

# THE EXAKTA-SYSTEM



## Practical tables

**EXA EXAKTA**  
*Varex*

24 mm x 36 mm

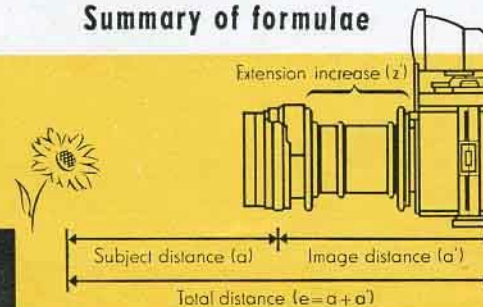


**IHAGEE KAMERAWERK AG • 8016 DRESDEN**  
IN VERWALTUNG

## Close-ups

with the 3 miniature reflex cameras of the **EXAKTA-SYSTEM**

### Summary of formulae



**EXA EXAKTA**  
*Varex*

For arriving at the correct focus (also at large subject distances), the following combination of formulae are used:

$$\text{Focal length } f = \frac{a \cdot a'}{a + a'} = \frac{a'}{\beta' + 1} = \frac{a \cdot z'}{a'} = \frac{y \cdot z'}{y'}$$

$$\text{Subject distance } a = \frac{a' \cdot f}{a' - f} = \left(\frac{1}{\beta' + 1}\right) \cdot f = \frac{a' \cdot f}{z'}$$

$$\text{Image distance } a' = \frac{a \cdot f}{a - f} = (\beta' + 1) \cdot f = \frac{a \cdot z'}{f}$$

$$\text{Scale of reproduction } \beta' = \frac{y'}{y} = \frac{a' - f}{f} = \frac{z'}{f}$$

$$\text{Extension increase } z' = \beta' \cdot f = \frac{y' \cdot f}{y}$$

$$\text{Image size } y' = \frac{y \cdot z'}{f}$$

$$\text{Subject size } y = \frac{y' \cdot f}{z'}$$

$$\text{Exposure factor } v = \left(\frac{a'}{f}\right)^2 = (\beta' + 1)^2$$

The two last named formulae for calculating the exposure factor (v) only apply for lenses of standard design.

Wide angle lenses having a focal length of 35 mm and shorter, as well as true telephoto lenses and similarly constructed lenses require the following formulae:

$$\text{With the lens used the normal way round } v = \left(\frac{\beta'_B + 1}{\beta'_B}\right)^2 \quad \text{With the lens used in the reversed position } v = \left(\frac{1}{\beta'_B} + \beta'_B\right)^2$$

$\beta'_B$  Pupil magnification of the lens =  $\frac{\text{Ø of the exit pupil}}{\text{Ø of the entrance pupil}}$  (These values should be ascertained from the optical firms.)

The subject area ( $F_G$ ) is arrived at by division of  $\frac{24}{\beta'_B}$  and  $\frac{36}{\beta'_B}$

