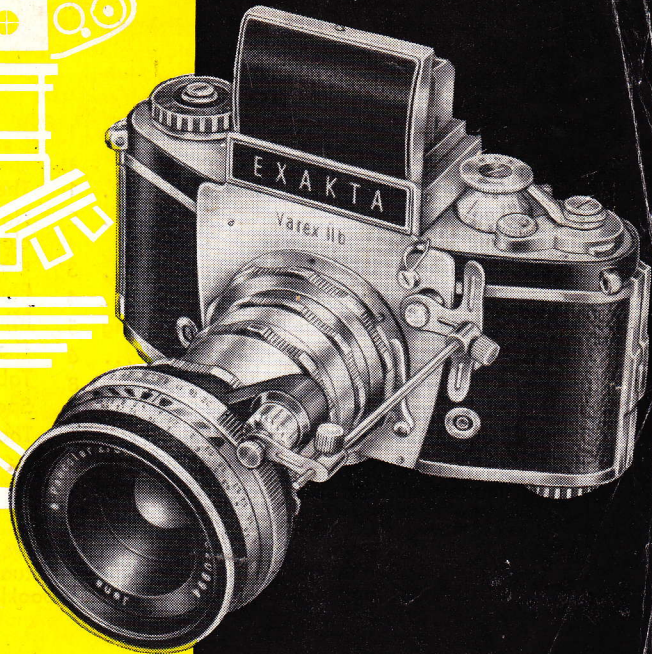


**EXAKTA
and EXA
accessories**



**for close-up photography
and photomicrography**

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Slight variations may occur between the actual appearance of the cameras and accessories, and the illustrations in this booklet.

One of the most important advantages of the single-lens reflex camera is the ease with which it can be used for taking close-up pictures and photomicrographs. For this reason the EXAKTA system provides a range of indispensable accessories for this type of work, which can be employed without restrictions with all models of the EXAKTA Varex (including the former Kine-Exakta) as well as the EXA II a. (Only the special focusing screens cannot be used with the EXA II a.) When the EXA Ia is used with long

Taking close-up pictures

In accordance with optical laws, the image distance (= distance between lens and film plane) increases when the subject distance (= distance between lens and subject) decreases. Consequently, when focusing on a subject at a very short distance from the camera, it will only be possible to obtain a sharp image by increasing the distance between the lens and the film plane to a greater extent than is possible with the helical focusing mount of

extensions (i. e. when the lens is at a considerable distance from the film plane), then a certain amount of marginal cut-off will occur; this does not however completely exclude this camera from close-up work and photomicrography.

Since the lens bayonet is the same on all Ihagee cameras, any of the accessories mentioned in this booklet in connection with the EXAKTA Varex can also be attached to either of the other two models.

the lens. It will therefore be necessary to use additional means of increasing the lens extension, the simplest devices being Bayonet Rings and Extension Tubes. These may be used in any desired combination, and are fitted between the lens and the camera body (Fig. 1). It is one of the most important characteristics of the single-lens reflex camera that there is no need for special optical devices for focusing at short distances: the ground-glass screen in the

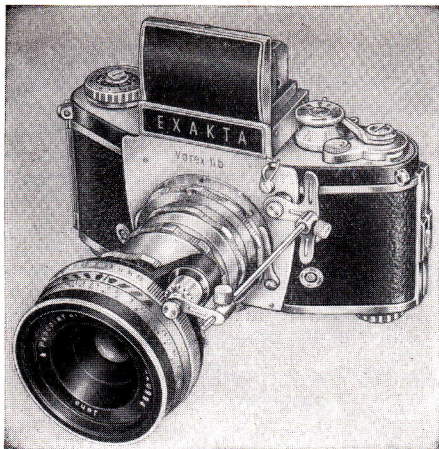


Fig. 1

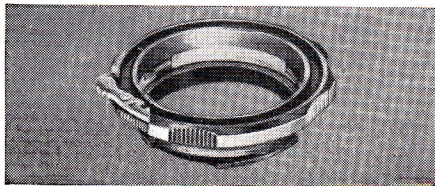


Fig. 2

reflex viewfinder can be used at all times for controlling the definition and depth of field as well as for observing the framing and pictorial composition of the picture. The image on the ground-glass screen and the final picture are always identical and free from parallax displacement, even at the very shortest distances.

Two-in-One Ring

(Order number 187, Figure 2)

To provide the minimum increase in extension (5 mm) the Two-in-One Ring is available. This is fitted into the front bayonet mount on the camera after removing the lens; insert the Two-in-One Ring into the lens mount so that the red dots on both are in line, just as when inserting a lens. The lens itself is similarly inserted into the Two-in-One Ring: by giving it a short turn to the right (as viewed from the front) the spring catch of the Two-in-One Ring will be heard to lock the lens firmly in position. To remove the lens from the Two-in-One Ring, depress the small lever of the catch

on the ring and then turn the lens to the left until the red dots are once again in line; the lens can then be removed from the bayonet mount of the ring. When the Two-in-One Ring is already attached to a lens, the combination can be inserted into the camera lens mount just as when fitting a lens by itself. Hold the lens so that the red dots on the camera and on the rear of the Two-in-One Ring are in line, fit the ring into the camera bayonet, then turn the ring and lens together briefly to the right until the locking lever on the camera snaps into the locked position. The ring is removed from the camera in the same way as the lens is normally.

Set of Adapter Rings and Extension Tubes
(Order No. 180/Figure 3)

The next larger increase in extension is 10 mm, and is obtained by using the pair of Bayonet Adapter Rings screwed together (Fig. 3, top). These are handled in the same

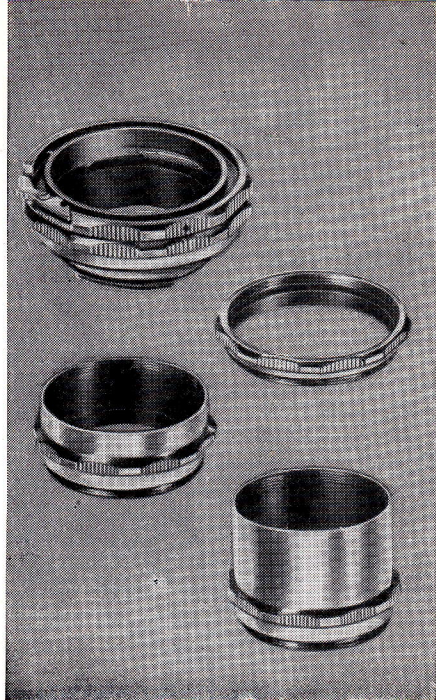


Fig. 3

Extensions available with the Two-in-One Ring, both Bayonet Adapter Rings and Extension Tubes are as follows:

