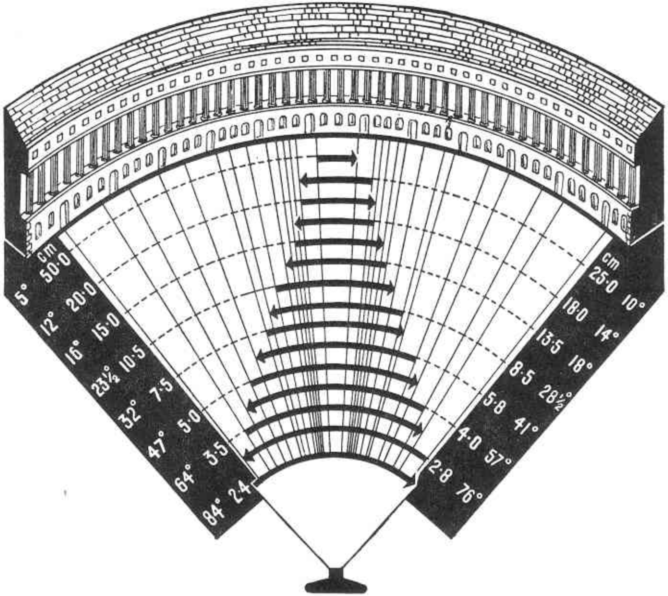
EXAKTA LENSES



A very wide range of lenses is available for the Exakta cameras, from 20 to 1000 mm. focal length and covering angles of view from 93° to 2½°. All lenses have the focusing movement incorporated in the mount, and special viewfinders are not required since the reflex screen automatically shows the exact picture area. The angles quoted above (24 to 500 mm.) are for the diagonal of the frame.

EXAKTA, EXA II AND EXA 500 LENSES

Name of lens	Focal length	Aperture	Angle of field	No. of elements	Closest focusing distance to film plane	Lens mount diameter (mm.)	Lens mount screw thread (mm.)	Overall length (mm.)	Weight approx. (grammes)	Aperture Control *	Designed for RTL 1000 internal auto pressure release
Flektogon .	20	f4	93°	10	6½ in.	80†	77†	50	330	F.A.	—
Flektogon .	25	f4	82°	7	7⅞ in.	80†	77†	53.3	300	F.A.	—
Orestegon .	29	f2.8	73°	7	13 in.	—	—	—	—	F.A.	√
Oreston .	50	f1.8	47°	6	13 in.	51	49	—	—	F.A.	√
● Lydith .	30	f3.5	72°	5	13 in.	51†	49†	63	150	S.A.	—
Flektogon .	35	f2.8	62°	6	14 in.	51†	49†	48.8	175	F.A.	—
● Primogon .	35	f4.5	62°	4	15¾ in.	51†	49†	63	170	P.S.	—
Domiplan .	50	f2.8	47°	3	30 in.	42	40.5	52	150	F.A	—
Tessar .	50	f2.8	45°	4	19¾ in.	51	49	36	150	F.A.	—
● Pancolor .	50	f2	45°	6	19¾ in.	51	49	36	175	F.A.	—
● Domiron .	50	f2	45°	6	13 in.	51	49	42	200	F.A.	—
● Biotar .	75	f1.5	32°	6	31½ in.	60	58	73.8	450	P.S.	—
● Biometar .	80	f2.8	32°	5	31½ in.	51	49	56	260	F.A.	—
Orestor .	100	f2.8	24°	5	39 in.	—	—	—	—	F.A.	√
● Trioplan N .	100	f2.8	24°	3	43 in.	57	55	116	430	F.A	—
● Biometar .	120	f2.8	21.5°	5	51 in.	70	67	106	530	F.A.	—
● Primotar .	135	f3.5	18°	4	5 ft. 2 in.	57	55	163	465	P.S.	—
Orestor .	135	f2.8	18°	5	4 ft. 10 in.	—	—	—	—	P.S.	—
Sonnar .	135	f4	18.5°	4	40 in.	51	49	87.3	375	P.S.	—
Sonnar .	180	f2.8	14°	5	4 ft. 11 in.	80	77	151.8	1325	P.S.	—
● Primotar .	180	f3.5	14°	4	7 ft. 3 in.	70	67	215	600	P.S.	—
Tele Megor .	180	f5.5	14°	4	6 ft. 7 in.	51	49	148	350	P.S.	—
Orestogor .	200	f4	12°	4	8 ft. 3 in.	60	58	160	600	P.S.	—
Tele Megor .	250	f5.5	10°	4	10 ft. 10 in.	60	58	215	600	P.S.	—
Orestegor .	300	f4	8°	5	12 ft.	—	—	—	—	P.S.	—
Sonnar .	300	f4	8°	5	9 ft. 10 in.	80	77	233	1950	P.S.	—
Tele Megor .	300	f4.5	8°	4	10 ft. 10 in.	85	82	274	1800	P.S.	—
Tele Megor .	400	f5.5	6°	4	19 ft.	85	82	342	1750	P.S.	—
Fernobjectiv	500	f8	5°	2	19 ft.	80	77	555	—	Normal	—
Mirrorlens .	500	f4	5°	4 +2 Mirrors	23 ft.	Built-in revolving mount		306	7300	None	—
Mirrorlens .	1000	f5.6	2.5°	4 +2 Mirrors	50 ft.	Built-in revolving mount		—	—	None	—

Data apply to lenses made since 1963.
*Aperture Control: F.A.=Fully Automatic; S.A.=Semi-automatic; P.S.=Preset Manual.
†Only usable with special wide-front filters and lens hood.

the standard lenses and thus should be focused more carefully. Also, their size and weight have an adverse influence on our steady grip of the camera, making it advisable to operate longish exposure times with the camera fixed on a tripod.

Long-focus lenses for the 35 mm. Exaktas:

75 mm. *f*4.5 Biotar
80 mm. *f*2.8 Biometar
100 mm. *f*2.8 Orestor
100 mm. *f*2.8 Trioplan
120 mm. *f*2.8 Biometar
135 mm. *f*3.5 Primotar
135 mm. *f*2.8 Orestor
135 mm. *f*4 Sonnar
180 mm. *f*2.8 Sonnar
180 mm. *f*3.5 Primotar
180 mm. *f*5.5 Tele Megor
200 mm. *f*4 Orestogor
250 mm. *f*5.5 Tele Megor
300 mm. *f*4 Orestegor
300 mm. *f*4 Sonnar
300 mm. *f*4.5 Tele Megor
400 mm. *f*5.5 Tele Megor
500 mm. *f*8 Fernobjectiv
500 mm. *f*5.6 Orestegor
500 mm. *f*4 Mirrorlens, Jena
1000 mm. *f*5.6 Mirrorlens, Jena

While the Exa II, IIa will take the same lenses as the Exakta with some of the long-focus lenses, the edges of the negatives are cut off on the Exa I. This occurs when the distance between the lens and film plane exceeds 70 mm. This is negligible with lenses up to 100 mm. in focal length, but longer focal lengths should not be used.

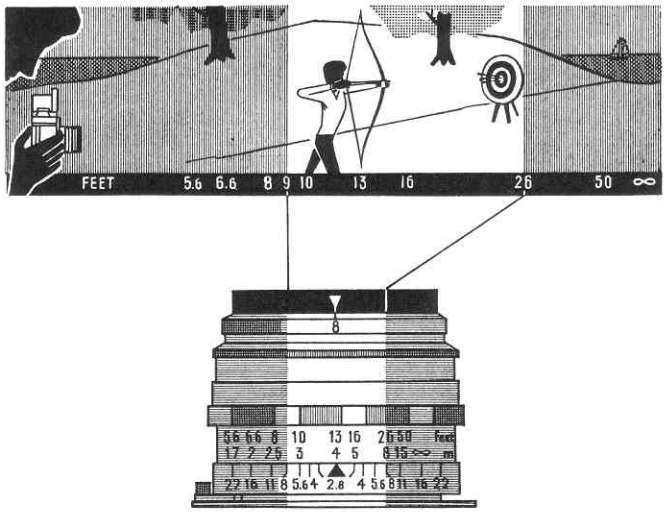
THE TECHNIQUE OF FOCUS

Depth of Field

Strictly speaking, an ideal photographic lens can give a critically sharp image of a single plane only—so far as the image formed in the plane of the film is concerned. This is the "plane of focus", and its distance from the plane of the film represents the distance on which the lens has been focused. Still, points in front of and behind the actual distance focused at *appear* to be sharp. How is this possible? Any point lying outside the plane of focus will not be represented in the plane of the film as a point, but as a small "circle of confusion"; the diameter of this circle of confusion increases in size with the aperture of the lens. Furthermore, the greater its focal length the further the point to be represented lies from the plane of focus, and the larger the circle on the film. Indeed, we know, the longer the focal length and the larger the aperture, the narrower the belt in front of and behind the distance focused which appears to be sharp. Still, the human eye does not perceive an image to be unsharp as long as its departure from "pin-point" delineation does not exceed certain limits. That area in front and behind the plane actually focused which, although not "pin-point" sharp, can be accepted as sharp by the human eye, is described in photographic language as "depth of field".

As a matter of experience it is found that the circle of confusion still appears as a sharp point if it is seen from a distance at which the angle of view which it subtends amounts to two minutes of arc at most. In plain English, at a viewing distance of 10 in. (25 cm.), which may be regarded as normal for a print between 4×6 in., and 6×8 in. (13×18 and 18×24 cm.) in size, this means that the highest permissible diameter of the circle of confusion is 1/6 mm.

