Solar Street Light

User Manual

Ver 1.5

Model	✓	Booster Panel			
		25W	34W	45W	60W
Badr 1+G2					
Badr 2+G2					
Kamr S+G2					
Kamr 3+G2					
Kamr 2+G2					
Kamr 1+G2					
Kamr 1L+G2					
Kamr 2L+G2					
Kamr 3L+G2					
Kamr 4L+G2					

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Contents

Document Revision Control

Revision	Date	Comments
1.4	25th May 2016	Update XL G2

Disclaimer

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Unpacking - Box Contents

Please take care as one of the key components of the Solar Street Light is the Solar Panel that is protected via a toughened glass panel.

Please unbox the Solar Street Light and very carefully inspect the light to check that there has been no damage to the Light during transportation.

Badr 1/2+G2

Description	Silicon CPV Part No	Qty
Main Light Unit - Badr	Badr 1/2+G2	1
Pole adaptor – Badr	TBC	1
Pole adaptor fixings – 3 x M8 x 12mm taptite hex washer head stainless	SCREW0013	3
Installation Guide including Warranty Certificate	GUIDE001	1

Kamr+G2 Range

Description	Silicon CPV Part No	Qty
Main Light Unit - Kamr	Kamr S+,3+,2+,1+,1L+,2L+,3L+,4L+	1
Pole adaptor - fitted	ALUM0030	1
Pole adaptor fixings – Security Self Tappers Pin Torx BH - 10 x 3/4" (4.8 x 19mm)	SCREW0039	3

Installation Guide including Warranty Certificate	GUIDE001	1
Antenna		1

Booster Pack

Description	Silicon CPV Part No	Qty
Booster Panels	25W SOLARPANEL0055 34W SOLARPANEL0045 45W SOLARPANEL0035 60W SOLARPANEL0060	2
Aluminium Fixing Bracket	ALUM1035	1
Pozi flange head self-tapping screws	SCREW0098	8
Hex Head Self Drilling Screw	TBC	2

Tools Required for Installation and Maintenance

The table below details the key tools that will be needed to install a Silicon CPV Solar Street Light. It is assumed that the appropriate height pole has already been installed. (Please refer to pole sizing section for pole details)

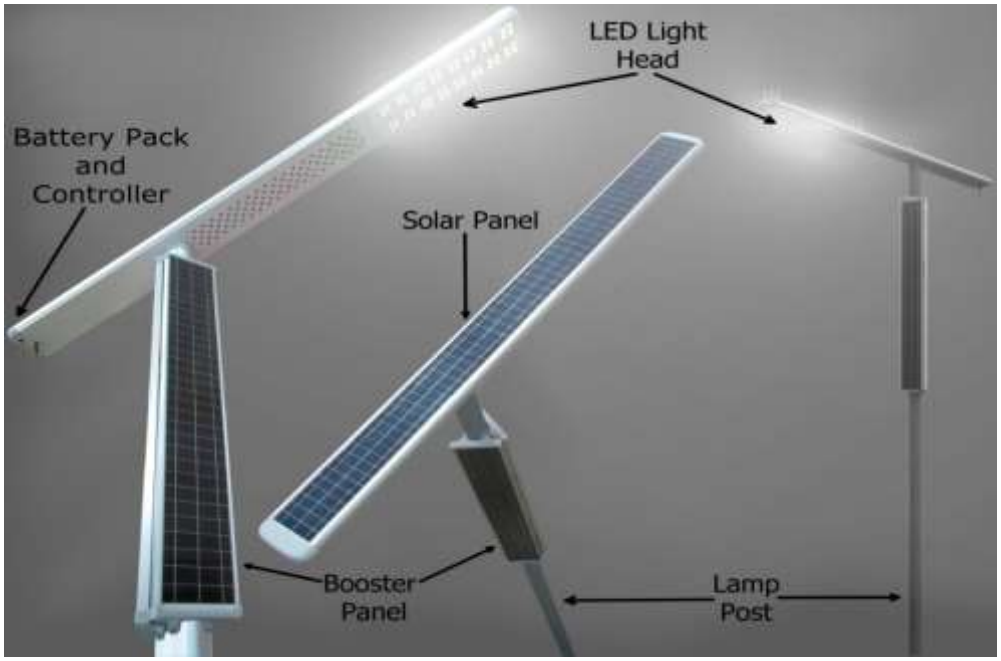
Item	Description	Qty
1	Small flat bladed screw driver for light switch selector	1
2	Mains Operated Electric or Battery Drill	1
3	Screwdriver set – pozi drive	1
4	Set of HSS Drill bits (must include 4.5mm for light body to pole fixing)	1
5	Tape measure	1
6	Long nose pliers	1
7	Side Cutters	1
8	Sprit or laser Level	1
9	Cherry Picker or equivalent access platform for installation of Solar Light	1
10	Appropriate Personal protective equipment (PPE) that conforms to local health and safety legislation	1
11	Digital Multi-meter	1
12	Electrical insulation tape	1
13	Security Bit Screwdriver Set (Torx Button Head TX25)	1

