

TABLE II. Conversion Tables^a for Arithmetic and Additive (Logarithmic) Systems of Exposure Units

Time T (sec)	T_v	Aperture A A_v (f/)		Film Speed S_x S_v		Luminance ^b B B_v (ft-L) (c sq ft)		B_v	Incident Light ^c I I_v (ft-c)	Exposure A^2/T E_v		
1	0	1	0	3	0°	1	0.32	0	6	0	1	0
1/2	1	1.4	1	6	1°	2	0.64	1	12	1	2	1
1/4	2	2	2	12	2°	4	1.25	2	25	2	4	2
1/8	3	2.8	3	25	3°	8	2.50	3	50	3	8	3
1/15	4	4	4	50	4°	16	5.00	4	100	4	16	4
1/30	5	5.6	5	100	5°	32	10.0	5	200	5	32	5
1/60	6	8	6	200	6°	64	20.0	6	400	6	64	6
1/125	7	11	7	400	7°	125	40.0	7	800	7	125	7
1/250	8	16	8	800	8°	250	80.0	8	1600	8	250	8
1/500	9	22	9	1600	9°	500	160	9	3200	9	500	9
1/1000	10	32	10	3200	10°	1000	320	10	6400	10	1000	10
				6400	11°	2000	640	11	12500	11	2000	11
				12500	12°	4000	1250	12	25000	12	4000	12
											8000	13
											16000	14
											32000	15
											64000	16
											125000	17
											250000	18

^a For nomenclature see Table I.^b Luminance for $K = 3.3333$ and $K_0 = 1.061$.^c Illuminance for $C = 20.83$. Incident light is measured in the plane of the subject, perpendicular to the direction of the camera.^d The tabular values of T , A , S_x , B , B_v , and I are rounded off to a uniform series of numbers which are easy to remember. However, the actual numbers to be used in designing and calibrating equipment are in a power-of-two geometric progression, starting with the precise values of the figures on the fourth line. The precise value of $f/2.8$ is $8^{1/2}$, $B_0 = B_v$. The precise value of $S_x 25 = 32 \cdot 2^{1/2} = 25.4$. According to the formulas in Table I, the precise equivalent of $S_v 3$ is $S_x 25 = 26.7$. Since APEX values are intended to be precise, the tabular luminance figures are based on $S_x 25 = 26.7$ and $K = 3.333$. The center points of the E_m intervals (Fig. 1) which define S_x and S_v differ by a twelfth-root-of-two step because the relations given in Table I were used to establish common boundaries and not common midpoints. Tables of precise values of all exposure parameters will be published in another American standard.^e If intermediate subdivisions are used, square-root-of-two steps are preferred for all parameters except S_x . Cube-root-of-two steps are preferred for these arithmetic speeds in accordance with PH2.5-1960.¹

not agree with those of illuminating engineers. The tolerance on the value of the exposure constant K for reflected-light meters is less than that on the value of C for incident-light meters, because of the greater variations in the acceptance angles and directions of aiming the incident-light receivers.

The ratio of K to C is the average scene reflectance for which the meter is calibrated. The mean value is now $R = 3.333/20.83 = 16\%$. This value of reflectance is indicated when the reflected-light meter is aimed from the camera toward the subject, and the incident-light meter is aimed from the subject toward the camera. However, it is close to the reflectance of the "gray card" used with reflected-

light meters. Kodak's "Neutral Gray Card" had a reflectance of 18%. The difference is due to the angle at which the card is held.

The luminance value and incident-light value scales on exposure meters are exact photometric quantities for a particular meter. The values are related to established photometric units by the selected exposure constant.

The definitions of aperture value⁶ A_v , Eq. (7) and time value⁷ T_v , Eq. (8) were originated by ASA Sectional Committee PH3 and published in 1959.

The logarithmic system of nomenclature in Table I and the units involved are compatible with the exposure-value* system introduced by Deckel on the Compur shutter in 1954. The original purpose of the E_v system was to simplify the exposure meter by eliminating the need for aperture and time scales on the exposure computer. This made the built-in meter more practical. The cross coupling of the diaphragm and shutter also simplified the use of the camera. With the introduction of automatic exposure-controlled cameras the need for exposure-value

* At the 1955 International Standards Organization meeting in Stockholm the exposure meter subcommittee of the ISO agreed that the English translation of the German "Lichtwerte" would be exposure-value instead of light-value. The new terminology became the American Standard⁵ in 1957.

6. American Standard for Aperture Markings for Still Camera Lenses, PH3.33-1959.

7. American Standard for Exposure Time Markings for Shutters used in Still Cameras, PH3.32-1959.

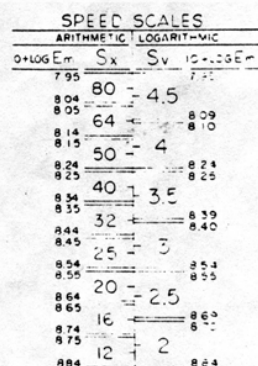


Fig. 1. Graphical conversion chart between typical ASA film speeds and ASA film-speed values showing that the centers of the prescribed $\log_{10}E_m$ intervals do not exactly coincide. The formulas for determining S_x and S_v from sensitometric measurements are $S_x = 0.8/E_m$ and $2^{S_v} = 0.24/E_m$.