For the 24×36 mm. ($1\times1\frac{1}{2}$ in.) negative of the 35 mm. Exakta this corresponds to 1/30 mm. maximum permissible



The depth of field scale on the Exakta lens mounts shows the range of distances over which the picture will be adequately sharp. The scale shows the series of lens apertures engraved on each side of the setting mark for the distance scale. Having focused the lens, note the distances on the scale opposite the two figures representing the aperture you are using, and these indicate the extent of the depth of field. Above the lens is set at 13 ft. (4 m.); at *f*8 the depth of field is 9 to 26 ft. (2.7 to 8 m.).

diameter of the circle of confusion. Thus, all points which are represented on the 35 mm. Exakta negative by a circle of confusion of not more than 1/30 mm. diameter can be accepted as covered by "depth of field" and therefore as sufficiently "sharp".

Control of Depth of Field

The depth of field—being dependent on the focal length of the lens used, the distance actually focused at and the aperture employed—has to be ascertained for every stop separately.

The reflex image of the Exaktas permits control of the depth of field In stopping down, the increase in definition to the foreground and the background from the actual point one has focused at can be seen (up to the state where the reflex image grows too dark for observation). Use of the magnifier and focusing hood extension (see page 20) facilitates the observation considerably.

Nevertheless, one should make some allowance for the fact that our focusing screen is only negative size, not the size of the enlarged print, and that the eye cannot distinguish a very small circle from a mathematical point, so it can happen that towards the extremes of the range of depth of field seen on the ground-glass, the enlargement will show blur. Indeed, in every case when importance is attached to good definition in depth, one should rather rely on depth of field tables than on what appears on the focusing screen.

The lenses of the Exakta are in addition fitted with a depth of field calculator, allowing one to read off figures for depth of field for the different stops and distances at once. The lens mount has been provided with a special scale bearing the aperture figures, diverging from either side of the index mark.

To read, first set the distance index (obtained by reflex-focusing or by guessing) to, let us say, 10 ft. Assuming that we are working with a 2 in. (5 cm.) lens with aperture *f*5.6, the two index lines marked 5.6 on the depth of field ring

point on one side to 6 ft., and on the other side to 30 ft. The range of depth of field is therefore from 6 ft. to 30 ft., while actually set to 10 ft.

The reader will be surprised to find these figures very different from those given for the same conditions in our depth of field tables, the reason being that on perfectly unjustifiable grounds 1/10*mm. has been allowed by the manufacturers as permissible circle of confusion, compared with the accepted standard of* 1/30 *mm. for* $1\frac{1}{2} \times 1$ *in. negatives (page* 52*). The depth of field calculator is misleading.*

Limits of Depth of Field

The widely held idea that everything is equally sharp within the depth of field and completely unsharp outside these limits is mistaken. It must be emphasized that, as we have said before, critical "pin-point" definition can be expected only in the plane actually focused.

For this very reason care should be taken to *place the focus as exactly as possible at the spot on which the greatest sharpness is required.* It may be emphasized again that focusing should always be done with full aperture of the lens to have the least "depth" on the screen and stopping down only be done afterwards.

In the case of distant landscapes, use should *not* be made of hyperfocal distance (described below) if the greatest sharpness is required in the far distance. In this case, focusing on the object in the far distance will give better results. This applies also to the use of the safety-zone focusing detailed on page 56.

When making use of the built-in magnifier, the Exakta forces us automatically to concentrate on the main subject, as the magnifier shows only a portion of the whole reflex image. This is all the better, as otherwise one is rather apt to judge the picture by its general appearance on the ground-glass, which as regards pin-sharp definition can be somewhat deceiving.

Further, the assumed circle of confusion which has been

laid down for the depth of focus tables is derived on the supposition that the whole negative is viewed or enlarged. When small sections of the negative are greatly enlarged, the depth of field decreases accordingly, because the circle of confusion is enlarged at the same time. That is just one more reason why focusing should be carried out as exactly as possible.

On the other hand, in exactly the same way as sharpness is not absolutely uniform within the depth of field, the region of unsharpness outside the depth of field area increases only gradually.

The Hyperfocal Distance

The depth of field extends for a greater distance in the direction of infinity than towards the camera. When a lens is focused on such a distance that the depth of field just reaches the far distance (infinity), then the lens is focused on the "infinity-near point" or the "hyperfocal distance". This adjustment of focus is always advisable when it is desired to secure adequate sharpness from the farthest distance as far as possible into the foreground, rather than extreme sharpness in the far distance only (see page 57).

Safety-zone Focusing

There are opportunities in a photographer's life which, like time and tide, wait for no man; when, to bring your whole technical armament to bear—reflex focusing, exposure meter and the rest—would be to let your prey escape you for ever. Such situations are best dealt with by applying a kind of pre-prepared depth focusing as follows:

FOR 35 mm. EXAKTA WITH 2 in. (5 cm.) LENS:

Focus at 15 ft. (4 m.), stop 8.
Everything between 10 and 30 ft. will be sharp.

Focus at 30 ft. (9 m.), stop 8.
Everything between 15 ft. and infinity will be sharp.

Hyperfocal Distance and Depth of Field Tables

These tables have been computed in conformity with the principles laid down on page 52 for circle of confusion.

In the depth of field tables the figures on the left of each group relate to the setting of the lens stop. The bold (middle) figures in each group indicate the distance in feet to which the lens has to be set on the focusing mount. The corresponding figures above them give the distance of the near limit (in feet and inches), and the figure below gives the distance of the distant limit (in feet and inches) of the region of depth of field.

HYPERFOCAL DISTANCE

Table of focusing distances, giving the greatest possible depth of field from the foreground to infinity with the 2 in. (5 cm.) lenses.

(For conversion into metric units, see page 90)

Aperture f	*Setting of lens in feet*	*Extent of depth to infinity from:*
1.5	160	80
1.9, 2	120	60
2.2	110	55
2.8	80	45
3.2, 3.5	70	35
4	60	30
4.5	50	25
5.6	40	20
6.3	35	17–6
8	30	15
9	25	12–6
11	20	10
12.5	17	8–6
16	15	7–6
18	12	5
22	10	6

NOTE.—The infinity near point (hyperfocal distance) should *not* be used when maximum sharpness is required in the far distance.

DEPTH OF FIELD FOR STANDARD 2 in. (5 cm.) LENSES

(For conversion into metric units, see page 90)

*f*2	3–11	4–10	5–9	6–8	7–7	8–5	9–3	11	13	17	25	35	55	120
(*f*2.2)	4	5	6	7	8	9	10	12	15	20	30	50	100	∞
	4–1	5–2	6–3	7–5	8–6	9–8	11	13	17	24	40	80	∞	∞
*f*2.8	3–10	4–9	5–7	6–6	7–4	8–2	8–11	10–6	12–6	16	22	30	45	80
	4	5	6	7	8	9	10	12	15	20	30	50	100	∞
	4–2	5–4	6–6	7–7	8–10	10	11–5	14	18	27	48	130	∞	∞
*f*3.5	3–9	4–8	5–6	6–4	7–2	8	8–9	10–3	12–4	15–6	20	30	40	70
	4	5	6	7	8	9	10	12	15	20	30	50	100	∞
	4–3	5–5	6–7	7–9	9	10–4	11–8	14–6	19	28	50	17	∞	∞
*f*4	3–9	4–7	5–6	6–3	7–1	7–10	8–7	10	12	15	20	27	37	60
	4	5	6	7	8	9	10	12	15	20	30	50	100	∞
	4–4	5–6	6–8	7–11	9–2	10–6	11–11	15	20	30	60	300	∞	∞
*f*5.6	3–8	4–6	5–3	6	6–9	7–5	8	9–3	11	13	17	22	30	40
	4	5	6	7	8	9	10	12	15	20	30	50	100	∞
	4–5	5–8	7	8–4	9–10	11–6	13	17	24	40	120	∞	∞	∞
f	3–6	4–3	5	5–8	6–4	6–11	7–6	8–7	10	12	15	18	23	30
	4	5	6	7	8	9	10	12	15	20	30	50	100	∞
	4–7	6	7–6	9–1	10–9	12–10	15	20	30	60	∞	∞	∞	∞
*f*11	3–5	4–1	4–9	5–4	5–10	6–3	6–8	7–6	8–6	10	12	15	17	20
	4	5	6	7	8	9	10	12	15	20	30	50	100	∞
	4–10	6–5	8–2	10–2	12–6	16	20	30	60	∞	∞	∞	∞	∞
*f*16	3–2	3–9	4–4	4–9	5–3	5–8	6	6–8	7–7	8–8	10	11–6	13	15
	4	5	6	7	8	9	10	12	15	20	30	50	100	∞
	5–4	7–4	9–9	12–9	16–7	20	30	60	∞	∞	∞	∞	∞	∞
*f*22	2–10	3–3	3–9	4–2	4–6	4–9	5	5–6	6	7	8	9	10	10
	4	5	6	7	8	9	10	12	15	20	30	50	100	∞
	8–9	10	15	25	40	90	∞	∞	∞	∞	∞	∞	∞	∞

