

Additive Photographic Exposure System (APEX System)

Log value Av, Tv, Sv or Bv§	A, Aperture f/ stop* (f/)	T, Exposure time** (seconds)	S, Film speed ISO number†	B, Subject brightness‡ (foot-candles)	B, Subject brightness‡ (lux)
0	1¶	1	3	6	65
1	1.4	1/2	6	12	129
2	2	1/4	12	25	258
3	2.8	1/8	25	50	516
4	4	1/15	50	100	1033
5	5.6	1/30	100	200	2066
6	8	1/60	200	400	4132
7	11	1/125	400	800	8264
8	16	1/250	800	1600	16530
9	22	1/500	1600	3200	33050
10	32	1/1000	3200	6400	66110

§ Each increase in log value means the amount of light is reduced by half. Each decrease in log value doubles the amount of light. For example, increasing aperture from f/2 to f/2.8 reduces the light by one half or changing from a film speed of 100 to 400 requires one quarter the amount of light for proper exposure.

* f/stops are approximate powers of $\sqrt{2}$. I.e., for log value 3, aperture = $\sqrt{2}^3 = 2.828... = f/2.8$

**Exposure time is also called Shutter speed.

† ISO number is the same as the ASA number.

‡ Lightmeters measure subject brightness but rarely report the values.

¶ This aperture is rarely available in a lens. It indicates that no light is absorbed by the lens due to refraction, reflection or impurities in the glass of the lenses. Expensive lenses have larger maximum apertures (smaller f/stop numbers) to indicate that they can transmit more light when their apertures (irises) are wide open.

Definitions:

$$EV = \text{Exposure Value} = Av + Tv = Bv + Sv$$

$$1 \text{ foot-candle} = 10.76 \text{ lux (lx)}$$

$$1 \text{ lux} = 1 \text{ lumen/metre}^2 = 1 \text{ candela.steradian/metre}^2 = 1 \text{ cd.sr/m}^2$$

Examples:

Given an exposure value of 10 and a subject brightness of 50 foot-candles (Bv=3), a film speed of 400 ISO (Sv=7) is required for proper exposure. If an exposure time of 1/125 s (Tv=7) is used the aperture must be f/2.8 (Av=3).

These calculations are simplified by using a lightmeter with a calculating dial for determining appropriate apertures and exposure times. Some cameras have built in lightmeters which indicate the appropriate aperture or exposure time for a given film speed. Aperture priority cameras (AE) select the correct aperture for a given exposure time. Exposure priority cameras select the correct exposure time for a selected aperture. Totally automated cameras select both aperture and exposure time to properly expose the select film speed.

To determine an appropriate aperture for a given film speed, subject brightness and exposure time first set the film speed on the lightmeter. Next, meter the subject to determine the subject brightness and exposure value (if available on meter). After aligning the meter's dial with its measured brightness value find the exposure time on the dial and read the associated aperture.