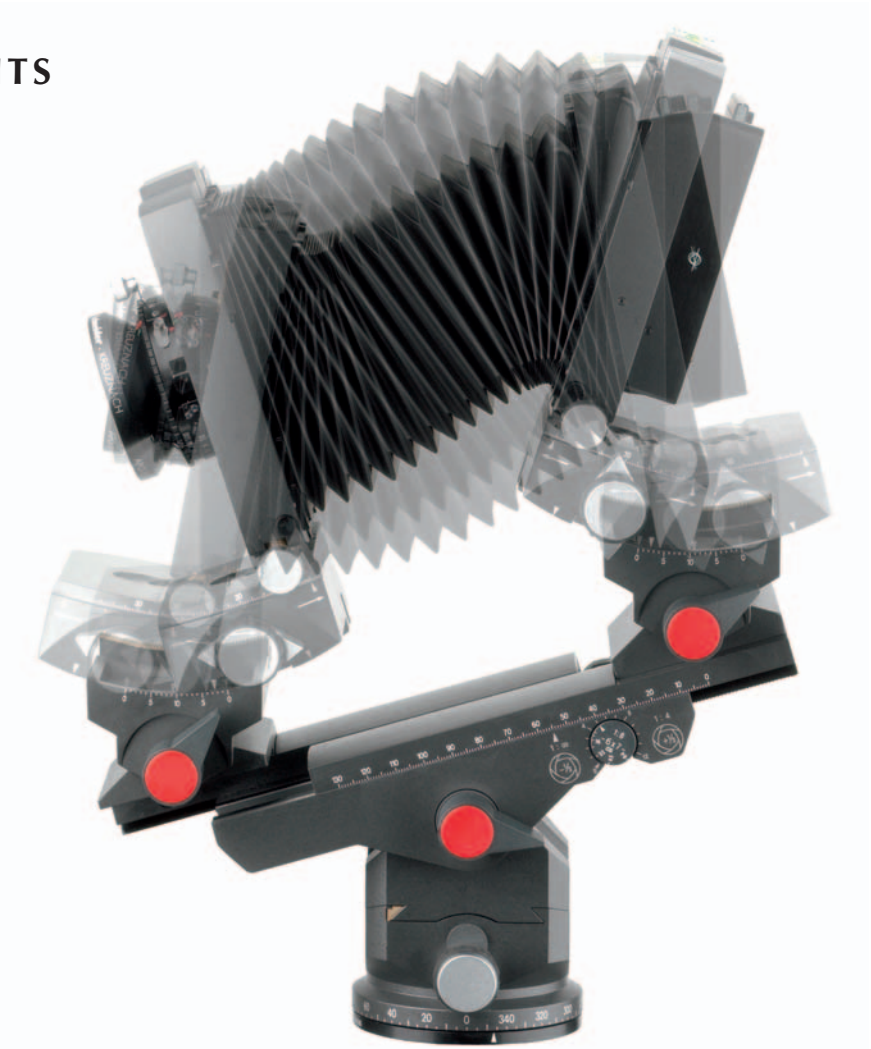
4. CAMERA ADJUSTMENTS

Only by the possibility of displacing lens and rear standard all advantages of a view camera are fully utilized. These displacements serve for control of perspective, positioning of the depth-of-field and creative image composing.
Any camera displacement requires the appropriate lens with the sufficient image circle.
Before starting to use camera movements, return all camera controls to zero.



3.2. IMAGE CIRCLE

In order to make optimum use of the decisive advantage of the M 679cs, i.e. its wide range of displacements lenses are needed with large image circle and first-class image reproduction quality right up to the edge of the image circle. The most important camera displacement is the parallel adjustment to eliminate or reduce converging verticals. For this, the lens must have an image circle far beyond the size of the taking format.The image circle stated in the technical specifications of the lens manufacturers always refer to a focusing distance of infinity and a working aperture of f/22. For shorter distances (e.g.for table shots), the image circle diameter will increase so that even larger adjustments are required. For digital lenses the the corresponding working aperture is referred as f/11.
The Linhof M 679cs offers the necessary long mechanical adjustment facilities.
Please always ensure that the image circle of the lens covers the mechanical displacements.
As a practical hint: when looking through the lens onto the groundglass at working aperture all four edges of the picture format have to be visible.