DEPTH OF FIELD FOR $1\frac{1}{2}$ in. (4 cm.) LENSES

(For conversion into metric units, see page 90)

f2	3–9 4 4–3	4–8 5 5–4	5–6 6 6–6	6–5 7 7–9	7–3 8 8–11	8 9 10–1	8–10 10 11–6	10–4 12 14–3	12–6 15 19	15–9 20 27	21 30 50	30 50 150	43 100 ∞	75 ∞ ∞
f2.8	3–8 4 4–4	4–7 5 5–6	5–5 6 6–9	6–2 7 8	7 8 9–6	7–9 9 11	8–4 10 12–6	9–9 12 15–9	11–6 15 21	14 20 33	18 30 75	25 50 ∞	33 100 ∞	50 ∞ ∞
f4	3–7 4 4–6	4–5 5 5–9	5–2 6 7–1	5–11 7 8–6	6–7 8 10	7–4 9 11–8	8 10 13–5	9–2 12 17–4	10–10 15 24	13–3 20 40	17 30 120	22 50 ∞	28 100 ∞	40 ∞ ∞
f5.6	3–6 4 4–9	4–3 5 6–3	4–10 6 7–11	5–6 7 9–9	6–1 8 11–9	6–7 9 14	7–2 10 16–6	8 12 23	9–6 15 38	11 20 100	14 30 ∞	17 50 ∞	20 100 ∞	25 ∞ ∞
f8	3–4 4 5	4 5 6–8	4–7 6 8–7	5–2 7 10–10	5–8 8 13–6	6–2 9 16–6	6–7 10 20	7–5 12 30	8–6 15 60	10 20 ∞	12 30 ∞	14 50 ∞	16 100 ∞	20 ∞ ∞
f11	3 4 5–10	3–8 5 8	4–1 6 11–1	4–6 7 15	5 8 20	5–4 9 30	5–8 10 43	6–3 12 150	7 15 ∞	8 20 ∞	9 30 ∞	10–3 50 ∞	11–6 100 ∞	13 ∞ ∞
f16	2–10 4 6–8	3–4 5 10	3–9 6 15	4–1 7 23	4–5 8 40	4–9 9 90	5 10 ∞	5–6 12 ∞	6 15 ∞	6–8 20 ∞	7–6 30 ∞	8–4 50 ∞	9 100 ∞	10 ∞ ∞

DEPTH OF FIELD FOR 3–$3\frac{1}{2}$ in. (7.5–8.5 cm.) LENSES

(For conversion into metric units, see page 90)

f1.9	3–11 4 4–1	4–11 5 5–1	5–10 6 6–2	6–10 7 7–2	7–9 8 8–3	8–9 9 9–3	9–8 10 10–4	11–7 12 12–6	14–3 15 15–10	18–11 20 21–4	27–6 30 33	43 50 59	76 100 145	320 ∞ ∞
f2.8	3–11 4 4–1	4–11 5 5–1	5–10 6 6–2	6–9 7 7–3	7–8 8 8–4	8–7 9 9–5	9–6 10 10–6	11–5 12 12–10	14 15 16–2	18–3 20 22–3	26 30 35	40 50 67	67 100 200	200 ∞ ∞
f4	3–11 4 4–1	4–10 5 5–2	5–9 6 6–3	6–8 7 7–4	7–7 8 8–5	8–6 9 9–6	9–5 10 10–8	11–2 12 13	13–9 15 16–7	17–10 20 23	25 30 37	38 50 73	63 100 270	160 ∞ ∞
f5.6	3–10 4 4–2	4–9 5 5–3	5–8 6 6–4	6–7 7 7–6	7–5 8 8–8	8–3 9 9–10	9–1 10 10–1	10–8 12 13–8	13 15 17–8	16–8 20 25	23 30 43	33 50 100	50 100 ∞	100 ∞ ∞
f8	3–10 4 4–2	4–9 5 5–4	5–7 6 6–6	6–6 7 7–7	7–4 8 8–11	8–1 9 10–1	8–11 10 11–5	10–5 12 14–2	12–7 15 18–6	16 20 27	22 30 47	30 50 130	45 100 ∞	80 ∞ ∞
f11	3–9 4 4–4	4–7 5 5–7	5–4 6 6–10	6–2 7 8–2	6–11 8 9–6	7–7 9 11	8–4 10 12–6	9–8 12 15–10	11–6 15 21	14 20 33	19 30 75	25 50 ∞	33 100 ∞	50 ∞ ∞
f16	3–8 4 4–6	4–5 5 5–8	5–3 6 7–1	6 7 8–6	6–8 8 10	7–4 9 11–7	8 10 13–4	9–3 12 17	11 15 24	13–4 20 40	17 30 120	22 50 ∞	28 100 ∞	40 ∞ ∞
f22	3–6 4 4–9	4–2 5 6–3	4–10 6 7–10	5–6 7 9–8	6 8 11–9	6–7 9 14	7–2 10 16–8	8–1 12 23	9–4 15 37	11–2 20 100	13 30 ∞	17 50 ∞	20 100 ∞	25 ∞ ∞

DEPTH OF FIELD FOR 4–4¼ in. (10–10.5 cm.) LENSES

(For conversion into metric units, see page 90)

f2.8	3–11 4 4–1	4–11 5 5–1	5–10 6 6–2	6–10 7 7–2	7–9 8 8–3	8–9 9 9–3	9–8 10 10–4	11–7 12 12–6	14–3 15 15–10	18–11 20 21–4	27–6 30 33	43 50 59	76 100 145	120 200 500	320 ∞ ∞
f4	3–11 4 4–1	4–11 5 5–1	5–10 6 6–2	6–9 7 7–3	7–8 8 8–4	8–7 9 9–5	9–6 10 10–6	11–5 12 12–10	14 15 16–2	18–3 20 22–3	26 30 35	40 50 67	67 100 200	100 200 ∞	200 ∞ ∞
f5.6	3–11 4 4–1	4–10 5 5–2	5–9 6 6–3	6–8 7 7–4	7–7 8 8–5	8–6 9 9–6	9–5 10 10–8	11–2 12 13	13–9 15 16–7	17–10 20 23	25 30 37	38 50 73	63 100 270	90 200 ∞	160 ∞ ∞
f8	3–10 4 4–2	4–9 5 5–3	5–8 6 6–4	6–7 7 7–6	7–5 8 8–8	8–3 9 9–10	9–1 10 11–1	10–8 12 13–8	13 15 17–8	16–8 20 25	23 30 43	33 50 100	50 100 ∞	67 200 ∞	100 ∞ ∞
f11	3–10 4 4–2	4–9 5 5–4	5–7 6 6–6	6–6 7 7–7	7–4 8 8–11	8–1 9 10–1	8–11 10 11–5	10–5 12 14–2	12–7 15 18–6	16 20 27	22 30 47	30 50 130	45 100 ∞	57 200 ∞	80 ∞ ∞
f16	3–9 4 4–4	4–7 5 5–7	5–4 6 6–10	6–2 7 8–2	6–11 8 9–6	7–7 9 11	8–4 10 12–6	9–8 12 15–10	11–6 15 21	14 20 33	19 30 75	25 50 ∞	33 100 ∞	40 200 ∞	50 ∞ ∞
f22	3–8 4 4–6	4–5 5 5–8	5–3 6 7–1	6 7 8–6	6–8 8 10	7–4 9 11–7	8 10 13–4	9–3 12 17	11 15 24	13–4 20 40	17 30 120	22 50 ∞	29 100 ∞	33 200 ∞	40 ∞ ∞

DEPTH OF FIELD FOR 5⅜ in. (13.5 cm.) LENSES

(For conversion into metric units, see page 90)

f3.5	3–11½ 4 4–0½	4–11½ 5 5–0½	5–11 6 6–1	6–11 7 7–1	7–10 8 8–2	8–10 9 9–2	9–9 10 10–3	11–8 12 12–4	14–6 15 15–6	19–3 20 20–10	28 30 32	45 50 56	80 100 130	150 200 350	470 ∞ ∞
f4	3–11½ 4 4–0½	4–11½ 5 5–0½	5–11 6 6–1	6–11 7 7–1	7–10 8 8–2	8–10 9 9–2	9–9 10 10–3	11–8 12 12–4	14–6 15 15–6	19–1 20 21	28 30 32	44 50 57	78 100 135	130 200 400	400 ∞ ∞
f4.5	3–11 4 4–1	4–11 5 5–1	5–10 6 6–2	6–10 7 7–2	7–9 8 8–3	8–9 9 9–3	9–8 10 10–4	11–7 12 12–6	14–3 15 15–10	18–11 20 21–4	27–6 30 33	43 50 59	76 100 145	120 200 500	320 ∞ ∞
f5.6	3–11 4 4–1	4–11 5 5–1	5–10 6 6–2	6–9 7 7–3	7–8 8 8–4	8–7 9 9–5	9–6 10 10–6	11–5 12 12–10	14 15 16–2	18–3 20 22–3	26 30 35	40 50 67	67 100 200	100 200 ∞	200 ∞ ∞
f8	3–11 4 4–1	4–10 5 5–2	5–9 6 6–3	6–8 7 7–4	7–7 8 8–5	8–6 9 9–6	9–5 10 10–8	11–2 12 13	13–9 15 16–7	17–10 20 23	25 30 37	38 50 73	63 100 270	90 200 ∞	160 ∞ ∞
f11	3–10 4 4–2	4–9 5 5–3	5–8 6 6–4	6–7 7 7–6	7–5 8 8–8	8–3 9 9–10	9–1 10 10–1	10–8 12 13–8	13 15 17–8	16–8 20 25	23 30 43	33 50 100	50 100 ∞	67 200 ∞	100 ∞ ∞
f16	3–10 4 4–2	4–9 5 5–4	5–7 6 6–6	6–6 7 7–7	7–4 8 8–11	8–1 9 10–1	8–11 10 11–5	10–5 12 14–2	12–7 15 18–6	16 20 27	22 30 47	30 50 130	45 100 ∞	57 200 ∞	80 ∞ ∞
f22	3–9 4 4–4	4–7 5 5–7	5–4 6 6–10	6–2 7 8–2	6–11 8 9–6	7–7 9 11	8–4 10 12–6	9–8 12 15–10	11–6 15 21	14 20 33	19 30 75	25 50 ∞	33 100 ∞	40 200 ∞	50 ∞ ∞

