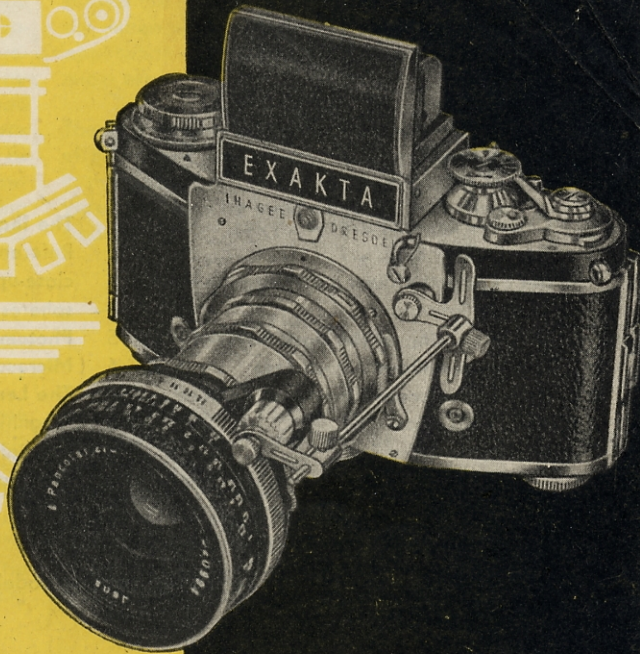


**EXAKTA  
and EXA  
accessories**



**for Macrophotography  
and Photomicrography**



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There may be slight deviations between camera models and the illustrations in this booklet.

Close-up and micro exposures offer the most important scope for the single-lens reflex camera. Therefore, the EXAKTA system has provided, for these kinds of work, some indispensable accessories which can be employed unconditionally for all models of EXAKTA Varex (including the former Kine-Exakta) as well as for EXA II. (The special focusing screens, however, cannot be used with EXA II.) When focusing at a long distance between film plane and

## Close-ups

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 short distance from the camera, the distance between lens and film plane must be larger than that attained by the helical focusing

subject the EXA I shows vignetting margins on the image which, however, do not exclude the application of this camera for close-up and micro exposures.

The lens bayonet being the same for all three of the Ihagee models, accessories referred to in this booklet in connection with the EXAKTA Varex can also be attached to the two other models.

mount of the lens. Then extensions (bayonet rings and extension tubes) must be used. They are fitted in appropriate combinations, between lens and camera body (Fig. 1). It is a characteristic of the single-lens reflex camera that there is no need for special optical attachments for focusing at short distances; the ground-glass is used at all times for controlling sharp-

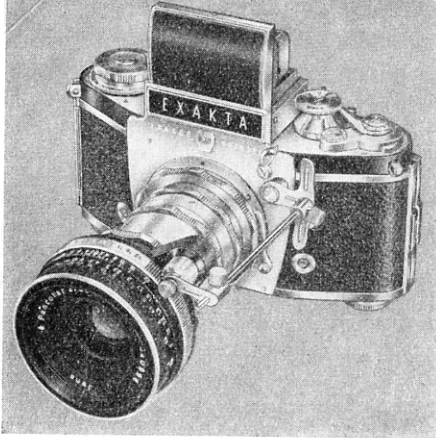


Fig. 1

ness, depth of field, as well as for aesthetical judgement of the photo and for composing the intended picture. The groundglass screen image and the final picture are always identical and parallax-free, even at short distances.

## Two-in-One Ring

(Cat. N° 187/Figure 2)

For the minimum extension increase of 5 mm a Two-in-One Ring is available. It fits into the camera after the lens is removed and is inserted into the front bayonet, so that the red dots on the lens mount and on the front part of the Two-in-One Ring come opposite each other. By a short turn to the right the lens, looking on face of camera, locks into the Two-in-One Ring, the stop-lever of which catches with a click. To remove the lens from the Two-in-One Ring, press the little release button of the adapter ring and

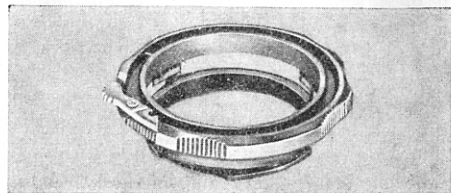


Fig. 2

turn the lens to the left, until the red dots are opposite each other again; then the lens can be removed from the adapter bayonet. - Inserting the Two-in-One Ring with the lens into the camera is achieved in the same manner as attaching the lens alone. When the red dots on the camera and on the back part of the Two-in-One Ring are opposite each other, turn the adapter ring with the lens shortly to the right, until the little lever on the camera snaps into position. The removal is achieved in the same manner as removing the lens from the camera.

## Front and Back Bayonet Adapter Rings and Extension Tubes

(Cat. N° 180/Figure 3)

The next extension increase is of 10 mm and is attained by the Pair of Bayonet Adapter Rings screwed together (Fig. 3 above). Its handling is approximately the same as that of the Two-in-

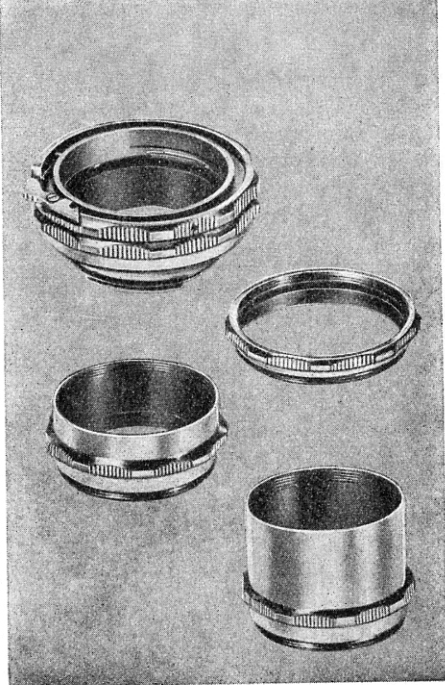


Fig. 3

## Possible Extensions

for Two-in-One Ring, Bayonet Adapter Rings (= Pair of Bayonet Adapter Rings) and Extension Tubes are as follows:

| Extension<br>in mm | Attainable with         |   |       |       |       |
|--------------------|-------------------------|---|-------|-------|-------|
|                    | Two-in-One<br>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                 | +                       | +   | +     | +     | +     |

The list of variable combinations may be extended to personal requirements by the addition of more tubes. - When using the Two-in-One Ring and a Pair of Bayonet Adapter Rings simultaneously, it is possible to attach the Two-in-One Ring to the back as well as to the front ring of the Pair of Bayonet Adapter Rings.

