

# APACK Introduction (LED)

[www.apack.net](http://www.apack.net)



# Company Brief

Profile

## Foundation

July 16, 1999

## CEO & Executives

CEO : Song Kyusop  
Board member : Kim Kwangsoo Ph.D.(VP/ CTO)  
Son Kyunghwan (MKT), Yun Jangsoo(Solar Biz.)  
Electronics and Telecomm. Research Institute (ETRI) spin-off company

## Business

LED Lighting, Solar Thermal System,  
PC Cooler, Customized Thermal Solutions, Printer Heating Roller

## Capital

USD 2.1Million (2006, Intel Capital, USD 3Million invested)

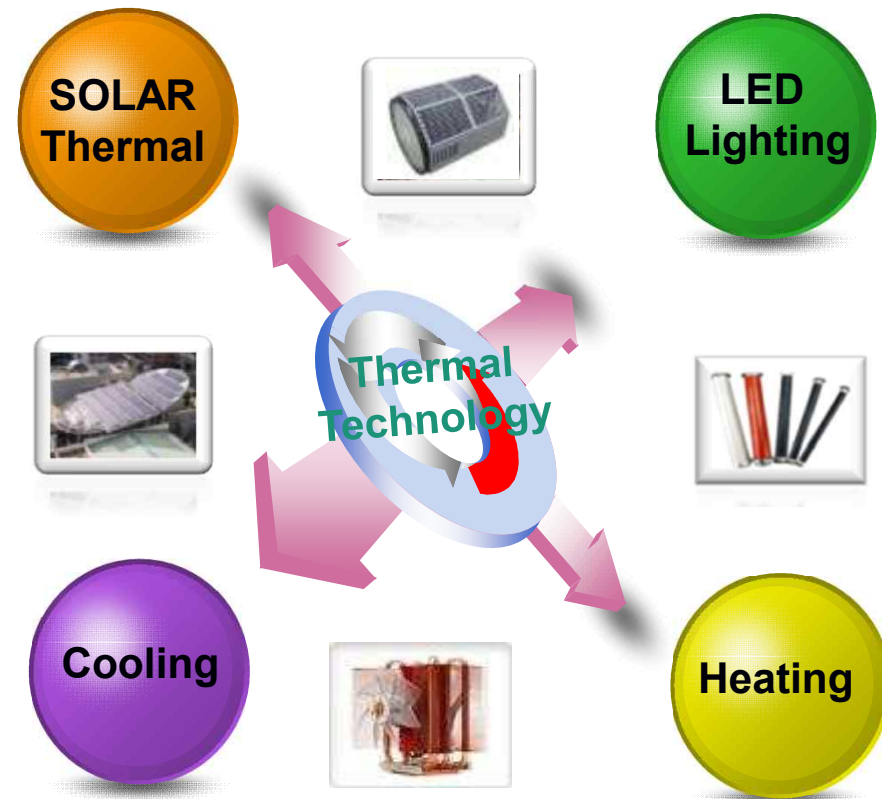
## Certification

CE, UL, RoHS, TS16949, ISO 9001, ISO 14000 Certified, Green Tech.

## Location

HQ & 1<sup>st</sup> Factory: 838 Daedeok-daero, Yuseong-gu, Daejeon, Korea  
2<sup>nd</sup> Factory : 22 Cheomdan venture-ro 28beon-gil, Buk-gu, Gwangju, Korea  
Partners: US, Canada, Germany, Japan, Malaysia, Qatar (Over 25 in W/W)

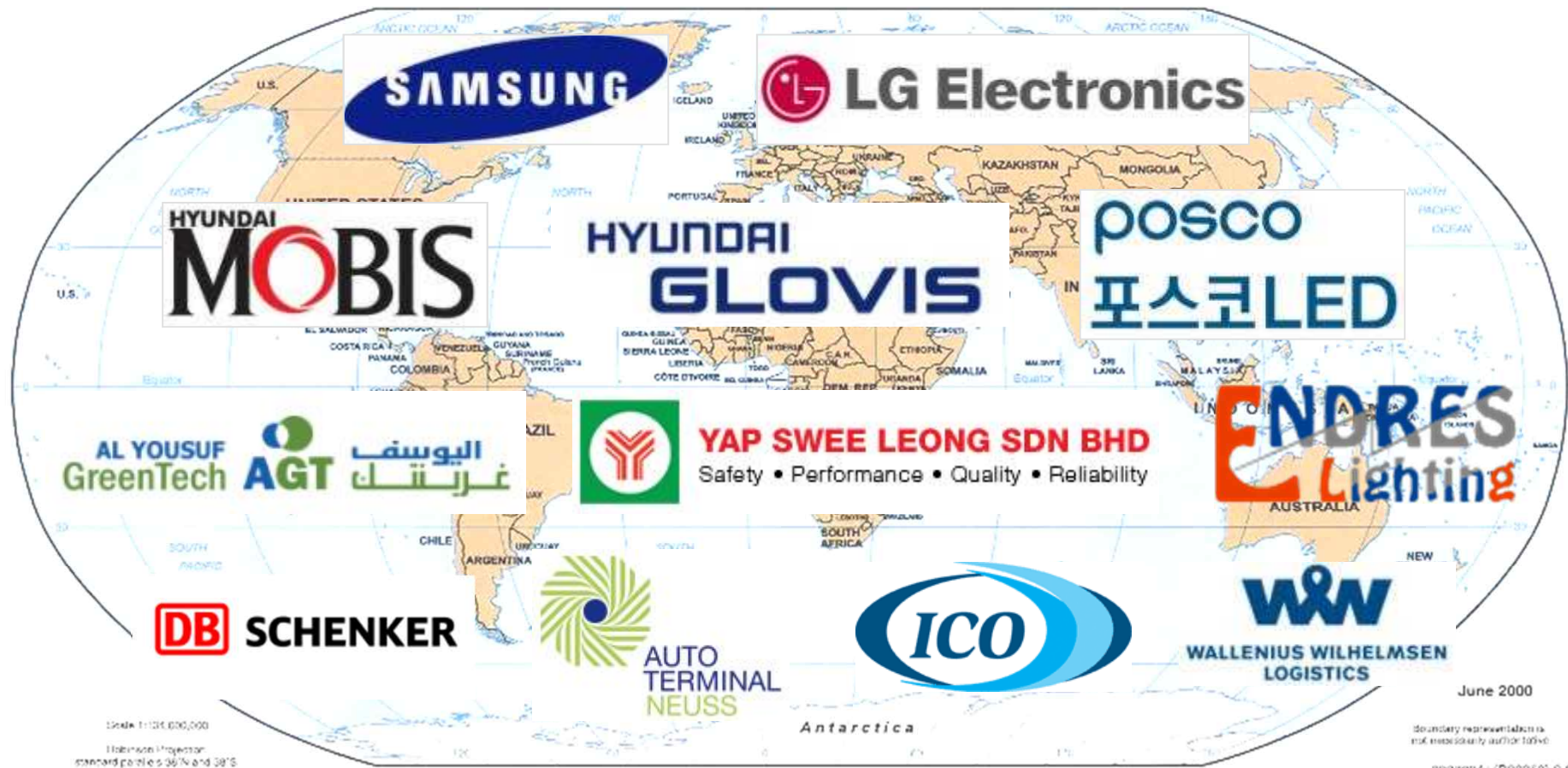
- **Green Lighting**
  - LED Lighting
  - Automotive LED Head Light
- **Green Energy [Solar Thermal System]**
  - Solar Air-conditioning & Heating System
  - Solar Hot Water Heater
  - Solar Desalination
- **Green IT**
  - Computer Cooler
  - Electronics Cooling
  - Laser Printer Heating Roller





# Company Brief

Partner



# Company Brief

Milestone

**1999**

APACK, Inc. Established

**2001**

MP Started for LGE/PC Cooler

**2006**

Intel Capital Investment  
(USD 3M)

**2007**

First LED Lighting installation  
@National Assembly Hall, Korea

**2011**

G70L Security Light Certified  
High Efficient Energy Product  
GREEN COMPANY  
Selected by KOREA government

**2012**

TS 16949 Certificate  
MP Started for Kia Motors / LED Head  
Light Module  
POHANG New Port - First LED Harbor  
Lighting Install

1999

2004

2007

2009

2012

2014

**2002**

MP Started for SEC/Printer  
Heating Roller

**2003**

ISO9001:2000 &  
ISO14001:1996 Certificate

**2004**

First Solar-driven cooling  
system Demonstration Study

**2008**

5M USD Export Monument  
Prize

**2009**

Development of LED IC  
driver and high efficiency  
LED lighting

**2013**

KS, CE, UL Certificate  
- LED Lighting  
Sports Lighting Installation-  
YAHOO DOME, Dallas Cowboys,  
US NFL stadium

