

ISO vs f/stop							Shutter Speed vs Exposure Value Measured at ISO 100 (EV <sub>100</sub> )													
100	200	400	800	1600	3200	6400	1s	1/2s	1/4s	1/8s	1/15s	1/30s	1/60s	1/125s	1/250s	1/500s	1/1000s	1/2000s	1/4000s	
					1	1.4	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	
				1	1.4	2	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	
			1	1.4	2	2.8	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	
		1	1.4	2	2.8	4	-2	-1	0	1	2	3	4	5	6	7	8	9	10	
	1	1.4	2	2.8	4	5.6	-1	0	1	2	3	4	5	6	7	8	9	10	11	
1	1.4	2	2.8	4	5.6	8	0	1	2	3	4	5	6	7	8	9	10	11	12	
1.4	2	2.8	4	5.6	8	11	1	2	3	4	5	6	7	8	9	10	11	12	13	
2	2.8	4	5.6	8	11	16	2	3	4	5	6	7	8	9	10	11	12	13	14	
2.8	4	5.6	8	11	16	22	3	4	5	6	7	8	9	10	11	12	13	14	15	
4	5.6	8	11	16	22	32	4	5	6	7	8	9	10	11	12	13	14	15	16	
5.6	8	11	16	22	32		5	6	7	8	9	10	11	12	13	14	15	16	17	
8	11	16	22	32			6	7	8	9	10	11	12	13	14	15	16	17	18	
11	16	22	32	32			7	8	9	10	11	12	13	14	15	16	17	18	19	
16	22	32					8	9	10	11	12	13	14	15	16	17	18	19	20	
22	32						9	10	11	12	13	14	15	16	17	18	19	20	21	

EV 15 - Direct and Hazy sunlight    EV 10 - Overcast Day in Boston, London, Paris    EV 5 - Home Interiors at Night    EV 0 - Dim Ambient Artificial Light at Night

Minimum Hand Held Shutter -- Adjusted for Resolution -- Based on Doug Criner's Formulae www.enginova.com												
Sensor Classification	lp/mm	mega	17mm	28mm	50mm	70mm	100mm	135mm	200mm	300mm	400mm	
FOV Crop (DX & APS-C)	103	15	1/30	1/50	1/100	1/125	1/200	1/250	1/400	1/500	1/800	
FOV Crop (DX & APS-C)	93	12	1/30	1/50	1/80	1/125	1/160	1/250	1/320	1/500	1/640	
FOV Crop (DX & APS-C)	85	10	1/25	1/40	1/80	1/100	1/160	1/200	1/320	1/500	1/640	
FOV Crop (DX & APS-C)	76	8	1/25	1/40	1/60	1/100	1/125	1/200	1/250	1/400	1/500	
Canon 1D (APS-H)	68	10	1/20	1/30	1/60	1/80	1/125	1/160	1/250	1/400	1/500	
Full Frame (35mm)	84	24	1/25	1/40	1/80	1/100	1/160	1/200	1/320	1/500	1/640	
Full Frame (35mm)	78	21	1/25	1/40	1/60	1/100	1/125	1/200	1/250	1/400	1/500	
Full Frame (35mm)	70	16	1/20	1/30	1/60	1/80	1/125	1/160	1/250	1/400	1/500	
Olympus 4/3	101	10	1/30	1/50	1/100	1/125	1/200	1/250	1/400	1/500	1/800	

Sun Altitude vs Scene Details		
Sun Alt°	Shadow	EV <sub>100</sub>
01°	55	7-9
03°	20	8-10
06°	10	9-11
11°	5.0	10-12
22°	2.5	11-13
45°	1.0	12-14
65°	0.5	12-15
80°	0.2	13-15

[www.LFphoto.info/sunmooncalc](http://www.LFphoto.info/sunmooncalc)

CUT ABOVE DOTTED LINE

INSTRUCTIONS

Please print specific pages of this document double-sided to create 1/2 page reference cards for your camera bag. For maximum strength, either print on light paper and laminate or a color laser printer with cardstock paper (laser printer toner is water resistant).

\* Please refer to "Fred Parker's Ultimate Exposure Computer" to learn how to use the Exposure Value table [www.fredparker.com/ultexp1.htm](http://www.fredparker.com/ultexp1.htm) Please note EV<sub>100</sub> refers to a scene's EV value when measured at ISO 100 with a light meter. e.g. EV15 is the scene's EV at ISO 100. Further typical EV<sub>100</sub> scene values can be found on the next page.

\* The "Sun Altitude Table" indicates the sun's altitude above the horizon (Alt) in degrees, it's shadow factor (Shadow), and approximate scene exposure value (EV<sub>100</sub>). The Altitude can be measured with a clinometer and calculated with free software at the following website [www.LFphoto.info/sunmooncalc](http://www.LFphoto.info/sunmooncalc) The shadow factor indicates how long the shadows are compared to a subject; where 1.0 is as long as the subject is tall. The scene's derived EV<sub>100</sub> is based on the equations for 'Diffused Skylight' with a two stop swing for cloud cover. Direct sunlight is always EV 15 once the sun has risen sufficiently. Please see this website for more information: [www.squ1.org/wiki/Design\\_Sky](http://www.squ1.org/wiki/Design_Sky)

\* The "Minimum Hand Held Shutter Speed" is intended for people who would like critically sharp digital images - based on the work by Doug Criner and adjusted for digital resolution. [www.enginova.com/Minimum%20Shutter%20Speed.htm](http://www.enginova.com/Minimum%20Shutter%20Speed.htm)

For comments and suggestions please email [gordon@night-ray.com](mailto:gordon@night-ray.com) or visit my blog at [www.night-ray.com](http://www.night-ray.com)

I am keen to link anyone who blogs a tutorial on using this cheat sheet, please contact me at the address above.