One Ring. The Pair of Bayonet Adapter Rings differ from the Two-in-One Ring mainly in that, that they can be separated.

In order to increase extension, additional Tubes must be screwed between the adapters. These Extension Tubes are supplied in 3 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, supplied singly.

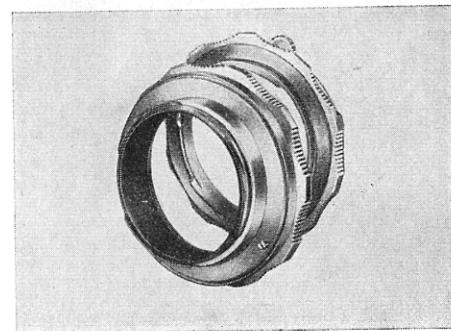
## Clamping Ring of the Back Bayonet Ring

(Figure 4)

The Back (camera-sided) Bayonet Adapter Ring has as Locking Ring serving the following purpose: When using the Pair of Bayonet Adapter Rings and Extension Tubes in different combinations the lens is often turned on its axis so

that the lens-scales are difficult to read. This awkward procedure can be avoided as follows: First turn the rim of the rear bayonet ring to the left (looking on face of camera), then you can turn the other extension increases with the lens into the desired position (e. g.: when using the Ihagee Autocouple Extension Release de-

Fig. 4





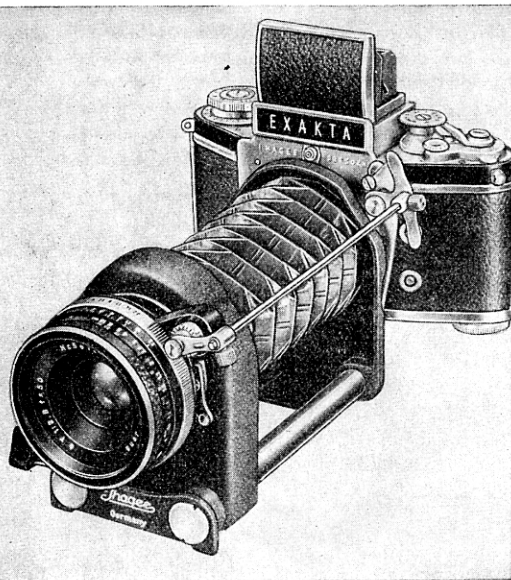


Fig. 5

scribed on pages 8 . . 10, the release buttons of camera and lens must lie exactly one behind the other). By turning the rim for handling to the right, the lens and the other extension increases, firmly screwed together, are fixed in this position. If the front extensions (front bayonet ring or tubes) shall be removed from the rear bayonet ring, turn the rim for handling also to the right, then the extension increase can be screwed out. When inserting and removing all extensions with rear bayonet ring, always hold the rim for handling.

### Miniature Bellows Attachment

(Cat. N<sup>o</sup> 176/Figure 5)

This Miniature Bellows Attachment which is easy to carry, is recommended when taking frequently close-ups whereby the bellows extension has to be changed quickly and continuously from 35 mm to 125 mm. Changing of the image ratio and other focusing data is always a matter of

seconds. The apparatus is mainly intended for close-up work by hand, but it can also be employed on any tripod or in connection with the copying stand.

For handling the Miniature Bellows Attachment, we recommend to proceed as follows: Put camera in vertical or horizontal position to the camera carrier, and lens to the lens carrier (and note that the red points must be opposite: For the horizontal position of the camera, the red point on the camera must be opposite the single red point, and for the vertical position opposite the double red point on the camera carrier. Swing camera to the right facing subject of exposure). Loosen locking knob at lens carrier and set required extension increase between 35 and 125 mm: shift lens carrier forward and hold it with the locking knob. The distance between every two division strokes at the right guide shaft amounts to 10 mm. The extension is always read before the front edge of the lens carrier. When transporting and preserving the miniature bellows attachment, camera car-

rier and lens carrier shall directly stand together for protecting the bellows (lock lens carrier!).

For photography from the hand the whole taking apparatus can be kept upright and transverse without difficulty; for using the miniature bellows attachment on a tripod employ a durable tilt top. There are threads ( $1/4''$ ) at camera and lens carrier. With tripods and tilt tops with thread of  $3/8''$  an adapter must be used. Whether you employ the thread at the camera or the lens carrier, depends on the centre of gravity of the whole apparatus, and you will want the thread of the lens carrier especially when using heavy long-focus lenses. With the copying stand with one-piece column the miniature bellows attachment can be used, but in this case the camera is screwed on with its own tripod thread.

For using the fully automatic diaphragm of the new lenses, we recommend to insert the Auto-couple Extension Release with the long coupling rod between release knob of camera and

releasing knob or lever of lens (see figure 5 and description at pages 8 . . . 10).

When photographing from the hand, exact focusing with the camera, prepared for the desired image scale, is done by to and fro movements of the whole apparatus. The same focusing method is also possible with the copying stand with its own rack-and-pinion mechanism. When working, however, with a tripod, focusing is done by to and fro sliding of the lens carrier. In this case, of course, the scale of reproduction changes with the varying object distance. With normal f/50 mm lenses all measuring scales from 0.7 (extension 35 mm) up to 2.5 (extension increase 125 mm) can be reached and objects with dimensions from  $34 \times 51$  mm down to  $10 \times 14$  mm are fully shown on the negative. Larger objects need less extension increase. For covering the gap from infinity to 35 mm, we recommend the use of the special lens Jena T 2.8/50 with sunk mount for the miniature bellows attachment. With this lens you can reach extension increases from 0 to 90 mm.

For wide angle lenses of 35 mm and shorter focal length, the miniature bellows attachment is not applicable, but all long-focus lenses can be used, if they are not too heavy.

