

# The Olympus OM Way

FACTS AND FIGURES



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## BATTERY REQUIREMENTS

| Equipment                      | No. of cells | Volts |       | Size desig. |      |       | Type             | Maker's designations   |
|--------------------------------|--------------|-------|-------|-------------|------|-------|------------------|--|
|                                |              | Each  | Total | ASA         | ANSI | IEC   |                  |  |
| OM-2 and OM-10 camera          | 2            | 1.5   | 3     | —           | S-15 | —     | Silver* oxide    | Mallory 10 L 14, Varta 7301, Rayovac RW 42 or 22, National (and Japanese) G-13, UCAR Eveready S-76 or EXP 76 |
| OM-1 camera                    | 1            | 1.35  | 1.35  | —           | M-20 | MR-9  | Mercury          | Mallory PX-625, Eveready EPX-625, Varta 7002, National etc. H-D  |
| Auto-Quick 310 and 300 flash   | 4            | 1.5   | 6     | AA          | L-40 | LR-9  | Alkali**         | Mallory etc. Mn 1500, Eveready E91, Varta 7244, Japanese AM-3  |
| Bounce flash grip for 310, 300 | 4            | 1.5   | 6     | C           | L-70 | LR-14 | Alkali**         | Mallory etc. Mn 1400, Eveready E93, Varta 7233, Japanese AM-2  |
| T20 flash                      | 2            | 1.5   | 3     | AA          | L-40 | LR-14 | Alkali           | Mallory etc. Mn 1500, Eveready E91, Varta 7244, Japanese AM-3  |
| or                             | 2            | 1.25  | 2.5   | AA          | K-40 | LR-14 | NC re-chargeable | Varta 500 RS, Saft VR0.5 AA, Eveready CH 500; CF 500   |
| Motor drive 1                  | 12           | 1.5   | 18    | AA          | L-40 | LR-14 | Alkali           | Mallory etc. Mn 1500, Eveready E91, Varta 7244, Japanese AM-3  |
| or                             | 12           | 1.25  | 15    | AA          | K-40 | LR-14 | NC re-chargeable | Varta 500 RS, Saft VR0.5 AA, Eveready CH 500; CF 500   |
| Winder 1                       | 4            | 1.5   | 6     | AA          | L-40 | LR-14 | Alkali           | Mallory etc. Mn 1500, Eveready E91, Varta 7244, Japanese AM-3  |
| or                             | 4            | 1.25  | 5     | AA          | K-40 | LR-14 | NC re-chargeable | Varta 500 RS, Saft VR0.5 AA, Eveready CH 500; CF 500   |
| Recordata 1                    | 3            | 1.5   | 4.5   | —           | S-15 | —     | Silver* oxide    | Mallory 10 L 14, Varta 7301, Rayovac RW 42 or 22, National (Japanese) G-13, UCAR Eveready S-76 or EXP 76     |
| Recordata 2                    | 2            | 1.5   | 3     | —           | S-15 | —     | Silver oxide*    | Mallory 10 L 14, Varta 7301, Rayovac RW 42 or 22, National (Japanese) G-13, UCAR Eveready S-76 or EXP 76     |

\* Do not use mercury cells of same size but lower voltage (1.35 volts).

\*\* Do not use rechargeable nickel-cadmium (NC) cells for this equipment.

Cell types and the number required in OM cameras and other battery-powered equipment. The maker's designations are the type numbers of main manufacturers; often other makers use similar type numbers. Where alkali and rechargeable NC cells are shown as alternatives, the alkali batteries generally have two to three times the capacity of the rechargeable cells. Ordinary zinc-carbon cells of the heavy duty type can be used in place of alkali cells, but have about the same capacity as rechargeable NC cells. Equivalent types of different makes of such zinc-carbon cells are too numerous to list; they are recommended as an emergency measure only.

## INTERCHANGEABLE OM FOCUSING SCREENS

| Characteristics                       | Screen types and compatibility codes |     |     |     |     |     |     |     |     |      |      |      |       |
|---------------------------------------|--------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-------|
|                                       | 1-1                                  | 1-2 | 1-3 | 1-4 | 1-5 | 1-6 | 1-7 | 1-8 | 1-9 | 1-10 | 1-11 | 1-12 | 1-13  |
| Centre                                | p                                    | pl  | w   | m   | pw  | pl  | pe  | f   | s   | m    | c+c  | c+c  | w+p   |
| Centre dia. mm                        | 4                                    | 4   | 4   | 8   | 4   | 4   | 4   | 9   | 23  | 8    | 4    | 8    | 2.5/5 |
| Outer area (all with Fresnel except*) | m                                    | m   | m   | m   | c   | c   | c   | f   | c*  | m+g  | f    | c    | m     |
| <i>Lenses and applications</i>        |                                      |     |     |     |     |     |     |     |     |      |      |      |       |
| 8 mm fisheye                          | E                                    | H   | E   | E   | E   | —   | —   | H   | —   | E    | —    | —    | E     |
| 16 mm fisheye                         | A                                    | D   | A   | B   | E   | —   | —   | —   | —   | B    | —    | —    | A     |
| 18-28 mm                              | A                                    | B   | A   | B   | E/H | K   | —   | —   | —   | A    | —    | —    | A     |
| 35 mm shift                           | B                                    | D   | B   | A   | H   | —   | —   | B   | —   | X    | —    | —    | B     |
| 35 mm other                           | A                                    | B   | A   | A   | E   | H   | —   | B   | —   | A    | —    | —    | A     |
| 50-55 mm standard                     | A                                    | B   | A   | A   | E   | H   | —   | B   | —   | A    | —    | —    | A     |
| 85-135 mm tele                        | A                                    | A   | A   | A   | H   | E   | —   | B   | —   | A    | —    | —    | A     |
| 180 mm, 200 mm f4                     | B                                    | A   | A   | B   | —   | E   | E   | A   | —   | B    | —    | —    | B     |
| 200 mm f5                             | D                                    | A   | B   | B   | —   | H   | E   | A   | —   | B    | —    | —    | D     |
| 300 mm f4.5                           | D                                    | B   | B   | B   | —   | H   | E   | X   | —   | B    | A    | —    | D     |
| 400-600 mm                            | D                                    | B   | D   | B   | —   | —   | E   | X   | —   | B    | A    | —    | D     |
| 1000                                  | D                                    | D   | D   | B   | —   | —   | E   | X   | —   | B    | A    | —    | D     |
| 35-70 and 75-150 mm zoom              | A                                    | A   | A   | A   | K   | H   | —   | B   | —   | A    | —    | —    | A     |
| 85-250 mm zoom                        | B                                    | A   | A   | A   | —   | E   | H   | B   | —   | A    | —    | —    | B     |
| <i>Macro</i>                          |                                      |     |     |     |     |     |     |     |     |      |      |      |       |
| 20 and 38 mm                          | —                                    | —   | —   | D   | —   | —   | —   | B   | —   | D    | A    | X    | —     |
| 50 mm f3.5 (macro range)              | A                                    | A   | B   | B   | K   | H   | —   | A   | —   | B    | —    | —    | A     |
| 80 mm                                 | D                                    | B   | D   | A   | —   | —   | —   | A   | —   | A    | X    | —    | D     |
| <i>Photomicrog.</i>                   |                                      |     |     |     |     |     |     |     |     |      |      |      |       |
| <i>Astrophot.</i>                     | —                                    | —   | —   | —   | —   | —   | —   | X   | —   | —    | —    | —    | —     |
| <i>Endoscopic phot.</i>               | —                                    | —   | —   | —   | —   | —   | —   | —   | X   | —    | —    | —    | —     |

Main characteristics of the 13 screens available for the Olympus OM cameras and their suitability or compatibility with different lenses and applications.

c = Clear screen. c + c = Clear screen centre with crosshair pattern. f = Fine-grained matt surface. g = Grid. m = Standard matt surface. p = Standard microprism pattern. pe = Very low-profile microprism pattern for extra long tele lenses. pl = Low-profile microprism pattern for longer focus and smaller aperture lenses. pw = High-profile microprism pattern for wide-angle and wide-aperture lenses. s = Special condenser lens. w = Wedge range-finder (split-image).

The compatibility codes indicate:

- A = Screen compatible with lens or application, yields excellent and convenient focusing image. Meter measurements of screen image indicate correct exposures.
- B = Screen compatible with lens or application as A; acceptable rather than best possible screen. Meter measurements of screen images indicate correct exposures.
- D = Screen usable, usually subject to vignetting. Microprism or split image pattern blacks out if eye not accurately centred behind finder eyepiece. Meter measurements of screen image indicate correct exposures.
- E = Screen compatible with lens or application, yields clear and convenient focusing image but meter measurements of screen image do not indicate correct exposures (OM-1 or manual operation of OM-2) or not possible (with 8 mm fisheye). Despite wrong indication, automatic exposure with OM-2, controlled by silicon cells, is correct.
- H = Screen compatible with lens/application as E (incorrect exposure indication of screen image measurements) but not best screen available for the purpose.
- K = For emergency use only; screen usable but neither convenient nor yields correct exposure indication.
- X = Screen specially designed for this lens/application.
- = Unsuitable screen/lens combination.



## OM SYSTEM LENSES

| No.                     | Lens<br>desig. (1) | Focal<br>length | Max.—Min.<br>aperture | Angle of View(2) |                  |        | Nearest focus                         |      |
|-------------------------|--------------------|-----------------|-----------------------|------------------|------------------|--------|---------------------------------------|------|
|                         |                    |                 |                       | Horiz.           | Vert.            | Diag.  | Distance<br>(film plane)<br>m      ft |      |
| For use on camera       |                    |                 |                       |                  |                  |        |                                       |      |
| 1                       | Auto-Fisheye       | 8 mm            | f2.8—22               | 180°             | (circular image) |        | 0.2                                   | 0.7  |
| 2                       | Auto-Fisheye       | 16 mm           | f3.5—22               |                  |                  | 180°   | 0.2                                   | 0.7  |
| 3                       | MC Auto-W          | 18 mm           | f3.5—16               | 90°              | 67°              | 100°   | (4)0.25                               | 0.8  |
| 4                       | G Auto-W           | 21 mm           | f3.5—16               | 81°              | 59°              | 92°    | 0.2                                   | 0.7  |
| 5                       | MC Auto-W          | 21 mm           | f2—16                 | 81°              | 59°              | 92°    | (4)0.2                                | 0.7  |
| 6                       | H Auto-W           | 24 mm           | f2.8—16               | 74°              | 53°              | 84°    | 0.25                                  | 0.8  |
| 7                       | MC Auto-W          | 24 mm           | f2—16                 | 74°              | 53°              | 84°    | (4)0.25                               | 0.8  |
| 8                       | G Auto-W           | 28 mm           | f3.5—16               | 65°              | 46°              | 75°    | 0.3                                   | 1    |
| 9                       | MC Auto-W          | 28 mm           | f2—16                 | 65°              | 46°              | 75°    | (4)0.3                                | 1    |
| 10                      | G Auto-W           | 35 mm           | f2.8—16               | 54°              | 38°              | 63°    | 0.3                                   | 1    |
| 11                      | Shift              | 35 mm           | f2.8—22               | 54°              | 38°              | 63°(3) | 0.3                                   | 1    |
| 12                      | MC Auto-W          | 35 mm           | f2—16                 | 54°              | 38°              | 63°    | 0.3                                   | 1    |
| 13                      | F Auto-S           | 50 mm           | f1.8—16               | 40°              | 27°              | 47°    | 0.45                                  | 1.5  |
| 14                      | G Auto-S           | 50 mm           | f1.4—16               | 40°              | 27°              | 47°    | 0.45                                  | 1.5  |
| 15                      | Auto-Macro         | 50 mm           | f3.5—22               | 40°              | 27°              | 47°    | (4)0.23                               | 0.8  |
| 16                      | G Auto-S           | 55 mm           | f1.2—16               | 36°              | 25°              | 43°    | 0.45                                  | 1.5  |
| 17                      | Auto-Zoom          | 35—70 mm        | f3.6—22               | 54—29°           | 38—19°           | 63—34° | 0.8                                   | 2.7  |
| 18                      | Auto-Zoom          | 75—150 mm       | f4—22                 | 27—14°           | 18—9°            | 32—16° | 1.6                                   | 5.2  |
| 19                      | MC Auto-Zoom       | 85—250 mm       | f5—32                 | 24—8.2°          | 16—5.5°          | 29—10° | 2.0                                   | 6.6  |
| 20                      | F Auto-T           | 85 mm           | f2—16                 | 24°              | 16°              | 29°    | (4)0.85                               | 2.8  |
| 21                      | E Auto-T           | 100 mm          | f2.8—22               | 20°              | 14°              | 24°    | 1.0                                   | 3.3  |
| 22                      | E Auto-T           | 135 mm          | f3.5—22               | 15°              | 10°              | 18°    | 1.5                                   | 4.9  |
| 23                      | E Auto-T           | 135 mm          | f2.8—22               | 15°              | 10°              | 18°    | 1.5                                   | 4.9  |
| 24                      | MC Auto-T          | 180 mm          | f2.8—32               | 11°              | 7.6°             | 14°    | 2.0                                   | 6.6  |
| 25                      | F Auto-T           | 200 mm          | f5—32                 | 10°              | 6.9°             | 12°    | 2.5                                   | 8.2  |
| 26                      | E Auto-T           | 200 mm          | f4—32                 | 10°              | 6.9°             | 12°    | 2.5                                   | 8.2  |
| 27                      | F Auto-T           | 300 mm          | f4.5—32               | 6.9°             | 4.6°             | 8.3°   | 3.5                                   | 11.5 |
| 28                      | E Auto-T           | 400 mm          | f6.3—32               | 5.2°             | 3.4°             | 6.2°   | 5                                     | 16.4 |
| 29                      | F Auto-T           | 600 mm          | f6.5—32               | 3.4°             | 2.3°             | 4.1°   | 11                                    | 36   |
| 30                      | E Auto-T           | 1000 mm         | f11—45                | 2.1°             | 1.4°             | 2.5°   | 30                                    | 100  |
| For use on bellows only |                    |                 |                       |                  |                  |        |                                       |      |
| 31                      | Macro              | 20 mm           | f3.5—16               | —                | —                | —      | —                                     | —    |
| 32                      | Macro              | 38 mm           | f3.5—16               | —                | —                | —      | —                                     | —    |
| 33                      | Macro              | 80 mm           | f4—22                 | —                | —                | —      | —                                     | —    |

