Solar Street Light

User Manual

Ver 1.7

Model	✓	Booster Panel			
		25W	34W	45W	60W
Kamr S-G2					
Kamr 3-G2					
Kamr 2-G2					
Kamr 1-G2					
Kamr L-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
1.6	23rd January 2018	Reformatted, new images for new boosters, updated for G2
1.7	19th October 2018	Added Booster panel positioning diagram.Edited battery removal process for G2.

Disclaimer

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.

Kamr G2 Range

Description	Silicon CPV Part No	Qty
Main Light Unit - Kamr	Kamr (G2) S, 3, 2, 1, L, 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
Pozi flange head self-tapping screws	SCREW0098	8
Hex Head Self Drilling Screw Stainless A2 - 5.5 x 38mm	SCREW0115	4

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 Technical Specification 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 regulation	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

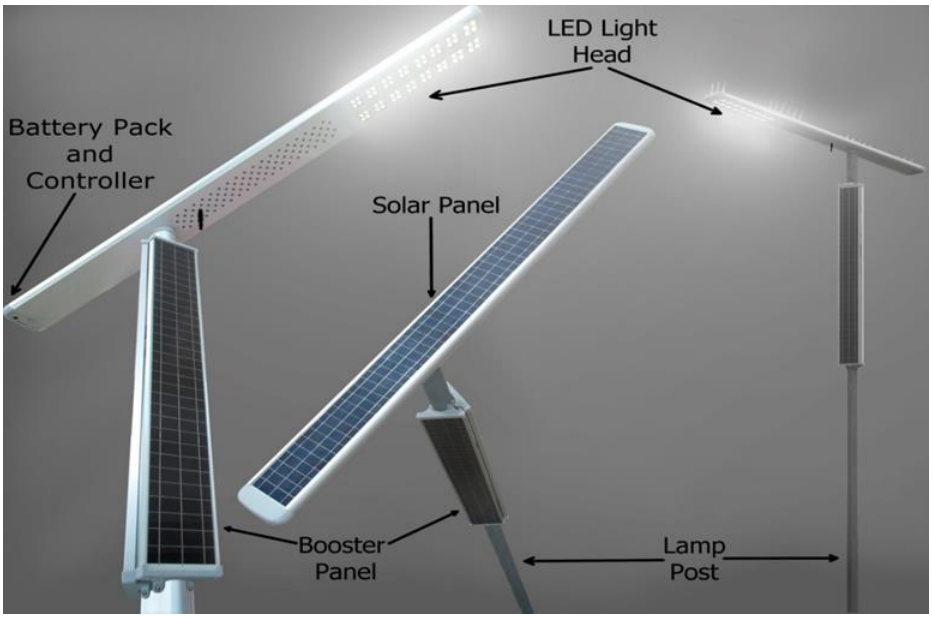


Figure 1

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- Kamr S-G2	√	√	√	√	√	√	√	√
SiliconCPV- Kamr 3-G2	√	√	√	√	√	√	√	√
SiliconCPV- Kamr 2-G2	√	√	√	√	√	√	√	√
SiliconCPV- Kamr 1-G2	√	√	√	√	√	√	√	√
SiliconCPV- Kamr L-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-the-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 is then capable of a custom light output profile during the night period (Dusk to Dawn).

The second processing unit is the **Communications Management System** (CMS). This unit provides all the necessary facilities for a mesh local and wide area network communications. The 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 begins to build a solar light model and an environmental profile. This process is fully automatic, however, it does require 2-3 days to complete.

The system will need to gain data on 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 as well as night and day time hours.

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

By default the system will automatically create an energy storage reserve which will provide 2 days of operational autonomy.

Installation Instructions for Kamr – Part 1

The 'ON/OFF' switch for the kamr Street Light is located on the underside of the light, the small silver button of the switch indicates this and will be situated adjacent to and in line with the antenna. (see figure 2).

Mode selection

1. When the button of the switch is in the position where the button if the switch is below the switch bezel, the Kamr Street Light is in the 'OFF' state.
2. When the button of the switch is in the position where the the button of the switch is level with the switch bezel, the Kamr Street Light is the 'ON' state.