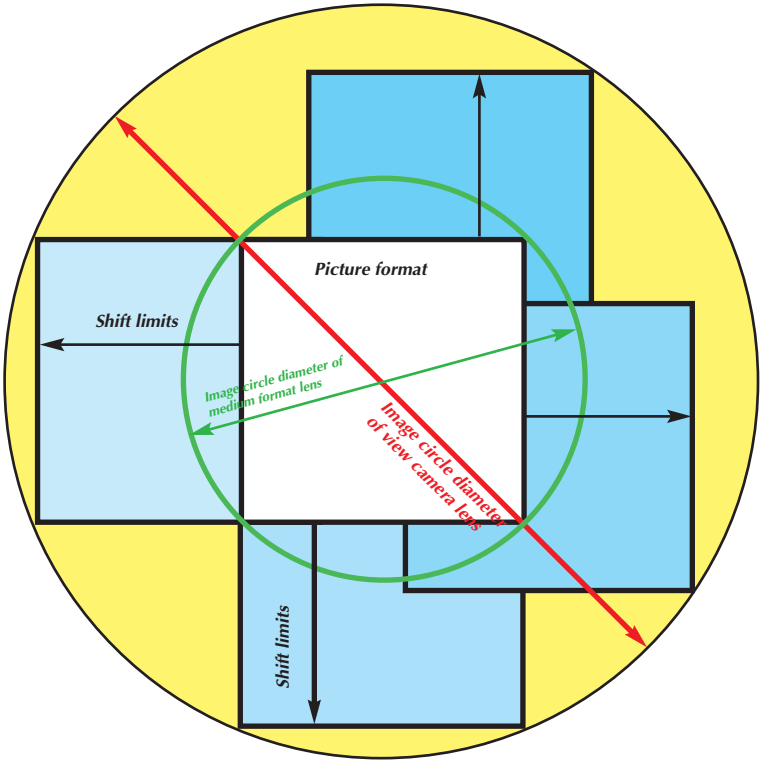
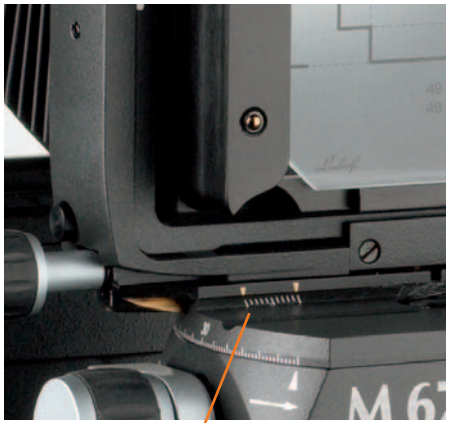


Image circles and shift limits.
Within the limit of a sufficiently large image circle the picture format can be displaced.



Scale for lateral shift at the rear standard

Direct parallel adjustment (vertical shift) with self aligning micro drives at the lens standard (M 679cs with Apo-Sironar 4,5/35 mm and wide angle bellows).

4.1. VERTICAL AND LATERAL SHIFT (DIRECT DISPLACEMENT)

Horizontal and vertical parallel displacements are operated with self-aligning micro drives. Direct adjustments are recommended for precise cropping corrections and should normally be made after having finished all settings thus avoiding any movement of the tilting axis out of their centre position .

When working with extremely short lenses (24, 28, 35, 38 mm) we recommend the direct camera displacement using the horizontal and vertical shift facilities. In general their range of adjustment is sufficient and all displacements remain parallel.

4.2. INDIRECT PARALLEL DISPLACEMENTS

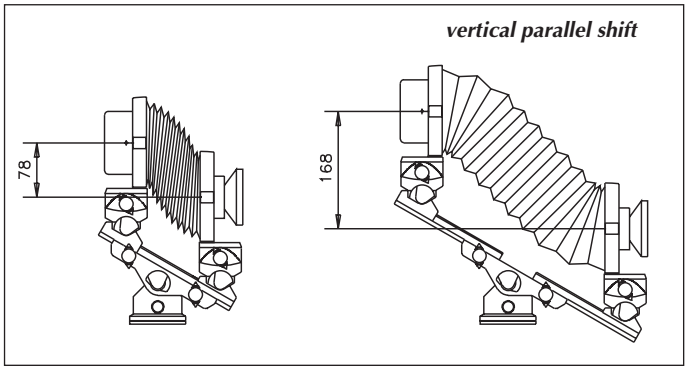
Parallel movements (rise and shift of the front and back standards) are primarily used to eliminate converging verticals or horizontals in subjects with predominantly parallel lines. While vanishing lines are simply the normal perspective rendition resulting from an oblique position of the image plane relative to the main subject plane, the experienced professional will see that through proper use of camera adjustments pictures do not show any of the unwanted perspectives so often found in architectural and industrial subjects.