### **Ihagee Autocouple Extension Release**

(Cat. N<sup>o</sup> 178/Figures 1, 5, 6, and 7)

In order to employ the fully automatic diaphragm of EXAKTA- and EXA-lenses, also when using Bayonet Adapter Rings and Tubes, or the Miniature Bellows Attachment for close-ups, the Autocouple Extension Release is inserted between objective and camera.

If you use the Two-in-One Ring only for extension increase, it is sufficient to screw the small screwing knob of the Ihagee Autocouple Extension Release into the shutter release knob of the camera. Then the pressure on the release knob or the release lever of the lens is transferred to the camera.

With all the extension increases of more than 5 mm one uses the complete Autocouple Extension Release (up to 60 mm extension increase with the short coupling rod, with longer increases up to about 125 mm with the long one). Finger grip and connecting part must be pushed on at the coupling rod. The finger grip is screwed firmly at the end of the rod. With the long screwing knob one attaches the finger grip to the releasing knob of the camera, with the short one the connecting part to the releasing knob or the release lever of the lens. Now the connecting part must be firmly screwed on the coupling rod; the finger grip must lie close directly on the head of the big screwing knob and the connecting part at the release knob or release lever of the lens. When pressing the finger grip, the diaphragm must shut as far as the pre-selected aperture, and with a further pressure, the shutter is allowed to be released. The coupling rod must always run parallel to the optical axis. Therefore, the release knob of the camera as well as the releasing knob or the release lever of the objective must lie exactly

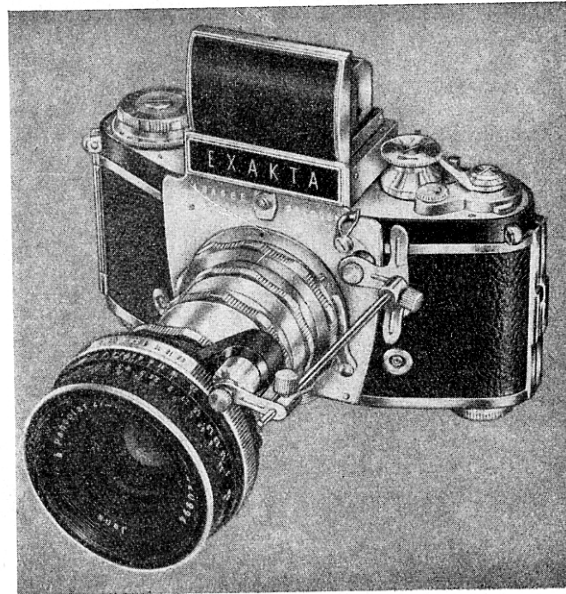


Fig. 6

behind one another. To enable the lens to be turned, the back bayonet ring (near the camera) possesses a clamping ring. Details at page 5.

### Explanation of the tables for close-ups

at pages 14 ... 16

The tables at pages 14 ... 15 contain all data for close-ups with lenses of 50, 80, 100, and 135 mm focal length and facilitate the right selection of the extension increases. The tables give calculated values which may differ a little from the real values because of the admissible tolerances of the focal distances of the lenses. However, these small differences can be ignored when applying the tables to any kind of regular work. References for rough estimate listed below:

#### Extension increase

i. e. the total length of the bayonet rings and tubes being used or bellows extensions

of the same length as the focal distance  
= picture 1 : 1 on the negative (scale of reproduction 1.0)

of double length of the focal distance  
= double magnification on the negative (scale of reproduction 2.0)

of triple length of the focal distance  
= three times magnification on the negative (scale of reproduction 3.0)

of quadruple length of the focal distance  
= four times magnification on the negative (scale of reproduction 4.0)

of quintuple length of the focal distance  
= five times magnification on the negative (scale of reproduction 5.0).

The figures of the tables are for the lens set at infinity ( $\infty$ ). Intermediate values are found with helical focusing type, by focusing at shorter distances (means lower figures in metres). By adding tubes you will get greater enlargement on the negatives, according to the length of extension.

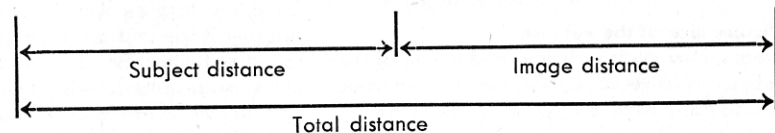
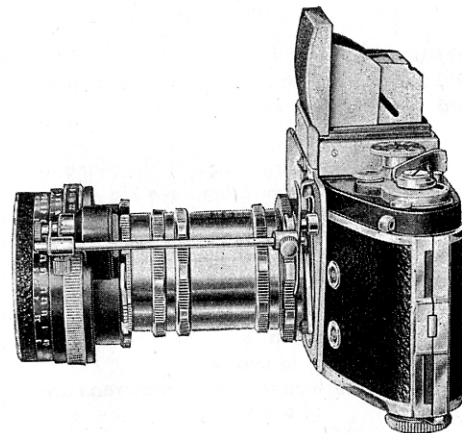


Fig. 7

**Subject distance**

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

**Image distance**

= distance from sharp image of film plane to lens (about diaphragm plane), see Fig. 7.

**Total distance**

= distance from subject to sharp image of film plane (about subject distance + image distance), see Fig. 7.

**Scale of reproduction**

= ratio of subject to image

e. g. 1 : 1 = 1.0 means: subject and image are of same size,

1 : 2 = 0.5 means: the image is half as large only as the subject,

2 : 1 = 2.0 means: double size of image = two times enlargement.

**Picture size of the subject**

means, how much of length and height of the subject is covered by the film (= effective image part) Here, partly, round figures in millimetres are quoted.

**Exposure factor**

When working with increased extension, the exposure time must be longer, for there will be a diminution of light with the increasing image distance. Therefore, the exposure time for a certain diaphragm opening must be multiplied by an exposure factor corresponding to the extension increase. When focusing at short distance with the lens helical focusing mount alone there is a small exposure increase only that can be overlooked, but with longer extensions it has to be calculated according to the following formula:

Exposure increase =

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

Example:

Extension increase with the Pair of Bayonet Adapter Rings and all three Tubes or corresponding Bellows Extension (= 60 mm). Length of the image distance = focal length of lens e. g.  $f = 50 \text{ mm} + \text{extension increase e. g. } 60 \text{ mm} = 110 \text{ mm}$ . The focal distance is 50 mm in length.

