



Lanterns, Sun, Moon and Stars

Solar light manufacturers have learnt from past experiences

Whether the “Kurfürstendamm” or the “Champs-Élysées”: a street’s flair is not defined by the lanterns on its paths and sidewalks. So far this was the knock-out criterion for solar lights as they were anything but attractive. However now there are solar lights being produced which need not to be afraid of the comparison with conventional street lights - whether the design or the price is the deciding factor.

Find more to this new development in the following article and adjacent market overview.

When the children from the settlement Dargon on the Baltic Sea island of Usedom run to catch the school bus on the winter mornings, they do not need to worry about not finding the bus stop: the path is lighted by lanterns. It would not be worth mentioning if the lanterns used in this small village were not solar-powered. The responsible island administration stated that they bought a total of eight lanterns using funding from the European Union as well as the province Mecklenburg-Vorpommern. Britta Radünzel from the construction department says that it costed round about EUR 12,500 to buy and construct the lanterns.

She reports that on the whole the management is happy with the lights’ performance even though now and then the Dargen children have to walk part of their route in the dark. Occasionally when the

days in winter are short and grey, the batteries in the lights fail. The manufacturer, Leuchten GmbH Pasewalk, is aware of this problem but has not been able to find a solution yet. In winter the available sunshine just is not enough to charge the lantern battery to its maximum. “In the best of cases the solar modules achieve half the performance in winter than they do in summer”, say Rico Burmeister from Pasewalk. Therefore in the darkest part of the year the 12 volt battery only rarely charges up to its maximum. Because of this a guarantee against a blackout or a temporary failure could no be given. Nevertheless the solar modules and batteries are programmed so that the lights can shine for six hours, five consecutive days without recharging

Lanterns shape the style of public spots - for example in front of the Brandenburger Gate. So far this was rather hindering for the circulation of solar lights as even in bog-standard locations the lamp design played an important role. But a solution nears.

Large output for little input - this is what all solar light manufacturers in Central Europe are challenged with. A further challenge: an appealing design. Some of the PV-modules on the lights take some real getting used to. For example the business Bega Gantenbrink-Leuchten KG which is, according to their own information, the market leader when it comes to external lights has found no way to integrate the PV-module into the lantern appropriately. "Both design and quality are very important to our customers", says Bega-manager Peter Sagwitz. So this would mean that in Central Europe solar lights remain to be condemned to the outskirts for example the earlier described bus stop. The reason: it is not worth laying an electricity cable to these areas.

As a matter of fact there are now also many lights to be found on the market that set new standards in the design domain and thereafter are appropriate for locations where appearance plays a significant role. Our market overview confirms this. They are for example appropriate to illuminate office buildings or pedestrian areas. The perfect example is the Champ model from HEI Consulting GmbH situated in Vienna. It consists of a slim column in which a rim of white light diodes as well as a cylindrical PV-module are integrated. In all-out operation the light gives off up to 2,200 Lumen which is comparable to the light output of a 150 watt light bulb.

Solar lights are now much more frequently seen on the streets. On the Island Usedom they illuminate the path to a bus stop. Over the years their use is much cheaper compared to conventional lights.





Every few years the battery of a solar lantern has to be changed. It doesn't matter if it is one of the first or the second, optically clearly more attractive generation (on the right a current exemplar from EPS Soltec Solartechnik GmbH).

An automatic control system controls the lighting using a movement sensor and so saves battery power. If the sensor does not register any movement then several of the 24 watt LEDs are turned off. "Exactly this movement dependent control of the lamps is interesting especially for residential areas. Generally people are rarely out late in the evening. This means that it would completely satisfactory if the lighting went into full operation as soon as someone walked by. Otherwise it could run on low-power", praised Ulrich Kuipers, professor for electrical engineering at the advanced technical college Südwestfalen in Hagen.

The development of the HEI

solar module - a world innovation and dominant constitutive criteria of the lamp - took up most of the time in the all in all one and half years of development, says Jürgen Brand the marketing manager at HEI. The high performance solar cells used come from Sunpower Corp. which depending on the lamp model are used in numbers of 44, 64 or 88. Together they generate a capacity between 132 and 264 watt although this can in practice never be achieved due to the cylindrical form of the module.

The cells are flexed and bent in a compression machine and then laminated into a glass cylinder. However the company will not reveal the exact procedure.

The tube form of the solar lamp is similar to that of the conventional modern street lamps. However a look into the prospect shows that the technology still retains the flaws of its predecessors. Even the Viennese company does not give a guarantee against possible black-outs. The conditions in various areas are just too differential to offer a general guarantee says Norman Lindner from the HEI sales department. However black-out security does not seem to be all too relevant: in autumn 2008 round about 2.600 Austrian communes were contacted to promote the new lamp. So far more than 30 communities have ordered the exemplar and even for positions where the design plays a huge role. Amongst others is one order from the community of Gmundn for lanterns to be built on their esplanade on the Traunsee - a real tourist attraction right next to the mountain lake. In Leibnitz in Styria a HEI solar lamp will light the inner courtyard of the city hall.