Whether up, down or lateral shift of the lens or rear standard:

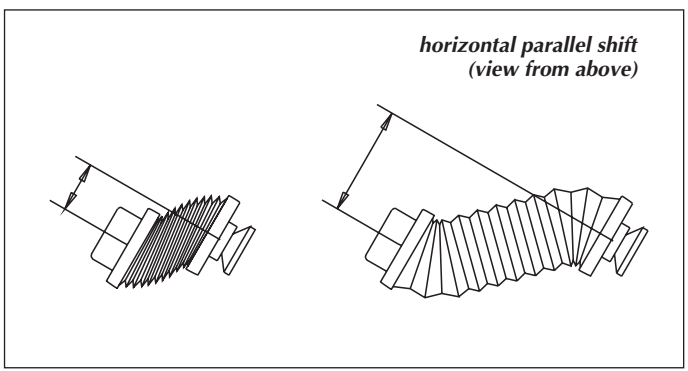
Most parallel adjustments are executed indirectly.

In other words:

The front and rear standard is simply placed parallel to the main view of the subject.



The possible adjustments increase linear with the camera extension. The M 679cs offers an up/down or lateral shift of 168 mm each at maximum camera extension (tilting angle 30°). At minimum camera extension the possible indirect parallel shift is approximately 38 mm. The sketch shows extension and adjustment which can be achieved with normal bellows.

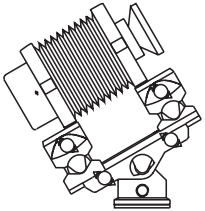


4.3. VERTICAL PARALLEL SHIFTS (INDIRECT)

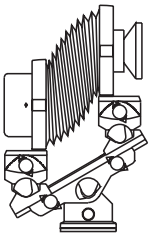
Indirect vertical shifts (lens rise or lens drop) are used to produce an image without converging lines when shooting from a low or high view point.

LENS RISE:

With all adjustments in neutral position and with the aid of the integrated panorama benchholder the camera is set to the subject. Focus until the object appears in focus on the groundglass. Adjust lens and rear standards to vertical with the aid of the spirit level. If necessary, refocus. The picture was taken with a 58 mm wide angle lens.



1. *Set the camera to the subject, composing the image.*



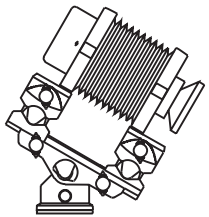
2. *Adjust lens and rear standards ti vertical with the aid of the spirit level, if necessary make cropping correction, focus.*

LENS DROP

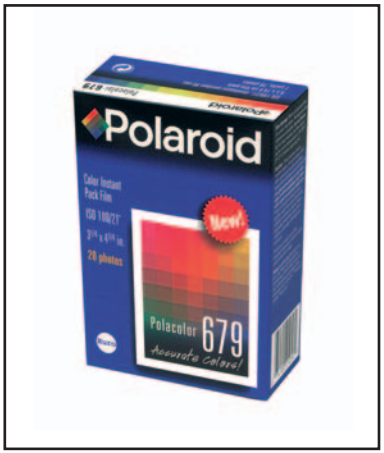
When working in the studio shooting is often made from a high view point (still life, table-tops etc.): with the aid of the integrated panorama benchholder the camera is set to the subject determining the image on the groundglass and focus. Adjust front and rear standards to vertical with the aid of the spirit level, refocus.

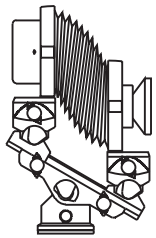
REMAINING PERSPECTIVE

Since totally corrected images can sometimes appear unreal a so-called "remaining perspective" is often desirable. This is an uncomplicated procedure: read off the angle of tilting of the optical bench and reduce the base tilt of the standard by approximately 25%.

