

# WELCOME

Use Scotopic Lumens To Achieve Energy Efficiency In Lighting!

## SCOTOPIC LUMENS

(Everything you always wanted  
to know about Scotopic Lumens)



# How do we measure light now?



# Photopic? - Scotopic?

- The issue:

Human perception of the lighted environment is driven by both **Photopic and Scotopic** vision

... but ...

**only Photopic** vision is typically considered applicable to interior lighting design

... however ...

Studies show **Scotopic vision is also important** and may support lighting energy savings



# Photopic / Scotopic Properties

## Photopic:

- Known as light or daylight vision ("cones")
- Higher sensitivity in "brighter" light
- Peak sensitivity towards "red" (550 nm)
- Basis for modern photometry (light metering)

## Scotopic:

- Known as dark or night vision ("rods")
- Higher sensitivity and speed in different spectral range
- Peak sensitivity towards "blue" (500 nm)
- High color temperature lamps 3500K - 7000K



# Recent Study Results

- Rods are active in bright light and do contribute to the perception of brightness
- Scotopic contributes to improved acuity but this is not yet well defined
- Higher Scotopic sources can provide equivalent brightness with lower energy
- S/P ratio



# Scotopic / Photopic Ratios

## Light Source

## Scotopic / Photopic Ratio (S/P)

Low Pressure Sodium	0.20
High Pressure Sodium (35W)	0.40
Warm White Fluorescent	1.00
Cool White Fluorescent	1.46
Metal Halide (Sodium/Scandium)	1.49
Quartz Halogen (~3200° K)	1.50
4100°K Fluorescent (RE741)	1.54
4100°K Fluorescent (RE841)	1.62
5000°K Fluorescent (RE850)	1.96
6500°K Fluorescent (RE865)	2.14
Daylight Fluorescent	2.22
7500°K Fluorescent Lamp	2.47



# Photopics

- **Combination of Scotopic, Photopic, and Mesopic.**

There is usually complexity, if not trouble, whenever we mix physics with biology. The physical side of things - the radiant power of a light source - is simply enough defined and is well-behaved, but the biological side of things - the evoking of a visual sensation - is very hard to define and not at all well-behaved. One of the most obvious things about the visual system that changes is its sensitivity to light.

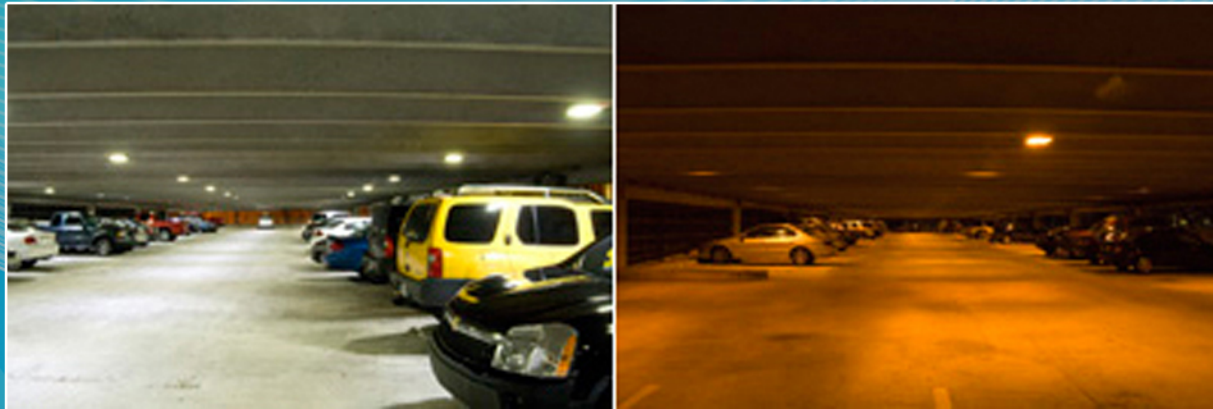
The smaller the amount of light involved, the more sensitive the visual system becomes. The differences between daytime (high light level) vision and nighttime (low light level) vision are obvious to us all. This change in sensitivity is so great that it proved to be useful and necessary to have two definitions of light: one for high light levels, which is called photopic, and one for low light levels, which is called scotopic. And so we have photopic lumens and scotopic lumens. "Photopic" comes from one of the Greek word for light, and "scotopic" comes from the Greek word for darkness.



