



HARTBLEI PHOTOGRAPHIC LENSES



MC PCS HARTBLEI
3.5/45



MC TS-PC HARTBLEI
3.5/45



MC TS-PC HARTBLEI 3.5/45
SUPER-ROTATOR

OPERATING MANUAL

MC PCS HARTBLEI 3.5/45, MC TS-PC HARTBLEI 3.5/45, MC TS-PC HARTBLEI 3.5/45 SUPER-ROTATOR

GENERAL INFORMATION

The medium format wide-angle photographic lens brands: PCS, TS-PC, and TS-PC Super-Rotator MC HARTBLEI 45mm / $f=3.5$, are for the professional photographer. The eight-lens optical system is multi-coated (MC) and has anti-reflection surfaces on the lenses, which improve the quality of the image and increase its contrast range due to the increased integrated light transmission. In addition, each lens is hand assembled and carefully checked. All lenses have a metal housing, no plastics are used. The front lens-casing surface is deep matte.

The lenses make it possible to compensate for perspective distortion, to vary the depth of field and zone of sharpness and soften the image if necessary. These lenses allow medium format cameras instead of large format studio cameras to be used which is especially important for photographing architecture, interiors, landscapes, and all kinds of advertising pictures.

The lenses provide for different opportunities due to the applied technical solutions, including:

PCS - a mechanism for perspective correction by shifting the lens in any direction.

TS-PC - a mechanism for perspective correction by shifting the lens in any direction, as well as adjusting depth of field by way of tilting the lens downwards.

Super-Rotator - a mechanism for adjusting depth of field by tilting the lens in any direction, and the PCS mechanism is preserved.

At the customer's request, the photographic lens can be supplied with a metal lens hood with deep matte internal surface.

LENS MOUNT TYPES

Depending on a mount ring type, photographic lens can be used with a corresponding camera.

The lens PCS (Shift) is manufactured with next mount types: Pentacon Six (identical to Exakta 66, Kiev 60), Mamiya 645, Contax 645, Pentax 645 and Kiev 88 bayonet.

The lenses TS-PC (Tilt-Shift) and TS-PC (Tilt-Shift) Super-Rotator are manufactured with Pentacon Six (identical to Exakta 66, Kiev 60), Mamiya 645, Contax 645 and Pentax 645 bayonet.

There is also the option of mounting the lens via an adapter on a 35mm camera. In this way, the parameters of shift are increased.

SPECIFICATIONS

Bayonet type:

PCS Pentacon Six, Mamiya 645, Contax 645, Pentax 645, Kiev 88
 TS-PC, TS-PC Super-Rotator Pentacon Six, Mamiya 645, Contax 645, Pentax 645

Frame format 6x6 (6x4.5, 4.5x6) cm

Focal length 45 mm

Focusing manual

Maximum aperture 1:3.5

Aperture range 3.5 - 22 (manual)

Construction:

elements / groups 8 / 7

Angle of view:

without optical unit shift 83° (equivalent to 24 mm focal length for a 35mm cameras)

with optical unit shift 98°

Minimum focus:

PCS 0.5 m

TS-PC, TS-PC Super-Rotator 0.35 m

Filter size dia 82 mm

Lens movement:

PCS shift in any direction

TS-PC shift in any direction and downward tilt

TS-PC Super-Rotator shift and tilt in any direction

Shift movement range 0 to 12 mm (0 to 11 mm for Kiev 88) in any direction

Tilt movement range:

TS-PC 0 to 6° downward

TS-PC Super-Rotator 0 to 8° in any direction

Dimensions:

PCS dia 96 mm x 100 mm

TS-PC, TS-PC Super-Rotator dia 96 mm x 110 mm

Weight:

PCS 750 grams

TS-PC 850 grams

TS-PC Super-Rotator 880 grams

RESOLUTION TABLES

The average values of the tests of several lenses performed on the films with the resolution of 200 lines per mm – Kodak T-max 100 by INFPHO laboratory.