Data, setting parameters, construction etc. of lenses announced to date for the Olympus OM cameras. Most lenses are used directly on the camera and many can be used with extension tubes which—in the case of the long focus and tele lenses—also extended the near focusing limit. The macro lenses listed last in the table are usable only in conjunction with the Auto-bellows (or the bellows of the PMT-35 outfit). The 20 and 38 mm macro lenses have to be mounted via the PM-MTob adapter. All lenses with exception of these macro lenses and of the 35 mm shift lens are coupled with the aperture input for full-aperture metering with the OM cameras.

Numbered notes:

(1) All lenses are named Zuiko; this name precedes the codes beginning with 'Auto' but comes after the initial letter code. Thus the full designation of the lens entered as MC Auto-W is MC Zuiko Auto-W. *Auto* in all cases indicates automatic aperture coupling.

## OM SYSTEM LENSES

| No. | Nearest focus |           | No. of   |        | Filter<br>mount<br>(screw) | Hood<br>(7) | Length<br>min.<br>(8) | Max.<br>dia.<br>mm | Weight<br>grams |
|-----|---------------|-----------|----------|--------|----------------------------|-------------|-----------------------|--------------------|-----------------|
|     |               |           | Elements | Groups |                            |             |                       |                    |                 |
|     | Scale         |           |          |        |                            |             |                       |                    |                 |
|     | 1:            | ×         |          |        |                            |             |                       |                    |                 |
| 1   | —             | —         | 11       | 7      | (5)                        | —           | 82                    | 102                | 640             |
| 2   | —             | —         | 11       | 8      | (5)                        | —           | 31                    | 59                 | 180             |
| 3   | 7.8           | 0.13      | 11       | 9      | 72 mm(6)                   | (6)         | 42                    | 62                 | 250             |
| 4   | 5.8           | 0.17      | 7        | 7      | 49 mm                      | 49 mm S     | 31                    | 59                 | 180             |
| 5   | 5.8           | 0.17      | 11       | 9      | 55 mm                      | 57 mm C     | 43                    | 60                 | 240             |
| 6   | 6.4           | 0.16      | 8        | 7      | 49 mm                      | 49 mm S     | 31                    | 59                 | 180             |
| 7   | 6.4           | 0.16      | 10       | 8      | 55 mm                      | 55 mm S     | 48                    | 60                 | 280             |
| 8   | 7.5           | 0.13      | 7        | 7      | 49 mm                      | 49 mm S     | 31                    | 59                 | 180             |
| 9   | 7.5           | 0.13      | 9        | 8      | 49 mm                      | 49 mm S     | 43                    | 60                 | 250             |
| 10  | 5.8           | 0.17      | 7        | 6      | 49 mm                      | 51 mm C     | 33                    | 59                 | 180             |
| 11  | 5.8           | 0.17      | 8        | 7      | 49 mm                      | 49 mm S     | 58                    | 68                 | 310             |
| 12  | 5.8           | 0.17      | 8        | 7      | 55 mm                      | 55 mm S     | 42                    | 60                 | 240             |
| 13  | 6.7           | 0.15      | 6        | 5      | 49 mm                      | 51 mm C     | 31                    | 59                 | 170             |
| 14  | 6.7           | 0.15      | 7        | 6      | 49 mm                      | 51 mm C     | 36                    | 60                 | 230             |
| 15  | 2             | 0.5       | 5        | 4      | 49 mm                      | B           | 40                    | 60                 | 200             |
| 16  | 6.4           | 0.16      | 7        | 6      | 55 mm                      | 57 mm C     | 47                    | 65                 | 310             |
| 17  | 20–10         | 0.05–0.10 | 10       | 8      | 55 mm                      | 60 mm S     | 74                    | 67                 | 400             |
| 18  | 18–8.9        | 0.06–0.11 | 15       | 11     | 49 mm                      | BE          | 115                   | 63                 | 440             |
| 19  | 20–7.2        | 0.05–0.14 | 15       | 11     | 55 mm                      | BE          | 196                   | 70                 | 890             |
| 20  | 6.9           | 0.14      | 6        | 4      | 49 mm                      | 49 mm S     | 46                    | 60                 | 260             |
| 21  | 8.1           | 0.12      | 5        | 5      | 49 mm                      | 49 mm S     | 48                    | 60                 | 230             |
| 22  | 8.9           | 0.11      | 5        | 4      | 49 mm                      | BE          | 73                    | 60                 | 290             |
| 23  | 8.9           | 0.11      | 5        | 5      | 55 mm                      | BE          | 80                    | 61                 | 360             |
| 24  | 9.7           | 0.10      | 5        | 5      | 72 mm                      | BE          | 124                   | 80                 | 700             |
| 25  | 10            | 0.10      | 6        | 5      | 49 mm                      | BE          | 105                   | 62                 | 380             |
| 26  | 10            | 0.10      | 5        | 4      | 55 mm                      | BE          | 127                   | 67                 | 510             |
| 27  | 9.2           | 0.11      | 6        | 4      | 72 mm                      | BE          | 181                   | 80                 | 1100            |
| 28  | 10            | 0.10      | 5        | 5      | 72 mm                      | BE          | 255                   | 80                 | 1300            |
| 29  | 15            | 0.07      | 6        | 4      | 100 mm                     | BE          | 377                   | 110                | 2800            |
| 30  | 27            | 0.04      | 5        | 5      | 100 mm                     | BE          | 662                   | 110                | 4000            |
| 31  | —             | 4.3–12.4  | 4        | 3      | 21 mm C                    | —           | 20                    | 32                 | 70              |
| 32  | —             | 1.8–6.1   | 5        | 4      | 32 mm C                    | —           | 28                    | 43                 | 90              |
| 33  | —             | 0.3–2.3   | 6        | 4      | 49 mm                      | —           | 46                    | 59                 | 200             |

The letter following this indicates the lens application: W = wide angle, S = standard, T = tele. Initial letters from E to J indicate the number of elements: E = 5, F = 6, G = 7 and so on. MC indicates a multi-coated lens.

(2) At infinity setting.

(3) When the shift is utilised, the lens covers various sections of an image circle amounting to altogether 83°.

(4) Floating elements for close-up performance correction.

(5) Filters built in.

(6) With 49-72 mm step-up ring; this also acts as lens hood.

(7) S = screw-in, C = clamp-on, B = built-in (lens sufficiently recessed not to need hood), BE = built-in extending hood. Filters are all screw-in except for the macro lenses.

(8) Measured from front of lens mount to camera mounting flange, lens set at infinity, i.e. this is the amount by which the lens protrudes from the camera.

# FOCUSING ZONES

| <i>Lens</i>                  | <i>Stop</i>  | <i>Focus setting</i>     | <i>Sharp zone (approx.)</i> |             |
|------------------------------|--------------|--------------------------|-----------------------------|-------------|
|                              |              |                          | <i>metres</i>               | <i>feet</i> |
| <i>Near zones</i>            |              |                          |                             |             |
| 28 mm                        | <i>f</i> 5.6 | 6 ft to index            | 1.5–3                       | 5–10        |
| 35 mm                        | <i>f</i> 5.6 | 3 m to index             | 2–6                         | 7–20        |
| 50 mm                        | <i>f</i> 4   | 3 m to index             | 2.6–3.6                     | 8.5–12      |
| 85 mm                        | <i>f</i> 8   | 3 m to index             | 2.7–3.3                     | 9–11        |
| 100 mm                       | <i>f</i> 11  | 3 m to index             | 2.7–3.3                     | 9–11        |
| <i>Medium zones</i>          |              |                          |                             |             |
| 50 mm                        | <i>f</i> 4   | 5 m to index             | 4–7                         | 13–23       |
| 85 mm                        | <i>f</i> 8   | 5 m to index             | 4.3–6                       | 14–20       |
| 100 mm                       | <i>f</i> 11  | 5 m to index             | 4.3–6                       | 14–20       |
| 135 mm                       | <i>f</i> 16  | 10 m to index            | 7.9–13.6                    | 25–45       |
| <i>Far and extreme zones</i> |              |                          |                             |             |
| 24 mm                        | <i>f</i> 5.6 | 3 m to index             | 1.5–∞                       | 1.5–∞       |
| 28 mm                        | <i>f</i> 5.6 | 6 ft to LH <i>f</i> 8    | 2.2–∞                       | 7.2–∞       |
| 35 mm                        | <i>f</i> 5.6 | 3 m to LH <i>f</i> 4/8   | 3–∞                         | 10–∞        |
| 50 mm                        | <i>f</i> 8   | 10 m to index            | 5–∞                         | 16–∞        |
| 85 mm                        | <i>f</i> 11  | 10 m to LH <i>f</i> 8/16 | 10–∞                        | 33–∞        |
| 100 mm                       | <i>f</i> 16  | 10 m to LH <i>f</i> 11   | 8–∞                         | 25–∞        |
| 135 mm                       | <i>f</i> 16  | 30 m to index            | 15–∞                        | 50–∞        |

The depth of field indicator of the different lenses helps you to select suitable zones of sharpness needed for various subjects. To save time for this however it is also useful to have a few commonly used zones at your fingertips. This table lists a selection of such zones for the lenses most likely to be used in candid snapshooting, sports etc.

The actual zone indicated is approximate, but to know where you are it is useful to have strictly repeatable scale settings. So for these zones set the indicated white metre figure or orange feet value of the distance scale either opposite the red focusing index or to one of the depth of field index lines. Thus '6 ft to index' means that you set the orange 6 on the feet scale opposite the red focusing index. Similarly, '10 m to LH *f*11' means that you set the white 10 on the metre scale opposite the left-hand *f*11 line of the depth of field scale. Occasionally a distance figure has to be set halfway between two depth index lines; e.g. 'LH *f*4/8' means that you set the distance figure in the gap between the left-hand *f*4 and *f*8 index lines.