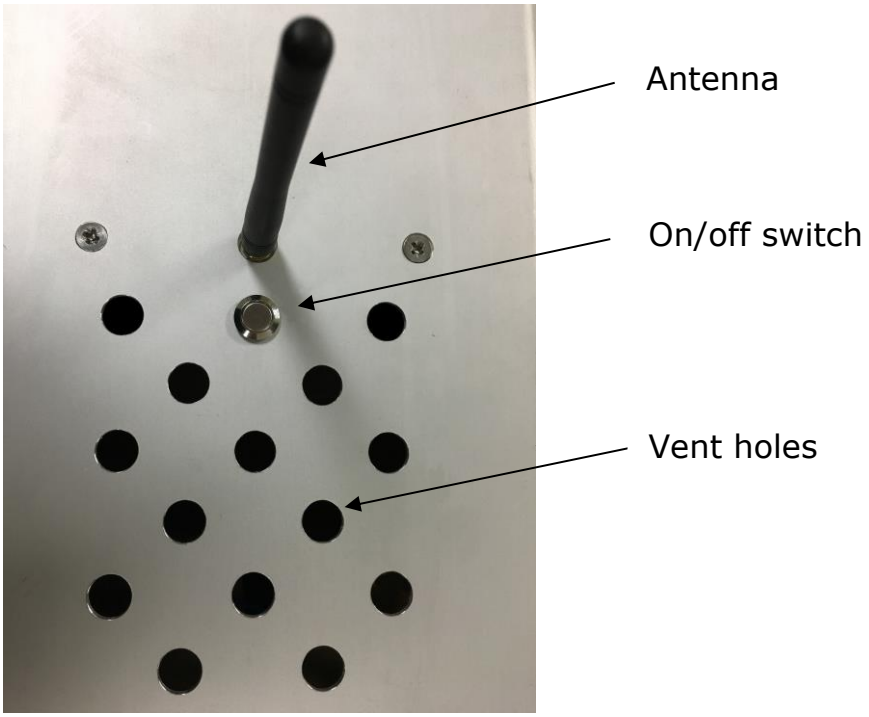


Figure 2

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 the antenna in place and hand tighten. Care must be taken during this process as the Antenna should not be overtightened.

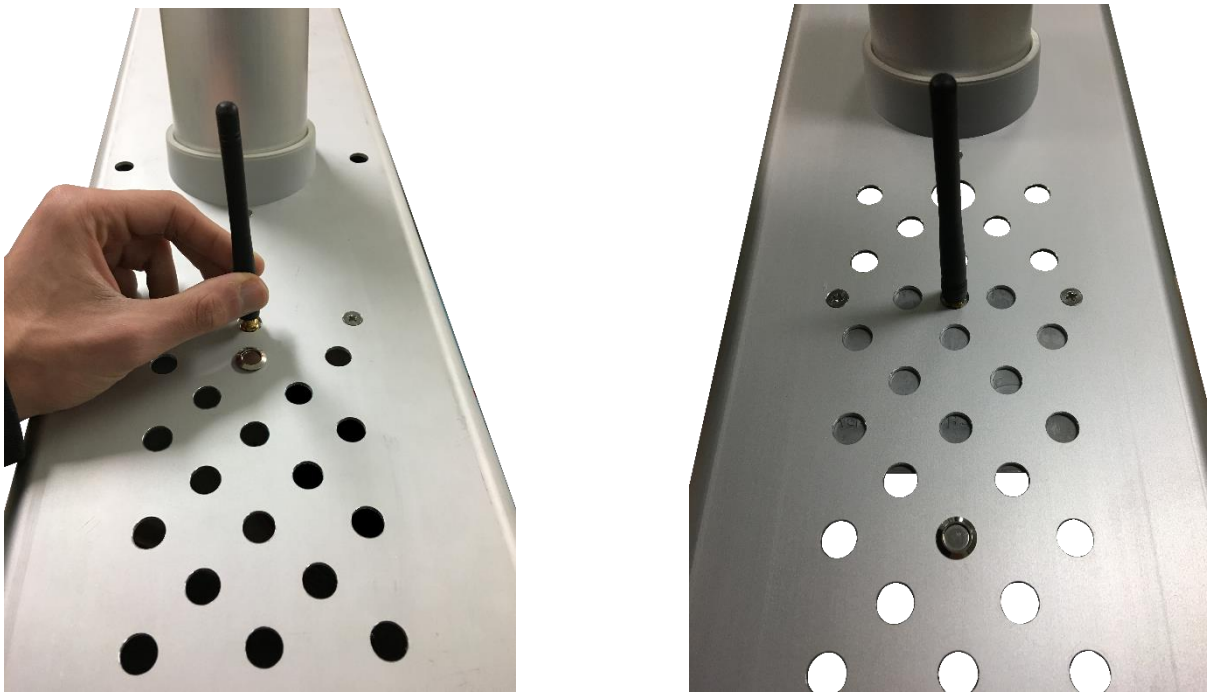


Figure 3

(The On/Off switch is shown in different locations solely to highlight how it can be altered to take account of the specifications of the light and customer requirements).

Installation Instructions for Kamr – Part 2

Fixing the Solar Street Light to the Pole

Warning: During the installation of the street light, operative(s) will be required to carry out work at heights sufficient to cause personal injury in the event of a fall, as such it is important to observe safe working practices to ensure their own and any others protection, including the use of the appropriate Personal protective Equipment (PPE).

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 switch is set to "ON" (button level with the switch bezel).