Line resolution per millimeter:

PC Hartblei 3.5/45	Distance from the center of the frame:				
	0mm	8mm	19mm	29mm	37mm
Aperture 3.5	40	38	25	21	20
Aperture 5.6	35	38	32	26	23
Aperture 8	45	40	36	31	25
Aperture 16	55	45	35	35	31
Aperture 22	55	40	40	32	31

The resolution at 6 mm of shift in lines on millimeter (in the direction of shift / in the direction opposite to shift):

PC Hartblei 3.5/45	Distance from the center of the frame:			
	0mm	19mm	29mm	37mm
Aperture 3.5	20	35/25	25/25	25/20
Aperture 8	30	35/25	30/25	20/16
Aperture 22	55	35/34	30/30	30/27

The resolution at 12 mm of shift in lines on millimeter (in the direction of shift / in the direction opposite to shift):

PC Hartblei 3.5/45	Distance from the center of the frame:			
	0mm	19mm	29mm	37mm
Aperture 3.5	30	22/22	21/20	15/10
Aperture 8	35	32/27	25/20	25/15
Aperture 22	50	38/35	33/30	27/22

The resolution at tilt (in the range of sharpness) in lines on millimeter:

PC Hartblei 3.5/45	Angle of tilt:		
	3°	6°	8°
Aperture 3.5	35	35	25
Aperture 8	40	35	30

The resolution at tilt-and-shift (in the range of sharpness) in lines on millimeter:

PC Hartblei 3.5/45	Tilt / Shift:					
	3°/6 mm	3°/12 mm	6°/6 mm	6°/12 mm	8°/6 mm	8°/12 mm
Aperture 3.5	37	35	30	28	25	30
Aperture 8	47	45	40	35	40	40
Aperture 22	50	42	42	37	40	40

The data of the tests of a Nikkor 50mm / f=1.8 Als lens are listed for comparison (tests are performed on the same technique):

Nikkor 1.8/50 Als	Distance from the center of the frame:		
	0mm	8mm	19mm
Aperture 1.8	38	40	32
Aperture 8	40	50	39

OPERATIONG INSTRUCTIONS

Lens Mounting and Removal

To mount and remove the lens, please follow the instructions in the user's manual of the camera.

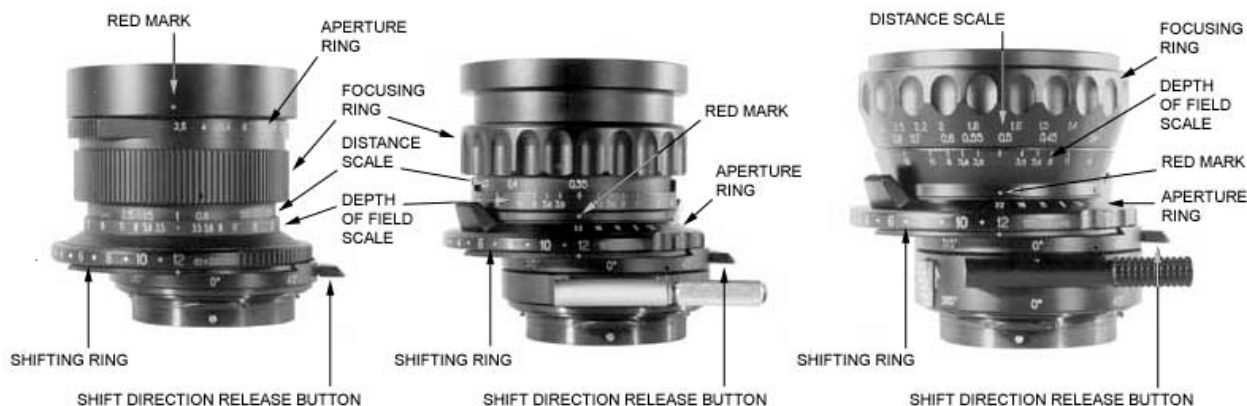
Focusing

To focus, rotate the focusing ring with the distance scale on it until the image is sharp in the viewfinder (it is preferable to do this with the aperture being maximum open).

The distance scale can be used instead to give an approximate focus.

Determine the depth of field using the distance scale and the depth-of-field scale, and check it visually by the image on the focusing screen, in the viewfinder at the chosen aperture.