Consequently  $110:50 = 2.2$ .  $2.2 \times 2.2 = 4.84$ . Thus, in this case, the exposure factor is 4.8, in other words the normal exposure time must be multiplied practically by 5. Supposing the exposure meter indicates  $1/25$  you have to calculate  $1/25 \times 5 = 1/5 \text{ s}$ .

**Advice for close-ups**

Of course, increases of extension can also be used with other lenses not mentioned in the tables. For a certain scale of reproduction you will attain, when using a wide angle lens, a shorter subject distance and with a long-focus lens, a longer subject distance than with a normal lens. Both cases are possible in practice. Focusing is done always on the groundglass screen as usual. Tables for close-ups with special lenses up to  $f = 35 \text{ mm}$  focal distance are available and will be sent on request free of charge.

The wide angle lenses of 35 mm focal length, however, can be used with limited increased

extension only. In accordance with its special construction, the object plane at very short subject distances is placed just before the front lens or even within the objective. These lenses can be used for all scales of reproduction only, if their rear lens faces the object. This can be achieved by means of lens reversal rings mentioned below. Extreme wide angle lenses with shorter focal length than 35 mm are not suitable for taking close-ups with increased extensions.

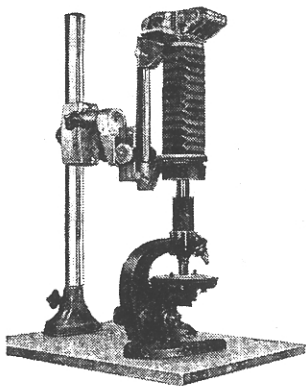
Tables for close-ups with focal length lenses of 50 mm and 80 mm

| 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             | ∞              | differ-               | variable                    | 1.0             | ∞                                | 80             | ∞              | differ-               | variable                    | 1.0             |
| 5                                | 550              | 55             | 605            | 0.1                   | 240x360                     | 1.2             | 1360                             | 85             | 1445           | 0.06                  | 392x576                     | 1.1             |
| 10                               | 300              | 60             | 360            | 0.2                   | 120x180                     | 1.4             | 720                              | 90             | 810            | 0.12                  | 192x288                     | 1.3             |
| 15                               | 217              | 65             | 282            | 0.3                   | 80x120                      | 1.7             | 507                              | 95             | 602            | 0.19                  | 127x192                     | 1.4             |
| 20                               | 175              | 70             | 245            | 0.4                   | 60x90                       | 2.0             | 400                              | 100            | 500            | 0.25                  | 96x144                      | 1.6             |
| 25                               | 150              | 75             | 225            | 0.5                   | 48x72                       | 2.3             | 336                              | 105            | 441            | 0.31                  | 77x115                      | 1.7             |
| 30                               | 133              | 80             | 213            | 0.6                   | 40x60                       | 2.6             | 294                              | 110            | 404            | 0.38                  | 64x96                       | 1.9             |
| 35                               | 121              | 85             | 206            | 0.7                   | 34x51                       | 2.9             | 263                              | 115            | 378            | 0.44                  | 55x82                       | 2.1             |
| 40                               | 113              | 90             | 203            | 0.8                   | 30x45                       | 3.2             | 240                              | 120            | 360            | 0.50                  | 48x72                       | 2.3             |
| 45                               | 106              | 95             | 201            | 0.9                   | 27x40                       | 3.6             | 222                              | 125            | 347            | 0.56                  | 43x64                       | 2.5             |
| 50                               | 100              | 100            | 200            | 1.0                   | 24x36                       | 4.0             | 208                              | 130            | 338            | 0.62                  | 38x58                       | 2.7             |
| 55                               | 95               | 105            | 200            | 1.1                   | 22x33                       | 4.4             | 196                              | 135            | 331            | 0.69                  | 35x52                       | 2.9             |
| 60                               | 92               | 110            | 202            | 1.2                   | 20x30                       | 4.8             | 186                              | 140            | 326            | 0.75                  | 32x48                       | 3.1             |
| 70                               | 86               | 120            | 206            | 1.4                   | 17x26                       | 5.8             | 171                              | 150            | 321            | 0.88                  | 27x41                       | 3.5             |
| 80                               | 81               | 130            | 211            | 1.6                   | 15x23                       | 6.8             | 160                              | 160            | 320            | 1.00                  | 24x36                       | 4.0             |
| 90                               | 78               | 140            | 218            | 1.8                   | 13x20                       | 7.8             | 151                              | 170            | 321            | 1.12                  | 21x32                       | 4.5             |
| 100                              | 75               | 150            | 225            | 2.0                   | 12x18                       | 9.0             | 144                              | 180            | 324            | 1.25                  | 19x29                       | 5.0             |
| 110                              | 73               | 160            | 233            | 2.2                   | 11x16                       | 10.2            | 138                              | 190            | 328            | 1.38                  | 17x26                       | 5.6             |
| 120                              | 71               | 170            | 241            | 2.4                   | 10x15                       | 11.6            | 133                              | 200            | 333            | 1.50                  | 16x24                       | 6.2             |
| 130                              | 69               | 180            | 249            | 2.6                   | 9x14                        | 13.0            | 129                              | 210            | 339            | 1.63                  | 15x22                       | 6.9             |
| 140                              | 68               | 190            | 258            | 2.8                   | 9x13                        | 14.4            | 126                              | 220            | 346            | 1.75                  | 14x21                       | 7.6             |
| 150                              | 67               | 200            | 267            | 3.0                   | 8x12                        | 16.0            | 123                              | 230            | 353            | 1.87                  | 13x19                       | 8.3             |
| 160                              | 66               | 210            | 276            | 3.2                   | 8x11                        | 17.6            | 120                              | 240            | 360            | 2.00                  | 12x18                       | 9.0             |
| 170                              | 65               | 220            | 285            | 3.4                   | 8x11                        | 19.4            | 118                              | 250            | 368            | 2.12                  | 11x17                       | 9.8             |
| 180                              | 64               | 230            | 294            | 3.6                   | 7x10                        | 21.2            | 116                              | 260            | 376            | 2.25                  | 11x16                       | 10.6            |
| 190                              | 63               | 240            | 303            | 3.8                   | 6x9                         | 23.0            | 114                              | 270            | 384            | 2.38                  | 10x15                       | 11.4            |
| 200                              | 63               | 250            | 313            | 4.0                   | 6x9                         | 25.0            | 112                              | 280            | 392            | 2.50                  | 10x14                       | 12.3            |
| 210                              | 62               | 260            | 322            | 4.2                   | 6x9                         | 27.0            | 110                              | 290            | 400            | 2.63                  | 9x14                        | 13.2            |
| 220                              | 61               | 270            | 331            | 4.4                   | 5x8                         | 29.0            | 109                              | 300            | 409            | 2.75                  | 9x13                        | 14.1            |