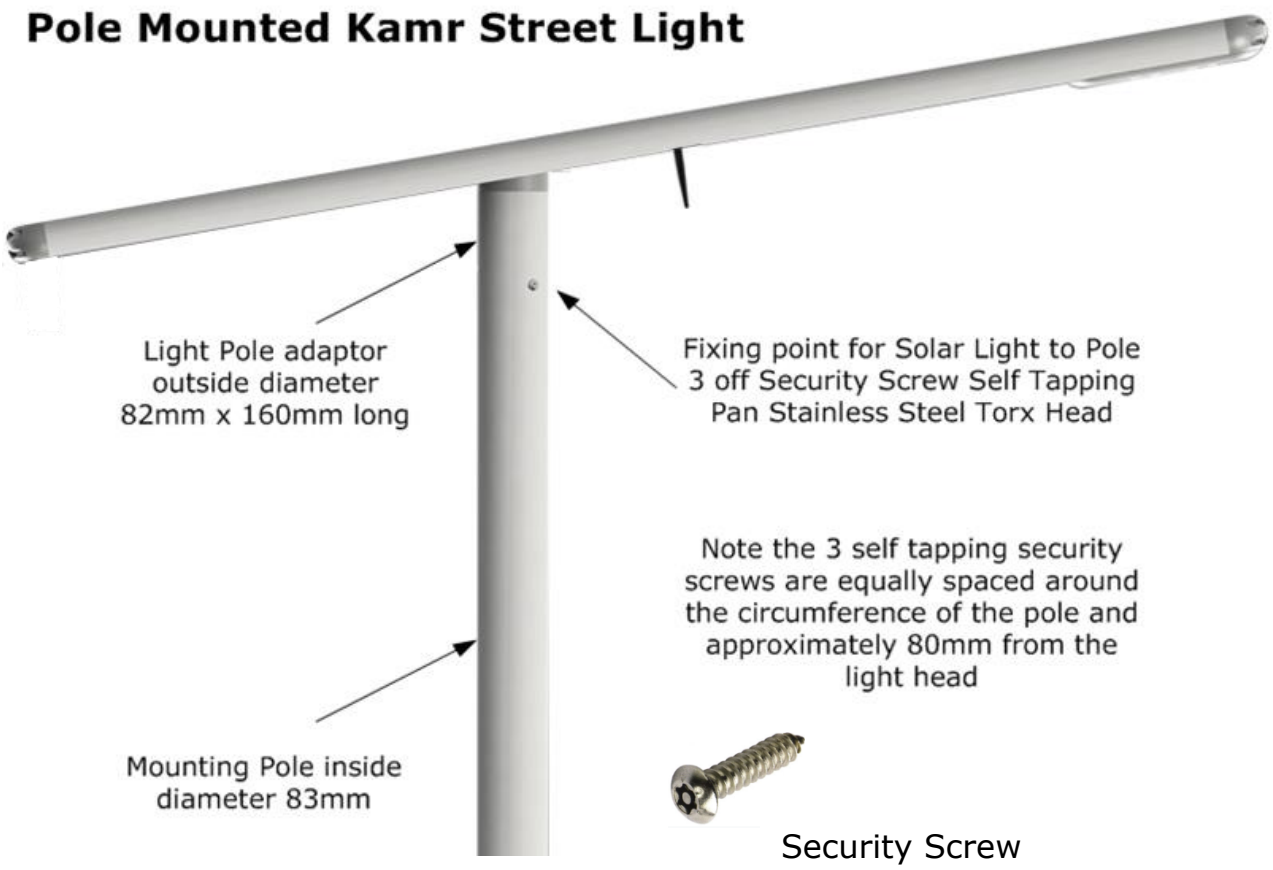

Pole Mounted Kamr Street Light
Light Pole adaptor outside diameter 82mm x 160mm long
Fixing point for Solar Light to Pole 3 off Security Screw Self Tapping Pan Stainless Steel Torx Head
Note the 3 self tapping security screws are equally spaced around the circumference of the pole and approximately 80mm from the light head
Mounting Pole inside diameter 83mm
Security Screw

Figure 4

Installation Instructions for Kamr Booster Pack

Fixing the Booster Panels to the bracket

Please Note:
That before starting the Booster pack installation you ensure that the directional positioning (Booster Panels aligned East – West) is marked out so that the booster panels work to optimum efficiency