Note: Please be aware that no tools are provided with the product

Key Solar Street Light Components

Please see below for main Solar Light Components

Kamr



Badr

Available Model Numbers with Optical Lens Options

Please refer to the Optical Lens section for more details

	Available Lens Options							
	T2	T3	T4	DN	AT	ME	DWC	DNW
Model								
SiliconCPV- Badr 1+G2	√	√	√	√	√	√	√	√
SiliconCPV- Badr 2+G2	√	√	√	√	√	√	√	√
SiliconCPV- Kamr S+G2	√	√	√	√	√	√	√	√
SiliconCPV- Kamr 3+G2	√	√	√	√	√	√	√	√
SiliconCPV- Kamr 2+G2	√	√	√	√	√	√	√	√
SiliconCPV- Kamr 1+G2	√	√	√	√	√	√	√	√
SiliconCPV- Kamr 1L+G2	√	√	√	√	√	√	√	√
SiliconCPV- Kamr 2L+G2	√	√	√	√	√	√	√	√
SiliconCPV- Kamr 3L+G2	√	√	√	√	√	√	√	√
SiliconCPV- Kamr 4L+G2	√	√	√	√	√	√	√	√

Theory of Operation

The Silicon CPV Solar Light is based on a pair of state-of-art embedded ultra-low power processing units.

Using a highly adaptive and predictive algorithm, the first processing unit looks after the **Energy Management System** (EMS). This unit is responsible for extracting and storing the maximum amount of solar energy available during daylight hours. Using the available stored energy the unit then manages a custom user light output profile during the night time period (Dusk to Dawn).

The second processing unit is the **Communications Management System** (CMS). This unit provides all the necessary facilities for a meshed local and wide area network communications. This unit then provides users with local or remote wide area light cluster management and local light-to-light connectivity for wide area network communications.

When the light is first switched on the system has to build a solar light model and environmental profile. This process is fully automatic but takes 2-3 days to complete.

The system will need to discover a number of key parameters to maximise performance, these will include the following;

- Solar PV Panel Output Power
- LED Light Output
- Battery Capacity
- Daylight Hours
- Night-time Hours

Following switch on, the system will detect the “dusk” period and enter the “First Night” period. During this period the LED light will be turned onto maximum brightness for a period dependant on the current battery “state of charge”.

The system will then automatically detect dawn on the “Second Day”; the system can then start calculating additional parameters including PV panel power, battery capacity and night and day time hours.

After successful completion of this "**Adaptive Learning Phase**" the system operation will stabilise and the light output will become predictive based on weather conditions.

The system then automatically creates an energy storage reserve providing 1 day of operational autonomy.

Installation Instructions for Kamr – Part 1

When the Solar Street Light is delivered the controller will be sent in 'ship mode', which prevents excessive battery discharging during transit. This needs to be changed to the 'on' mode *before* installing the light.

The mode selection switch is located on the front panel of the battery pack and controller module. During normal operation the mode switch is hidden due to the insertion of a weather seal rubber plug. The plug can be easily pulled out to show the mode switch (see **fig 1**). Please ensure the rubber plug is re-inserted after inspection to prevent water ingress. Change the switch to the following modes of operation using the switch (**fig 2**):

Mode selection

1. **On Mode** – This is the normal operating position. Please ensure that when the Street Light is installed the mode switch is **ALWAYS** in this position.
2. **Ship Mode** – This position is selected when the unit is not in use. This is typically when the unit is stored or packed and being transported to site for installation. The controller automatically enters a power down state to conserve battery power.
3. **Test Mode** – This position is used to check the operation of the light under test conditions. This should not be selected for normal light operation.

Fig 1

Important Note:

We recommend that the change of switch selection is done by the use of a small flat bladed screwdriver. Care must used to ensure that the switch is in the correct position. Excessive force should NOT be used during this operation.