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VERSION HISTORY

- 1.89 - Alien Bees & White Lightning, thx to A.R.Berrones
- 1.88 - Extended range of Photogenic w/s power
- 1.87 - Changed sensor class for 1.5/1.6 cameras
- 1.86 - Added Sony A900, 24mp camera
- 1.85 - Canon 50D, increasing handheld 14mp to 15mp
- 1.84 - Minor changes strobe text formatting
- 1.83 - Added Photogenic Monoblock Guide Numbers
- 1.82 - Added Sony A350, 14 megapixel APS-C
- 1.81 - Added Canon 1Ds mkIII, 21mp. Note on Sunny 16.
- 1.80 - Sun Table simplified and instructions enhanced.
- 1.78 - Updated instructions.
- 1.76 - Added a new page with typical scene exposures.
- 1.75 - Integrated detailed feedback from Jeff Conrad.
- 1.71 - Trivial layout correction.
- 1.70 - Added 285HV, SB-80DX, Sunpak 383 Super.
- 1.67 - Estimated umbrella GNs for consumer speedlites.
- 1.66 - Added Olympus FL-36 and FL-50.
- 1.65 - Added 580EX II custom functions.
- 1.63 - Added SB-600 and 430EX speedlites.
- 1.62 - Added Olympus 10 mega pixel handheld shake.
- 1.61 - Updated instructions with links to further resources.
- 1.60 - Added silver and satin umbrella guide numbers.
- 1.58 - Meters and Feet added to speedlites titles.
- 1.57 - Instructions enhanced.
- 1.55 - Errors and Omissions corrected.
- 1.50 - First draft of the new cheat sheet. Information has been simplified, larger font for easy reading, and averaged speedlites guide numbers.

0.60-1.06 - Historical version of the cheat sheet. Please email

Daylight	EV <sub>100</sub>
Light sand or snow in full or slightly hazy sunlight (distinct shadows)	16
Typical scene in full or slightly hazy sunlight (distinct shadows)	15
Typical scene in hazy sunlight (soft shadows)	14
Typical scene, cloudy bright (no shadows)	13
Typical scene, heavy overcast	12
Areas in open shade, clear sunlight	12

Rainbows	EV <sub>100</sub>
Clear sky background	15
Cloudy sky background	14

Sunsets and skylines	EV <sub>100</sub>
Just before sunset	12~14
At sunset	12
Just after sunset	9~11

The Moon, altitude > 40°	EV <sub>100</sub>
Full	15
Gibbous	14
Quarter	13
Crescent	12

**EV<sub>100</sub>:** All Exposure Values (EV) are given in relation to ISO 100. e.g. when measuring a scene with a light meter set at ISO 100.

**Sunny 16 Rule:** This equates to direct sunlight, EV 15, approximately two hours after sunrise and two hours before sunset.

**Further Information:** This data and a more detailed explanation can be found at the Wikipedia here [http://en.wikipedia.org/wiki/Exposure\\_value](http://en.wikipedia.org/wiki/Exposure_value)

Outdoor, Artificial Light	EV <sub>100</sub>
Neon and other bright signs	9~10
Night sports	9
Fires and burning buildings	9
Bright street scenes	8
Night street scenes and window displays	7~8
Night vehicle traffic	5
Fairs and amusement parks	7
Christmas tree lights	4~5
Floodlit buildings, monuments, and fountains	3~5
Distant views of lighted buildings	2

Indoor, Artificial Light	EV <sub>100</sub>
Galleries	8~11
Sports events, stage shows, and the like	8~9
Circuses, floodlit	8
Ice shows, floodlit	9
Offices and work areas	7~8
Home interiors	5~7
Christmas tree lights	4~5
Darkly Lit Church Interior	3~5
Candle at 20cm	2

**Daylight:** Values for direct sunlight apply between approximately two hours after sunrise and two hours before sunset, and assume front lighting. As a rough general rule, decrease EV by 1 for side lighting, and decrease EV by 2 for back lighting

**The Moon:** These values are appropriate for pictures of the Moon taken at night with a long lens or telescope, and will render the Moon as a medium tone. They will not, in general, be suitable for landscape pictures that include the Moon.

v3.0 - CANON SPEEDLITE 580EX / 550EX / 430EX CUSTOM FUNCTIONS						
580EX I	580EX II	550EX	430EX	Custom Function	#	Setting [0 = factory default]
	00			Distance Indicator	0	meters
					1	feet
01	03	01		FEB (Flash Exposure Bracketing) auto cancel	0	Enable
					1	Disable
02	04	02		FEB Shooting Sequence	0	Normal -> Under -> Over
					1	Under -> Normal -> Over
03	05	03		Metering System	0	E-TTL II and E-TTL
					1	TTL
					2	External Meter Auto (580EX II)
					3	External Meter Manual (580EX II)
04	10	04	02	Slave Auto Power Off Timer	0	Power down after 60 mins
					1	Power down after 10 mins
05	11	05		Slave Auto Power Off Cancel	0	Within 1 hour
					1	Within 8 hours
06		06	05	Modeling Flash	0	Enable
					1	Disable
	02			Modeling Flash	0	Enabled (DOF preview button)
					1	Enabled (Test flung button)
					2	Enabled (with both buttons)
					3	Disable
07	12			Recharging /w External Power Supply	0	Internal + External Power
					1	External Power Only
08	06			Continuous Shooting with Quick Flashing	0	Disable
					1	Enable
09	07			Test Button Flash Power	0	1/32 flash
					1	Full flash
10				Test Button Triggers Modeling Light	0	Disable
					1	Enable
11	09		03	Reduced Frame Sensor Awareness	0	Enable
					1	Disable
12	08		04	AF-Assist Beam	0	Enable
					1	Disable
13	13			Auto flash Compensation Setting	0	Select/Set + Command Dial
					1	Command Dial Only
14	01		01	Automatic Power Down	0	Enable
					1	Disable
			06	LCD Panel Display when halfway shutter pressed	0	Display Max Flash Range
					1	Display Aperture