Extension In mm	Attainable with				
	Two-in-One Ring 5 mm	Front and Back Bayonet Adapter Ring (= Pair of Bayonet Adapter Rings) 10 mm	Tubes		
			5 mm	15 mm	30 mm
5	+				
10		+			
15		+	+		
20	+	+	+		
25		+		+	
30		+	+	+	
35	+	+	+	+	
40		+			+
45		+	+		+
50	+	+	+		+
55		+		+	+
60		+	+	+	+
65	+	+	+	+	+

This list of variable combinations may be adapted to your personal requirements by the addition of extra tubes. When using the Two-in-One Ring and the pair of Bayonet Adapter Rings together, it is possible to attach the Two-in-One Ring to either the front or rear ring of the pair of Bayonet Adapter Rings.

way as the Two-in-One Ring. The chief difference between the pair of Bayonet Adapter Rings and the Two-in-One Ring is that the former two rings can be separated.

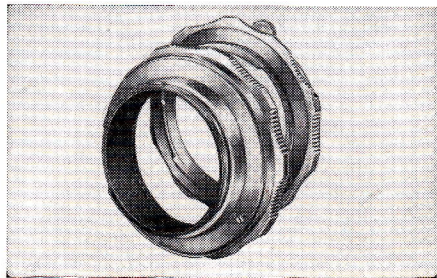
To increase the extension still further, Extension Tubes must be screwed between the two Bayonet Adapter Rings. These Extension Tubes are supplied in three lengths: 5 mm, 15 mm and 30 mm (Fig. 3). They are sold only in complete sets together with the pair of Bayonet Adapter Rings. The Two-in-One Ring is however available separately.

Clamping Ring of the Bayonet Ring (Figure 4)

The back Bayonet Adapter Ring (the one used next to the camera) has a locking ring to serve the following purpose: when the pair of Bayonet Adapter Rings and Extension Tubes are used in various combinations, the lens is often turned on its axis with the result that the lens scales cannot be read from above. If this occurs, first turn the milled ring on the back Bayonet Ring

to the left (looking towards the camera from the front) and it will then be possible to rotate the other components (front Bayonet Ring and Extension Tubes) so as to turn the lens into the desired position. When using the Ihagee Autocouple Extension Release described on pages 8...10, the release buttons on the camera and lens must lie exactly one behind the other.

Fig. 4



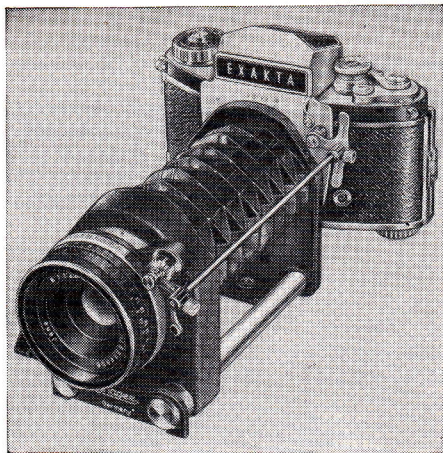


Fig. 5

By turning the milled ring to the right, the lens and other components screwed to it can be locked in this position. If it is de-

sired to remove the front Bayonet Ring or Extension Tubes from the rear Bayonet Ring, then the same milled ring should once again be turned to the right whereupon the front ring and tubes can be unscrewed. When fitting or detaching any of the Bayonet Rings or Extension Tubes, the milled rim of the back Bayonet Ring should always be gripped tightly.

Miniature Bellows Attachment

(Order No. 176/Figure 5)

The Miniature Bellows Attachment is an easily portable unit and strongly recommended for use when taking frequent close-ups whenever the lens extension needs to be adjusted quickly and continuously within a range from 35 mm to 125 mm. With this Bellows Attachment, altering the image scale and other focusing data is only a matter of seconds. This device is chiefly intended for taking close-up pictures with a hand-held camera, but it can also be employed on any tripod or attached to the Copying Stand.

The following procedure is recommended for handling the Miniature Bellows Attachment: attach the camera to the camera standard of the Bellows Attachment (the camera can be positioned for taking both vertical or horizontal pictures) and the lens to the lens standard; note that the red dots must be in line in both cases. When the camera is positioned for taking horizontal pictures, the red dot on the camera must be opposite the single red dot on the camera standard of the Bellows Attachment, whilst for taking vertical pictures the red dot on the camera must be opposite the double red dot on the camera standard.

Then swing the camera to the right (looking towards the subject). Slacken the locking knob on the lens standard and set the required increase in extension to any distance between 35 and 125 mm by sliding the lens standard forward; then lock it in position by re-tightening the locking knob. The distance between each two divisions on the right-hand guide rail is equivalent to 10 mm; to read off the extension setting, observe the position on the scale of the

front of the lens-standard guide sleeve. When transporting or packing away the Miniature Bellows Attachment, the camera and lens standards should be pushed together so as to protect the bellows; lock the lens standard in this position.

For taking hand-held pictures the whole apparatus can be pointed towards the subject in any direction without difficulty; when using the Miniature Bellows Attachment on a tripod, a sturdy ball-and-socket head should be employed. A $\frac{1}{4}$ " tripod thread is provided on both camera and lens standards; thread adapters must be used when employing tripods and socket heads with $\frac{3}{8}$ " threads. Whether to screw the tripod head into the camera standard or lens standard depends on where the centre of gravity of the complete apparatus is located: in particular, the lens-standard thread should be used when employing heavy long-focus lenses. The Miniature Bellows Attachment can also be used on the Copying Stand, but in this case the camera is secured by means of its own tripod thread.

When using lenses with fully-automatic spring or pressure diaphragms, it is advisable to fit the Autocouple Extension Release (using the long coupling rod) between the release knob of the camera and the release knob or rocker on the lens (see Fig. 5 and description on page 9).