Heinz Meseberg from LSC Lichttechnik & Straßenaustattung in Berlin believes that because of its comparatively high light intensity the lamps are also appropriate for the lighting of residential and service roads in Germany. He is an expert in the field of street lighting and a member of the responsible DIN technical committee. By his account side streets in Germany are normally lighted by 50 watt high pressure lamps.

Large Potential for Solar Lamps

According to Stadtlicht GmbH, which operates the street and traffic lights in Berlin German communes, public services and public utilities spend approximately 150 million euro annually for the maintenance and repair of the street light system. It could also be more: by its own accounts the city of Düsseldorf alone uses up a budget of approx. 4,5 million euro for the maintenance and new acquisition of street lighting.

The type and amount of the street lighting Germany is regulated by the DIN EN 13201. Decisive for the lighting is the type of street and the traffic for example the number of vehicles, pedestrians and cyclists per hour. Main streets require a very high lighting standard. This means that the lighting must be designed so that a driver can analyse the situation on the road, roadside and on the pavement by night.

By the account of the Berliner Energieagentur GmbH round about 9,1 millions street lamps are scattered around Germany's streets and paths. An investigation by the central organization for electro technology and electrical industry (Zentralverband Elektrotechnik und Elektronikindustrie / ZVEI) shows that 30 percent of the street lanterns in Germany are still equipped with technology from the 1960's. The energy input is accordingly high. The potential savings add up to 2,7 billion kilowatt-hours per year. That equates to around 567 million euro (at 21 cent per kilowatt-hour) or an emission of 1,6 million tons of carbon dioxide respectively.

Annually only three percent of street lanterns are renewed. The use of solar lamps is restricted to isolated locations in the outskirts where there are no electricity cables.



Here in this lantern from HEI the light module and the PV-module form a cylindrical tube. Thus the solar cells do not stand out. This makes the lantern perfect for locations where the design is very important for example in front of this office block "Energybase".

The mercury vapour lamp which is usually used for these street light applications generates a luminous flux of 1,800 lumen and so even less than the LED solar light. An important criterion for the illumination of residential streets is that a pedestrian must be able to see the other pedestrians and the bumps on the pavement.

These requirements that also this second example of the new generation is able to fulfil: the Streetsun from EPS Soltec Solartechnik GmbH, also an Austrian company. In this light – it performs considerably less than the HEI product – the PV-module is also integrated into the collective structure however EPS chose a rather more classical approach: the slim tubular illuminant dilates under the module and so slightly incorporates a tilted element into the casing. Two years ago the lamp was awarded with the iF-prize by the International Forum of Design. Inside, 28 monocrystalline solar cells from Ersol Solar Energy AG generate 23.6 watt to charge the battery. The

battery then supplies two watt to two LEDs. Altogether the light power equates to that of a 70 watt light bulb. The lamp is fitted with a 9.6 volt nickel metal hydride battery which has a capacity of up to 13 ampere hours. It is enough – the programming accepts a maximum discharge of 70 percent – for the light to shine for approximately 22 hours. However with the EPS light also the possibility of a warranty for perfect proceedings without any black outs does not exist. "It is still a solar light", states EPS spokeswoman Heidrun Hehle laconically.

Both lights are to be found in the higher price category: The Champ costs EUR 4,500 per unit (net.) and the Streetsun is available for EUR 2,480. The much simpler alternative from Pasewalk can be bought for EUR 1,800. In comparison: the city Düsseldorf, by its own accounts, makes a calculation of approximately EUR 2,500 for the purchase and assemblance of a conventional street light, including the necess-

ary constructions work. Furthermore the laws for public bidding state that the communes must opt for the cheapest option, says Rico Burmeister from Pasewalk-Leuchten. "Even if the people concerned know better, their hands are tied by the rules."

Principally that is correct, Britta Radünzel from the island administration of Usedom agrees. However in any individual case the long term follow-up costs would be accounted for a criterion for the assignment to build street lanterns. And in this case the solar light should not fear the comparison to any conventional street lighting system. A calculation by EPS showed that over the course of 30 years the solar version saved EUR 20,000 more than the normal light. This calculation is based on an example where the running costs of eleven solar lights were compared to that of nine conventional lights over a distance of 340 meters. In total the acquirement, installation and maintenance of the solar lights over the 30 years would sum up to EUR 43,252 and the total of the normal lights would be EUR 31,294. Over the 30 years the electricity costs for the traditional lighting would amass to more than EUR 32,000 at a price of 21 cent per kilowatt-hour and an average price increase of five percent per year. So the solar variant amortises after approximately 13 years. So also in regard to the financial aspect large output for little input.