DEPTH OF FIELD FOR $7\frac{1}{8}$–8 in. (18–20 cm.) LENSES

(For conversion into metric units, see page 90)

*f*4.5	5–11½ **6** 6–0½	6–11½ **7** 7–0½	7–11 **8** 8–1	8–11 **9** 9–1	9–11 **10** 10–1	11–10 **12** 12–2	14–8 **15** 15–4	19–6 **20** 20–7	29 **30** 31	47 **50** 54	88 **100** 113	160 **200** 280	700 ∞ ∞
*f*5.5 (*f*5.6)	5–11½ **6** 6–0½	6–11½ **7** 7–0½	7–11 **8** 8–1	8–11 **9** 9–1	9–11 **10** 10–1	11–10 **12** 12–2	14–8 **15** 15–4	19–5 **20** 20–8	28–6 **30** 31–6	46 **50** 55	86 **100** 120	150 **200** 300	600 ∞ ∞
*f*6.3	5–11½ **6** 6–0½	6–11 **7** 7–1	7–11 **8** 8–1	8–10 **9** 9–2	9–10 **10** 10–2	11–8 **12** 12–4	14–7 **15** 15–6	19–3 **20** 20–10	28 **30** 32	45 **50** 56	83 **100** 125	143 **200** 330	500 ∞ ∞
*f*8	5–11 **6** 6–1	6–11 **7** 7–1	7–10 **8** 8–2	8–10 **9** 9–2	9–9 **10** 10–3	11–8 **12** 12–4	14–6 **15** 15–6	19–1 **20** 21	28 **30** 32	44 **50** 57	78 **100** 135	130 **200** 400	400 ∞ ∞
*f*11	5–10 **6** 6–2	6–10 **7** 7–2	7–9 **8** 8–3	8–9 **9** 9–3	9–8 **10** 10–4	11–7 **12** 12–6	14–3 **15** 15–10	18–11 **20** 21–4	27–6 **30** 33	43 **50** 59	76 **100** 145	120 **200** 500	320 ∞ ∞
*f*16	5–10 **6** 6–2	6–9 **7** 7–3	7–8 **8** 8–4	8–7 **9** 9–5	9–6 **10** 10–6	11–5 **12** 12–10	14 **15** 16–2	18–3 **20** 22–3	[illegible] **30** 35	40 **50** 67	67 **100** 200	100 **200** ∞	200 ∞ ∞
*f*22	5–9 **6** 6–3	6–8 **7** 7–4	7–7 **8** 8–5	8–6 **9** 9–6	9–5 **10** 10–8	11–2 **12** 13	13–9 **15** 16–7	17–10 **20** 23	25 **30** 37	38 **50** 73	63 **100** 270	90 **200** ∞	160 ∞ ∞
*f*32	5–8 **6** 6–4	6–7 **7** 7–6	7–5 **8** 8–8	8–3 **9** 9–10	9–1 **10** 10–1	10–8 **12** 13–8	13 **15** 17–8	16–8 **20** 25	23 **30** 43	33 **50** 100	50 **100** ∞	67 **200** ∞	100 ∞ ∞

THE TECHNIQUE OF EXPOSURE

The correct exposure time depends on two sets of circumstances:

(1) The amount and colour of light reflected from the object to be photographed. This, in its turn, depends on the season of the year, time of day, situation, weather, etc.

(2) The speed of film, the kind of filter used, the aperture employed and probably an allowance for an increase in exposure in the case of special fine grain development.

The correct exposure time can be ascertained by:

EXPOSURE TABLES. These are based on mathematical calculations and practical experience. They tabulate all or most of the factors given above, and, if used with discretion, will give an exposure-figure which lies within the latitude of the film. A simplified table is usually contained in the leaflet packed with the film.

PHOTO-ELECTRIC EXPOSURE METERS. They are accurate and dependable means for arriving at the right exposure time. Some consist of a photo-electric cell which converts light-energy into electricity, which in turn moves an indicator over a table of light values.

CdS exposure meters employ a cadmium sulphide photo resistance. They have a narrow angle of acceptance, are very sensitive and accurate. They employ a mercury button battery which has an average life, in normal use, of about two years.

To the experienced Exakta photographer, *the brightness of the image on the reflex focusing screen soon becomes a useful guide to the correct exposure.* It acts to some extent as an optical exposure meter. By using a standard exposure time, e.g. 1/60 sec. for average subjects, it can become a matter of habit to vary the aperture so that the screen has a standard intensity of illumination or to see how far into the corners of the screen details may be observed but the latter only if the subject is of even illumination).

EXAMAT TTL Meter Attachment

This is a pentaprism finder attachment for the Exakta and Exa I cameras which permits combined viewfinding and exposure measuring by means of a built-in CdS meter, measuring the light through the lens.

There are three methods of exposure measuring:

1. **By varying the aperture setting with a pre-selected shutter speed.**
2. **By varying the shutter speed with a pre-selected aperture.**
3. **By measuring the shutter speed-aperture combination as on ordinary manually operated meters.**

To use the Examat:

1. **Insert battery** (PX13) by removing battery cover on the side of the unit with a coin, insert battery with + sign upwards and replace cover. The life of a battery exceeds one year.
2. **Insert the Examat** into the top of the camera body.
3. **Set film speed** by turning the two studs in the top of the meter disc until the required speed points to the index mark on the appropriate ASA or DIN cut-out window.
4. **Switch on meter** by sliding the switch on the top left to the green "switched-on" position.

The procedure then varies according to the metering method used.

For aperture adjustment metering:

5. **Set camera lens to manual aperture setting.**
6. **Set on the camera the preselected shutter speed.**
7. **Set the shutter speed on the main setting dial of the meter** in line with the white setting mark.
8. **Turn aperture ring of the lens** until the meter needle in the viewfinder points to the zero index mark.

If the meter needle cannot be aligned with the index mark, this indicates that with the shutter speed preselected one cannot obtain a correct exposure and a slower shutter speed may have to be preselected. After use, switch off the meter.

For shutter speed adjustment metering:

5. **Set camera lens to manual aperture setting.**
6. **Stop lens down** to the preselected aperture value.
7. **Turn the main setting dial,** with the viewfinder eyepiece at eye level, until the meter needle in the viewfinder lines up with its zero mark.
8. **Read off the correct shutter speed** to be set on the camera opposite the white setting mark and take your picture. After use, switch off meter.

For manual metering:

5. **Set camera lens to automatic iris.**
6. **Turn the widest aperture value of your lens to the white setting mark on the aperture dial.**
7. **Turn the main setting dial** until the meter needle in the finder points to the zero mark and switch off meter.
8. **Select any shutter speed and aperture combination** which face each other on the shutter speed and aperture dials and transfer them to the camera and lens.

Exposure Meter Attachment

A special exposure meter unit was provided for the Exakta Varex, but was discontinued in 1961. It is a combination of a pentaprism focusing unit (still available, see page 21) with a built-in photo-electric exposure meter and, in addition, it incorporates a direct vision optical finder.

To use the meter:

1. **Set film speed.**
2. **Point camera at subject.**
3. **Set index to needle position.**
4. **Read off aperture-exposure combination and transfer to lens and shutter.**

1. The film speed is set by turning the wedge-shaped disc with the printed aperture numbers (from 2 to 22) to the appropriate value in either DIN (left) or ASA (right).
3. The light falling on the cell produces a certain deflection of the needle in the cut-out window on top of the meter. Rotate the outer disc until the *black* triangle (▽) engraved on it points to the black or white band facing the needle.

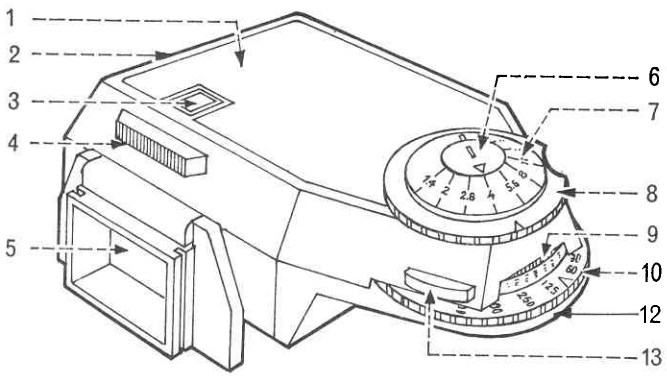
In poor light there may be no noticeable movement of the meter needle. In this case, open up the front cover of the cell and set the *red* triangle (▽) opposite the black or white band facing the needle.

4. The correct aperture to use (in the cut-out in the inner disc) faces the exposure time you want to use (on the bush of the outer disc) or vice versa. Transfer this result to the lens and shutter.

A translucent plastic disc which may be clipped over the closed or open cell is intended for incident light measurement. See page 72.

The TTL Pentaprism for the Exakta RTL1000

The TTL pentaprism for the Exakta RTL1000 combines the pentaprism focusing-viewing system described earlier with internal through-the-lens measuring of the exposure,



The TTL pentaprism finder replaces the normal pentaprism or reflex finder on the Exakta RTL 1000 The features are: 1, TTL pentaprism. 2, Battery chamber. 3, Switch signal. 4, Meter switch. 5, Viewfinder eyepiece. 6, Centre disc of aperture setting device. 7. Lower disc of aperture setting device. 8, Change over switch. 9, Film speed setting disc. 10, Shutter speed setting disc. 12, Shutter speed setting mark. 13, Push-button for film speed setting

automatically taking into account film speed, shutter speed, aperture, any filters, extension tubes, etc., which may be connected to the camera.