When taking hand-held pictures, with the camera set up to give a specific image scale, the image should be focused by moving the complete apparatus forwards and backwards. The same method of focusing can also be employed with the Copying Stand by means of its own rack-and-pinion drive. When working from a tripod, however, focusing is undertaken by sliding the lens standard to and fro. In this case, of course, the image scale will change with the varying subject distance. With standard lenses (50 mm focal length) it is possible to cover all image scales from 0.7 (extension 35 mm) up to 2.5 (extension 125 mm) and subjects with dimensions from 34 mm x 51 mm down to 10 mm x 14 mm can be recorded to fill the whole negative. Larger subjects will need a smaller increase

in extension. To extend the focusing range right up to infinity (zero extension), it is possible to use the special Jena T 2.8/50 mm lens in sunk mount with the Miniature Bellows Attachment. With this lens the variable-extension range is from 0 to 90 mm,

The Miniature Bellows Attachment is not suitable for use with wide-angle lenses with focal lengths of 35 mm or below, but all long-focus lenses can be employed provided that they are not too heavy.

Ihagee Autocouple Extension Release

(Order No. 178/Figures 1, 5, 6, 7 and 12)

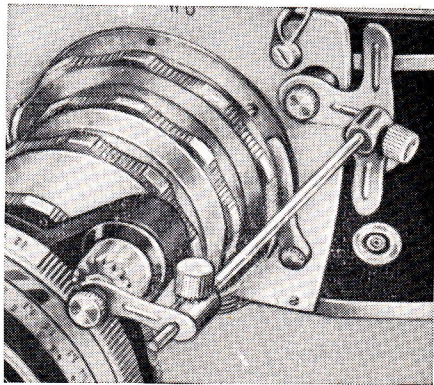
In order to be able to employ the fully-automatic spring or pressure diaphragms of the EXAKTA and EXA lenses when using Bayonet Rings and Extension Tubes or the Miniature Bellows Attachment for taking close-up pictures, the Autocouple Extension Release must be fitted between the lens and the camera.

When using only the Two-in-One Ring for obtaining a small increase in extension, it

is sufficient to screw the small threaded knob on the Autocouple Extension Release into the shutter release knob on the camera. Then a pressure on the release knob or rocker of the lens will be transferred directly to the camera. Whenever extensions of more than 5 mm are employed, the complete Autocouple Extension Release should be used (with the short coupling rod for extensions up to 60 mm, and with the longer rod for greater extensions up to about 125 mm). The finger grip and connector are fitted on to the coupling rod and the finger grip screwed firmly on to the end of the rod. The finger grip is then attached to the release knob of the camera with the longer threaded knob, and the connector is attached to the release knob or rocker on the lens with the shorter threaded knob. Next, the connector must be screwed firmly on to the coupling rod; the finger grip must fit tightly against the head of the longer threaded knob and the connector must also fit tightly against the release knob or rocker on the lens. When the finger grip is depressed, the lens dia-

phragm must close down to the pre-selected aperture, and then with a further pressure on the finger grip the shutter should be released. The coupling rod must always be parallel to the optical axis. For this reason the release knob on the camera and the release knob or rocker on the lens

Fig. 6



must always be exactly in line one behind the other. To enable the lens to be rotated in order to align the two release knobs, the back Bayonet Ring (next to the camera) is provided with a clamping ring; for further details see page 5.

Explanation of data in tables for close-up photography

See pages 14...16.

The tables on pages 14...15 contain all data necessary for taking close-ups with lenses of 50, 80, 100 and 135 mm focal length and provide assistance in selecting the correct extension increases. The tables give calculated values which may differ slightly from the actual values because of the permissible tolerances in the focal lengths of the lenses. However, these small discrepancies can be ignored when applying the tables to any kind of normal work. Some suggestions for approximate estimations are given below:

Extension increase

= the total length of the Bayonet Rings

and Extension Tubes or belows extension employed:

When the extension increase is equal to the lens focal length

= subject reproduced in 1 : 1 proportion on negative (image scale 1.0)

When extension increase is double the focal length

= image reproduced on negative at x 2 magnification (image scale 2.0)

When extension increase is 3 times the focal length

= image reproduced at x 3 magnification on negative (image scale 3.0)

When extension increase is four times the focal length

= image is reproduced at x 4 magnification on negative (image scale 4.0)

When extension increase is five times the focal length

= image reproduced at x 5 magnification on negative (image scale 5.0).

The figures in the tables apply when the lens is set to the infinity (∞) on its own focusing scale. Intermediate values can be obtained with lenses having helical focus-

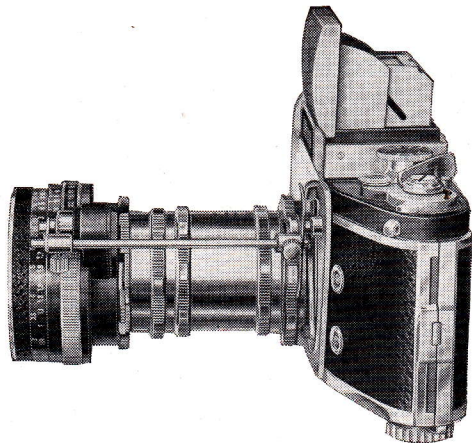
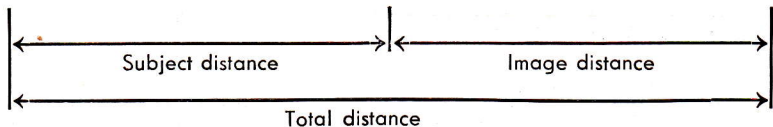


Fig. 7



ing mounts, by focusing the lens to closer distances on the feet or metre scales. By fitting additional extension tubes the

degree of enlargement on the negative will be increased in proportion to the increase in lens extension.

Subject distance

= distance from subject to lens (approx. diaphragm plane), see Fig. 7.

Image distance

= distance from sharply-focused image in film plane to lens (approx. diaphragm plane), see Fig. 7.

Total distance

= distance from subject to sharply-focused image in film plane (approx. subject distance + image distance), see Fig. 7.

Image scale (scale of reproduction)

= ratio of subject size to image size

e. g. $1 : 1 = 1.0$, meaning subject and image are of equal size;

$1 : 2 = 0.5$, meaning that the image is only half as large as the subject;

$2 : 1 = 2.0$, meaning that the image is double the size of the subject

= x 2 enlargement on negative.

Recorded area (coverage) of subject

meaning the horizontal and vertical dimensions of the subject area which is recorded on the film (= area covered by lens). In some cases, the figures quoted have been rounded-off to the nearest millimetre.