# Close-ups with the 3 miniature reflex cameras of the EXAKTA-SYSTEM

## Close-up table

For lenses of 50 mm focal length | For lenses of 80 mm focal length

Extension increase (z')	Subject distance (a)	Image distance (a')	Total distance (a+a'=e)	Scale of re-production (β')	Subject area (F <sub>G</sub> )	Exposure factor (v)	Subject distance (a)	Image distance (a')	Total distance (a+a'=e)	Scale of re-production (β')	Subject area (F <sub>G</sub> )	Exposure factor (v)
mm	mm	mm	mm	—	mm	—	mm	mm	mm	—	mm	—
0	∞	50	∞	different	variable	1.0	∞	80	∞	different	variable	1.0
5	550	55	605	0.1	240x360	1.2	1360	85	1445	0.06	392x576	1.1
10	300	60	360	0.2	120x180	1.4	720	90	810	0.12	192x288	1.3
15	217	65	282	0.3	80x120	1.7	507	95	602	0.19	127x192	1.4
20	175	70	245	0.4	60x90	2.0	400	100	500	0.25	96x144	1.6
25	150	75	225	0.5	48x72	2.3	336	105	441	0.31	77x115	1.7
30	133	80	213	0.6	40x60	2.6	294	110	404	0.38	64x96	1.9
35	121	85	206	0.7	34x51	2.9	263	115	378	0.44	55x82	2.1
40	113	90	203	0.8	30x45	3.2	240	120	360	0.50	48x72	2.3
45	106	95	201	0.9	27x40	3.6	222	125	347	0.56	43x64	2.5
50	100	100	200	1.0	24x36	4.0	208	130	338	0.62	38x58	2.7
60	92	110	202	1.2	20x30	4.8	186	140	326	0.75	32x48	3.1
70	86	120	206	1.4	17x26	5.8	171	150	321	0.88	27x41	3.5
80	81	130	211	1.6	15x23	6.8	160	160	320	1.00	24x36	4.0
90	78	140	218	1.8	13x20	7.8	151	170	321	1.12	21x32	4.5
100	75	150	225	2.0	12x18	9.0	144	180	324	1.25	19x29	5.0
110	73	160	233	2.2	11x16	10.2	138	190	328	1.38	17x26	5.6
120	71	170	241	2.4	10x15	11.6	133	200	333	1.50	16x24	6.2
130	69	180	249	2.6	9x14	13.0	129	210	339	1.63	15x22	6.9
140	68	190	258	2.8	9x13	14.4	126	220	346	1.75	14x21	7.6
150	67	200	267	3.0	8x12	16.0	123	230	353	1.87	13x19	8.3
160	66	210	276	3.2	8x11	17.6	120	240	360	2.00	12x18	9.0
170	65	220	285	3.4	8x11	19.4	118	250	368	2.12	11x17	9.8
180	64	230	294	3.6	7x10	21.2	116	260	376	2.25	11x16	10.6
190	63	240	303	3.8	6x9	23.0	114	270	384	2.38	10x15	11.4
200	63	250	313	4.0	6x9	25.0	112	280	392	2.50	10x14	12.3
210	62	260	322	4.2	6x9	27.0	110	290	400	2.63	9x14	13.2
220	61	270	331	4.4	5x8	29.0	109	300	409	2.75	9x13	14.1

See separate table for depth of field.



# Close-ups with the 3 miniature reflex cameras of the EXAKTA-SYSTEM

## Close-up table

For lenses of 100 mm focal length | For lenses of 135 mm focal length

Extension increase (z')	Subject distance (a)	Image distance (a')	Total distance (a+a'=e)	Scale of re-production (β')	Subject area (F <sub>G</sub> )	Exposure factor (v)	Subject distance (a)	Image distance (a')	Total distance (a+a'=e)	Scale of re-production (β')	Subject area (F <sub>G</sub> )	Exposure factor (v)	Exposure factor (v) for lens 5.4/135 mm f1
mm	mm	mm	mm	—	mm	—	mm	mm	mm	—	mm	—	—
0	∞	100	∞	different	variable	1.0	∞	135	∞	different	variable	1.0	1.0
5	2100	105	2205	0.05	480x720	1.1	3780	140	3920	0.04	600x900	1.1	1.2
10	1100	110	1210	0.10	240x360	1.2	1958	145	2103	0.07	343x514	1.2	1.3
15	767	115	882	0.15	160x240	1.3	1350	150	1500	0.11	218x327	1.2	1.5
20	600	120	720	0.20	120x180	1.4	1046	155	1201	0.15	160x240	1.3	1.6
25	500	125	625	0.25	96x144	1.6	864	160	1024	0.19	126x189	1.4	1.8
30	433	130	563	0.30	80x120	1.7	742	165	908	0.22	109x164	1.5	2.0
35	386	135	521	0.35	69x103	1.8	656	170	826	0.26	92x138	1.6	2.2
40	350	140	490	0.40	60x90	2.0	591	175	766	0.30	80x120	1.7	2.5
45	322	145	467	0.45	53x80	2.1	540	180	720	0.33	73x109	1.8	2.6
50	300	150	450	0.50	48x72	2.3	500	185	685	0.37	65x97	1.9	2.9
60	267	160	427	0.60	40x60	2.6	439	195	634	0.44	55x82	2.1	3.3
70	243	170	413	0.70	34x51	2.9	395	205	600	0.52	46x69	2.3	4.0
80	225	180	405	0.80	30x45	3.2	363	215	578	0.59	41x61	2.5	4.5
90	211	190	401	0.90	27x40	3.6	338	225	563	0.67	36x54	2.8	5.1
100	200	200	400	1.00	24x36	4.0	317	235	552	0.74	32x49	3.0	5.8
110	191	210	401	1.10	22x33	4.4	301	245	546	0.82	29x44	3.3	6.5
120	183	220	403	1.20	20x30	4.8	287	255	542	0.89	27x40	3.6	7.2
130	177	230	407	1.30	18x27	5.3	275	265	540	0.96	25x38	3.9	7.9
140	171	240	411	1.40	17x26	5.8	265	275	540	1.04	23x35	4.2	8.8
150	167	250	417	1.50	16x24	6.3	257	285	542	1.11	21x32	4.5	9.5
160	163	260	423	1.60	15x23	6.8	249	295	544	1.18	20x30	4.8	10.4
170	159	270	429	1.70	14x21	7.3	242	305	547	1.26	19x29	5.1	11.4
180	156	280	436	1.80	13x20	7.8	236	315	551	1.33	18x27	5.4	12.3
190	153	290	443	1.90	13x19	8.4	231	325	556	1.41	17x26	5.8	13.4
200	150	300	450	2.00	12x18	9.0	226	335	561	1.48	16x25	6.2	14.4
210	148	310	458	2.10	11x17	9.6	222	345	567	1.56	15x23	6.5	15.5
220	145	320	465	2.20	11x16	10.2	218	355	573	1.63	15x22	6.9	16.4