The light measurement applies when the TTL prism is used in conjunction with the regular focusing screen with microprism centre. If a completely matt focusing screen is employed, the film speed has to be increased by 4 DIN and with a matt screen with 6 mm. bright centre spot by 3 DIN.

Fitting the TTL Pentaprism

The connecting of the TTL prism is the same as described earlier. After fitting the prism into the camera, engage the driver pin of the shutter-speed knob on the camera in the grooves on the base of the prism by rotating its shutter-speed setting disc from stop to stop. When correctly connected, the shutter-speed knob will turn when the shutter-speed disc of the prism is turned.

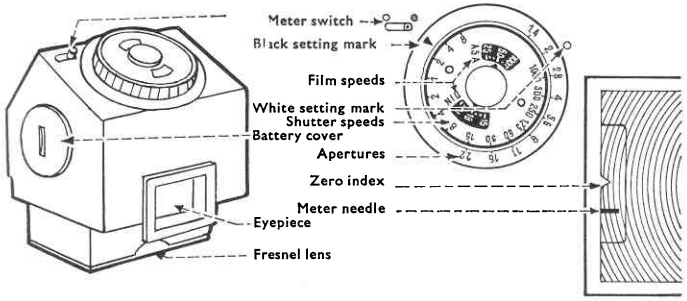
Using the TTL Pentaprism Meter

Set the film speed: First turn the shutter-speed disc so that the orange triangle is visible. Now turn the lower disc of the aperture setting device so that its line points to the line of the centre disc and push the change-over switch home at the two lines. The film speed (orange figures ASA, white figures DIN) is finally set by pressing the push-button as far as it will go into the TTL prism and turning the lower disc of the aperture setting device with its white line to the ASA or DIN speed of the film to be used.

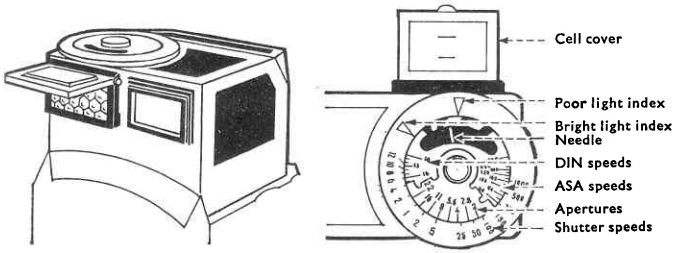
Open Aperture Measuring

With automatic aperture lenses (see page 29), set lens to automatic (A), push change-over switch on lower disc home at the recess without line. Raise and turn the lower aperture setting device so that the widest aperture of the lens used points to the triangular mark on the inside disc (intermediate values may be set). Let the lower disc return. One

EXPOSURE METER UNITS



The Examat converts the Exakta and Exa I cameras to TTL types, enabling accurate light readings to be taken through the camera lens, no matter what lens or attachments are in use. It replaces the normal pentaprism finder or focusing screen and serves as a combined viewing/focusing and exposure meter attachment. Its CdS meter is powered by a battery housed in the side of the unit.



The earlier exposure meter unit for the Varex and Exa I was a combined pentaprism focusing unit and exposure meter, but did not read through the lens. It also incorporated a direct-vision viewfinder.

can NOT measure with incorrectly set widest aperture (smallest aperture number).

To measure, pre-select and set shutter speed on the shutter-speed disc (one can NOT use intermediate speeds). Push meter switch (above eyepiece) to the left. A green circle will appear in the window above it to indicate that the meter is switched on. Point the camera towards the subject and turn the lower disc of the aperture setting device until the pointer on the left-hand side in the viewfinder shows in the centre of the engraved circle. If the circle cannot be reached, use a slower shutter speed. Read off on the aperture setting device the aperture value pointing to the triangular mark and transfer this to aperture setting ring of the lens. Now release. Switch off the meter by turning the switch to the right.

One can reverse the procedure and pre-select the aperture. Turn the lower disc of the aperture setting device until the pointer shows in to the circle. Turn shutter-speed disc until the required aperture on the central disc of the aperture setting device points to the triangular mark on the lower disc. It may be necessary to slightly readjust the aperture on the lens if one does not arrive at a full aperture number. If the required position on the pointer cannot be obtained, a larger or smaller aperture has to be selected.

Stop Down Measurement

To use non-automatic lenses or automatic lenses for manual aperture setting, push the change-over switch of the lower disc home at the recess line. Set the shutter-speed setting device so that the lines of all three discs are on top of each other by raising the lower disc and turning it.

To measure, preset the shutter speed by turning the shutter-speed setting disc above the mark. *NO* intermediate values must be set. Switch on meter—a green indicator circle will appear in the window above the switch. Point camera to subject and turn the lens aperture ring until the pointer on the left of the viewfinder is in the centre of the

circular mark there engraved. If this position cannot be reached, pre-select a slower shutter speed. Release and switch off meter.

One can reverse the procedure and pre-select the aperture required on the lens, and turn the shutter-speed setting disc until the pointer in the finder show to the circle, release and switch off meter. Do not set intermediate shutter-speed values; if necessary, make fine corrections by means of the aperture setting ring. If pointer position cannot be reached, pre-select a wider or smaller lens aperture.

Fitting and Changing Battery

The TTL pentaprism for the RTL1000 Exakta is fitted with a 625 or equivalent mercury oxide battery. The life of the battery in normal use is well in excess of one year.

To change the battery, unscrew the battery compartment in the side wall of the TTL prism, remove old battery and replace by new one, making certain that its plus (+) sign points towards the screw lid and close lid again. Keep battery and its contacts free from finger marks, perspiration, dirt, etc., which can impair the function of the meter. The battery should be removed and stored in a dry place if the TTL prism unit is not used for some time.

Using an Exposure Meter

To get the best results, the 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.

The Exakta meter—as any other—is 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.

REFLECTED LIGHT MEASUREMENT. The usual method of using the meter is to point it directly at the subject. The light reaching the photo-electric cell is therefore that reflected by the subject, so this method is called "reflected light measurement".

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 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 the next higher light value.

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 sliding the white diffuser supplied with the Exakta meter over the honeycomb 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—you must then 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. Another way is to use the incident light diffuser on the meter, pointing it towards the subject from the camera position, and then double the exposure indicated.

COLOUR FILMS have only a small exposure latitude, so particularly careful reading is advisable. The meter is used in the *same* way as for black-and-white films, although the incident light method is often considered best for reversal films. This is because exposure of these should be based on the highlights, and the diffuser itself constitutes a highlight, with the meter in effect reading directly from it.

Because of the importance of the highlights, if you are using the meter without diffuser 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.

THE TECHNIQUE OF TONE

The Use of Filters

The photographic black-and-white film, even though panchromatic, fails to render colours in their true black-and-white tone values, so that the photograph often gives quite a false impression of the real scene. The explanation of this discrepancy is the following.

Scientifically speaking, to the human eye yellow appears to be over ten times as bright as blue, three times as bright as red, and one and a half times as bright as green. The average panchromatic film, however, registers blue with a brilliance of about four-fifths that of yellow, green with one-third, and red with two-thirds of the brightness of yellow.

It is therefore evident that in order to obtain a colour rendering which will correspond with some degree of accuracy to the impression of colours received by our eye, the comparative sensitivity of the various colours to each other in our film will have to be corrected. This can be achieved by the use of filters.

Filters are intended to correct on our negative material the various degrees of brightness of the actual picture. Principally, *they lighten objects of their own colour and darken those of their complementary colour* (e.g. a yellow filter will darken the blue of the sky). They may be used to obtain a colour rendering in our picture which corresponds more closely to the impression made upon our eye by the object: here we speak of "correction filters". Filters may also be employed to produce certain effects; for instance, our picture can be made to show heavy clouds against a particularly dark sky, whereas the actual landscape revealed only light clouds in a blue sky. Filters employed to such ends are termed "effect filters".

All filters cut out certain parts of the light and an increase in exposure time is always necessary when using them.

Exact figures can only be given for each particular case, according to the film used, for the exposure ratio depends not only on the nature of the filter, but on the colour sensitivity of the film and on the colour of the light in which the photograph has to be taken.

FILTER FACTORS

In Daylight	*Panchromatic Film*	*Infra-red Film*
Yellow—Light (1) ...	1.5	—
Medium (2) ...	2	—
Dark (3) ...	3	—
Green —Light ...	3	—
Medium ...	4	—
Orange—Light ...	4	—
Dark ...	5	—
Red —Light ...	7	10
Dark ...	—	15
In Artificial Light		
Yellow—Light (1) ...	1.5	—
Medium (2) ...	1.5	—
Dark (3) ...	2	—
Green —Light ...	3	—
Dark ...	5	—
Blue ...	1.5	—

The following list gives a summary of the filters recommended and a short explanation of their use. The best practical guide to choosing and handling filters is the *Focal Filter Chart*.

YELLOW FILTERS mainly reduce the actinic effect of blue, rendering it darker, and are therefore particularly suitable for landscape photography in order to obtain clearly defined cloud effects on a normal blue sky. In the case of a very light blue sky, a darker filter should be used and vice versa.

GREEN FILTERS have a similar effect to yellow filters, but they also hold back red (render it darker), to which some panchromatic films are comparatively oversensitive (photographing it too light).