**2014**

Expand Biz. In Europe -  
DBSCHENKER, ATN, ICO  
Sports Lighting – VfB Stuttgart



# Company Brief

# Quality Management

## Certified Samsung SQCI (Supplier Quality Control Innovation)



## ISO 9001,14001 Certification



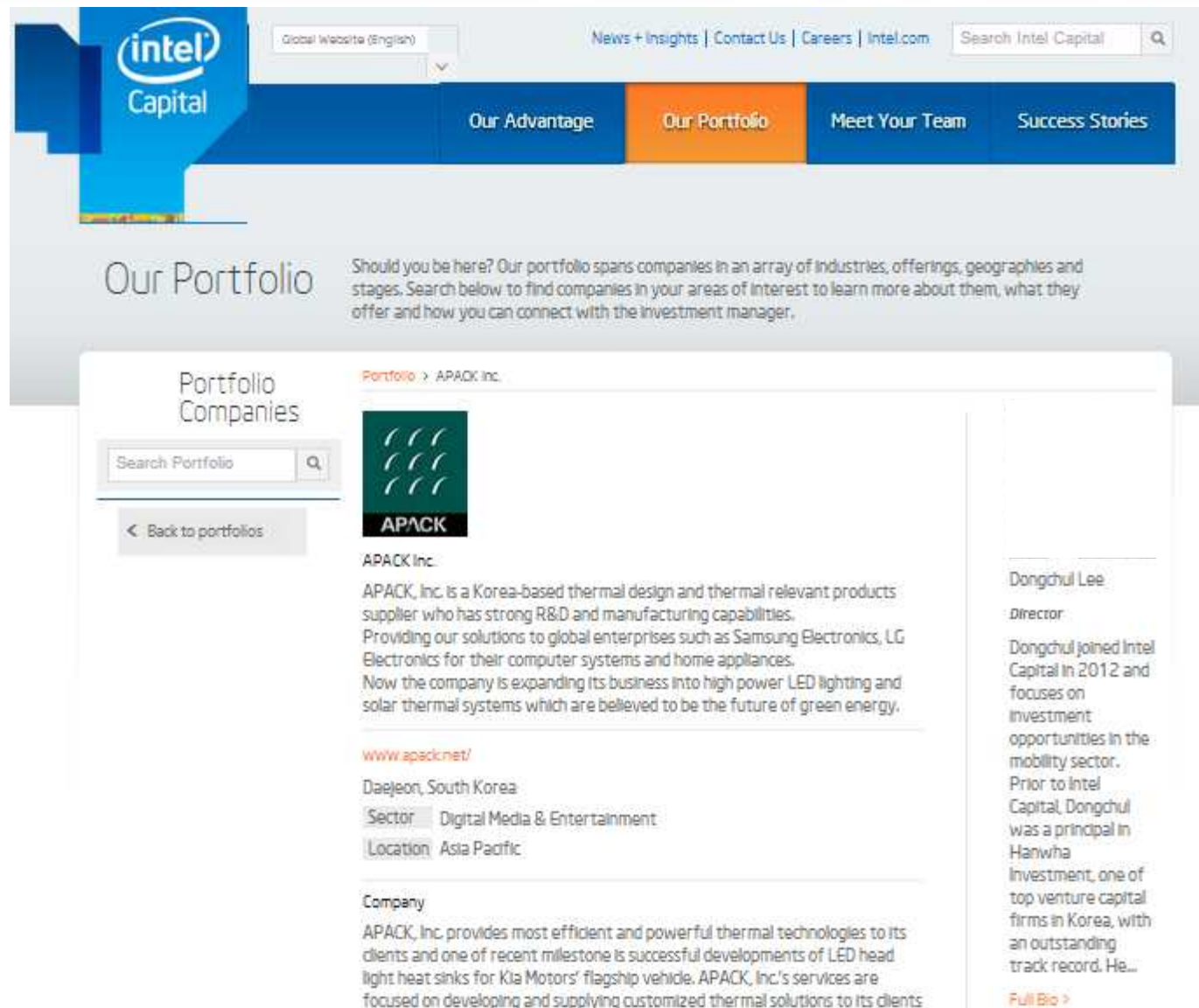
## TS 16949 Certification





# Company Brief

## Intel Investment



The screenshot displays the Intel Capital website's 'Our Portfolio' section. At the top, the Intel Capital logo is on the left, and navigation links for 'Global Website (English)', 'News + Insights', 'Contact Us', 'Careers', and 'Intel.com' are on the right. A search bar for 'Intel Capital' is also present. Below the navigation bar, a horizontal menu highlights 'Our Portfolio' in orange, with other options like 'Our Advantage', 'Meet Your Team', and 'Success Stories' in blue. The main heading 'Our Portfolio' is followed by a descriptive paragraph. A 'Portfolio Companies' sidebar on the left includes a search bar and a 'Back to portfolios' link. The main content area features the APACK logo, a brief description of the company, its website, location, sector, and a 'Full Bio' link. A biographical note about Dongchul Lee, Director, is shown on the right.

Global Website (English) | News + Insights | Contact Us | Careers | Intel.com | Search Intel Capital

Our Advantage | **Our Portfolio** | Meet Your Team | Success Stories

### Our Portfolio


Should you be here? Our portfolio spans companies in an array of industries, offerings, geographies and stages. Search below to find companies in your areas of interest to learn more about them, what they offer and how you can connect with the investment manager.

#### Portfolio Companies

Search Portfolio

< Back to portfolios

Portfolio > APACK Inc.



**APACK Inc.**

APACK, Inc. is a Korea-based thermal design and thermal relevant products supplier who has strong R&D and manufacturing capabilities. Providing our solutions to global enterprises such as Samsung Electronics, LG Electronics for their computer systems and home appliances. Now the company is expanding its business into high power LED lighting and solar thermal systems which are believed to be the future of green energy.

[www.apack.net/](http://www.apack.net/)

Daejeon, South Korea

Sector Digital Media & Entertainment

Location Asia Pacific

**Company**

APACK, Inc. provides most efficient and powerful thermal technologies to its clients and one of recent milestone is successful developments of LED head light heat sinks for Kia Motors' flagship vehicle. APACK, Inc.'s services are focused on developing and supplying customized thermal solutions to its clients

**Dongchul Lee**

**Director**

Dongchul joined Intel Capital in 2012 and focuses on investment opportunities in the mobility sector. Prior to Intel Capital, Dongchul was a principal in Hanwha Investment, one of top venture capital firms in Korea, with an outstanding track record. He...

[Full Bio >](#)



### Head Office & 1<sup>st</sup> Factory

- Address : 59-6 Hwaam-dong, Yuseong-gu, Daejeon, Korea
- Plottage : 16,442m<sup>2</sup>
- Building area : 5,806m<sup>2</sup> (3 buildings)
- Main products : LED lighting, Cooler, Solar thermal system.



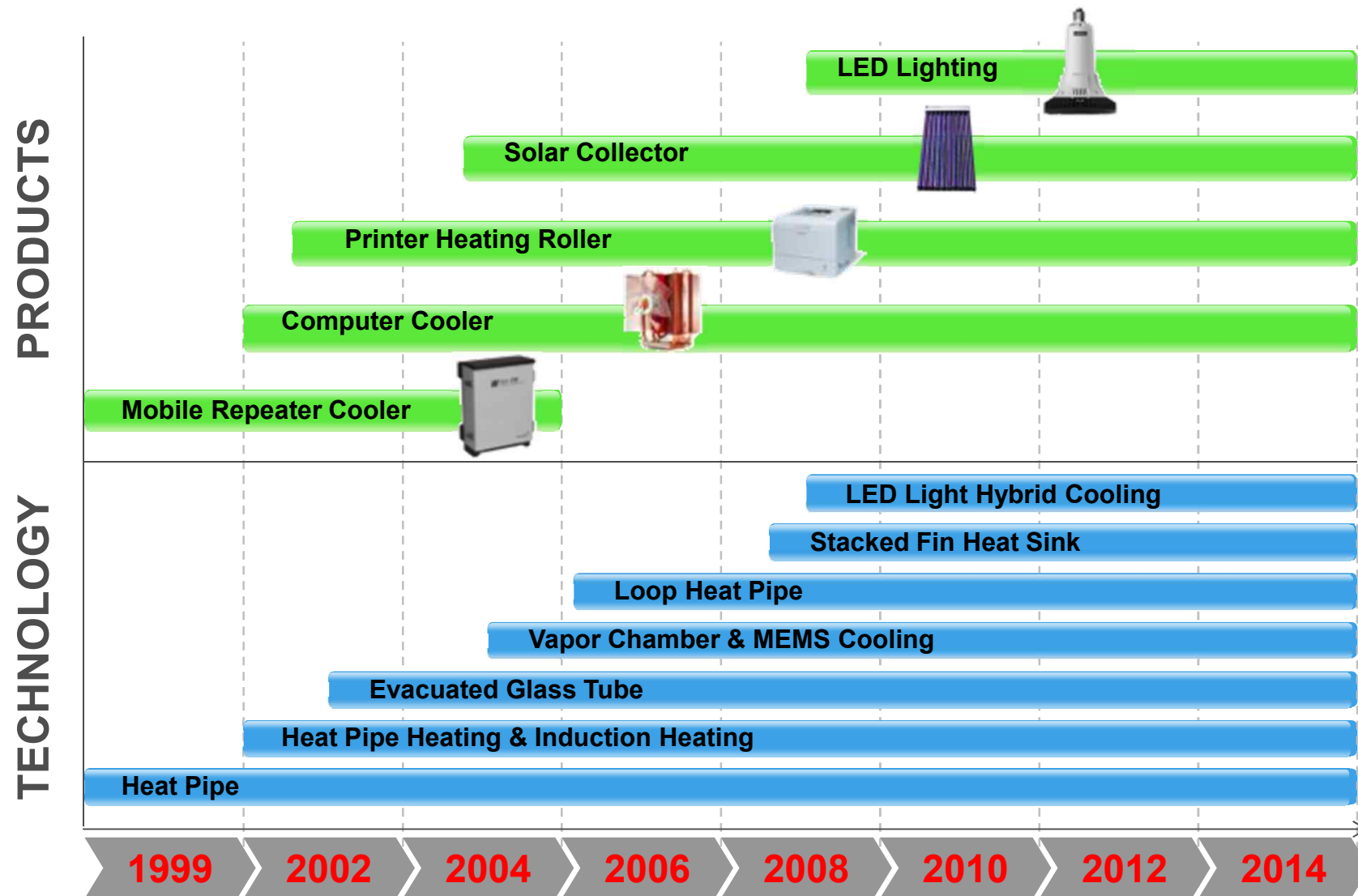
### 2<sup>nd</sup> Factory

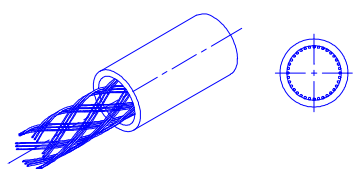
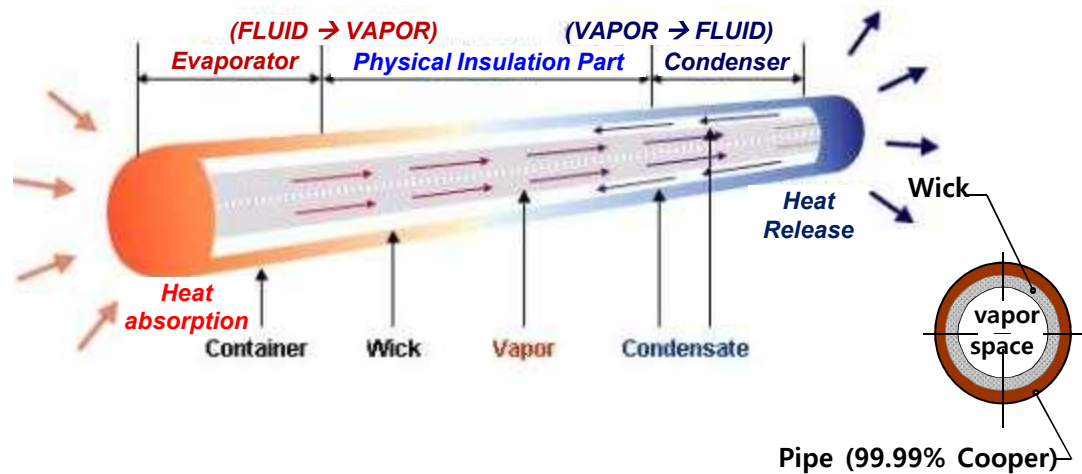
- Address : 959-47 Daechon-dong, Buk-gu, Gwangju, Korea.
- Plottage : 1,650m<sup>2</sup>
- Building area : 335m<sup>2</sup>
- Main products : LED lighting, Solar thermal system