When focusing the lens after it has been shifted, it is possible that the microprism and the split-image rangefinder of the viewfinder of the camera may darken. In that case, check the image sharpness on the matte spot of the focusing screen. Orientation based on a distance scale after the lens has been shifted shall not give precise result.



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Aperture Setting

To set the aperture, rotate the aperture ring with the scale number on it until the selected one matches with the red mark on the fixed ring.

Lens Shifting

To shift the optical unit of the lens, rotate the shifting ring with the shift scale on it.

Choose the direction of the shift by rotating the lens about the bayonet axis. To rotate the lens, push the shift direction release button on the shift mechanism. The lens can be turned around the bayonet axis 360° in any direction and may be fixed at each 15°. The lens may be used in positions between these intervals as well.

To shift the lens more than 10 mm the vignetting is used, a darkening toward the corner of the viewfinder shows i.e. the decrease of the intensity from the center to the edge of the frame. This may be avoided by using the 6x4.5 cm format of the frame (shifting the lens along the short sides of the frame) while photographing or choosing the aperture from 11 up to 22.

The values of shift, at which the vignetting is observed, are marked in red on the shift scale of the lens.

WARNING FOR USERS OF PENTACON SIX BAYONET MOUNT!

Due to the design characteristics of the TS-PC and TS-PC Super-Rotator lenses with the Pentacon Six bayonet type, it is desirable to use the shift adjustment after the tilt value has been fixed.

In the TS-PC lens with the Pentacon Six bayonet while the maximum tilt is set, the shift against the tilt direction shall not exceed 10 mm.

In the TS-PC Super-Rotator lens with the Pentacon Six bayonet while the maximum tilt is set, the shift against the tilt direction shall not exceed 9 mm.

In order to prevent inaccurate operation, it is recommended that after each shot, return the parameters of the shift and tilt to the initial (zero) position.

Finding the Exposure when Using Lens Shift

When shifting the lens, it is necessary to introduce exposure adjustment of the external or handheld (not TTL system) exposure meter. The exposure adjustment increases from 0 to +0.5 of the aperture step that is proportional to the shift of the lenses optical system. So, at the shift of 6 mm adjustment makes +0.25 of the aperture step, at the shift of 12 mm - makes +0.5.

Tilting the TS-PC and TS-PC Super-Rotator Lenses

Lens tilt is achieved by rotating clockwise the tilt handle. One full revolution of the handle corresponds to a lens tilt of 1.13° for the TS-PC lens and 1.5° for the TS-PC Super-Rotator lens.

The direction of the tilt for the TS-PC Super-Rotator lens is made by rotating the lens about the bayonet axis. To rotate the lens, depress the tilt direction release button on the tilt mechanism in the direction of the pointer. The lens can be turned around the bayonet axis 360° in any direction and fixed every 15° . The lens may operate in the position between these intervals as well.

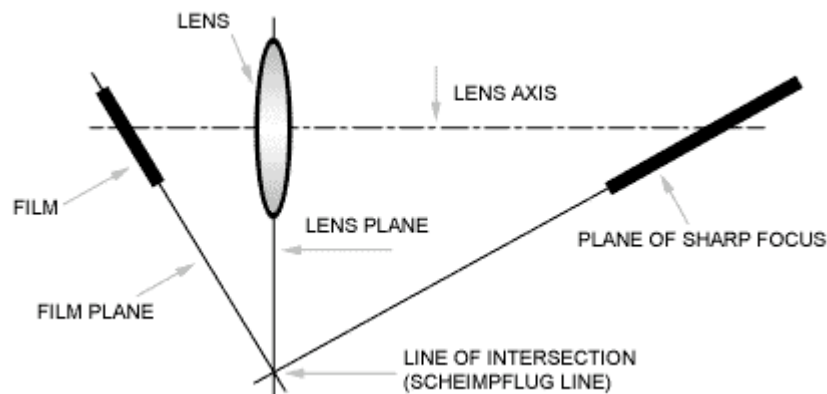


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MC TS-PC HARTBLEI 3.5/45 Super-Rotator

If applying the tilt when photographing, obey the Scheimpflug's principal, which states that if a lens is tilted such that the lens plane intersects the film plane, the plane of sharp focus must also pass through that same line of intersection.



