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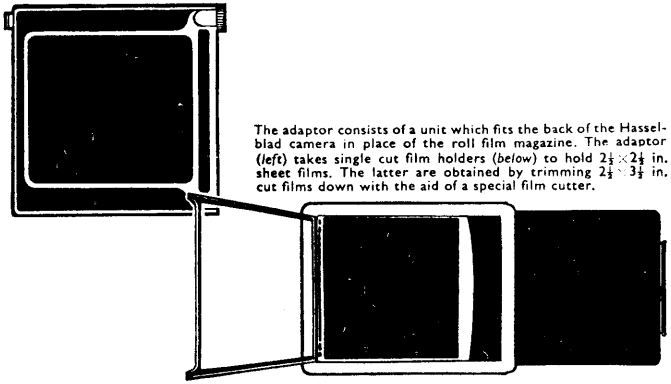
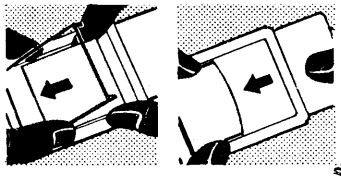
THE CUT FILM ADAPTOR

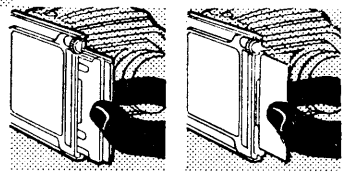


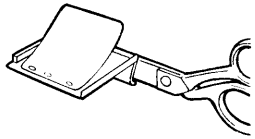
The adaptor consists of a unit which fits the back of the Hasselblad camera in place of the roll film magazine. The adaptor (*left*) takes single cut film holders (*below*) to hold $2\frac{1}{4} \times 2\frac{1}{4}$ in. sheet films. The latter are obtained by trimming $2\frac{1}{4} \times 3\frac{1}{4}$ in. cut films down with the aid of a special film cutter.



To load the cut film holder place the trimmed sheet of film below the film frame (*left*), fold down the latter and push in the sheath (*right*). This must be done in total darkness.

Push the cut film holder into the adaptor from the side (*left*), then withdraw the sheath ready for exposure (*right*). After the exposure replace the sheath before removing the film holder.





The film cutter cuts down $2\frac{1}{4} \times 3\frac{1}{4}$ in. sheet films to $2\frac{1}{4} \times 2\frac{1}{4}$ in. To trim the film, push it under the cover guard so it touches the stop pins. Then trim the film with the built-in scissor blades. This also must be done in total darkness.

If the backing plate is removed by sliding it away from the film frame, plates can also be used. Insert plates in the same way as the film.

Attaching the Adapter to the Camera

Fit the back to the camera in the same way as the roll film magazine. Push the holder into position on the camera back until it gets blocked by the lock which moves automatically aside. Pull out the sheath completely. You can now expose the film.

After exposing, re-insert the sheath.

The sheet film holder lock prevents the back from being fitted to or removed from the camera when the sheet film holder is in position. The holder fulfils here the same function as the roll film magazine sheath: you cannot release the shutter until the sheath has been withdrawn completely. The holder remains locked in the adapter as long as the sheath is pulled out.

The red knob on the handle of the sheath can be used as an exposure signal.

Polaroid Back for the Hasselblad 500C

This adaptor can be attached to the camera in place of the Hasselblad magazine. The standard 107 black and white or 108 colour pack can be used to provide 8 pictures, the picture size remaining $2\frac{1}{4} \times 2\frac{1}{4}$ in. This back offers a finished print in 15 seconds and is also useful as a check of picture quality, depth of field and lighting.

Command Unit

This unit is intended for simultaneously exposing up to four cameras to release with the same impulse signal. It is operated by a battery in one of the connected cameras. Exposure can be made by impulse signal, cable, timer or radio.

Underwater Equipment

A range of underwater cases has been designed for Hasselblad cameras. A case for the 500C with prism finder and another for the Super Wide C with viewfinder clamp are available.

(*continued from page 24 before the green page section*)

6. Reset the exposure-counter to 1.
7. Expose another 12 frames (until stop).

Magazine Serial No: 64400-

1. Thread the film in the usual manner on to the Hasselblad spool-holder. The protecting paper is drawn forward so that the dotted line comes to the centre of the receiving spool.
2. After the spool-holder is inserted in the magazine, set the exposure-counter to 1.
3. Wind the film forwards 9 complete turns (18 half-turns) or until the frame number 7 appears in the exposure-counter window.
4. Reset the exposure-counter to 1.
5. Expose 12 frames (until stop).
6. Reset the exposure-counter to 1.
7. Expose another 12 frames (until stop).

Loading in accordance with the above gives relatively good spacing results throughout. In older magazines, up to Serial No. 64399 it must be expected that certain frames, especially in the film-section 8-12 might overlap by a few millimetres. But spacing is better in the later magazines.

Magazines 16 and 16S which have manufacturing numbers below 204.200 should be loaded in accordance with the instructions according to magazines of Serial Nos. 20000–64399; from manufacturing number 204.200 and above as for Serial Nos. 64400 and above; reset the exposure-counter after 16 exposures have been made.

FILMS AND FILTERS

The film used in the Hasselblad is the standard size 120 roll film. It gives 12 exposures $2\frac{1}{4}\times2\frac{1}{4}$ in. (6×6 cm.) in the standard film magazine. In the special 16-exposure magazine the same film produces 16 pictures $1\frac{5}{8}\times2\frac{1}{4}$ in. (4.5×6 cm.) and in the 16S magazine it is used for 16 pictures 2×2 in. (5×5 cm.). For use of '220' film, see page 23.

The sheet film adapter permits single exposures on sheet film (● ●). A wide range of emulsions is available.

Black-and-white Film

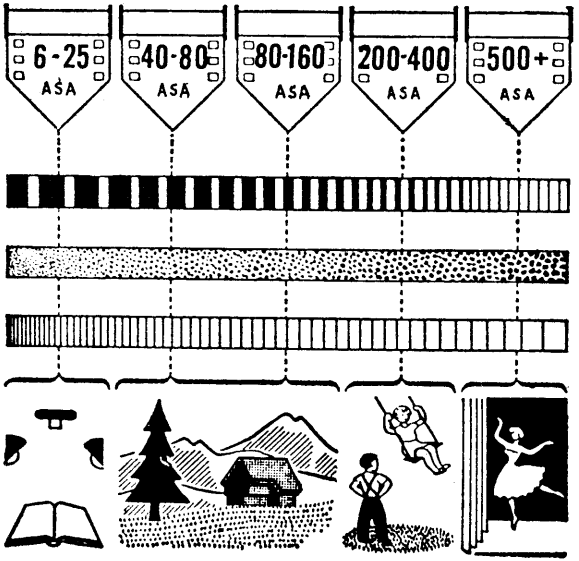
This produces a negative in which the colours and brightness range of the subject are translated into black and white. From it, prints or enlargements on paper or black-and-white transparencies can be made.

The black-and-white film used normally is panchromatic; that means that it is sensitive to all colours. A few emulsions still on the market are orthochromatic, i.e., not sensitive to red. There is a choice of several types differing mainly in sensitivity as well as certain other characteristics.

SLOW FILMS are of low sensitivity, requiring comparatively great exposure. Their main advantage is the extremely fine grain, permitting a high degree of enlargement without its granular structure becoming unpleasantly visible. Such films also yield images of the greatest sharpness. On the other hand, these slow films are not very suitable for coping with fast movement in other than exceptionally good lighting, nor for general work in poor light. Such films are rated at 40–80 ASA or 17–20 DIN.

MEDIUM SPEED FILMS still yield a reasonably fine grain with good gradation. They are the most suitable material for all-round photography, other than in poor light. These films are rated at 100–160 ASA or 21–23 DIN.

FAST FILMS with somewhat coarser grain (still acceptable for reasonable degrees of enlargement) will cope with most light conditions including poor light and interiors in



Generally speaking, low speed goes with greatest contrast, finest grain, and highest resolving power, and vice versa. The film speed in the *top row* points to the corresponding contrasts, grain and resolving power. The contrast row (*from left to right*) shows how high contrast becomes medium and low with the faster films. The grain row shows (*from left to right*) how fine grain becomes progressively coarser with increasing speed, while the resolving power row indicates the gradual decrease in maximum resolution with the fastest films. The bottom row indicates the type of subject for which films of the various speeds are best; copying (special document films), general views and pictures of people (fine grain and medium speed films), high-speed action (high-speed films) and poor light conditions (ultra-speed films).

favourable conditions. This is the right film for the photographer who wants to be prepared for the unusual, to arrest fast movement with high shutter speeds, and to take shots in poor light. The speeds are 200–400 ASA or 24–27 DIN.

ULTRA FAST FILMS are primarily intended for high-speed sports shots in dull weather, interior snapshots in poor light, night photography and ill-lit stage pictures. These films are specialist types for conditions where normal materials are totally inadequate. The high speed is achieved at some cost in definition and graininess. Speed ratings range from 500–1,300 ASA or 28–32 DIN.

The above speed figures are based on the latest ASA Standard for film speeds (and on the BS and DIN Standards under revision). These figures, when used on the exposure meter, give minimum correct exposures, to make the most of the versatility of the film and of the image quality. They are also the figures quoted by most film manufacturers. Sometimes films are, however, still rated according to earlier standards which, in effect, incorporated a generous safety factor against underexposure—by the simple process of overexposing films about 100 per cent (well within the exposure latitude of most black-and-white films). So you may come across films apparently only half as fast as others of similar type, because of this difference in ratings. The table on page 68 indicates the current film speeds to be used with the exposure meter, even if the film packing gives a lower rating.

This applies to *black-and-white negative* materials only; speed rating methods have not changed for colour films.

There is a wide range of different makes of films in all speeds on the market. Their characteristics, apart from speed, vary slightly from make to make. It is safe to say that all well-known brands are reliable and good. The best film is the one you are used to. Professional photographers and advanced amateurs may find one or the other characteristic of a particular make, i.e., its gradation, granular structure, acutance, etc., of particular value for specific jobs.

Colour Film

These films produce an image in colour after appropriate processing, corresponding directly or indirectly to the natural colours of the subject. From the practical point of view, colour film is as easy to use as black-and-white film,

but needs a little more care in exposure. Processing is more complex and is often carried out by the film maker or specially appointed processing laboratories.

There are two types of colour film: reversal and negative.

Colour Reversal Film

This produces a colour transparency on the actual film exposed in the camera. This transparency held up to the light shows a positive image with all parts of the subject in their original colours. It can be viewed in a suitable transparency viewer with a magnifier or it can be projected in a slide projector to give a large picture on a screen.

There is little doubt that the projected image is the most natural and best for showing colour.

Although the colour transparency is an end product, it can still be used to make:

(*a*) duplicate positive colour transparencies,
(*b*) a black-and-white negative which can then be used to produce black-and-white prints or enlargements,
(*c*) a colour negative for making colour prints and enlargements, as from colour negative film (described below),
(*d*) direct colour enlargements on colour reversal paper.

Colour prints on paper invariably show a loss of colour quality as compared with the original positive transparency.

For correct colour rendering, colour reversal films have to be carefully matched to the light by which they are to be exposed. Accordingly, most makes are available in two or more of the following types:

(*a*) daylight colour film which will give correct colour reproduction in daylight or with blue-tinted flash bulbs,
(*b*) artificial light type colour film which will give correct rendering by photoflood or tungsten illumination,
(*c*) flash type colour film (type F) which will give correct rendering with the normal clear flash bulbs.