# Scotopics



# Scotopics



# How it can affect your business



$$= 9,200 \text{ X } 1.96 = 18,032$$

**Photopic Lumens**                      **S/P Ratio**                      **Scotopic Lumens**

150W 5000K  
HighMax



$$= 24,500 \text{ X } 0.62 = 15,190$$

**Photopic Lumens**                      **S/P Ratio**                      **Scotopic Lumens**

250W  
HPS



# TECHNICAL UPDATE

UPDATE NO: 1655 / ISSUED BY THE PRODUCT DEVELOPMENT LAB IN FAIRFIELD, NJ





"Scotopic Lumens is a scientific way to measure the light we see. It measures the quality of the perceived light. This perception which occurs in our eye is the reason one lamp can look brighter than another, even though they both have the same lumens."

Chart 1  
SP Ratio For Several Light Bulbs

Lamp	S/P Ratio
High Pressure Sodium	0.62
Metal Halide	1.49
HighMax 5000K	1.96

Chart 2  
Calculating Scotopic Lumens

	$9,200 \times 1.96 = 18,032$
150W HighMax	Lumens S/P Ratio Scotopic Lumens
	$24,500 \times 0.62 = 15,190$
250W HPS	Lumens S/P Ratio Scotopic Lumens

## HOW A 150 WATT LAMP CAN REPLACE A 400 WATT LAMP AND STILL PROVIDE MORE LIGHT!

### The Science Of Scotopic Lumens

Scotopic Lumens is a scientific way to measure the light we see. It measures the quality of the perceived light. This perception which occurs in our eye is the reason one lamp can look brighter than another, even though they both have the same lumens.

This phenomenon occurs because the human eye sees light several ways at the same time. (It has to do with the rods and cones in the eye). Technical measuring tools, however, measure light in one dimension only. They do not allow for the perceived value of light that a human eye sees. This perceived value of light is measured in Scotopic Lumens. And different light sources have different Scotopic Ratios. (See Chart 1)

The scotopic lumens of a light source are determined by multiplying the lumens by the Scotopic Ratio of the light source. (See Chart 2: The HighMax CFL has more useable (scotopic) lumens, and uses less energy than the HID lamp; even though the HID lamp had more initial lumens).

Use the Scotopic Lumen Cross Reference Chart below as a guide to replacement wattages. Calculate which is the lowest wattage that can be used to replace the existing HID source.

For more information on these and other MaxLite products, please contact your MaxLite representative or manager

Product "Scotopic" Lumen Cross Reference Chart\*

HighMax 5000K	40W	60W	80W	100W	150W	200W
Mercury Vapor	175W		250W		400W	
High Pressure Sodium	75W	100W	150W	175W	200W	400W
Low Pressure Sodium	90W	180W				
Metal Halide	100W	120W	150W	175W	200W	320-400W

\*Replacement wattages are for comparison only.

**MaxLite** Tel: 1-800-555-5629  
 Fax: 973-244-7333  
 E-mail: info@maxlite.com  
 Web: www.MaxLite.com

**ENERGY STAR PARTNER**

# HighMax CFLs



## COMMERCIAL FIXTURES AND LAMPS SPECIFICATIONS

### HIGHMAX CFLs



For more information on MaxLite products, visit:  
www.MaxLite.com

#### FOR ORDERING:

Tel: 1-800-555-5629  
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E-mail: info@maxlite.com