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

| 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            | ∞              | differ-               | variable                    | 1.0             | ∞                                 | 135            | ∞              | differ-               | variable                    | 1.0             |
| 5                                 | 2100             | 105            | 2205           | 0.05                  | 480x720                     | 1.1             | 3780                              | 140            | 3920           | 0.04                  | 600x900                     | 1.1             |
| 10                                | 1100             | 110            | 1210           | 0.10                  | 240x360                     | 1.2             | 1958                              | 145            | 2103           | 0.07                  | 343x514                     | 1.2             |
| 15                                | 767              | 115            | 882            | 0.15                  | 160x240                     | 1.3             | 1350                              | 150            | 1500           | 0.11                  | 218x327                     | 1.2             |
| 20                                | 600              | 120            | 720            | 0.20                  | 120x180                     | 1.4             | 1046                              | 155            | 1201           | 0.15                  | 160x240                     | 1.3             |
| 25                                | 500              | 125            | 625            | 0.25                  | 96x144                      | 1.6             | 864                               | 160            | 1024           | 0.19                  | 126x189                     | 1.4             |
| 30                                | 433              | 130            | 563            | 0.30                  | 80x120                      | 1.7             | 742                               | 165            | 908            | 0.22                  | 109x164                     | 1.5             |
| 35                                | 386              | 135            | 521            | 0.35                  | 69x103                      | 1.8             | 656                               | 170            | 826            | 0.26                  | 92x138                      | 1.6             |
| 40                                | 350              | 140            | 490            | 0.40                  | 60x90                       | 2.0             | 591                               | 175            | 766            | 0.30                  | 80x120                      | 1.7             |
| 45                                | 322              | 145            | 467            | 0.45                  | 53x80                       | 2.1             | 540                               | 180            | 720            | 0.33                  | 73x109                      | 1.8             |
| 50                                | 300              | 150            | 450            | 0.50                  | 48x72                       | 2.3             | 500                               | 185            | 685            | 0.37                  | 65x97                       | 1.9             |
| 55                                | 282              | 155            | 437            | 0.55                  | 44x65                       | 2.4             | 466                               | 190            | 656            | 0.41                  | 59x88                       | 2.0             |
| 60                                | 267              | 160            | 427            | 0.60                  | 40x60                       | 2.6             | 439                               | 195            | 634            | 0.44                  | 55x82                       | 2.1             |
| 70                                | 243              | 170            | 413            | 0.70                  | 34x51                       | 2.9             | 395                               | 205            | 600            | 0.52                  | 46x69                       | 2.3             |
| 80                                | 225              | 180            | 405            | 0.80                  | 30x45                       | 3.2             | 363                               | 215            | 578            | 0.59                  | 41x61                       | 2.5             |
| 90                                | 211              | 190            | 401            | 0.90                  | 27x40                       | 3.6             | 338                               | 225            | 563            | 0.67                  | 36x54                       | 2.8             |
| 100                               | 200              | 200            | 400            | 1.00                  | 24x36                       | 4.0             | 317                               | 235            | 552            | 0.74                  | 32x49                       | 3.0             |
| 110                               | 191              | 210            | 401            | 1.10                  | 22x33                       | 4.4             | 301                               | 245            | 546            | 0.82                  | 29x44                       | 3.3             |
| 120                               | 183              | 220            | 403            | 1.20                  | 20x30                       | 4.8             | 287                               | 255            | 542            | 0.89                  | 27x40                       | 3.6             |
| 130                               | 177              | 230            | 407            | 1.30                  | 18x27                       | 5.3             | 275                               | 265            | 540            | 0.96                  | 25x38                       | 3.9             |
| 140                               | 171              | 240            | 411            | 1.40                  | 17x26                       | 5.8             | 265                               | 275            | 540            | 1.04                  | 23x35                       | 4.2             |
| 150                               | 167              | 250            | 417            | 1.50                  | 16x24                       | 6.3             | 257                               | 285            | 542            | 1.11                  | 21x32                       | 4.5             |
| 160                               | 163              | 260            | 423            | 1.60                  | 15x23                       | 6.8             | 249                               | 295            | 544            | 1.18                  | 20x30                       | 4.8             |
| 170                               | 159              | 270            | 429            | 1.70                  | 14x21                       | 7.3             | 242                               | 305            | 547            | 1.26                  | 19x29                       | 5.1             |
| 180                               | 156              | 280            | 436            | 1.80                  | 13x20                       | 7.8             | 236                               | 315            | 551            | 1.33                  | 18x27                       | 5.4             |
| 190                               | 153              | 290            | 443            | 1.90                  | 13x19                       | 8.4             | 231                               | 325            | 556            | 1.41                  | 17x26                       | 5.8             |
| 200                               | 150              | 300            | 450            | 2.00                  | 12x18                       | 9.0             | 226                               | 335            | 561            | 1.48                  | 16x25                       | 6.2             |
| 210                               | 148              | 310            | 458            | 2.10                  | 11x17                       | 9.6             | 222                               | 345            | 567            | 1.56                  | 15x23                       | 6.5             |
| 220                               | 145              | 320            | 465            | 2.20                  | 11x16                       | 10.2            | 218                               | 355            | 573            | 1.63                  | 15x22                       | 7.1             |



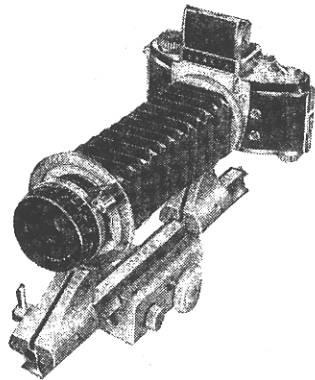


Repro Unit (Cat. N° 155.20) for photomicrography

**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

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° 155.10)

## Reproductions of DIN-patterns with EXAKTA and EXA cameras 24 × 36 mm

| Pattern                   | Extension increase in mm | Lens f = 50 mm<br>Image distance<br>mm | Lens to subject<br>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 extension increases are obtained with the helical focusing of the lens. When using Adapter Rings and Extension Tubes, the exact image distance is focused with the lens in helical mount as well. When working, however, with the Miniature Bellows Attachment, the special lens Jena T 2.8/50 mm with sunk mount has to be used (excepting the tiny pattern).

