Info 26

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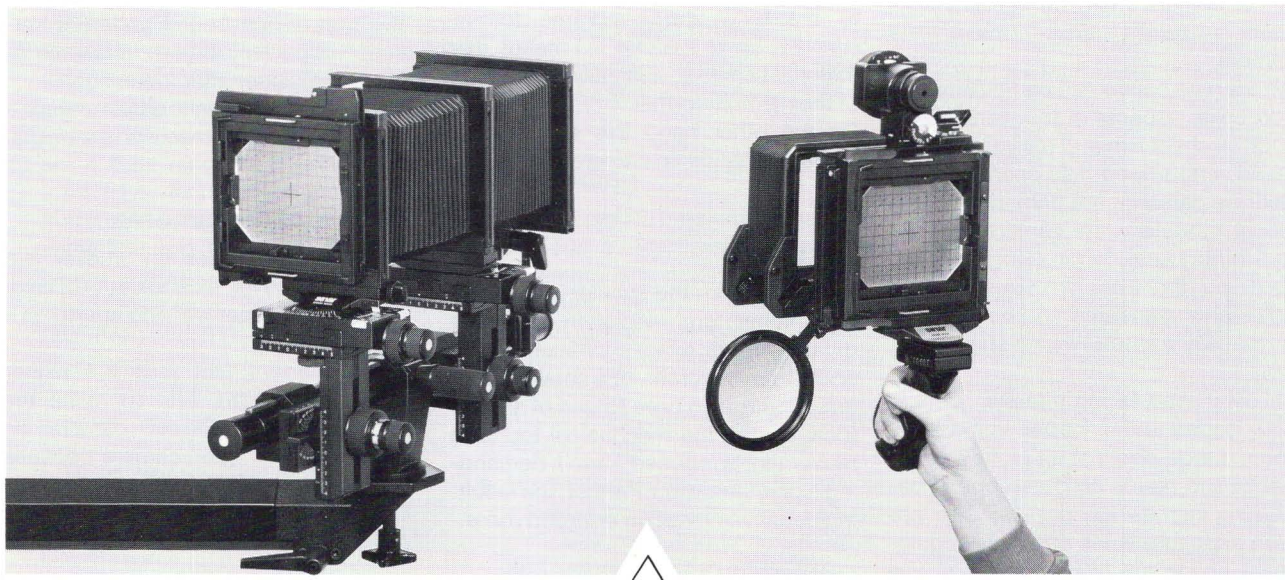
Borderline aspects of the bellows camera

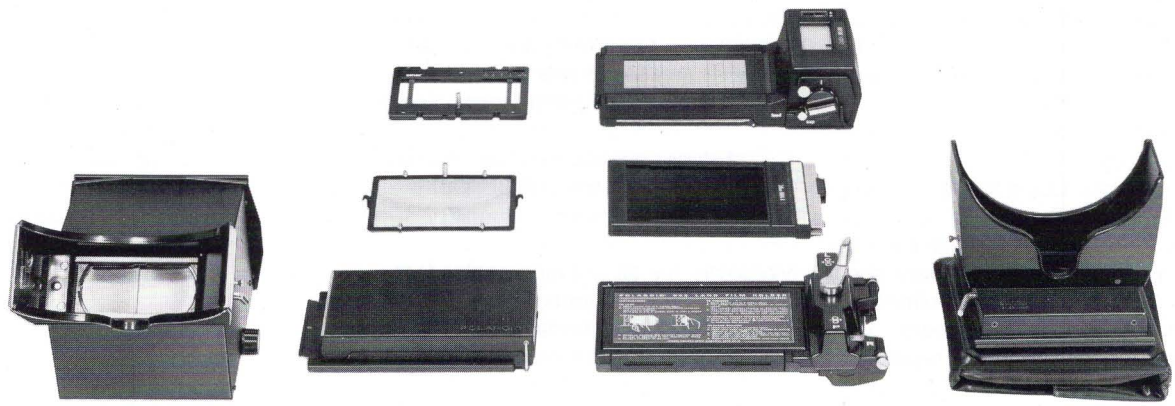
by Carl Koch sen., master of photography