MaxLite  
12 York Ave  
West Caldwell, NJ  
07006

#### PRODUCT FEATURES:

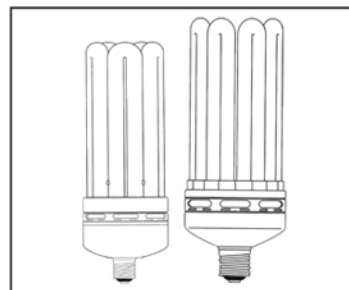
- High Lumens (up to 12,000) using less energy
- Long Life - 10,000 Hour $\Delta$
- Shortened MOL to fit common fixtures
- Self Ballasted / Instant-on
- Available in 120V, 277V, and 347V with Edison or mogul base, 2700K and 5000K

$\Delta$  MTF - Mean Time to Failure

PATENT PENDING FOR HEAT  
MANAGEMENT SYSTEM  
Publ'n No. 20090153061



MAX11148-24



## MAXLITE HIGHMAX CFLs

**Lamp:** The HighMax is a high wattage, self ballasted, instant on, compact fluorescent lamp. The lamps comprise both 5U and 8U models and the wattages run from 40 Watts through 200 Watts. The HighMax is available for both 120 Volts and 277 Volts, with some models also available in 347 Volts (Canada).

**Lumen Maintenance/ Heat Management:** All HighMax Models are designed to manage heat so that the lumen maintenance is maximized. Critical components (susceptible to heat failure) are chosen for their high heat tolerance. The body of the lamp is vented with patented air gaps to increase cooling air flow. And, placed between the heat producing components and the heat-sensitive ones is a thick aluminum wafer. This barrier is a heat sink, removing even more heat from the lamp.

**Uses:** For high and low bays, gymnasiums, warehouses, churches, wall packs, shop floors and parking garages.

**LIFE:** 10,000 hours all models  
 $\Delta$  MTF - Mean time to Failure

**PACK:** All lamps individually boxed  
**CASE:** 6 units per case

#### PRODUCT FEATURES:

- High Lumens (up to 12,000) using less energy
- Long life - 10,000 Hour  $\Delta$
- Shortened MOL to fit common fixtures
- Self Ballasted / Instant-on
- Available in 120V, 277V, and 347V, with Edison or mogul base, 2700K and 5000K

Watts	Order Code	Description	Voltage	HID Equivalent	Lumens	Scotopic Lumens	Efficacy (LM/W)	Power Factor	Current	Dimensions (W"xMOL")	K
40	11212	SKQ40EAWW 5U E26	120	100MH	3,000	n/a	75	0.5	0.67	3.5 x 6.8	2700
40	11211	SKQ40EA50 5U E26	120	100MH	3,000	5,900	75	0.5	0.67	3.5 x 6.8	5000
40	11183	SKQ40EA250 5U E26	277	100MH	3,000	5,900	75	0.9	0.16	3.5 x 6.8	5000
40	11291	SKQ40EA350 5U E26	347	100MH	3,000	5,900	75	0.9	0.13	3.5 x 6.8	5000
60	11272	SKQ60EAWW 5U E26	120	175MH	4,200	n/a	70	0.5	1.00	3.5 x 9.1	2700
60	11271	SKQ60EA50 5U E26	120	175MH	4,200	8,232	70	0.5	1.00	3.5 x 9.1	5000
60	11270	SKQ60EA250 5U E26	277	175MH	4,200	8,232	70	0.9	0.24	3.5 x 9.1	5000
60	11292	SKQ60EA350 5U E26	347	175MH	4,200	8,232	70	0.19	0.24	3.5 x 9.1	5000
80	11275	SKQ80EAWW 5U E26	120	175MH	5,500	n/a	68	0.5	1.33	3.5 x 10.4	2700
80	11274	SKQ80EA50 5U E26	120	175MH	5,500	10,780	68	0.5	1.33	3.5 x 10.4	5000
80	11273	SKQ80EA250 5U E26	277	175MH	5,500	10,780	68	0.9	0.32	3.5 x 10.4	5000
80	11293	SKQ80EA350 5U E26	347	175MH	5,500	10,780	68	0.9	0.26	3.5 x 10.4	5000
100	35844	SKQ100EAWW 5U E39	120	250MH	6,900	n/a	69	0.5	1.67	3.5 x 12.5	2700
100	35840	SKQ100EA50 5U E39	120	250MH	6,900	13,524	69	0.5	1.67	3.5 x 12.5	5000
100	35839	SKQ100EA250 5U E39	277	250MH	6,900	13,524	69	0.9	0.40	3.5 x 12.5	5000
100	11294	SKQ100EA350 5U E39	347	250MH	6,900	13,524	69	0.9	0.32	3.5 x 12.5	5000
150	35862	SKO150EAWW 8U E39	120	250-400W MH	9,200	n/a	61.3	0.5	2.50	5.0 x 12.5	2700
150	35861	SKO150EA50 8U E39	120	250-400W MH	9,200	18,032	61.3	0.5	2.50	5.0 x 12.5	5000
150	35863	SKO150EA250 8U E39	277	250-400W MH	9,200	18,032	61.3	0.9	0.60	5.0 x 12.5	5000
150	11295	SKO150EA350 8U E39	347	250-400W MH	9,200	18,032	61.3	0.9	0.48	5.0 x 12.5	5000
200	35872	SKO200EAWW 8U E39	120	400MH	12,000	n/a	60	0.5	3.33	5.0 x 13.75	2700
200	35871	SKO200EA50 8U E39	120	400MH	12,000	23,520	60	0.5	3.33	5.0 x 13.75	5000
200	35873	SKO200EA250 8U E39	277	400MH	12,000	23,520	60	0.9	0.80	5.0 x 13.75	5000
200	11296	SKO200EA350 8U E39	347	400MH	12,000	23,520	60	0.9	0.64	5.0 x 13.75	5000