The measurements indicated in the table are calculated values. They are founded on the supposition that the short side of the DIN-pattern is always focused on 24mm-image - (short side of the negative size 24 × 36 mm). In practice the indications in the table can differ a little from the measurements really attained (focal length tolerances of the lenses).

## Lens Reversal Rings

Close-ups with great magnifications of the subject require relatively long image distances and short subject distances. Our lenses are, however, corrected for the reverse ratio, that is long subject distance and short image distance.

Therefore, we recommend for close-ups with magnifications of more than 1.5 times, to use the lens in reverse position i. e. with its back turned towards the subject and the lens front facing the film. We supply reversal rings with which to screw the lens on the front extension tube. (Please give all technical data of the corresponding lens when placing an order.)

When using the lens this way, there is no possibility of helical focusing, therefore, critical focusing is done by slight changes of the camera position. When reversing the objective, there is furthermore an additional releasing extension which is unseizable on our tables.

## Special lenses „Jena M“

For taking pictures with over 5 times magnifications we recommend the lenses „Jena M“. Not being available with EXAKTA and EXA lens mount we supply on request adapters to be screwed into the rear bayonet adapter ring or tubes. These adapters are provided in their centre with a thread for the desired lens „Jena M“ (with the back bayonet adapter ring may be used the reversal rings and with them the special lenses „Jena M“ as well for our Bellows Attachments). As expressly special lenses for macro-photos they must, of course, not be attached inversely. When ordering an adapter, please state by all means focal length of the lens „Jena M“.

## Swing angle attachment

The swing angle attachment as a part of the Ihagee „Vielzweck“ already mentioned at

pages 14 to 15 can be fixed to a tripod vertically or horizontally, rendering possible the easy movement of the camera forwards and backwards, thus giving reliable focusing at maximum sharpness with the invaluable focusing slide. Furthermore the camera can be switched at will from horizontal to vertical and vice versa. The actual increase of extension is made by bayonet rings and tubes. For further details please refer to special booklets.

### Vignetting of the image field

When photographing with very large increased extensions there are little shadows on the extreme corners of the image field. In the same way a dark stripe appears on the top edge of the reflex image; when using a large image distance, the light rays of this small region don't impinge upon the mirror which has been kept as small as possible with regard to lenses of short focal length. This stripe, however, is fully contained in the negative or diapositive, i. e.

it is only in the reflex image without details. On raising the camera up a little, the details of the mentioned region can be seen.

### Photomicrographs

The single-lens reflex cameras EXAKTA Varex and EXA open also - similarly to close-ups - the large field of Photomicrography, by simple and inexpensive accessories. The reflex screen image serves for focusing and observing the microscopic picture. You observe it until you press the shutter release button.

### The Microscope Attachment

(Cat. No 153/Figures 8 . . . 10)

is used for connecting the EXAKTA and EXA cameras to any microscope. The cameras can be adapted with the attachment to the ocular tube of the microscope which has the standard

outside diameter of about 25 mm (approx. 1"). Microphotographs are taken with the optical system of the microscope and not with the camera lens.

Top and bottom parts of this attachment have to be separated by loosening the quick-change-mount: The indented screw is slightly screwed out and the top part of the microscope attachment lifted out of the mount. The top part is attachable by its bayonet ring to the camera as usual. Then, after removing the ocular of the microscope, push the bottom part of the microscope attachment over the ocular tube, replace the ocular and fasten the bottom part on the notch-ring by turning it to the left, whereby the grip-border must be held fast. The top part of the micro attachment with the camera is put into the quick-change-mount: First place the cone under the two latches, then the opposite side slides into position. Tighten the set screw and make the top part in the mount safe to

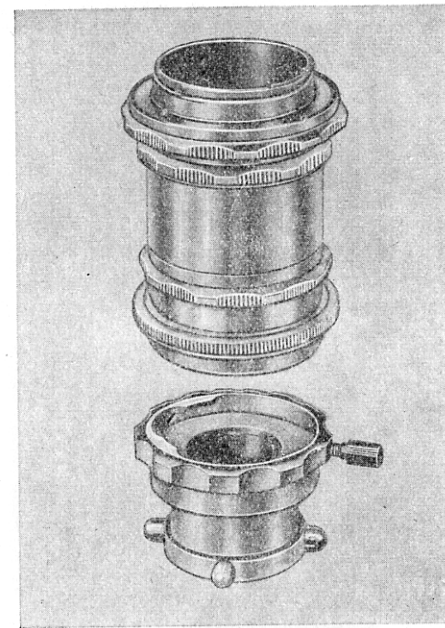
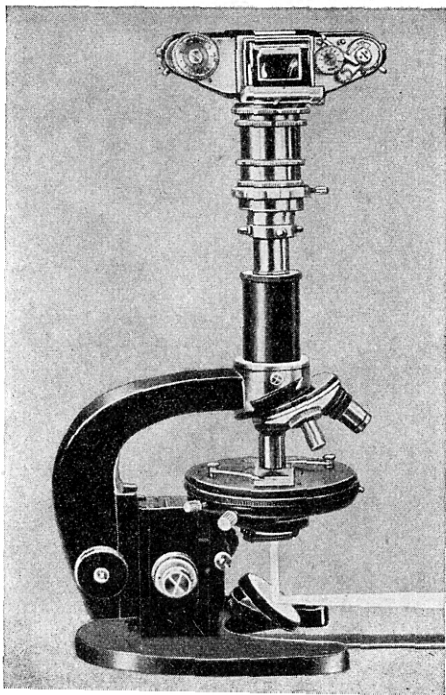


Fig. 8



operate. Figure 9 shows the combination ready to work. By means of the quick-change-mount the camera can always be removed from the microscope, when photographic work is being suspended for exchanging oculars or when subject observation should continue. As the bottom part of the microscope attachment does not disturb working, it can remain at the microscope.