See separate table for depth of field.  
 x) The construction of this lens necessitates an exposure factor different from that for other 135 mm lenses.



# Close-ups with the 3 miniature reflex cameras of the EXAKTA-SYSTEM

Depth of field in close-ups (circle of confusion = 0.05 mm)

Scale of reproduction	Depth of field in mm at aperture No.									
	2.8	4	5.6	8	11	16	22	32	45	64
0.3	4.00	6.00	8.00	12.00	16.00	23.00	32.00	46.00	65.00	91.00
0.4	2.50	3.50	5.00	7.00	9.50	14.00	19.00	28.00	39.00	56.00
0.5	1.70	2.40	3.40	4.80	6.60	9.60	13.50	19.20	27.00	38.40
0.6	1.20	1.80	2.50	3.50	4.90	7.10	9.70	14.20	20.00	28.40
0.7	1.00	1.40	1.90	2.80	3.80	5.60	7.60	11.10	15.60	22.10
0.8	0.80	1.10	1.60	2.20	3.10	4.50	6.20	9.00	12.60	18.00
0.9	0.70	0.90	1.30	1.90	2.60	3.70	5.20	7.50	10.50	15.00
1.0	0.60	0.80	1.10	1.60	2.20	3.20	4.40	6.40	9.00	12.80
1.5	0.31	0.44	0.62	0.89	1.22	1.78	2.44	3.60	5.00	7.04
2.0	0.21	0.30	0.42	0.60	0.82	1.20	1.65	2.40	3.37	4.80
2.5	0.16	0.22	0.31	0.45	0.62	0.90	1.23	1.79	2.52	3.58
3.0	0.12	0.18	0.25	0.36	0.49	0.71	0.98	1.42	2.00	2.84
3.5	0.10	0.15	0.21	0.29	0.40	0.59	0.81	1.18	1.65	2.35
4.0	0.09	0.12	0.17	0.25	0.34	0.50	0.69	1.00	1.41	1.99
4.5	0.08	0.11	0.15	0.22	0.30	0.44	0.60	0.87	1.22	1.74
5.0	0.07	0.10	0.13	0.19	0.26	0.38	0.53	0.77	1.08	1.53
5.5	0.06	0.09	0.12	0.17	0.24	0.34	0.47	0.69	0.97	1.38
6.0	0.05	0.08	0.11	0.16	0.22	0.31	0.43	0.63	0.88	1.25

This table gives the depth of field in close-ups, and shows that it depends on the scale of reproduction. The table can be used with lenses of different focal lengths, since, in close-ups, using the same scale of reproduction and aperture number, the depth of field will remain the same.

The scale of reproduction can easily be ascertained:

$$\text{Scale of reproduction} = \frac{\text{Extension Increase}}{\text{Focal length}}$$

The plane of critical sharpness lies at the focused distance, in the middle of the range of depth of field, which extends equally to the front and back of this plane. For example: with a lens of 50 mm focal length, with an exposure having a scale of reproduction of 1.0; subject distance 100 mm; the subject at this distance will be critically sharp, and the depth of field at f 22 will be 4.4 mm. This means it extends from 97.8 mm to 102.2 mm.



# Calculator for the 3 miniature reflex cameras of the EXAKTA-SYSTEM

Simplified application of the exposure factors when using extension increasing accessories, filters, Stereo accessories, etc.