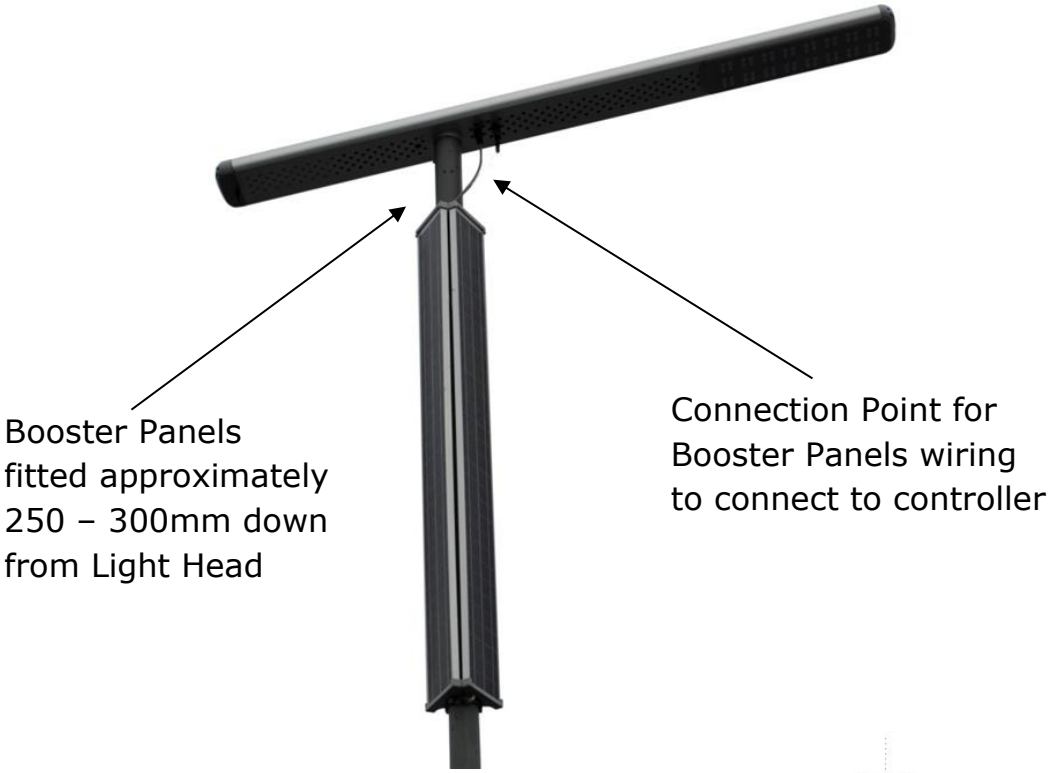
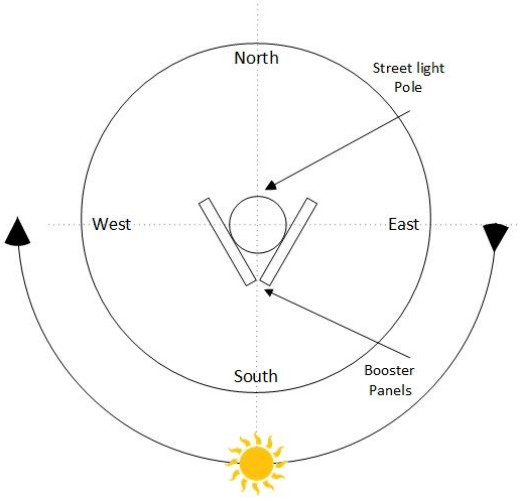


Figure 5



One will notice the 4 screw holes, 2 at the top and 2 at the bottom per Booster panel.

Using a Hex Head Self Drilling Screw Stainless A2 - 5.5 x 38mm screw, the panels must be screwed directly to the Street Light pole at approx 300mm from the light head or top of the pole (to ensure that the cable will reach the controller connector correctly).

Each Cable connects to a matching connector on the underside of the light body.