Colour films made for one kind of light may often be used under different light conditions with the aid of a conversion filter as recommended by the manufacturer.

Different makes of colour film may yield transparencies of a slightly different characteristic colour quality, colour saturation and colour contrast. Which you prefer is very much a matter of personal taste.

Colour Negative Film

On processing, this produces a colour negative which shows a negative image of the subject in its complementary colours, e.g. blue appears yellow, red appears blue-green and so on. These colours may sometimes be hidden under an overall orange or reddish tint.

The main purpose of the colour negative is the production of colour prints on paper. The quality is generally higher than that obtained from a positive transparency.

From the colour negative you can make:

(*a*) any number of colour prints in varying sizes,
(*b*) direct black-and-white prints or enlargements, in the same way as from a black-and-white negative,
(*c*) positive colour transparencies for viewing or projection.

Colour negative films are mostly suitable for exposure by any type of light, e.g. daylight, flash or photofloods. The necessary adjustment of the colour rendering is carried out during the printing stage. Manufacturers sometimes recommend conversion filters even with colour negative films. These mainly serve to simplify the subsequent correction needed in printing.

Colour Film Speeds

The majority of colour films, reversal and negative, are rated between 25 and 64 ASA or 15 to 19 DIN, corresponding to a slow to medium speed for black-and-white material. A few films go up to 160 ASA or more for poor light conditions.

As with black-and-white films, the slower types tend to yield improved image detail, especially with negative colour film, while the fastest emulsions may show slightly reduced colour saturation and image sharpness.

The Choice of Colour Film

Making your choice between colour reversal or negative film (in spite of the various uses that can be made of either type of material) remains an individual question.

First there is the way you want to see the result, as a colour print or as a colour transparency. The print has no doubt much to commend itself. It is easily shown, stored and carried about. The transparency calls for the aid of a viewer or projector.

Next, the cost of a colour print is about three times that of the transparency. This may at times be mitigated by the fact that from unsuitable negatives no colour prints need or can be made. The transparency user, however, has additional outlay in the form of a viewer or projector with screen (in most cases both).

A final point to consider is the quality. The transparency will record each colour and its brilliance in full. Held to the light or projected on a screen, the brightness range, which may be 100 : 1, is fully or almost fully retained. It shows colours brilliant with great depth and realism. The colour print can at its best only reflect four-fifths of the light falling on it and even the darkest tones reflect about one-twentieth to one-tenth, so that the full range is no more than 16 : 1. While the colour print is, by necessity, duller than the transparency, it is only fair to say that the eye soon adjusts itself to the reduced brightness range, and subjects without great contrasts will be very satisfying.

From the point of view of convenience, reversal film has the advantage that it directly gives finished colour pictures of high quality and is still capable of producing colour prints.

For the maximum versatility and control in print making, however, negative film is superior.

Filters for Black-and-white Film

By its nature, a black-and-white film can only translate colour values of the subject into tones of lighter or darker grey. Mostly these correspond fairly closely to the brightness of the colours, but do not, of course, differentiate between

them. In certain cases the difference between the brightness of two colours may be so slight that both record in almost the same tone of grey.

There a filter helps by modifying the depth of one or the other colour, and so making it show up lighter or darker than it would normally.

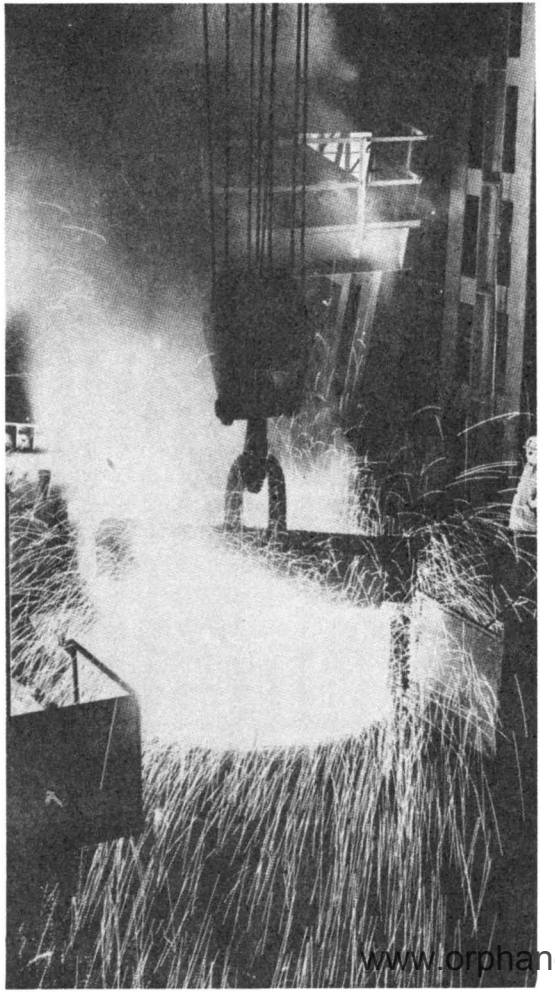
The commonest example is the blue sky in a landscape, with white clouds. The blue is so brilliant (and the film is often excessively sensitive to it) that the clouds do not show up against it. By putting a yellow filter in front of the camera lens we can subdue or "hold back" the blue, so making it record darker in the final print. We can even go further and over-emphasize the effect progressively with an orange or red filter; these darken the blue so much that the sky looks almost black for a really dramatic effect.

The same considerations hold for other filter effects. For instance, the film renders a red rose in the same tone of grey as the green leaves of the rose bush. With the colour contrast gone, the rose disappears in its surroundings. A green filter makes the rose darker and the leaves lighter; conversely, a red filter will show up the rose as light against dark foliage. Scientifically, both filters falsify the tone rendering, but produce a more acceptable pictorial result.

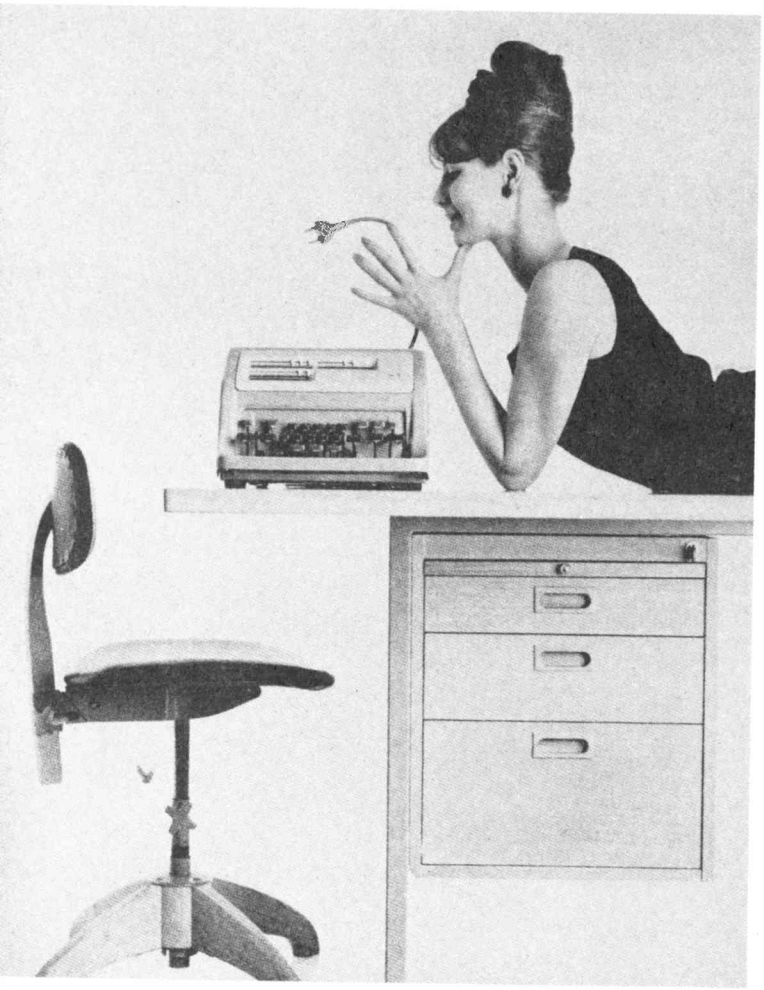
In all these cases a filter *lightens objects of its own colour, and darkens objects of its complementary colour.* Apart from isolated instances in pictorial photography, such contrast control is very valuable in copying and scientific work (e.g., photomicrography).

All filters cut out some part of the light and thus, as a compensation, an increase in exposure time is necessary when using them. This is stated on most filters in the form of a filter factor indicating by how much (e.g., 2 times, 3 times) the exposure must be increased with that filter. The factors are approximate for they depend not only on the nature of the filter but also on the exact colour sensitivity of the film and on the colour of the prevailing light.

With orthochromatic films the scope for control with filters is more limited, since the film is insensitive to the orange and red band of the