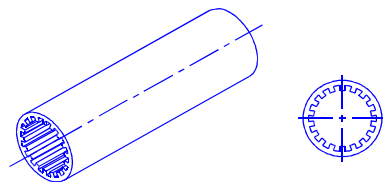
# Thermal Technology

Roadmap

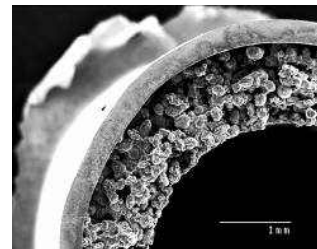




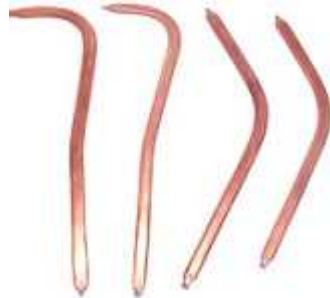
Woven-wired



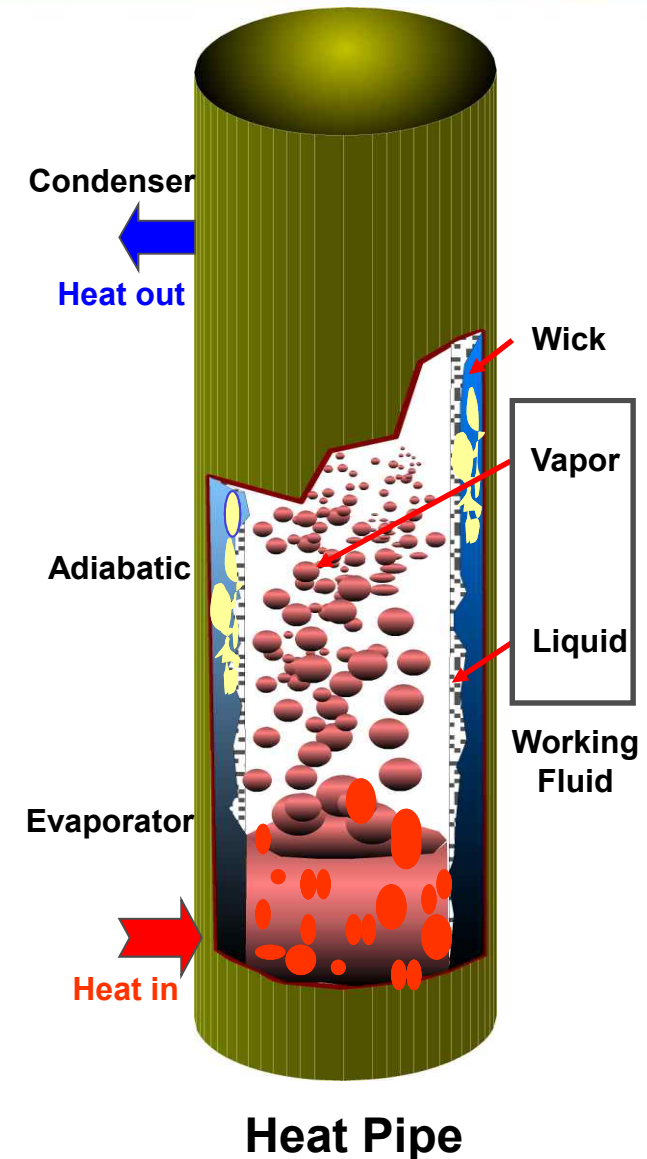
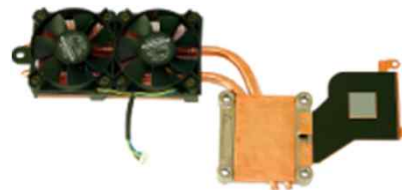
Axial groove



Sintered



*Flexibility of heat pipe*



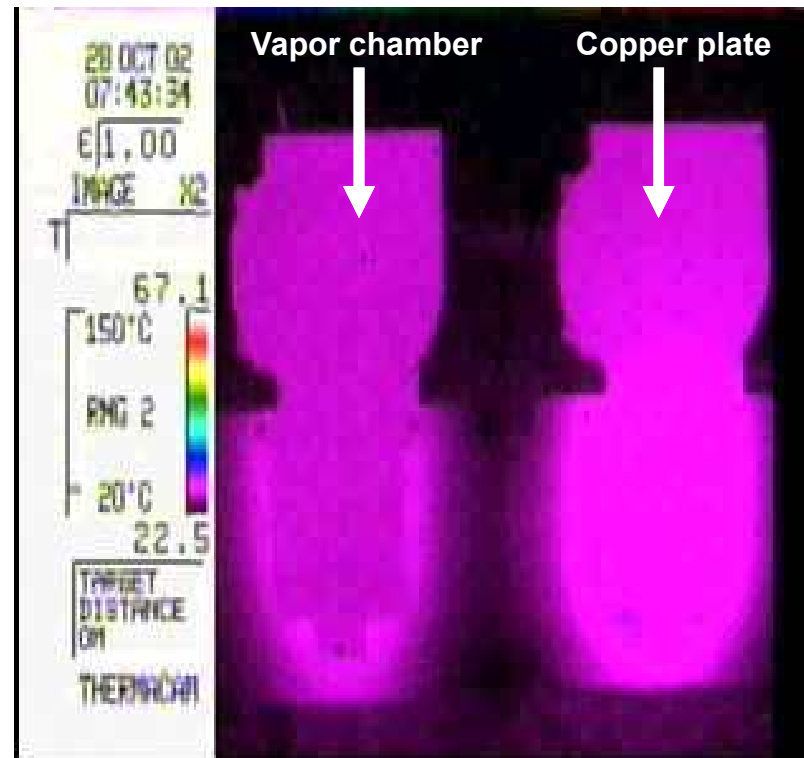
Heat Pipe

- **Application**

- Notebook CPU cooling
- PDA and mobile phone cooling

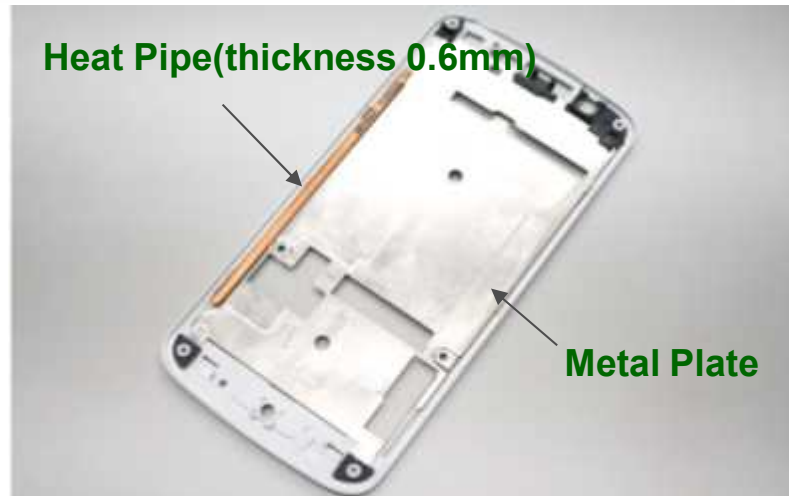
- **Specification**

- 80 W/cm<sup>2</sup> cooling capacity
- Metal wick by etching process
- Ultra-thin thickness (under 1.8mm)

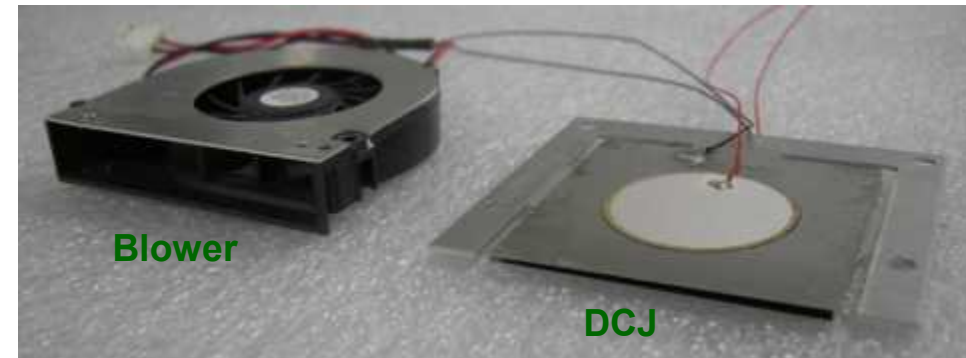


Comparison of the heat spreading performance





## Dual-Piezo Cooling Jet



**Min. Thickness : 0.45 mm**



## Ultra thin DCJ

- ◎1mm thickness is possible.
- ◎Low acoustic noise (<35dBA).
- ◎Low power consumption (<350mW).
- ◎Simple structure.

# LED Lighting

Why LED Light?

## Economic Feasibility

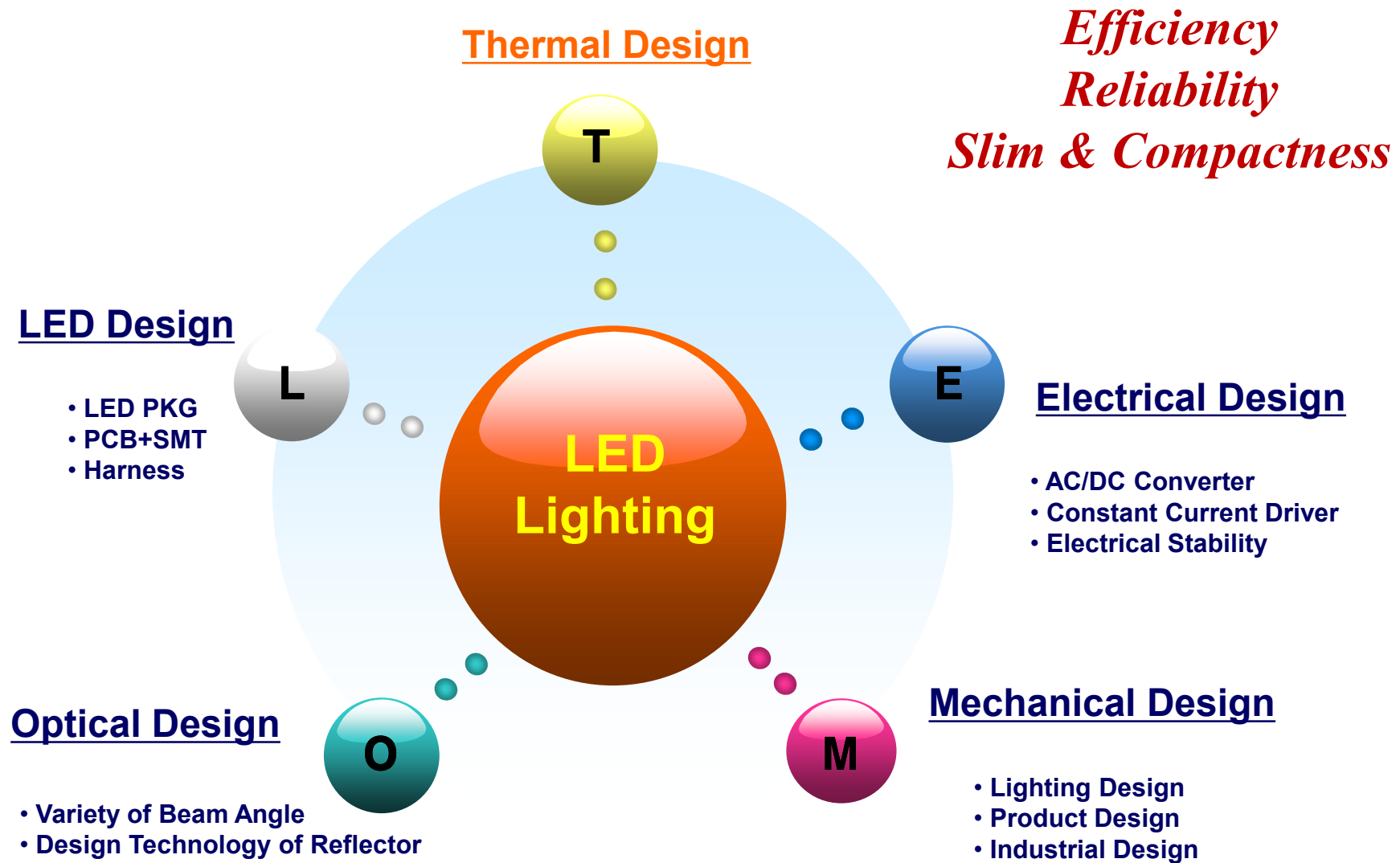
- Long life span (50,000hours)
- Save maintenance cost
- Save electricity cost (Save over 60% )