Figure 6

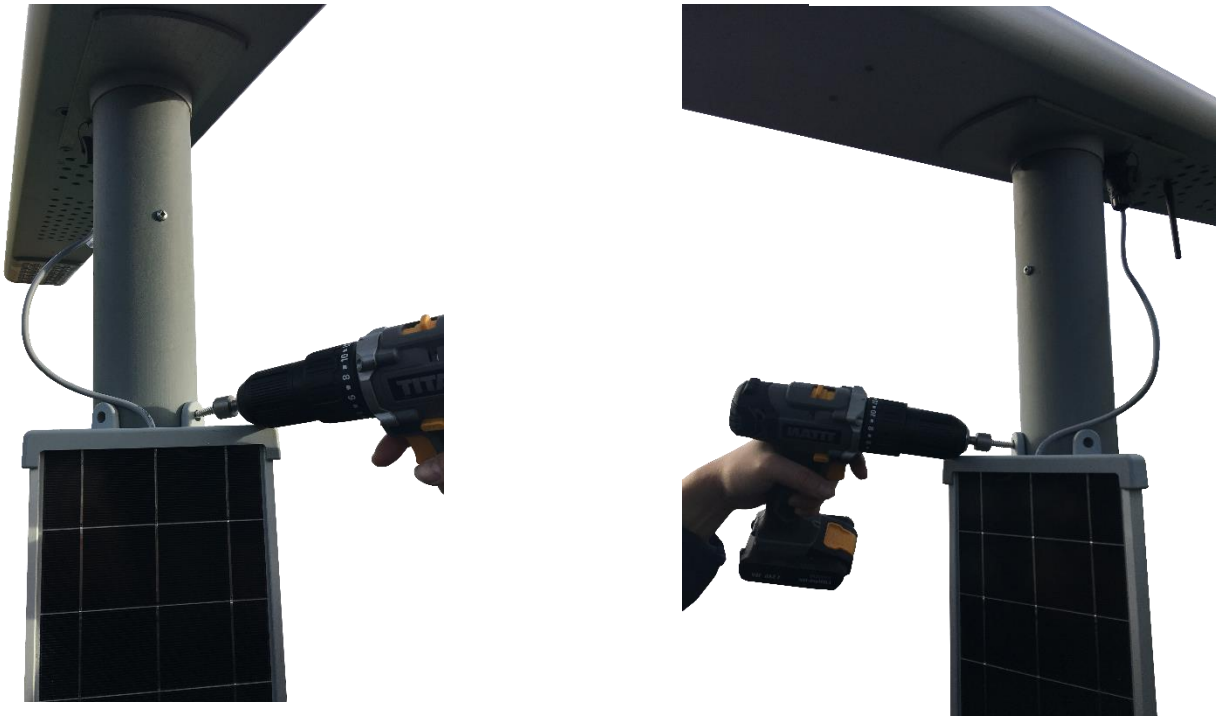
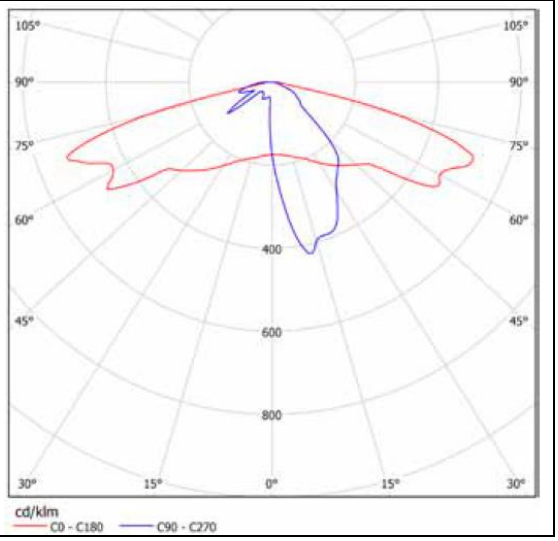


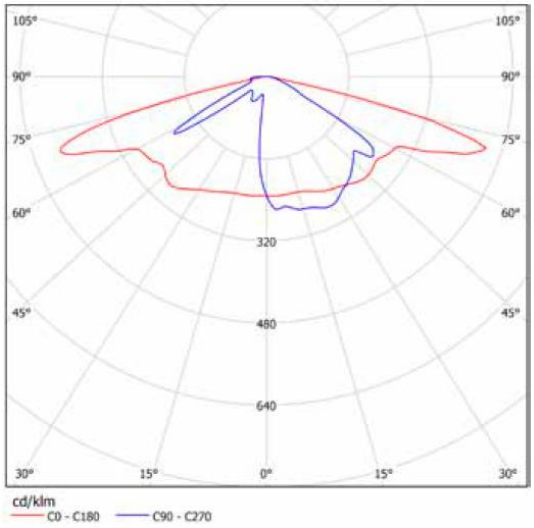
Figure 7

Optical Lens and Subsequent Light Distribution Patterns

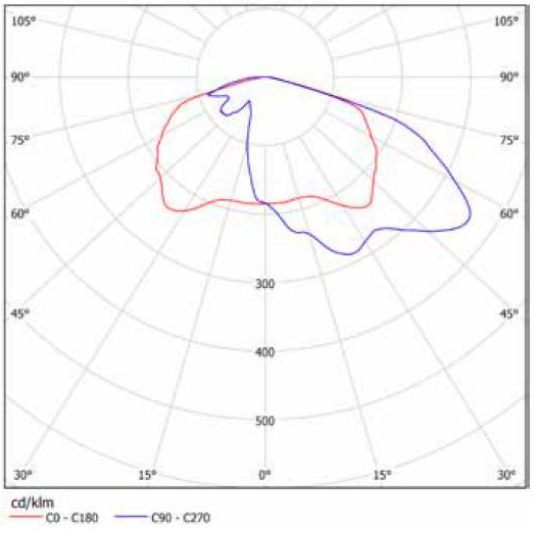
SiliconCPV -T2 is classified as IESNA type II, with a great mix of luminance and illuminance uniformity. It is also applicable to European S-standard pedestrian lighting.