SKY FILTERS are designed for photographing scenes with a bright background and a dark foreground, such as often occur in landscape photography. They serve mainly to avoid partial overexposure, and are obtainable as graduated green or yellow filters. If the top part of the object (as in landscapes) is bright, the coloured part of the filter should cover the top part of the lens. No exposure increase is necessary if the exposure time has been determined for the darker part of the picture.

ORANGE FILTERS give overcorrection, and serve, therefore, as an "effect" filter for drawing *heavy* clouds against a dark sky, and very clear distances in landscapes, eliminating light haze, etc.

RED FILTERS are of still stronger effect than the orange filter, for *extreme* contrast, creating black sky with brilliant clouds, faking sunshine into moonlight effects, etc.

DARK RED FILTERS to be used only with infra-red film. Chiefly used for scientific purposes, it penetrates mist.

BLUE FILTERS are for panchromatic film in artificial light. They absorb part of the red sensitivity. This results in better skin tones and darker reds (lips).

FILTERS FOR COLOUR PHOTOGRAPHY—see page 43.

Polarizing Filter

Highly polished subjects can be very 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. To overcome this difficulty the polarizing filter has been introduced. It suppresses light vibrating in one particular plane, while light vibrating in a plane at right angles to this will freely pass. Light reflections from glass, china, enamel, polished wooden surfaces, water, vibrate to a large extent in one plane (=it is polarized) and can therefore be almost extinguished by placing the polarizing filter in proper position over the lens.

The filter has to be rotated to find out its best position on the lens. The Exaktas are ideal for this observation. The filter is simply held in front of the lens, and then by slowly rotating the filter one can find the best or desired result on the reflex-focusing screen, and push the filter on to the lens in the position selected. As the polarizing filter is slightly tinted, the exposure time should be increased, the factor being about three times.

CARE OF THE CAMERA

Storage

When not in use, the camera should be protected from damp and dust, preferably in its case, and, as an additional precaution, inserted into a polythene bag.

Care should be taken to see that the camera is not kept in abnormally high or low temperatures—normal room temperature is best.

Take the precaution of removing any batteries, because however well made these may be there is always a risk of deterioration and corrosion.

Exercise

Cameras (like most mechanical instruments) need to be exercised regularly to keep them in good condition. Store your camera where you can get at it easily and put it through its normal operations at least once a month:

1. Set the shutter release and fire several times.
2. Turn to a slow shutter speed and again set the shutter release and fire. Also operate delayed action device.
3. Examine the exposure meter for correct operation.
4. Check film transport
5. Check the viewfinder.

These exercises will keep the mechanism in good order, retaining the natural qualities of the lubricant—thus ensuring the camera is ready for instant use when required.

Running Test after Storage

Before embarking on a holiday where your camera will be your constant companion, or on an important assignment, make a few trial exposures. It is advisable to test the camera at least four weeks prior to your departure to give time for a test film to be exposed and processed. This will avoid a possibly spoiled holiday record.

Keeping the Interior Clean

When your camera is used on the beach, or other conditions where dust or sand can easily infiltrate into the mechanism, take the precaution of putting the instrument with its case into a polythene or other container so that flying dust, sand, etc., particles are prevented from entering the camera. This applies particularly, of course, if it is laid down on a sandy beach. Furthermore, avoid leaving the camera in such a position that direct sunlight is allowed to fall upon it. This could ruin a camera.

Small chips of film can easily damage the mechanism; therefore, always make sure that the inside of your camera is spotless. Check your camera every time it is loaded with film.

Treating the Camera with Care

Your camera is a fine, precision instrument. It has been produced with great care and attention to detail. Do not allow it to be swung by its shoulder strap, thrown into the back of a car, nor treat as if it were as robust as a battleship. If you protect the camera against possible damage due to a knock, you will be amply repaid by years of excellent and trouble-free service.

Coping with Tropical Conditions

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 the lens

cap when not in use. 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 airtight 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 a time as possible in the camera. Storing camera and film in the glove compartment of the car is inviting trouble.

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.

CLOSE-UP WORK

The single-lens reflex cameras are particularly suited for close-up photography. When working with supplementary lenses or extension tubes, the actual image covered, as well as the exact definition, can be controlled on the reflex-focusing screen. Parallax, which makes close-up work with almost any other type of camera at least very difficult or necessitates expensive auxiliary attachments, simply does not exist in the Exaktas.

Supplementary Lenses

The Exakta cameras can be focused down to about 3 ft. This figure varies somewhat in accordance with the lens employed.

The field covered at 3 ft. with a 2 in. (5 cm.) lens is $25\frac{1}{2}+17$ in.

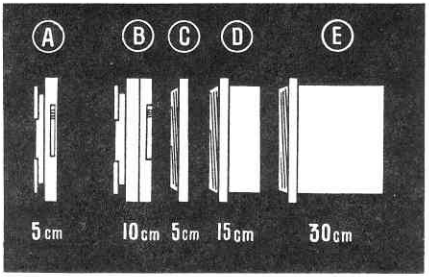
To photograph at closer range for table top, copying and similar work, supplementary lenses can be used. A range of three lenses, giving a scope which can reasonably be described as covering all practical needs, are a +1 diopter, a +2 diopter, and a +3 diopter. These may be had from photographic dealers or opticians. One will find it convenient to get these lenses of suitable diameter to fit into an interchangeable filter mount, so that one mount only is required and a lens can be inserted in accordance with the distance at which one has to work.

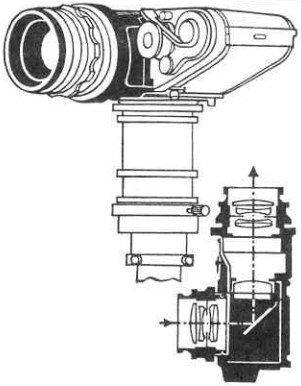
The distances covered by these supplementary lenses are:

Supplementary Lens	*Distance Covered*
+1 diopter	from $39\frac{3}{8}$ to 19 in. (100 to 50 cm.)
+2 diopter	from $19\frac{3}{4}$ to 13 in. (50 to 33 cm.)
+3 diopter	from $13\frac{1}{8}$ to $9\frac{1}{2}$ in. (33 to 25 cm.)

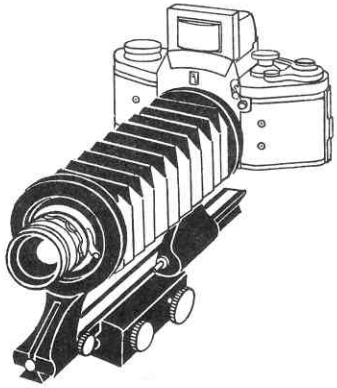
The field covered, the distance at which the lens has to be set, as well as definition can be observed on the reflex ground-glass. The following table giving these figures is intended for general information and purposes of comparison:

Right: The two-in-one adaptor (A) provides 5 mm. lens extension. The extension tube set (B, C, D, E) gives 10 to 60 mm.; B=10 mm., C=5 mm., D=15 mm., E=30 mm.





Left: The lens magnifier attachment enables the camera lens to be used as a distortion-free screen magnifier for photomicrography, etc. The camera is shown fitted to the microscope attachment Type 2.



Right: The bellows attachment for close-ups and macrophotography, giving lens extensions between 35 and 220 mm. A simplified miniature bellows focusing attachment gives lens extensions between 35 and 125mm.

CLOSE-UP FOCUSING TABLE FOR SUPPLEMENTARY LENSES

(For conversion into metric units, see page 90)

Lens setting (feet)	*Distances focused on (inches) ** +1 *diopter*	+2 *diopter*	+3 *diopter*
∞	39⅜	19¾	13⅛
100	38⅛	19⅜	13
50	37	19⅛	12⅞
25	34¾	18½	12½
15	32⅜	17¾	12⅛
10	29⅝	16⅞	11⅞
8	27⅞	16⅜	11½
6	25½	15½	11⅛
5	23¾	14⅞	10¾
4	21⅝	14	10⅜
3½	20⅜	13¾	10
3	18¾	12¾	9

*Measured from supplementary lens.

It should be noted that *no change in exposure time is required when working with these close-up lenses.* To obtain perfect definition, it is advisable to *stop down.*

The depth of field, when working at such close range, is obviously a very small one. One can count on an approximate *total* depth of:

6 in. with +1 diopter lens, at *f*6.3 and infinity setting;
2 in. with +1 diopter lens, at *f*6.3 and 3½ ft. setting;
2 in. with +2 diopter lens, at *f*6.3 and infinity setting;
1 in. with +2 diopter lens, at *f*6.3 and 3½ ft. setting;
1¼ in. with +3 diopter lens, at *f*6.3 and infinity setting;
¾ in. with +3 diopter lens, at *f*6.3 and 3½ ft. setting.

Extension Tubes

Instead of supplementary lenses for close-up focusing, extension tubes can be fitted between the lens and camera body. They can be had in different lengths to increase the extension of the lens of the Exakta at will. Their purpose is

similar to that of the supplementary lenses, but the working distances are rather less. They allow photographs up to natural size, and even larger-than-life size, to be taken straight on to the film (see table below).

A set of tubes consists of a number of sections of various lengths which are fitted together to provide the required extension. There is a back section with bayonet fitting to fit to the camera, and a front section with bayonet fitting to take the lens. These screw together to give an extension of 10 mm. (b). To lengthen the tube, intermediate rings are screwed between them. There are three—5 mm. (c), 15 mm. (d), and 30 mm. (e). In addition and sold as a separate item, there is a two-in-one adaptor ring of 5 mm. length and with bayonet fittings at each end (a). This is used alone to give 5 mm. extension; or it may be used with the set of tubes.