Remember that when using the TS-PC or TS-PC Super-Rotator lens with Pentacon Six bayonet type it is recommended to set up the tilt angle with the zero position of the shift.

Finding the Exposure when Using Tilt of the TS-PC and TS-PC Super-Rotator Lenses

With the lens tilt and the aperture open, there will be a difference in quantity of light entering the opposite edges of the frame. To correct it, choose the exposition pair "exposure-aperture" with the aperture closed down to 5.6 - 22. The use of a film with large exposure latitude is recommended. Exposure adjustment is not required.

Finding the Exposure when Using Tilt-and-Shift of the TS-PC and TS-PC Super-Rotator Lenses

When tilting and shifting the lens simultaneously it is necessary to introduce exposure adjustment to the external or handheld exposure meter (not TTL system). The exposure adjustment increases from 0 to +0.5 of the aperture step that is proportional to the shift of the lenses optical system. So, at the shift of 6 mm, adjustment is +0.25 of the aperture step, at the shift of 12 mm - is +0.5.

When using lens tilt and open aperture there will be a difference in the quantity of light falling on the opposite edges of the frame. The simultaneous shift of the optical unit magnifies the effect. To counter this use apertures 11 - 22. It is recommended to work with a film with large exposure latitude.

With 6° tilt (and more for TS-PC Super-Rotator) and simultaneous 6 mm and more shift for 6x6 format vignetting occurs.

With 6° tilt (and more for TS-PC Super-Rotator) and simultaneous 9 mm and more shift vignetting occurs in both 6x6 and 6x4.5 formats.

PRACTICAL ADVICES AND EXAMPLES

Bellow you find several pairs of pictures that illustrate possibilities provided by the lens shift and/or tilt functions. The picture «A» illustrates the standard position in which lens shift and/or tilt functions are not used, and the picture "B" illustrates the uses of the given functions. Both shots from each pair are made without change of the point of shooting.

Remove or Increase the Distortions

With the help of the control system of PCS and TS-PC lenses, you can if necessary remove or increase the effect of difference of level between a photographer and an object (Photo 1A, 1B).



Photo 1A



Photo 1B

When photographing architectural objects, the distance from the lens to upper and lower parts of the object is different. It would result in a distortion known as a "falling building" effect (the parallel vertical lines unnaturally come up to one point). Similar problems arise when photographing a model on a catwalk, interiors, sculptures placed on high stands, paintings and architectural details located at an unreachable height.

To correct this view, keep the plane of the film parallel to the photographed object (do not tilt the camera upwards or downwards). Then, to obtain the desirable composition, shift vertically the optical unit of the lens and as a result distortion problem is eliminated (Photo 2A, 2B).



Photo 2A



Photo 2B

Sometimes, instead of removing the distortion, there may be a need to exaggerate the reduction of perspective. To do it, tilt the camera and shift the lens in the direction, opposite to the tilt.

Eliminating or Adding Light Patches and Reflections

When photographing objects that have a reflecting surface (for example, a show-window of the building, a mirror), the reflection of the photographer or patches of light can appear in the frame. To fully overcome this, it will be necessary to transfer the point of shooting to one side and to shift the lens in the opposite direction, while keeping the planes of the object and the film parallel. It would allow you to work without polarization filters and labor-consuming retouching of the photograph on your computer (Photo 3A, 3B).



Photo 3A



Photo 3B

Tilting the TS-PC and TS-PC Super-Rotator Lenses and Adjusting Depth of Field

While photographing interiors, still lifes, portraits, objects for advertising it often happens that total control of the depth of field is required. With ordinary lenses, it is achieved via the aperture. The most widespread method to increase the depth of field is to minimize the aperture of the lens. However, it frequently happens that this is not possible: when you close the aperture, it is necessary to increase the exposure. In this case, it is hard to photograph objects in motion, or often even is impossible. With the minimum aperture the lens yields a "dry" unsaturated color image.

The operation of TS-PC and TS-PC Super-Rotator lenses with the tilt mechanism of the optical axis enables to increase or reduce the depth of field at any aperture (Photo 4A, 4B).



