

Exposure Value

EV (Exposure Value)											
Tv (Shutter Speed)	f-stop (Av) = focal ratio										
	1.0	1.4	2.0	2.8	4.0	5.6	8.0	11	16	22	32
1/1	0	1	2	3	4	5	6	7	8	9	10
2	1	2	3	4	5	6	7	8	9	10	11
4	2	3	4	5	6	7	8	9	10	11	12
8	3	4	5	6	7	8	9	10	11	12	13
15	4	5	6	7	8	9	10	11	12	13	14
30	5	6	7	8	9	10	11	12	13	14	15
60	6	7	8	9	10	11	12	13	14	15	16
125	7	8	9	10	11	12	13	14	15	16	17
250	8	9	10	11	12	13	14	15	16	17	18
500	9	10	11	12	13	14	15	16	17	19	19
1000	10	11	12	13	14	15	16	17	18	19	20
2000	11	12	13	14	15	16	17	18	19	20	21
4000	12	13	14	15	16	17	18	19	20	21	22

$f/\# = N = \frac{f}{D}$ where f is the focal length, and D is the diameter of the entrance pupil. For example, if the focal length is 16 times the pupil diameter, the f-number is $f/16$, or $N = 16$. The greater the f-number, the less light per unit area reaches the image plane of the system; the amount of light transmitted to the film (or sensor) decreases with the f-number squared. Doubling the f-number increases the necessary exposure time by a

factor of four.

The literal interpretation of the f/N notation for f-number N is as an arithmetic expression for the effective aperture diameter (entrance pupil diameter), which is equal to the focal length divided by the f-number: $D = f / N$.

The pupil diameter is proportional to the diameter of the aperture stop of the system. In a camera, this is typically the diaphragm aperture, which can be adjusted to vary the size of the pupil, and hence the amount of light that reaches the film or image sensor. The common assumption in photography that the pupil diameter is *equal* to the aperture diameter is not correct for many types of camera lens, because of the magnifying effect of lens elements in front of the aperture.

Tv – Shutter speed (inverse of Time)

Av – Aperture (f-stop)

Lens apertures are measured as the effective ratio of focal length to the diameter of the lens. The standard values are shown on the EV table beginning with 1.0, 1.4, 2.0, etc. These values are in increments that double (or halve) the amounts of light. This is approximately 1.414 times the previous value as amounts are exponential equivalents that increase to double the effective lens diameter. These values are called full f-stop increments.

Time or shutter speed is measured in standard values as shown on the Exposure Value chart. To change the amount of light to a value equivalent to the aperture f-stop we double or halve the time as shown by increments of 1/15 sec., 1/30 sec., 1/60 sec.

If an exposure had a EV value of 12, the aperture was set to f/8, and the speed was set to 1/60 sec., then any other EV value of 12 shown would provide the same amount of exposure. If we doubled the lens opening (move from f/8 to f/5.6 then the Tv shutter speed would need to change to 1/125 sec.)