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#### Accessories

Watts	Order Code	Description
N/A	11259	SKXE40 Mogul to Edison socket converter

All specifications are subject to change without notice

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The Training Department: Product and Marketing Division:



# HighBay Fixtures



## COMMERCIAL FIXTURES AND LAMPS SPECIFICATIONS

### T8&T5 HighBay Fixture



SKFHBLT86



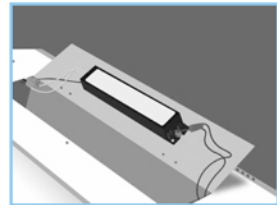
SKFHBLT84



SKFHBLT56



SKFHBLT54



#### HighBay Fixture Door

Hinged access door on the back of the fixture eliminates the need to take off the reflector to wire the ballast.

For more information on MaxLite products, visit: [www.MaxLite.com](http://www.MaxLite.com). Click on "PRODUCT LINE"

#### FOR ORDERING:

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 Fax: 973-244-7333  
 E-mail: [info@maxlite.com](mailto:info@maxlite.com)

MaxLite  
 12 York Ave  
 West Caldwell, NJ  
 07004

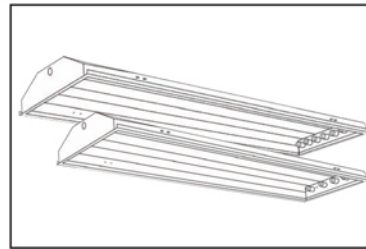
#### PRODUCT FEATURES:

- Designed for HID to Fluorescent retrofit
- High Polish Reflector – 90% enhanced
- High Efficiency - Universal Voltage Ballast
- Quick Connects - For Easy Install
- Hooks and Chains - For Mounting
- Hinged Access Door for Ballast Change
- Maximum Photometric Efficiency
- 5-Year Warranty
- 20 Gauge Galvanized Steel
- Knockouts on each end for motion sensor mounting
- HPT8 Certified; visit [www.CEE1.org](http://www.CEE1.org)

All specifications are subject to change without notice



MAX11043-2-14



## MAXLITE T8 & T5 HighBay Fixtures

**Fixture:** 20 Gauge die formed Galvanized Steel housing, with post-painted white baked on enamel to guarantee long life, even in harsh environments. Hinged ballast door means easy access to the ballast without tools or without taking down the fixture. Ample slots for hook and chain hanging (supplied). Fixture is shipped fully wired.

**Reflectors:** High polish reflector is 90% enhanced for maximum light output. Reflector designed for maximum photometric efficiency and maximum lumens.