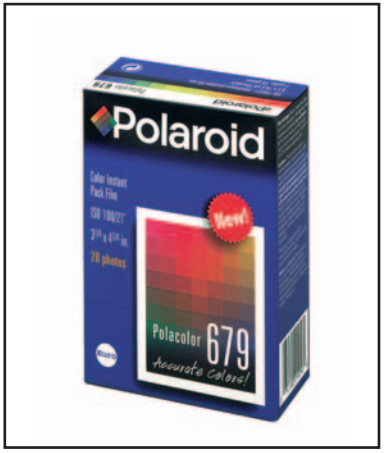


1. Set the camera to the object, frame the image. The package is seen with converging verticals.





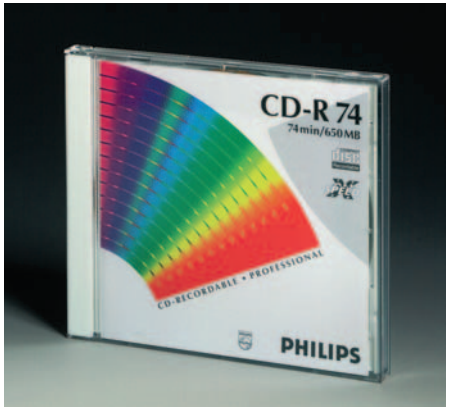
2. Adjust front and rear standard to vertical with the aid of the spirit level. The package is seen with undistorted verticals.



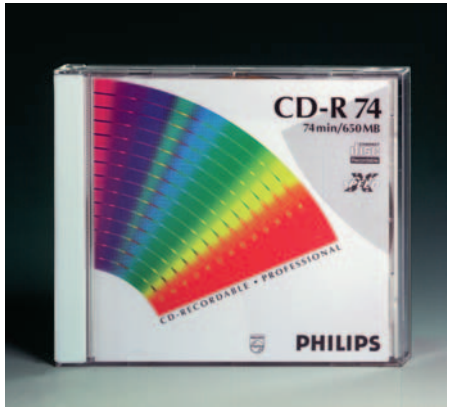
4.4. HORIZONTAL PARALLEL SHIFTS

Horizontal shifts (lateral displacement or cross front movements) are used to obtain frontal views from a lateral camera position, producing an image without vanishing lines and perspective distortion. This is a common requirement when standing in front of reflecting surfaces (mirrors, windows) or when the view from a centre position directly in front of the subject is obstructed or includes unwanted subject matter. To ensure correct perspective, start by placing the camera (and the filmplane) parallel to the main object plane:

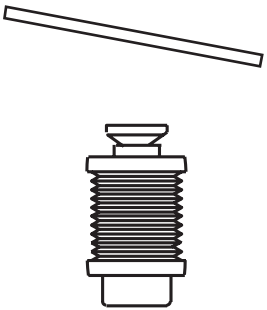
The camera has to be rotated with the bench panorama holder to the object until reaching the desired framing on the groundglass. Then turn the back standard around the vertical axis until you reach the main view of the object preferably utilizing the grid lines of the groundglass. Now transfer the angle of rotation of the panorama of the rear standard to the lens standard for obtaining exact parallelism.



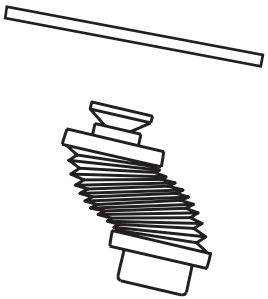
1. *Shooting with non-displaced camera: the main view shows converging lines.*



2. *Shooting with camera and parallel adjustments: the main view is seen undistorted.*



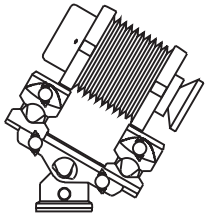
1a. *Set camera to the object, frame the image (camera is shown from above).*



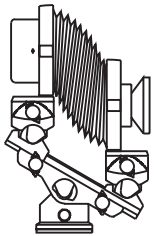
2b. *Adjust rear standard parallel to main view. Transfer angle to lens standard.*

4.5. COMBINED PARALLEL SHIFTS

Horizontal and vertical shifts can, of course, also be applied in combination.
A typical example is the reproduction of a package where the front cover is to be shown as a rectangle and both the top and the side should be visible as well.

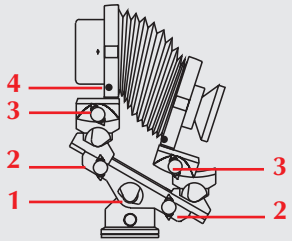


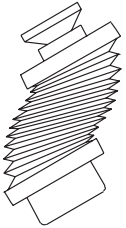
1. *Select the appropriate camera view point, adjust the groundglass, determine framing.*



2. *Adjust both standards vertically with the aid of the spirit level for avoiding converging lines.*

PRACTICAL HINT:
All camera adjustments should start at the panorama benchholder (1). Then follows - if necessary - the adjustment of the standards to vertical. All control elements are situated above the panorama benchholder at the optical bench (2). The final adjustment facilities (level 3) for the camera are swings and tilts by rack and pinion drives. Finally the cropping correction is made (4).