The Exa I is suitable for use with extension tubes from 20–50 mm. without cutting off any of the picture area. Longer extensions, however, produce a noticeably reduced picture field.

CLOSE-UP FOCUSING TABLE FOR EXTENSION TUBES
*2 in. (5 cm.) LENSES **

(For conversion into metric units, see page 90)

Tubes	*Extension (mm.)*	*Focused on (in.)*	*Subject area (in.)*	*Scale of reproduction (magnification)*	*Exposure factor*
a	5	21¾	9½×14	0·1	1·2
b	10	11¾	4½×7	0·2	1·4
b+c	15	8¼	3⅛×4¾	0·3	1·7
a+b+c	20	6⅛	2⅜×3½	0·4	2
b+d	25	6	1⅞×2¾	0·5	2·3
a+b+d	30	5¼	1½×2⅜	0·6	2·6
a+b+c+d	35	4¾	1⅜×2	0·7	2·9
b+e	40	4½	1⅛×1⅞	0·8	3·2
a+b+e	45	4¼	1×1⅝	0·9	3·6
a+b+c+e	50	4	⅞×1 7/16	1·0	4
b+d+e	55	3¾	⅞×1 7/16	1·1	4·4
b+c+d+e	60	3⅜	⅞×1 7/16	1·2	4·8

*Note that the values for 2¼ in. (5.8 cm.) lenses are rather different.

FLASH WITH THE EXAKTA

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

The flash bulb is similar to a small electric bulb. However, when the current passes through it, it lights up in an intense flash lasting about 1/50 sec. Each bulb will flash only once and has to be discarded afterwards.

The flash bulb is inserted in a flash gun, the current of the battery is used to set off the bulb, while a reflector behind the bulb directs most of the light towards the subject. The light is strong enough to allow a medium or small aperture to be used for the exposure; the shutter speed—provided it is not faster than 1/50 sec.—has no effect on exposure since the flash is shorter than the exposure time, but since focal plane shutters do not free the whole negative area simultaneously —see instructions below.

Electronic flash is produced by an electric discharge in a suitable flash tube. Unlike flash bulbs, these tubes will yield thousands of flashes with power supplied from the mains or various types of battery or accumulator.

How to Use Flash

All Exakta cameras are internally synchronized for flash. A flash socket is fitted on the camera front. An electric cable is connected from the battery case (with flash bulb and reflector) to the flash socket by means of a special two-pin plug (the 1956 VX takes a concentric plug). On release, the shutter automatically closed the firing circuit through the flash contact and sets off the bulb, so that the peak light of the bulb coincides with the instant that the shutter is fully open.

Exakta II, V and VX models have two sets of flash contacts, one marked M (formerly V) for flash bulbs and one marked X (formerly E) for electronic flash. With the X setting, electronic flash can be used with the shutter speed of 1/50 sec. With the M setting, focal-plane flash bulbs may be used (e.g., Philips P.F.24 or P.F.45) with shutter speeds between 1/100 and 1/1000 sec.

The Exakta Varex IIa, IIb and VX1000 also have a third flash socket, marked F, for use with small bulbs (P.F.1, P.F.5, etc.) at a shutter speed of 1/30 (1/25) sec. (The letters M and F do *not* signify class M or F flash bulbs.)

Ordinary "M" class flash bulbs may be used with the "X" contact if the Exakta shutter is set to 1/5 sec.; the short flash duration of the bulb will still produce an instantaneous shot.

Cameras with one flash contact are unsuitable for electronic flash —except RTL1000, see below. A reliable workshop can, however, install an "X" contact into these cameras. While the single flash contact cameras have been designed for "M" synchronization (see above), it is advisable to make practical tests with focal-plane bulbs to establish the correct working, as variations have been found in these older cameras.

The Exakta RTL1000 shutter has one flash contact on the side wall of the body (X) which is suitable for use with electronic flash at 1/125 sec. and with flash bulbs at 1/30 sec.

Exa cameras have the flash synchronization setting marked on the camera top plate, opposite the shutter speed disc. For electronic flash, set the flash symbol opposite the dot between 1/30 and 1/60 shutter speed. For bulbs, set the bulb sign opposite the dot.

When working with flash, it is essential to transport the film *before* the flash attachment is connected (or the bulb inserted).

Blue-tinted flash bulbs are suitable for colour-reversal, colour negative and black-and-white films. Clear bulbs, originally intended for black-and-white only are now discontinued.

FLASH EXPOSURES

With X-synchronization and shutter set at "B" or 1/5 sec.

Distance	*G.E., G.E.C., Mazda: No. 1 Philips: PF 1 AG 1*	*G.E., G.E.C., Mazda: No. 5 Philips: PF 5*	*Philips: PF 60*
6 ft. (2 m.) ...	f16	—	—
9 ft. (3 m.) ...	f11	f22	—
12 ft. (4 m.) ...	f8	f16	f22
18 ft. (6 m.) ...	f5.6	f11	f16
25 ft. (8 m.) ...	f4	f8	f11
35 ft. (12 m.) ...	f2.8	f5.6	f8

With M-synchronization and Philips PF 6B bulb on Exakta

Shutter Speed	*6 ft. (2 m.)*	*9 ft. (3 m.)*	*12 ft. (4 m.)*	*18 ft. (6 m.)*	*25 ft. (8 m.)*	*35 ft. (12 m.)*
1/100	f4	f10	f8	f5.6	f3.5	f2.2
1/250	f10	f6.5	f5	f3.5	f2.2	f1.8
1/500	f6.5	f4	f3	f2		

The above exposures apply to rooms of average brightness and 30–32° BS (80–125 ASA) films. In small bright rooms, use one stop smaller; or in large darker rooms, one stop larger. Outdoors at night, increase the aperture by two stops.

EXAKTA ACCESSORIES

• FINDER HOOD EXTENSION. This is a collapsible leather box which can be pushed over the reflex hood of the 35 mm. Exakta. It cuts out stray light, increases the brilliance of the reflex image and makes focusing easier.

EXAKTA LENS HOOD. To protect one's lens against stray light from objects outside the picture area, particularly when photographing against the light, a lens hood has to be used. This is a metal tube placed over the front of the lens. *There is no picture which could not be improved in clarity and brilliance by the use of a lens hood.* Various lens hoods are available for the different Exakta lenses. The Exakta lens hoods are slightly conical shaped tubes which are pushed on to the lens mount.

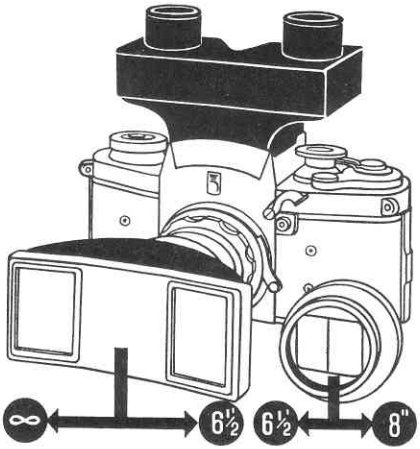
EXAKTA BUTTON RELEASE. A convex metal button can be screwed into the release knob, increasing its surface. It facilitates releasing the shutter while wearing gloves.

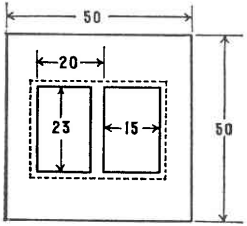
CABLE RELEASE. A cable release is supplied for the Exakta which screws into the screw thread in the centre of the release button.

MICROSCOPE ATTACHMENTS. The micro attachments (page 88) of the Exakta consist simply of a metal tube which can be fitted to the microscope around the draw-tube holding the eyepiece; hinged to this (Type 1) is a second tube which fastens to the camera. After connecting the Exakta by means of the hinged tubes to the microscope, the camera is swung to one side. The microscope can now be used in the usual way, set and focused. Now the Exakta is swung back into the taking position. The ground-glass screen image of the Exakta shows the picture and its definition as it will appear on the negative. Type 2 is not hinged, but has a rapid exchange mount. Adjustments which may be found necessary, both as regards picture framing and focusing, can be corrected by observation through the reflex image. Particu-

EXAKTA STEREO ATTACHMENT

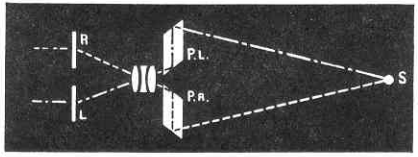
Right: For stereoscopic photography, two attachments are available for use with the standard 2 in. (5 cm.) lens. One has a 65 mm. base and is for distances infinity–6½ ft. The other has a 12 mm. base and covers the range 6½ ft.–8 in. The stereo effect can be observed on the screen by means of a stereo viewer, which is also used to view the finished slides.





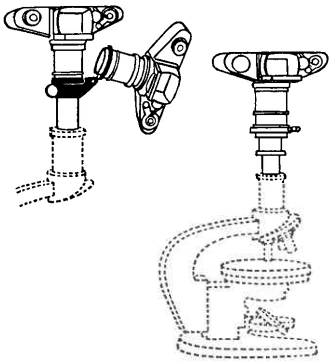
Above: The dimensions (in mm.) of a stereo slide mounted for projection. The mount is a standard 2×2 in. (50×50 mm.) as used for 24×36 mm. transparencies.