Exposure factor

When special accessories are employed to increase the lens extension, the exposure time must be longer than normal because the increasing image distance causes a diminution in the light reaching the film. The exposure time for any specific aperture setting (as measured for normal photography) must be multiplied by an exposure factor corresponding to the extension increase. Even when focusing at short distances by means of the helical lens mount alone, a small exposure increase is required in theory, which can normally be disregarded. When using longer extensions, however, this factor must be calculated by means of the following formula:

exposure factor =

$$\left(\frac{\text{image distance}}{\text{focal length}} \right)^2 = \left(\frac{a'}{f} \right)^2$$

Example: extension increase using the pair of Bayonet Adapter Rings and all three Extension Tubes (or corresponding extension with Bellows Attachment) = 60 mm. Length of image distance = focal length of lens (e. g. 50 mm) + extension increase (e. g. 60 mm) = 110 mm.

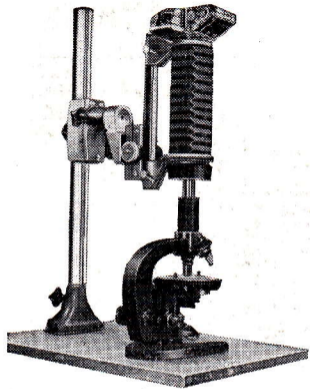
The focal length in this instance is 50 mm. Therefore $110 : 50 = 2.2$, $2.2 \times 2.2 = 4.84$. In this case the exposure factor is 4.8, or in other words the normal exposure time must be multiplied by 5 (approximately). If the exposure meter indicates 1 sec. exposure, you will in fact have to give 5 seconds exposure to obtain a correctly-exposed negative.

Hints on taking close-up pictures

These accessories for increasing the lens extension can also be used with other lenses not mentioned in the tables. When using a wide-angle lens, you will obtain

(for any given image scale) a shorter subject distance than with the normal lens, whilst with a long-focus lens the subject distance will be longer. Both these situations can be utilized in practice. Focusing is always performed by observing the reflex image as usual. Tables for taking close-ups with special lenses down to 30 mm focal length are available and will be sent on request free of charge.

Wide-angle lenses with focal lengths from 30 to 35 mm can however only be used with limited increases in extension. Because of their special construction, at very short subject distances the subject plane will be positioned only just in front of the front element or even inside the lens. Such lenses can only be used for taking pictures at all image scales when their rear element is facing the subject. This can be achieved by means of the Lens Reversal Rings described on page 17. Extreme wide-angle lenses with focal lengths shorter than 30 mm are not suitable for taking close-up pictures with extension-increasing accessories.

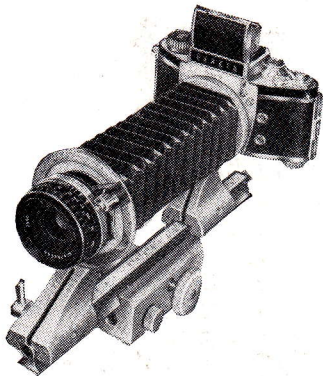


Important note: Close-up pictures and photomicrographs can be taken with the EXAKTA and EXA cameras by other means than with the accessories described in this booklet. For achieving the utmost simplicity of operation in these fields, as well as in many other branches of photography, the Ihagee "Vielzweck" (multi-purpose) equipment has been designed. All photographers will be impressed by the versatility of this equipment, and requests for further information are invited; we will gladly send you a detailed brochure. Here is just a short review of the individual units of the "Vielzweck" equipment: for close-up and high-magnification photography there is the

Repro Unit (Cat. N^o 155.20) for photomicrography

large Bellows Attachment with its extension range from 35 to 220 mm (see illustration on right). Copying can be conveniently carried out with the aid of the Copying Stand, which can also be employed as a sturdy table tripod for other purposes. The Bellows Attachment and Copying Stand are also used in combination for photomicrography (see picture on left). Duplicates of small transparencies can be printed optically by means of the Transparency Copying Equipment.

For medical photography, especially for photographing body cavities, the "Kolpofot" has been specially designed; this is used in conjunction with an electronic flash unit.



Bellows Attachment (Cat. N^o 155.10)

Tables for close-ups with lenses of 50 mm and 80 mm focal length

For lens focal distance of 50 mm							For lens focal distance of 80 mm					
Extension increase	Subject distance	Image distance	Total distance	Scale of reproduction	Picture size of the subject	Exposure factor	Subject distance	Image distance	Total distance	Scale of reproduction	Picture size of the subject	Exposure factor
mm	mm	mm	mm		mm		mm	mm	mm		mm	
0	∞	50	∞	diffe- rent	variable	1.0	∞	80	∞	diffe- rent	variable	1.0
5	550	55	605	0.1	240x 360	1.2	1360	85	1445	0.06	392x 576	1.1
10	300	60	360	0.2	120x 180	1.4	720	90	810	0.12	192x 288	1.3
15	217	65	282	0.3	80x 120	1.7	507	95	602	0.19	127x 192	1.4
20	175	70	245	0.4	60x 90	2.0	400	100	500	0.25	96x 144	1.6
25	150	75	225	0.5	48x 72	2.3	336	105	441	0.31	77x 115	1.7
30	133	80	213	0.6	40x 60	2.6	294	110	404	0.38	64x 96	1.9
35	121	85	206	0.7	34x 51	2.9	263	115	378	0.44	55x 82	2.1
40	113	90	203	0.8	30x 45	3.2	240	120	360	0.50	48x 72	2.3
45	106	95	201	0.9	27x 40	3.6	222	125	347	0.56	43x 64	2.5
50	100	100	200	1.0	24x 36	4.0	208	130	338	0.62	38x 58	2.7
55	95	105	200	1.1	22x 33	4.4	196	135	331	0.69	35x 52	2.9
60	92	110	202	1.2	20x 30	4.8	186	140	326	0.75	32x 48	3.1
70	86	120	206	1.4	17x 26	5.8	171	150	321	0.88	27x 41	3.5
80	81	130	211	1.6	15x 23	6.8	160	160	320	1.00	24x 36	4.0
90	78	140	218	1.8	13x 20	7.8	151	170	321	1.12	21x 32	4.5
100	75	150	225	2.0	12x 18	9.0	144	180	324	1.25	19x 29	5.0
110	73	160	233	2.2	11x 16	10.2	138	190	328	1.38	17x 26	5.6
120	71	170	241	2.4	10x 15	11.6	133	200	333	1.50	16x 24	6.2
130	69	180	249	2.6	9x 14	13.0	129	210	339	1.63	15x 22	6.9
140	68	190	258	2.8	9x 13	14.4	126	220	346	1.75	14x 21	7.6
150	67	200	267	3.0	8x 12	16.0	123	230	353	1.87	13x 19	8.3
160	66	210	276	3.2	8x 11	17.6	120	240	360	2.00	12x 18	9.0
170	65	220	285	3.4	8x 11	19.4	118	250	368	2.12	11x 17	9.8
180	64	230	294	3.6	7x 10	21.2	116	260	376	2.25	11x 16	10.6
190	63	240	303	3.8	6x 9	23.0	114	270	384	2.38	10x 15	11.4
200	63	250	313	4.0	6x 9	25.0	112	280	392	2.50	10x 14	12.3
210	62	260	322	4.2	6x 9	27.0	110	290	400	2.63	9x 14	13.2
220	61	270	331	4.4	5x 8	29.0	109	300	409	2.75	9x 13	14.1