3. *Swing rear standard for parallel position to the book cover. Set camera to grid net lines of the groundglass. Read off angle and transfer to the lens standard. Refocus (illustration shows camera from top). Make cropping correction when necessary.*

4.6. SCHEIMPFLUG ADJUSTMENTS

When talking about camera movements, the term "Scheimpflug" is often subject to a certain amount of misinterpretation. Even by experienced photographers, the use of Scheimpflug adjustments to control focus and depth-of-field is either looked upon as a highly complex mathematical problem or considered a simple adjustment procedure which a modern view camera should do more or less automatically by itself. Neither opinion really corresponds with the photographic practice, as the truth is somewhere in the middle, but once there is a certain understanding of the theory behind all Scheimpflug adjustments, their practical application becomes as simple and fool proof routine.

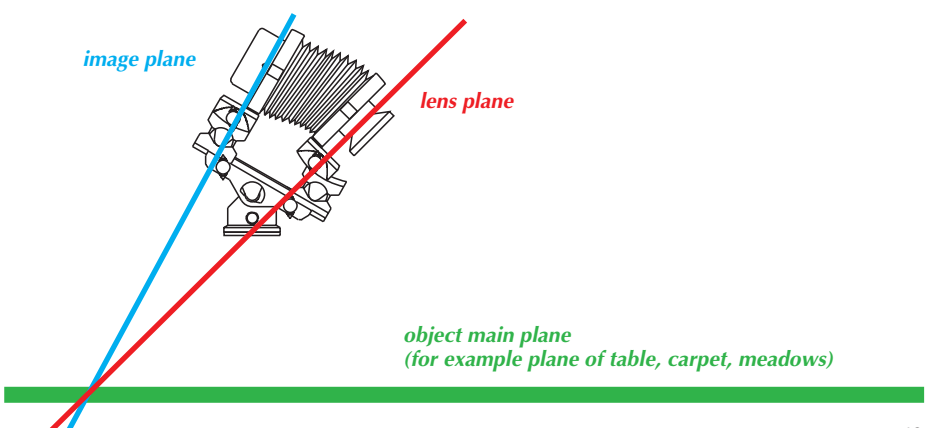
THE SCHEIMPFLUG RULE

To provide sharp focus over the entire picture when main object plane is at an angle to the camera, the object main plane, the lens plane and the image plane must intersect in one common line.

This rule can be applied by swinging the groundglass or (and) the lens standard. Scheimpflug by swinging the lens standard does not alter the given perspective "consuming" however much of the image circle (limits of the adjustment possibilities). Groundglass-Scheimpflug exaggerates the perspective rendition but "saves" image circle.

PRACTICAL PROCEDURE

Before starting with any Scheimpflug adjustments, the plane of sharp focus running from the near to the far object point should be determined. The most simple application can be found with two dimensional objects, such as plane of table, carpet, meadows or wall: the main object plane has a certain angle to the image plane. First determine one near object point and one far object point of the object plane. Near and far object point should be seen on the opposite side of the groundglass. The amount and direction to any camera adjustment required to fulfill the Scheimpflug condition can easily be determined by looking at the camera and the subject from the side. It will be seen that the more distant objects in the infinity range (buildings) require relatively small adjustments of a few degrees which will steadily increase with closer focusing distances. In extreme close-up work, with reproduction ratios between 1:4 and natural size 1:1, the amount of swings or tilts needed will often require the adjustments of both the front and the rear standard (for instance small table-top subjects, tools, electronic components and assemblies etc.).



DISPLACEMENTS, WHERE?

The M 679 with its highly practical centre rotation of the lens standard, also allows direct Scheimpflug adjustments with the front simply by focusing to the near object point and swinging/tilting the lens standard until also the far object point comes into focus. As a result of the centre rotation, only a slight focus adjustment will become necessary.

DOUBLE SCHEIMPFLUG

There are many objects where the desired sharpness is in an oblique plane. In this case, both axis - the vertical and the horizontal axis - have to be swung.

First swing the horizontal or lateral axis, then swing around the vertical axis in order to avoid any yawing.