**Ballast:** The fixture comes standard with MaxLite's High Efficiency Universal Voltage Ballast; for 120 Volts through 277 Volts (inclusive). This is a Nominal Ballast Factor ballast. Also available for special order is MaxLite's High Efficiency High Ballast Factor Universal Ballast; for 120Volts through 277 Volts (inclusive). Both the fixture and the ballasts have Quick Connects to speed up install and maintenance.

**Accessories:** Wire Guards and Lens and Door Frames come with Easy Lock catches which enable fixture to be opened from either side. Halves maintenance time as it eliminates excess moving of ladders or lifts. 10 Foot 3-Wire cord with plug also has Quick Connects for easy install.



SKFHBLC120



SKFHBLC277

#### PRODUCT FEATURES:

- Designed for HID to Fluorescent retrofit
- High Polish Reflector – 90% enhanced
- High Efficiency - Universal Voltage Ballast
- Quick Connects - For Easy Install
- Hooks and Chains - For Mounting
- Hinged Access Door for Ballast Change
- Maximum Photometric Efficiency
- 5-Year Warranty
- Knockouts on each end for motion sensor mounting
- 20 Gauge Galvanized Steel
- HPT8 Certified; visit [www.CEE1.org](http://www.CEE1.org)

(B) Complete the Build-A-Model worksheet; then transfer the complete model number here:

**WRITE YOUR COMPLETED MODEL NUMBER HERE:**

(A) Work from left to right to build your model number. Choose the options you want, and write the corresponding code on the blank line.

#### BUILD-A-MODEL:

Example: SKFHBLT56 / SKFHBLC277 / SKFHBL6WG

#### SKFHBL

SERIES	LAMPS	# OF LAMPS	BALLAST FACTOR	VOLTAGE CORD WITH PLUG	COVER OPTIONS	OTHER OPTIONS
SKFH = MaxLite HighBay fixture	T5 = T5 Lamps T8 = T8 Lamps	4 = 4 Lamps 6 = 6 Lamps	— = High efficiency nominal ballast factor. This is the standard ballast. Write nothing in the model #.  HEH = High efficiency high ballast factor. If you want this ballast write HEH in the model #.	SKFHBLC277 = 277V cord with plug  SKFHBLC120 = 120V cord with plug	SKFHBL6WG = 6 lamp wire guard  SKFHBL4WG = 4 lamp wire guard  SKFHBL6DF = 6 lamp lens and door frame  SKFHBL4DF = 4 lamp lens and door frame	MS = Motion Sensor. (Available only on T5's)

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MAX11043-2-14



The Training Department: Product and Marketing Division:



# LED - Large 60W Wall Pack: Dark Sky

## MLLWP60LED50DS

LED WALLMAX - LARGE 60W WALL PACK: DARK SKY



Fully qualified where "Dark Sky compliance" is required; DLC listed on the "Approved Product List", so the fixture is available in all programs that require approved products.

**LED Module:** Full cut-off at 90 degree plane. This makes the fixture an efficient, energy saving replacement for metal halide and high-pressure sodium fixtures. Self-contained UL Driver.

Fixture can mount to electrical box or direct to surface.

### FEATURES:

- Replaces up to 250 Watt Metal Halide
- DLC qualified
- Dark Sky approved
- Lumens delivered 4400
- 69 Watts total consumed
- CCT 5000K
- 50,000 hour life at L70 standards
- Self-contained driver
- Universal 120V through 277V
- Maintenance free; no UV
- Dusk To Dawn / Occupancy sensor compatible
- Can mount on electrical box or direct to surface
- LM-79/80, and Insitui data available
- 5 Year Limited Warranty
- 20W, 30W, and 40W models available
- Does not attract insects



PROJECT NAME
CATALOG NUMBER
NOTES
FIXTURE TYPE

### CONSTRUCTION:

**Fixture:** Heavy-duty cast aluminum one-piece housing; epoxy coated; rust and corrosion proof. Fixture is sealed to be dirt and bug proof.

