Comparison of LED to Conventional Lighting

Generic Parameters

Description	LED	Incandescent	CFL	Fluorescent	T5 - FL	Halogen	Metal Halide	HPSV
Efficacy (Lumens per Watt)	10-120	12-20	50-90	70-90	90-110	20-30	80-100	100-140
Colour temperature - Min (#1)	2500	2500	6500	6500	6500	5000	6500	2500
Colour temperature - Max	10000	3500	10000	10000	8000	7000	9000	3500
Colour Rendering Index (#2)	70 to 90	100	55 - 75	55 - 75	60 - 75	70 - 80	70 - 85	0.3 - 0.5
Ultraviolet rays	No	No	Yes	Yes	Yes	Yes	Maybe	Yes
Illumination Angle (#3)	5 to 120	360	360	360	360	360	360	360
Need for reflectors (#4)	No	Yes	Maybe	Yes	Yes	Yes	Yes	Yes
Loss of light after 5000 hrs (#5)	Fades only after 30000 hrs	Not applicable	=>20%	=>20%	=>10%	=>10%	=>10%	=>20%
Life in Hours (#6)	50000 to 100,000	1000	5000 to 8000	2000 to 5000	5000 to 12000	2000 to 3000	8000 to 10000	8000 to 10000
Effect of high Ambient temperature (#7)	life and light reduces but depends on heat sink	None	Limited	Limited	Limited	Limited	Limited	None

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Operating Parameters

Description	LED	Incandescent	CFL	Fluorescent	T5 - FL	Halogen	Metal Halide	HPSV
Minimum watts	-	5	5	20	18	15	40	150
Maximum watts	-	1000	100	40	28	2000	500	500
Effect of lower voltage (within specs)	-	Light reduces 4th power of V	dims partially with EMC		No effect	Light reduces	-	Light reduces
Effect of higher voltage (within specs)	-	Bulb failure rate increases	Component failure rate increases	Component failure rate increases	Component failure rate increases	Bulb failure rate increases	Component failure rate increases	Component failure rate increases
Effect of frequency change	-	None	dims partially with EMC	dims partially with EMC	No effect	No effect	No effect	dims partially with EMC
Effect of fluctuation	-	highly visible	slightly visible	slightly visible	No effect	highly visible	No effect	slightly visible
Operating Voltage	-	Rating +/- 5%	rating +/- 10% for EMC	rating +/- 10% for EMC	rating +/- 20%		rating +/- 10% for EMC	rating +/- 10% for EMC
Surge Protection	-	No or little effect	Components can fail with EMC	Components can fail with EMC	Components can fail with EMC	No or little effect	No or little effect	No or little effect
Power efficiency	82 - 90%	N A	<80% with EMC	<80% with EMC	90 - 95%	-	<80% with EMC	<80% with EMC
Harmonics (#8)	Yes	No	Yes	Yes	Yes	No	No	No
Power factor (#9)	lagging 0.8 to 0.9	NIL	lagging 0.6 to 0.8	lagging 0.6 to 0.8	lagging 0.8 to 0.9	-	lagging 0.6 to 0.8	lagging 0.6 to 0.8
No of switchings	-	lamp life decreases	Components can fail with electronic choke	Components can fail with electronic choke	Components can fail with electronic choke	lamp life decreases	lamp and choke failure increases	lamp and choke failure increases

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Other parameters								
Description	**LED**	**Incandescent**	**CFL**	**Fluorescent**	**T5 - FL**	**Halogen**	**Metal Halide**	**HPSV**
Luminaire	Optional	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd	Reqd
Failure of accessories	Possible	None	Yes	Yes	Yes	Yes	Yes	Yes
Mercury / Other Gases (#10)	**Nil**	**NIL**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
PCB	Yes	No	for electronic chokes	for electronic chokes	for electronic chokes	No	No	No
Disposal problem	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
effect of humidity (internal) (#11)	Maybe	NIL	Maybe	Maybe	Maybe	Nil	NA	NA
Ingress protection (Exterior)	IP 66		IP 65	IP 65	IP 65	Maybe	Maybe	Maybe

Notes

#1	Colour temperature is indicative of the black body, which would be having a comparable spectrum. lower colour temperatures (2500K) indicates reddish/yellowish tint, and higher colour temperature (10,000) indicates bluish tint. Sun at noon could be taken as 5000K, and 6500K is considered “daylight” , 3500K as “warm daylight”, and 8000 as “cool daylight”
#2	Colour rendering index is an indication of showing the true colours of the object. The natural light at noon is considered to have a colour rendering index of 100. The spectrum distribution of the lamp distorts the colours.
#3	No application, including general lighting, requires light in 360 degrees in all the three axes. The largest possible requirement would be hemispherical, or 180 degree. LEDs, due to the nature of construction, is directional.
#4	All lights other than LED, has 360 degree light output. Hence they require reflectors to direct the light, where required. LEDs being directional light, does not require any reflector.
#5	Light output of the LEDs, like most other lights, come down with the number of burning hours. The various factors which affect the life are, temperature, humidity, current levels in each LED etc.
#6	Life of LED, unlike other lights can be very long, even when the light out put is 1% of the initial light output. Due to this, a convention is being formulated, to indicate the life as the number of burning hours, at which the light output is 50% of the initial light output. SRM has designed its lights to have about 50% deterioration at the end of 50,000 hours.
#7	All LEDs are sensitive to increase in junction temperature. Both light output and life decreases with increase in junction temperature, and ambient temperature is an impportant factor contributoing to increased junction temperature. As LEDs used by SRM can withstand upto 80 degre, SRM's design ensures that that even in large lamps, the temperature increase is maximum 20 degrees above ambient, the expected life can be achieved.
#8	Every system which uses Switch mode electronics, such as electronic choke, introduces harmonics. However, it can be considered as part of the price for the very high Power conversion efficiency (>96%)
#9	SRM uses capacitor based current limiting circuits, which causes leading power factor. This can be taken as advantage, it can reduce the capacitors required for power factor compensation.
#10	While mercury is not present in Incandescent and tungsten halogen lamps, the amount of mercury released by the coal fired thermal plants(as in India), is more than the sum of mercury in the fluorescent lamps and the mercury by the coal fired plants for the power per 7000 hours of burning.
#11	The condensing humidity, when mixed with acidic dust, corrodes the PCB tracks. Thus, if there is PCB, most of the internal luinaires /PCB are not totally protected, they get affected by high internal humidty.