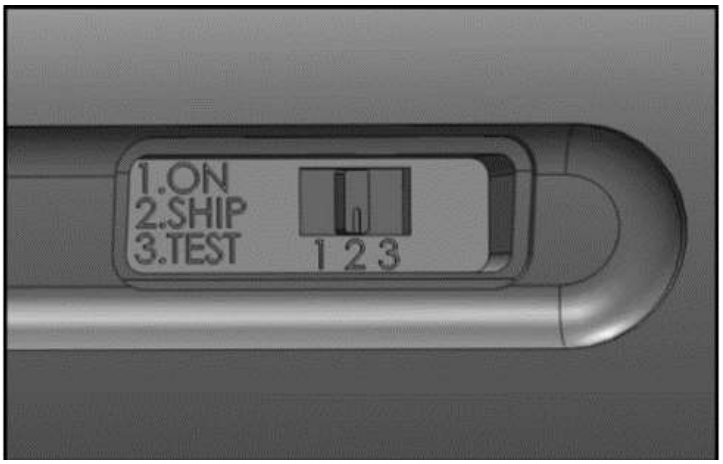
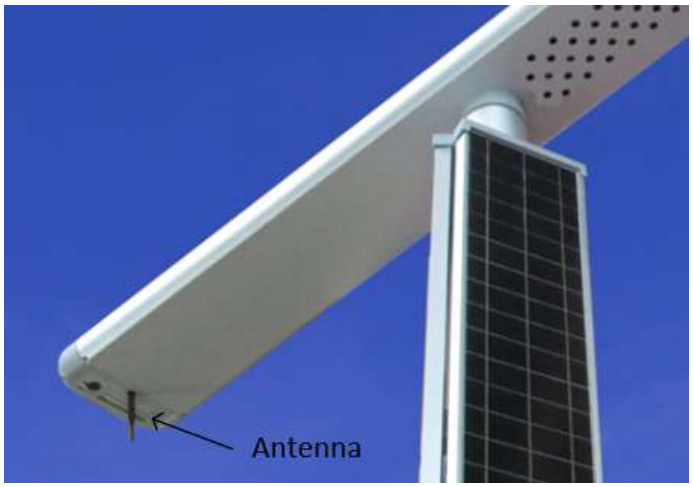


Fig 2

Antenna Installation

To prevent damage during packing / unpacking of the solar street light the antenna required for network communications is included in the accessory bag. Please screw in place and hand tighten with pliers. Care must be taken during this process and the Antenna should not be overtightened.



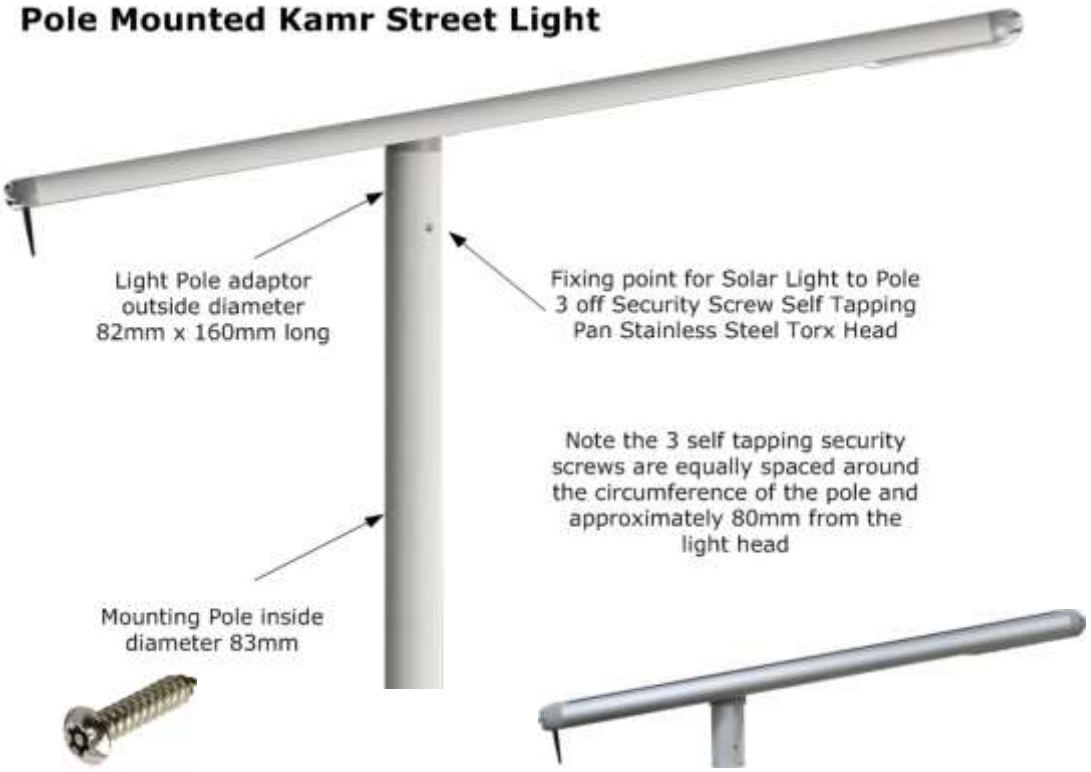
Installation Instructions for Kamr – Part 2

Fixing the Solar Street Light to the Pole

Warning: During the installation of the street light please observe safe working practices when working at height.