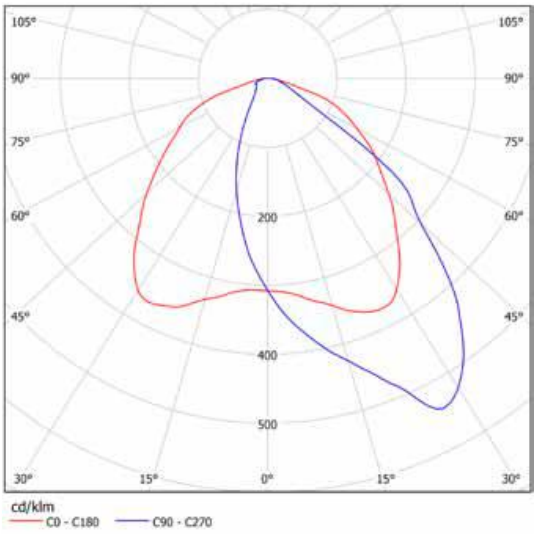
SiliconCPV -T3 is classified as IESNA type III, with a great mix of luminance and illuminance uniformity.



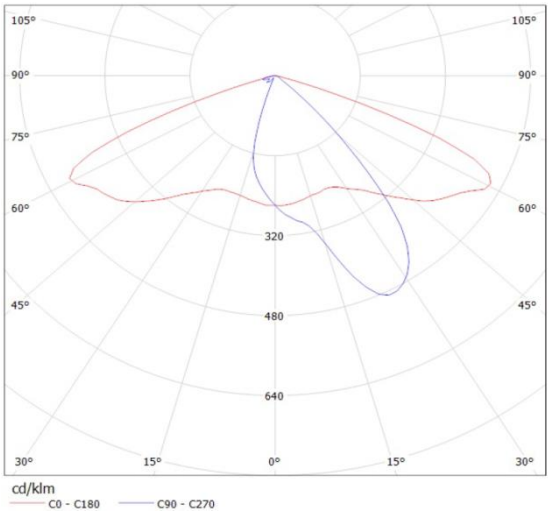
SiliconCPV -T4 is classified as IESNA type IV, being best suited for wider roads. It is also an excellent choice for wide area lighting, for example parking lots and yards.



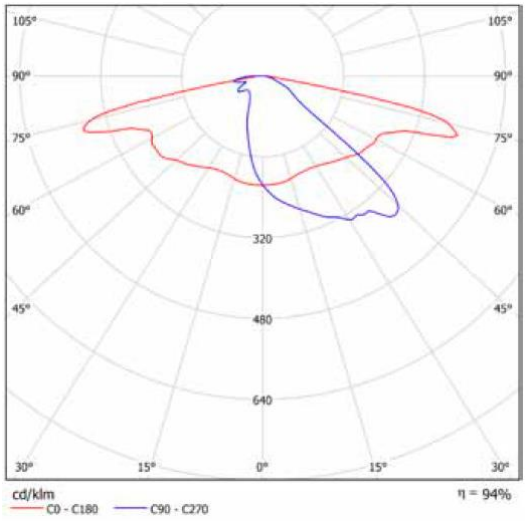
SiliconCPV -DN is a 2X2 array of asymmetric lenses suitable for area lighting. It has asymmetric forward tilted beam and wider light distribution than -FN.



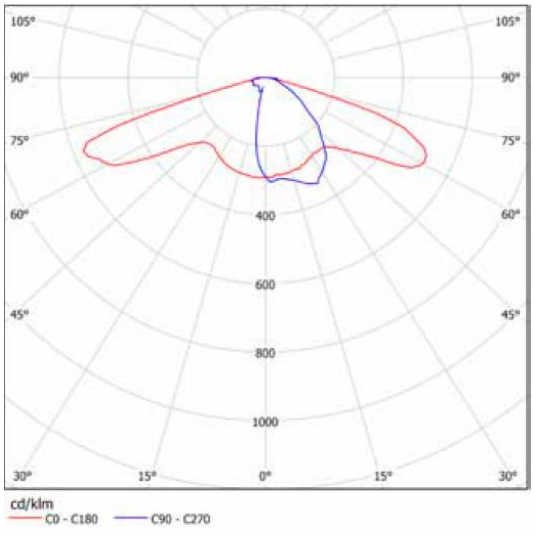
SiliconCPV -A-T has similar light distribution as SCPVSQ-A-T and is designed to work on roads that are narrower than the height of the pole and when the spacing is four times the height of the pole.