ISO vs f/stop							PopUp		14mm	17mm	24mm	28mm	35mm	50mm	70mm	80mm	105mm	Umbrella 24mm	
100	200	400	800	1600	3200	6400	Nikon	Canon	GN15	GN19	GN29	GN31	GN37	GN43	GN50	GN53	GN57	Silver	Satin
				1	1.4		206	243	281	356	543	581	693	806	937	993	1068	243	187
			1	1.4	2		144	170	196	249	380	406	485	564	656	695	748	170	131
		1	1.4	2	2.8		103	121	140	178	271	290	346	403	468	496	534	121	93
	1	1.4	2	2.8	4		72	85	98	124	190	203	242	282	328	347	374	85	65
	1	1.4	2	2.8	4	5.6	51	60	70	89	135	145	173	201	234	248	267	60	46
1	1.4	2	2.8	4	5.6	8	36	42	49	62	95	101	121	141	164	173	187	42	32
1.4	2	2.8	4	5.6	8	11	25	30	35	44	67	72	86	100	117	124	133	30	23
2	2.8	4	5.6	8	11	16	18	21	24	31	47	50	60	70	82	86	93	21	16
2.8	4	5.6	8	11	16	22	12	15	17	22	33	36	43	50	58	62	66	15	11
4	5.6	8	11	16	22	32	9	10	12	15	23	25	30	35	41	43	46	10	8
5.6	8	11	16	22	32		6	7	8	11	16	18	21	25	29	31	33	7	5
8	11	16	22	32			4	5	6	7	11	12	15	17	20	21	23	5	4
11	16	22	32				3	3	4	5	8	9	11	12	14	15	17	3	2

**Bounce** - Add one (1) stop    **Stofen Omni Bounce** - Add two and one half (2.5) stops    **High Speed Sync** - Add one (1) stop plus shutter stops exceeding x-sync

Ratio	ΔEV	Ra	Ratio	f/1.4	f/2.0	f/2.4	f/2.8	f/3.4	f/4.0	f/4.8	f/5.6	f/6.7	f/8	f/10	f/11	f/13	f/16	f/19	f/22
f/2.0			f/2.0	1:2.0	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:11	1:16	1:23	-	-	-	-	-
1.0	1:2		f/2.8	1:4.0	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15	1:22	-	-	-
1.6	1:3		f/4.0	1:8.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:7.5	1:11	1:16	1:23	-
2.0	1:4		f/5.6	1:16	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15
2.3	1:5		f/8	-	1:16	1:11	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:2.5	1:4.0	1:5.5	1:7.5
2.6	1:6		f/11	-	-	1:21	1:15	1:10	1:7.5	1:5.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0
2.8	1:7		f/13	-	-	-	1:22	1:15	1:11	1:7.5	1:5.5	1:3.5	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0
3.0	1:8		f/16	-	-	-	-	1:22	1:16	1:11	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5	1:2.0
3.2	1:9		f/19	-	-	-	-	-	1:23	1:16	1:12	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5
3.3	1:10		f/22	-	-	-	-	-	-	1:21	1:15	1:11	1:7.5	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=

ISO vs f/stop							PopUp		14mm	17mm	24mm	28mm	35mm	50mm	70mm	80mm	105mm	Umbrella 24mm	
100	200	400	800	1600	3200	6400	Nikon	Canon	GN15	GN19	GN29	GN31	GN37	GN43	GN50	GN53	GN57	Silver	Satin
					1	1.4	62	74	85	108	165	177	211	245	285	302	325	74	57
				1	1.4	2	44	52	60	76	116	124	148	172	200	212	228	52	40
			1	1.4	2	2.8	31	37	42	54	82	88	105	122	142	151	162	37	28
		1	1.4	2	2.8	4	22	26	30	38	58	62	74	86	100	106	114	26	20
	1	1.4	2	2.8	4	5.6	15	18	21	27	41	44	52	61	71	75	81	18	14
1	1.4	2	2.8	4	5.6	8	11	13	15	19	29	31	37	43	50	53	57	13	10
1.4	2	2.8	4	5.6	8	11	7	9	10	13	20	22	26	30	35	37	40	9	7
2	2.8	4	5.6	8	11	16	5	6	7	9	14	15	18	21	25	26	28	6	5
2.8	4	5.6	8	11	16	22	3	4	5	6	10	11	13	15	17	18	20	4	3
4	5.6	8	11	16	22	32	2	3	3	4	7	7	9	10	12	13	14	3	2
5.6	8	11	16	22	32		1	2	2	3	5	5	6	7	8	9	10	2	1
8	11	16	22	32			1	1	1	2	3	3	4	5	6	6	7	1	1
11	16	22	32				1	1	1	1	2	2	3	3	4	4	5	1	0

**Bounce** - Add one (1) stop    **Stofen Omni Bounce** - Add two and one half (2.5) stops    **High Speed Sync** - Add one (1) stop plus shutter stops exceeding x-sync

Ratio	ΔEV	Ra	Ratio	f/1.4	f/2.0	f/2.4	f/2.8	f/3.4	f/4.0	f/4.8	f/5.6	f/6.7	f/8	f/10	f/11	f/13	f/16	f/19	f/22
f/2.0			f/2.0	1:2.0	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:11	1:16	1:23	-	-	-	-	-
1.0	1:2		f/2.8	1:4.0	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15	1:22	-	-	-
1.6	1:3		f/4.0	1:8.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:7.5	1:11	1:16	1:23	-
2.0	1:4		f/5.6	1:16	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15
2.3	1:5		f/8	-	1:16	1:11	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:2.5	1:4.0	1:5.5	1:7.5
2.6	1:6		f/11	-	-	1:21	1:15	1:10	1:7.5	1:5.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0
2.8	1:7		f/13	-	-	-	1:22	1:15	1:11	1:7.5	1:5.5	1:3.5	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0
3.0	1:8		f/16	-	-	-	-	1:22	1:16	1:11	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5	1:2.0
3.2	1:9		f/19	-	-	-	-	-	1:23	1:16	1:12	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5
3.3	1:10		f/22	-	-	-	-	-	-	1:21	1:15	1:11	1:7.5	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=