The top part cone of our microscope attachment is also adaptable to all microscopes with tubes of 25 mm diameter. On these microscopes the tube is removable and the camera together with the top part of the micro attachment is placed into the switch mount of the tube support of the microscope. It is possible to take - of course in a less powerful magnification - so-called „Lupen“ Pictures - Macrophotographs - with the microscope objective alone (the Microtars are especially suitable for this purpose), see Figure 10. We regret that it is impossible

Fig. 9

to give here technical instructions for taking photomicrographs. This field is so large that it will be of no use picking out a few points only. We rather recommend to consult one of the many books about this subject. (Please refer to notes on page 29).

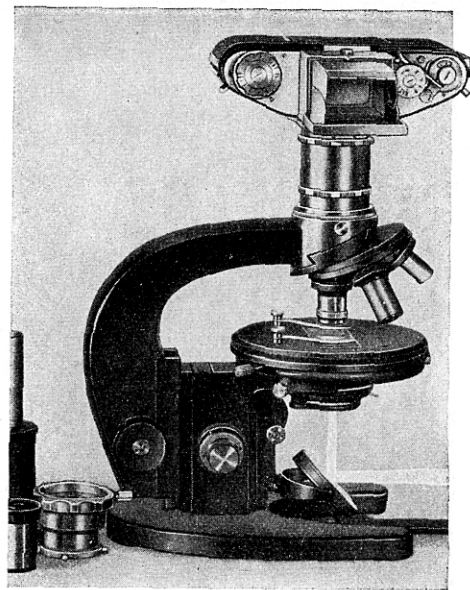


Fig. 10

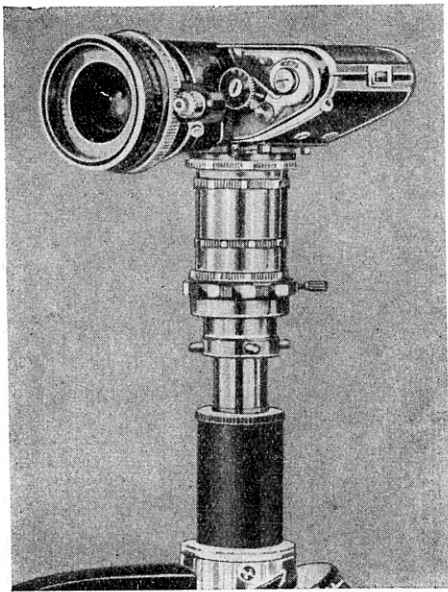


Fig. 11

## Lens Magnifier (Magnear)

(Cat. N<sup>o</sup> 308.01/Figures 11 and 12)

The supplementary magnifying lens in the Finder Hood of the EXAKTA Varex does not always meet the great optical requirements of critical focusing in close-up and micro-work. Therefore, the „Lens Magnifier“ was designed for the specialized fields of Macrophotography and Photomicrography. It can be inserted into the EXAKTA Varex instead of the Finder Hood or Penta Prism, and makes it possible to focus and examine the reflected image with one of the highly corrected EXAKTA Varex Normal and Special lenses. The lens is, as Figure 11 shows, set into the bayonet mount of the Lens Magnifier. Focused at infinity, it shows a magnified and evenly sharp reflected image without distortion or aberration. All normal and special ground or clear focusing screens may be used in the Lens Magnifier (see next section). With a partially or completely clear screen, the image is easily and quickly discernable. The Normal or

Long-focus lenses when used as critical magnifiers permit examination of the whole area of the reflected image, whereas with a 35 mm picture taking lens, the range of vision is somewhat limited so that you will see the centre part of the image only.

The Lens Magnifier is all the more practical as the normal lens of the EXAKTA Varex is not used for taking Photomicrographs, thus being free for serving as magnifier. For the reflex image magnifications possible with the different lenses see the following table. - Additional magnifications can be obtained, when holding a small pocket telescope as supplementary focusing help over the Lens Magnifier (e. g. the Tellup giving a 2.5 times magnification).

The total magnification results from multiplying the lens magnification with that of the pocket telescope. The modern lenses, the mounts of which offer the advantages of the pre-set diaphragm and the automatic diaphragm pre-setting device and additionally operate as a

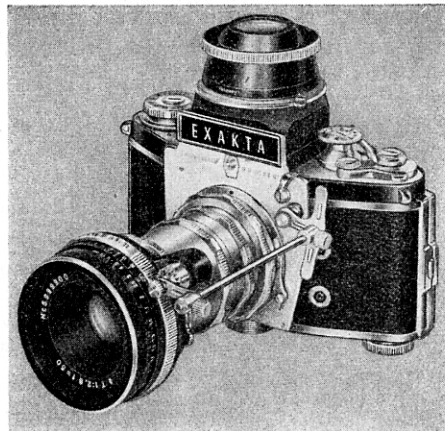


Fig. 12

natural light trap, too, have, however, when used as a magnifier, a distance somewhat too large between frontlens and eye, so that you can no more see the full groundglass image.



Furthermore, when taking close-ups often the appropriate lens is not free for serving as magnifier. For the Lens Magnifier, therefore, a Top Lens (see Fig. 12) was made, effecting a magnification of about 4.5 times (this total magnification with the magnifying groundglass about 5 times). So you can very well control and

accurately focus the total groundglass image owing to the good optical performance of the additional magnifier. This magnifying glass is mounted in the same way as a lens of the EXAKTA Varex and inserted in a similar way into the bayonet of the Lens Magnifier.

#### Magnifications

|                                 |            |             |            |
|---------------------------------|------------|-------------|------------|
| Lens with 35 mm focal distance  | 8.1 times, | with Tellup | 20.3 times |
| Lens with 50 mm focal distance  | 5.7 times, | with Tellup | 14.3 times |
| Lens with 80 mm focal distance  | 3.6 times, | with Tellup | 9.5 times  |
| Lens with 100 mm focal distance | 2.8 times, | with Tellup | 7.0 times  |
| Lens with 135 mm focal distance | 2.1 times, | with Tellup | 5.3 times  |

### Special focusing screens

(Figure 13)

The possibility of instantaneously interchanging the focusing screens of the EXAKTA Varex is of great advantage for taking micro- and „Lupen“ (macro)-pictures. You can use, instead of the regular groundglass, the special screens described below. Although it is desirable to compose the image on a groundglass, the sharpness may be determined through the clear centre spot by focusing into the air. Of course, a fully clear focusing screen can also be used. Both types of this special focusing screens are very practical for endoscopic pictures in medical photography.