Please complete the following steps below to correctly install the Kamr Solar Street Light

1. For this task you will need a powered drill with a 4.5mm HSS drill bit and the 3 off Security Self Tappers Pin Torx BH - 10 x 3/4" (4.8 x 19mm) supplied in the light carton
2. Mount the street light on the pole as shown below and correctly align with the road
3. Drill three pilot holes equally spaced around the circumference of the pole and approximately 80mm from the light head
4. With the screws supplied fix the light to the pole
5. Ensure the mode switch is set to "ON" and insert the rubber plug



Security Screw

Light with Pole

Pole Sizing and Spacing for Kamr

The values below are specified using T2 optics as per IESNA Type II and III specifications

	Solar Street Light Models			
	Kamr 1+G2	Kamr 2+G2	Kamr 3+G2	Kamr S+G2
Pole Height (m)	7-8	6-7	5-6	4-5
This is dependent on optics Pole Spacing (m) For T2 optics	25-30	20-25	15-20	10-15
Light Envelope (m²) For T2 optics	240	180	120	80

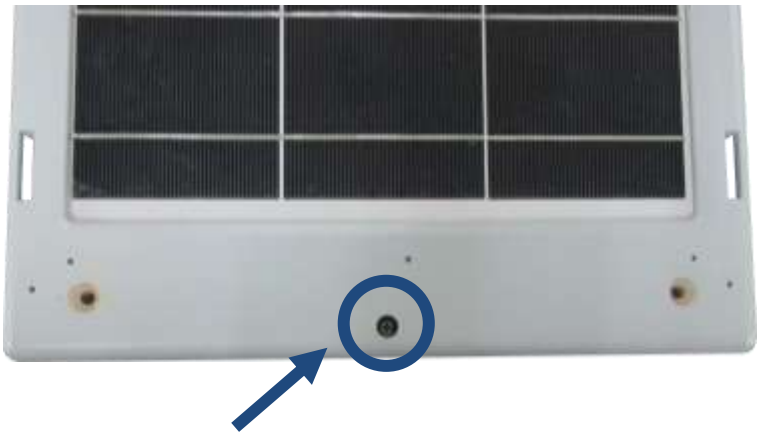
	Solar Street Light Models (L)			
	Kamr 1L+G2	Kamr 2L+G2	Kamr 3L+G2	Kamr 4L+G2
Pole Height (m)	8-9	9-10	10-11	11-12
This is dependent on optics Pole Spacing (m) For T2 optics	30-35	35-40	50-55	55-60
Light Envelope (m²) For T2 optics	300	400	600	700

Installation Instructions for Badr – Part 1

When the Solar Street Light is delivered the battery bank and controller is left in the "**SHIP MODE**". This will prevent excessive battery discharge during transit.

Battery Bank and Controller Access

1. Remove the pan pozi screw that secures the battery pack and controller to the main light body



Correct Screw Hole for the pozi screw

2. Carefully slide the battery and controller pack out of the main moulding. A small amount of force may be required.

Installation Instructions for Badr – Part 2

The mode selection switch is located on the PCB moulding on the battery pack. During normal operation the mode switch is hidden due to the insertion of a weather seal rubber plug. The plug can be easily pulled out to show the mode switch (see **fig 1**). Please ensure the rubber plug is re-inserted after inspection to prevent water ingress. Using a small flat bladed screw driver (**fig 2**), change the switch to the following modes of operation (**fig 3**):

Mode selection

1. **On Mode** – This is the normal operating position. Please ensure that when the Street Light is installed the mode switch is ALWAYS in this position.
2. **Ship Mode** – This position is selected when the unit is not in use. This is typically when the unit is stored or packed and being transported to site for installation. The controller automatically enters a power down state to conserve battery power
3. **Test Mode** - This position is used to check the operation of the light under test conditions. This should not be selected for normal light operation.

Fig 1

Fig 2

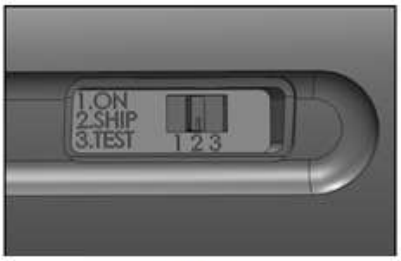


Fig 3

Installation Instructions for Badr – Part 3

Fixing the Solar Street Light to the Pole

Warning: During the installation of the street light please observe safe working practices when working at height.

Set the street light mode to 'on mode'. Secure the battery and controller pack into the Street Light using the pozi screw and install as instructed below.