ISO vs f/stop							Popup		14mm	24mm	28mm	35mm	50mm	70mm	80mm	85mm	105mm	Umbrella 24mm	
100	200	400	800	1600	3200	6400	Nikon	Canon	GN12	GN25	GN27	GN30	GN35	GN37	GN40	GN40	GN43	Silver	Satin
					1	1.4	206	243	224	468	506	562	656	693	749	749	806	210	161
				1	1.4	2	144	170	157	328	354	393	459	485	524	524	564	147	113
			1	1.4	2	2.8	103	121	112	234	253	281	328	346	374	374	403	105	80
		1	1.4	2	2.8	4	72	85	78	164	177	196	229	242	262	262	282	73	56
	1	1.4	2	2.8	4	5.6	51	60	56	117	126	140	164	173	187	187	201	52	40
1	1.4	2	2.8	4	5.6	8	36	42	39	82	88	98	114	121	131	131	141	36	28
1.4	2	2.8	4	5.6	8	11	25	30	28	58	63	70	82	86	93	93	100	26	20
2	2.8	4	5.6	8	11	16	18	21	19	41	44	49	57	60	65	65	70	18	14
2.8	4	5.6	8	11	16	22	12	15	14	29	31	35	41	43	46	46	50	13	10
4	5.6	8	11	16	22	32	9	10	9	20	22	24	28	30	32	32	35	9	7
5.6	8	11	16	22	32		6	7	7	14	15	17	20	21	23	23	25	6	5
8	11	16	22	32			4	5	4	10	11	12	14	15	16	16	17	4	3
11	16	22	32				3	3	3	7	8	8	10	11	11	12		3	2

**Bounce** - Add one (1) stop    **Stofen Omni Bounce** - Add two and one half (2.5) stops    **High Speed Sync** - Add one (1) stop plus shutter stops exceeding x-sync

Ratio	ΔEV	Ra	Ratio	f/1.4	f/2.0	f/2.4	f/2.8	f/3.4	f/4.0	f/4.8	f/5.6	f/6.7	f/8	f/10	f/11	f/13	f/16	f/19	f/22
f/2.0			f/2.0	1:2.0	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:11	1:16	1:23	-	-	-	-	-
1.0	1:2		f/2.8	1:4.0	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15	1:22	-	-	-
1.6	1:3		f/4.0	1:8.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:7.5	1:11	1:16	1:23	-
2.0	1:4		f/5.6	1:16	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15
2.3	1:5		f/8	-	1:16	1:11	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:2.5	1:4.0	1:5.5	1:7.5
2.6	1:6		f/11	-	-	1:21	1:15	1:10	1:7.5	1:5.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0
2.8	1:7		f/13	-	-	-	1:22	1:15	1:11	1:7.5	1:5.5	1:3.5	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0
3.0	1:8		f/16	-	-	-	-	1:22	1:16	1:11	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5	1:2.0
3.2	1:9		f/19	-	-	-	-	-	1:23	1:16	1:12	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5
3.3	1:10		f/22	-	-	-	-	-	-	1:21	1:15	1:11	1:7.5	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=

ISO vs f/stop							PopUp		14mm	24mm	28mm	35mm	50mm	70mm	80mm	85mm	105mm	Umbrella 24mm	
100	200	400	800	1600	3200	6400	Nikon	Canon	GN12	GN25	GN27	GN30	GN35	GN37	GN40	GN40	GN43	Silver	Satin
					1	1.4	62	74	68	142	154	171	200	211	228	228	245	64	49
				1	1.4	2	44	52	48	100	108	120	140	148	160	160	172	44	34
			1	1.4	2	2.8	31	37	34	71	77	85	100	105	114	114	122	32	24
		1	1.4	2	2.8	4	22	26	24	50	54	60	70	74	80	80	86	22	17
	1	1.4	2	2.8	4	5.6	15	18	17	35	38	42	50	52	57	57	61	16	12
1	1.4	2	2.8	4	5.6	8	11	13	12	25	27	30	35	37	40	40	43	11	8
1.4	2	2.8	4	5.6	8	11	7	9	8	17	19	21	25	26	28	28	30	8	6
2	2.8	4	5.6	8	11	16	5	6	6	12	13	15	17	18	20	20	21	5	4
2.8	4	5.6	8	11	16	22	3	4	4	8	9	10	12	13	14	14	15	4	3
4	5.6	8	11	16	22	32	2	3	3	6	6	7	8	9	10	10	10	2	2
5.6	8	11	16	22	32		1	2	2	4	4	5	6	6	7	7	7	2	1
8	11	16	22	32			1	1	1	3	3	3	4	4	5	5	5	1	1
11	16	22	32				1	1	1	2	2	2	3	3	3	3	3	1	0

**Bounce** - Add one (1) stop    **Stofen Omni Bounce** - Add two and one half (2.5) stops    **High Speed Sync** - Add one (1) stop plus shutter stops exceeding x-sync

Ratio	ΔEV	Ra	Ratio	f/1.4	f/2.0	f/2.4	f/2.8	f/3.4	f/4.0	f/4.8	f/5.6	f/6.7	f/8	f/10	f/11	f/13	f/16	f/19	f/22
f/2.0			f/2.0	1:2.0	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:11	1:16	1:23	-	-	-	-	-
1.0	1:2		f/2.8	1:4.0	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15	1:22	-	-	-
1.6	1:3		f/4.0	1:8.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:7.5	1:11	1:16	1:23	-
2.0	1:4		f/5.6	1:16	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15
2.3	1:5		f/8	-	1:16	1:11	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:2.5	1:4.0	1:5.5	1:7.5
2.6	1:6		f/11	-	-	1:21	1:15	1:10	1:7.5	1:5.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0
2.8	1:7		f/13	-	-	-	1:22	1:15	1:11	1:7.5	1:5.5	1:3.5	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0
3.0	1:8		f/16	-	-	-	-	1:22	1:16	1:11	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5	1:2.0
3.2	1:9		f/19	-	-	-	-	-	1:23	1:16	1:12	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5
3.3	1:10		f/22	-	-	-	-	-	-	1:21	1:15	1:11	1:7.5	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=