## Eco-friendly

- Less Heat
- No Mercury
- No UV & IR

## Light Quality

- Dimming control
- Cool White, Warm White available
- Controllable beam angle (by lens)





### Out-door

#### Flood Light



FM Series



FT Series



FA Series



G Series



S Series



SL Series

#### Street Light

### Industrial

#### High-bay Light



FS Series

- 90~120Watt
- 110lm/W
- High Ceiling
- Factory
- Other Applications



BU Series

- 150~200Watt
- 110lm/W
- High Ceiling
- Factory
- Other Applications

### In-door

#### PAR Lamp



- Lobby
- Office
- Hotel
- Banquet Room
- Restaurant

#### Flat Light



- Office
- Apartment
- Government
- Store
- Shop
- Education

#### Parking Light



- Parking Lot
- Apartment
- Complex Bldg

#### Downlight



- Office
- Hotel
- Restaurant

#### T8 Tube



- Office
- Education
- Parking Lot

# LED Lighting

## Flood Light (FT Series)



### Specifications



Model	*By order from left image			
	F200T	F400T	F600T	F800T
Power Consumption [W]	200	400	600	800
Input Voltage [VAC]	90~305 / 50~60Hz			
Power Factor	Over 0.9			
Size [mm, LxWxH]	497 x 295 x 100	497 x 295 x 230	497 x 295 x 360	497 x 295x 490
Weight [kg, exc. M-Bracket]	4.8	10.1	15	20
Beam Angle[°]	15 / 20 / 30 / 45 / 60 / BATWING / Asymmetric			
Water Proof	IP66			
Color Temp.[K]	5,000 / 5,700			
CRI[Ra]	> 75 (*Optional 80Ra)			
Luminous Flux[lm]	22,000	44,000	66,000	88,000
Efficiency[lm/w]	110 (*100 for 80Ra)			
Operating Temp. [°C]	-30 ~ +50 (Internal SMPS type -30 ~ +45)			
Storage Temp. [°C]	-40 ~ +80			
Usage	Indoor & Out door sports filed, Tower, High Mast, Harbor, etc.			

# LED Lighting

## Flood Light (FT Series)



**F200TA (200W)**



**F400TB (400W)**



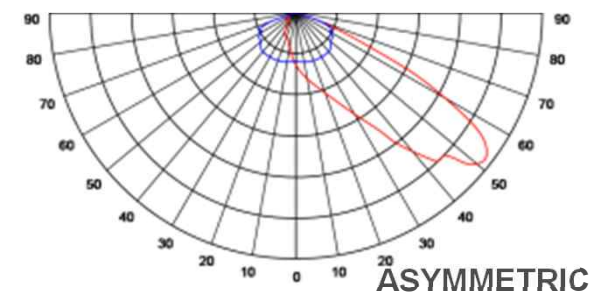
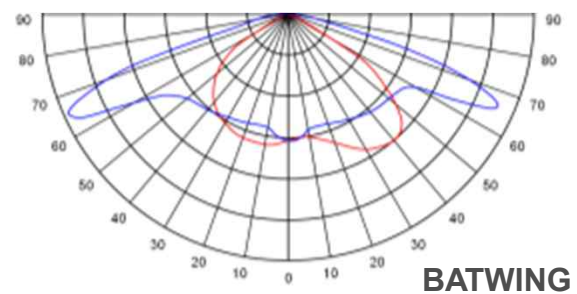
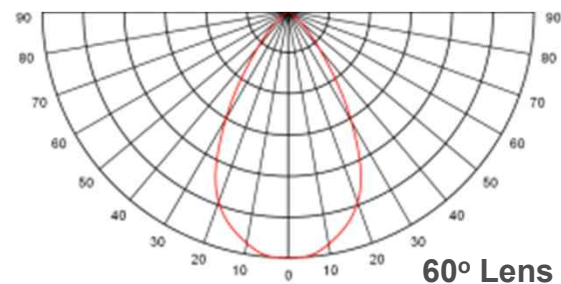
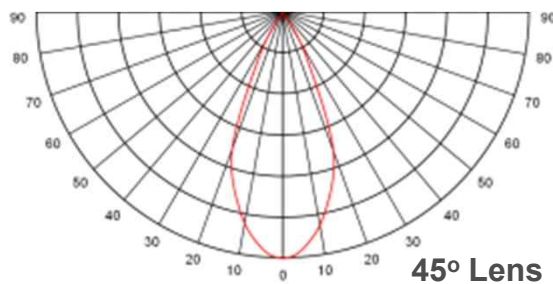
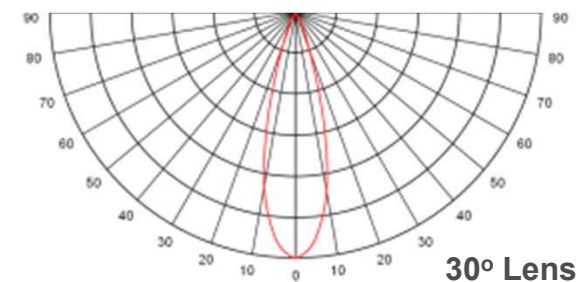
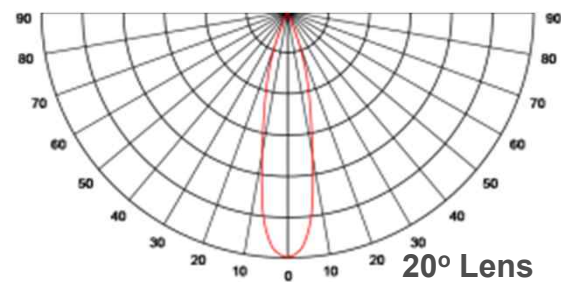
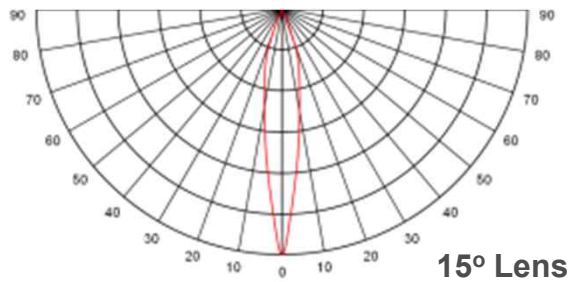
### Specification



Model	F200TA	F400TB
Power Consumption [W]	200	400
Input Voltage [VAC]	90~305 / 50~60Hz	
Power Factor	Over 0.9	
Size [mm, LxWxH]	697 x 120 x 255	697 x 230 x 255
Weight [kg, exc. SMPS & Bracket]	3.1	6.3
Beam Angle[°]	BATWING	
Water Proof	IP66	
Color Temp.	5,000K / 5,700K	
CRI[Ra]	Over 70	
Luminous Flux[lm]	22,000 / 44,000	
Efficiency[lm/w]	110	
Operating Temp. [°C]	-30 ~ +50 (Internal SMPS type : -30 ~ +45)	
Storage Temp. [°C]	-40 ~ +80	
Usage	Street Lighting, High Mast	



### ■ Beam Distribution

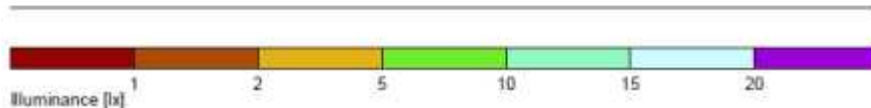
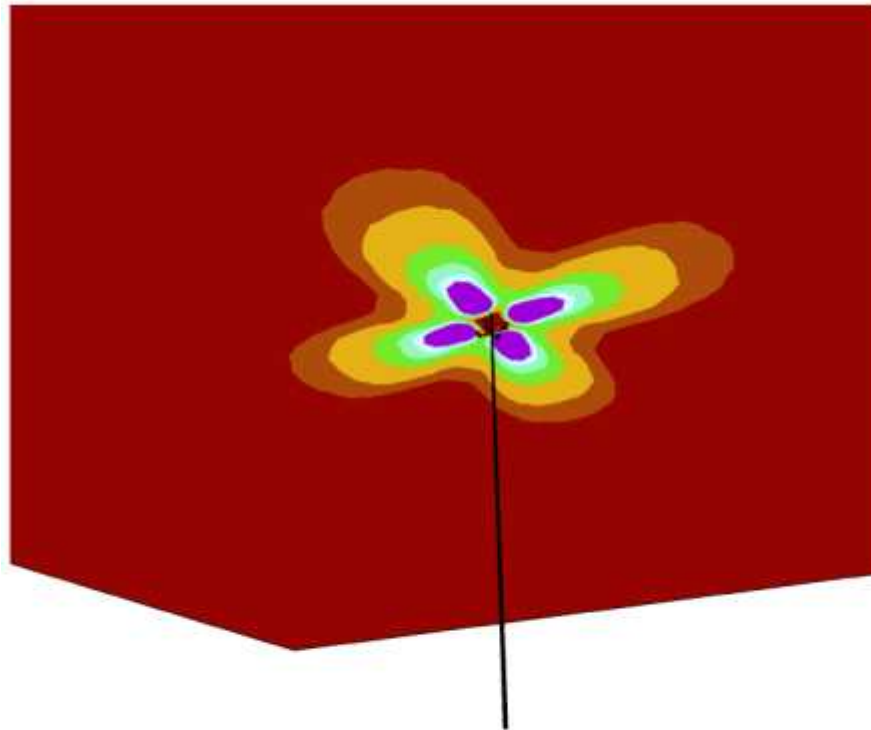