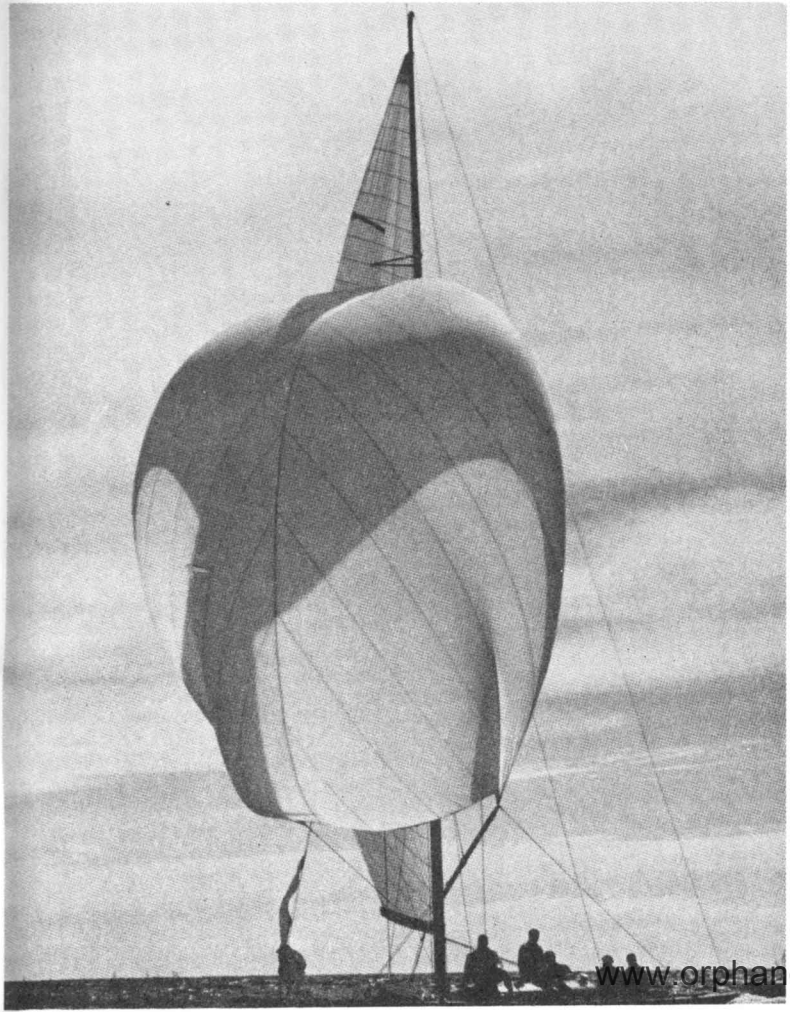


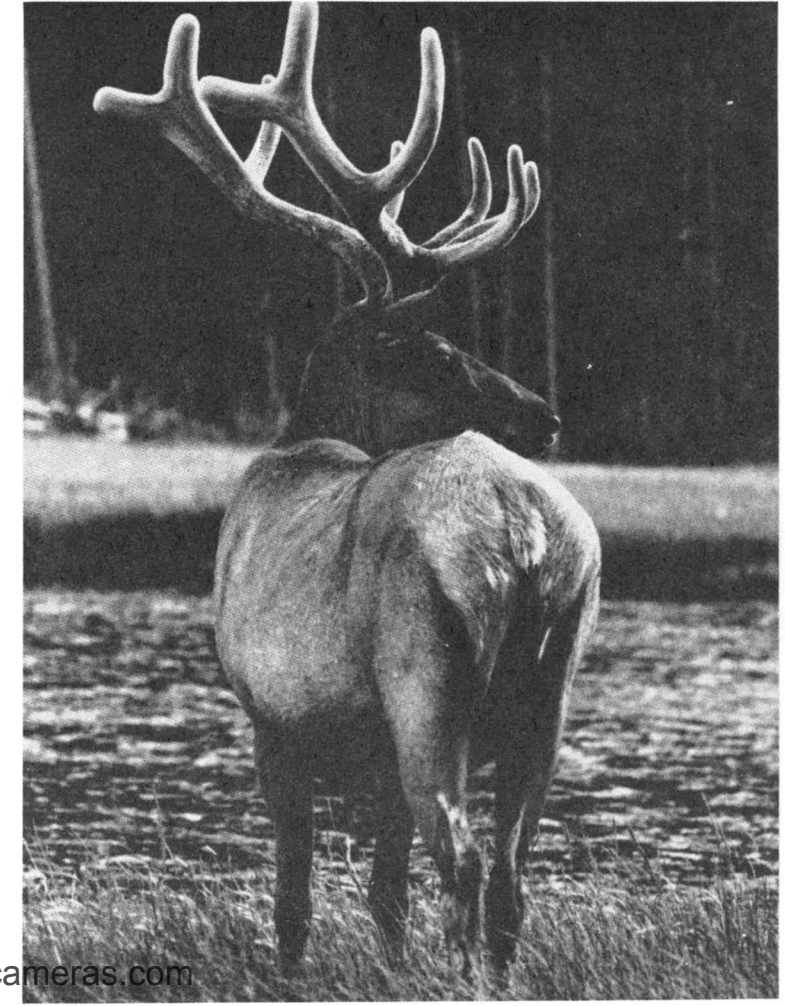
INDUSTRIAL SHOTS like this picture taken in a steel works, prove the versatility of the Hasselblad. Although this utilizes only a part of the film area, the wide angle of view to be covered from top to bottom makes the Hasselblad Super Wide particularly useful. All the prevailing light comes from the glowing steel and the sparks; this requires a comparatively slow shutter speed, which however adds a touch of deliberate movement blur by recording the flying sparks as lines of light.



WITH SPORTS and action subjects, especially where it is not easy to get close, the longer focal lengths are useful. The shot of the skating race (above) *was taken with the 500 mm. Tele-Tessar f8 from a viewpoint in the stands. For sailing pictures* (opposite) *the long reach of the tele lenses enables what would otherwise be a pin-point on the horizon to fill the frame.*—TAGE SKAR.

PORTRAITURE (page 34) *and advertising photography* (page 35) *are typical of the versatility of the Hasselblad in commercial work. The view on the reflex screen permits judging of the exact lighting effect—whether the aim is to bring out the wisps of cigarette smoke* (page 34) *or the more factual and almost shadowless illumination for the girl admiring her electric typewriter* (page 35).





CLOSE-UPS are equally jobs within the province of the commercial and advertising photographer. An arrangement of glassware like this (above) *would probably require only a low power Proxar supplementary lens; more elaborate accessories are available for macro-photography.*—TAGE SKAR.

WILD LIFE of shy animals like the elk (page 38) *and rare birds* (page 39) *needs a very cautious approach. Usually that also involves shooting from great distances—again with the long-focus lenses up to the 500 mm. Tele-Tessar.*—L. L. E. RUE and V. HASSELBLAD.

spectrum. Hence there is no point in controlling tones by blue or green filters, and no possibility of doing so by red and orange ones. Only yellow filters are of use with ortho films.

Filters for Colour Film

The normal yellow, orange and other filters for black-and-white film must never be used with colour films, as they would give the colour picture a strong overall colour tint.

In daylight and with daylight type film, only two filters are ever required. One is a haze filter, almost colourless but for a slight straw tinge. It is usefully employed on hazy days and in high altitudes to avoid excessive bluishness of the colour picture, especially with distant landscapes, seascapes and near water. This filter does not call for any change in exposure. On dull days a skylight filter compensates for the excessive coldness of the colour rendering.

Either filter is also useful for colour photography with electronic flash as it produces somewhat warmer tones.

Light balancing filters are used if a colour film balanced for one type of light should be used in another type of light.

The Polarizing Filter

There are times when the judicious use of reflections will enhance the pictorial effect of the picture, but they are also frequently obtrusive and undesirable. Thus highly-polished subjects are difficult to illuminate successfully so as to obtain a true photographic rendering, since they will reflect too much light and so spoil the reproduction with a glare which obscures the detail. This difficulty can be overcome by the use of the polarizing screen.

It has the special property of suppressing so-called "polarized" light. Light reflections from glass, china, enamel, polished wooden surfaces, water, to a large extent are polarized and can, therefore, be almost extinguished by placing the polarizing filter in the proper position over the lens. This screen will prove particularly useful when taking shop windows, furniture, wet objects, etc.

The effect of the polarizing filter depends on its orientation in front of the lens, and changes as you rotate the filter. The Hasselblad is ideal for observing this. Simply mount the filter on the lens and rotate it in its mount while watching the image on the viewing screen. As the polarizing filter is slightly tinted, the exposure time should be increased, the factor being about two times (= −1 exposure value).

EXPOSURE

Exposure means—to expose the film in your camera to light. The dose of light any film needs to produce the right sort of image depends on how sensitive that film is to light. A fast film is more sensitive than a slow film.

Once your choice of film is settled, the basic condition of exposure is settled with it. You are now left with the problem of scaling the light you find in front of your camera to the amount your film needs.

Your job is to judge the light reflected from the subject you are about to photograph. Your grandfather as an amateur photographer used to take into account his geographical position, the time of the year, the hour of the day, the state of the sky as well as the tone of the subject itself, and by so adding one thing to another size up the light reflected from the subject. The experienced professional, of course, hardly ever worked that way. He just had a look and he knew.

Today a light meter or exposure meter does the same for any photographer. It takes a look, it measures the light and it lets you know.

In fact, it does more than that. It translates the light measured straight into terms of photographic exposure. It does so by presenting you with the choice of aperture numbers and shutter speeds, sorting them out in pairs.

Aperture and Speed

The aperture number or *f*-stop controls the *amount of light* allowed to enter through the lens. These numbers run in a series: 2.8–4–5.6–8–11–16–22; each higher stop number lets through half the light of the next lower number (next larger stop).

The shutter speed controls the *length of time* for which the lens is kept open to light. Shutter speed figures represent fractions of a second: 2 = $\frac{1}{2}$ second, 4 = $\frac{1}{4}$ second . . . 500 = 1/500 second.

The actual exposure is a product of these two: "how

much" and "how long". A large amount of light striking the film for a short time may produce an image similar to that produced by a small amount of light striking the film for a long time. Hence the free choice from a series of balanced aperture-shutter combinations offered by your exposure meter: more or less open apertures paired with more or less quick shutter speeds and more or less stopped down apertures paired with more or less slow shutter speeds.

The recent Hasselblad cameras combine these pairs, made up of aperture stops and shutter speeds, into single figures which are then called exposure values or light values. Once you set the exposure value suggested by the exposure meter both the aperture and the shutter speed move up and down in step against each other, and so keep the resulting exposure right at every combination.

Choosing the Combination

But whether you work out the right exposure from an elaborate table or chart;

whether you are presented with a series of pairs of aperture figures and shutter speeds;

whether these pairs are summed up in a series of single exposure values;

whether you just set the exposure to the point shown by the needle in your meter;

you still have one decision to face: which aperture-shutter combination to choose for any given shot. Paradoxically enough, they all are right and yet one is better than the other.

Why should it be so?

Because both the aperture and the shutter also have secondary functions and effects.

The aperture not only controls the amount of light that is allowed to pass the lens—it also has a bearing on how much of the image will be sharp.

The shutter, in controlling the length of time for which the light strikes the film, will inevitably record any movement during that time as a slight or greater blur.

So you are left with three things to think of:

How fast is the action you want to catch?

How much of the scene in front of the lens has to be sharp?

Is the light good enough for either?

If there is fast action, you have to choose and pre-set an appropriately fast shutter speed (page 49) and then pair it with the stop which is right by your meter.

If the scene is to be sharp from a point close to the lens to some other point well away from it, you should choose the stop that will yield the necessary depth of field (page 48) and then pair it with the shutter speed agreed by your meter for correct exposure.

If the light is very poor, the chances are that you may not be able to cope with either extremely fast or particularly deep subjects.

Yet your choice in putting shutter speed or depth of field first should still be governed by what you value most about the picture you propose to take.

Exposure nowadays is no problem at all. You can arrive at the right exposure by guessing it, or measuring it. But to hit it off in such a way that it will produce the picture *you* want is still a matter of intelligent judgment.

Time Exposures

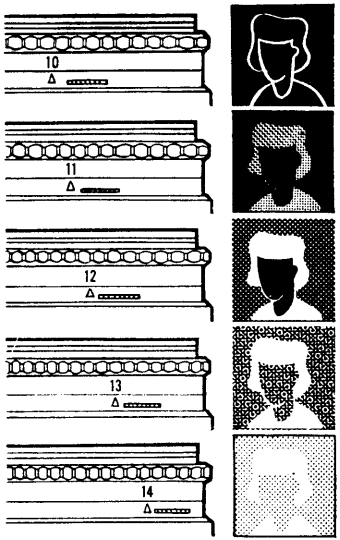
When the light is very weak, especially when you have to use a small stop, even the slowest shutter speed of 1 sec. may be too short. In that case, you need time exposures. Set the shutter to B and press the release button. The shutter now remains open until you let go of the release button.

For such time exposures, the camera must be mounted on a firm support such as a tripod.

It is safest to release the shutter with the help of a cable release to avoid shaking the camera. This release screws into the bush of the cable release socket.

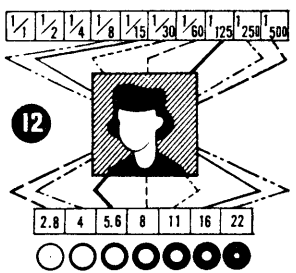
For long time exposures, where the shutter is to remain open for longer than you can conveniently keep the release depressed, use the time lock or cable release on the camera.

EXPOSURE VALUES



The exposure value system works by assigning a single setting, one of a series of plain numbers, to the exposure. A low exposure value corresponds to a great exposure, higher exposure values corresponds to decreased exposures. Thus if an exposure value of 12 yields a correctly exposed negative, settings of 10 or 11 yield over-exposed negatives, settings of 13 or 14 under-exposed ones. Every exposure value setting yields double the exposure (twice as much light reaching the film) of the next higher value, and half the exposure obtained with the next lower value. Intermediate settings are also possible.

On Hasselblad lenses with exposure value scale the exposure values are marked and set on the shutter rim.