ISO vs f/stop							28mm	35mm	50mm	105mm		17mm	24mm	28mm	35mm	50mm	70mm	85mm	105mm
100	200	400	800	1600	3200	6400	GN21	GN30	GN37	GN43		GN19	GN32	GN34	GN38	GN44	GN50	GN53	GN56
					1	1.4	400	571	685	800		356	599	637	712	824	937	993	1049
				1	1.4	2	280	400	480	560		249	419	446	498	577	656	695	734
			1	1.4	2	2.8	200	285	342	400		178	299	318	356	412	468	496	524
		1	1.4	2	2.8	4	140	200	240	280		124	209	223	249	288	328	347	367
	1	1.4	2	2.8	4	5.6	100	142	171	200		89	149	159	178	206	234	248	262
1	1.4	2	2.8	4	5.6	8	70	100	120	140		62	104	111	124	144	164	173	183
1.4	2	2.8	4	5.6	8	11	50	71	85	100		44	74	79	89	103	117	124	131
2	2.8	4	5.6	8	11	16	35	50	60	70		31	52	55	62	72	82	86	91
2.8	4	5.6	8	11	16	22	25	35	42	50		22	37	39	44	51	58	62	65
4	5.6	8	11	16	22	32	17	25	30	35		15	26	27	31	36	41	43	45
5.6	8	11	16	22	32		12	17	21	25		11	18	19	22	25	29	31	32
8	11	16	22	32			8	12	15	17		7	13	13	15	18	20	21	22
11	16	22	32				6	9	10	12		5	9	10	11	13	14	15	16

**Sunpak 383 Super - Equivalent to Vivitar at 50mm, GN 37m / 120ft**

Ratio	Ratio	f/1.4	f/2.0	f/2.4	f/2.8	f/3.4	f/4.0	f/4.8	f/5.6	f/6.7	f/8	f/10	f/11	f/13	f/16	f/19	f/22
<b>ΔEV Ra</b>																	
1.0 1:2	f/2.0	1:2.0	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:11	1:16	1:23	-	-	-	-	-
1.6 1:3	f/2.8	1:4.0	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15	1:22	-	-	-
2.0 1:4	f/4.0	1:8.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:7.5	1:11	1:16	1:23	-
2.3 1:5	f/5.6	1:16	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15
2.6 1:6	f/8	-	1:16	1:11	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:2.5	1:4.0	1:5.5	1:7.5
2.8 1:7	f/11	-	-	1:21	1:15	1:10	1:7.5	1:5.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0
3.0 1:8	f/13	-	-	-	1:22	1:15	1:11	1:7.5	1:5.5	1:3.5	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0
3.2 1:9	f/16	-	-	-	-	1:22	1:16	1:11	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5	1:2.0
3.3 1:10	f/19	-	-	-	-	-	1:23	1:16	1:12	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5
	f/22	-	-	-	-	-	-	1:21	1:15	1:11	1:7.5	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=

ISO vs f/stop								28mm	35mm	50mm	105mm		17mm	24mm	28mm	35mm	50mm	70mm	85mm	105mm
100	200	400	800	1600	3200	6400		GN21	GN30	GN37	GN43		GN19	GN32	GN34	GN38	GN44	GN50	GN53	GN56
					1	1.4		121	174	209	243		108	182	194	217	251	285	302	320
				1	1.4	2		85	121	146	170		76	128	136	152	176	200	212	224
			1	1.4	2	2.8		60	87	104	121		54	91	97	108	125	142	151	160
		1	1.4	2	2.8	4		42	60	73	85		38	64	68	76	88	100	106	112
	1	1.4	2	2.8	4	5.6		30	43	52	60		27	45	48	54	62	71	75	80
1	1.4	2	2.8	4	5.6	8		21	30	36	42		19	32	34	38	44	50	53	56
1.4	2	2.8	4	5.6	8	11		15	21	26	30		13	22	24	27	31	35	37	40
2	2.8	4	5.6	8	11	16		10	15	18	21		9	16	17	19	22	25	26	28
2.8	4	5.6	8	11	16	22		7	10	13	15		6	11	12	13	15	17	18	20
4	5.6	8	11	16	22	32		5	7	9	10		4	8	8	9	11	12	13	14
5.6	8	11	16	22	32			3	5	6	7		3	5	6	6	7	8	9	10
8	11	16	22	32				2	3	4	5		2	4	4	4	5	6	6	7
11	16	22	32					1	2	3	3		1	2	3	3	4	4	4	5

**Sunpak 383 Super - Equivalent to Vivitar at 50mm, GN 37m / 120ft**

Ratio		Ratio																
ΔEV	Ra	f/1.4	f/2.0	f/2.4	f/2.8	f/3.4	f/4.0	f/4.8	f/5.6	f/6.7	f/8	f/10	f/11	f/13	f/16	f/19	f/22	
		1:2.0	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:11	1:16	1:23	-	-	-	-	-	
1.0	1:2	f/2.8	1:4.0	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15	1:22	-	-	
1.6	1:3	f/4.0	1:8.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:7.5	1:11	1:16	1:23	
2.0	1:4	f/5.6	1:16	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15
2.3	1:5	f/8	-	1:16	1:11	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:2.5	1:4.0	1:5.5	1:7.5
2.6	1:6	f/11	-	-	1:21	1:15	1:10	1:7.5	1:5.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0
2.8	1:7	f/13	-	-	-	1:22	1:15	1:11	1:7.5	1:5.5	1:3.5	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0
3.0	1:8	f/16	-	-	-	-	1:22	1:16	1:11	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5	1:2.0
3.2	1:9	f/19	-	-	-	-	-	1:23	1:16	1:12	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5
3.3	1:10	f/22	-	-	-	-	-	-	1:21	1:15	1:11	1:7.5	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=