By swinging of the image and lens plane any desired focal plane can be achieved.

Displacement with rear standard:

+ *only slight focusing necessary*
+ *desired plus of perspective rendition*
+ *centre raise of the lens are used: positive for a clear quality of the image*
+ *extremely simple control of depth-of-field: turning axis always remains in focus*

– *distortions unavoidable*
– *rays do not meet the groundglass centrally thus complicating the viewing of the image*

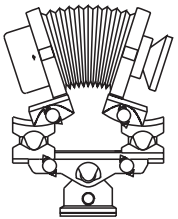
Displacement with the lens standard:

+ *no perspective distortion*
+ *easy viewing of the image on the groundglass*

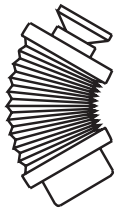
– *refocusing necessary during adjustments*
– *border rays of the lens will be used, i.e. the limit of the image circle is quickly reached. Vignetting is possible*

Utilizing the advantages of both procedures:

1. *Displacements with the rear standard - centre of groundglass remains in focus.*
2. *Angle value is transferred to lens standard (reduced by angle value of adjustment in per cent values), swing in opposite direction, refocus.*



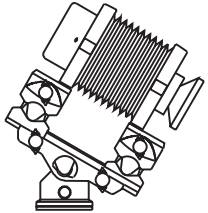
*Displacements with rear **and** lens standard: Tilting at the horizontal axis*



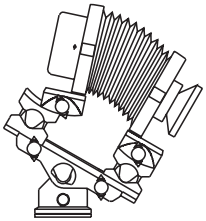
*Displacements with rear **and** lens standard: swinging around the vertical axis (illustration shows camera from above).*

PPRACTICAL EXAMPLE

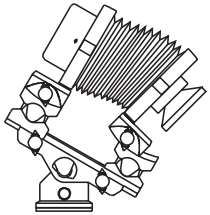
The design of the M 679cs permits turning and swinging of the lens in the principle point (focal length over 90 mm). Tilting and swinging of the groundglass is made exactly in the horizontal and vertical axis. This design therefore permits the easy use of the Scheimpflug rule (the example shows a typcial still life situation in the studio).
This systematic operation can, of course, be facilitated by starting to swing the lens standard. In this case, however, continue as refocusing is necessary.



1. Set the camera with the panorama bench-holder to the object. If possible focus an object point (M) on the groundglass axis (swinging axis) which should be in the desired focal plane.



2. Now, swing rear standard toward the expected direction until the near and far point become simultaneously sharp (N + F both in the desired plane). The Scheimpflug adjustment is made. The plane of sharpness runs from the foreground to the background. But the foreground is still distorted.

