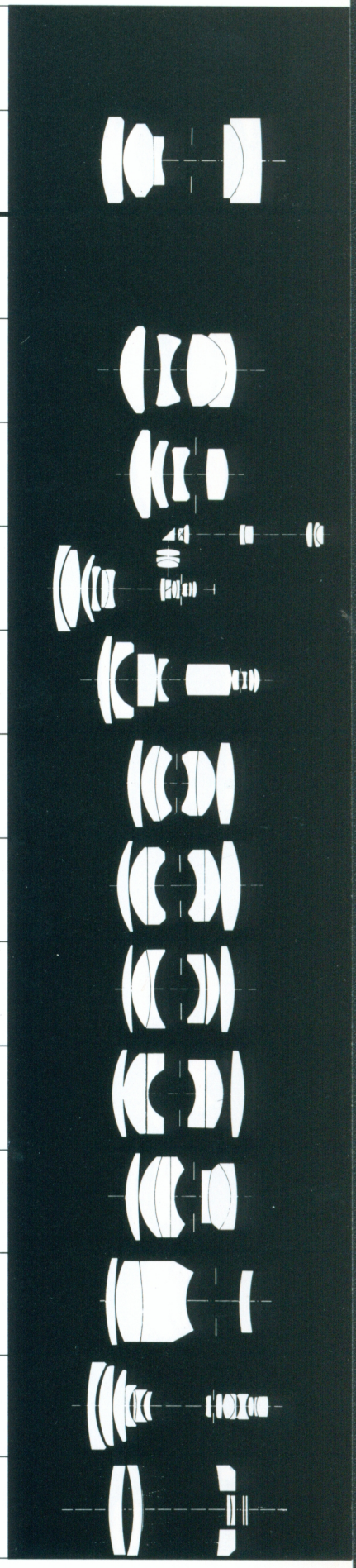


Lens for format 90 × 120 mm.

Lens	Largest aperture	Focal length mm.	Angle of view	Shutter	Remarks
SONNAR	f/5.6	250	33°	Compur I	with click-stops

Movie Camera Lenses

Lens	Largest aperture	Focal length mm.	Angle of view	for	Remarks
TESSAR	f/1.9	10	32°	8 mm.	
SONNAR	f/1.9	12.5	27°	8 mm.	
VARIO-SONNAR	f/1.9	7.5÷30	43÷11°	8 mm.	with reflex viewfinder and rangefinder
DISTAGON	f/2	8	75°	16 mm.	for cameras with mirror reflex shutter
PLANAR	f/2	16	42°	16 mm.	for cameras with mirror reflex shutter
PLANAR	f/2	25	29°	16 mm.	for cameras with mirror reflex shutter
PLANAR	f/2	32	49°	16 mm. 35 mm.	for cameras with mirror reflex shutter
PLANAR	f/2	50	32°	16 mm. 35 mm.	for cameras with mirror reflex shutter
SONNAR	f/2	85	20°	16 mm. 35 mm.	for cameras with mirror reflex shutter
SONNAR	f/4	135	12°	16 mm. 35 mm.	for cameras with mirror reflex shutter
VARIO-SONNAR	f/2	12.5÷75	53÷10°	16 mm.	for cameras with mirror reflex shutter
MIROTAR	f/4.5	500	3.3°	16 mm. 35 mm.	for cameras with mirror reflex shutter



Movie Camera Lens

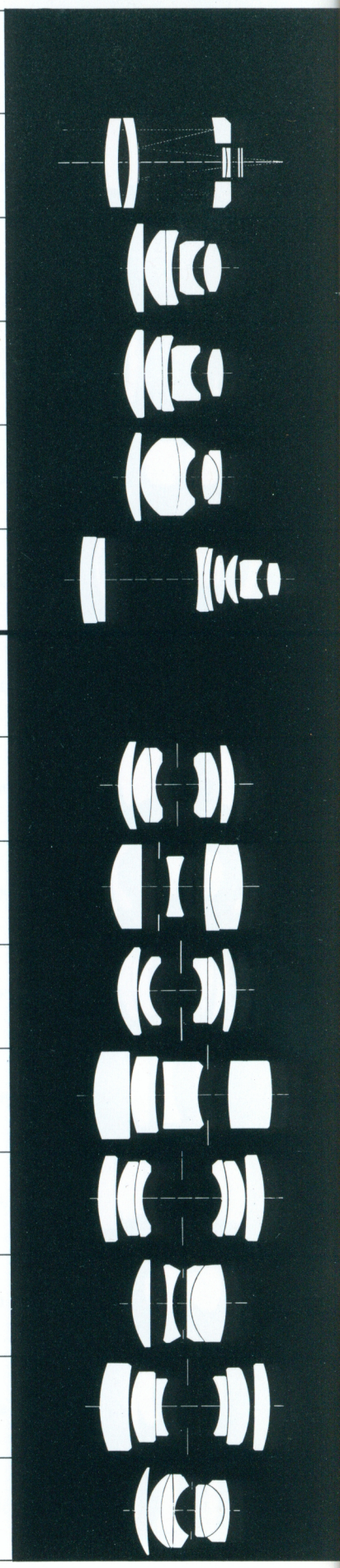
Lens	Largest aperture	Focal length mm.	Angle of view	for	Remarks
MIROTAR	f/5.6	1000	1.6°	16 mm. 35 mm.	for cameras with mirror reflex shutter

Movie Projector Lenses

P-SONNAR	f/1.4	15	20°	8 mm.	
P-SONNAR	f/1.2	20	15°	8 mm.	
P-SONNAR	f/1.3	20	16°	8 mm.	
VARIO-P-SONNAR	f/1.4	15÷25	20÷15°	8 mm.	