Tables for close-ups with lenses of 100 mm and 135 mm focal length

For lens focal distance of 100 mm							For lens focal distance of 135 mm					
Extension increase	Subject distance	Image distance	Total distance	Scale of reproduction	Picture size of the subject	Exposure factor	Subject distance	Image distance	Total distance	Scale of reproduction	Picture size of the subject	Exposure factor
mm	mm	mm	mm		mm		mm	mm	mm		mm	
0	∞	100	∞	different	variable	1.0	∞	135	∞	different	variable	1.0
5	2100	105	2205	0.05	480x 720	1.1	3780	140	3920	0.04	600x 900	1.1
10	1100	110	1210	0.10	240x 360	1.2	1958	145	2103	0.07	343x 514	1.2
15	767	115	882	0.15	160x 240	1.3	1350	150	1500	0.11	218x 327	1.2
20	600	120	720	0.20	120x 180	1.4	1046	155	1201	0.15	160x 240	1.3
25	500	125	625	0.25	96x 144	1.6	864	160	1024	0.19	126x 189	1.4
30	433	130	563	0.30	80x 120	1.7	742	165	908	0.22	109x 164	1.5
35	386	135	521	0.35	69x 103	1.8	656	170	826	0.26	92x 138	1.6
40	350	140	490	0.40	60x 90	2.0	591	175	766	0.30	80x 120	1.7
45	322	145	467	0.45	53x 80	2.1	540	180	720	0.33	73x 109	1.8
50	300	150	450	0.50	48x 72	2.3	500	185	685	0.37	65x 97	1.9
55	282	155	437	0.55	44x 65	2.4	466	190	656	0.41	59x 88	2.0
60	267	160	427	0.60	40x 60	2.6	439	195	634	0.44	55x 82	2.1
70	243	170	413	0.70	34x 51	2.9	395	205	600	0.52	46x 69	2.3
80	225	180	405	0.80	30x 45	3.2	363	215	578	0.59	41x 61	2.5
90	211	190	401	0.90	27x 40	3.6	338	225	563	0.67	36x 54	2.8
100	200	200	400	1.00	24x 36	4.0	317	235	552	0.74	32x 49	3.0
110	191	210	401	1.10	22x 33	4.4	301	245	546	0.82	29x 44	3.3
120	183	220	403	1.20	20x 30	4.8	287	255	542	0.89	27x 40	3.6
130	177	230	407	1.30	18x 27	5.3	275	265	540	0.96	25x 38	3.9
140	171	240	411	1.40	17x 26	5.8	265	275	540	1.04	23x 35	4.2
150	167	250	417	1.50	16x 24	6.3	257	285	542	1.11	21x 32	4.5
160	163	260	423	1.60	15x 23	6.8	249	295	544	1.18	20x 30	4.8
170	159	270	429	1.70	14x 21	7.3	242	305	547	1.26	19x 29	5.1
180	156	280	436	1.80	13x 20	7.8	236	315	551	1.33	18x 27	5.4
190	153	290	443	1.90	13x 19	8.4	231	325	556	1.41	17x 26	5.8
200	150	300	450	2.00	12x 18	9.0	226	335	561	1.48	16x 25	6.2
210	148	310	458	2.10	11x 17	9.6	222	345	567	1.56	15x 23	6.5
220	145	320	465	2.20	11x 16	10.2	218	355	573	1.63	15x 22	7.1

Reproduction of DIN sizes with 24 mm x 36 mm EXAKTA and EXA cameras

Pattern	Extension Increase in mm	Lens $f = 50$ mm Image distance mm	Lens to subject increase in mm
DIN A 0 (84.1 × 118.9 cm)	1.5	51.5	1800
DIN A 1 (59.4 × 84.1 cm)	2.0	52.0	1290
DIN A 2 (42.0 × 59.4 cm)	3.0	53.0	930
DIN A 3 (29.7 × 42.0 cm)	4.0	54.0	670
DIN A 4 (21.0 × 29.7 cm)	5.5	55.5	490
DIN A 5 (14.8 × 21.0 cm)	8.0	58.0	360
DIN A 6 (10.5 × 14.8 cm)	11.5	61.5	270
DIN A 7 (7.4 × 10.5 cm)	16.0	66.0	205
DIN A 8 (5.2 × 7.4 cm)	23.0	73.0	160
DIN A 9 (3.7 × 5.2 cm)	32.5	82.5	125
DIN A 10 (2.6 × 3.7 cm)	46.0	96.0	105

The small increases in lens extension given in the table are obtained by using the helical focusing mount of the lens. When using Bayonet Rings and Extension Tubes, the exact image distance should also be adjusted by using the focusing movement of the lens. When working with the Miniature Bellows Attachment, however, the special Jena T 2.8/50 mm lens in sunk mount must be used except with very small originals.

The measurements given in the table are calculated values, based on the assumption that the short side of the DIN format is always focused to give a length of 24 mm on the negative (the shorter dimension of the 24 mm x 36 mm negative format). In practice, the data given in the table may differ slightly from the measurements actually obtained on account of the tolerances in the actual focal lengths of the lenses.