# LED Lighting

## Flood Light (FT Series)

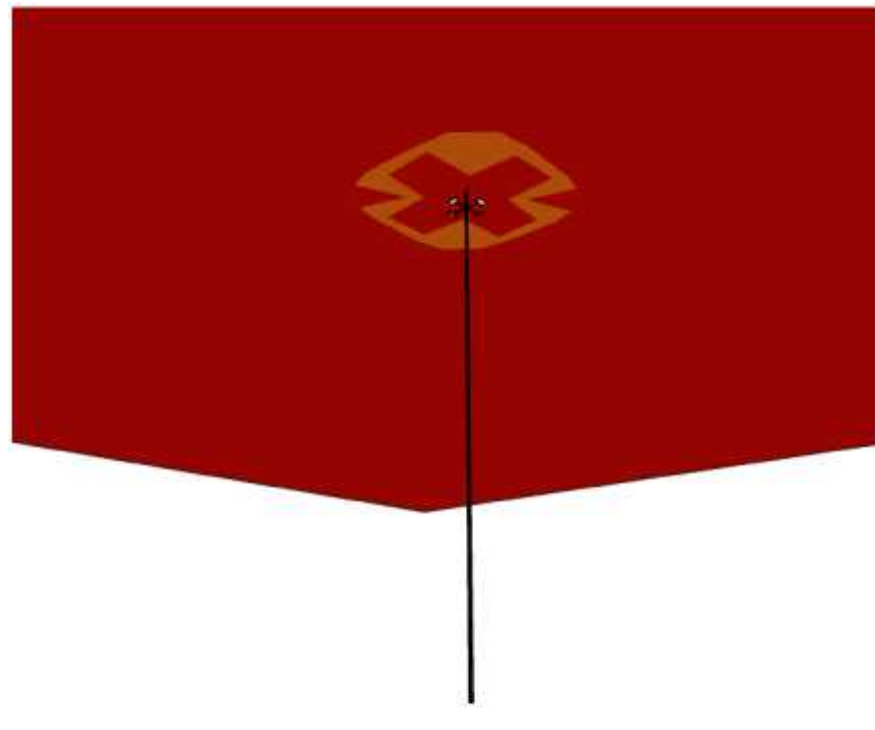
### ❖ Spill Light (Light Pollution)

LED Flood Light with conventional beam distribution



Average illuminance	Eav	: 0.1 lx
Minimum illuminance	Emin	: 0 lx
Maximum illuminance	Emax	: 13.1 lx
Uniformity U0	Emin/Eav	: ---
Uniformity g2	Emin/Emax	: ---

LED Flood Light with Asymmetric beam distribution

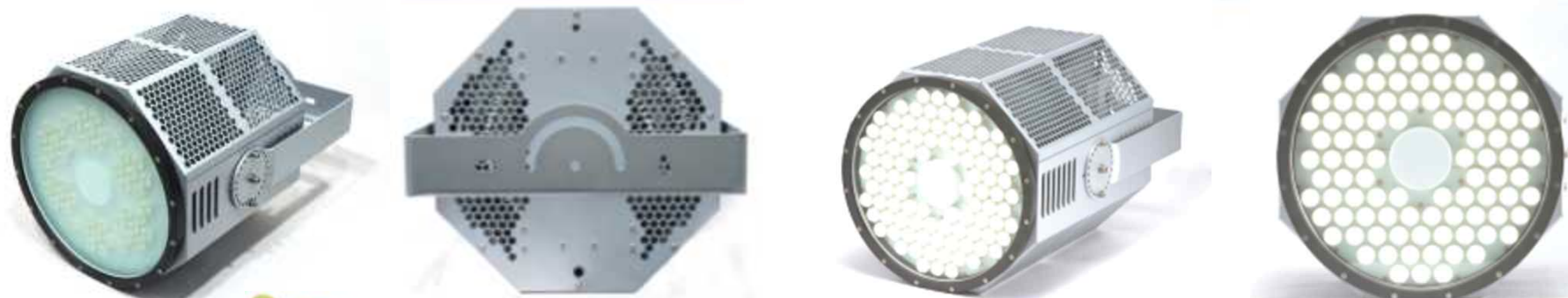


Average illuminance	Eav	: 0.02 lx
Minimum illuminance	Emin	: 0 lx
Maximum illuminance	Emax	: 0.48 lx
Uniformity U0	Emin/Eav	: ---
Uniformity g2	Emin/Emax	: ---

(Lower is better)

# LED Lighting

## Flood Light (FA Series)



Specifications



Model	F280A	F320A	F480A	F560A	F640A
Power Consumption [W]	280	320	480	560	640
Input Voltage [VAC]	90~305 / 50~60Hz				
Power Factor	Over 0.9				
Size [mm]	363(Φ) x 343(H)			363(Φ) x 451(H)	
Weight [kg, exc. SMPS & Bracket]	8.0 (10~11, inc. SMPS)			9.2 (12.6~13.2, inc. SMPS)	
Beam Angle[°]	15 / 20 / 30 / 45 / 60				
Water Proof	IP66				
Color Temp. [K]	5000 / 5700				
CRI[Ra]	75				
Luminous Flux[lm]	30800	35200	52800	61600	70400
Efficiency[lm/W]	110				
Operating Temp. [°C]	-30 ~ +50 (Internal SMPS type : -30 ~ +45)				
Usage	Railway, High mast, Tower, Sports Lighting, High Ceiling				



# LED Lighting

Street Light (GL Series)

High Power  
Cree LED  
(MX6/XP-G)

UV Protect

Slim &  
Light Weight

Hybrid Thermal  
Technique

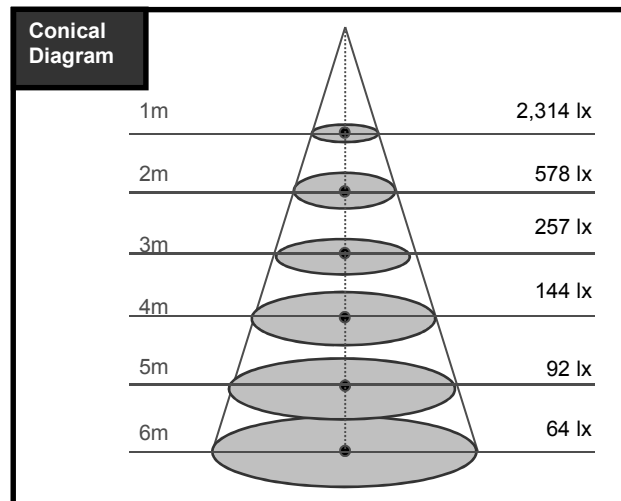
Starlight  
Design



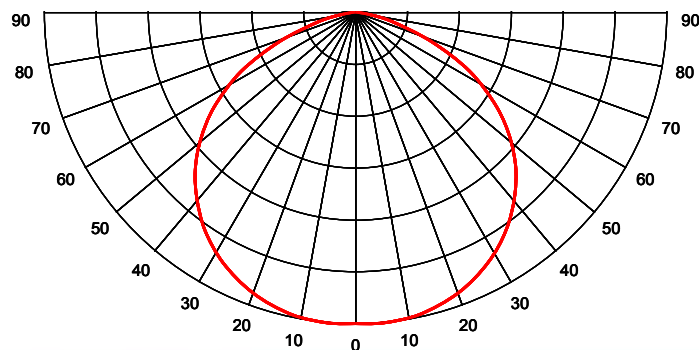
# LED Lighting

## Street Light (GL Series)

### Illuminance Distribution(G70L)



### Angular Distribution



### Specifications



Model	G70L	G120L
Power Consumption [W]	65	120
Input Voltage [VAC]	90~295 / 50~60Hz	
Power Factor	Over 0.9	
Size [mm]	343(Φ)X 30(H)	
Weight [kg] (Exc. SMPS)	2.9	
Beam Angle [°]	120	
IP Level	IP66	
LED PKG	Cree / LG	
Color Temp.	Warm / Neutral / Cool White	
CRI [Ra]	Over 80	Over 70
Luminous Flux [lm]	5,850	8,400
Efficiency [lm/W]	90	70
Operating Temp. [°C]	-30 ~ +50	
Storage Temp. [°C]	-40 ~ +80	
Usage	Sidewalk, Park, Parking lot, Street, Factory other guard lighting area	

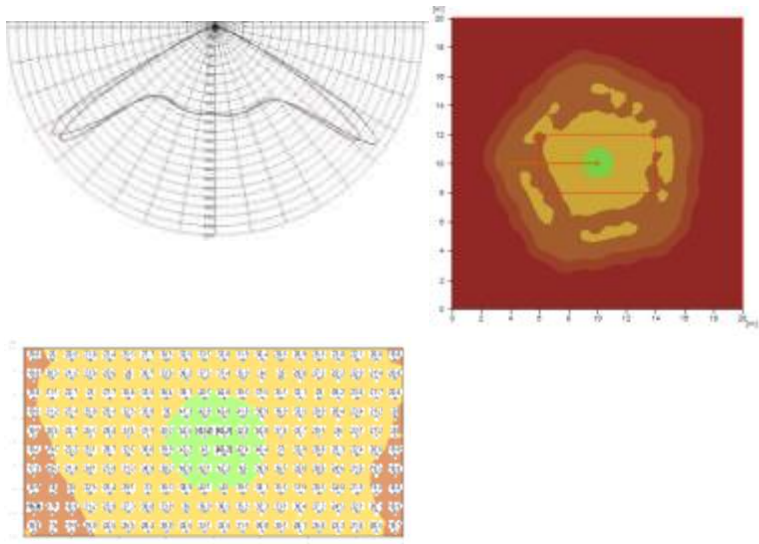
# LED Lighting

## Street Light (GLS Series)

### Lens Adopted Lamp



Lens for  
Guard Light



### Specifications



Model	G70LS	G120LS
Power Consumption [W]	65	120
Input Voltage [VAC]	90~295 / 50~60Hz	
Power Factor	Over 0.9	
Size [mm]	343(Φ)X 30(H)	
Weight [kg] (Exc. SMPS)	2.9	
Beam Angle [°]	BATWING	
IP Level	IP66	
LED PKG	Cree	
Color Temp.	Warm / Neutral / Cool White	
CRI [Ra]	Over 70	
Luminous Flux [lm]	5,525	9,000
Efficiency [lm/W]	85	75
Operating Temp. [°C]	-30 ~ +50	
Storage Temp. [°C]	-40 ~ +80	
Usage	Sidewalk, Park, Parking lot, Street, Factory, other guard lighting area	

# LED Lighting

Street Light (PV, Dimming)

Stand alone - Solar Power



2 Step Dimming w/PIR Sensor

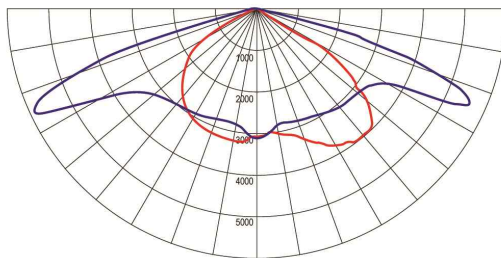


# LED Lighting

## Street Light (SP Series)



**Angular Distribution**



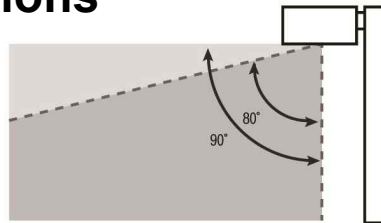
### Specifications



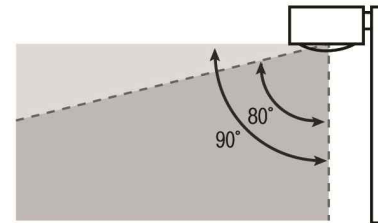
Model	S120P	S160P	S200P
Power Consumption [W]	120	160	200
Input Voltage [VAC]	90~305 / 50~60Hz		
Power Factor	Over 0.9		
Size [mm]	817(L) x 266(W) x 153(H)		
Weight [kg]	Under 8.5 (with power supply)		
Beam Angle[°]	BATWING		
Water Proof	IP65		
Color Temp.	Warm / Neutral / Cool White		
CRI[Ra]	over 70		
Luminous Flux[lm]	10,800	14,400	16,000
Efficiency[lm/w]	90	90	80
Operating Temp. [°C]	-30 ~ +50 (Internal SMPS type : -30 ~ +45)		
Storage Temp. [°C]	-40 ~ +80		
Usage	Street, Guard, Parking Lot, Parks, Etc		