# FILM SPEEDS AND TYPES

| <i>ASA</i> | <i>DIN</i> | <i>Film types</i>  |  |
|------------|------------|--|--|
|            |            | <i>Black-and-white</i>   | <i>Colour</i>  |
| (2–10)     | (4–11)     | Special copying and extra slow                                     |  |
| 12         | 12         |  |  |
| 16         | 13         |  |  |
| 20         | 14         | Extra-fine grain films (negative)                                  | Slow colour reversal film (slides)                   |
| 25         | 15         |  |  |
| 32         | 16         |  |  |
| 40         | 17         |  |  |
| 50         | 18         | Fine grain negative, direct reversal films                         | Medium-speed negative and reversal films             |
| 64         | 19         |  |  |
| 80         | 20         |  |  |
| 100        | 21         |  |  |
| 125        | 22         | Medium to high-speed negative films                                | High-speed reversal films. High-speed negative films |
| 160        | 23         |  |  |
| 200        | 24         |  |  |
| 250        | 25         |  |  |
| 320        | 26         | High to extreme-speed negative films, often with forced processing | Forced-processing reversal                           |
| 400        | 27         |  |  |
| 500        | 28         |  |  |
| 640        | 29         |  |  |
| 800        | 30         |  |  |
| 1000       | 31         |  |  |
| 1250       | 32         |  |  |
| 1600       | 33         |  |  |

The ASA speeds listed are those marked on the film speed setting control of the OM cameras (though not necessarily all models cover the full range). Corresponding DIN values—as used in parts of central Europe—are given alongside. Nowadays most films, even if rated in DIN speeds, also carry ASA figures.

When dealing with films of East European origin which may have GOST (Russian standard) film speeds, simply set the OM meter to the next higher ASA value. For instance for 90 GOST film set to 100 ASA.

The table also indicates the general speed range of different black-and-white and colour film types.



# FILTERS FOR COLOUR

| Filter  | Colour temp. correct. |                    |             | Exposure correct. |     | Uses   |
|---|-----------------------|--------------------|-------------|-------------------|-----|--|
|   | Typically             |                    |             | X                 | EV  |  |
|   | From K                | To K               | Approx. dkM |                   |     |  |
| UV: L39*  | —                     | —                  | —           | 1                 | 0   | Absorbs ultraviolet, e.g. in mountain views (daylight film)  |
| Skylight 1A*                                    | —                     | —                  | —           | 1                 | 0   | Absorbs ultraviolet, stronger than L39. Outdoor views in shade, dull weather lit by blue skylight. Uncorrected electronic flash with daylight film |
| <i>Amber filters (lower colour temperature)</i> |                       |                    |             |                   |     |  |
| 81A   | 3400                  | 3200               | +2          | 1¼                | −⅓  | Photoflood lighting with type B or K film. Also for stronger effect in same applications as No. 1A   |
| 81C or 81D A4*                                  | 3800<br>4200          | 3200<br>or<br>3400 | +4 to +5    | 1¼                | −⅓  | AG1 flash bulbs (clear) with type A film or B or K film  |
| 86B   |                       |                    | +6.7        | 2                 | −1  |  |
| 85C   |                       |                    | +8          | 2                 | −1  |  |
| 85  | 5500                  | 3400               | +11         | 2                 | −1  | Daylight or blue flash with type A film  |
| 85B   | 5500                  | 3200               | +13         | 2                 | −1  | Daylight or blue flash or electronic flash with type B or K film   |
| <i>Blue filters (raise colour temperature)</i>  |                       |                    |             |                   |     |  |
| 78C or 82A                                      | 3200                  | 3400               | −2          | 1¼                | −⅓  | Tungsten (3200K) light with type A film  |
| 82C, B4*  | 2800                  | 3200               | −4.5        | 1⅔                | −⅔  | Ordinary tungsten light (2800K) with type B or K film  |
| 80D   | 4200                  | 5500               | −5.5        | 1⅔                | −⅔  | AG1 clear flash with daylight film   |
| 78B   | 2800                  | 3400               | −6.7        | 2                 | −1  | Ordinary (2800K) tungsten light with type A reversal film or negative colour film  |
| 80C   |                       |                    | −8          | 2                 | −1  | Tungsten light with negative colour films  |
| 80B   | 3400                  | 5500               | −11         | 3                 | −1½ | Photoflood light with daylight reversal film   |
| 80A   | 3200                  | 5500               | −13         | 4                 | −2  | Tungsten (3200K) light with daylight type reversal film  |

\* Olympus filters

Apart from the UV and skylight filter, the filters listed are colour conversion filters to match different light sources to films of different colour balance. Some filters are also included for correction balancing when copying colour transparencies. The filter numbers—other than the Olympus filters marked with an asterisk (\*)—are Wratten, or equivalent designations of other makes using the same numbering system.

# FILTER FITTINGS AND AVAILABILITY

| Filter size (screw) | Availability of Olympus filter types |          |          |          |          |          |          |     |     |            | Fits (Lenses)   |
|---------------------|--------------------------------------|----------|----------|----------|----------|----------|----------|-----|-----|------------|---|
|                     | 1A                                   | L39 (UV) | A4 (81C) | B4 (82C) | Y48 (Y2) | O56 (O2) | R60 (R1) | ND2 | ND4 | Polarising |   |
| 55 mm               | X                                    | X        | X        | X        | X        | X        | X        | X   | X   | X          | 21 mm f2<br>24 mm f2<br>35 mm f2<br>55 mm f1.2<br>*35–70 mm f3.6<br>*85–250 mm f5<br>135 mm f2.8<br>200 mm f4 |
| 72 mm               | X                                    | X        | —        | —        | X        | X        | X        | —   | —   | —          | 18 mm f3.5<br>180 mm f2.8<br>300 mm f4.5<br>400 mm f6.3   |
| 100 mm              | X                                    | X        | —        | —        | X        | X        | X        | —   | —   | —          | 600 mm f6.5<br>1000 mm f11  |
| 49 mm               | X                                    | X        | X        | X        | X        | X        | X        | X   | X   | X          | All other lenses <i>except</i> fisheye (have built-in turret) and 20 and 38 mm macro                          |

X = available filters in size indicated

\* Zoom lenses

Olympus filters are available in four sizes which between them cover all lenses of the OM system except the fisheye lenses (which have their own built-in filters) and the 20 and 38 mm macro lenses (not normally used with filters).

The table shows which filters are available in which size. All Olympus filters are available in the 49 and 55 mm sizes.

# RECIPROCITY FAILURE CORRECTIONS

| Nominal exposure (indicated or calculated) | Actual exposure required | Compensating override on OM-2 |
|--|--------------------------|-------------------------------|
| Shorter than ½ sec                         | As nominal               | None                          |
| 1 sec                                      | 1½ sec                   | +⅓                            |
| 2 sec                                      | 3 sec                    | +⅔                            |
| 4 sec                                      | 6–9 sec                  | +⅔ to +1                      |
| 8 sec                                      | 12–20 sec                | +⅔ to +1½                     |
| 16 sec                                     | 30–65 sec                | +1 to +2                      |
| 30 sec*                                    | 100–250 sec              | —                             |

\* For greater compensation switch to manual exposure control; OM-2 does not reliably time exposures longer than about 45–60 sec.

With longer exposure times the effective film speed drops and exposures need a longer time than the nominal time indicated by calculation or exposure metering. The actual correction for this so-called reciprocity failure varies from film to film, so consult the manufacturer's instruction literature. This table gives a rough guide to the magnitude of corrections to be expected. For automatic exposures with the OM-2 this can be allowed for by appropriate settings of the exposure compensating dial.

GUIDE NUMBERS AND FILM SPEEDS

| <i>(m)</i> |     |     |     |     |     | <i>ASA</i> | <i>Speed</i> |     |     | <i>(ft)</i> |     |     |     |     |     |
|------------|-----|-----|-----|-----|-----|------------|--------------|-----|-----|-------------|-----|-----|-----|-----|-----|
| 25         | 32  | 40  | 50  | 64  | 80  | 100        | 125          | 160 | 200 | 250         | 320 | 400 | 500 | 640 | 800 |
| 15         | 16  | 17  | 18  | 19  | 20  | 21         | 22           | 23  | 24  | 25          | 26  | 27  | 28  | 29  | 30  |
| <i>(m)</i> |     |     |     |     |     | <i>DIN</i> | <i>Speed</i> |     |     | <i>(ft)</i> |     |     |     |     |     |
| 10         | 11  | 12  | 14  | 16  | 18  | 20         | 22           | 25  | 28  | 32          | 36  | 40  | 45  | 50  | 56  |
| 11         | 12  | 14  | 16  | 18  | 20  | 22         | 25           | 28  | 32  | 36          | 40  | 45  | 50  | 56  | 64  |
| 12         | 14  | 16  | 18  | 20  | 22  | 25         | 28           | 32  | 36  | 40          | 45  | 50  | 56  | 64  | 72  |
| 14         | 16  | 18  | 20  | 22  | 25  | 28         | 32           | 36  | 40  | 45          | 50  | 56  | 64  | 72  | 80  |
| 16         | 18  | 20  | 22  | 25  | 28  | 32         | 36           | 40  | 45  | 50          | 56  | 64  | 72  | 80  | 90  |
| 18         | 20  | 22  | 25  | 28  | 32  | 36         | 40           | 45  | 50  | 56          | 64  | 72  | 80  | 90  | 100 |
| 20         | 22  | 25  | 28  | 32  | 36  | 40         | 45           | 50  | 56  | 64          | 72  | 80  | 90  | 100 | 110 |
| 22         | 25  | 28  | 32  | 36  | 40  | 45         | 50           | 56  | 64  | 72          | 80  | 90  | 100 | 110 | 125 |
| 25         | 28  | 32  | 36  | 40  | 45  | 50         | 56           | 64  | 72  | 80          | 90  | 100 | 110 | 125 | 140 |
| 28         | 32  | 36  | 40  | 45  | 50  | 56         | 64           | 72  | 80  | 90          | 100 | 110 | 125 | 140 | 160 |
| 32         | 36  | 40  | 45  | 50  | 56  | 64         | 72           | 80  | 90  | 100         | 110 | 125 | 140 | 160 | 180 |
| 36         | 40  | 45  | 50  | 56  | 64  | 72         | 80           | 90  | 100 | 110         | 125 | 140 | 160 | 180 | 200 |
| 40         | 45  | 50  | 56  | 64  | 72  | 80         | 90           | 100 | 110 | 125         | 140 | 160 | 180 | 200 | 225 |
| 45         | 50  | 56  | 64  | 72  | 80  | 90         | 100          | 110 | 125 | 140         | 160 | 180 | 200 | 225 | 250 |
| 50         | 56  | 64  | 72  | 80  | 90  | 100        | 110          | 125 | 140 | 160         | 180 | 200 | 225 | 250 | 280 |
| 56         | 64  | 72  | 80  | 90  | 100 | 110        | 125          | 140 | 160 | 180         | 200 | 225 | 250 | 280 | 320 |
| 64         | 72  | 80  | 90  | 100 | 110 | 125        | 140          | 160 | 180 | 200         | 225 | 250 | 280 | 320 | 360 |
| 72         | 80  | 90  | 100 | 110 | 125 | 140        | 160          | 180 | 200 | 225         | 250 | 280 | 320 | 360 | 400 |
| 80         | 90  | 100 | 110 | 125 | 140 | 160        | 180          | 200 | 225 | 250         | 280 | 320 | 360 | 400 | 450 |
| 90         | 100 | 110 | 125 | 140 | 160 | 180        | 200          | 225 | 250 | 280         | 320 | 360 | 400 | 450 | 500 |
| 100        | 110 | 125 | 140 | 160 | 180 | 200        | 225          | 250 | 280 | 320         | 360 | 400 | 450 | 500 | 560 |
| 110        | 125 | 140 | 160 | 180 | 200 | 225        | 250          | 280 | 320 | 360         | 400 | 450 | 500 | 560 | 640 |
| 125        | 140 | 160 | 180 | 200 | 225 | 250        | 280          | 320 | 360 | 400         | 450 | 500 | 560 | 640 | 720 |
| 140        | 160 | 180 | 200 | 225 | 250 | 280        | 320          | 360 | 400 | 450         | 500 | 560 | 640 | 720 | 800 |
| 160        | 180 | 200 | 225 | 250 | 280 | 320        | 360          | 400 | 450 | 500         | 560 | 640 | 720 | 800 | 900 |

The table shows equivalent guide numbers at different film speeds and is valid for metric or feet values. To find the equivalent of a known guide number for one speed in a different film speed, look up the known guide number in the appropriate ASA or DIN speed column. From that guide number trace horizontally across to the column of the new film speed value and read off the new guide number there.