1. For this task you will need a powered drill with a 4.5mm HSS drill bit and the 3 off Security Self Tappers Pin Torx BH - 10 x 3/4" (4.8 x 19mm) supplied in the light carton
2. Mount the street light on the pole as shown below and correctly align with the road
3. Drill three pilot holes equally spaced around the circumference of the pole and approximately 80mm from the light head
4. With the screws supplied fix the light to the pole

Pole Mounted Badr Street Light

Security Screw

Light with Pole

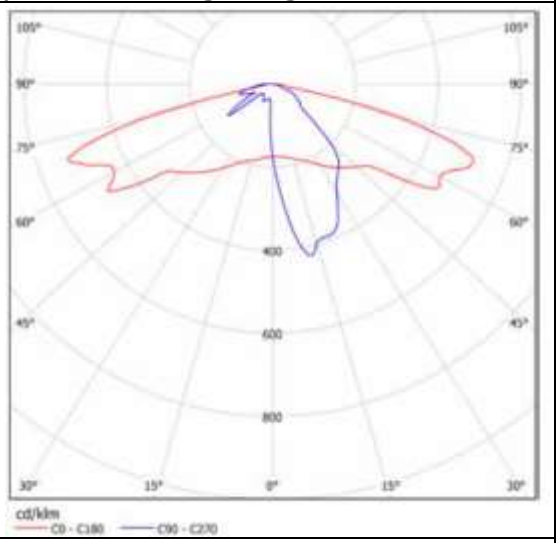
Pole Sizing and Spacing for Badr

The values below are specified using T2 optics as per IESNA Type II and III specification

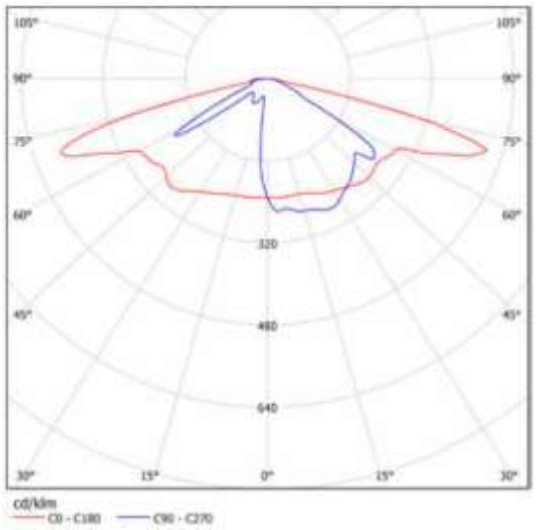
	Solar Street Light Models
	Badr 1+G2 / Badr 2+G2
Pole Height (m)	9-10
This is dependent on optics Pole Spacing (m) For T2 optics	35-40
Light Envelope (m^2) For T2 optics	400

Optical Lens and Distribution Patterns

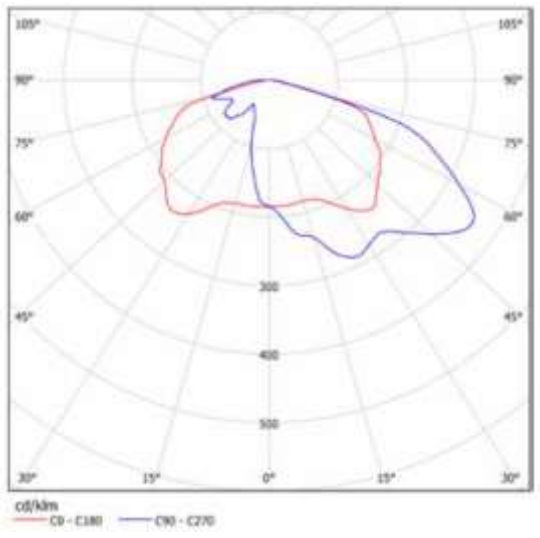
SiliconCPV -T2 is classified as IESNA type II, with a great mix of luminance and illuminance uniformity. It is also applicable to European S-standard pedestrian lighting.



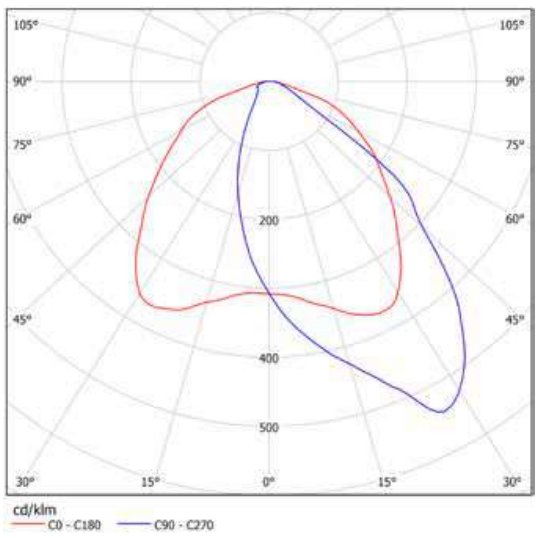
SiliconCPV -T3 is classified as IESNA type III, with a great mix of luminance and illuminance uniformity.