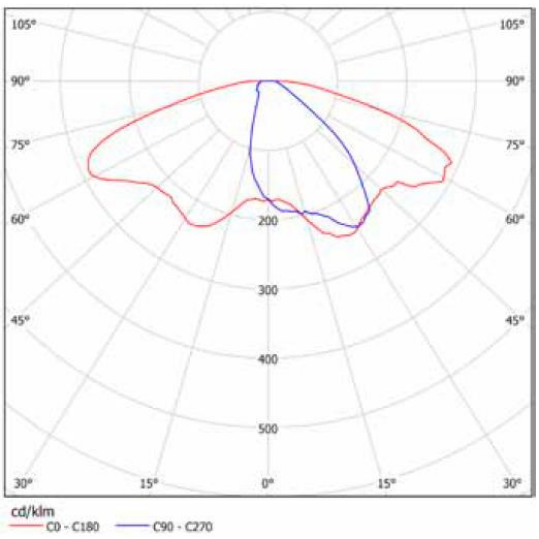
SiliconCPV -ME is the best of the class. Typical ME4a installations are possible with the ratio of pole distance and height up to 5.5. SCPV-ME is designed to fulfil ME-classes on a road whose width is equal to pole height or less.



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, rain or dusty and arid conditions over the years, it is recommended to clean the glass typically every 6 months to maintain maximum performance.

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

Figure 8

Troubleshooting

Problem	Possible Cause and Solution
Light fails to come on in normal operate mode	It may not be dark enough. Cover solar panel and check if the light head illuminates within 30 minutes.
Light comes on but is very bright	The system has been reset. When initially switched 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 system from 'ON' to 'OFF' and back again. 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. Change the switch to 'OFF' mode then 'ON' mode and re-check the communication.