All guide numbers follow the preferred guide number sequence recommended in ISO standards and now used by many electronic flash manufacturers in quoting guide numbers.

Example: If the guide number for a given flash is quoted as 32 at 100 ASA, what is the guide number with 250 ASA film? Trace down the 100 ASA column to 32, then trace horizontally across to the 250 ASA column: the new guide number shown there is 50.

The two bold columns in the table—headed *(m)* and *(ft)* at the top—can also serve as a ready reckoner to convert from metric to feet guide numbers or vice versa. To convert a metric guide number to feet, look up the metric value in the left-hand bold *(m)* column and trace across to the right-hand *(ft)* column. To convert from feet to metric, look up the guide number in the *ft* column and trace to the left to the corresponding value in the *m* column.

Example: 36 metric (left-hand column) = 110 in feet (right column). This conversion is approximate but with an average error not exceeding 3%.

QUICK AUTO 310 AND 300 OPERATING MODES

| Camera         |                     | Flash connection (2) | Uses (3) | Mode (4) for selector setting on flash unit |                              |       |       |
|----------------|---------------------|----------------------|----------|---|------------------------------|-------|-------|
| Model          | Meter switching (1) |                      |          | TTL AUTO                                    | MANUAL High                  | Low   | AUTO  |
| Quick Auto 310 |                     |                      |          |   |                              |       |       |
| OM-2           | AUTO                | OM-2 shoe            | G        | A-TTL                                       | MF                           | MR    | A     |
| OM-2           | AUTO                | AuC                  | G, B     | A-TTL                                       | A-TTL                        | A-TTL | A-TTL |
| OM-2           | AUTO                | SyC                  |          | MF  | MF                           | MR    | A     |
| OM-2           | MANUAL              | OM-2 shoe            | FI       | MF(5)                                       | MF                           | MR    | A     |
| OM-2           | MANUAL              | AuC                  | NR       | MF(5)                                       | MF                           | MF    | MF    |
| OM-2           | MANUAL              | SyC                  | FI       | MF  | MF                           | MR    | A     |
| OM-1           | Any                 | SyC                  | G, FI    | MF  | MF                           | MR    | A     |
| OM-1           | Any                 | ExS                  | B        | Mode as set on remote sensor                |                              |       |       |
| OM-1           | Any                 | OM-1 shoe            | G, FI    | MF  | MF                           | MR    | A     |
| OM-1           | Any                 | AuC                  | NR       | MF  | MF                           | MF    | MF    |
| Quick Auto 300 |                     |                      |          |   |                              |       |       |
| OM-2 or 1      | Any                 | Shoe                 | G, FI    | —   | MF                           | MR    | A     |
| OM-2 or 1      | Any                 | AuC                  | NR       | —   | MF                           | MF    | MF    |
| OM-2 or 1      | Any                 | SyC                  | G, FI    | —   | MF                           | MR    | A     |
| OM-2 or 1      | Any                 | ExS                  | B        | —   | Mode as set on remote sensor |       |       |

The Quick Auto flash units operate in different ways according to which camera they are linked with and by what means. This table summarises the combinations and results. The numbered notes below indicate special points and abbreviations used:

(1) With the OM-2 at the AUTO or OFF settings the flash does not fire if the prevailing light causes the automatic system to select a shutter speed of 1/125 second or faster. Nor will the OM-2 trigger the flash at manual settings with such shorter shutter speeds.

(2) The different connections, apart from fitting the flash directly into the camera shoe, are: AuC = Auto synchronising cord (flash off camera or on bounce grip); SyC = normal synchronising cord (with coaxial plug to fit camera socket, or synchronising cord built into bounce grip); ExS = external or remote sensor.

(3) G = general flash photography (preferred combination); B = bounce flash (flash on bounce grip); FI = suitable for fill-in lighting with daylight; NR = not recommended combination (shown only to indicate what happens with it).

(4) The modes indicated are: A-TTL = auto flash with through-the-lens flash control; MF = manual with full power flash; MR = manual with reduced power flash; A = automatic, controlled by built-in sensor of flash or external remote sensor.

(5) Spurious reduced power output if shutter speed is set to 1/60 second.



# SELECTING QUICK AUTO 310 AND 300 COMBINATIONS

| Flash model   | Camera |                 | Flash                            |                             |                  |
|---|--------|-----------------|----------------------------------|-----------------------------|------------------|
|   | Model  | Meter switching | Mounting                         | Connection                  | Selector setting |
| <i>On-camera automatic: simple, straightforward</i>             |        |                 |                                  |                             |                  |
| 310   | OM-2   | AUTO            | Shoe                             | Shoe                        | TTL-AUTO*        |
| 310/300   | OM-1   | Any             | Shoe                             | Shoe                        | AUTO             |
| 300   | OM-2   | MANUAL          | Shoe                             | Shoe                        | AUTO             |
| <i>Off-camera automatic: more modelling</i>                     |        |                 |                                  |                             |                  |
| 310   | OM-2   | AUTO            | Bounce grip                      | Auto cord                   | TTL-AUTO**       |
| 310   | OM-2   | AUTO            | Separate                         | Auto cord                   | TTL-AUTO**       |
| 310/300   | OM-1   | Any             | Bounce grip                      | Synch cord                  | AUTO             |
| 310/300   | OM-1   | Any             | Separate                         | Synch cord or remote sensor | AUTO             |
| 300   | OM-2   | MANUAL          | Bounce grip                      | Synch cord                  | AUTO             |
| 300   | OM-2   | MANUAL          | Separate                         | Remote                      | AUTO             |
| <i>Bounce flash for soft light</i>                              |        |                 |                                  |                             |                  |
| 310   | OM-2   | AUTO            | Bounce grip                      | Auto cord                   | TTL-AUTO**       |
| 310/300   | OM-1   | Any             | Bounce grip                      | Remote sensor               | AUTO             |
| 300   | OM-2   | MANUAL          | Bounce grip                      | Remote sensor               | AUTO             |
| <i>Daylight fill-in (select suitable aperture and/or speed)</i> |        |                 |                                  |                             |                  |
| 310/300   | OM-2   | MANUAL          | Shoe                             | Shoe                        | MANUAL HI        |
| 310/300   | OM-1   | Any             | Shoe                             | Shoe                        | MANUAL HI        |
| <i>Close-up</i>   |        |                 |                                  |                             |                  |
| 310   | OM-2   | AUTO            | Separate                         | Auto cord                   | TTL-AUTO**       |
| 310   | OM-2   | AUTO            | Bounce grip (angled)             | Auto cord                   | TTL-AUTO**       |
| 310/300   | OM-1   | Any             | Separate or bounce grip (angled) | Remote sensor               | AUTO             |
| 300   | OM-2   | MANUAL          | Separate or bounce grip (angled) | Remote sensor               | AUTO             |

\* Automatic control of flash duration by internal cells of camera.

\*\* In fact auto through-the-lens control takes place irrespective of 310 selector setting when Auto Cord is used and OM-2 set to AUTO (or OFF).

Combinations of camera with flash plus the required mounting, synchronising connection and setting on the selector dial of the flash unit. Where the remote sensor is used, the selector setting applied to the dial on the sensor.

# CLOSE-UP TELEPHOTOGRAPHY RANGES

| Lens                    | Extension tube | Focusing range* |         | Magnification range |
|-------------------------|----------------|-----------------|---------|---------------------|
|                         |                | m               | feet    |                     |
| 135 mm                  | None           | 1.36**          | 4.5**   | 0.11**              |
|                         | 7 mm           | 2.7–0.95        | 9–3.2   | 0.05–0.16           |
|                         | 14 mm          | 1.4–0.75        | 4.7–2.5 | 0.10–0.21           |
| 180 mm                  | None           | 1.93**          | 6.3**   | 0.10**              |
|                         | 14 mm          | 2.5–1.2         | 8.2–3.9 | 0.08–0.18           |
| 200 mm                  | None           | 2.3**           | 7.5**   | 0.10**              |
|                         | 14 mm          | 3.05–1.4        | 10–4.5  | 0.07–0.17           |
| 300 mm                  | None           | 3.1**           | 10**    | 0.11**              |
|                         | 14 mm          | 6.7–2.2         | 22–7.3  | 0.05–0.16           |
|                         | 25 mm          | 3.9–1.8         | 12.7–6  | 0.08–0.19           |
| 400 mm                  | None           | 4.6**           | 15**    | 0.10**              |
|                         | 25 mm          | 6.8–2.8         | 22–9.4  | 0.06–0.16           |
|                         | 25 + 14 mm     | 4.5–2.4         | 14.8–8  | 0.10–0.20           |
| 600 mm                  | None           | 10.5**          | 35**    | 0.07**              |
|                         | 25 mm          | 13.8–5.3        | 45–17.4 | 0.04–0.1            |
|                         | 25 + 14 mm     | 8.6–4.2         | 28–14   | 0.07–0.13           |
| 1000 mm                 | None           | 30**            | 100**   | 0.04**              |
|                         | 25 mm          | 39–15.5         | 128–51  | 0.03–0.06           |
|                         | 25 + 14 mm     | 24.6–12.4       | 81–41   | 0.04–0.07           |
| 85 mm<br>(85–250 zoom)  | None           | 1.8**           | 6**     | 0.05**              |
|                         | 7 mm           | 1.1–0.73        | 3.6–2.4 | 0.08–0.13           |
|                         | 14 mm          | 0.6–0.48        | 2.0–1.6 | 0.16–0.22           |
| 250 mm<br>(85–250 zoom) | None           | 2**             | 6.6**   | 0.14**              |
|                         | 7 mm           | 9.2–1.7         | 30–5.7  | 0.03–0.17           |
|                         | 14 mm          | 4.7–1.5         | 15.5–5  | 0.06–0.2            |
|                         | 25 mm          | 2.75–1.3        | 9–4.2   | 0.10–0.24           |

\* Approx. lens/subject distances. \*\* At near focusing limit of lens

Near focusing limits of tele lenses can be extended for close range telephotography, i.e. medium subject scales at comparatively long subject distances. The table lists the distance ranges and magnification ranges available with long focus and tele lenses combined with extension tubes.

## CLOSE-UP ZOOM RANGES

| Zoom lens | Ext. tube | Focus setting* | Zoom distance range** |          | Magnification range |
|-----------|-----------|----------------|-----------------------|----------|---------------------|
|           |           |                | metres                | feet     |                     |
| 35–70 mm  | 7 mm      | ∞              | 0.2–0.75              | 0.7–2.5  | 0.2–0.1             |
|           | 14 mm     | ∞              | 0.12–0.4              | 0.4–1.4  | 0.4–0.2             |
| 75–150 mm | 7 mm      | ∞              | 0.8–3.4               | 2.6–11   | 0.09–0.05           |
|           |           | c.             | 0.46–0.95             | 1.5–3.1  | 0.19–0.19           |
|           | 14 mm     | ∞              | 0.4–1.75              | 1.3–5.75 | 0.19–0.09           |
|           |           | c.             | 0.31–0.7              | 1.0–2.3  | 0.23–0.22           |
|           | 25 mm     | ∞              | 0.25–0.95             | 0.8–3.1  | 0.33–0.17           |
|           |           | c.             | 0.18–0.58             | 0.6–1.9  | 0.36–0.34           |
| 85–250 mm | 7 mm      | ∞              | 1.1–9.2               | 3.6–30   | 0.08–0.03           |
|           |           | c.             | 0.7–1.7               | 2.4–5.7  | 0.17–0.13           |
|           | 14 mm     | ∞              | 0.6–4.7               | 2.0–15.5 | 0.16–0.06           |
|           |           | c.             | 0.5–1.5               | 1.6–5    | 0.22–0.2            |
|           | 25 mm     | ∞              | 0.4–2.75              | 1.3–9    | 0.3–0.1             |
|           |           | c.             | 0.3–1.3               | 1–4.2    | 0.4–0.35            |

\* Infinity (∞) or closest focus (c.)