Photo 4A



Photo 4B

Tilting and shifting the optical unit jointly allows to control both depth of field and perspective distortion at the same time. The latter is especially important when photographing interiors and objects for advertising purposes (Photo 5A, 5B).



Photo 5A



Photo 5B

The TS-PC Super-Rotator lens provides a photographer with the ability to adjust the zone of sharply viewed space, and hence, gives the photographer the opportunity to be more creative (Photo 6A, 6B, 6C, 6D).



Photo 6A



Photo 6B



Photo 6C

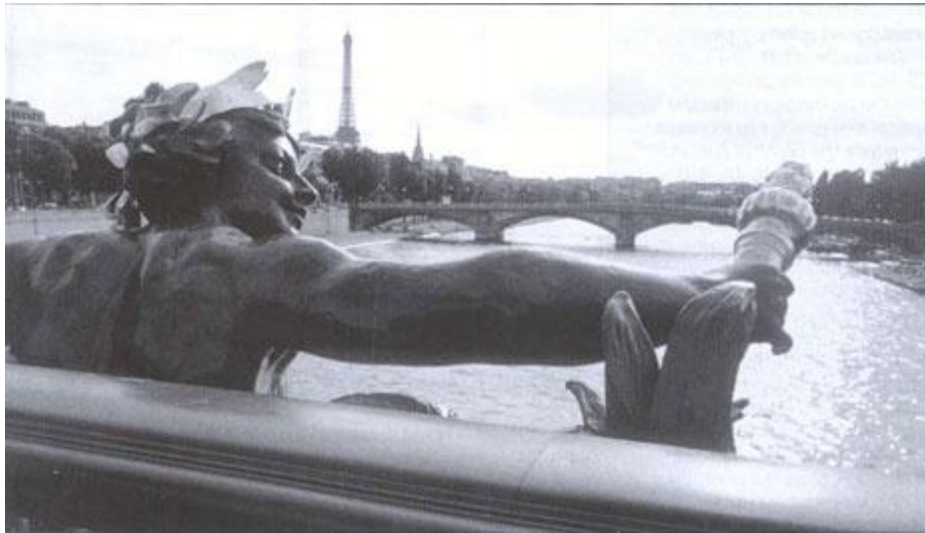


Photo 6D

Panoramic Photographing

The PCS and TS-PC lenses can be used for panoramic shooting with tripod.

For this purpose take two shots from the same point: the first - with the maximum shift of the lens to the right, and the second - with maximum shift to the left. Both shots combined during the printing will give a uniform panoramic photograph, which will correspond to a negative format of the frame 6x8 (56x79 mm) and normal perspective (Photo 7A, 7B, 7C, 7D).



Photo 7A



Photo 7B



Photo 7C



Photo 7D

Vertical panoramic shooting is possible too.

CARE AND STORAGE

The photographic lens is a complex optical instrument and requires special care and handling. Protect it from shocks, extreme temperature changes, as well as from dust and moisture. The photographic lens will operate in temperatures from -15° up to $+45^{\circ}$ Celsius.

When entering a warm room in winter, do not take the lens out of the case at once. Let it get warm to avoid moisture condensation on the lens surfaces. Keep the lens away from direct sunlight or other sources of heat.

When dust and moisture appear on the lens surface, remove it with a soft fabric (flannel, cambric, or suede). When dust appears on the surface of the lens, blow it off with a "rubber pear". Do not blow dust off with your breath, or spray.

When fingerprints and other spots appear on the surface of the lens, first remove the dust from the lens and casing around. Then, using a special rice paper, natural cambric or new non-colored suede (a special suede for cleaning optics), wipe the lens with circular motions (from center of a lens in a spiral to edges) applying no pressure. In some cases, apply some cleaning fluid if necessary. For this purpose, use a special fluid for photographic optics, medical spirit, or ether. Take care that the fluid does not get between the lens and its housing (to avoid this do not use spray fluids under pressure). Residue from the cleaning fluid should be removed with new and unused suede or microfibre lens cleaning cloth.

The photographic lens you have purchased may have minor alterations on their cover that will be different from the one you find on the figure in the instruction. This is due to the processes in the manufacture of the lenses, the shape and operational qualities that are regularly updated.