Battery and Controller Pack Replacement for Kamr

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

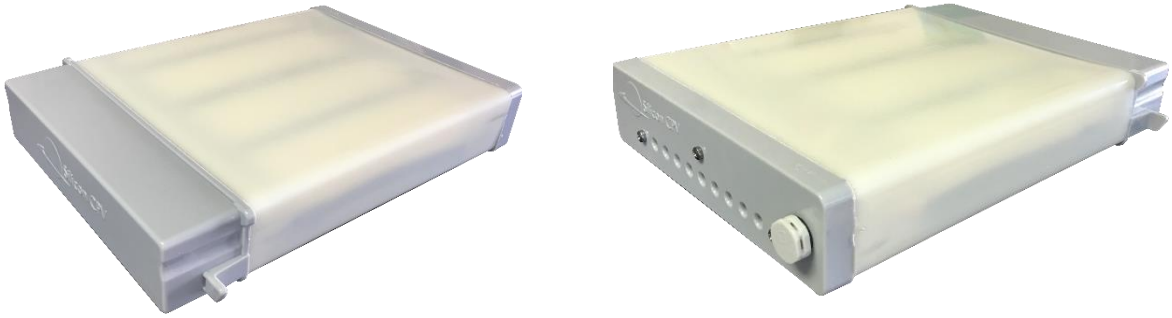


Figure 9

Battery Bank and Controller Removal

1. Turn off the Street Light using the On/Off switch situated on the underside of the main light body.

2. Remove the two pozi screws that secure the battery pack end cap to the main light body.

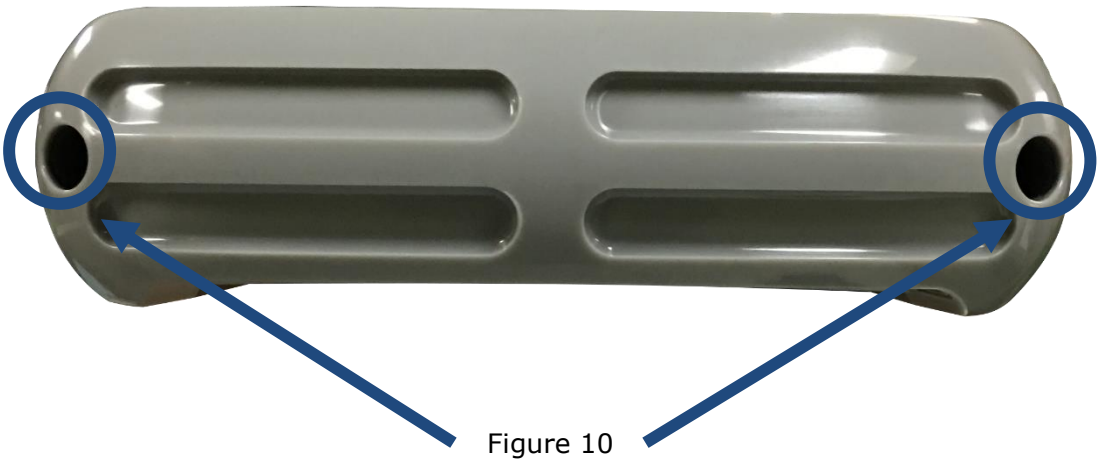


Figure 10
Correct Screws Holes for the two pozi screws

3. Carefully remove the end cap.

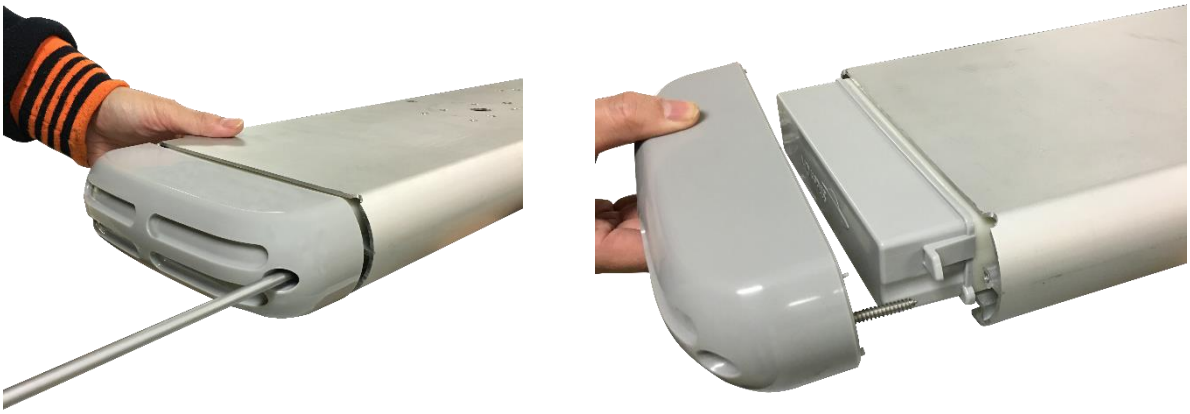


Figure 11

4. Carefully pull the battery pack towards you to remove it.

Figure 12

5. There are no wires on the connected to the battery pack and and so removal of the battery pack can be completed at this stage.

6. Using a new battery pack reverse the removal process to install the new pack.

7. Finally, switch the system ON using the On/Off switch on the underside of the main light body.

Figure 13

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Technical Specification

Specification	Kamr S-G2	Kamr 3-G2	Kamr 2-G2	Kamr 1-G2	Kamr L-G2	Kamr 1L-G2	Kamr 2L-G2	Kamr 3L-G2	Kamr 4L-G2
Max Light Output Phase 1 (Lumens)	1,300	2,600	3,900	5,200	6,500	7,800	9,100	10,400	11,700
Battery – Type	Lithium - ion								
Capacity (Wh)	64	127	191	254	318	382	445	509	572
Battery – Service Life	7 years at 75% DoD and at 45°C ambient temperature					7 years at 70% DoD and at 45°C ambient temperature			
Light source – Type	High Efficiency LED 4000k Colour Temp					High Efficiency LED 5000k Colour Temp			
Total Light Output (Lumens/hr) @90% DoD	12,672	25,146	37,818	50.292	62,964	75,636	88,110	100,782	113,256
Number of LEDs	16	32	48	64	80	96	112	128	144
Light Head Lifetime	80,000 hours to LM80 specifications								
LED Efficiency	220 lumens / Watt								
Optical Efficiency	>93%								
Main Body	Aluminium Alloy								
Solar Panels (W)	20	25	37	50	65	115	140	165	195
Solar Cells	Very High Efficiency – proprietary Solar Cells								
Solar Panel – Service Life	25 Years								
Controller	Microprocessor based Energy Management and Wireless Communication								
Wireless Network	proprietary Wireless Network allows Remote Management and Control of Lights using Internet or GSM. One Gateway per 200 lights and all the gateways report to a central control room.								
Light Control	Intelligent Adaptive Light level control based on energy received or predefined user selectable light level								
Light Hours	Programmable trigger levels from 'Dusk till Dawn'								
Optics	Options for 8 different light profiles for each light								
Recommended Pole height	4m	5m	6m	7m	8m	8-9m	9-10m	10-11m	11-12m
Pole Spacing		For T2 optics, Pole Spacing is 5* the pole height							
Light Envelope (m^2) for T2 Optics	80	125	180	245	320	320	405	500	605
Average Light Level	16 Lux (Depending on road width and height)					10-16 Lux (Depending on road width and height)			
Max Light Level	30 Lux (Depending on road width and height)					20-30 Lux (Depending on road width and height)			
Min Light Level	10 Lux (Depending on road width and height)					5-10 Lux (Depending on road width and height)			
Dimensions (L*W*H) cm	87x23x7	97x23x7	136x23x7	180x23x7	228x23x7	229x23x7 (Dimensions exclude pole adaptor)			
Weight (Kg)	5	7	10	13	16	18	20	23	26
Operating temperature	-20°C to +60°C								
Protections rating	IP67					Main Body -IP67 (Battery IP66)			
Standards Compliance	BS 5489:2003 EN13201, ME4a, IESNA Type II or Type III								
Note: All figures have been specified using T2 optics as per IESNA Type II									

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 Warranties are 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 following options are available:

- Returned to Silicon CPV for repair
- Returned to Silicon CPV, on-site agent or local representative for repair
- Repaired on-site
- 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.

Contact Information

If any technical problems arise during the installation of the Silicon CPV Kamr Solar Street Light, then please contact us 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 or national disposal regulations for electronic and electrical devices.