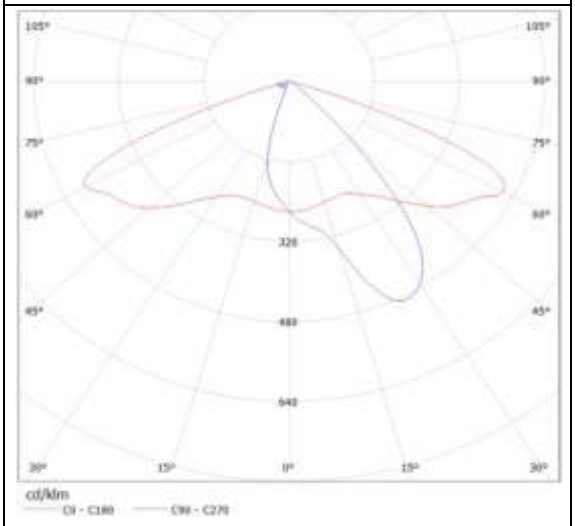
SiliconCPV -T4 is classified as IESNA type IV, being best suited for wider roads. It is also an excellent choice for wide area lighting, for example parking lots and yards.



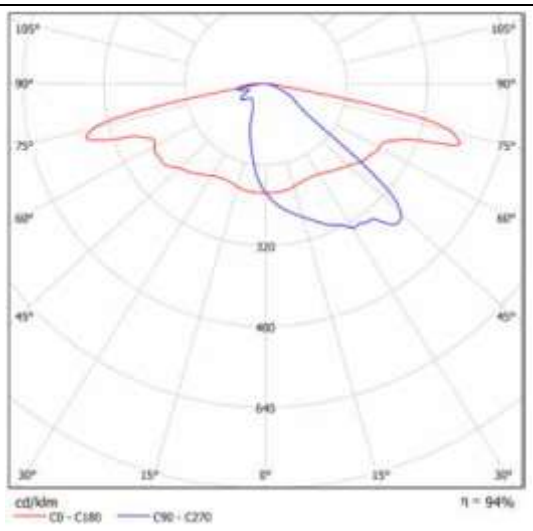
SiliconCPV -DN is a 2X2 array of asymmetric lenses suitable for area lighting. It has asymmetric forward tilted beam and wider light distribution than -FN.



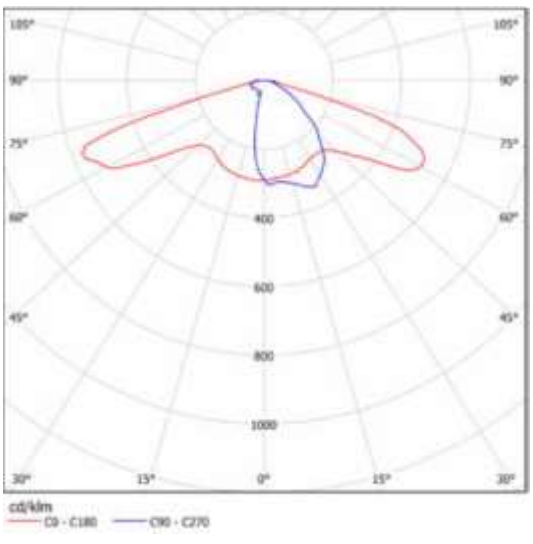
SiliconCPV -A-T has similar light distribution as SCPVSQ-A-T and is designed to work on roads that are narrower than the height of the pole and when the spacing is four times the height of the pole.



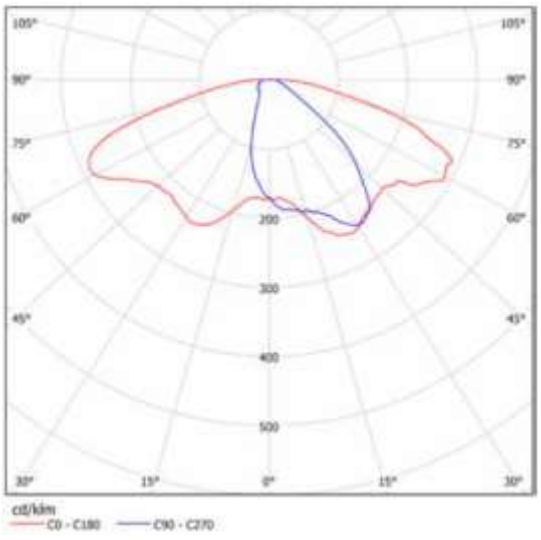
SiliconCPV -ME is the best of the class. Typical ME4a installations are possible with the ratio of pole distance and height up to 5.5. SCPV-ME is designed to fulfil ME-classes on a road whose width is equal to pole height or less.



SiliconCPV -DWC is designed for roads with longer pole distances. It can be used in street lighting setups where the pole distance is six times the pole height.