When changing the focusing screens, the Finder Hood, Penta Prism, or Lens Magnifier have to be removed from the EXAKTA Varex (after having placed the hinged focusing magnifier of

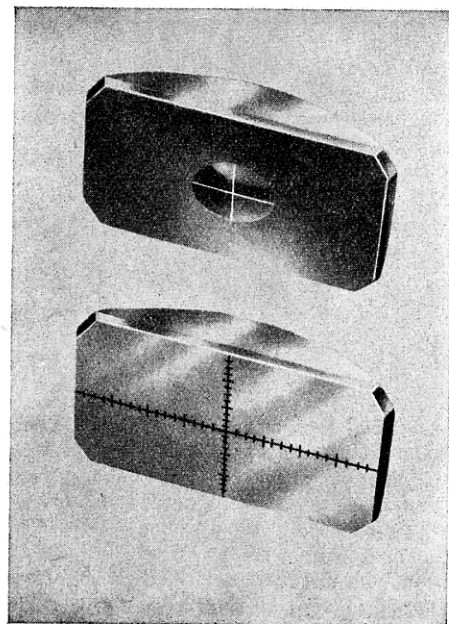


Fig. 13

the Finder Hood into rest position). The magnifying groundglass is taken on both sides and lifted out of the focusing system. The special focusing screen, too, has to be held on both sides and pressed in between the clamping springs of the focusing system.

**The following special focusing screens are offered:**

a) Special focusing screen for Reflex Finder Hood (latest design), Penta Prism, and Lens Magnifier with groundglass and clear centre spot of 3 or 10 mm diameter (both with hairline cross in the clear spot),

b) Special focusing screen for Reflex Finder Hood (latest design), Penta Prism, and Lens Magnifier completely clear with hairline cross. The hairline cross avoids, at all times, the unwanted continuing accommodation by the eye. In Photomicrography correct focusing is attained, when both hairline cross and image appear to be simultaneously sharp. When moving the

eye over the clear spot to and fro, hairline cross and image must not shift each against the other, if correctly focused.

Special types of focusing screens of former models of the Reflex Finder Hood with frame viewfinder can be supplied. The two little holding screws at the small sides of the Finder Hood are loosened and the magnifying body can be removed. After inserting the special focusing screen from below the two little holding screws are tightened again. We supply:

c) Special focusing screen for Reflex Finder Hood (with frame viewfinder) with groundglass and clear centre spot of 3 or 10 mm diameter (both with hairline cross),

d) Special focusing screen for Reflex Finder Hood (with frame viewfinder) completely clear with hairline cross.

Other special types of focusing screens for technical and architectural photos, reproductions, etc. can be supplied according to your

wishes (e. g. with etched cross lines, cm or mm graduations, etc.). Please write to our „Publicity Department“!

Reproductions can be focused without any disturbing influence by the curvature of the magnifying glass using a flat groundglass in the new Reflex Finder Hood, Penta Prism, or Magnifier Lens. It can be supplied with any graduation or subsidiary lines.

### **Ihagee Macro-Micro Photometer**

(Cat. N<sup>o</sup> 167/Figure 14)

In macrophotography and photomicrography the shutter speed setting is often very problematic. Therefore, under certain circumstances, the Ihagee Macro-Micro Photometer is a great aid and can be recommended. It can be adapted directly to the camera and a selenium cell element is lowered into the central light beam in order to measure the light effective in the

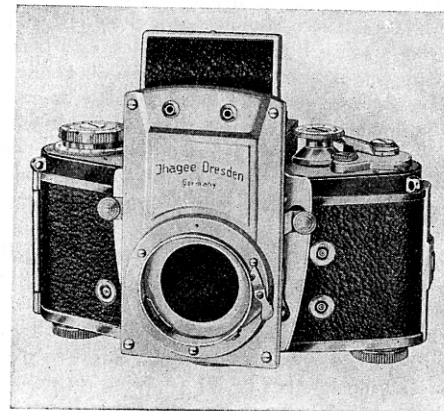


Fig. 14

camera. During the measuring process the shutter release knob of the camera is locked automatically in order to avoid an accidental exposure.

The Macro-Micro Photometer is provided with just the same bayonet as the lens, and lens-sided, with the counterbayonet to set in Lenses, Back Bayonet Adapter Ring and Microscope Attachment or to connect the Bellows Attachments. The increased extension effected by the Ihagee Macro-Micro Photometer is 20 mm. Special consideration must be given when the image scale is to be found out.

As it is generally known, the selenium cell element converts the energy of light into electric energy, generating in this way a current which can be measured by means of a normal pattern micro-ammeter or light-galvanometer (effective measuring range 5 . . . 30  $\mu$ A, plate resistance 1000 . . . 5000 Ohms). The connection between the Ihagee Macro-Micro Photometer and the micro-ammeter is made by a cable which can be inserted into the two input jacks at the Photometer.

In order to evaluate the results of measurement it is necessary to produce a series of test shots with graduated shutter speeds. According to the results it is possible to make future use of the data of the accurately exposed pictures: i. e. using the same film, the same shutter speed and the same deflection of the needle of micro-ammeter or light-galvanometer. The latter can be reached by choice of the lens diaphragm or by modification of the intensity of illumination. The Ihagee Macro-Micro Photometer is - as mentioned before - a great aid in macrophotography, photomicrography, and for optical copying. When working in the described manner in connection with a micro-ammeter or light-galvanometer respectively any complicated calculation no longer exists, also the multiplication factors are practically covered with the measurement when increased extensions for close-ups are used.

## Literature

If you are interested in the EXAKTA and EXA cameras and accessories, please do inform us of your specific requirements. The general basis instruction book bears the title „EXAKTA Manual“ and its author is Werner Wurst. This book is published by Fountain Press, London, and is available at book shops. Other books that lead the way to good photos 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).