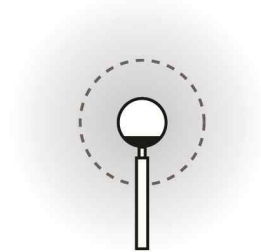
### Cutoff Classifications



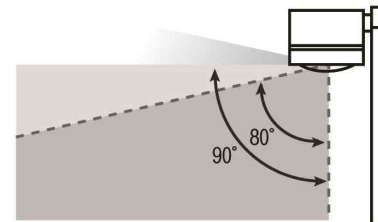
**ALLOWS**  
No light at 90° ----- 0%  
100 cd per 1000 lamp lumens at 80°--- 10%



**ALLOWS**  
25 cd per 1000 lamp lumens at 90° ----- 0%  
100 cd per 1000 lamp lumens at 80°--- 10%



**ALLOWS**  
Unrestricted distribution of light at any angle



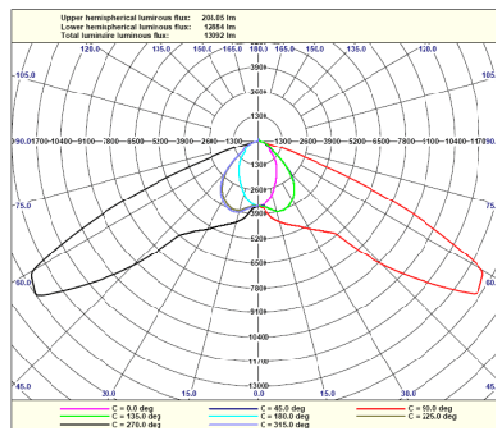
**ALLOWS**  
50 cd per 1000 lamp lumens at 90°----- 0%  
100 cd per 1000 lamp lumens at 80°--- 10%

\* This standard is referred to IESNA Handbook 9<sup>th</sup> Edition

Classification	Candelas at or above	
	90°	80°
Full Cutoff	0	<10%
Cutoff	< 2.5%	<10%
Semicutoff	<5%	<20%
Noncutoff	NA	NA
S160P	0.03%	1.18%,

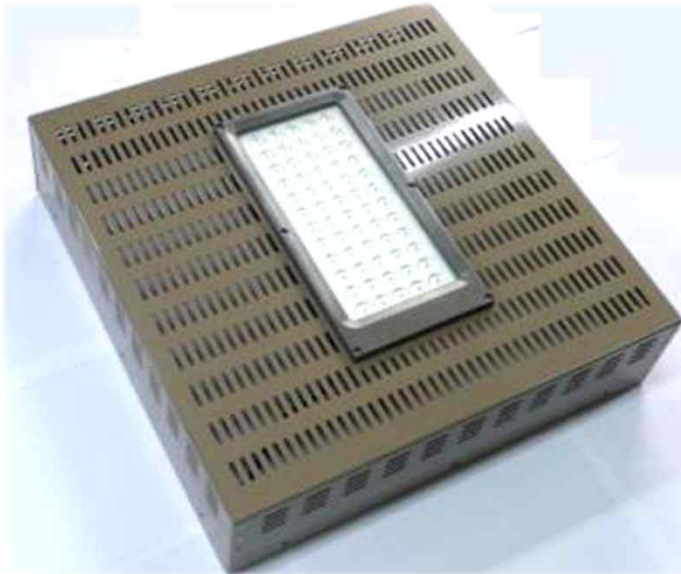
# LED Lighting

## Street Light (SL Series)



### Specifications

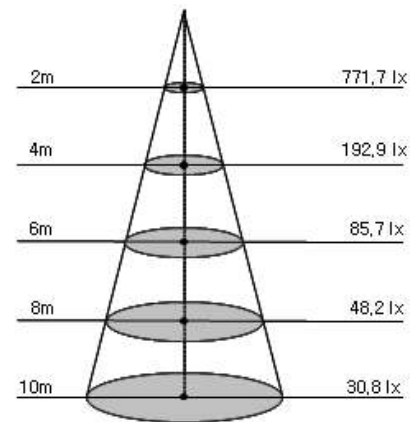
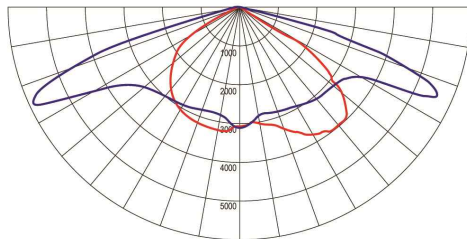
Model No.	S100L	S120L	S150L	S180L	S200L	S240L
Power Consumption [W]	100	120	150	180	200	240
Input Voltage [VAC]	90~305 / 50~60Hz					
Power Factor	Over 0.9					
Beam Angle[°]	Batwing					
Water Proof	IP65					
Color Temp.	Warm / Neutral / Cool White					
CRI[Ra]	80					
Luminous Flux[lm]	9,500	11,400	14,250	16,200	18,000	21,600
Efficiency[lm/w]	95	95	95	90	90	90
Operating Temp. [°C]	-30 ~ +50 (Internal SMPS type : -30 ~ +45)					
Storage Temp. [°C]	-40 ~ +80					
Usage	Street, Guard, Parking Lot, Parks, Etc					



### ■ Specification

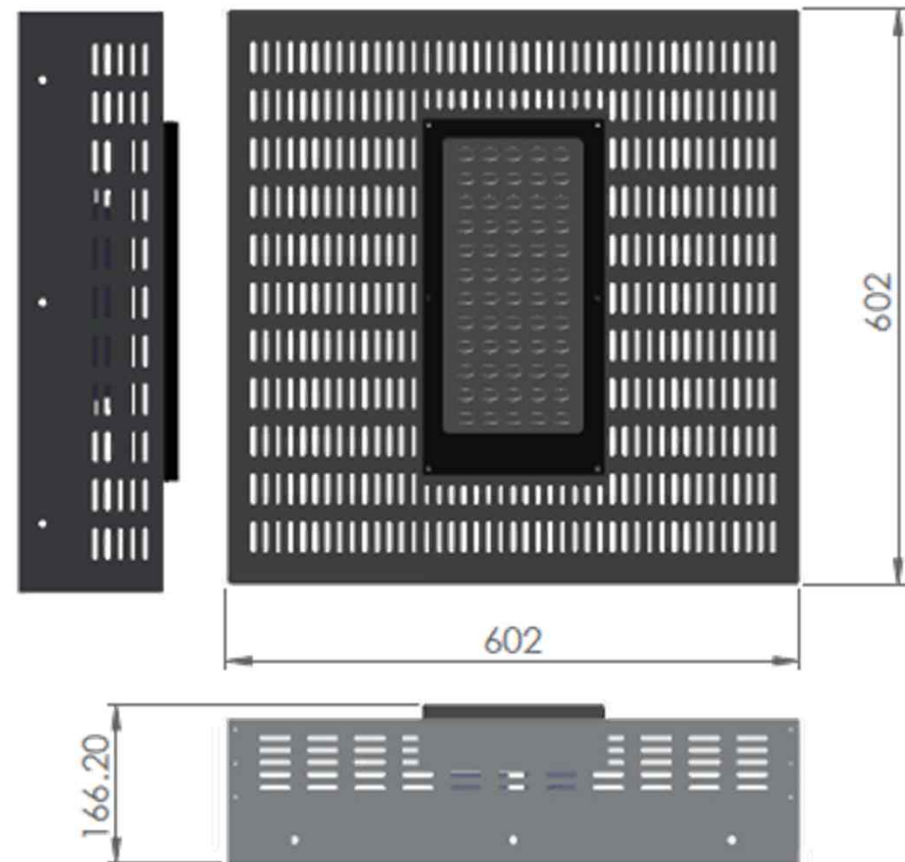
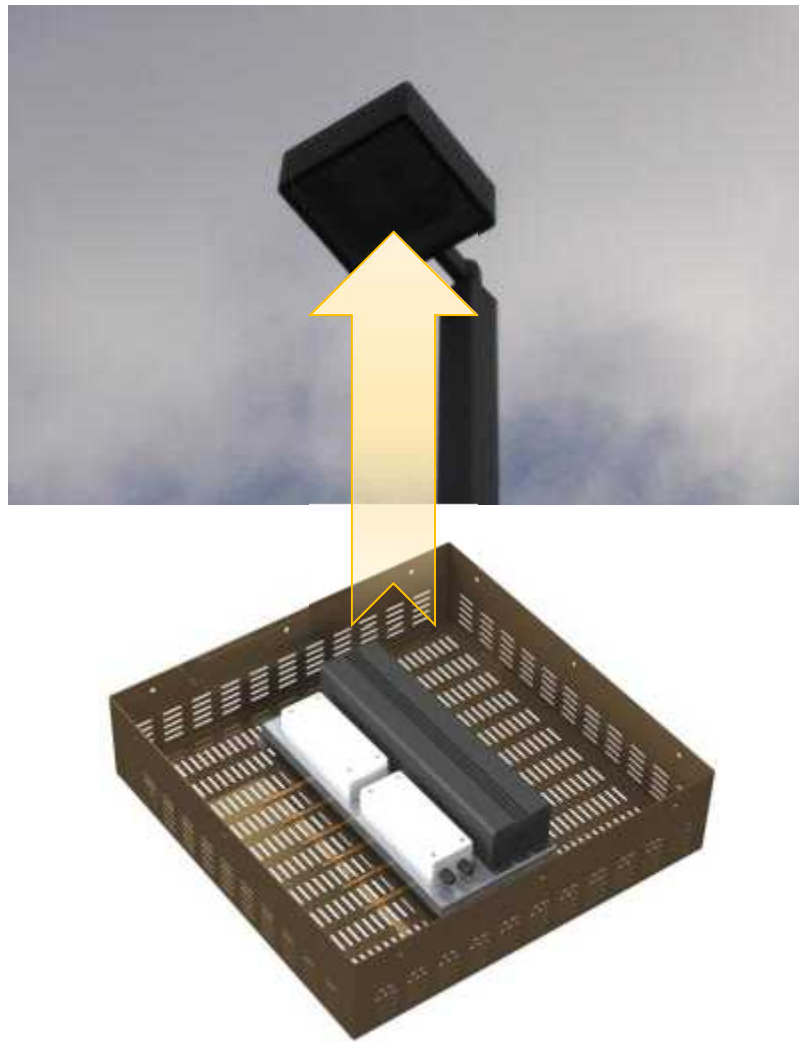


Model	S120B	S150B
Power Consumption [W]	120	150
Input Voltage [VAC]	90~305 / 50~60Hz	
Power Factor	Over 0.9	
Size [mm]	602(L) x 602(W) x 166.2(H)	
Weight [kg]	6.5 (Inc. SMPS)	
Beam Angle [°]	Batwing	
IP Level	IP65	
Color Temp. [CCT, K]	Warm / Neutral / Cool White	
CRI [Ra]	Over 70	
Luminous Flux [lm]	11,400	14,250
Efficiency [lm/W]	95	
Operating Temp. [°C]	-30 ~ +50 (Internal SMPS type : -30 ~ +45)	
Storage Temp. [°C]	-40 ~ +80	
Usage	Street, Guard, Parking Lot, Parks, Etc	



**S150B**

### *Best LED Retrofit for Shoebox!*



*\* Designed for 1:1 replacement of conventional shoebox fixture.*



# LED Lighting

High-bay (FS Series)

FS series distinguishes itself with existing LED bay lights by practical experience of 100lm/W system efficacy. Both E39 socket and pendant type installations are available in a wide variety of industrial applications.