Special Lenses

Lens	Relative aperture at ∞	Focal length mm.	Format mm.	Scale of reproduction	for
S-PLANAR	f/4	50	24×36	1:2.8 to 1:13	reproductions and enlargements
S-TESSAR	f/3.5	60	7.5×10.36	1:2.12	reduction lens for motion picture printing
S-PLANAR	f/4	60	32×45	1:5 to 1:30	micro-film recording
S-SONNAR	f/2.5	62	7.5×10.36	1:2.12	reduction lens for motion picture printing
S-PLANAR	f/4	74	24×36	1:1	film printing lens
S-TESSAR	f/4.5	75	32×45	1:5 to 1:30	micro-film recording
S-PLANAR	f/5.6	120	60×60	1:5 to 1:∞	reproductions and enlargements
R-SONNAR	f/1.5	50	32×32	1:12.5	fluoroscopic screen photography



Special Lens

Lens	Relative aperture at ∞	Focal length mm.	Format mm.	Scale of reproduction	for
R-SONNAR	f/1.5	100	63×63	1:3.8	fluoroscopic screen photography

LUMINARS

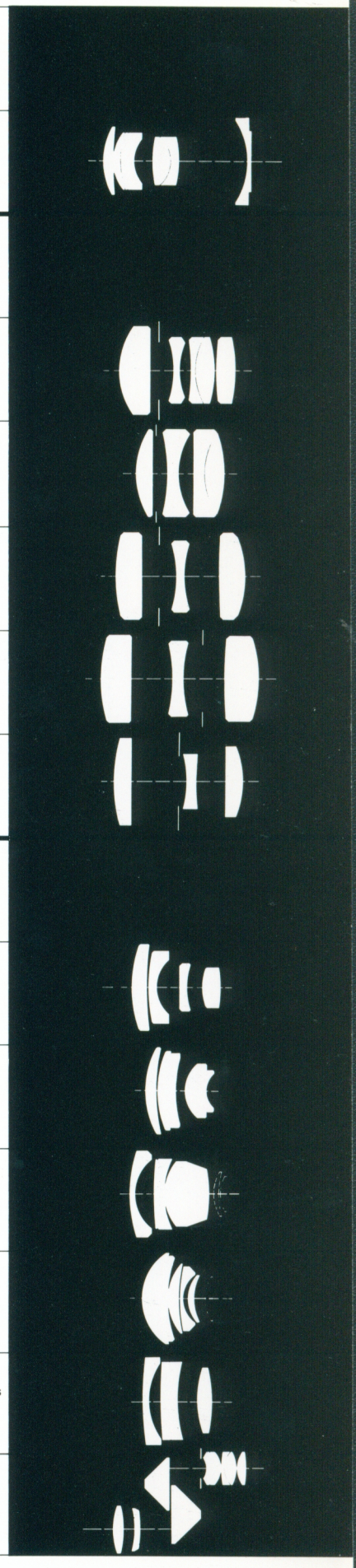
Lens	Relative aperture at ∞	Focal length mm.	Angle of view for ∞	Scale of reproduction from	to
LUMINAR	f/2.5	16	appr. 18°	11:1	65:1
LUMINAR	f/3.5	25	appr. 22°	6:1	40:1
LUMINAR	f/4.5	40	appr. 27°	3.5:1	25:1
LUMINAR	f/4.5	63	appr. 27°	2:1	15:1
LUMINAR	f/6.3	100	appr. 35°	1:1	10:1

MUTARS

Name	Magnification	with lens	Largest aperture	Focal length mm.	Angle of view	Remarks
MUTAR	0.6×	f/2.8, 25 mm.	f/2.8	15.6	68°	format 12×17 mm.
MUTAR	1.7×	f/2.8, 25 mm.	f/2.8	42	28°	format 12×17 mm.
MUTAR	0.7×	f/3.5, 75 mm. f/2.8, 80 mm.	f/4	54 57	72° 69°	twin-lens system format 60×60 mm.
MUTAR	1.5×	f/3.5, 75 mm. f/2.8, 80 mm.	f/4	110 116	40° 38°	twin-lens system format 60×60 mm.
MUTAR	0.7×	f/1.9 7.5÷30 mm.	f/1.9	5.5 to 21	57° to 16°	8 mm. movie cameras

Monocular Telescope

Monocular Telescope 8×30 B	8×	f/2.8, 50 mm. f/2, 50 mm.	f/16	400	6.3°	format 24×36 mm.



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