SiliconCPV -DNW is designed for roads where the pole height and the roadway width are similar.



Network Management and Monitoring

Please see “Network & Monitoring Guide” for details

Maintenance and Care of Solar Lights

The Silicon CPV Solar Light may be exposed to wind and rainy weather conditions over the year, it is recommended to maintain the maximum performance, you are to clean the glass typically every 6 months.

The use of a glass cleaning spray and wet cloth to clean the glass is normally sufficient to remove the dust and dirt that may have accumulated since the last maintenance session:

Troubleshooting

Problem	Cause and Solution
Light fails to come on in test mode	Battery pack may be low and needs replacement.
Light fails to come on in normal operate mode	It may not be dark enough. Check Test mode operation.
Light comes on but is very bright	The system has been reset. The SHIP mode or TEST mode has been selected then set to ON. The light is going through its first night learning curve. Leave 2-3 days until it adapts to the conditions.
Light comes on but is very dim	The energy captured during the daylight hours was small, therefore the LED output is held low for the night-time duration. Check after a few days to confirm light output has increased.
Light comes on during the daylight hours	Switch the mode selection to SHIP mode then ON mode. Check light operates correctly.
Light comes at dusk but does not stay on for the night period	If the light is bright then the light may be going through its "First Night" condition. Please leave for 2-3 days and re-check the operation.
Communication with the light fails	If the light is fully functioning then this indicates a possible fault with the street light controller. Switch the mode selection to SHIP mode then ON mode and re-check the communication.

Battery and Controller Pack Replacement for Kamr

To replace the Solar Street Light battery bank and controller please follow the steps below. Failure to follow the instructions below may result in the light failing to operate correctly.

Battery Bank and Controller Removal

1. Set mode switch to **"SHIP"**
2. Remove the two pozi screws that secure the battery pack and controller to the main light body

Correct Screws Holes for the two pozi screws

3. Carefully slide the battery and controller pack out until the wires are visible. Be careful not to pull out the pack too far, the connections to the Solar panel and LED light head are in place.

4. Unplug the connector by unscrewing, then pulling the connector apart.

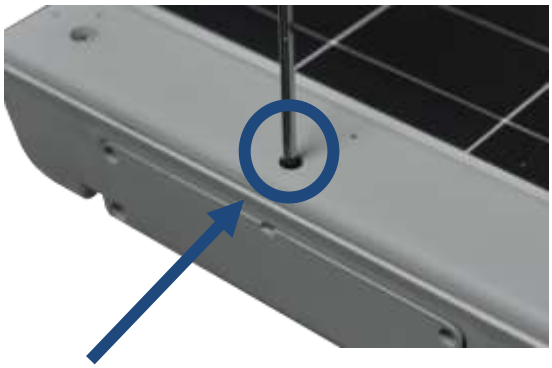
5. The old battery and controller pack can now be completely removed from the light head
6. Using a new battery and controller pack reverse the removal process to install the new pack.
7. Place the unit in **ON** mode and please ensure the rubber plug is re-inserted after inspection to prevent water ingress.

Battery and Controller Pack Replacement for Badr

To replace the Solar Street Light battery bank and controller please follow the steps below. Failure to follow the instructions below may result in the light failing to operate correctly.

Battery Bank and Controller Removal

1. Remove the pozi screw that secures the battery pack and controller to the main light body



Correct Screw Hole for the pozi screw

2. Carefully slide the battery and controller pack in the direction of the arrow.

Carefully slide the battery pack out

3. Using a new battery and controller pack reverse the removal process to install the new pack.
4. Place the unit in TEST mode, slide the battery pack in and check correct operation of the light source
5. If the light works correctly, remove the battery and controller and change the mode to ON, ensuring the rubber plug is re-inserted after inspection to prevent water ingress.

Insertion and removal of Battery and Controller Pack

Push the battery and controller pack in the direction of the arrow

Warranty

To register your standard warranty or to view and purchase extended warranty options then please visit our website at www.siliconcpv.com

Standard Warranty	The Solar Street Light comes with a comprehensive return to base 2 Year product Warranty
Extended Warranty	Optional 5 Year and 10 Year Warranty is available. Please visit our web site at www.siliconcpv.com for more details

Warranty Terms and Conditions

If a Solar Street Light becomes defective during the standard or extended warranty period at the discretion of Silicon CPV the device will be,

· returned to Silicon CPV for repair, or

· returned to Silicon CPV, on-site agent or local representative for repair,

· repaired on-site, or

· exchanged for a replacement device of equivalent value according to model and age.

In the latter case, the remainder of the warranty entitlement will be transferred to the replacement device and your entitlement and will be documented by Silicon CPV.

The warranty includes the costs to Silicon CPV of work and material for the restoration and faultless operation of work by Silicon CPV personnel or designated agent.