On stand
Large format up to 8×10″

Hand-held/on stand
SINAR handy 4×5″ and rollfilms
4.5×6, 6×6, 6×7, 6×9 and 6×12 cm

Dual format 4×5″





Standard accessories:

- Viewing aids, also to turn the image upright
- Fresnel lens and rollfilm-format frames 4.5×6 cm up to the panorama format 6×12 cm
- Holders for sheet films, rollfilms and polaroid material
- Filter holders and viewfinder

Stand/hand camera

This article addresses professionals – photographers who most of the time take pictures for clients rather than for their own pleasure.
That distinction is significant also for those who design professional cameras. While the amateur can photograph as the spirit moves him, the professional must cope with whatever comes his way. Hence the professional camera must be similarly versatile, especially a large-format or view camera.
We are here concerned particularly with borderline aspects of that versatility – such as sheet film and rollfilm use, and stand versus hand-held operation.
Bellows cameras are primarily professional modular view cameras for the 4×5 in./9×12 cm, 5×7 in./13×18 cm and 8×10 in./18×24 cm film sizes. With its adjustable standards and bellows this is normally a studio-bound stand camera.
The preferred taking material is sheet film, loaded and unloaded in the darkroom. Large-size instant picture material (which needs no darkroom) is becoming increasingly popular. The longish exposure times and heavy equipment oblige the photographer to use this camera type on a stand. So does the need for changing film holders between focusing and exposure without upsetting delicate camera adjustments such as perspective control and/or sharpness distribution in inclined planes (Scheimpflug).
A generation or two ago manufacturers tried to scale down this view camera to rollfilm formats. Using the same configuration with bellows and full movements of the standards, such cameras thus switched from customary sheet film to more easily handled rollfilm.
Significantly, these compact view cameras did not manage to replace the larger models or indeed to slow down their growing popularity. Let us look at the reasons.

Rollfilm characteristics

The greater resolution of rollfilms (up to 100 line pairs/mm) makes smaller picture formats utilisable.
With suitable cameras higher film speed (up to ISO 400/27°) in turn allows mobility and hand held camera application.
The wide range of rollfilm picture sizes, from 4.5×6 through 6×6, 6×7, 6×9 to the 6×12 cm panorama format (1¾×2¼ up to 2¼×4½ in.) makes this material versatile, and calls for the use of the medium format.
On the other hand this also makes higher demands on camera precision.

Focusing

To benefit from the smaller image size and higher film resolution, focusing must be more exact – difficult on the scaled-down screen of a smaller camera. As this also uses lenses of shorter focal length, the mechanical focusing movement is reduced – again demanding higher precision. Further, the resulting negatives must be enlarged more.

View camera movements

The fully adjustable view camera has two separate standards, each with five movements (two swing and tilt joints, two shift joints and one fine focusing drive – a total of 10 interfaces). Even with best possible workmanship the scaled-down adjustable view camera cannot overcome the problems of the separate standards and their 10 mechanical connections.
Moreover, the tilt or swing angles (e.g. for sharpness distribution control) become smaller with shorter focal lengths (and shorter camera extensions) and call for still greater focusing accuracy on the smaller screen. So we obviously have tolerance problems.
The scaled-down bellows camera with full movements is thus approaching usability limits.

Still a stand camera

With this camera you still have to observe the image on the focusing screen while adjusting the camera settings. Hence the smaller view camera remains as tripod-bound as larger versions – especially as you still have to insert a film holder after focusing.
A finder system might ease matters – but does not affect precision problems.

More mobile cameras

Shorter-focus lenses on smaller film formats, however, extend depth of field. You can use larger working apertures – often a real gain.
This important fact plus the higher speed of rollfilms help to make the handy medium format camera as popular as the stand camera because of extended mobility.
Larger lens apertures on the other hand again increase precision requirements in camera construction.