Any given exposure value corresponds to a series of aperture and shutter speed combinations, each combination yielding the same exposure. Thus an exposure value of 12 would cover settings of 1/250 second at f4, 1/125 second at f5.6, 1/60 second at f8, and so on. The aperture and speed controls of the exposure value shutter are cross-coupled so that setting a slower shutter speed at the same time stops down the lens accordingly, and setting a large aperture in turn adjusts the shutter speed to keep the exposure constant.

The Self-timer

All lenses of Hasselblad 500C and Super Wide C have shutters which incorporate a delayed action release or self-timer. When the release is pressed down with the delayed action in operation, the shutter goes off after 8½ seconds and you have time to take your own picture. The camera must, of course, be mounted on a tripod.

Using an Exposure Meter

To get the best results an exposure meter has to be used intelligently. This may look like a contradiction, since we have already said that it is an accurate light measuring instrument. But light from all parts of the subject—highlights, shadows and middle tones—falls on the meter, so the reading it gives us is an average one for the whole subject area.

Meters are scaled to suit typically average subjects—i.e. subjects with average areas of light, dark and middle tones. So if you point the meter at a subject of this kind, the exposure reading will be correct.

But if the subject is not average—if there are large highlight areas and little shadow, or large shadow areas with few highlights—then you have to modify the exposure reading to obtain the best results.

So there is more to using a meter than just pointing it at the subject and accepting without question the reading indicated.

The usual method of using a meter is to point it directly at the subject. This gives the correct exposure reading provided the subject has an average mixture of highlights, shadows and middle tones. But if there is a large bright area, or a large dark area, the best method is to go near to the main subject and take a close-up reading. For example, if the subject is a figure against a white or dark background, by going closer you will reduce the amount of background affecting the meter and therefore get a reading in terms of a more average subject, which is what you want.

For some subjects you can take a reading from really close up, aiming the meter at the part of the subject that you

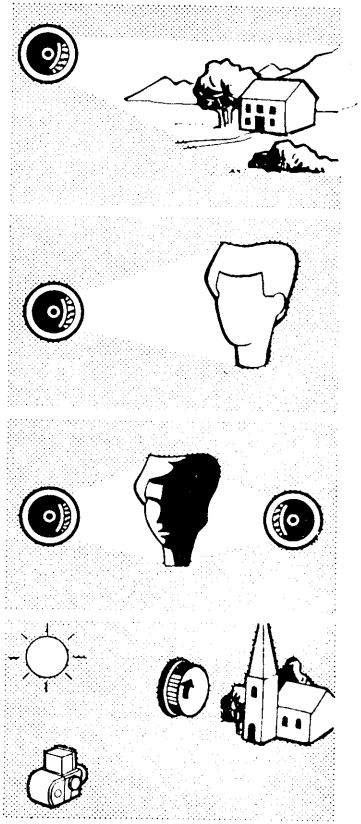
EXPOSURE METER MEASUREMENT

For normal readings point the cell of the exposure meter (usually in the winding knob of the camera) at the subject while observing the latter on the screen. With outdoor scenes point the meter cell slightly downwards to exclude excessively bright sky areas.

For more accurate readings, especially of figures against a very light or very dark background, go close to the subject so that the meter takes in just the subject itself. For this purpose it is often more convenient to detach the meter from the camera.

With very contrasty subjects with unpredictable proportions of very bright and very dark areas, take separate close-up readings of the light and dark parts. The correct exposure is then the mean of the two.

For incident light readings—especially with colour film—move the white plastic blind on the meter knob so that it covers the meter cell. Then point the meter from the subject toward the camera position to be used for the exposure. For this reading it is again often more convenient to remove the exposure meter unit from the camera, rather than carry the latter around for such incident light readings.



want to make sure has optimum exposure. For instance, many photographers take a close-up reading of the sitter's face in portraiture; out-of-doors you can take the reading from the back of your hand instead of going up to the subject.

If you cannot go close up to a subject that needs a close-up reading, then try to find something near at hand that is similar in tone to the subject, and take a reading from this.

When taking readings of general scenes including a good deal of sky, you have to tilt the meter down slightly to reduce the area of sky "seen" by the meter. The sky is a bright highlight, and by tipping the meter down to exclude some of it, the subject becomes "average" in tone range.

Open views, such as distant landscapes, usually have very light shadows, so you can give a shorter exposure than the meter indicates. It is usual to give half the exposure—i.e. use double the shutter speed, or use one stop smaller.

INCIDENT LIGHT MEASUREMENT. Another method of assessing exposure is to measure the strength of the light falling on the subject instead of that reflected by it. But if you point the meter straight at the light you get a much higher reading than if you point it at the subject. So the light has to be cut down for the meter to indicate the correct exposure. This is done by fitting a white diffuser supplied with most meters over the cell of the meter which is designed to reduce the light just the right amount. It also serves another important purpose, and this is to ensure that the meter includes all the light falling on the subject over an angle of almost a full 180°.

The incident light method is particularly useful for reversal colour films, and for subjects with contrasting backgrounds when it is impossible to make a close-up reading.

To take a reading, the method is simply to turn your back on the subject and point the meter in exactly the opposite direction. If the main light—say the sun—is coming from the side, don't just partly turn round and point the meter at this; turn round completely, and let the main light strike the meter at the same angle that it strikes the subject.

If the light on the subject is different from that on yourself at the camera position (say if the subject is in the shade, and you are in the sun), go up to the subject and take the reading, pointing the meter towards the camera position.

AGAINST THE LIGHT subjects are extreme cases of non-average tone range. The main lighting becomes a very bright highlight in the field of view, so if you point the meter straight at the subject it will indicate too short an exposure and give you a silhouette effect in the final picture.

This is all right if you want a silhouette. But if you want correct exposure for the subject, you should either take a close-up reading, or take a reading from the camera position and give four to eight times the exposure indicated.

COLOUR FILMS have little exposure latitude, so particularly careful reading is advisable. The meter is used in the same way as for black-and-white films.

Because of the importance of the highlights, if you are using a meter from the camera position for an against the light shot, it is best to only double the reading, and not multiply it four to eight times as recommended for black-and-white negative films.

Shutter Speeds and Movement

The actual shutter speed you need within a series of available aperture-speed combinations is governed by considerations of camera steadiness as well as of subject movement.

An unsteady camera hold results in camera shake, which will lead to inferior definition of the negative. Practical experience goes to show that 1/125 sec. is safe, while you have to hold the camera particularly steady when using 1/60 or 1/30 sec. Where lighting conditions make even longer exposure times essential and there is no subject movement, either support the camera on a tripod, or look round for extra support for your elbows and hands—e.g. a wall, railing, etc.

The shutter speed required to arrest movement depends of course primarily on the speed with which the subject

moves. Remember, however, that parts of the subject (e.g. the legs of a runner) may move faster than the subject as a whole; you may sometimes have to compromise and show such parts slightly unsharp. Often that is not a serious fault, as slight blurring—provided the main part of the subject is sharp—helps to emphasise the impression of movement. Other factors to consider are the distance of the subject—the farther away, the less noticeable the movement blur; the focal length of the lens—a long-focus lens in effect brings the subject nearer; and the direction of the movement. Objects moving across your field of view blur more than if they are approaching or receding.

The most convenient way of allowing for all these factors is with the aid of a simple table (page 69).

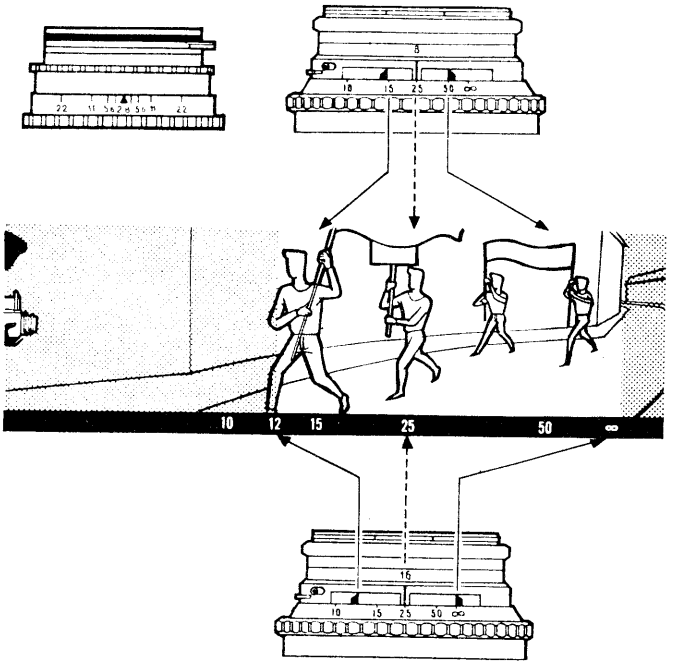
Aperture and Depth of Field

When you focus the Hasselblad on a given object, the image of that object will be really sharp on the film. Things nearer or farther away will be gradually less and less sharp, until they are noticeably blurred. The range of distances over which objects are still acceptably sharp, before you do notice the loss of definition, is known as the depth of field.

You can control the extent of this sharp zone by the lens aperture. As you stop down the lens, the zone of sharpness grows in both directions; as you open up the lens, its depth decreases.

You can obtain the actual zone of sharpness at various apertures and distances from tables, but in practice the most convenient way is to use the depth of field indicator.

On the lenses for the Hasselblad 500C and Super Wide C this consists of two red pointers above the distance scale of each lens. The pointers are coupled to the aperture setting. They automatically close up at large apertures and move apart at small apertures. One pointer indicates the near, the other the far limit of the depth of field for the distance and aperture the camera has been set to. For example, on the standard lens of the Hasselblad 500C, at 25 ft. and *f* 8, you will find the two pointers opposite 15 and 50 ft., so you have



The automatic depth of field indicator fitted to the Hasselblad 500C and Super Wide C consists of two red markers next to the distance scale. These markers indicate the extent of the depth of field available as shown on the distance scale. The field automatically becomes narrower on opening the lens aperture, and gets wider on stopping down. The larger the aperture, therefore, the shallower the zone of sharp focus. Thus with the camera focused on 25 feet, the depth at *f*8 will extend from about 15 to 50 ft. (*top right*); at *f*16 it will cover a range from 12½ ft. to infinity (*bottom*). The depth also depends on the actual distance focused (it is less with closer subjects) and on the focal length of lens. Longer focus lenses yield reduced depth of field. Every lens however carries its own depth of field indicator which automatically allows for that.

The Hasselblad 1600F, 1000F, and the original Super Wide have a depth of field scale engraved on the lens mount next to the distance scale. This indicates the depth by means of index lines numbered to correspond to the lens apertures (*top left*).

a sharp zone from 15 to 50 ft. At *f* 16 the distances opposite the pointers may be 12½ ft. and ∞ respectively.

Hasselblad 1600F, 1000F and Super Wide have a special scale of aperture numbers marked opposite the distance scale. There are two sets of such numbers from the largest stop (*f* 2.8) to the smallest (*f* 22) on each side of the focusing index (the mark that indicates the distance to which you have set the lens).

You will also notice that the depth of field is greater at far distances than at near ones.

Two more points on depth of field.

First, the depth obtained depends also on the focal length of the lens. Short focus lenses yield more depth and tele lenses less depth. That is why the alternative lenses of the Hasselblad have their own depth of field indicator.

Secondly, the sharp zones obtained by the scale or indicator are based on a somewhat arbitrary assumption of how much blurring is acceptable. So depth of field data for different cameras with the same lens may not always agree, and you are also quite safe in rounding off figures obtained from such data. And if you intend to make really big enlargements from your negatives you can use stricter standards of sharpness by simply stopping down the lens by one stop.