\*\* Approx. distance range (lens/subject) covered by zooming from longest to shortest focal length.

By combining zoom lenses with extension tubes you not only bring the near focusing limit nearer but also cover a near subject range at reasonably constant magnification by operating the zoom adjustment rather than the focusing ring. The scale remains particularly constant when the zoom lens is set to its near focusing limit.

The table shows the distance ranges (approximate lens/subject distances) covered by the zooming adjustment with different zoom lenses and extension tube combinations, plus other relevant data. In every case the shortest distance (and the highest magnification) is obtained with the zoom lens at its shortest focus setting.

## HAND COPY STAND DATA

| Camera lens  | Close up lens or ext. tube | Leg extens. | Approx. focus scale setting |       | Subject area covered |            | Reprod. scale |      |
|--|----------------------------|-------------|-----------------------------|-------|----------------------|------------|---------------|------|
|  |                            |             | m                           | ft    | cm                   | in.        | 1:            | x    |
| Large originals (A4, Foolscap): 38 × 50 cm (15 × 20 inch) support area                   |                            |             |                             |       |                      |            |               |      |
| 50 mm  | None                       | Long        | 0.65                        | 2     | 24.2 × 36.3          | 9.5 × 14.3 | 10.2          | 0.10 |
| Macro f3.5   |                            |             |                             |       |                      |            |               |      |
| 50 mm f1.8   | None                       | Long        | 0.65                        | 2     | 24.2 × 36.3          | 9.5 × 14.3 | 10.2          | 0.10 |
| 50 mm f1.4   | None                       | Long        | 0.65                        | 2     | 24.7 × 37.2          | 9.7 × 14.7 | 10.3          | 0.10 |
| 55 mm f1.2*  | None                       | Long        | 0.68                        | 2½    | 23.3 × 35.0          | 9.1 × 13.8 | 9.75          | 0.10 |
| Medium originals (Trimmed quarto, larger book): 27 × 36 cm (10.5 × 14 inch) support area |                            |             |                             |       |                      |            |               |      |
| 50 mm  | None                       | Med.        | 0.50                        | 1.7   | 17.3 × 26.2          | 6.8 × 10.3 | 7.5           | 0.13 |
| Macro f3.5   |                            |             |                             |       |                      |            |               |      |
| 50 mm f1.8   | None                       | Med.        | 0.47                        | —     | 17.0 × 25.8          | 6.7 × 10.2 | 7.25          | 0.14 |
| 50 mm f1.4   | None                       | Med.        | 0.47                        | —     | 17.5 × 26.6          | 6.9 × 10.5 | 7.5           | 0.13 |
| 50 mm f1.2*  | None                       | Med.        | 0.50                        | —     | 16.9 × 25.6          | 6.6 × 10.1 | 7.13          | 0.14 |
| Smaller originals (Octavo, normal book page): 20 × 28 cm (8 × 11 inch) support area      |                            |             |                             |       |                      |            |               |      |
| 50 mm  | None                       | Short       | 0.40                        | 1.3   | 12.7 × 19.0          | 5.0 × 7.4  | 5.4           | 0.19 |
| Macro f3.5   |                            |             |                             |       |                      |            |               |      |
| 50 mm f1.8   | 49 mm/40 cm                | Short       | 1.15                        | 3¾    | 12.8 × 19.3          | 5.1 × 7.6  | 5.5           | 0.18 |
| 50 mm f1.4   | 49 mm/40 cm                | Short       | 1.15                        | 3¾    | 13.1 × 19.7          | 5.1 × 7.7  | 5.6           | 0.18 |
| 50 mm f1.2*  | 55 mm/40 cm                | Short       | 1.25                        | 4     | 12.3 × 18.5          | 4.8 × 7.25 | 5.25          | 0.19 |
| Very small: 11 × 15 cm (4.5 × 6 inch) support area                                       |                            |             |                             |       |                      |            |               |      |
| 50 mm  | None                       | Shortest    | 0.24                        | 9¾ in | 5.1 × 7.7            | 2 × 3      | 2.25          | 0.44 |
| Macro f3.5   |                            |             |                             |       |                      |            |               |      |
| 50 mm f1.8   | 7 + 14 mm tubes            | Shortest    | 0.9                         | 3     | 4.8 × 7.3            | 1.9 × 2.9  | 2             | 0.5  |
| 50 mm f1.4   | 7 + 14 mm tubes            | Shortest    | 2.5                         | 8     | 5.3 × 8.1            | 2.1 × 3.2  | 2.25          | 0.44 |
| 55 mm f1.2*  | 7 + 14 mm                  | Shortest    | 1.50                        | 5     | 5.4 × 8.3            | 2.15 × 3.3 | 2.3           | 0.43 |

\* With 55/49 mm step-down adapter ring. Where close-up lens is used, screw this into 55 mm lens, and adapter ring into close-up lens

Subject areas covered with different 50 and 55 mm lenses at the three leg extensions of the Handy copy stand. The leg extensions determine the lens/copy distance and the focusing scale settings. The latter are approximate; focus accurately by observing the image in the finder. The lenses are listed in order of preference for optimum quality. Subject areas refer to conditions where the copy stand legs actually stand on the surface being copied—the ideal condition for keeping a page etc. flat. Closer focusing (and hence smaller subject areas) may be involved where a book of finite thickness is placed within the field covered by the legs. Subject areas refer to the field covered by the OM camera finder (and by transparency frames); slightly more is included on the film. The support area in each case is the minimum area required to support the legs safely.



# RECOMMENDED CLOSE-UP/MACRO COMBINATIONS

| Reprod.<br>scale                   | Suitable combinations of |                                   |  |   |
|------------------------------------|--------------------------|-----------------------------------|--|---|
|                                    | Lens                     | Extension<br>unit or<br>accessory | Focusing<br>means  | Minimum camera<br>support                   |
| <i>Preferred combinations</i>      |                          |                                   |  |   |
| 0–0.5×                             | 50 mm<br>Auto-Macro      | None needed                       | Lens mount,<br>plus possibly<br>focusing rail<br>and stage | Hand held or<br>tripod, copy<br>stand etc.  |
| 0.5–2.2×                           | 80 mm<br>Macro           | Bellows                           | Bellows  | Copy stand or<br>VST-1 or PMT-35            |
| 1.8–6×                             | 38 mm<br>Macro           | Bellows                           | Bellows  | VST-1 or PMT-35                             |
| 4.3–12.4×                          | 20 mm<br>Macro           | Bellows                           | Bellows  | VST-1 or PMT-35                             |
| <i>Other feasible combinations</i> |                          |                                   |  |   |
| 0–0.5×                             | Any 50 mm                | Tubes and/or<br>supp. lens        | Lens mount   | Hand held, or<br>tripod, copy stand<br>etc. |
|                                    | Other lenses             | Tubes                             | Lens mount   | As above                                    |
| 0.5–1×                             | 50 mm<br>Auto-Macro      | 25 mm tube                        | Lens mount,<br>focusing rail<br>and stage                  | Copy stand,<br>focusing rail<br>and stage   |
| 0.7–1.6×                           | 135 mm                   | Bellows                           | Bellows  | Copy stand                                  |
| 0.7–2×                             | 100 mm                   | Bellows                           | Bellows  | Copy stand                                  |
| 0.75–4×                            | 50 mm<br>Auto-Macro      | Bellows                           | Bellows  | VST-1                                       |
| 1× and over                        | Other lenses             | Bellows                           | Bellows  | Copy stand or VST-1                         |

\* Greater maximum magnification possible with PMT-35 system or addition of extension tubes

\*\* Approx. max. magnification with retro-mounted lens

A guide to selecting the appropriate items for different macro set-ups, depending on the scale of reproduction to be covered. The first half of the table (preferred combinations) lists lenses, extension units and focusing means that yield the best results and also indicates the standard of rigidity required in supporting the camera.

The second half of the table shows feasible equipment combinations you can use if for instance you do not have any or all the macro lenses indicated, or if you have to work without a bellows unit.

# CLOSE-UP RANGES WITH CLOSE-UP LENS AND EXTENSION TUBES

| Lens                  | Close-up<br>aid (1) | Focusing range (2) |           | Scale of reprod. |           |
|-----------------------|---------------------|--------------------|-----------|------------------|-----------|
|                       |                     | mm                 | inches    | Mag. x           | Red. 1:   |
| 50 mm<br>Macro f3.5   | None                | ∞–114              | ∞–4.5     | 0–0.5            | ∞–2       |
|                       | CL                  | 395–85             | 15.5–3.3  | 0.13–0.67        | 7.7–1.5   |
|                       | 14                  | 200–75             | 7.9–3     | 0.29–0.8         | 3.4–1.25  |
|                       | 14 + CL             | 130–60             | 5.1–2.35  | 0.42–0.9         | 2.4–1.1   |
|                       | 25                  | 118–64             | 4.7–2.5   | 0.57–1.0         | 1.75–1.0  |
|                       | 25 + CL             | 89–51              | 3.5–2.0   | 0.67–1.14        | 1.5–0.9   |
|                       | 25 + 14             | 80–51              | 3.2–2.0   | 0.8–1.33         |           |
| 50 mm<br>Standard (3) | 25 + 14 + 7         | 70–48              | 2.75–1.9  | 0.93–1.35        |           |
|                       | None                | ∞–362              | ∞–14.75   | 0–0.15           | ∞–6.5     |
|                       | CL                  | 393–188            | 15.5–7.4  | 0.13–0.3         | 7.5–3.4   |
|                       | 7                   | 390–195            | 15.4–7.7  | 0.14–0.31        | 7–3.25    |
|                       | 7 + CL              | 195–130            | 7.7–5.15  | 0.29–0.44        | 3.5–2.25  |
|                       | 14                  | 204–140            | 8.0–5.5   | 0.29–0.43        | 3.5–2.3   |
|                       | 14 + CL             | 133–102            | 5.25–4.0  | 0.44–0.57        | 2.25–1.75 |
|                       | 14 + 7              | 142–110            | 5.6–4.4   | 0.44–0.57        | 2.25–1.75 |
|                       | 14 + 7 + CL         | 104–84             | 4.1–3.3   | 0.57–0.73        | 1.75–1.4  |
|                       | 25                  | 124–99             | 4.9–3.9   | 0.50–0.67        | 2–1.5     |
|                       | 25 + CL             | 91–76              | 3.5–3.0   | 0.65–0.8         | 1.55–1.25 |
|                       | 25 + 7              | 99–85              | 3.9–3.35  | 0.67–0.8         | 1.5–1.25  |
|                       | 25 + 14             | 86–76              | 3.4–3     | 0.8–1.0          |           |
|                       | 25 + 14 + 7         | 76–68              | 3–2.7     | 0.95–1.14        |           |
| 55 mm f12             | None                | ∞–349              | ∞–13.7    | 0–0.167          | ∞–6       |
|                       | CL                  | 394–182            | 15.5–7.2  | 0.14–0.31        | 7–3.25    |
|                       | 7                   | 438–191            | 17.2–7.5  | 0.13–0.31        | 7.75–3.25 |
|                       | 7 + CL              | 205–127            | 8.0–5.0   | 0.29–0.44        | 3.5–2.25  |
|                       | 14                  | 220–134            | 8.7–5.25  | 0.25–0.43        | 4–2.3     |
|                       | 14 + CL             | 139–97             | 5.5–3.95  | 0.4–0.57         | 2.5–1.75  |
|                       | 25                  | 124–91             | 4.9–3.6   | 0.43–0.62        | 2.33–1.63 |
|                       | 25 + CL             | 94–70              | 3.7–2.75  | 0.61–0.77        | 1.65–1.3  |
|                       | 25 + 7              | 95–76              | 3.8–3.0   | 0.59–0.75        | 1.7–1.33  |
|                       | 25 + 7 + CL         | 76–63              | 3.0–2.45  | 0.87–0.95        | 1.15–1.08 |
|                       | 25 + 14             | 78–64              | 3.1–2.5   | 0.73–0.89        | 1.38–1.13 |
|                       | 25 + 14 + 7         | 66–56              | 2.6–2.25  | 0.89–0.98        | 1.13–1.03 |
| 100 mm f2.8           | CL                  | 390–270            | 15.3–10.6 | 0.26–0.43        | 3.9–2.3   |
|                       | 14                  | 814–470            | 32–18.5   | 0.14–0.27        | 7.1–3.7   |
|                       | 14 + CL             | 260–212            | 10.3–8.3  | 0.43–0.59        | 2.3–1.7   |
|                       | 25                  | 500–365            | 19.7–14.4 | 0.26–0.40        | 3.9–2.5   |
|                       | 25 + CL             | 215–187            | 8.5–7.7   | 0.61–0.77        | 1.65–1.3  |
|                       | 25 + 14             | 355–295            | 14–11.7   | 0.42–0.56        | 2.4–1.8   |
|                       | 25 + 14 + 7         | 318–274            | 12.5–0.65 | 0.49–0.65        | 2.05–1.55 |

The close-up lens generally provides a greater focusing range than an extension tube, but the image quality with the latter is better at the higher magnifications. Combinations with the close-up lens at reproduction scales above about 0.3 × require some stopping down to reduce definition loss towards the edge of the field. The same applies also to higher magnifications (above about 0.4 ×) with the extension tubes.