What the market wants

Despite the limitations discussed (mechanical tolerance and restriction to tripod use) the market still wants a more mobile and compact medium-format professional camera. The specifications below show how this could be met.

Specifications for a professional medium-format rollfilm camera based on the above considerations (SINAR handy)

Applications

1. Dual use as a stand and hand camera (in the studio and on location).
2. Dual use of sheet film and rollfilm (4×5 in. and rollfilm sizes).

Design features

3. Sweeping reduction of the ten camera adjustments to two (one shift and one focusing movement) and elimination of the two separate camera standards. These are of course the interfaces subject to mechanical tolerances in the view camera with movements. The aim was to achieve a sufficiently precise and rigid camera body to match the high resolution of type 120 and type 220 rollfilm.
4. Universal lens board with built-in direct shift.
5. Lenses with helical focusing mount of increased extension for a wide focusing range.
6. Screen and/or finder viewing.
7. Screen focusing with optical aids.
8. Versatile in application yet relatively compact camera body.

This is not a new list of requirements. Existing 6×7 cm to 4×5 in. rollfilm cameras with shift lenses meet at least some of these points.
But there remain shortcomings in terms of professional application, especially relating to items 1 to 3 and 8 of the above specifications. These, too, must be satisfied.

Item (1):
The dual 4×5 in. format

Where a 4×5 in. hand camera uses the same picture size as a fully adjustable 4×5 in. view camera, we have a complete dual-function hand and stand camera. Even the camera back with its viewing aids remains the same (see illustration).

Without needing a special camera, this further includes the useful 6×12 cm rollfilm panorama size – hence a full range. The dual-function 4×5 in. format also provides the alternatives of tripod use in the studio and hand-held shooting out of doors.

Item (2):
Dual rollfilm and sheet film use

A choice of both film types in one and the same camera back in a stand and in a hand camera is another multifunction aspect – in economy and versatility. (Dual film types hardly affect the bulk weight of the camera.)

Item (3):
Reducing mechanical tolerances

- The rigid precision body (as in a rollfilm camera) has just a single direct shift* of the lens board, switchable from upright to horizontal for two directions.
- An extended focusing range is available directly on the lens.

Item (8):
Compactness and versatility

At first sight making a medium-format camera compact with a rigid body appears to reduce the extension of this design.

In fact a selection of focal lengths from 47 mm to 120 mm is realistic and needs no bulky lens mounting assembly. For our compact medium-format camera this focal length range also covers a range of reproduction scales of about 1:2.5. With faster rollfilms and larger working apertures, made possible by the rigid construction, most exposures can then be hand-held. So we have a more mobile camera, still with a lens shift and high resolution (up to 100 line pairs/mm). But that is not all...

* For more exact focusing this scaled-down camera does without the swings and tilts. Sharpness distribution control with swings and tilts is in any case more appropriate to the large-format stand camera with longer camera extension and greater swing and tilt angles that are easier to set exactly while you view the image on a large focusing screen.

Image sharpness is obviously not determined by the best but by the poorest link of tolerance.

The high resolution of type 120 and 220 rollfilms (up to 100 line pairs/mm) also permits appropriate enlargement of the image. Further, as the rollfilm is a continuous length it can accommodate frame sizes from 4.5×6 cm through 6×6, 6×7, 6×9 and up to 6×12 cm. In special cases even longer image sizes are possible.

For professional photography, rollfilm ideally complements larger-format sheet film. The nominal frame length of 12 cm is the perfect interface between the film types, as it covers 6×12 cm on the one hand and 4×5 in. on the other.

In terms of camera design, any 4×5 in. view camera will take rollfilm in suitable rollfilm magazines. However, smaller image sizes not only call for the higher rollfilm resolution but also matching high precision of the focusing, swing and tilt adjustments for a consistently high standard of definition (final image sharpness always depends on the weakest link).