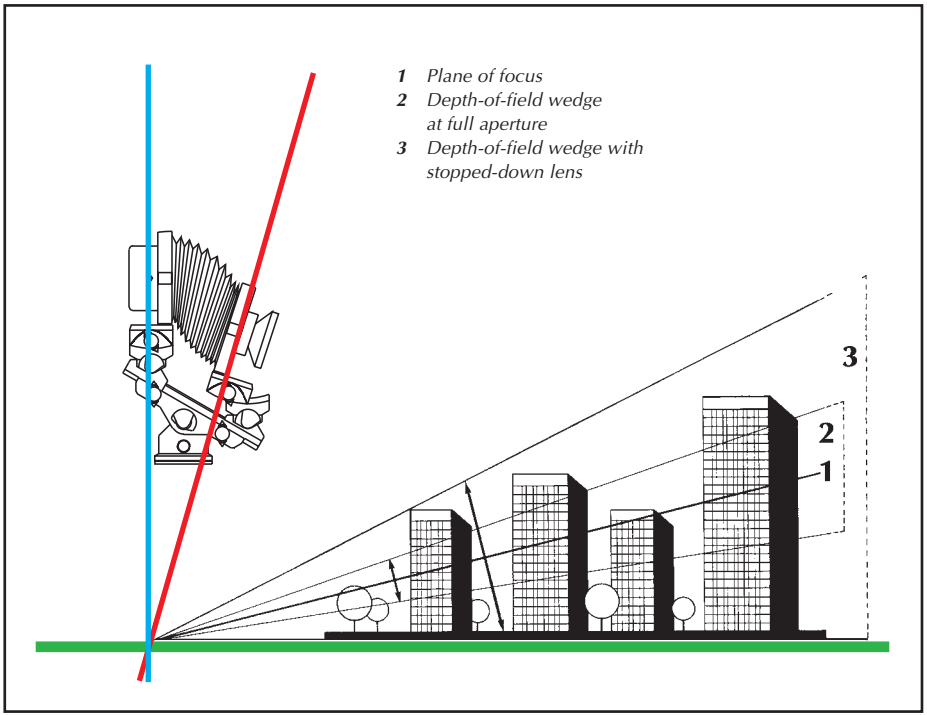


3. Whilst maintaining the perspective rendition the tilting angle of the rear standard is transferred to the lens standard reduced by the percentage of angle value. For example: the tilting angle of the rear standard is 18°, minus 18% of 18 (approximately 3), results into the required angle of the lens standard of 15°. The rear standard will then be reset to zero. Finally, refocus.

4.7. DEPTH-OF-FIELD WEDGE

Since the objects to be handled are normally 3-dimensional you have to use additionally a small lens aperture.

Example: The height of a building is the area of the required depth-of-field. In order to reach this position with the smallest possible lens aperture the focal plane is set in such a way that the object is intersected in the centre as the depth-of-field zone, which extends to either side of the plane of focus, increases uniformly. The area of the depth-of-field is like a wedge. This will become smaller when being nearer to the camera. Table-top shooting with increased depth-of-field necessitate placing flat objects near to the camera whereas higher objects should be placed in a more distant position of the camera. Most still lifes are typical examples.

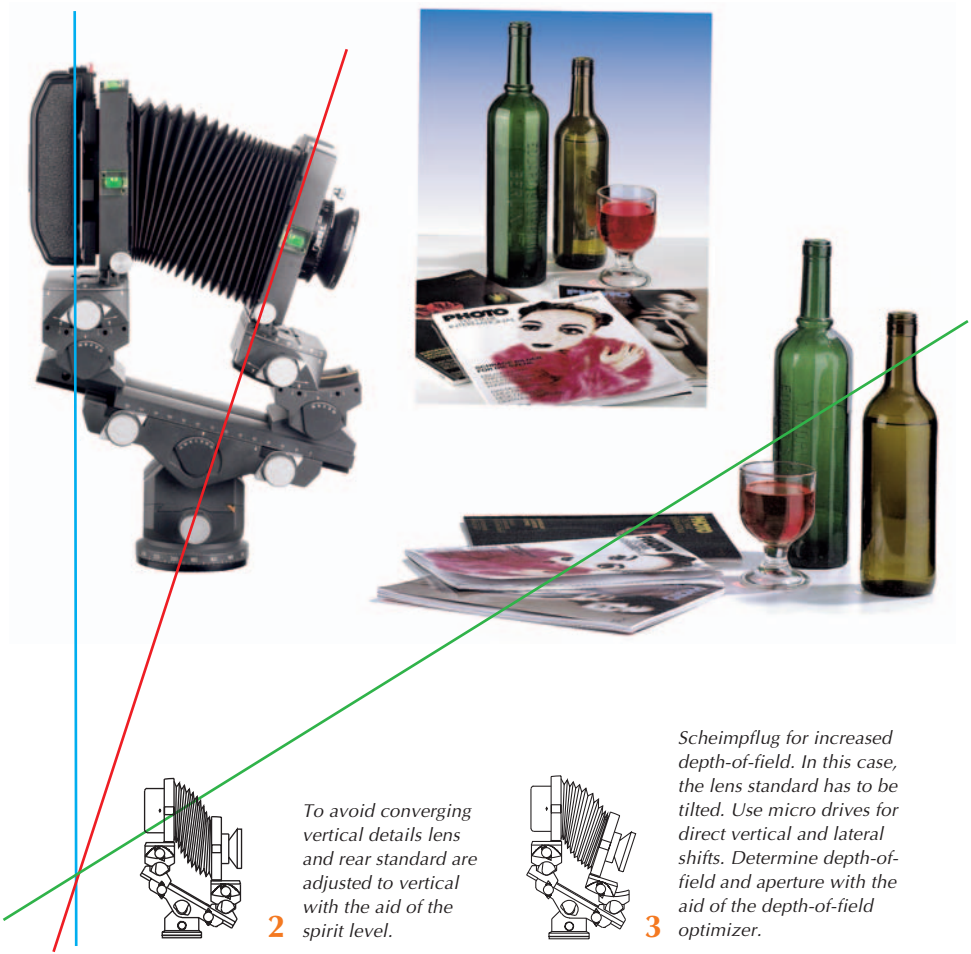


How to gain depth-of-field

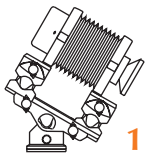
As the depth-of-field zone, which extends to either side of the plane of focus, increases uniformly when the lens is stopped down, it is important to adjust the camera in such a way that the plane of focus runs through the middle of the object. Since the depth-of-field increases at same aperture with increasing distance from the camera, a wedge type area for the sharpness is the result.