Zone Focusing

With action subjects and similar occasions where you want to shoot quickly, determining sharp zones even with the depth of field indicator wastes too much time. There you need prepared settings covering given near and medium distance ranges that you can easily memorize and set on the camera. Then you only have to worry about keeping the subject within that zone while you shoot.

WORKING IN HOT CLIMATES

High and widely varying temperatures with low humidity, as occur in desert regions and dry seasons, and very high humidity in rainy seasons, call for special precautions to protect the life and continued good performance of the camera. These conditions also cause the growth of moulds on organic matter. Sand, dust and insects may present problems.

The camera should be kept dry and clean. Leather parts should be wax polished, metal parts lightly greased. Never leave the camera unnecessarily exposed to heat. Always keep it in its case. The lens should be covered with a lens cap when not in use; additionally, it should be protected by a colourless filter. Outer lens surfaces have to be kept clean, dirt and grit removed with an air-blower and by tapping. Wipe the lens surface with cotton wool or open mesh fabric (butter muslin), when required.

Store photographic equipment in an airtight metal box or a tin which should be sealed with adhesive (e.g. medical) tape. In a humid atmosphere, add some desiccating agent, e.g. silica gel.

Condensation on the lens may occur when the camera is moved from a cool place into humid heat; this has to be removed before use and the whole camera carefully wiped before re-storing.

Films should not be kept longer than six months in their original air-tight tins (tropical packing) at continual temperatures of 90° F (32° C). At continual 100° F (38° C), the life of most films is limited to a month or two. Keep films for as short as possible a time in the camera.

Films should be processed as soon as possible after exposure—within a week or two, or in very hot, humid climates within a few days. Keep the film in an airtight container with desiccant (to absorb moisture). If possible, keep in a refrigerator, but only if you can dry out the exposed film and the container is sealed.

FLASH WITH THE HASSELBLAD

Flash is an efficient light source where no or insufficient daylight is available such as at night, indoors, etc. In the flashlight you carry your own private "sun" with which you can illuminate your subject or scene at any time and place.

THE FLASH BULB is similar to a small electric bulb. However, when current passes through it, it lights up in an intense flash lasting usually about 1/40 to 1/60 sec. Each bulb will flash only once and has to be discarded afterwards.

The flash bulb is inserted in a flash gun and the current of the battery fires the bulb, while a reflector fixed behind the bulb makes sure that all the light is directed towards the subject. Most flash guns incorporate a capacitor unit which increases the reliability of firing, even when the battery is nearly exhausted. The shutter speed, provided it is slower than 1/30 sec. (1/60 sec. with small bulbs), has no effect on exposure since the flash is shorter than the exposure time.

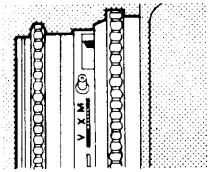
Most flash bulbs are available with a clear glass bulb (for black-and-white and negative colour film and for type F reversal colour film) or with a blue-tinted bulb (for daylight type reversal colour films). The blue bulbs can also be used for fill-in lighting by daylight with any type of colour film.

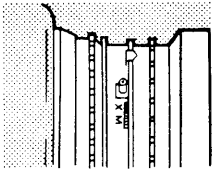
ELECTRONIC FLASH UNITS utilize the discharge of a high-tension capacitor through a flash tube. The power is derived from an accumulator or battery (there are also models working from the mains electricity supply). The electronic flash outfit is rather bigger and heavier than the flash bulb outfit, its comparative light output equals a small flash bulb and its initial cost is higher. On the other hand, anything from 10,000 to 25,000 flashes are obtained from one tube. The flash duration is extremely short (1/700 to 1/2000 sec.) and will arrest the fastest movements. The cost of an individual exposure is negligible.

Electronic flash is suitable for black-and-white and negative colour film and also for daylight type, reversal colour films. It can also be used for fill-in lighting by daylight.

The Hasselblad cameras are synchronized for use with

FLASH EXPOSURES

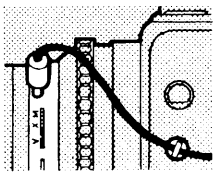


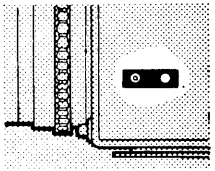


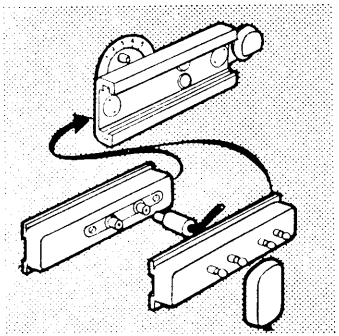
The shutters on the lenses of the model 500C (*left*) carry a synchronizing lever with three positions: V, X, and M. The V position is the setting for the self-timer, the X and M positions are for different types of flash synchronization (page 54). On the original Super Wide there are only two settings: X and M (*right*).

The flash cable plugs into the socket next to the synchronizing lever (*left*). A cable bearer fits into one of the two sockets in the left hand side of the camera to prevent accidental pulling out of the cable.

The model 500C also carries a further flash contact in the side of the camera (*right*) for synchronization of the auxiliary shutter in the camera back (■).

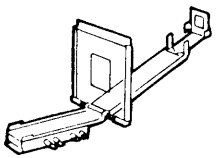






For these models a special frame finder used to be available carrying similar flash outlets in the finder foot, to permit connection of flash units when working with the frame finder.

The models 1000F and 1600F have a synchronizing contact built into the finder shoe at the side of the camera. The synchronization is here adjustable by moving the small control above the shoe to a series of numbers from 1 to 5. To connect the flash, a flash shoe fits into the finder shoe. The flash shoe carries either two co-axial sockets, or two pairs of two-pin sockets (older version). The outlets in each case are marked "flash" (for flash bulbs) and "strobe" (for electronic flash).



flash bulbs and electronic flash. The handling of the camera models using lenses with Compur shutter (500C, Super Wide and Super Wide C) and those with focal plane shutter (1600F, 1000F) is different and therefore described separately.

Flash with Compur Shutter Models

The cable from the flash gun is plugged into the flash socket on the shutter. On releasing the shutter, the electric firing circuit automatically closes through the flash socket, setting off the flash at this moment.

A synchronizing lever protrudes at the side of the shutter. This can be set to X or M.

WITH THE SYNCHRONIZING LEVER SET TO X the shutter closes the flash circuit at the moment when the blades are fully open. Therefore, electronic flash is synchronized at any shutter speed to 1/500 sec. This setting may also be used with flash bulbs of a short firing delay (i.e. bulbs which require only 4–6 milliseconds or 1/250 to 1/160 sec. to reach the peak of their light output) with the shutter set to 1/60 sec. With other bulbs, the fastest usable speed is 1/30 sec.

WITH THE SYNCHRONIZING LEVER SET TO M the shutter closes the flash circuit 16–18 milliseconds before the shutter blades open to allow for the firing delay of most average flash bulbs. This setting is suitable for normal flash bulbs at all speeds up to 1/500 sec. The M-setting will not synchronize electronic flash or short-delay bulbs.

WITH THE SYNCHRONIZING LEVER SET TO V the delayed-action release for self-portraits comes into action. At the same time the shutter works with X-synchronization. This means that you can work with delayed action and X-synchronized flash; delayed action is not possible with M-synchronization.

Flash with Focal Plane Shutter Models

With these models the shutter is synchronized for the different types of flash with the aid of a synchronizing lever

above the accessory shoe (●). The latter carries a flash socket, but a special attachment is required to fit into the shoe for taking the flash cable connection. Two types of this connector attachment are available, with standard European 3-mm. co-axial and American two-pin sockets respectively. The connector carries two sockets for flash bulbs and electronic flash respectively.

Exposure Guide Numbers

The most convenient way of working out exposures with flash is by means of a guide number. When you buy flash bulbs you will always find the guide number for any speed of film printed on the packet. With electronic flash, the guide number is given in the instruction book for the flash unit.

To find the correct aperture to use, divide the guide number by the distance between the flash and the subject. For instance, suppose you find that the guide number of the bulb with the film in use, and the shutter speed required, is 160. If you then want to take a photograph at a distance of 10 ft. from the subject, divide 160 by 10 = 16. Therefore the correct aperture to use is *f* 16. Conversely if you want to use a definite aperture, say *f* 8, then the correct flash distance is given by 160 ÷ 8 = 20. So the flash must be 20 ft. from the subject.

Synchro-Sunlight

For fill-in flash in daylight, use the normal exposure for the sunlit parts plus a flash exposure based on a doubled guide number.

Example: Exposure meter reading at 1/60 sec.—*f* 16.
Guide number for the flash at 1/60 sec.—120.
The guide number doubled is 240.
Divide 240 by 16—15.

That means that the flashgun should be 15 ft. from the subject. It is advisable to use an extension cable between camera and flashgun. This enables you to place the flash farther away from or closer to the subject than the camera.

THE INTERCHANGEABLE LENSES

The Hasselblad cameras, except the Super Wide models, have an interchangeable lens and a range of alternative focal lengths is available. The field of view covered by the standard 80-mm. lens is most suitable for the majority of subjects. For specialized purposes a greater or reduced field of view has distinct advantages.

Wide-angle Lens

A wide-angle lens is a lens of shorter focal length, it sees and reproduces more of the subject in front of the camera than does the standard lens.

Such a wide-angle lens has definite advantages in cases where the practicable distance between camera and subject is limited and insufficient for the standard lens to record the subject in its entirety. The wide-angle lens is, therefore, primarily used for architectural photography and interiors.

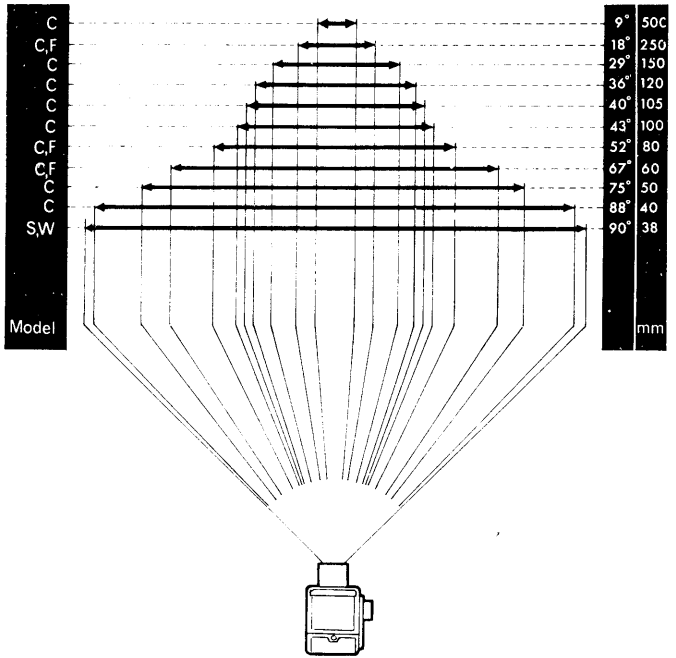
In view of the short focal length, the depth of field covers a particularly wide zone, even at full aperture. It can, therefore, be employed with advantage as a quick-shooting lens for general purposes where accurate focusing or distance-setting would be inconvenient (e.g. insufficient time).

To get a large image, even of a near object, you have to go really close to it. Near objects then tend to dwarf more distant ones, and the resulting picture shows pronounced perspective effects. In this way, the wide-angle lens can be used to emphasize perspective.

Telephotography

A tele lens on the other hand has a smaller angle of view than the standard lens. It is of longer focal length, and reproduces less of the subject in front of the camera than the standard lens does, but on a larger scale.