Numbered notes:

(1) CL = close-up lens (40 cm focal length); 7, 14, 25 = length in mm of extension tubes.

(2) Lens-to-subject distances (not lens-to-film plane).

(3) Figures measured for 50 mm f1.8; values very similar for 50 mm f1.4.

## EXTENSION TUBES WITH MACRO LENSES

| Lens            | Close-up aid (1) | Lens/subject distance<br>(from front lens rim) |        | Scale of reproduction |         |
|-----------------|------------------|--|--------|-----------------------|---------|
|                 |                  | mm   | inches | Magnif.               | Red. 1: |
| 80 mm Macro     | 25               | 640  | 25.0   | 0.14×                 | 7.25    |
|                 | 25 + 7           | 393  | 15.5   | 0.23×                 | 4.33    |
|                 | 25 + 14          | 295  | 11.6   | 0.36×                 | 2.75    |
|                 | 25 + 14 + 7      | 238  | 9.4    | 0.41×                 | 2.45    |
|                 | 25 + CL          | 242  | 9.5    | 0.36×                 | 2.75    |
|                 | 25 + 7 + CL      | 195  | 7.7    | 0.44×                 | 2.25    |
|                 | 25 + 14 + CL     | 167  | 6.5    | 0.57×                 | 1.75    |
|                 | 25 + 14 + 7 + CL | 148  | 5.8    | 0.67×                 | 1.5     |
|                 |                  |  |        |                       |         |
| 38 mm Macro (2) | None             | 71   | 2.8    | 0.87×                 | 1.15    |
|                 | 7                | 62   | 2.5    | 1.18×                 |         |
|                 | 14               | 56   | 2.25   | 1.35×                 |         |
|                 | 25               | 51   | 2.0    | 1.6×                  |         |

The 80 mm and 38 mm macro lenses have no focusing movement and hence yield sharp images with extension tubes and (in the case of the 80 mm lens) the close-up lens only at single fixed distances. In view of the special close-up correction of these lenses, definition performance is however good. The 38 mm macro lens is mounted via the PM-MTob adapter. Still larger scales are possible with further extension tube combinations; here the tube set-up however becomes inconvenient and the bellows should be used. (They are preferable with the macro lenses, anyway.)

Numbered notes:

(1) CL = close-up lens (40 cm focal length); 7, 14, 25 = length in mm of extension tubes.

(2) Mounted via PM-MTob adapter.

## MACRO LENSES WITH BELLOWS

| Magnif.               | 50 mm<br>Macro (N) |     | 50 mm<br>Macro (R) |     | 80 mm<br>Macro |            | 38 mm<br>Macro |      | 20 mm<br>Macro |     |
|-----------------------|--------------------|-----|--------------------|-----|----------------|------------|----------------|------|----------------|-----|
|                       | B                  | L/S | B                  | L/S | B              | L/S        | B              | L/S  | B              | L/S |
|                       | mm                 | mm  | mm                 | mm  | mm             | mm         | mm             | mm   | mm             | mm  |
| 0.4×                  | —                  | —   | —                  | —   | 79             | 243        | —              | —    | —              | —   |
| 0.6×                  | —                  | —   | —                  | —   | <b>95</b>      | <b>176</b> | —              | —    | —              | —   |
| 0.8×                  | 74                 | 77  | —                  | —   | <b>111</b>     | <b>143</b> | —              | —    | —              | —   |
| 1.0×                  | 84                 | 64  | 102                | 62  | <b>127</b>     | <b>123</b> | —              | —    | —              | —   |
| 1.2×                  | —                  | —   | 112                | 53  | <b>143</b>     | <b>110</b> | —              | —    | —              | —   |
| 1.4×                  | —                  | —   | 123                | 47  | <b>159</b>     | <b>100</b> | —              | —    | —              | —   |
| 1.6×                  | —                  | —   | 134                | 42  | <b>175</b>     | <b>93</b>  | —              | —    | —              | —   |
| 1.8×                  | —                  | —   | 144                | 38  | <b>191</b>     | <b>88</b>  | —              | —    | —              | —   |
| 2.0×                  | —                  | —   | 155                | 35  | <b>207</b>     | <b>83</b>  | 75             | 44   | —              | —   |
| 2.2×                  | —                  | —   | 166                | 33  | 223            | 80         | 83             | 43   | —              | —   |
| 2.4×                  | —                  | —   | 177                | 31  | (**)           | (**)       | 90             | 41   | —              | —   |
| 2.6×                  | —                  | —   | 187                | 29  | (**)           | (**)       | 98             | 40   | —              | —   |
| 2.8×                  | —                  | —   | 198                | 28  | —              | —          | 106            | 39   | —              | —   |
| 3.0×                  | —                  | —   | 209                | 26  | —              | —          | 113            | 38   | —              | —   |
| 3.5×                  | —                  | —   | —                  | —   | —              | —          | 132            | 36   | —              | —   |
| 4.0×                  | —                  | —   | —                  | —   | —              | —          | 151            | 35   | —              | —   |
| 4.5×                  | —                  | —   | —                  | —   | —              | —          | 170            | 34   | 73             | 21  |
| 5.0×                  | —                  | —   | —                  | —   | —              | —          | 189            | 33   | 83             | 21  |
| 5.5×                  | —                  | —   | —                  | —   | —              | —          | 208            | 32   | 93             | 20  |
| 6.0×                  | —                  | —   | —                  | —   | —              | —          | 227            | 32   | 103            | 20  |
| 6.5×                  | —                  | —   | —                  | —   | —              | —          | (**)           | (**) | 113            | 20  |
| 7.0×                  | —                  | —   | —                  | —   | —              | —          | (**)           | (**) | 123            | 20  |
| 8.0×                  | —                  | —   | —                  | —   | —              | —          | —              | —    | 143            | 19  |
| 9.0×                  | —                  | —   | —                  | —   | —              | —          | —              | —    | 163            | 19  |
| 10.0×                 | —                  | —   | —                  | —   | —              | —          | —              | —    | 183            | 19  |
| 12.0×                 | —                  | —   | —                  | —   | —              | —          | —              | —    | 223            | 18  |
| Subject/film addition | 54 mm              |     | 50 mm              |     | 60 mm          |            | 48 mm          |      | 39 mm          |     |

\* Magnifications obtainable with lens directly on camera—but minimum bellows extension too long

\*\* Can be reached with bellows and ext. tubes but cumbersome—better use next shorter focal length

Magnifications obtainable with macro lenses used in conjunction with the Auto-bellows. The bold values are preferred ranges.

Higher magnifications are possible with the 80 mm and 38 mm lenses by adding extension tubes to the bellows; in these cases it is however more convenient to switch to the 38 mm and 20 mm lenses respectively.

*B* in all cases is the location of the rear edge of the rear bellows standard on the scale, when the front standard is pushed fully forward against the rail screw.

*L/S* is the distance in mm from the front lens mount to the subject plane. The distances give an approximate indication of the amount of space available for lighting etc.

*N* indicates normal mounting and *R* retro mounting of 50 mm macro lens.

*Subject/film addition*: The table indicates lens/subject distances. To obtain subject/film distances, add together the bellows extension value (*B*) and the lens/subject distance (*L/S*) for the required magnification, and add to this the subject/film addition shown at the bottom of the appropriate lens column. For example, with the 38 mm macro lens at 3× magnification, the subject/film plane distance is 113 + 38 mm (*B* + *L/S*) plus 48 mm (subject/film addition) = 199 mm.

The figures are also valid for the 20, 38 and 80 mm macro lenses used on the PMT-35 bellows. The setting values on the bellows scale are there however higher by 13 mm (e.g. for the 80 mm macro lens at 1.0× magnification, the bellows scale setting would be 140 mm and not 127 mm) because the PMT-35 bellows scale does not start at zero. To calculate total subject/film distance however use the figures for *B* in this table, not those corrected for the PMT-35 scale. (i.e. the total subject/film distance with the 80 mm macro lens at 1.0× would still be 127 + 123 + 60 mm = 310 mm—not 140 + 123 + 60 mm).



## OTHER LENSES WITH BELLWS

| Magnif.               | 50 mm f1.8(N) |     | 50 mm f1.8(R) |     | 50 mm f1.4(N) |     | 50 mm f1.4(R) |     |
|-----------------------|---------------|-----|---------------|-----|---------------|-----|---------------|-----|
|                       | B             | L/S | B             | L/S | B             | L/S | B             | L/S |
|                       | mm            | mm  | mm            | mm  | mm            | mm  | mm            | mm  |
| 0.7×                  | 69            | 92  | —             | —   | 69            | 82  | —             | —   |
| 0.8×                  | 74            | 83  | —             | —   | 74            | 73  | —             | —   |
| 0.9×                  | 79            | 76  | —             | —   | 79            | 66  | —             | —   |
| 1.0×                  | 85            | 70  | —             | —   | 85            | 60  | —             | —   |
| 1.2×                  | —             | —   | 78            | 78  | —             | —   | 74            | 78  |
| 1.4×                  | —             | —   | 89            | 72  | —             | —   | 84            | 72  |
| 1.6×                  | —             | —   | 99            | 67  | —             | —   | 95            | 67  |
| 1.8×                  | —             | —   | 109           | 63  | —             | —   | 105           | 63  |
| 2.0×                  | —             | —   | 120           | 61  | —             | —   | 115           | 60  |
| 2.2×                  | —             | —   | 130           | 58  | —             | —   | 126           | 58  |
| 2.4×                  | —             | —   | 140           | 56  | —             | —   | 136           | 56  |
| 2.6×                  | —             | —   | 151           | 55  | —             | —   | 146           | 54  |
| 2.8×                  | —             | —   | 161           | 53  | —             | —   | 157           | 53  |
| 3.0×                  | —             | —   | 171           | 52  | —             | —   | 167           | 52  |
| 3.5×                  | —             | —   | 197           | 49  | —             | —   | 193           | 49  |
| 4.0×                  | —             | —   | 223           | 48  | —             | —   | 219           | 48  |
| Subject/film addition | 45 mm         |     | 50 mm         |     | 50 mm         |     | 50 mm         |     |

\* Use 55–49 mm step-down adapter ring on front of reversed lens to couple with bellows

\*\* Data similar with 135 mm f2.8 lens but lens/subject distances 28 mm shorter at all settings (f3.5 lens is more pronounced telephoto type)

\*\*\* Higher magnifications possible with extension tubes but with serious loss of image quality

While the macro lenses are specially corrected for a near focusing range, the other standard lenses and short tele lenses are usable in the near range subject to some limitations. In particular, they need more stopping down for reasonable sharpness over the whole image area.