Lens Reversal Rings

Extreme close-ups giving high magnifications of the subject on the negative require relatively great image distances and short subject distances. Conventional photographic lenses are however computed for the opposite situation that is to say for long subject distances and short image distances.

When taking close-ups at magnifications greater than $\times 1.5$ it is therefore advisable to turn the lens round so that its rear element faces towards the subject and the front element faces the film. We can supply Lens Reversal Rings for screwing the reversed lens on to the front extension tube. Lens Reversal Rings are available for lenses with the following screw-in filter threads: M 35.5 x 0.5 order number 159/37; M 40.5 x 0.5 order number 159/42; M 49 x 0.75 order number 159/51.

When using the lens in this way, it is not possible to employ the helical focusing movement; critical focusing must therefore be undertaken by moving the camera

slightly. When the lens is used reversed, a slight additional increase in extension is provided which cannot however be shown in the tables.

Adapter Ring for photomicrographic lenses

For taking pictures at image scales larger than 5.0, lenses such as the "Jena M" which are specially designed for extreme close-up work should be used instead of the normal camera lenses (even though these may be reversed). Adapter Rings with a screw-in thread for these lenses are therefore available. The ring should be screwed into the front extension tube. When using the Bellows Attachment, the rear Bayonet Ring should first be fitted to the lens standard, and then the Adapter Ring screwed into the Bayonet Ring. The Adapter Ring for photomicrographic lenses can be supplied with either an international microscope-objective thread, W 0.8" x 1/36" (order number 193/1) or with an M 26.5 x 0.5 mm thread (e. g. for "Jena M") (order number 193/2).

Swing Angle Attachment

The Swing Angle Attachment, which is a part of the Ihagee "Vielzweck" equipment already mentioned on pages 14...15, can be fitted to a tripod either vertically or horizontally, whilst its focusing slide makes it possible to move the camera both forwards and backwards with ease to locate the point of maximum image definition. Furthermore, the camera can be swung round as required for taking vertical or horizontal photographs. The actual increase in extension is achieved by using Bayonet Rings and Extension Tubes. For further details refer to our special leaflets.

Vignetting of the image field

When taking photographs at very long extensions, a slight degree of shading will be noticeable in the extreme corners of the image field. Under the same conditions, a dark strip may appear along the top edge of the reflex image; this is caused by the fact that when a long image distance is being used, the light rays forming this part of the image will fall outside the area

covered by the reflex mirror, the latter having been kept as small as possible to facilitate the use of short-focus lenses. This obscured strip will not however appear in the negative or transparency, since it only affects the reflex image. If the camera is tilted upwards slightly, the details in the obscured region can be seen.

Photomicrography

The EXAKTA Varex and EXA single-lens reflex cameras are equally suitable for taking photomicrographs, for which specialized application — just as for close-ups — they can be adapted easily and economically by means of a few simple accessories. The reflex viewfinder screen is employed for focusing and observing the microscope image; it will remain under observation until the shutter release button is depressed.

The Microscope Attachment

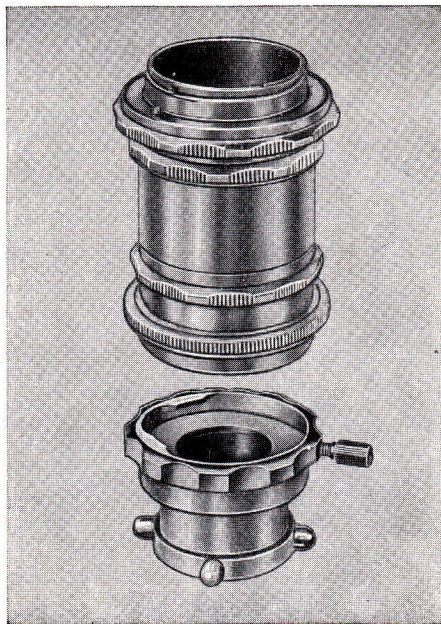
(Order number 153/Figures 8...10)

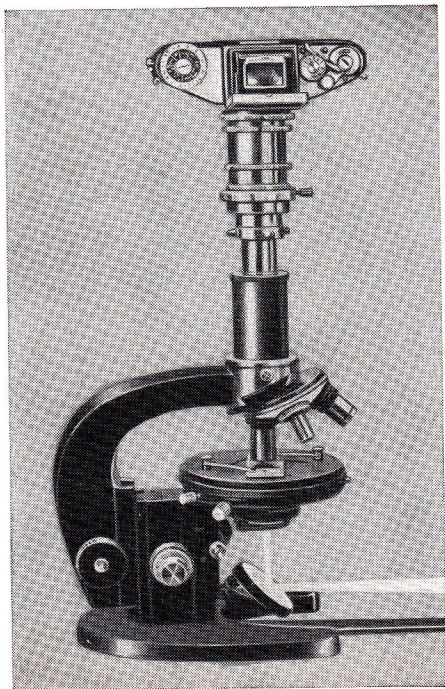
is used for connecting the EXAKTA and EXA cameras to any type of microscope.

The cameras can be connected by means of this attachment to the ocular tube of any microscope which has the standard external diameter of about 25 mm (approx. 1 inch). The photomicrographs are taken with the optical system of the microscope and not with the camera lens.

The top and bottom parts of the Microscope Attachment should be separated by loosening the quick-change mount: the milled screw should be slackened slightly and the top part of the Microscope Attachment lifted out of the mount, first raising it on the side where the screw is so as to release it from the two lugs on the opposite side. The other part of the attachment can then be fitted to the camera by coupling the bayonet rings as usual. Then remove the ocular of the microscope, push the lower part off the Microscope Attachment over the ocular tube, replace the ocular and secure the lower part of the attachment in position by turning the notched ring to the left whilst holding the milled ring firmly.

Fig. 8





The upper portion of the Microscope Attachment (fitted to the camera) is then inserted into the quick-change mount: first push the cone beneath the two lugs, and then fit the opposite side in place; tighten the setscrew and ensure that the upper part of the attachment is locked securely in position. Figure 9 shows the combination ready for action. By means of the quick-change mount the camera can be removed quickly and easily from the microscope whenever photographic work is suspended for exchanging oculars, or when observation is to be continued visually. As the lower part of the Microscope Attachment does not disturb the operator, it can remain on the microscope.