# Olympus 4/3 Speedlites - feet

zoom head calibrated for 4/3 focal length

# Photographic Cheat Sheet v1.89

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ISO vs f/stop					10mm	12mm	14mm	17mm	25mm	35mm	42mm		10mm	12mm	14mm	17mm	25mm	35mm	42mm
100	200	400	800	1600	GN14	GN20	GN22	GN26	GN28	GN32	GN36		GN20	GN28	GN30	GN36	GN40	GN45	GN50
					262	374	412	487	524	599	674		374	524	562	674	749	843	937
				1	183	262	288	341	367	419	472		262	367	393	472	524	590	656
			1	1.4	131	187	206	243	262	299	337		187	262	281	337	374	421	468
		1	1.4	2	91	131	144	170	183	209	236		131	183	196	236	262	295	328
	1	1.4	2	2.8	65	93	103	121	131	149	168		93	131	140	168	187	210	234
1	1.4	2	2.8	4	45	65	72	85	91	104	118	Olympus FL-36	65	91	98	118	131	147	164
1.4	2	2.8	4	5.6	32	46	51	60	65	74	84	Olympus FL-50	46	65	70	84	93	105	117
2	2.8	4	5.6	8	22	32	36	42	45	52	59		32	45	49	59	65	73	82
2.8	4	5.6	8	11	16	23	25	30	32	37	42		23	32	35	42	46	52	58
4	5.6	8	11	16	11	16	18	21	22	26	29		16	22	24	29	32	36	41
5.6	8	11	16	22	8	11	12	15	16	18	21		11	16	17	21	23	26	29
8	11	16	22	32	5	8	9	10	11	13	14		8	11	12	14	16	18	20
11	16	22	32		4	5	6	7	8	9	10		5	8	8	10	11	13	14
type 135 / 35mm focal len					20mm	24mm	28mm	35mm	50mm	70mm	85mm		20mm	24mm	28mm	35mm	50mm	70mm	85mm

Ratio		Ratio	f/1.4	f/2.0	f/2.4	f/2.8	f/3.4	f/4.0	f/4.8	f/5.6	f/6.7	f/8	f/10	f/11	f/13	f/16	f/19	f/22
$\Delta EV$	$R_a$	f/2.0	1:2.0	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:11	1:16	1:23	-	-	-	-	-
1.0	1:2	f/2.8	1:4.0	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15	1:22	-	-	-
1.6	1:3	f/4.0	1:8.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:7.5	1:11	1:16	1:23	-
2.0	1:4	f/5.6	1:16	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15
2.3	1:5	f/8	-	1:16	1:11	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:2.5	1:4.0	1:5.5	1:7.5
2.6	1:6	f/11	-	-	1:21	1:15	1:10	1:7.5	1:5.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0
2.8	1:7	f/13	-	-	-	1:22	1:15	1:11	1:7.5	1:5.5	1:3.5	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0
3.0	1:8	f/16	-	-	-	-	1:22	1:16	1:11	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5	1:2.0
3.2	1:9	f/19	-	-	-	-	-	1:23	1:16	1:12	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5
3.3	1:10	f/22	-	-	-	-	-	-	1:21	1:15	1:11	1:7.5	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=

# Olympus 4/3 Speedlites - meters

zoom head calibrated for 4/3 focal length

# Photographic Cheat Sheet v1.89

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ISO vs f/stop					10mm	12mm	14mm	17mm	25mm	35mm	42mm		10mm	12mm	14mm	17mm	25mm	35mm	42mm
100	200	400	800	1600	GN14	GN20	GN22	GN26	GN28	GN32	GN36		GN20	GN28	GN30	GN36	GN40	GN45	GN50
					80	114	125	148	160	182	205		114	160	171	205	228	257	285
				1	56	80	88	104	112	128	144		80	112	120	144	160	180	200
			1	1.4	40	57	62	74	80	91	102		57	80	85	102	114	128	142
		1	1.4	2	28	40	44	52	56	64	72		40	56	60	72	80	90	100
	1	1.4	2	2.8	20	28	31	37	40	45	51		28	40	42	51	57	64	71
1	1.4	2	2.8	4	14	20	22	26	28	32	36		20	28	30	36	40	45	50
1.4	2	2.8	4	5.6	10	14	15	18	20	22	25		14	20	21	25	28	32	35
2	2.8	4	5.6	8	7	10	11	13	14	16	18		10	14	15	18	20	22	25
2.8	4	5.6	8	11	5	7	7	9	10	11	12		7	10	10	12	14	16	17
4	5.6	8	11	16	3	5	5	6	7	8	9		5	7	7	9	10	11	12
5.6	8	11	16	22	2	3	3	4	5	5	6		3	5	5	6	7	8	8
8	11	16	22	32	1	2	2	3	3	4	4		2	3	3	4	5	5	6
11	16	22	32		1	1	2	2	2	2	3		1	2	2	3	3	4	4
type 135 / 35mm focal len					20mm	24mm	28mm	35mm	50mm	70mm	85mm		20mm	24mm	28mm	35mm	50mm	70mm	85mm

Ratio		Ratio	f/1.4	f/2.0	f/2.4	f/2.8	f/3.4	f/4.0	f/4.8	f/5.6	f/6.7	f/8	f/10	f/11	f/13	f/16	f/19	f/22
<b>ΔEV</b>	<b>Ra</b>	<b>f/2.0</b>	1:2.0	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:11	1:16	1:23	-	-	-	-	-
1.0	1:2	<b>f/2.8</b>	1:4.0	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15	1:22	-	-	-
1.6	1:3	<b>f/4.0</b>	1:8.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:7.5	1:11	1:16	1:23	-
2.0	1:4	<b>f/5.6</b>	1:16	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15
2.3	1:5	<b>f/8</b>	-	1:16	1:11	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:2.5	1:4.0	1:5.5	1:7.5
2.6	1:6	<b>f/11</b>	-	-	1:21	1:15	1:10	1:7.5	1:5.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0
2.8	1:7	<b>f/13</b>	-	-	-	1:22	1:15	1:11	1:7.5	1:5.5	1:3.5	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0
3.0	1:8	<b>f/16</b>	-	-	-	-	1:22	1:16	1:11	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5	1:2.0
3.2	1:9	<b>f/19</b>	-	-	-	-	-	1:23	1:16	1:12	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5
3.3	1:10	<b>f/22</b>	-	-	-	-	-	-	1:21	1:15	1:11	1:7.5	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=