Exposure factor	1.5	2	3	4	5...6	7...9	10...12	13...18	19...26	27...32
Step Number	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5

## Aperture Numbers

2/1.4	1.4
2.8/2	2
4/2.8	2.8
5.6/4	4
8/5.6	5.6
11/8	8
16/11	11
22/16	16
32/22	22
45/32	32
64/45	45
	64

## Exposure times

128 s	192 s
64 s	96 s
32 s	48 s
16 s	24 s
8 s	12 s
4 s	6 s
2 s	3 s
1 s	
1/2 s	
1/4 s	
1/8 s	
1/15 s	
1/30 s	
1/60 s	
1/125 s	
1/250 s	
1/500 s	
1/1000 s	

1. Basic exposure (exposure time and aperture number) to be determined by exposure metre, tables, etc.

2. Determine from the close-up tables which exposure factor is necessary for the particular extension increasing accessory or filter in use, and then read off in the yellow block the appropriate step number.

3. From the values of the basic exposure (exposure time and aperture number) move the appropriate number of steps in the direction of the arrows, either in one column only or partially in each column. Half steps can be read off on the outsides of the columns.

Example: Exposure factor 12 = 3 1/2 steps. - Basic expos. 1/60 sec., f 8.

Either: 3 steps in the expos. time column = 1/30 sec. and 1 1/2 step in the aperture column = between f 8 and f 5.6.

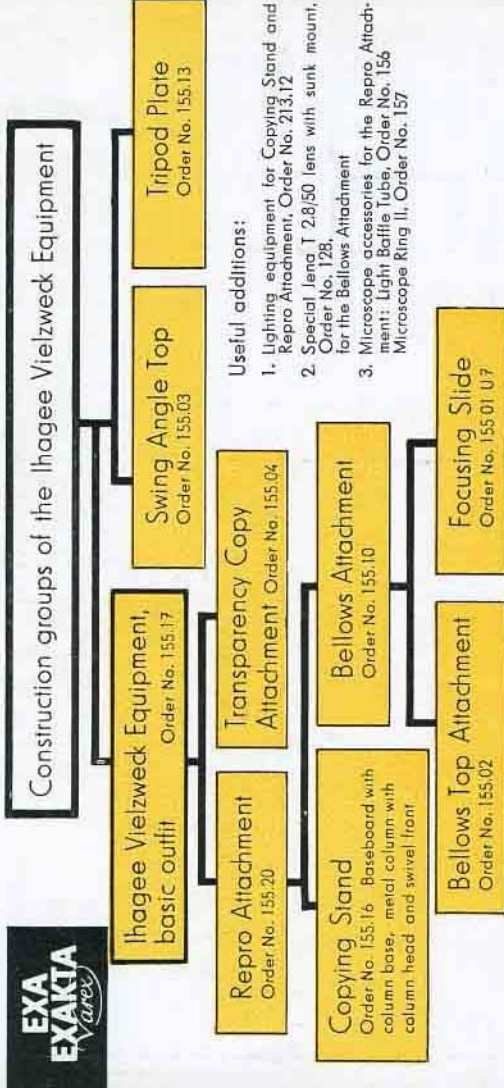
Or: 1 step in the expos. time column = 1/30 sec. and 2 1/2 steps in the aperture column = between f 4 and f 2.8.

Or: 2 steps in the exposure time column = 1/15 sec. and 1 1/2 steps in the aperture column = between f 5.6 and f 4.

The use of this simplified calculator can, in a few cases, result in approximately 25% over-exposure or approximately 10% under-exposure. In practice, this is negligible. The effect of reciprocity failure has not been taken into consideration.



# Ihagee Vielzweck Equipment for the 3 miniature reflex cameras of the EXAKTA-SYSTEM



### Useful additions:

1. Lighting equipment for Copying Stand and Repro Attachment, Order No. 213.12
2. Special lens, T 2,8/50 lens with sunk mount, Order No. 128, for the Bellows Attachment
3. Microscope accessories for the Repro Attachment: Light Baffle Tube, Order No. 156; Microscope Ring II, Order No. 157

### Possible combinations:

1. Repro Attachment = Bellows Attachment + Copying Stand
2. Bellows Close-up Attachment = Bellows Top Attachment + Focusing Slide
3. Transparency Copying Equipment = Bellows Attachment + Transparency Copying Attachment
4. Swing Angle Attachment = Swing Angle Top + Focusing Slide
5. Swing Angle Plate = Swing Angle Top + Tripod Plate