The cone on the upper portion of the Ihagee Microscope Attachment can be fitted to all Jena L and M microscopes. The tube of these microscopes is detachable, and the upper portion of the attachment (complete with camera) can be fitted into the ocular-changing mount on the tube

Fig. 9

support of the microscope. By using the microscope objective alone, it is also possible to take enlarged close-up pictures or "macro-photographs" (at a lower magnification than true photomicrographs); the Jena M objective lenses are especially suitable for this purpose – see Figure 10. It is unfortunately not possible to give detailed technical instructions for taking photomicrographs in this booklet. This field is so large that it would be of little value to pick out only a few points at random. We rather recommend the user to consult one of the many books on this subject (see the literature recommendations inside the back cover).

Lens Magnifier

(Order No. 308.01/Figs. 11 and 12)

Extreme close-up photography and photomicrography make particularly exacting demands on the optical systems used for focusing and viewing the image. It was for this reason that the Lens Magnifier

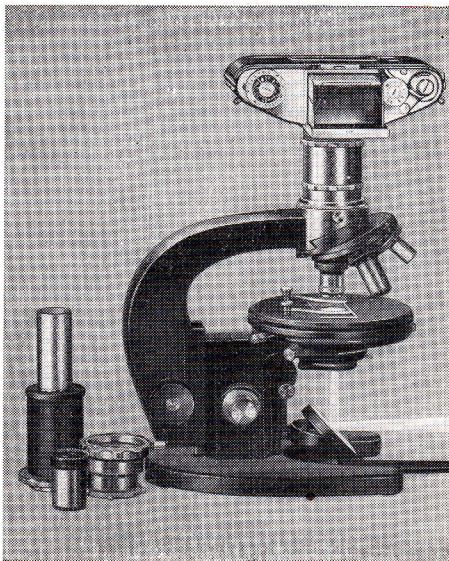


Fig. 10

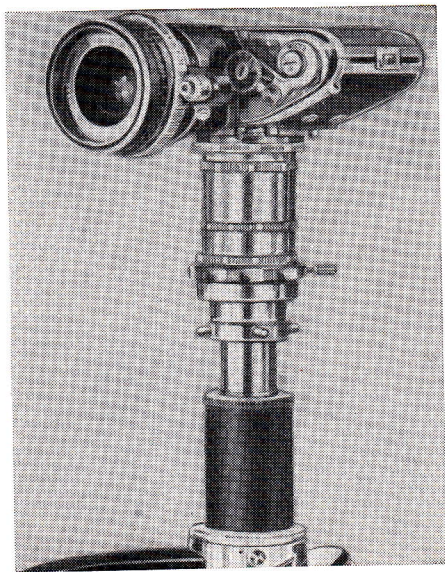


Fig. 11

was designed. This unit can be inserted into the EXAKTA Varex instead of the Finder Hood or Penta Prism, and makes it possible to focus and inspect the reflex image with one of the highly corrected standard or special lenses of the EXAKTA Varex. The lens is fitted into the bayonet mount of the Lens Magnifier as shown in Fig. 11. When focused to the infinity-setting on its distance scale, the lens will reveal a magnified and uniformly sharp reflex image free from distortion and aberrations. All the normal and special ground-glass or clear focusing screens may be used with the Lens Magnifier (see next section). With a partially or completely clear screen, the image can be observed with great clarity. By using standard or long-focus lenses as magnifiers it is possible to observe the whole area of the reflex image, whilst with a lens of 35 mm focal length the area of vision is somewhat restricted, making it possible to observe the centre part of the image only.

The Lens Magnifier is made even more practical when taking photomicrographs,

since the standard lens of the EXAKTA Varex is not utilized for this purpose and is thus freed to act as a magnifier. The magnifications of the reflex image which can be obtained with various lenses are shown in the following table. Additional magnification can be obtained by holding a small pocket magnifier as a supplementary focusing aid over the Lens Magnifier itself (e. g. the Tellup, which gives $\times 2.5$ magnification).

The total magnification is obtained by multiplying the lens magnification with that of the pocket magnifier. If the design of the lens mount is such that the eye cannot be held close to the front element of the lens, then the complete finder image will not be visible. Furthermore, the appropriate lens is often not free for use as a magnifier when taking close-up pictures. A special Top Lens (see Figure 12) has therefore been produced for the Lens Magnifier, providing a magnification of about $\times 4.5$; the total magnification including that provided by the magnifying ground-glass screen is about $\times 5$. The excellent optical perform-

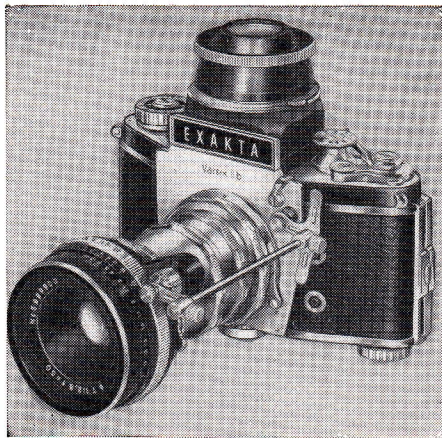


Fig. 12

ance of this additional magnifier allows you to observe the complete reflex image with ease and focus it accurately. This Top

Lens is fitted with the same bayonet mount as all other EXAKTA lenses and is inserted

in the same way into the bayonet on the Lens Magnifying unit.

Magnifications

Lens of 35 mm focal length	= x 8.1, with Tellup	x 20.3
Lens of 50 mm focal length	= x 5.7, with Tellup	x 14.3
Lens of 80 mm focal length	= x 3.6, with Tellup	x 9.5
Lens of 100 mm focal length	= x 2.8, with Tellup	x 7.0
Lens of 135 mm focal length	= x 2.1, with Tellup	x 5.3

Special focusing screens

(Figure 13)

The ability to exchange the focusing screens of the EXAKTA Varex in a matter of moments is a great advantage for taking photomicrographs and extreme close-up pictures. Instead of the standard ground-glass screen you can use any of the special screens described below. Although it is preferable to compose the image on a ground-glass screen, the definition can be controlled by focusing on the aerial image through the clear centre spot. A completely clear focusing screen can of course also be employed. Both these types of special focusing screen are very useful for taking endoscopic pictures in medical photography. In order to exchange the focusing screen, the Finder Hood, Penta Prism or Lens Magnifier must be removed from the EXAKTA Varex (first folding the Finder Hood). The magnifying ground-glass screen should then be gripped on either side and lifted out of the viewfinder unit. The spe-