# Photogenic Strobe - feet

AC monoblock with 6in reflector and 45in satin shoot through umbrella

# Photographic Cheat Sheet v1.89

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ISO vs f/stop							44ws	88ws	125ws	176ws	250ws	353ws	500ws	706ws	1000ws	1500ws	2000ws	3000ws	4000ws
100	200	400	800	1600	3200	6400	GN11	GN13	GN16	GN18	GN22	GN27	GN32	GN37	GN44	GN53	GN62	GN74	GN86
					1	1.4	206	249	299	343	412	499	599	687	824	989	1162	1394	1612
				1	1.4	2	144	174	209	240	288	349	419	481	577	692	813	976	1128
			1	1.4	2	2.8	103	124	149	171	206	249	299	343	412	494	581	697	806
		1	1.4	2	2.8	4	72	87	104	120	144	174	209	240	288	346	406	488	564
	1	1.4	2	2.8	4	5.6	51	62	74	85	103	124	149	171	206	247	290	348	403
1	1.4	2	2.8	4	5.6	8	36	43	52	60	72	87	104	120	144	173	203	244	282
1.4	2	2.8	4	5.6	8	11	25	31	37	42	51	62	74	85	103	123	145	174	201
2	2.8	4	5.6	8	11	16	18	21	26	30	36	43	52	60	72	86	101	122	141
2.8	4	5.6	8	11	16	22	12	15	18	21	25	31	37	42	51	61	72	87	100
4	5.6	8	11	16	22	32	9	10	13	15	18	21	26	30	36	43	50	61	70
5.6	8	11	16	22	32		6	7	9	10	12	15	18	21	25	30	36	43	50
8	11	16	22	32			4	5	6	7	9	10	13	15	18	21	25	30	35
11	16	22	32				3	3	4	5	6	7	9	10	13	15	18	22	25

Ratio		Ratio																
ΔEV	Ra	f/1.4	f/2.0	f/2.4	f/2.8	f/3.4	f/4.0	f/4.8	f/5.6	f/6.7	f/8	f/10	f/11	f/13	f/16	f/19	f/22	
		1:2.0	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:11	1:16	1:23	-	-	-	-	-	
1.0	1:2	f/2.8	1:4.0	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15	1:22	-	-	
1.6	1:3	f/4.0	1:8.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:7.5	1:11	1:16	1:23	
2.0	1:4	f/5.6	1:16	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15
2.3	1:5	f/8	-	1:16	1:11	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:2.5	1:4.0	1:5.5	1:7.5
2.6	1:6	f/11	-	-	1:21	1:15	1:10	1:7.5	1:5.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0
2.8	1:7	f/13	-	-	-	1:22	1:15	1:11	1:7.5	1:5.5	1:3.5	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0
3.0	1:8	f/16	-	-	-	-	1:22	1:16	1:11	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5	1:2.0
3.2	1:9	f/19	-	-	-	-	-	1:23	1:16	1:12	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5
3.3	1:10	f/22	-	-	-	-	-	-	1:21	1:15	1:11	1:7.5	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=

# Photogenic Strobe - meters

AC monoblock with 6in reflector and 45in satin shoot through umbrella

# Photographic Cheat Sheet v1.89

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ISO vs f/stop								44ws	88ws	125ws	176ws	250ws	353ws	500ws	706ws	1000ws	1500ws	2000ws	3000ws	4000ws
100	200	400	800	1600	3200	6400		GN11	GN13	GN16	GN18	GN22	GN27	GN32	GN37	GN44	GN53	GN62	GN74	GN86
					1	1.4		63	76	91	105	126	152	183	210	251	302	354	425	491
				1	1.4	2		44	53	64	73	88	107	128	147	176	211	248	298	344
			1	1.4	2	2.8		31	38	46	52	63	76	91	105	126	151	177	213	246
		1	1.4	2	2.8	4		22	27	32	37	44	53	64	73	88	106	124	149	172
	1	1.4	2	2.8	4	5.6		16	19	23	26	31	38	46	52	63	75	89	106	123
1	1.4	2	2.8	4	5.6	8		11	13	16	18	22	27	32	37	44	53	62	74	86
1.4	2	2.8	4	5.6	8	11		8	10	11	13	16	19	23	26	31	38	44	53	61
2	2.8	4	5.6	8	11	16		6	7	8	9	11	13	16	18	22	26	31	37	43
2.8	4	5.6	8	11	16	22		4	5	6	7	8	10	11	13	16	19	22	27	31
4	5.6	8	11	16	22	32		3	3	4	5	6	7	8	9	11	13	16	19	22
5.6	8	11	16	22	32			2	2	3	3	4	5	6	7	8	9	11	13	15
8	11	16	22	32				1	2	2	2	3	3	4	5	6	7	8	9	11
11	16	22	32					1	1	2	2	2	2	3	3	4	5	6	7	8

Ratio		Ratio																
ΔEV	Ra	f/1.4	f/2.0	f/2.4	f/2.8	f/3.4	f/4.0	f/4.8	f/5.6	f/6.7	f/8	f/10	f/11	f/13	f/16	f/19	f/22	
		1:2.0	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:11	1:16	1:23	-	-	-	-	-	
1.0	1:2	f/2.8	1:4.0	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15	1:22	-	-	
1.6	1:3	f/4.0	1:8.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:7.5	1:11	1:16	1:23	
2.0	1:4	f/5.6	1:16	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15
2.3	1:5	f/8	-	1:16	1:11	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:2.5	1:4.0	1:5.5	1:7.5
2.6	1:6	f/11	-	-	1:21	1:15	1:10	1:7.5	1:5.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0
2.8	1:7	f/13	-	-	-	1:22	1:15	1:11	1:7.5	1:5.5	1:3.5	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0
3.0	1:8	f/16	-	-	-	-	1:22	1:16	1:11	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5	1:2.0
3.2	1:9	f/19	-	-	-	-	-	1:23	1:16	1:12	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5
3.3	1:10	f/22	-	-	-	-	-	-	1:21	1:15	1:11	1:7.5	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=