**Power Consumption Chart**

Light Type	Power Consumption (W)	System Efficacy (lm/W)
Metal Halide 400W	400	12,000lm
LED 130W (70lm/W)	130	100lm/W
F130S (100lm/W)	130	100lm/W

**SAVE 50%**

**SAVE Over 70%**

## **DISTINGUISHED PERFORMANCE**

Over 100lm/W(System Efficiency)  
– Over 60% energy saving

## **EXPANDED COMPATIBILITY**

Bracket / E39 base / Pendant

## **ULTRA LOW WEIGHT**

1.6kg only (Exclude SMPS)



Bracket Type



E39 base

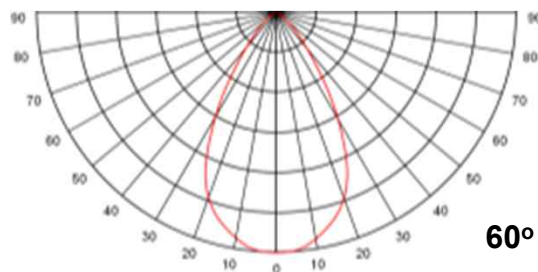
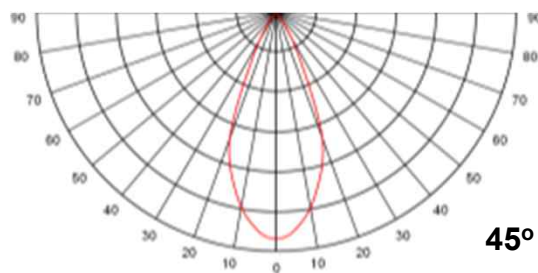
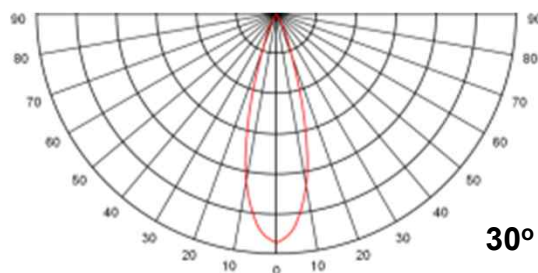


Pendant Type

# LED Lighting

## High-bay (FS Series)

### Angular Distribution



### ■ Specification



Model No.	F90S	F120S
Power Consumption [W]	90	120
Input Voltage [VAC]	90~305 / 50~60Hz	
Power Factor	Over 0.9	
Socket Type	E39 Base / Pendant Type (External SMPS)	
Size [mm]	224(Φ)X 300(H)	
Weight [kg]	1.6 (Exc. SMPS)	
Beam Angle[°]	30 / 45 / 60 / 120	
Water Proof	IP65	
Color Temp.	Warm / Neutral / Cool White	
CRI[Ra]	over 70	
Luminous Flux[lm]	9,900	13,200
Efficiency[lm/w]	110	
Operating Temp. [°C]	-30 ~ +45	
Storage Temp. [°C]	-40 ~ +80	
Usage	High Bay, Factory, Gyms, Building, etc.	

### **INNOVATIVE THERMAL DESIGN**

Patent heat pipe thermal design

### **RATIONAL DESIGN**

E39, Pendant or Bracket installation  
Designed and Made in Korea

### **DISTINGUISHED PERFORMANCE**

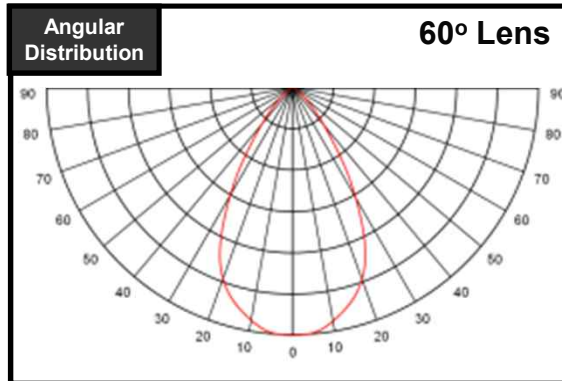
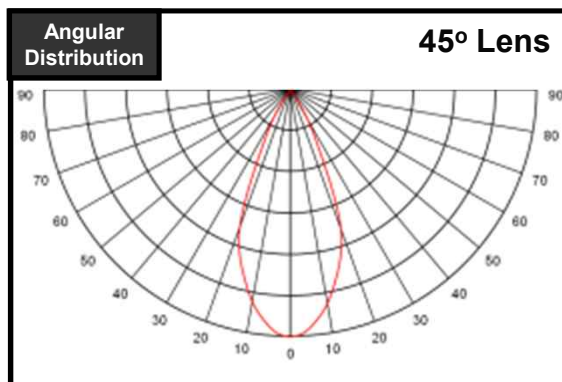
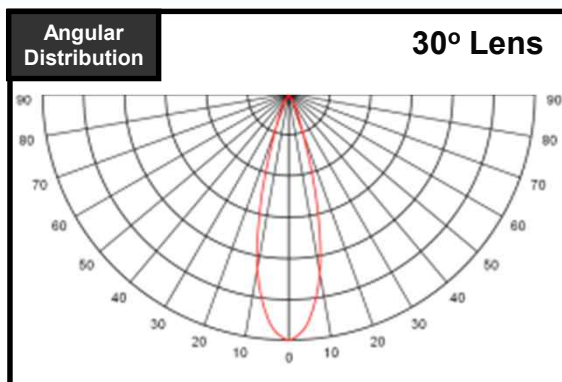
Realized 110lm/W(System Efficiency)  
– Over 60% energy saving  
3 Lens option – Narrow, Medium, Wide Angle

### **EASY INSTALLATION**

Weight under 2.4kg (Exc. SMPS)  
Safety chain included – Safe from earthquake and vibration

# LED Lighting

## High-bay (BU Series)



### ■ Specification



Model		-	B150U	B185U	B200U
General	Power Consumption	W	150	185	200
	Dimension	mm	350(Ø) x 340(H)		
	Weight	kg	2.4 ((Exc. SMPS)		
	Working Temp.	°C	-30 ~ +45		
	Storage Temp.	°C	-40 ~ +80		
	Working Humidity	RH	20 ~ 95%		
	Storage Humidity	RH	10 ~ 95%		
	IP Rate	-	IP65		
Optical	Luminous Flux	lm	16,500	20,350	22,000
	Color Temp.	K	Warm / Neutral / Cool White		
	CRI	Ra	Over 70		
	Beam Angle	FWHM	30° / 45° / 60° / 120°		
	Luminous Efficiency	lm/W	110		
Electrical	Voltage Range	Vac	90 ~ 305		
	Frequency Range	Hz	50 ~ 60		
	Power Factor	PF	Over 0.9		
	Efficiency	%	Over 90%		
Mechanical	Connection Type	-	E39 Base / Pendant / Bracket		
	Etc	-	Included Safety Chain		
Usage		-	High Bay, Building, Factory, Industry area		



# LED Lighting

PAR Lamp

## PAR 30 15W



## PAR 38 25W



## Specifications

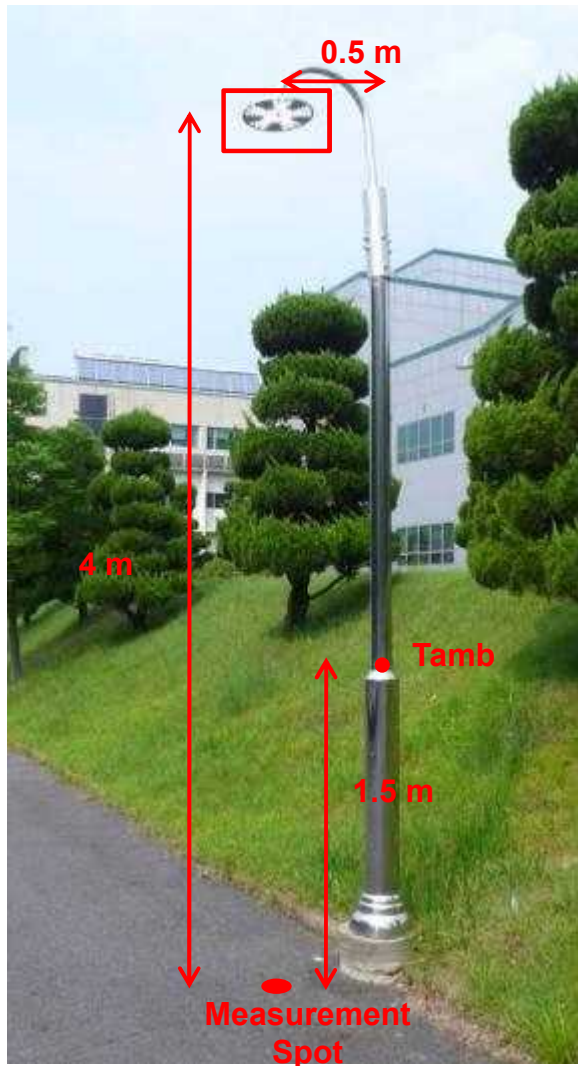


Model	PAR 30 15W	PAR 38 25W
Power Consumption [W]	15	25
Input Voltage [VAC]	AC220V / 60Hz	
Power Factor	Over 0.95	
Socket	E26 Base	
Size [mm]	95(Φ) x 106(H)	120(Φ) x 132(H)
Weight [g]	160	300
Beam Angle [°]	110°	
IP Level	IP65	
LED PKG	Cree	
Color Temp. [CCT, K]	3,000(W/W) / 4,000(N/W) / 5,700(C/W)	
CRI [Ra]	Over 75	
Luminous Flux [lm]	930	1,750
Efficiency [lm/W]	62	70
Operating Temp. [°C]	- 30 ~ +50	
Storage Temp. [°C]	- 40 ~ +80	
Illuminance	362 lx / 1M	681 lx / 1M