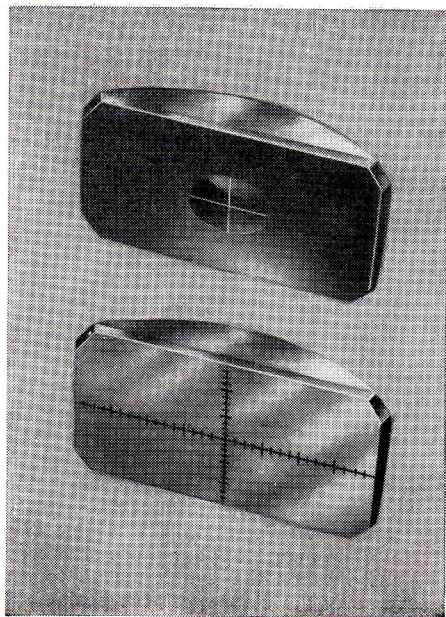


Fig. 13

cial-purpose screen which is to be inserted must also be held on either side and pressed into position between the clamping springs on the viewfinder.

The following special focusing screens are available:

- a) Special focusing screen for Reflex Finder Hood (current design), Penta Prism and Lens Magnifier: ground glass with clear centre spot, 3 or 10 mm in diameter (both with hairline cross in the clear spot);
- b) special focusing screen for Reflex Finder Hood (current design), Penta Prism and Lens Magnifier: completely clear, with hairline cross. The purpose of the hairline cross is to prevent the unwanted after-accomodation of the eye. In photomicrography the point of correct focus is obtained when both the hairline cross and the image appear sharp simultaneously. When the eye is moved to and fro over the clear sport, the positions of

the cross and the image must not alter in relation to each other when the lens is correctly focused.

Special models of these focusing screens can be supplied for use with earlier models of the Finder Hood (with frame viewfinder). The two small screws on the shorter sides of the Finder Hood should be loosened, after which the body of the ground-glass screen can be removed. Insert the special replacement focusing screen from below and then re-tighten the two small retaining screws. The following screens are available:

- c) Special focusing screen for Finder Hood (with frame viewfinder): ground glass with clear centre spot, 3 or 10 mm diameter (both with hairline cross);
- d) special focusing screen for Finder Hood (with frame viewfinder): completely clear with hairline cross.

Other special types of focusing screens for technical and architectural photography, copying, etc. can be supplied according to your specifications (e. g. with etched right-

angled guide lines, centimetre or millimetre graduations, etc.). Please write to our Publicity Department.

Documents, etc. can be focused without any distortions which might be caused by the curvature of the normal magnifying focusing screen, by using a plain ground-glass screen in the current Finder Hood, Pentaprism or Lens Magnifier. This plane screen can be supplied with any form of graduation or guide lines.

Ihagee Macro-Micro Photometer

(Order No. 167/Figure 14)

In extreme close-up photography and photomicrography, the determination of the correct exposure settings is often somewhat difficult. Under suitable circumstances, the Ihagee Macro-Micro Photometer can be recommended as a most useful aid in exposure measurement. It can be fitted directly to the camera, and operates by lowering a selenium photo-cell into the image beam passing through the lens in order to measure the light which actually

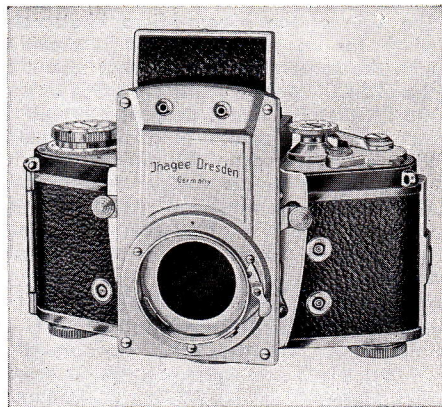


Fig. 14

enters the camera. Whilst the exposure is being measured the shutter release knob of the camera is locked automatically in order to avoid exposing the film prematurely by accident.

The side of the Macro-Micro Photometer which fits on to the camera is provided with the same standard bayonet mount as the EXAKTA lenses, whilst the other side of the Photometer has a counter-bayonet for inserting the camera lens, rear Bayonet Ring or Microscope Attachment, or for connecting it to the Bellows Attachments. The increase in extension provided by the Ihagee Macro-Micro Photometer is 20 mm: this must be borne in mind when calculating the image scale.

As most photographers are aware, the selenium photo-cell converts light energy into electric energy, thus generating a current which can be measured by means of a standard microammeter or luminous-spot galvanometer (with effective measuring range $5 \dots 30 \mu\text{A}$, internal resistance $1000 \dots 5000 \text{ ohms}$). The connection between the Macro-Micro Photometer and the microammeter or galvanometer is effected by a cable, which can be inserted into the two connection sockets on the photometer.

To evaluate the results of measurements taken in this way, it is necessary to produce a series of test pictures at progressively increasing exposure times. The most accurately exposed pictures will provide data which can be used as a reference in future; when using the same film and the same exposure time, an identical deflection of the microammeter needle or galvanometer spot will give an equally well-exposed picture. The needle or spot deflection can be controlled by altering the lens aperture setting or modifying the intensity of the illumination. The Ihagee Macro-Micro Photometer is, as we have mentioned before, a most useful aid in extreme close-up photography, photomicrography and optical copying. When used in the manner described together with a microammeter or luminous-spot galvanometer, no complicated calculations are necessary, and furthermore the exposure factor involved when using increased-extension accessories is automatically allowed for when taking the reading.

Literature

If you are interested in the EXAKTA and EXA cameras and their accessories, please let us know about your specific requirements.

The general textbook on these cameras is the "EXAKTA Manual" by Werner Wurst. This book is published by Fountain Press, London, and is available at good bookshops and photographic dealers. Other books which will help you to take good pictures are:

"35 mm EXAKTA Handbook" by K. L. Allinson A. R. P. S. (Published by Fountain Press, London)

"35 mm Photography with an EXAKTA" by K. L. Allinson, A. R. P. S. (Published by Fountain Press, London)

"EXAKTA Photography" by Jacob Deschin (Published by Camera Craft Publishing Company, San Francisco 5, California)

"EXAKTA GUIDE" by W. D. Emmanuel (Published by Focal Press, London)

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