4.8. SUMMARY

1. Use Scheimpflug adjustments for depth-of-field control only for subjects which are in an oblique position to the camera from the near point to the far point.
2. Without stopping down only 2-dimensional subjects (carpets, walls etc.) will have an overall sharpness.
3. Scheimpflug adjustments are a logical way to control depth-of-field as long as there is one major and clearly defined plane of focus.
4. If overall sharpness over an expanded 3-dimensional space without clearly defined sharpness planes is required, this can only be achieved in the conventional way through a correspondingly small lens aperture as determined by a suitable depth-of-field calculator.



Typical studio situation



1 *With the aid of the integrated panorama tilt head the camera is set to the object.*

2 *To avoid converging vertical details lens and rear standard are adjusted to vertical with the aid of the spirit level.*

3 *Scheimpflug for increased depth-of-field. In this case, the lens standard has to be tilted. Use micro drives for direct vertical and lateral shifts. Determine depth-of-field and aperture with the aid of the depth-of-field optimizer.*

4.9. DEPTH-OF-FIELD AND DEPTH-OF-FIELD OPTIMIZER

Generally speaking, only one plane can remain sharp. Everything behind or before becomes increasingly unsharp. The area the photographer is not visualizing this sharpness is called depth-of-field. This depth-of-field is based on the following factors:

1. **Reproduction range.**
   The smaller the reproduction range, the larger the depth-of-field area.
2. **Stopped-down lens.**
   The more the lens is stopped down, the larger is the depth-of-field.
   Please observe that the physically given defraction of the lenses result into a decrease of the lens performance. Therefore, never stop down too much if unnecessary.

The general rule for the ideal point of focus with a desirable depth-of-field zone is: Focus on 50% of the difference of the camera extension, i.e. on the middle between near and far point focusing of the camera.

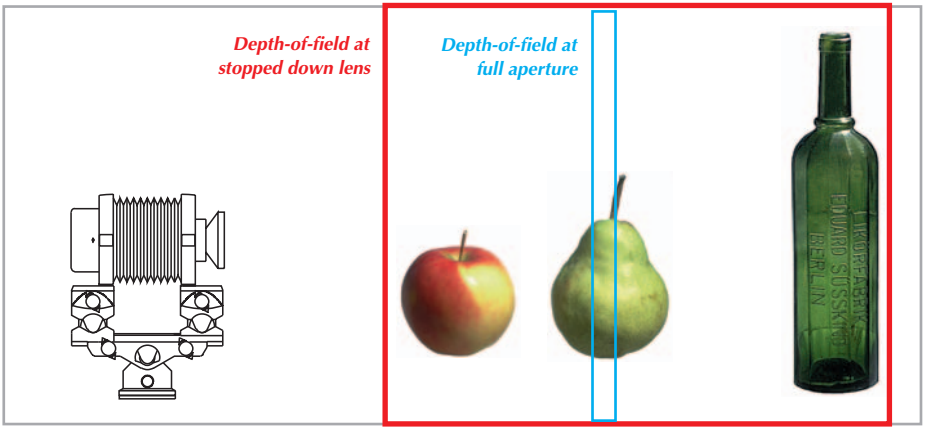
Depth-of-field optimizer

The M 679cs offers an integrated depth-of-field optimizer. For the depth-of-field optimizer, interchangeable format dials are available:

- Format dial 3x3 for digital backs, chip size from 24x26 to 37x49 mm
- Format dial 6x7 for formats 6x6 – 6x8 cm (included in camera price)
- Format dial 6x9 cm

If the optical bench is tilted more than 20° the calculated aperture value can be reduced by 1/3 f/stop.

If the depth-of-field requirements result in an excessively large extension difference, try to reduce the distance by re-arranging the depth-of-field zone using Scheimpflug adjustments. Sometimes it is necessary to increase the taking distance to eliminate or reduce depth-of-field problems.



When stopping down a non-displaced camera the depth-of-field increases more in the background than in the foreground depending on distance and aperture.