**Lens:** High quality anti-shock Boron glass.

**LED Module:** Copper plating to provide high thermal transfer rate minimizing junction temperature of LED to maximize service life.



Luminaire Ordering Information:

WATTS	ORDER CODE	MODEL NUMBER	LUMENS	LAMP LIFE (Hrs)	DIMENSIONS (L"xW"xH")	K
60	70908	MLLWP60LED50DS	4400	50,000	16.9 x 13.6 x 9.0	5000

Lighting layouts and spacing criteria available upon request

\*Caution: This fixture is Dark Sky compliant and designed for downward illumination only.

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## LED WALLMAX - LARGE 60W WALL PACK: DARK SKY

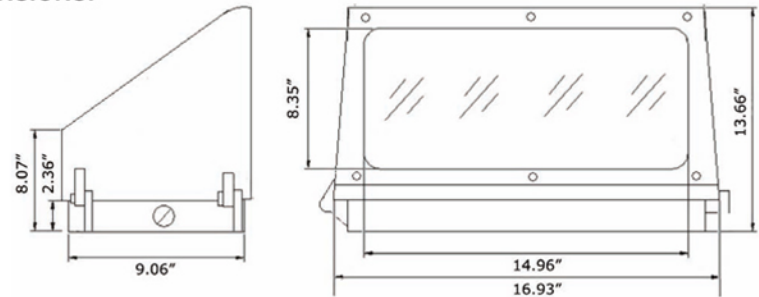


### SPECIFICATIONS:

Item	Specification	Details
<b>General Performance</b>	Spacing Criteria	Available upon request
	Color Temperature	5000K
	Lumens	4400
	Efficacy	64 lumen/watt
	Color Consistency	Proprietary binning for uniform color
	Lumen Maintenance (L70)	50,000 hours
<b>Electrical</b>	Power Factor	Over 98%
	Input Voltage	120V-277V 50/60 Hz
	Power Consumption	69 Watts
<b>Physical</b>	Dimensions	16.9" x 13.6" x 9.0"
	Weight	10.5 lbs
	Housing	Aluminum
	Lens	Anti-Shock Boron Glass
	Mounting	Fits electrical box or mount direction surface
	Operating Temperature	-30°F to 130°F
	Humidity	20% - 85% RH, non condensing
<b>Certification</b>	Certification	ETL, FCC, DLC, NEEP, LM79, LM80
	Material Usage	RoHS compliant; no mercury
	Environment	Indoor / Outdoor
	LED Class	L70 rated to 50,000 hours

Lighting layouts and spacing criteria available upon request

### DIMENSIONS:



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The Training Department: Product and Marketing Division:



# MaxLite Webinars

MaxLite has been hosting free webinars once per month on a variety of topics. A lot of great content has been presented, here's how to find it:



- MaxLite.com - click on the red “WEBINAR SCHEDULE & SIGNUP” button to see what’s on the schedule. Click the “MAXLITE WEBINAR LIBRARY” icon to see previous webinars.
- Check/Subscribe to our YouTube channel
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- [http://www.lakefrontlighting.ca/pdf/Education\\_PhotopicScotopicLumens\\_1.pdf](http://www.lakefrontlighting.ca/pdf/Education_PhotopicScotopicLumens_1.pdf)
- <http://www.lightresource.com/article9.html>
- Veitch, J.A., and McColl, S.I., (1995) Modulation of fluorescent light: Flicker rate and light source effects on visual performance and visual comfort, *Lighting Research and Technology*, 27, 243-256.
- <http://www.ergolight.com/articles/berman.html>
- Boyce, P.R., Akashi, Y., Hunter, C.M., and Bullough, J.D., (2002) The impact of spectral power distribution on visual performance, LRC report to the US Department of Energy (to be published in *Lighting Research and Technology*)
- Visual Performance and Light Spectrum: The Inadequacy of Conventional Photometry, S. Berman, G. Fein, D. Jewett, B. Benson, T. Law and A. Myers, December 1994, LBL-37861, Proceedings of the CIE Symposium on Advances in Photometry, Vienna, Austria, December 1994.



**Thanks for your time and attention!**



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