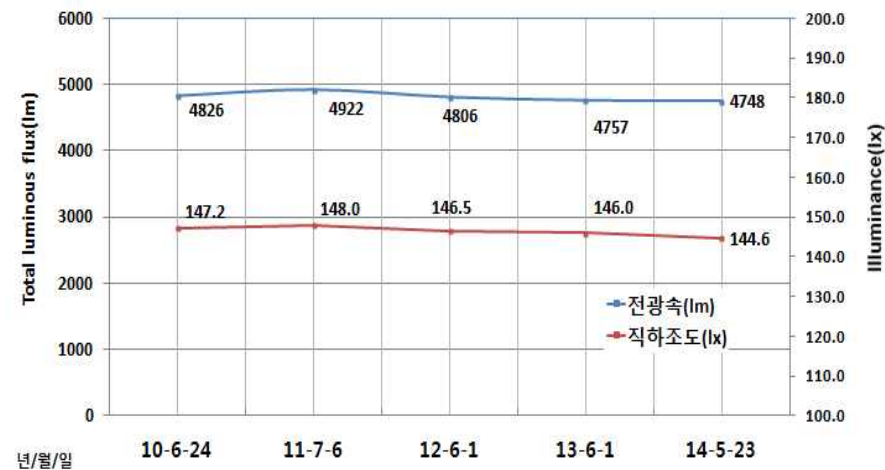
# Reliability

## Lumen Maintenance

### ❖ Reliability Test (G70L, 2010 June 4 ~ Present)



\* Latest Measurement : 23<sup>RD</sup> of May 2014  
(48 Months / 34,560hrs continuous operation)



Illumination	Jun. 2010 *T <sub>1</sub>	Jun. 2011	Jun. 2012	Jun. 2013	May 2014 *T <sub>2</sub>	T <sub>2</sub> /T <sub>1</sub> (%) **
Lux	147.2	148	146.5	145	144.6	98.2 (▼1.8)
Lumen	4,826	4,922	4,806	4,757	4,748	98.4 (▼1.6)

\*\* LM-80 defines lifetime of LED luminaire as 70% of initial luminous flux

# Reliability

IP & IK

## ❖ Reliability Test (FT series)



*<Water proof test of FT series>*



*<No maintenance made during 3 years operation  
in POSCO – APACK ODM  
430W LED flood light>*



*<Water proof test of FM series>*

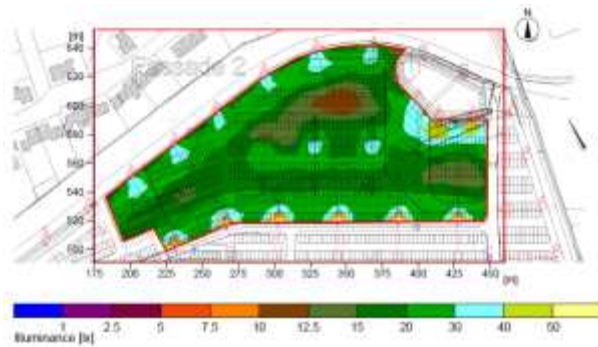




# Lighting Calculation

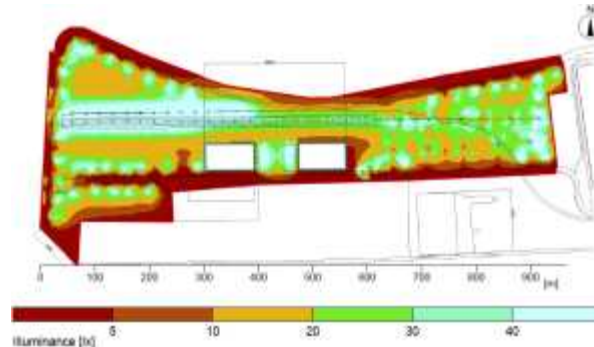
Plan & Execution

***APACK Provides the most accurate lighting simulation for our valued clients!***



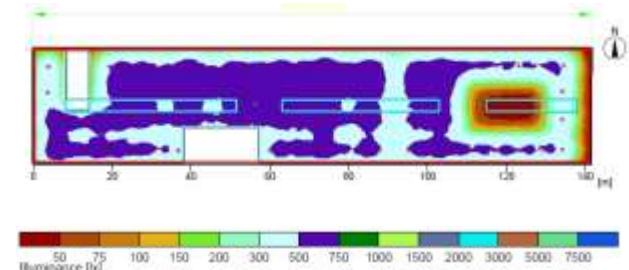
## Illuminance

Average illuminance	Eav	22.6 lx
Minimum illuminance	Emin	10.1 lx
Maximum illuminance	Emax	64.2 lx
Uniformity Uo	Emin/Em	1.2.24 (0.45)
Uniformity g2	Emin/Emax	1.6.33 (0.16)



## Evaluation area 1

Em	Reference plane 1.1
Emin	Horizontal
Emin/Em	20.1 lx
Emin/Eav (Uo)	0.2 lx
UGR	0.01
Position	0.00 m



## Evaluation area 1

Em	Reference plane 1.1
Emin	Horizontal
Emin/Em	443 lx
Emin/Eav (Uo)	37 lx
UGR	0.08
UGR (22.4H 4.6H)	<= 18.6
Position	0.00 m





# LED Lighting

## Application & References

### Sports Lighting



*Dallas Stadium / US (F640A, 2013~)*

*Boat Racing Range, JPN  
(F700T, 2013~)*



*VfB Stuttgart / Germany (F800T, 2014~)*



*Golf Practice Range / Korea  
(F800T, 2013~)*



*Golf Course / Korea  
(F640A, 2013~)*



*Indoor Gym / JPN  
(F320A, 2013~)*



*Yahoo Dome / Japan  
(F640A, 2013~)*

### Harbor Lighting



*DB SCHENKER, Bremen / Germany (FT Series, 2014~)*



*ICO Terminal / Belgium (F600T, 2014~)*



*WWL Zeebrugge / Belgium  
(FT Series, 2014~)*



*Pohang New Port / Korea  
(FM Series, 2012~)*



*Marina / Spain (F100M, 2012~)*



*Neuss-Düsseldorf Port / Germany  
(F200T, 2014~)*



### ***Tower Lighting***

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***AutoTerminalNeuss / Germany  
(F200T/F200TA, 2014 ~)***



***ALTMANN / Germany  
(FT ASM Series, 2014 ~)***

# LED Lighting

## Application & References

### Other Flood Lighting



*Photoshop Lighting @ WWL / Germany  
(F200T, 2014~)*



*BLG RailTec / Germany  
(F200T, 2014~)*



*Railroad Lighting @ ATN /  
Germany (F200T, 2014~)*



*ALTMANN / Germany  
(F100M, 2014~)*



*Façade Lighting @ Matsumoto Castle /  
Japan (F640A, 2013~)*



### *Street Lighting (I)*



*YeoSoo City / Korea (S120P, 2014~)*



*Seoyoung Precison / Korea  
(SP Series, 2014~)*



### *Street Lighting (II)*



*Park / Korea (G70L, 2011~)*



*Alley / Korea (G70L, 2012~)*



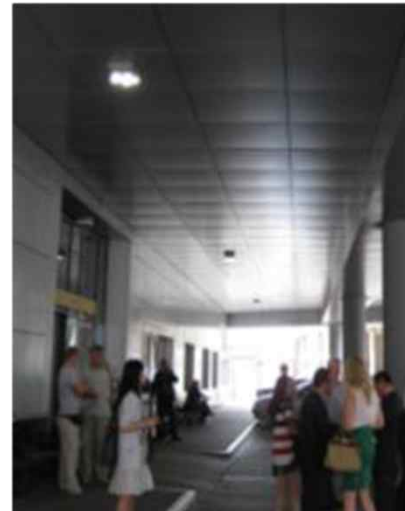
*Parking Lot / Korea  
(G70L/G120L, 2011~)*



*Street / Spain (G70L, 2012~)*



*Street / Germany  
(G70L, 2012~)*



*Moscow Aeroexpress Terminal / Russia (G70L/G120L, 2012~)*





# LED Lighting

## Application & References

### High bay Lighting



**WWL Workshop, Belgium**  
(B185U, Belgium, 2014~)



**BLG RailTec, Germany**  
(F100S, 2014~)



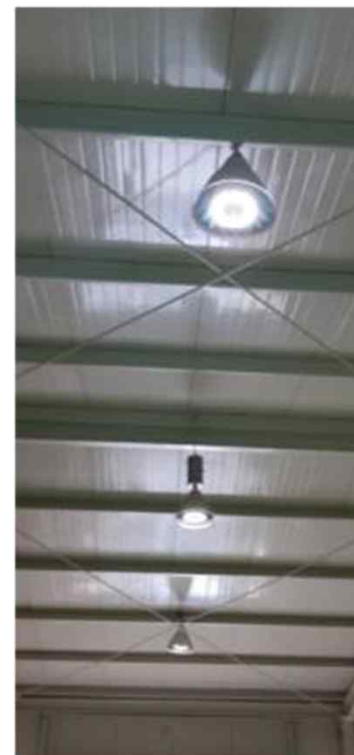
**Factory**  
(F150M, Korea, 2012~)



**Factory**  
(F120S, Korea, 2013~)



**Distribution Center**  
(F120S, Germany, 2013~)



**Warehouse, Korea**  
(B185U, 2013~)

# LED Lighting

## Application & References

### *Tube , Bulb, D/L*



*T8 1500mm Tube @ BLG  
/ Germany, 2013~*



*DownLight @ Daejeon Culture Center  
/ Korea , 2012~*



*PAR38 @ Busan Traditional Market  
/ Korea , 2012~*


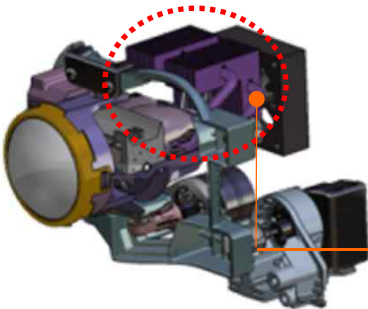
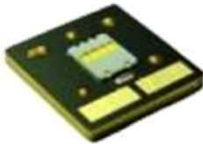

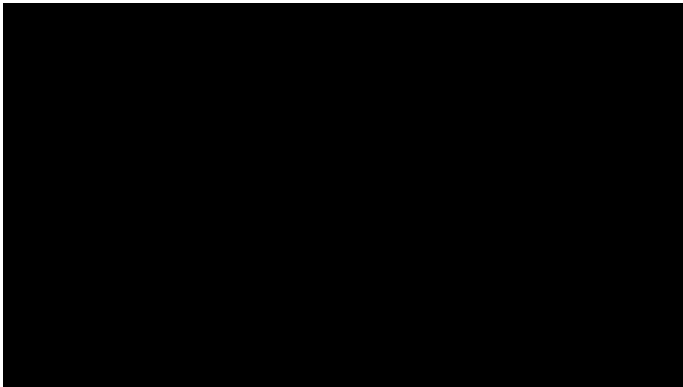


*PAR38 @ Busan Traditional Market  
/ Korea , 2012~*



# LED Head Lamp

KIA Motors Corp. – K9

Section	LED head lamp		
Exterior	  <p>Heat Pipe applied Bi-Functional LED Heatsink</p>		
Source of Light		Intensity of radiation (lm)	700
		Chromaticity (K)	4,800
		Lifespan (Hrs)	10,000
Running mechanism	 		

***More information available***

***Peter CHOI***

***BELAUS SARL***

***[belaus65@gmail.com](mailto:belaus65@gmail.com)***

***Tél : 01 4253 7311 Mobile : 06 8964 7317***

[www.apack.net](http://www.apack.net)