The standard (50 and 55 mm) lenses should be mounted normally (N) at reproduction scales up to 1.0×, or reversed (retro-mounted) for higher magnifications (R). These lenses should be set to infinity. The 100 and 135 mm lenses—given here as examples of longer focal length to obtain greater lens/subject distance—are used with the focusing movement set to its closest distance (C). With the 50 and 55 mm lenses the bellows can be mounted on the VST-1 stand; use the copy stand or other arrangement for the 100 and 135 mm lenses as the minimum lens/subject distance is here too great for the VST-1.

## OTHER LENSES WITH BELLWS

| Magnif.               | 55 mm f1.2(N) |     | 55 mm f1.2(R)* |     | 100 mm f2.8(C) |     | 135 mm f3.5(C) |               |
|-----------------------|---------------|-----|----------------|-----|----------------|-----|----------------|---------------|
|                       | B             | L/S | B              | L/S | B              | L/S | B              | L/S**         |
|                       | mm            | mm  | mm             | mm  | mm             | mm  | mm             | mm            |
| 0.7×                  | 72            | 80  | —              | —   | 88             | 252 | 110            | 362           |
| 0.8×                  | 78            | 70  | —              | —   | 98             | 234 | 123            | 338           |
| 0.9×                  | 83            | 62  | —              | —   | 108            | 220 | 136            | 319           |
| 1.0×                  | 89            | 56  | —              | —   | 118            | 209 | 150            | 304           |
| 1.2×                  | —             | —   | —              | —   | 138            | 193 | 177            | 282           |
| 1.4×                  | —             | —   | 93             | 75  | 158            | 181 | 204            | 265           |
| 1.6×                  | —             | —   | 104            | 70  | 178            | 172 | 231            | 253           |
| 1.8×                  | —             | —   | 115            | 66  | 198            | 165 | (***)          | —             |
| 2.0×                  | —             | —   | 126            | 63  | 218            | 159 | —              | —             |
| 2.2×                  | —             | —   | 137            | 60  | (***)          | —   | —              | —             |
| 2.4×                  | —             | —   | 149            | 58  | (***)          | —   | —              | —             |
| 2.6×                  | —             | —   | 160            | 56  | —              | —   | —              | —             |
| 2.8×                  | —             | —   | 171            | 55  | —              | —   | —              | —             |
| 3.0×                  | —             | —   | 182            | 53  | —              | —   | —              | —             |
| 3.5×                  | —             | —   | 211            | 51  | —              | —   | —              | —             |
| 4.0×                  | —             | —   | —              | —   | —              | —   | —              | —             |
| Subject/film addition | 61 mm         |     | 50 mm          |     | 73 mm          |     | 102 mm (f3.5)  | 109 mm (f2.8) |

\* Use 55–49 mm step-down adapter ring on front of reversed lens to couple with bellows

\*\* Data similar with 135 mm f2.8 lens but lens/subject distances 28 mm shorter at all settings (f3.5 lens is more pronounced telephoto type)

\*\*\* Higher magnification possible with extension tubes but with serious loss of image quality

B is the bellows extension, being the location of the rear standard on the bellows rail scale when the front (lens) standard is moved fully to the front rail end.

L/S is the lens/subject distance (measured from subject plane to front lens mount).

Subject/film addition: The tables indicate lens/subject distances. To obtain subject/film distances, add together the bellows extension value (B) and the lens/subject distance (L/S) for the required magnification, and add to this the subject/film addition shown at the bottom of the appropriate lens column. For example, with the 50 mm f1.8 lens used at 1.0× magnification, add together 85 + 70 (B + L/S) + 45 mm (subject/film addition) = 200 mm total subject/film plane distance.

## SLIDE COPIER LENS AND BELLOWS SETTINGS

| Lens                    | Mounting               | Focus<br>setting<br>on lens | Alignment of   |   |  | Magnif. |
|-------------------------|------------------------|-----------------------------|--|---|--|---------|
|                         |                        |                             | Front of<br>bellows rail<br>(mark) on<br>slide copier<br>arm | Lens<br>standard on<br>bellows<br>rail<br>(front) | Camera<br>standard on<br>bellows<br>rail<br>(rear) |         |
| Same-size copying       |                        |                             |  |   |  |         |
| 80 mm Macro             | Normal                 | —                           | 1 ×<br>orange  | 25 mm<br>(1)                                      | 152 mm<br>(2)                                      | 1 ×     |
| 50 mm<br>Macro f3.5     | Normal                 | 0.3 m                       | 1 ×/1.5 ×<br>white   | 25 mm<br>(1)                                      | 95 mm<br>(3)                                       | 1 ×     |
| 50 mm<br>f1.4, f1.8, f2 | Normal                 | ∞                           | 1 ×/1.5 ×<br>white   | 25 mm<br>(1)                                      | 108 mm<br>(4)                                      | 1 ×     |
| Magnified copying       |                        |                             |  |   |  |         |
| 80 mm Macro             | Normal                 | —                           | 1.5 ×<br>orange  | 25 mm<br>(1)                                      | 192 mm<br>(5)                                      | 1.5 ×   |
| 50 mm<br>Macro f3.5     | Reversed<br>(retro)    | 0.23 m                      | 1 ×/1.5 ×<br>white   | 0 mm<br>(6)                                       | 120 mm<br>(7)                                      | 1.5 ×   |
| 50 mm<br>Macro f3.5     | Normal                 | 0.23 m                      | 1 ×/1.5 ×<br>white   | 25 mm<br>(1)                                      | 108–110 mm<br>(4)                                  | 1.5 ×   |
| 50 mm*<br>f1.4, f1.8    | Reversed<br>(retro)    | ∞                           | 1 ×/1.5 ×<br>white   | 0 mm<br>(6)                                       | 88 mm  | 1.5 ×   |
| 80 mm Macro             | Normal                 | —                           | forward of<br>1.5 ×<br>orange                                | 25 mm<br>(1)                                      | 230 mm<br>(8)                                      | 2 ×     |
| 38 mm Macro             | Normal<br>(on PM-MTob) | —                           | 1 ×/1.5 ×<br>white   | 0 mm<br>(6)                                       | 80 mm  | 2 ×     |
| 50 mm*                  | Reversed<br>(retro)    | 0.23 m                      | 1 ×/1.5 ×<br>white   | 0 mm<br>(6)                                       | 145 mm   | 2 ×     |
| 80 mm Macro             | Normal                 | —                           | forward of<br>1.5 ×<br>orange                                | 0 mm<br>(6)                                       | 230 mm<br>(8)                                      | 2.3 ×   |
| 38 mm** Macro           | Normal<br>(on PM-MTob) | —                           | 1 ×/1.5 ×<br>white   | 0 mm<br>(6)                                       | 115 mm**<br>(7)                                    | 3 ×     |
| 50 mm Macro             | Reversed<br>(retro)    | 0.3 m                       | 1 ×/1.5 ×<br>white   | 0 mm<br>(6)                                       | 230 mm<br>(8)                                      | 3.6 ×   |

\* Lens needs stopping down to at least f8

\*\* Still higher magnifications possible with increased bellows extension but unlikely to be needed

Positions of lens standard and camera standard on the bellows rail and the alignment of the latter against appropriate marks on the slide copier panel, as a starting point in setting up the slide copier for same-size or enlarged reproduction. The magnification is determined by the bellows extension (distance from front of lens standard to rear of camera standard) and by the lens. Alignments of front rail are approximate, preparatory to fine focusing. Combinations marked with (\*) yield even overall sharpness only with the lens stopped down to at least f8 or even f11; with other combinations stop down to f5.6.

Enlarged reproduction figures here go beyond the combinations described in the text (Chapt. *Small-scale close-up equipment*).

Lenses are listed in each magnification range in descending order of preference and close-up image quality. Intermediate positions yield intermediate magnifications.

Numbered notes refer to locations of standards on *bellows rail*:

(1) Orange/white line mark. (2) Orange 1 × mark. (3) Bellows fully compressed. (4) White 1 × mark. (5) Orange 1.5 × mark. (6) Extreme front of bellows rail. (7) Near white 1.5 × mark. (8) Extreme rear of bellows rail.

## PMT-35 SETTINGS

| Lens  | Magnif.      | Coarse adjustment of |                   |                      |
|---|--------------|----------------------|-------------------|----------------------|
|   |              | Object stage (1)     | Lens standard (2) | Illuminator lamp (3) |
| Transillumination   |              |                      |                   |                      |
| 80 mm   | 3× to 0.9×   | Up                   | Down              | Slightly out         |
|   | 0.75×        | Down                 | Down (4)          | Slightly out         |
|   | 0.5×         | Down                 | Down (5)          | In                   |
|   | 0.37×        | Down                 | Up (5)            | In                   |
| 38 mm   | 8× to 2.9×   | Down                 | Down              | In                   |
|   | 2.9× to 1.9× | Down                 | Down (5)          | In                   |
| 20 mm   | 16× to 6.2×  | Down                 | Down              | In                   |
|   | 6.2× to 4.8× | Down                 | Down (5)          | In                   |
| Shadowless lighting with Lieberkühn reflector (no suppl. condenser) |              |                      |                   |                      |
| 38 mm   | 8× to 2.9×   | Down                 | Down              | Slightly out         |
| 20 mm   | 16× to 6.2×  | Down                 | Down              | Slightly out         |

Coarse adjustments as initial settings of the object stage and lens standard plus preliminary lamp socket adjustment on the PMT-35 macrophotography unit. The 'down' position of the object stage is the stage rail on the PM-DL 95 illuminator fully lowered on its dovetail guide. The 'up' position has the stage dovetail rail raised in its dovetail holder as far as it will go without unscrewing the stop pin. In both cases the rack-and-pinion fine focusing adjustment of the stage along the rail covers all object positions within the magnification range indicated.

The lens standard is nearly always located at the bottom end of the bellows rail ('down'); the 'up' position implies that the lens standard is raised to the top of its 70 mm long rack. The magnification scale on the bellows rail for the camera standard is in this case not valid. At the lowest magnifications with each lens a sufficiently short bellows extension is only obtainable by removing the leaf shutter at the rear of the lens standard. To retain leaf shutter use in these ranges preferably switch to a longer-focus macro lens.

The lamp socket is normally fully pushed home in the lamphouse; in the cases indicated, pulling the socket out by about 5 mm improves evenness of illumination.

The data for shadowless lighting with the Lieberkühn reflector apply to the supplementary condenser (for 20 and 38 mm macro lens) *removed* from the main condenser.

Numbered notes:

(1) Refers to position of stage rail in front dovetail holder.

(2) Refers to position of lens standard on lower section of bellows rail.

(3) 'Slightly out' means pulling lamp socket about 5 mm out of lamp housing.

(4) Lowest magnification obtainable with shutter in position.

(5) With shutter removed. (With 20 mm and 38 mm lens in this magnification range switch to 38 or 80 mm respectively.)



