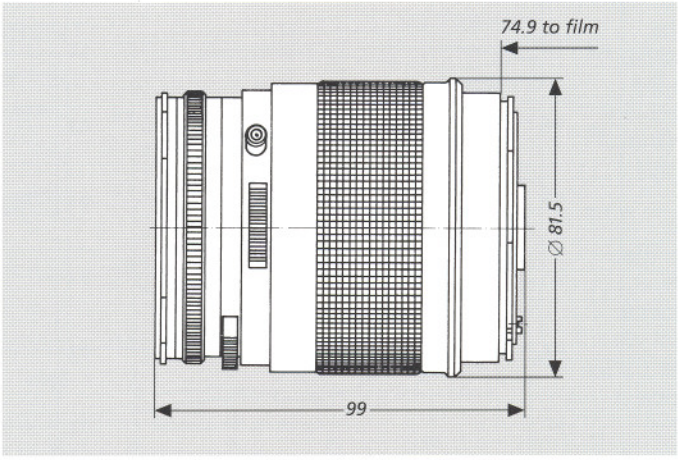
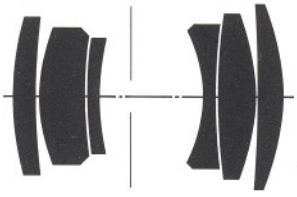
Makro-Planar® T*
f/4–120 mm



HASSELBLAD



As is already indicated by the name of this new lens in a Prontor CF shutter, its main field of application is close-up photography. Like its predecessor, the 120 mm S-**Planar**® T* f/5.6 lens, the new lens consists of 6 elements in 4 groups which are arranged almost symmetrically to the iris diaphragm. This **Makro-Planar**® lens performs best in the region of slightly reduced imaging of the subject. The close focusing distance is 0.8 m (reproduction ratio of 1:4.5). By inserting the Hasselblad extension tube 32 the macro range can be increased to 1:2. It was a major achievement on the part of the designer that the initial aperture of the new **Makro-Planar**® lens could be increased to f/4 compared with the f/5.6 of its predecessor without exceeding the optical dimensions of the f/5.6 lens or making any concessions on the image quality.

Macro pictures are usually taken at small working apertures to increase the depth of field. At first glance the wider initial aperture therefore seems unnecessary. But as the considerable increase in extension when taking close-ups results in a marked reduction of the effective lens speed and hence in focusing screen brightness, the maximum aperture of f/4 doubles the brightness of the screen image compared with the f/5.6 lens. Furthermore, the shallow depth of field associated with the new initial aperture makes it easier to recognize the plane of sharpness. Both factors facilitate the work of the photographer and give him more confidence in the composition of his picture. The recommendation that only extension tubes and no supplementary lenses should be used for close-ups below the shortest marked distance holds good also for the new **Makro-Planar**® lens. This ensures that the good image quality of this lens is maintained.

Cat. No. of lens:	**10 78 36**
Number of elements:	6
Number of groups:	4
Max. aperture:	f/4*
Focal length:	120.9 mm
Negative size:	56.5 x 56.5 mm
Angular field 2w:	diagonal 36.6°, side 26°
Spectral range:	visible spectrum
Aperture scale:	4 – 5.6 – 8 – 11 – 16 – 22 – 32
Mount:	Prontor CF
Filter connection:	bayonet for Hasselblad series 60
Weight:	approx. 695 g
Focusing range:	∞ to 0.8 m
Reproduction ratio:	0 to 1:4.5
Close-limit field size:	254 x 254 mm
Entrance pupil:	
Position*:	30.2 mm behind the first lens vertex
Diameter*:	29.7 mm
Exit pupil:	
Position*:	41.9 mm in front of the last lens vertex
Diameter*:	33.5 mm
Position of principal planes:	
H:	43.1 mm behind the first lens vertex
H':	27.5 mm in front of the last lens vertex
Back focal distance:	93.4 mm
Distance between first and last lens vertex:	61.0 mm

*for 1:∞

Planar
100 Years

ZEISS

Performance data:
Makro-Planar® T* f/4 – 120 mm
No. 107836

1. MTF Diagrams

The image height u – calculated from the image center – is entered in mm on the horizontal axis of the graph. The modulation transfer T (MTF = **M**odulation **T**ransfer **F**actor) is entered on the vertical axis. Parameters of the graph are the spatial frequencies R in cycles (line pairs) per mm given at the top of this page.
The lowest spatial frequency corresponds to the upper pair of curves, the highest spatial frequency to the lower pair. Above each graph the f-number k is given for which the measurement was made. "White" light means that the measurement was made with a subject illumination having the approximate spectral distribution of daylight.

Unless otherwise indicated, the performance data refer to large object distances, for which normal photographic lenses are primarily used.