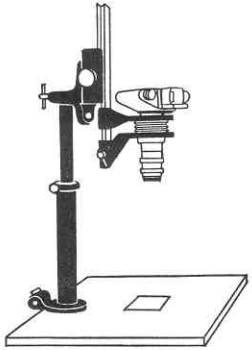
Below: The stereo attachment consists of two prisms, P.L. and P.R., which enable the camera lens to "see" the subject from two viewpoints and produce two images side by side on the film —R the right-eye image and L the left-eye image.



FURTHER EXAKTA ACCESSORIES

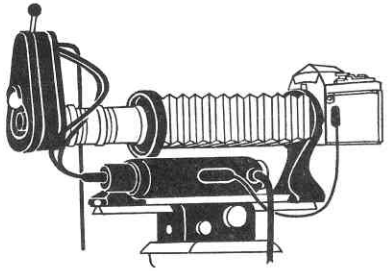
Right: Microscope attachments Type 1, with a hinged clamp; and Type 2, with a rapid exchange mount. The camera is used without lens, the microscope optics forming the image.





Above: The complete bellows attachment—i.e. focusing slide and bellows extension—may be used on a tripod or similar support. Here it is set up on the multipurpose stand for copying.

Below: The Kolpofot electronic flash attachment for close-ups, clinical and medical photography. It includes the bellows attachment, a special 5⅛ in. (13.5 cm.) f4 lens, and flash head with a flash tube around the lens mount.



larly when taking living objects, following up the object on the reflex image by moving the mechanical stage of the microscope or the slide may prove invaluable. The degree of enlargement is determined by objective and eyepiece.

FOCUSING SLIDE. This is to facilitate focusing for close-ups and macrophotography. The slide is screwed to a tripod or copying stand and the camera attached to a bracket clamped to the slide. A control knob moves the slide, and therefore the camera, to and fro.

BELLOWS ATTACHMENT. This is used with the focusing slide and gives 3.5 to 22 cm. lens extension for close-ups and macrophotography.

• PRISM ATTACHMENT FOR EXAKTA I and II. This is pushed over the opened finder hood, and allows the camera to be used at eye level. The full reflex image is visible, right way up and right way round. The image in the finder therefore moves in the same direction as the object. This is particularly valuable in following moving subjects in the viewfinder. The prism attachment carries an additional magnifier.

A similar attachment is available for the Exakta V and VX, where it is interchangeable with the regular reflex finder (pages 18-21).

A range of specialised attachments have been produced for the Exakta, such as a *multipurpose stand* for macrophotography, duplicating transparencies and photomicrography; and adapters for medical instruments—cystoscope, endoscope, gastroscope, ophthalmoscope, the Koloscope for photographing cavities of the human and animal body. The description of these instruments has been omitted here as being beyond the scope of this booklet.

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 following table shows at a glance equivalent lengths.

British to Metric		*Metric to British*	
1/8 in.	0.32 cm.	0.5 cm.	3/16 in.
1/4 in.	0.64 cm.	1 cm.	3/8 in.
1/2 in.	1.27 cm.	2 cm.	13/16 in.
1 in.	2.54 cm.	3 cm.	1 3/16 in.
2 in.	5.08 cm.	4 cm.	1 9/16 in.
3 in.	7.62 cm.	5 cm.	1 15/16 in.
4 in.	10.2 cm.	6 cm.	2 3/8 in.
5 in.	12.7 cm.	7 cm.	2 3/4 in.
6 in.	15.2 cm.	8 cm.	3 1/8 in.
7 in.	17.8 cm.	9 cm.	3 1/2 in.
8 in.	20.3 cm.	10 cm.	3 15/16 in.
9 in.	22.9 cm.	12 cm.	4 3/4 in.
10 in.	25.4 cm.	15 cm.	5 7/8 in.
11 in.	27.9 cm.	20 cm.	7 7/8 in.
1 ft.	30.5 cm.	25 cm.	9 13/16 in.
2 ft.	61.0 cm.	30 cm.	11 3/4 in.
3 ft.	91.4 cm.	40 cm.	15 3/4 in.
4 ft.	1.22 m.	50 cm.	19 3/4 in.
5 ft.	1.52 m.	60 cm.	23 5/8 in.
6 ft.	1.83 m.	80 cm.	31 1/2 in.
7 ft.	2.13 m.	100 cm.	39 3/8 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.	32 ft. 9 in.
50 ft.	15.24 m.	15 m.	49 ft. 2 in.
100 ft.	30.48 m.	20 m.	65 ft. 7 in.

SHUTTER SPEEDS TO ARREST MOVEMENT

Subject	Speed in m.p.h.	With Normal Focal Length Lens	Distance Between Camera and Object					
			3 m.	5 m.	7.5 m.	12.5 m.	25 m.	50 m.
			10 ft.	17 ft.	25 ft.	42 ft.	83 ft.	165 ft.
Swimmer ...	2½	Speed m.p.h.	Shutter Speeds in Fractions of Seconds					
Walker ...	3							
Runner ...	12½							
Cyclist ...	15							
Skater ...	28							
Horse walking	4	0—1	1/50	1/20	1/16	1/12	2/5	1/2
,, trotting	9	2	1/60	1/30	1/25	1/15	1/8	1/3
,, galloping	19	3	1/100	1/60	1/40	1/25	1/12	1/6
Racehorse ...	31	4	1/125	1/75	1/50	1/30	1/15	1/8
Waves ...	15	6	1/200	1/100	1/75	1/50	1/25	1/10
Heavy waves	44	8	1/250	1/150	1/100	1/60	1/30	1/15
Boats making 10 knots ...	11½	10	1/300	1/200	1/125	1/75	1/60	1/30
Boats making 20 knots ...	23	20	1/600	1/400	1/250	1/150	1/75	1/40
Tramcar ...	20	30	1/1000	1/600	1/400	1/250	1/125	1/60
Motor car on open road...	35–80	40		1/750	1/500	1/300	1/150	1/75
Slow train ...	25	60			1/750	1/500	1/250	1/100
Express train	60	80			1/1000	1/600	1/300	1/150
Aeroplane ...	95–700	100				1/750	1/400	1/200

The values given are for PERPENDICULAR displacement to the optical axis.
MOTION 45° to optical axis increase time by 50 per cent.
MOTION parallel to optical axis increase time 300 per cent.

With a wide-angle lens of two-thirds of the normal focal length the exposure time can be one-third longer than indicated above, while with a lens twice the normal focal length only half the exposure time is permissible and with three times the normal focal length only one-third of the time listed above for normal focal length lenses should be used.

HOW TO . . .

WHAT IS WHERE?

The Focalguide to Cameras Clyde Reynolds

Clyde advises each reader on which camera he needs. He cuts through technical jargon, sales flannel, gadget gimmickry and price snobbery and concentrates on selecting the right camera for the job, how cameras work, and how to use them. It is written for camera-buyers, owners, designers and salesmen.

The Focalguide to 35mm Leonard Gaunt

A concise introduction to photography with 35mm cameras of any kind, including cartridge loading cameras. It shows the advantages and disadvantages of each type and of its accessories, advises the beginner on choice of camera and how to get the most from it.

The Focalguide to the 35mm Single Lens Reflex Leonard Gaunt

This book tells exactly how the single lens reflex camera and its accessories work for all users, students, amateurs and professionals—how to choose it, use it and get the best results out of it, make the most of its advantages and overcome its few disadvantages.

The Focalguide to Lenses Leonard Gaunt

A compact guide to all lenses used in photography—the earliest to the most modern. It studies their history and design while keeping a wary eye open for gimmicks, examines the validity of claims made for new lenses, and probes the theory behind lens design and performance.

The Focalguide to Filters Clyde Reynolds

A guide to all types of filter in photography, the materials they are made of and the way they work, which assumes the reader has no prior knowledge of the subject. It tells him exactly which filter is needed for each job and is the first such book to put its main emphasis on colour.

The Focalguide to Colour David Lynch

Colour is everywhere. Colour is easy. Colour isn't expensive. Here is advice about achieving good colour photos even if they are the first the photographer has ever taken. It forms a bridge between successful snapshots and successful pictures.

The Focalguide to Effects and Tricks Günter Spitzing

Magic is no mystery—just another man's skill. This survey of photography which brings about fantastic changes in the subject, explains what you can achieve while *taking* the picture—that is at the exposure stage. It teaches you how to have fun and bend the rules with your camera.

The Focalguide to Low Light Photography Paul Petzold

Photography by 'existing light', however dull, indoors and out, in colour or black-and-white is the subject. Whether you find your picture under a street light at night, in a smokey pub or a flood-lit sports stadium, you can learn to make the most of the opportunities it offers.

The Focalguide to Flash Günter Spitzing

Bad light does not stand in the way of good results when you have 'flash' know-how at your fingertips. Camera users will welcome this exhaustive treatment of flash photography. After a thorough course in fundamentals it studies applications and techniques; the simplest to the most sophisticated.

The Focalguide to Lighting Paul Petzold

Get good photos from the start by mastering the use of artificial light when taking pictures. Flash, photo and domestic lamps are valuable aids to success. Special attention is paid to the perennial problems of high contrast lighting conditions and of combining day and artificial light.

The Focalguide to Home Processing R. E. Jacobson

Why wait to see the results when you can process your films within an hour of removing them from the camera, and you can save money? Find out how simple and inexpensive it is for both colour and black-and-white photography. You don't need a darkroom either.

The Focalguide to Enlarging Günter Spitzing

Here are the techniques used for enlarging graphic effects in colour and black-and-white photography. It is fun to do, you can control exactly what you enlarge—just a small section of the photo if you want—and it takes less money, time and trouble than you might think.