# MAGNIFICATIONS AND SUBJECT FIELDS

| Scale of reproduction | Subject field on 24 × 36 mm film |             |
|-----------------------|----------------------------------|-------------|
|                       | mm                               | inches      |
| 0.1× (1:10)           | 240 × 360                        | 9.45 × 14.2 |
| 0.2× (1:5)            | 120 × 180                        | 4.7 × 7.1   |
| 0.3× (1:3.3)          | 80 × 120                         | 3.15 × 4.7  |
| 0.4× (1:2.5)          | 60 × 90                          | 2.35 × 3.5  |
| 0.5× (1:2)            | 48 × 72                          | 1.9 × 2.8   |
| 0.6× (1:1.67)         | 40 × 60                          | 1.57 × 2.36 |
| 0.7× (1:1.4)          | 34 × 51                          | 1.35 × 2.02 |
| 0.8× (1:1.25)         | 30 × 45                          | 1.18 × 1.77 |
| 0.9× (1:1.1)          | 26 × 40                          | 1.05 × 1.57 |
| 1×                    | 24 × 36                          | 0.94 × 1.42 |
| 1.5×                  | 16 × 24                          | 0.63 × 0.94 |
| 2×                    | 12 × 18                          | 0.47 × 0.71 |
| 2.5×                  | 9.6 × 14.4                       | 0.38 × 0.57 |
| 3×                    | 8.0 × 12.0                       | 0.31 × 0.47 |
| 3.5×                  | 6.8 × 10.3                       | 0.27 × 0.40 |
| 4×                    | 6.0 × 9.0                        | 0.24 × 0.35 |
| 4.5×                  | 5.3 × 8.0                        | 0.21 × 0.31 |
| 5×                    | 4.8 × 7.2                        | 0.19 × 0.28 |
| 6×                    | 4.0 × 6.0                        | 0.16 × 0.24 |
| 7×                    | 3.4 × 5.1                        | 0.13 × 0.20 |
| 8×                    | 3.0 × 4.5                        | 0.12 × 0.18 |
| 10×                   | 2.4 × 3.6                        | 0.09 × 0.14 |
| 12×                   | 2.0 × 3.0                        | 0.08 × 0.12 |
| 14×                   | 1.7 × 2.5                        | 0.07 × 0.10 |
| 16×                   | 1.5 × 2.25                       | 0.06 × 0.09 |

Size of subject field taken in at different scales of reproduction in close-up macrophotography. The subject fields are based on the full 24 × 36 mm frame recorded on the film; the field on the focusing screen is smaller. Subject fields at intermediate magnifications are proportional. Thus at 0.25× magnification the field would be 96 × 144 mm (or 10 times the field at 2.5×).

# CLOSE-UP DEPTH OF FIELD

| Magnification | Limiting aperture | Total depth of field (mm) at |        |        |       |       |      |
|---------------|-------------------|------------------------------|--------|--------|-------|-------|------|
|               |                   | f3.5-4                       | f5.6   | f8     | f11   | f16   | f22  |
| 0.1×          | —                 | 27                           | 41     | 59     | 81    | 117   | 162  |
| 0.2×          | —                 | 7.5                          | 11.1   | 16     | 22    | 32    | 44   |
| 0.3×          | —                 | 3.6                          | 5.3    | 7.6    | 10.5  | 15    | 21   |
| 0.4×          | —                 | 2.2                          | 3.2    | 4.6    | 6.4   | 9.2   | 13   |
| 0.5×          | f22               | 1.5                          | 2.2    | 3.2    | 4.4   | 6.3   | 8.7  |
| 0.6×          | f22               | 1.1                          | 1.6    | 2.3    | 3.2   | 4.7   | 6.5  |
| 0.7×          | f22               | 0.87                         | 1.3    | 1.8    | 2.5   | 3.7   | 5.0  |
| 0.8×          | f22               | 0.71                         | 1.0    | 1.5    | 2.0   | 3.0   | 4.1  |
| 0.9×          | f16               | 0.59                         | 0.87   | 1.2    | 1.7   | 2.5   | 3.4* |
| 1×            | f16               | 0.50                         | 0.74   | 1.1    | 1.5   | 2.1   | 2.9* |
| 1.5×          | f11               | 0.28                         | 0.41   | 0.59   | 0.81  | 1.2*  | 1.6* |
| 2×            | f11               | 0.19                         | 0.28   | 0.40   | 0.55  | 0.79* | 1.1* |
| 2.5×          | f11               | 0.14                         | 0.21   | 0.30   | 0.41  | 0.59* | —    |
| 3×            | f8                | 0.11                         | 0.16   | 0.23   | 0.32* | 0.47* | —    |
| 3.5×          | f8                | 0.092                        | 0.14   | 0.19   | 0.27* | 0.39* | —    |
| 4×            | f8                | 0.078                        | 0.12   | 0.17   | 0.23* | —     | —    |
| 4.5×          | f5.6              | 0.068                        | 0.10   | 0.14*  | 0.20* | —     | —    |
| 5×            | f5.6              | 0.060                        | 0.089  | 0.13*  | —     | —     | —    |
| 6×            | f5.6              | 0.050                        | 0.072  | 0.10*  | —     | —     | —    |
| 7×            | f4                | 0.041                        | 0.060* | 0.086* | —     | —     | —    |
| 8×            | f4                | 0.035                        | 0.052* | —      | —     | —     | —    |
| 10×           | f3.5              | 0.028                        | 0.040* | —      | —     | —     | —    |
| 12×           | f3.5              | 0.023*                       | 0.033* | —      | —     | —     | —    |
| 14×           | f3.5              | 0.019*                       | —      | —      | —     | —     | —    |
| 16×           | f3.5              | 0.017*                       | —      | —      | —     | —     | —    |

In the close-up and macro ranges, depth of field rapidly decreases and also becomes dependent only on the scale of reproduction.

In addition to listing the theoretically available depth of field at different magnifications and apertures, the table shows the limiting aperture beyond which the lens should not be stopped down at higher magnifications. Otherwise diffraction effects lead to increased unsharpness that masks any gain in depth of field.

The depth values marked (\*) indicate depth that would be available in the absence of diffraction; in practice at these limiting settings depth of field is somewhat greater but the standard of sharpness is also inevitably reduced. Where no depth values are given, the lens should not be stopped down to that aperture at the magnification in question.

The values for the limiting aperture and total depth of field are based on an approximate sharpness standard of a 0.03 mm circle of confusion.

LAMP FILTER TYPES AND DESIGNATIONS

| <i>Filter type</i>                 | <i>45 mm round<br/>unmounted<br/>(glass)</i> | <i>45 mm round<br/>mounted<br/>(interference)</i> | <i>45 × 60 mm<br/>rectangular<br/>unmounted (glass)</i> |
|------------------------------------|--|---|---|
| Monochromatic                      |  |   |   |
| Yellow                             | 45 Y-48                                      | —   | 60 × 45 Y-48  |
| Green                              | 45 G-53                                      | —   | 60 × 45 G-53  |
| Heat filter<br>(cobalt glass)      | —  | —   | 60 × 45 B-76  |
| Diffuser                           | —  | —   | 60 × 45 WF  |
| Colour temperature<br>compensating | 45 LB-45<br>45 LB-100<br>45 LB-200           | —<br>—<br>—                                       | 60 × 45 LB-45<br>60 × 45 LB-100<br>60 × 45 LB-200       |
| Neutral density                    | —<br>—<br>—                                  | 43 LBD W-45<br>43 ND-6<br>43 ND-12<br>43 ND-50    | —<br>—<br>—<br>—  |

In conjunction with the LSD and PM-DL 95 micro spotlights the lamp filters modify the light quality and intensity. The monochromatic filters are used primarily as contrast filters in photomicrography and macrophotography, the colour temperature compensating and neutral density filters for colour temperature and intensity control in colour photography. The 45 × 60 mm rectangular filters fit the LSD illuminator, the other filters fit the LSD, PM-LSD 2 and PM-DL 95 illuminators. Colour temperature and neutral density filters can be used in combination. The LSD and LSD-2 illuminators can take two filters at the same time, the PM-DL 95 up to 4 filters.

ND FILTERS FOR MACROPHOTOGRAPHY

| <i>Transmission<br/>%</i> | <i>No. of ND filters used</i> |              |             | <i>Effective<br/>total density</i> | <i>Exposure factor</i> |           |
|---------------------------|-------------------------------|--------------|-------------|------------------------------------|------------------------|-----------|
|                           | <i>ND 50</i>                  | <i>ND 12</i> | <i>ND 6</i> |                                    | <i>Arith.</i>          | <i>EV</i> |
| 50%                       | 1                             | —            | —           | 0.30                               | 2×                     | -1        |
| 25%                       | 2                             | —            | —           | 0.60                               | 4×                     | -2        |
| 12%                       | —                             | 1            | —           | 0.92                               | 8×                     | -3        |
| 6%                        | —                             | —            | 1           | 1.22                               | 16×                    | -4        |
| 3%                        | 1                             | —            | 1           | 1.52                               | 33×                    | -5        |
| 1.5%                      | 2                             | —            | 1           | 1.82                               | 66×                    | -6        |
| 0.72%                     | —                             | 1            | 1           | 2.14                               | 138×                   | -7        |
| 0.36%                     | 1                             | 1            | 1           | 2.44                               | 275×                   | -8        |
| 0.18%                     | 2                             | 1            | 1           | 2.74                               | 550×                   | -9        |

The number designation of the ND 50, ND 12 and ND 6 filters indicates their percentage transmission—used here to mark the fact that these are lamp filters to reduce the illumination of the LSD and LSD 2 illuminators or the transilluminator of the PMT-35 macro outfit.

The table indicates the transmission, effective density and exposure factors (in arithmetic values and EV) with different ND filter combinations of the PMT-35 outfit. The latter includes two ND 50 and one each ND 12 and ND 6 filters.

LAMP FILTERS FOR COLOUR TEMPERATURE CONTROL

| <i>Colour<br/>temperature<br/>K</i> | <i>Lamp<br/>voltage<br/>V</i> | <i>Filters</i>                             | <i>Use with</i>   |
|-------------------------------------|-------------------------------|--|---|
| 3200                                | 4.5<br>5<br>6<br>7            | LBD + LB 45<br>LBD<br>LB 45<br>None        | Tungsten type<br>(3200K balanced)<br>colour reversal film                       |
| 3400                                | 5<br>6<br>7.5                 | LBD + LB 45<br>LB 45<br>None               | Type A (3400K<br>balanced) colour<br>reversal film                              |
| 4000                                | 6<br>7                        | 2× LB 45<br>or LB 100<br>LBD               | Acceptable for<br>negative colour<br>films                                      |
| 4500–5000                           | 6<br>8                        | LB 100<br>2× LB 45                         | Negative colour film or<br>daylight type colour reversal<br>film (warm colours) |
| 5500                                | 6<br>7–8                      | LB 100 + LB 45<br>or LB 200<br>LBD + LB 45 | Daylight type colour<br>reversal film   |

The colour temperature of lighting in macrophotography depends on the lamp voltage of the LSD illuminator or PM-LD 95—which can be controlled by the transformer setting and may be modified also by colour temperature compensating filters. The preferred way of matching the colour temperature to the colour film type in use is by checking with the CT (colour temperature) probe of the EMM-7 exposure meter. Lacking such a meter, this table shows approximate colour temperatures obtainable by varying degrees of over-running the lamp of the micro spotlight with or without colour temperature compensating filters. The exact colour temperatures obtained may vary somewhat depending on the age of the lamp.

EMM-7 EXPOSURE SCALE FOR BELLOWS READINGS

| <i>Index<br/>scale</i> | <i>Exposure time (sec)</i> |            | <i>Index<br/>scale</i> | <i>Exposure time (sec)</i> |            |
|------------------------|----------------------------|------------|------------------------|----------------------------|------------|
|                        | <i>High</i>                | <i>Low</i> |                        | <i>High</i>                | <i>Low</i> |
| 1                      |                            |            | 5                      |                            |            |
|                        | 1/15                       | 2          |                        |                            | 1/4        |
| 2                      |                            |            | 6                      |                            |            |
|                        | 1/30                       | 1          |                        | 1/250                      |            |
| 3                      |                            |            | 7                      |                            |            |
|                        | 1/60                       |            |                        |                            | 1/8        |
| 4                      |                            | 1/2        | 8                      |                            |            |
| 5                      | 1/125                      |            | 9                      |                            |            |
|                        |                            | 1/4        |                        |                            | 1/15       |
| 6                      |                            |            | 10                     |                            |            |

When the EMM-7 exposure meter cell is located in the equivalent film plane (via the PM-EA adapter) exposures are derived by reference to the innermost index scale of the meter. This table shows the actual exposures for different scale readings with the meter switched to its HIGH or LOW range. Note that many of the exposure time settings for the leaf shutter (PMT-35 or PM-PBM housing) or for the camera shutter are between numbered positions on the index scale. As often intermediate exposures are not possible, carry out the final exposure matching with the lens aperture.