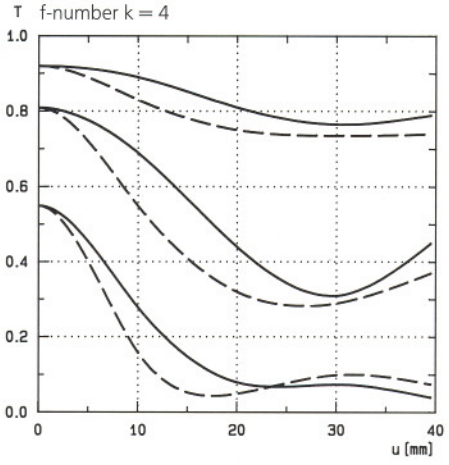
2. Relative illuminance

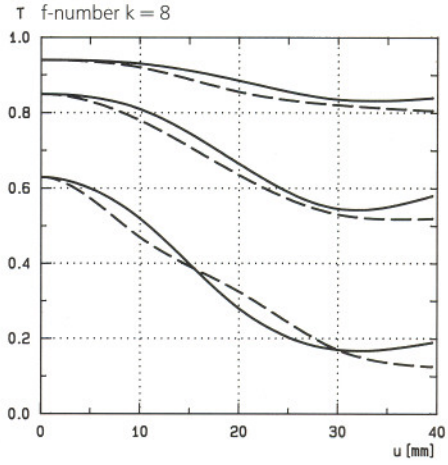
In this diagram the horizontal axis gives the image height u in mm and the vertical axis the relative illuminance E, both for full aperture and a moderately stopped-down lens. The values for E are determined taking into account vignetting and natural light decrease.

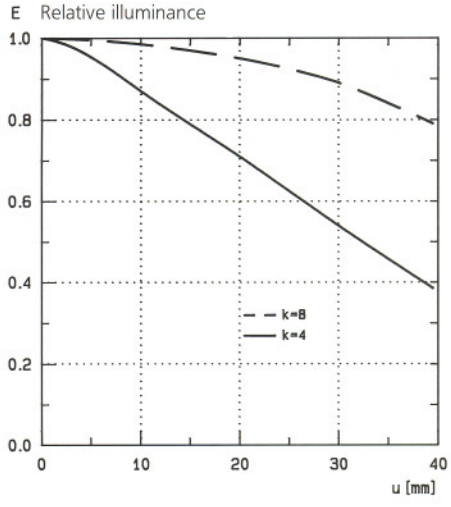
3. Distortion

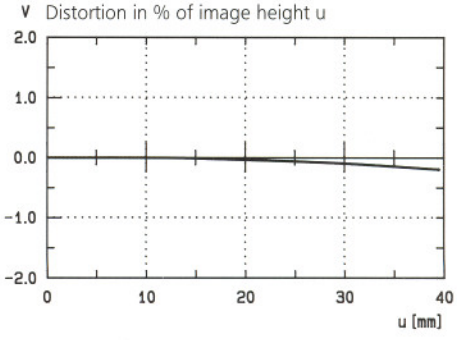
Here again the image height u is entered on the horizontal axis in mm. The vertical axis gives the distortion V in % of the relevant image height. A positive value for V means that the actual image point is further from the image center than with perfectly distortion-free imaging (pincushion distortion); a negative V indicates barrel distortion.

Modulation transfer T as a function of image height u. Slit orientation: tangential — — — sagittal ———
White light. Spatial frequencies R = 10, 20 and 40 cycles/mm

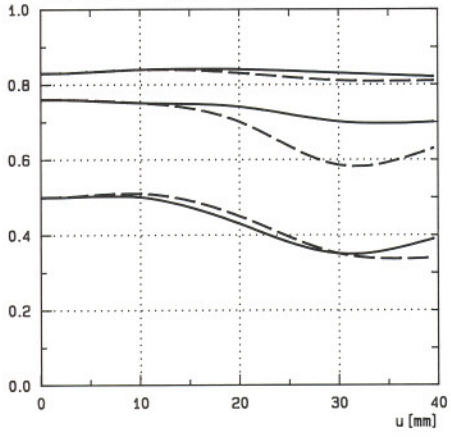




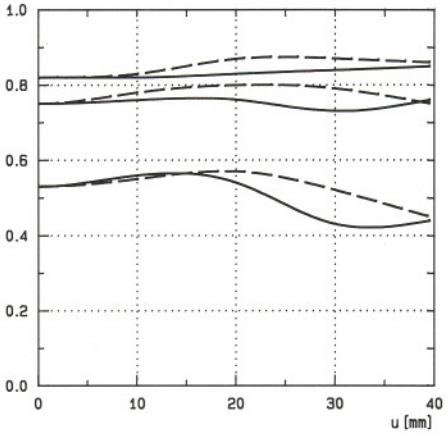




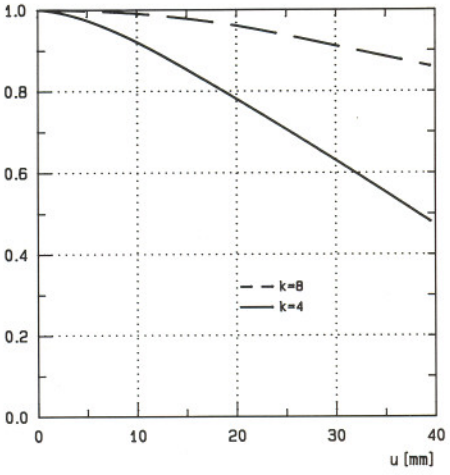
T f-number k = 4; i.s. = 1:5



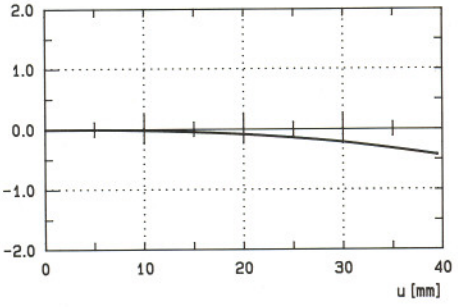
T f-number k = 8; i.s. = 1:5



E Relative illuminance; i.s. = 1:5



V Distortion in % of image height u; i.s. = 1:5



i.s. = image scale