### Applications:

- Copying, close-ups, photomicrography  
Close-ups  
Optical copying of transparencies, making inter-negatives  
Close-ups with Bayonet Rings and Tubes and Tripod  
Weight distributor in conjunction with Tripod

# Extension-increasing Accessories for the 3 miniature reflex cameras of the EXAKTA-SYSTEM

Description	Order No.	Extension increases in mm at ∞ setting of lens	Reproduction ratio with lenses of f=50 mm (∞ setting)	Ihagee-Auto-couple Extension Release for fully automatic lenses (Order No. 178)	Special characteristics
Two-in-One Ring (D-Ring)	187	5	0.1	Can be used	Can be used together with the set of Bayonet-Rings and Extension Tubes
Set of Bayonet-Rings and Extension Tubes	180	10 ... 60	0.2 ... 1.2	Can be used	Only available as a complete set, consisting of Front and Rear Bayonet-Ring = Pair of Bayonet-Rings having 10 mm extension, and three tubes of 5, 15, and 30 mm extension. Convenient, ease in transporting, but no continuous extension
Miniature Bellows Attachment	176	35 ... 125 (continuously) Increases of extension from 0 ... 90 mm and focusing from infinity is possible with the special lens T 2,8/50 lens in sunk mount (Order No. 128)	0.7 ... 2.5 to 1.8	Can be used (with long Coupling Rod)	Continuous extension. Still permitting hand-held close-ups
Bellows Attachment	155,10	35 ... 220 (continuously) Increases of extension from 0 ... 185 mm and focusing from infinity is possible with the special lens, see above	0.7 ... 4.4 to 3.7	Cannot be used (the use of a thin cable release is recommended)	Continuous extension Increase. Preferably to be used in conjunction with Copying Stand or with a Tripod

The Bellows Attachments are not recommended for the EXA 1a and previous models due to the resulting edge vignetting.

## Characteristics of the 3 miniature reflex cameras of the EXAKTA-SYSTEM

All 3 camera models incorporate:

Quick, Rewind, Double Exposure Prevention Device, Uniform bayonet for rapid change of lenses (inner and outer bayonet), Exposure counter dial, Release lock, Film-type reminder-dial or -ring, cassette to cassette or normal film advance, Lenses with fully automatic spring or pressure diaphragm, standard viewing screen can, if desired, be interchanged with Fresnel lens with Rangefinder.

Camera Model	Shutter	Exposure Times	Viewing System	Flash Synchronization	Rewind Crank	Special Features
EXA I a	Flap-type Shutter	1/30 . . . 1/175s B and T	Interchangeable (Finder Hood, Pentaprism, and others)	Universal Flash outlet with Symbol Setting	no	Vignetting with the use of long extensions
EXA II b	Focal plane shutter (running upwards when camera held horizontally)	1/2 . . . 1/250s B and T	Fixed Pentaprism	Universal Flash outlet with Symbol Setting	yes	Instant return mirror
EXAKTA Varex II b	Focal plane shutter (running left to right when camera held horizontally, looking from the back)	12 . . . 1/1000s B and T	Interchangeable (Finder Hood, Pentaprism, and others)	3 separate flash outlets X, F, and FP	yes	Delayed Action, for 6 . . . 1/1000 sec., Film cutting knife, intentional double exposures possible.

## Focusing Systems for the 3 miniature reflex cameras of the EXAKTA-SYSTEM

Focusing System	For Model	Image is:		People with defective eyesight need:	Suitable for	Fresnel Lens can be used
		upright and	enlarged			
Finder Hood (interchangeable)	EXAKTA Varex II a and previous Models EXA	laterally reversed	approximately 6 times with both focusing Magnifiers	reading glasses	most exposures, mainly Photographs on the ground, above the head, over obstacles, and round the corner, with Tripod, Copying Stand, Microscope, etc.	no
	EXAKTA Varex II a Model 1961 EXAKTA Varex II b EXA I and EXA I a	laterally reversed	approximately 6 times with both focusing Magnifiers	distance glasses	all exposures, mainly action Photographs, (Sport, Children, Snapshots)	yes
Pentaprism (interchangeable)	EXAKTA Varex II b EXA I a and previous Models	laterally correct	4,4 times	distance glasses	all exposures	yes (built-in)
Prism Finder (built-in)	EXA II EXA II a and EXA II b	laterally correct	4,4 times	distance glasses	all exposures	yes (built-in)
Lens Magnifier (interchangeable)	EXAKTA Varex II b (EXA I a) and previous Models	laterally reversed	1,2x (focal length of lens used on the lens Magnifier), 5x with Top Lens	distance glasses	Photomicrography, Macrophotography, and Copying	yes
Stereo Viewer "Steriflex" (interchangeable)	EXAKTA Varex II b EXA I a and previous Models	laterally reversed and three dimensional	approximately 3 times	distance glasses	three dimensional Photographs with Stereo Attachment and as simple Stereo Viewer.	no