ISO vs f/stop							12ws	25ws	50ws	100ws	200ws	400ws	800ws	1600ws	3200ws	6400ws
100	200	400	800	1600	3200	6400	GN05	GN07	GN09	GN13	GN18	GN26	GN36	GN50	GN70	GN98
					1	1.4	88	124	174	244	341	478	669	937	1312	1837
				1	1.4	2	62	87	122	170	239	334	468	656	918	1286
			1	1.4	2	2.8	44	62	87	122	170	239	334	468	656	918
		1	1.4	2	2.8	4	31	43	61	85	119	167	234	328	459	643
	1	1.4	2	2.8	4	5.6	22	31	43	61	85	119	167	234	328	459
1	1.4	2	2.8	4	5.6	8	15	21	30	42	59	83	117	164	229	321
1.4	2	2.8	4	5.6	8	11	11	15	21	30	42	59	83	117	164	229
2	2.8	4	5.6	8	11	16	7	10	15	21	29	41	58	82	114	160
2.8	4	5.6	8	11	16	22	5	7	10	15	21	29	41	58	82	114
4	5.6	8	11	16	22	32	3	5	7	10	14	20	29	41	57	80
5.6	8	11	16	22	32		2	3	5	7	10	14	20	29	41	57
8	11	16	22	32			1	2	3	5	7	10	14	20	28	40
11	16	22	32				1	1	2	3	5	7	10	14	20	29

Power increases by one (1) stop with a bare 7in reflector (20mm field of view) -- and -- three (3) stops with a bare 11in reflector (35mm field of view)

Ratio	ΔEV	Ra	Ratio	f/1.4	f/2.0	f/2.4	f/2.8	f/3.4	f/4.0	f/4.8	f/5.6	f/6.7	f/8	f/10	f/11	f/13	f/16	f/19	f/22
f/2.0			f/2.0	1:2.0	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:11	1:16	1:23	-	-	-	-	-
1.0	1:2		f/2.8	1:4.0	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15	1:22	-	-	-
1.6	1:3		f/4.0	1:8.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:7.5	1:11	1:16	1:23	-
2.0	1:4		f/5.6	1:16	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15
2.3	1:5		f/8	-	1:16	1:11	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:2.5	1:4.0	1:5.5	1:7.5
2.6	1:6		f/11	-	-	1:21	1:15	1:10	1:7.5	1:5.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0
2.8	1:7		f/13	-	-	-	1:22	1:15	1:11	1:7.5	1:5.5	1:3.5	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0
3.0	1:8		f/16	-	-	-	-	1:22	1:16	1:11	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5	1:2.0
3.2	1:9		f/19	-	-	-	-	-	1:23	1:16	1:12	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5
3.3	1:10		f/22	-	-	-	-	-	-	1:21	1:15	1:11	1:7.5	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=

ISO vs f/stop							12ws	25ws	50ws	100ws	200ws	400ws	800ws	1600ws	3200ws	6400ws
100	200	400	800	1600	3200	6400	GN05	GN07	GN09	GN13	GN18	GN26	GN36	GN50	GN70	GN98
					1	1.4	27	37	53	74	104	145	204	285	400	560
				1	1.4	2	18	26	37	52	72	102	142	200	280	392
			1	1.4	2	2.8	13	18	26	37	52	72	102	142	200	280
		1	1.4	2	2.8	4	9	13	18	26	36	51	71	100	140	196
	1	1.4	2	2.8	4	5.6	6	9	13	18	26	36	51	71	100	140
1	1.4	2	2.8	4	5.6	8	4	6	9	13	18	25	35	50	70	98
1.4	2	2.8	4	5.6	8	11	3	4	6	9	13	18	25	35	50	70
2	2.8	4	5.6	8	11	16	2	3	4	6	9	12	17	25	35	49
2.8	4	5.6	8	11	16	22	1	2	3	4	6	9	12	17	25	35
4	5.6	8	11	16	22	32	1	1	2	3	4	6	8	12	17	24
5.6	8	11	16	22	32		0	1	1	2	3	4	6	8	12	17
8	11	16	22	32			0	0	1	1	2	3	4	6	8	12
11	16	22	32				0	0	0	1	1	2	3	4	6	8

Power increases by one (1) stop with a bare 7in reflector (20mm field of view) -- and -- three (3) stops with a bare 11in reflector (35mm field of view)

Ratio	ΔEV	Ra	f/1.4	f/2.0	f/2.4	f/2.8	f/3.4	f/4.0	f/4.8	f/5.6	f/6.7	f/8	f/10	f/11	f/13	f/16	f/19	f/22
f/2.0			1:2.0	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:11	1:16	1:23	-	-	-	-	-
1.0	1:2		f/2.8	1:4.0	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12	1:15	1:22	-	-
1.6	1:3		f/4.0	1:8.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:7.5	1:11	1:16	1:23
2.0	1:4		f/5.6	1:16	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0	1:4.0	1:5.5	1:8.0	1:12
2.3	1:5		f/8	-	1:16	1:11	1:8.0	1:5.5	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:2.5	1:4.0	1:5.5
2.6	1:6		f/11	-	-	1:21	1:15	1:10	1:7.5	1:5.0	1:4.0	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0	1:3.0
2.8	1:7		f/13	-	-	-	1:22	1:15	1:11	1:7.5	1:5.5	1:3.5	1:2.5	1:2.0	1:1.5	=	1:1.5	1:2.0
3.0	1:8		f/16	-	-	-	-	1:22	1:16	1:11	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=	1:1.5
3.2	1:9		f/19	-	-	-	-	-	1:23	1:16	1:12	1:8.0	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5	=
3.3	1:10		f/22	-	-	-	-	-	-	1:21	1:15	1:11	1:7.5	1:5.5	1:4.0	1:3.0	1:2.0	1:1.5