Such a lens is particularly suitable for subjects that are difficult to approach closely, such as animals, children, architectural detail, sports events, etc. In photographing



The shorter the focal length of the lens, the greater the angle of view taken in. With the interchangeable lenses the Hasselblad can thus control the angle of view—and also the scale of the image—recorded.

This diagram indicates the main lenses available for the Hasselblad camera, with their focal lengths and angles of view. The letters show the models for which the focal length are available. C stands for the Hasselblad 500C, F for the models 1000F and 1600F, and SW for the Super Wide and Super Wide C (the lens for this camera is not interchangeable).

distant views without near foreground, it brings the subject nearer. It also permits a greater camera-to-subject distance in portraiture, producing a more pleasing and subdued perspective. At the same time, its lesser depth of field concentrates definition on the portrait, avoiding a sharp background which would detract from the main object.

Focusing and Viewing

Focusing with the wide-angle or telephoto is much the same as with the standard lens. The Hasselblad reflex screen enables the image to be focused accurately; at the same time the screen shows the exact field of view of the particular lens used. There is no parallax error.

FACTS AND FIGURES

This section gives the more important data for Hasselblad films, exposure, close-up data, etc., in handy tabular form for easy reference.

CONVERSION OF FEET AND INCHES INTO METRIC UNITS

Many cameras are marked only in either the metric or British system, while most of the tables in this book are also given in only one system. The table below shows at a glance equivalent lengths.

British to Metric		Metric to British	
⅛ in.	0.32 cm.	0.5 cm.	3/16 in.
¼ in.	0.64 cm.	1 cm.	⅜ in.
½ in.	1.27 cm.	2 cm.	¾ in.
1 in.	2.54 cm.	3 cm.	1⅛ in.
2 in.	5.08 cm.	4 cm.	1⅝ in.
3 in.	7.62 cm.	5 cm.	1¹⁵/₁₆ in.
4 in.	10.2 cm.	6 cm.	2⅜ in.
5 in.	12.7 cm.	7 cm.	2¾ in.
6 in.	15.2 cm.	8 cm.	3⅛ in.
7 in.	17.8 cm.	9 cm.	3½ in.
8 in.	20.3 cm.	10 cm.	3¹⁵/₁₆ in.
9 in.	22.9 cm.	12 cm.	4¾ in.
10 in.	25.4 cm.	15 cm.	5⅞ in.
11 in.	27.9 cm.	20 cm.	7⅞ in.
1 ft.	30.5 cm.	25 cm.	9¹³/₁₆ in.
2 ft.	61.0 cm.	30 cm.	11¾ in.
3 ft.	91.4 cm.	40 cm.	15¾ in.
4 ft.	1.22 m.	50 cm.	19¾ in.
5 ft.	1.52 m.	60 cm.	23⅝ in.
6 ft.	1.83 m.	80 cm.	31½ in.
7 ft.	2.13 m.	100 cm.	39½ in.
8 ft.	2.44 m.	1.5 m.	4 ft. 11 in.
9 ft.	2.74 m.	2 m.	6 ft. 7 in.
10 ft.	3.05 m.	2.5 m.	8 ft. 3 in.
15 ft.	4.57 m.	3 m.	9 ft. 10 in.
20 ft.	6.10 m.	4 m.	13 ft. 2 in.
30 ft.	9.14 m.	5 m.	16 ft. 5 in.
40 ft.	12.20 m.	10 m.	33 ft. 0 in.
50 ft.	15.24 m.	15 m.	49 ft. 2 in.
200 ft.	30.48 m.	10 m.	66 ft. 0 in.

FOCAL PLANE FLASH SYNCHRONIZATION

(Hasselblad models 1000F and 1600F)

Bulb	Speed (sec.)	Synch. Setting	Bulb	Speed (sec.)	Synch. Setting
*PF 24	1/25	N.S.	**No. 31, 2A	1/25	5
**No. 6, 26	1/50	3	*PF 45	to	
**S2	1/100	4		1/1000	
	1/250–1/1000	5			

N.S. = Not suitable. * Philips. ** G.E., Westinghouse, Sylvania, etc.

DAYLIGHT EXPOSURE VALUES

For Hasselblad models without exposure meter add up the respective figures in tables 1, 2 and 3. The result is the exposure value to be set. On models without exposure value scale use table 4 to get aperture-speed combinations (set the shutter to nearest marked speeds if necessary—e.g. 1/25 sec. for 1/30 sec.).

1. *Subject and weather*

	Clear Sun	Cloudy Light	Cloudy Med.	Cloudy Dull
Distant land or seascape without foreground	13	12	11	10
—with light foreground	12	11	10	9
Open streets, squares, light buildings	11	10	9	8
Figures, groups in open, near objects without heavy shade	10	9	8	7
Average interiors, diffused light	3	2	1	0

2. *Month and time*

	May June July	Aug. April	Sept. March	Oct. Feb.	Nov. Dec. Jan.
11 a.m. to 2 p.m.	3	3	3	2	2
9 a.m. to 11 a.m. 2 p.m. to 4 p.m.	3	3	2	2	1
4 p.m. to 6 p.m.	2	2	1	1	0

3. *Film Speed*

ASA	20	32–40	50–64	100–140	200–250	400–500
	−2½	−1½	−1	0	+1	+2

4. *Exposure Values and Aperture-Speed Combinations.*

Exp. Value	f2.8	f4	f5.6	f8	f11	f16	f22
3	1	2s	4s	8s	15s	30s	60s
4	1/2	1	2s	4s	8s	15s	30s
5	1/4	1/2	1	2s	4s	8s	15s
6	1/8	1/4	1/2	1	2s	4s	8s
7	1/15	1/8	1/4	1/2	1	2s	4s
8	1/30	1/15	1/8	1/4	1/2	1	2s
9	1/60	1/30	1/15	1/8	1/4	1/2	1
10	1/125	1/60	1/30	1/15	1/8	1/4	1/2
11	1/250	1/125	1/60	1/30	1/15	1/8	1/4
12	1/500	1/250	1/125	1/60	1/30	1/15	1/8
13	—	1/500	1/250	1/125	1/60	1/30	1/15
14	—	—	1/500	1/250	1/125	1/60	1/30
15	—	—	—	1/500	1/250	1/125	1/60
16	—	—	—	—	1/500	1/250	1/125

FILTERS FOR BLACK-AND-WHITE FILM

Filter	Colour	Exposure Factor	Size Codes	Applications
Y 1.5	Yellow	1.5×	50, 50B, 63	Landscapes, snow, cloudy skies. Correction filter: lightens yellow and red, darkens blue.
YG 2	Yellow-green	2×	50, 50B	Cloud effects. Correction filter: lightens greens, darkens blue and red.
G 3	Green	3×	50, 50B, 63	Contrast filter: darkens red and blue, lightens green.
O 4	Orange	4×	50, 50B, 63, 86	Dramatic skies, cuts haze in distant views. Contrast filter: darkens blue and green, lightens red and orange.
R 6	Red	6×	50, 50B, 63	Contrast filter with still greater effect than orange.

The size code, which follows the filter code (e.g. Y 1.5–50) indicates the mount diameter: 50 = 50 mm.; 50B = 50 mm. bayonet mount (Hasselblad 500C), etc. A special filter ring is required (FUABC) for the 63-mm. filters on the 38-mm. Biogon and 60-mm. Distagon lenses. The filter factor applies to normal panchromatic film.

FILTERS FOR BLACK-AND-WHITE AND COLOUR FILM

Filter	Colour	Exposure Factor	Size Codes	Applications
HZ 0	Colourless	No exp. increase	50	Haze filter; absorbs ultra-violet radiation. Useful for mountain views, especially on colour film
DF 1	Colourless	No exp. increase	50, 50B	Soft-focus attachments, for portraits and landscapes. Yields soft "atmosphere" effects, especially when shooting against the light. DF 2 gives greater softening than DF 1.
DF 2	Colourless	No exp. increase	50B	
Pola 2	Colourless	2×	50	Reduces or eliminates reflections from non-metallic surfaces. Filter rotates within lens mount to vary effect; can be checked on ground glass screen.

The size code, which follows the filter code on the filter (e.g. DF 1-50B) indicates the mount diameter: 50 = 50 mm.; 50B = 50 mm. bayonet mount (for Hasselblad 500C).

LIGHT BALANCING FILTERS FOR REVERSAL COLOUR FILM

Film Type	Daylight (18)	Clear Flash (26)	Photoflood (29)	3200° K (31)
Daylight type (18)	None	B-8	B-11	B-13
Type F, flash type (26)	R-8	None	B-3	B-5
Tungsten 3400° K or type A (29)	R-11	R-3	None	B-2
Tungsten 3200° K or type B (31)	R-13	R-5	R-2	None

The figures in brackets are colour values in decamireds.

COLOUR TEMPERATURES AND LIGHT SOURCES

Light Source	Film Type	Colour Temp. ° K.	Decamireds
Blue skylight (shadow)		12,000	8
Lightly overcast sky		7,500	13
Electronic flash		6,500	15
Blue flashbulbs		6,000	16
Sunlight (average)	Daylight type	5,800	18
Sunlight, within 2 hours of sunrise or sunset (reddish)		5,000–3,300	20–30
Clear, wire-filled flashlamps	Type F	3,800	26
Photofloods	Type A	3,400	29
3,200° K. studio lamps	Type B	3,200	31
Household tungsten lamps (100W)		2,700	35

The film type is the type balanced for light of that colour temperature.

LIGHT BALANCING FILTER DATA

Filter	Typical Colour Temp. Conversion (° K.) from	to	Mired Shift	Filter Factor	Exposure Value Correction
R 1.5	5,900	5,400	+ 16	1.0×	0
	3,400	3,200			
R 3	6,500	5,400	+ 32	1.2×	−⅓
	3,600	3,200			
R 6	8,200	5,400	+ 64	1.4×	−⅓
	4,000	3,200			
R 9	11,000	5,400	+ 95	1.7×	−1
	4,700	3,200			
R 12	17,000	5,400	+127	2.0×	−1
	5,400	3,200			
B 1.5	5,000	5,400	− 16	1.2×	−⅓
	3,050	3,200			
B 3	4,600	5,400	− 32	1.4×	−⅓
	2,900	3,200			
B 6	4,000	5,400	− 64	2.0×	−1
	2,650	3,200			
B 9	3,600	5,400	− 95	2.6×	−1⅓
	2,500	3,200			
B 12	3,200	5,400	−127	3.5×	−2
	2,270	3,200			

FILTER EQUIVALENTS

Hasselblad	Wratten	Walz	Harrison & Harrison	Gevaert
B2	82	B0	B-$\frac{1}{2}$	CTB-2
B2 or B3	82A	B1	B-$\frac{1}{2}$	—
B3	82B	B2	B-$\frac{1}{2}$	CTB-4
B5	82C	B3	B-$\frac{1}{2}$	CTB-4
B8	80C	B7	B-2	CTB-8
B11 or B12	80B	B10	B-4	CTB-8+CTB-2
R2	81	A0	C-$\frac{1}{2}$	CTD-2
R2	81A	A1	C-$\frac{1}{2}$	CTD-2
R3	81B	—	C-$\frac{1}{2}$	—
R5	81C	A2	C-$\frac{1}{2}$	CTO-5
R5	81D	A3	C-$\frac{1}{2}$	CTO-5
R6	81EF	A4	C-1	—
R8 or R9	85C	A7	C-2	CTO-8
R11 or R 12	85	A9	C-4	CTO-8+CTO 2
R13 or R15	85B	A10	C-5	CTO-12