## Flash Synchronization for the 3 miniature reflex cameras of the EXAKTA-SYSTEM

Camera Model	Selection of Flash Contact and Shutter Speeds for				Flash bulbs of short duration (Synchro-M)	Flash bulbs of short duration (open flash technique)	Electronic flash without capacitors (open flash technique)	Normal electronic flash guns (open flash technique)	With longer focal lengths and larger image distances, the flash contact and shutter speed must be selected as follows:			The flash contacts are closed at the moment of synchronizing and
	Normal electronic flash guns (open flash technique)	Electronic flash without capacitors (open flash technique)	Flash bulbs of short duration (Synchro-M)	Flash bulbs of short duration (open flash technique)					All flash bulbs (fully synchronized)	With normal electronic flash guns, X and 1/25	With all electronic flash guns and flash bulbs, B setting only.	
EXA	X	X	B	F (1/25 to 1/500)	1/25	Cannot be used	Cannot be used	X	B	With normal electronic flash guns, X and 1/25	on X until after winding the shutter again, when winding the shutter again.	
EXA I	$\Sigma$	Universal Synchro-outlet	B	Universal Synchro-outlet	$\Delta$ 1/300	Cannot be used	Cannot be used	Universal Synchro-outlet	B	With all electronic flash guns and flash bulbs, B setting only.	on $\Sigma$ (1/60) until after winding the shutter again, (1/30) when winding the shutter again, until after winding the shutter again.	
EXA II	$\Sigma$	Universal Synchro-outlet	1/8	Universal Synchro-outlet	$\Delta$ 1/15	Cannot be used	Cannot be used	Universal Synchro-outlet	1/8	As per table	on $\Sigma$ (1/60), $\Delta$ (1/30), and 1/16 only at the moment of synchronizing.	
EXAKTA Varex	E (1/50 to 1/60)	E (=X)	1/5	F (1/25 to 1/500)	1/5	V (1/100 to 1/1000)	V (=M)	E (1/100 to 1/1000)	E (=X) longer	As per table	on E (=X) until after winding the shutter again, on V until after winding the shutter again.	
EXAKTA IIa	X	X	1/5	F (1/25 to 1/500)	1/25	M (1/100 to 1/1000)	M	X	1/6 or longer	As per table	on X for the duration of the shutter opening or of the pressure on the shutter button, when winding the shutter again, on F until after winding the shutter again, on M=FP only at the moment of synchronizing.	
EXAKTA IIb	X	X	1/8	F (1/30 to 1/500)	1/30	FP (1/100 to 1/1000)	FP	X	1/6 or longer	As per table	on X for the duration of the shutter opening or of the pressure on the shutter button, when winding the shutter again, on F until after winding the shutter again, on M=FP only at the moment of synchronizing.	