To determine the warranty entitlement, please submit a copy of the purchasing invoice or a copy of the warranty certificate, if necessary including the receipt of the warranty extension if purchased. The serial number label on the device must be completely legible. Otherwise, Silicon CPV reserves the right to refuse to provide warranty services.

Full terms and conditions of all warranty options are available on the Silicon CPV web site at www.siliconcpv.com.

Technical Specifications - Kamr

	Kamr S+	Kamr 3+	Kamr 2+	Kamr 1+	Kamr 1L+	Kamr 2L+	Kamr 3L+	Kamr 4L+
Rated Lumens Output (Lu)	1300	2600	3900	5200	7800	9100	10400	11700
Power (W)	16	32	48	64	96	112	128	144
Battery – Type	Lithium							
Capacity (Wh)	64	127	191	254	382	445	509	572
Battery – Service life	5 Years at 80% Depth of discharge and at 45ºC Ambient Temperature							
Light Source – Type	High Efficiency LED with 5000K Colour temperature							
Number of LEDs	8	16	24	32	48	56	64	72
Light Head Lifetime	20 years							
Light Head Efficiency	180 lumens/Watt							
Light Body	Proprietary composite Aluminum							
Solar Panel – Size (mm)	670 172	870 172	1275 172	1680 172	2165 172	2165 172	2165 172	2165 172
Solar Cells	Very High Efficiency - Proprietary Solar Cells							
Solar Panel – Service life	25 years							
Controller	Two Microprocessors for Energy Management and Communications							
Light Control	Intelligent Adaptive Light level control based on energy received							
Light Hours	Programmable, “Dusk to Dawn” or “Specified Hours after Dusk”							
Optics	8 different light profiles available for each light							
Pole Height (m)	4	5	6	7	10	10	11	12
Average Light level	15 Lux							
Maximum Light level	35 Lux							
Minimum Light Level	6 Lux							

Note: All figures above has been specified using T2 optics as per IESNA Type II

Technical Specifications - Badr

	Badr 1+	**Badr 2+**						
Rated Lumens Output (Lu)	7500	6300						
Power (W)	80	64						
Battery – Type	Lithium							
Capacity (Wh)	380	310						
Battery – Service life	5 Years at 80% Depth of discharge and at 45ºC Ambient Temperature							
Light Source – Type	High Efficiency LED with 5000K Colour temperature							
Number of LEDs	40	32						
Light Head Lifetime	20 years							
Light Head Efficiency	180 lumens/Watt							
Light Body	Proprietary composite Aluminum							
Solar Panel – Size (mm)	1445 272	1445 272						
Solar Cells	Very High Efficiency - Proprietary Solar Cells							
Solar Panel – Service life	25 years							
Controller	Two Microprocessors for Energy Management and Communications							
Light Control	Intelligent Adaptive Light level control based on energy received							
Light Hours	Programmable, “Dusk to Dawn” or “Specified Hours after Dusk”							
Optics	8 different light profiles available for each light							
Pole Height (m)	9	8						
Average Light level	15 Lux							
Maximum Light level	35 Lux							
Minimum Light Level	6 Lux							

Note: All figures above has been specified using T2 optics as per IESNA Type II

Technical Specifications – Badr / Kamr

Installation details

	Badr 1/2+G2	Kamr S,1,2,3,2L,3L,4L +G2 Range
Pole height	8-9m	See main specifications table

Mechanical data

	Badr 1/2+G2	Kamr S,1,2,3,2L,3L,4L +G2 Range
Dimensions (L x W x H)cm	155 x 32 x 8	K2: 140 x 23 x 7
Weight (Kg)	18	8,10,12,15,18,19,20,21

Dimensions exclude pole adaptor

Environmental conditions

	Badr 1+G2	Kamr S,1,2,3,2L,3L,4L +G2 Range
Operating Temperature	-10ºC to +60ºC	-10ºC to +60ºC
Relative Humidity		
Protection Rating	IP 68	IP 68
Standards Compliance	BS 5489:2003 EN13201, ME4a, IESNA Type II or Type III	

Contact Information

If any technical problems arise from the installation of the Silicon CPV Badr or Silicon CPV Kamr Solar Street Light, then please contact either by telephone or email using the Silicon CPV service line details below.

Silicon CPV plc

Akhter House,

Perry Road,

Harlow,

Essex,

CM18 7PN,

UK

Tel: +44 (0) 1279 821200

Email: enquiries@siliconcpv.co.uk

Disposal Information

The packaging protects the Silicon CPV Lights from transportation damage. Environmentally friendly packing materials are chosen for recycling purpose.

The Solar Street Light contains items of waste that may be hazardous to health and the environment. If necessary, disposal should be in accordance with local national disposal regulations for electronic and electrical devices.

or