MINIMUM FOCUSING RANGE WITHOUT ACCESSORIES

Lens	Minimum Focusing Distance	Subject Distance to Film Plane in in.	Field Size with 16-exposure Magazine
80-mm. Planar	3 ft.	35$\frac{3}{8}$	19$\frac{3}{4}$ × 14$\frac{3}{4}$
50-mm. Distagon *f* 4	27 in.	26$\frac{3}{4}$	21$\frac{1}{4}$ × 16
60-mm. Distagon *f* 4	22 in.	21$\frac{1}{16}$	14$\frac{3}{16}$ × 10$\frac{7}{8}$
120-mm. S-Planar	4$\frac{1}{2}$ ft.	56	21$\frac{1}{4}$ × 16
150-mm. Sonnar	5 ft.	59$\frac{1}{2}$	17 × 12$\frac{11}{16}$
250-mm. Sonnar	8$\frac{1}{2}$ ft.	101	17$\frac{1}{4}$ × 13
38-mm. Biogon	12 in.	11$\frac{1}{16}$	10$\frac{7}{16}$ × 7$\frac{3}{4}$

FOCUSING RANGES WITH THE 80-mm. PLANAR AND PROXARS

Proxar	Distance Setting on Lens in Feet	Distance to Film Plane in in.	Field Size with 16-exposure Magazine
1.0 m.	Inf.	42$\frac{1}{2}$	18$\frac{11}{16}$ × 13$\frac{11}{16}$
	3	27$\frac{7}{16}$	11$\frac{1}{4}$ × 8$\frac{1}{4}$
0.5 m.	Inf.	24$\frac{7}{16}$	12$\frac{3}{16}$ × 9$\frac{3}{8}$
	3	17$\frac{7}{16}$	7$\frac{1}{8}$ × 5$\frac{3}{8}$
1.0 m.+1.0 m.	Inf.	24$\frac{1}{2}$	12$\frac{1}{16}$ × 9$\frac{1}{4}$
	3	17$\frac{1}{2}$	7$\frac{1}{2}$ × 5$\frac{13}{16}$
0.5 m.+0.5 m.	Inf.	15	6$\frac{1}{4}$ × 4$\frac{3}{4}$
	3	13	4$\frac{1}{16}$ × 3$\frac{1}{8}$
1.0 m.+0.5 m.	Inf.	18$\frac{3}{16}$	8$\frac{1}{16}$ × 6$\frac{1}{4}$
	3	14$\frac{1}{16}$	5$\frac{1}{16}$ × 4$\frac{7}{16}$

FOCUSING RANGES WITH EXTENSION TUBES

Extension Tubes	Distance Setting on Lens	Distance to Film Plane in in.	Field Size (in.) with 16-exp. Magazine	Exposure Factor
60-mm. Distagon f 4				
21	Inf.	13$\frac{1}{4}$	6$\frac{3}{16}$ × 4$\frac{3}{4}$	2 ×
	22 in.	11$\frac{1}{2}$	4$\frac{3}{4}$ × 3$\frac{1}{2}$	3 ×
55	Inf.	10$\frac{9}{16}$	2$\frac{3}{4}$ × 1$\frac{3}{4}$	4 ×
	22 in.	10$\frac{7}{16}$	2$\frac{11}{16}$ × 1$\frac{1}{2}$	4 ×
21+21	Inf.	10$\frac{11}{16}$	3$\frac{1}{4}$ × 2$\frac{1}{2}$	3 ×
	22 in.	10$\frac{1}{2}$	2$\frac{15}{16}$ × 1$\frac{7}{8}$	4 ×
21+55	Inf.	10$\frac{7}{16}$	1$\frac{3}{4}$ × 1$\frac{1}{2}$	6 ×
	22 in.	10$\frac{3}{8}$	1$\frac{11}{16}$ × 1$\frac{1}{4}$	6 ×
55+55	Inf.	11$\frac{1}{2}$	1$\frac{7}{16}$ × 1$\frac{1}{16}$	8 ×
	22 in.	11$\frac{7}{16}$	1$\frac{1}{4}$ × 1$\frac{1}{16}$	8 ×
80-mm. Planar f 2.8				
21	Inf.	19$\frac{1}{4}$	8$\frac{3}{4}$ × 6$\frac{1}{2}$	1$\frac{1}{2}$ ×
	3 ft.	16	5$\frac{11}{16}$ × 4$\frac{1}{4}$	2 ×
55	Inf.	12$\frac{13}{16}$	3$\frac{7}{16}$ × 2$\frac{9}{16}$	3 ×
	3 ft.	12$\frac{1}{8}$	2$\frac{3}{4}$ × 2$\frac{1}{16}$	4 ×
21+21	Inf.	13$\frac{5}{8}$	4$\frac{1}{16}$ × 3$\frac{1}{16}$	2 ×
	3 ft.	13$\frac{1}{8}$	3$\frac{7}{16}$ × 2$\frac{7}{16}$	3 ×
21+55	Inf.	12$\frac{7}{16}$	2$\frac{1}{16}$ × 1$\frac{9}{16}$	4 ×
	3 ft.	12$\frac{7}{16}$	2$\frac{1}{16}$ × 1$\frac{9}{16}$	4 ×
55+55	Inf.	12$\frac{11}{16}$	1$\frac{11}{16}$ × 1$\frac{1}{16}$	6 ×
	3 ft.	12$\frac{7}{8}$	1$\frac{11}{16}$ × 1$\frac{1}{16}$	6 ×
150-mm. Sonnar f 4				
21	Inf.	55$\frac{1}{2}$	15$\frac{1}{2}$ × 11$\frac{3}{16}$	1$\frac{1}{2}$ ×
	5 ft.	36	8$\frac{1}{4}$ × 6$\frac{1}{16}$	2 ×
55	Inf.	30$\frac{5}{8}$	5$\frac{11}{16}$ × 4$\frac{3}{8}$	2 ×
	5 ft.	27$\frac{1}{2}$	4$\frac{3}{4}$ × 3$\frac{1}{2}$	3 ×
21+21	Inf.	35	7$\frac{3}{4}$ × 5$\frac{3}{4}$	1$\frac{1}{4}$ ×
	5 ft.	29$\frac{1}{2}$	5$\frac{7}{16}$ × 4	2 ×
21+55	Inf.	26$\frac{3}{4}$	4$\frac{1}{2}$ × 3$\frac{5}{16}$	3 ×
	5 ft.	25$\frac{1}{2}$	3$\frac{7}{16}$ × 2$\frac{7}{16}$	3 ×
55+55	Inf.	24$\frac{3}{8}$	3 × 2$\frac{7}{16}$	3 ×
	5 ft.	24$\frac{1}{8}$	2$\frac{7}{16}$ × 1$\frac{7}{8}$	4 ×
250-mm. Sonnar f 5.6				
21	Inf.	136	30$\frac{1}{4}$ × 22$\frac{3}{4}$	—
	8$\frac{1}{2}$ ft.	70	10$\frac{5}{16}$ × 7$\frac{11}{16}$	1$\frac{1}{2}$ ×
55	Inf.	67$\frac{1}{4}$	9$\frac{11}{16}$ × 7$\frac{1}{4}$	1$\frac{1}{2}$ ×
	8$\frac{1}{2}$ ft.	53	6$\frac{1}{2}$ × 4$\frac{13}{16}$	2 ×
21+21	Inf.	80	12$\frac{3}{8}$ × 9$\frac{1}{4}$	—
	8$\frac{1}{2}$ ft.	57$\frac{1}{2}$	7$\frac{1}{2}$ × 5$\frac{7}{16}$	1$\frac{1}{2}$ ×
21+55	Inf.	56$\frac{1}{2}$	7$\frac{1}{16}$ × 5$\frac{1}{4}$	1$\frac{1}{2}$ ×
	8$\frac{1}{2}$ ft.	48$\frac{3}{8}$	5 × 3$\frac{3}{4}$	2 ×
55+55	Inf.	47$\frac{1}{2}$	4$\frac{7}{8}$ × 3$\frac{5}{8}$	2 ×
	8$\frac{1}{2}$ ft.	44	3$\frac{11}{16}$ × 2$\frac{13}{16}$	3 ×

CLOSE RANGES WITH 50, 60-mm. DISTAGON AND PLANAR 80-mm.

Area covered in inches					DISTAGON 1:4	50 mm.		DISTAGON 1: 4	60 mm**		PLANAR 1: 2.8	80 mm.	
Magnification	MAGAZINE 12	MAGAZINE 16S	Depth of field (in.) f:11*	Reduction of exposure value by steps	Dist. to Film Plane (in.)	Focusing range of lens (ft.)	Close-up Equipment	Dist. to Film Plane (in.)	Focusing range of lens (ft.)	Close-up Equipment	Dist. to Film Plane (in.)	Focusing range of Lens (ft.)	Close-up Equipment
0.1	21.6	16.1	4.3		26.80	27"		30	30"		39.3	3.3	
0.2	10.8	8.1	1.18	½							21.15	7.5	P 0.5
0.3	7.2	5.4	0.55	½							17.75	7.5	M 21
0.4	5.4	4	0.31	1				12.45	4.6	M 21	14.83	6	M 21 + P 1.0
0.5	4.3	3.2	0.23	1	11.25	30"	M 21	11.5	22"	M 21			
0.6	3.6	2.7	0.17	1							13.40	3.8	M 21 + M 21
0.7	3.1	2.3	0.13	1½				10.62		M 21 + M 21	12.95	15	M 55
0.8	2.7	2	0.11	1½				10.43	30"	M 21 + M 21	12.24	3.5	M 55 + P 1.0
0.9	2.4	1.8	0.09	2	10.28	32"	M 21 + M 21				12.58	∞	B min
1.0	2.16	1.61	0.08	2	10.25	18"	M 21 + M 21	10.32	35"	M 55	12.55	3	B min
1.0	2.16	1.61	0.08	2							12.35	5.2	M 55 + M 21
1.1	1.97	1.47	0.065	2	10.27	8.2	M 55				12.58	∞	B 9 cm.
1.1	1.97	1.47	0.065	2							11.68	3.6	M 55 + M 21 P 0.5
1.2	1.80	1.34	0.06	2½	10.32	23"	M 55				12.65	3.6	B 9 cm.
1.3	1.65	1.22	0.053	2½				10.48	31"	B min.	12.78	4.8	B 10 cm.
1.3	1.65	1.22	0.053	2½				10.48	6.5	M 55 + M 21			
1.4	1.50	1.14	0.047	2½				10.60	3.3	B 8 cm.	12.92	7.3	B 11 cm.
1.4	1.50	1.14	0.047	2½							12.92	7.3	M 55 + M 55
1.5	1.44	1.07	0.043	2½	10.60	31"	B min.	10.72	∞	B 9 cm.	13.08	18	B 12 cm.
1.5	1.44	1.07	0.043	2½							12.58	4	M 55 + M 21 + P 1.0
1.6	1.35	1.01	0.039	2½	10.70	5.3	B 8 cm.	10.83	30"	B 9 cm.	12.76	6	B 12 cm. + P 1.0
1.7	1.27	0.95	0.036	3	10.82	22"	B 8 cm.	11.00	6.5	B 10 cm.	13.47	3.9	B 13 cm.
1.8	1.20	0.90	0.033	3	10.98	5.3	B 9 cm.	11.15	24"	B 10 cm.	13.68	4.4	B 14 cm.
1.9	1.14	0.85	0.031	3	11.15	20"	B 9 cm.	11.32	3.6	B 11 cm; M 55 + M 55	13.90	6.5	B 15 cm.
2.0	1.08	0.81	0.029	3	11.25	4.3	B 10 cm.	11.50	∞	B 12 cm.	14.15	14	B 16 cm.
2.5	0.86	0.64	0.021	3½	12.05	20"	B 12 cm.	12.43	∞	B 15 cm.	15.45	10	B 20 cm.
3.0	0.72	0.53	0.017	4	12.93	3.3	B 15 cm.	13.46	∞	B 18 cm.	16.83	3.4	B 18 cm. + M 55
3.5	0.62	0.46	0.014	4½	13.85	18"	B 17 cm.	14.53	22"	B max.			