## Flash Exposures with the 3 miniature reflex cameras of the EXAKTA-SYSTEM

Simplified use of the Guide numbers

Aperture	Flash to subject distance in metres by following guide numbers																								
	6	8	10	12	14	16	18	20	24	28	32	36	40	45	50	55	60	65	70	75	80	85	90	95	100
1.4	4.30	5.70	7.10	8.60	10.00	11.50	13.00	14.50	17.00	20.00	23.00	25.50	28.50	32.00	36.00	39.00	43.00	46.00	50.00	53.50	57.00	61.00	64.00	68.00	71.00
1.4 ... 2	3.80	4.70	5.90	7.10	8.20	9.40	10.60	11.75	14.00	16.50	19.00	21.00	23.50	26.50	29.50	32.50	35.00	38.00	41.00	44.00	47.00	50.00	53.00	56.00	59.00
2	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	12.00	14.00	16.00	18.00	20.00	22.50	25.00	27.50	30.00	32.50	35.00	40.00	42.50	45.00	47.50	50.00	
2 ... 2.8	2.60	3.30	4.20	5.00	5.80	6.70	7.50	8.30	10.00	11.70	13.30	15.00	16.75	18.75	21.00	23.00	25.00	27.00	29.00	31.25	33.00	35.50	37.50	39.50	42.00
2.8	2.10	2.90	3.60	4.30	5.00	5.70	6.30	7.10	8.50	10.00	11.40	13.00	14.25	16.00	18.00	19.50	21.50	23.00	25.00	26.75	28.50	30.50	32.00	34.00	36.00
2.8 ... 4	1.75	2.40	2.90	3.50	4.10	4.70	5.30	5.90	7.10	8.25	9.40	10.50	11.75	13.25	14.50	16.00	17.50	19.00	20.50	22.00	23.50	25.00	26.50	28.00	29.50
4	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	6.00	7.00	8.00	9.00	10.00	11.25	12.50	13.75	15.00	16.25	17.50	18.75	20.00	21.25	22.50	23.75	25.00
4 ... 5.6	1.25	1.65	2.10	2.50	2.90	3.30	3.75	4.20	5.00	5.30	6.70	7.50	8.30	9.40	10.50	11.50	12.50	13.50	14.50	15.50	16.50	17.75	18.75	19.75	21.00
5.6	1.05	1.45	1.80	2.10	2.50	2.90	3.20	3.60	4.30	5.00	5.70	6.40	7.10	8.00	9.00	9.80	10.75	11.50	12.50	13.50	14.30	15.25	16.00	17.00	18.00
5.6 ... 8	0.90	1.20	1.45	1.75	2.05	2.35	2.65	2.95	3.50	4.10	4.70	5.30	5.90	6.60	7.50	8.10	8.80	9.50	10.50	11.00	11.80	12.50	13.25	14.00	14.50
8	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	3.00	3.50	4.00	4.50	5.00	5.60	6.25	6.90	7.50	8.10	8.75	9.40	10.00	10.50	11.25	11.90	12.50
8 ... 11	0.65	0.85	1.05	1.25	1.50	1.70	1.90	2.10	2.50	2.95	3.35	3.80	4.20	4.75	5.25	5.80	6.30	6.80	7.40	7.90	8.50	8.95	9.50	10.00	10.50
11	0.55	0.75	0.90	1.10	1.25	1.45	1.65	1.80	2.20	2.55	2.90	3.25	3.65	4.10	4.50	5.00	5.45	5.90	6.35	6.80	7.30	7.75	8.20	8.60	9.00
11 ... 16	0.45	0.60	0.75	0.90	1.05	1.20	1.35	1.50	1.80	2.05	2.35	2.65	2.95	3.35	3.70	4.10	4.45	4.80	5.20	5.55	5.90	6.30	6.70	7.00	7.50
16	0.38	0.50	0.65	0.75	0.85	1.00	1.15	1.25	1.50	1.75	2.00	2.25	2.50	2.80	3.10	3.45	3.75	4.05	4.40	4.70	5.00	5.30	5.60	5.95	6.25
16 ... 22	0.32	0.42	0.53	0.63	0.75	0.85	0.95	1.05	1.25	1.45	1.70	1.90	2.10	2.35	2.65	2.90	3.15	3.40	3.70	3.95	4.20	4.50	4.75	5.00	5.30
22	0.27	0.36	0.45	0.55	0.65	0.75	0.80	0.90	1.10	1.25	1.45	1.65	1.80	2.05	2.25	2.50	2.75	2.95	3.20	3.40	3.60	3.85	4.10	4.30	4.50

The flash to subject distance in metres (see column under given number) will be on the same level as the appropriate aperture number in the left hand column. Use half a stop larger aperture (smaller f number) when focusing on close distances, e.g. 1 metre with a 50 mm lens, or 1.5 metre with an 80 mm lens, or 2 metres with a 100 mm lens, 2.25 metres with a 120 mm lens and 2.5 metres with a 135 mm lens. The guide numbers are for frontal lighting. With 45° angle lighting, the guide numbers are to be decreased by one fifth, and with a lighting angle of 60°, by one third. In close-up photography, using bayonet rings and extension tubes, as well as with bellows attachments the above flash distances must be shortened, as follows:

Flash distance for close-ups =

Distance in metres from the above table

Scale of reproduction  $\pm 1$

For scale of reproduction, see the table or formula card. Flash distance and lighting angle in close-ups are critical.

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