The fully adjustable view camera has at least 10 movement interfaces. Inevitably these introduce mechanical tolerances that set limits to scaling down of a camera. The same applies to focusing aids – especially to the use of tilts and swings for sharpness distribution control in inclined planes (Scheimpflug). For the shorter the camera extension, the smaller the angles of inclination and the more difficult they are to set accurately.

The solution presented here fully utilizes rollfilm advantages (including the handiness of smaller image sizes) yet maintains maximum definition by reducing mechanical camera tolerances.

The five-format SINAR-vario rollfilm holder

Rollfilm can not only cover a range of production scales with different focal lengths. It also offers a choice of different image formats ranging from 4.5×6 cm through 6×6, 6×7, 6×9 and up to the panoramic 6×12 cm size (1¾×2¼ in. up to 2¼×4½ in.). If we include 4×5 in. sheet film, we have a further doubling of an image scale range, for instance from 6×9 cm to 4×5 in. (or from 4.5×6 to 6×9 cm). With the 1:2.5 ratio of interchangeable focal lengths (above) the compact camera then covers a total range of image scales of 2.5×2=1:5. In terms of focal lengths that would cover a range from 47 mm to some 230 mm. If we include the entire image size range of the camera from 4.5×6 cm up to 6×12 cm and 4×5 in., the ratio even becomes 1:10 (analogous to focal lengths from 47 mm to 470 mm).
Relevant to definition and resolution is also the fact that when you extend the film format up to 6×12 cm or 4×5 in., the scale of reproduction of the lens used remains constant. In other words, as the image area increases you still maintain the same high resolution.

Focusing aids

Obviously focusing such an optimised camera type also requires suitable focusing aids.
Thus the traditional black cloth (of doubtful value anyway) is no longer adequate for accurately focusing the small screen image. We need at least magnifying viewing aids that cut off any stray light – preferably a binocular viewing aid with mirror to turn the image upright. These aids are still available with the standard 4×5 in. camera back, for instance taken over in the case of the SINAR from the bigger 4×5 in. camera version. This, too, is not only a practical but an economically sensible linkup.

Lens hood and filters

These important accessories remain the same as for the larger view camera.

Viewfinding

The more mobile medium-format camera needs a direct-vision viewfinder. The camera is normally used with the film holder already in place and focused in familiar fashion by the helical lens mount, using distance and depth of field scales.
To match the scope of the camera, the accessory finder must, however:

- Have an adjustable mask to cover all rollfilm formats from 4.5×6 through 6×6, 6×7, 6×9 and 6×12 cm up to and including 4×5 in. sheet film;
- Cover a focal length range of lenses from 47 mm to 120 mm;
- Provide parallax correction;
- Allow for the lens shift;
- The same finder should also be capable of being mounted on the view camera, for instance for a final check of the field of view. Further, it is useful as a subject finder, for instance to select the optimum focal length before setting up the camera.

The panorama format

Far too few people are familiar with the possibilities of the 6×12 cm panoramic image for upright shots. For this is a useful alternative to extended shifts, e.g. in views of tall buildings without converging verticals or for product shots (in catalogue illustrations) seen from above, again without converging verticals.
For such shots keep the camera upright (with the edge of the object parallel with the frame edge in the finder) and expose normally. The shift effect is introduced afterwards, by enlarging only the required portion of the image.
The camera described here is available from stock – it is the SINAR handy.
Also available are SINAR rollfilm holders for the 6×7, 6×9 and 6×12 cm (panorama) formats – for pushing in without removal of the focusing screen – and the SINAR-vario multiformat rollfilm holder (preset when loading the film) for 4.5×6, 6×6, 6×7, 6×9 and 6×12 cm images (1¾×2¼, 2¼×2¼, 2¼×2¾, 2¼×3¼ and 2¼×4½ in.).
All SINAR rollfilm holders take type 120 and 220 films and include provision for imprinting a copyright mark. The films are preloaded in special cartridges. SINAR rollfilm holders keep the film flat with minimum set, and are instantly ready for insertion in the magazine.

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