M 21 = Extension tube 21 P 0.5 = Proxar 0.5 B = Bellows extension
M 55 = Extension tube 55 P 1 = Proxar 1.0

* At aperture 22 the depth of field will be doubled and at aperture 5.6 on the other hand, the depth of field will be halved.
** For Distagon f/5.6 the distance should be reduced by about 7/16 in.

CLOSE RANGES WITH 120-mm. S-PLANAR; 150, 200-mm. SONNAR

Area covered in inches					S-PLANAR 1:5.6	120 mm.		SONNAR 1: 4	150 mm.		SONNAR 1: 5.6	250 mm.	
Magnification	MAGAZINE 12	MAGAZINE 16S	Depth of field (in.) f:11*	Reduction of exposure value by steps	Dist. to Film Plane (in.)	Focusing range of lens (ft.)	Close-up Equipment	Dist. to Film Plane (in.)	Focusing range of lens (ft.)	Close-up Equipment	Dist. to Film Plane (in.)	Focusing Range of lens (ft.)	Close-up Equipment
0.1	21.6	16.1	4.3		56	4.8		72.9	6.1		118	10	
0.2	10.8	8.1	1.18	½	33.8	15	M 21	40.1	9.2	M 21	72	8.9	M 21
0.3	7.2	5.4	0.55	½	26.2	4	M 21	33.6	23	M 21 + M 21	56.7	1.2	M 55
0.3	7.2	5.4	0.55	½							56.7	100	B min.
0.4	5.4	4	0.31	1	22.8	8.5	M 21 + M 21	29.3	16.4	M 55	49.5	10.5	M 55 + M 21
0.4	5.4	4	0.31	1							49.5	23	B 9 cm.
0.5	4.3	3.2	0.23	1	20.85	3.4	M 21 + M 21	26.9	4.8	M 55	45.5	16	M 55 + M 55
0.5	4.3	3.2	0.23	1	20.85	10	M 55	26.9	26	B min.	45.5	50	B 12 cm.
0.6	3.6	2.7	0.17	1	19.70	3.6	M 55	25.5	6.2	M 55 + M 21	43.3	24	B 14 cm.
0.6	3.6	2.7	0.17	1				25.5	100	B 9 cm.			
0.7	3.1	2.3	0.13	1½	19.10	7	M55 + M21	24.6	14	B 10 cm.	42	50	B 17 cm.
0.7	3.1	2.3	0.13	1½	19.10	14.8	B 8 cm.						
0.8	2.7	2	0.11	1½	18.70	3.2	M 55 + M 21	24.2	7.5	M 55 + M 55	41.2	25	B 19 cm.
0.8	2.7	2	0.11	1½	18.70	4	B 8 cm.	24.2	65	B 12 cm.			
0.9	2.4	1.8	0.09	2	18.55	∞	M 55 + M 55	24	13	B 13 cm.	40.8	10.8	B max.
0.9	2.4	1.8	0.09	2	18.55	3.4	B 9 cm.						
1.0	2.16	1.61	0.08	2	18.52	5.3	M 55 + M 55	23.9	65	B 15 cm.	40.7	60	B 19 cm. + M 55
1.1	1.97	1.47	0.065	2	18.52	3.3	B 10 cm.	23.95	12.5	B 16 cm.	40.75	13.5	B max. + M 55
1.1	1.97	1.47	0.065	2	18.55	16.4	B 13 cm.						
1.2	1.80	1.34	0.06	2½	18.70	4.6	B 13 cm.	24.1	46	B 18 cm.			
1.3	1.65	1.22	0.053	2½	18.85	3.6	B 14 cm.	24.3	12	B 19 cm.			
1.4	1.50	1.14	0.047	2½	19.10	3.3	B 15 cm.	24.55	7.9	B max.			
1.5	1.44	1.07	0.043	2½	19.30	3.1	B 16 cm.	24.9	40	B 17 cm. + M 55			
1.6	1.35	1.01	0.039	2½	19.50	4.8	B 18 cm.	25.2	11.5	B 18 cm. + M 55			
1.7	1.27	0.95	0.036	3	19.90	4	B 19 cm.	25.6	65	B max. + M 55			
1.8	1.20	0.90	0.033	3	20.05	4	B 20 cm.	26	5.6	B max. + M 55			
1.9	1.14	0.85	0.031	3	20.55	4	B 16 cm. + M 55						
2.0	1.08	0.81	0.029	3	20.90	3.6	B 17 cm. + M 55						

M 21 = Extension tube 21 P. 0.5 = Proxar 0.5 B = Bellows extension
M 55 = Extension tube 55 P 1 = Proxar 1.0

* At aperture 22 the depth of field will be doubled and at aperture 5.6 on the other hand, the depth of field will be halved.

FOCUSING RANGES WITH THE EXTENSION BELLOWS

Lens	Bellows Extension	Distance (in.) to Film Plane	Distance (in.) to Front of Lens	Field Size with 16-exposure Magazine*	Exposure Factor
80-mm. Planar *f* 2.8	Min.	12 7/16	4 11/16	2 7/16 × 1 13/16	4 ×
	Max.	15 1/2	2 3/8	3/4 × 3/8	12 ×
60-mm. Distagon *f* 4	Min.	10 7/16	2 7/16	1 13/16 × 1 3/8	6 ×
	Max.	14 1/4	2 1/16	3/4 × 1/2	16 ×
150-mm. Sonnar *f* 4	Min.	27 7/16	17 11/16	4 1/2 × 3 3/8	2 ×
	Max.	24 3/8	9 11/16	1 3/8 × 1 1/16	6 ×
250-mm. Sonnar *f* 5.6	Min.	57 1/2	45 3/4	7 3/8 × 5 1/2	1 1/2 ×
	Max.	41 1/8	24 1/4	2 3/8 × 2	3 ×

* See footnote to tables on page 65.

SHUTTER SPEEDS TO ARREST MOVEMENT

Subject	Distance between Camera and Subject: 10 ft. 3 m.	20 ft. 6 m.	40 ft. 12.5 m.	80 ft. 25 m.	160 ft. 50 m.
Swimmer	1/60	1/30	1/15	1/8	1/4
Walker	1/125	1/60	1/30	1/15	1/8
Runner	1/250	1/125	1/60	1/30	1/15
Cyclist	1/500	1/250	1/125	1/60	1/30
Skater	—	1/500	1/250	1/125	1/60
Horse galloping	1/500	1/250	1/125	1/60	1/30
Horse trotting	1/250	1/125	1/60	1/30	1/15
Horse walking	1/125	1/60	1/30	1/15	1/8
Racehorse	—	1/500	1/250	1/125	1/60
Waves	1/500	1/250	1/125	1/60	1/30
Heavy waves	—	—	1/300	1/150	1/75
Boats making 10 knots	1/250	1/125	1/60	1/30	1/15
Boats making 20 knots	1/500	1/250	1/125	1/60	1/30
Tramcar	1/500	1/250	1/125	1/60	1/30
Motor car on road	—	1/500	1/250	1/125	1/60
Slow train	1/500	1/250	1/125	1/60	1/30
Fast train	—	—	1/500	1/250	1/125
Aeroplane	—	—	—	1/500	1/250

The shutter speeds as listed above are applicable to motion which cuts right across the direction in which the lens and the photographer look.

If the motion photographed is at an acute angle with the direction in which the lens points the exposure time can be longer, say 1/30 second instead of 1/60.

If the subject moves directly towards the lens (or for that matter away from it) the exposure time can be three or four times longer, say 1/8 of a second instead of 1/30.

Further, the figures apply to the standard 80-mm. lens. Use the next faster speed (half the exposure time) with the 150-mm. lens, and two speeds faster (one-quarter the exposure time) with the 250-mm. lens.

Where the above table shows speeds not marked on the shutter use the next faster speed.

CONVERSION OF FILM SPEED SYSTEMS

ASA & BS Arith.*	ASA Log (Apex)	DIN	BS Log
3		6	16°
6	1°	9	19°
12	2°	12	22°
25	3°	15	25°
50	4°	18	28°
100	5°	21	31°
200	6°	24	34°
400	7°	27	37°
800	8°	30	40°
1600	9°	33	43°
3200	10°	36	46°

* Also Weston.

COLOUR FILMS

Film	Type	Speed ASA	Processing
Negative			
Agfacolor CN17	Universal	40	U
Agfacolor CNS	Universal	80	U
Fujicolor	Universal	32	M
Kodacolor X	Universal	64	U
Reversal			
Agfacolor CT18	Daylight	50	M
Agfacolor CK20	Artificial light	80	M
Anscochrome 64	Daylight	64	M
Ektachrome X	Daylight	64	U
Ektachrome E3 Professional	Daylight	50	U
H.S. Ektachrome	Daylight	160	U
Ferraniacolor CR50	Daylight	50	U
Fujicolor	Daylight	100	M
Perutz Color C18	Daylight	50	M
Telcolor	Daylight	50	M

Processing: L = by appointed laboratories only; M = by maker or main agent only
U = released for user processing.

BLACK-AND-WHITE FILMS

Make	Type	Speed in ASA	Speed in DIN	Grain
Adox—				
Adox R.14	P.	40	17	uf.
Adox R.17	P.	80	20	ef.
Adox R.21	P.	200	24	mg.
Adox R.25	P.	500	28	mg.
Agfa—				
Isopan FF	P.	32	16	uf.
Isopan F	P.	80	20	ef.
Isopan ISS	Pr.	200	24	mg.
Isopan Ultra	Pr.	500	28	mg.
Isopan Record	Pr.	1600	33	mg.
Ansco—				
Super Hypan	P.	500	28	mg.
All-weather Pan	P.	125	22	fg.
Ferrania—				
P.36	Pr.	320	26	mg.
Ilford—				
F.P.4	P.	125	22	ef.
H.P.4	Pr.	400	27	mg.
H.P.S.	Pr.	800	30	mg.
Selochrome Pan	P.	160	23	fg.
Kodak—				
Panatomic X	P.	40	17	ef.
Tri-X	P.	400	27	mg.
Royal X Pan	P.	1600	33	mg.
Verichrome Pan	P.	160	23	fg.
ORWO, Wolfen—				
NP10	P.	8	10	uf.
NP18	P.	50	18	ef.
NP22	P.	125	22	ef.
NP27	Pr.	400	27	mg.
Perutz—				
P.14	P.	40	17	uf.
P.17	P.	80	20	ef.
P.21	Pr.	200	24	fg.
P.25	Pr.	500	28	mg.

The ASA speeds are the minimum correct exposure ratings (page 28). Some manufacturers may, however, still be quoting their speeds according to the older system to give more liberal exposure.
TYPE: P. = panchromatic; Pr. = panchromatic with increased red sensitivity.
GRAIN: uf. = ultra fine grain; ef. = extra fine grain; fg. = fine grain; mg. = medium grain.

HOW TO . . .

WHAT IS WHERE?