Manufacturer	Activalis- Activasun	Activalis- Activasun	Carmanah Technologies Corp.	Carmanah Technologies Corp.
Model	Sunnyled 28	Sunnyled 56	Evergen 1530	Evergen 1520
Area of application	court, residential street	court, residential street	car park, residential street	car park, residential street
Max. light time per charged battery (h)	40	40	n.s.	n.s.
Light source				
Type	LED	LED	LED	LED
Number	28	56	20 - 80	20 - 80
Input while in full use(W)	14	28	100	100
Input while dimmed(W)	n/a	n/a	variable	variable
Luminous flux(lm)	n.s.	n.s.	800 - 6.800	800 - 6.800
Durability (h)	50.000	50.000	100.000	100.000
Control mechanism				
Movement sensor	yes	yes	yes	yes
Dusk sensor	yes	yes	yes	yes
astronomical clock	yes	yes	yes	yes
programmed cycle time	yes	yes	yes	yes
enabled control of a group of the lamps	planned	planned	no	no
Battery				
Type	lead gel	lead gel	lead	lead
Number	1	1	n.s.	n.s.
Battery capacity(Ah)	40	70	n.s.	n.s.
Battery voltage(V)	12	12	n.s.	n.s.
Manufacturer	Power-Sonic Corp.	Power-Sonic Corp.	n.s.	n.s.
Charge cycles	600	600	n.s.	n.s.
Battery location	upper part of lamp	upper part of lamp	lamp pole	lamp pole
charge controller	yes	yes	yes	yes
Solar module				
maximum output(W)	50	90	285	190
voltage in MPP	18,5	18,5	n.s.	n.s.
type	polycrystalline	polycrystalline	monocrystalline	monocrystalline
manufacturer	various	various	n.s.	n.s.
average battery charge time in winter(h)	depends on location	depends on location	depends on location	depends on location
Lamp pole				
Material	aluminium and zinc-plated steel	aluminium and zinc-plated steel	variable	variable
Foundation	n.s.	n.s.	variable	variable
Measurements				
height of the module(m)	4 - 5	4,5 - 7-5	customer preference	customer preference
height of the lamp(s) (m)	3,5 - 4,5	4 - 7	customer preference	customer preference
length x width(m)	0,63 x 1,04	1,70 x 0,83	customer preference	customer preference
weight(kg)	28	48	customer preference	customer preference
Miscellaneous				
light allocation available	n.s.	n.s.	yes	yes
operating temperature(°C)	n.s.	n.s.	- 30 - 50	- 30 - 50
maximum air humidity(%)	n.s.	n.s.	100	100
protection category	n.s.	n.s.	n.s.	n.s.
certificates	EN 61000-6-1 EN 61000-6-3 (2007)	EN 61000-6-1 EN 61000-6-3 (2007)	CE	CE
guarantee(years)	1	1	5	5
price(net €)	1 790	2 250	n.s.	n.s.
comment			sample lamp, configurations possible	sample lamp, configurations possible



Manufacturer	Ecolights Solare Beleuchtung GmbH	Ecolights Solare Beleuchtung GmbH	Ecolights Solare Beleuchtung GmbH	Ecolights Solare Beleuchtung GmbH
Model	Ecostar	Kion-permanent	Double-Sol	SPL-150
Area of application	cycle path, promenade, residential street, plaza	cycle path, promenade, residential street, plaza	cycle path, promenade, residential street, plaza	street, crossroads, stopover, plaza
Max. light time per charged battery (h)	60 (when lowered 120)	60 (when lowered 120)	60 (when lowered 120)	120
Light source				
Type	high power LEDs	high capacity LEDs	high current LEDs	sodium discharge lamp
Number	12	108	12 + 1 pole light	1
Input while in full use(W)	9	9	10	26
Input while dimmed(W)	5	5	5,5	n.s.
Luminous flux(lm)	1.100	800	1.100	3.600
Durability (h)	50.000	50.000	50.000	14.000
Control mechanism				
Movement sensor	no	optional	no	no
Dusk sensor	no (is controlled by the module voltage)	no (is controlled by the module voltage)	no (is controlled by the module voltage)	no (is controlled by the module voltage)
astronomical clock	no	no	no	no
programmed cycle time	yes	yes	yes	yes
enabled control of a group of the lamps	optional	optional	optional	optional
Battery				
Type	lead gel	lead gel	lead gel	lead gel
Number	4	4	2	2
Battery capacity(Ah)	48	48	52	280
Battery voltage(V)	12	12	12	24
Manufacturer	Fiamm	Fiamm	Fiamm	Exide Technologies
Charge cycles	800	800	800	1.200
Battery location	earth reservoir	lamp pole	upper part of the lamp	earth reservoir
charge controller	yes	yes	yes	yes
Solar module				
maximum output(W)	60	60	60	170
voltage in MPP	12	12	12	24
type	monocrystalline	monocrystalline	monocrystalline	monocrystalline
manufacturer	Sunware Solartechnik Produktions GmbH & Co. KG	Sunware Solartechnik Produktions GmbH & Co. KG	Sunware Solartechnik Produktions GmbH & Co. KG	Photovolttech BV
average battery charge time in winter(h)	16	16	18	25
Lamp pole				
Material	powder-coated aluminium	powder-coated aluminium	wood (glulam)	zinc-plated steel pole
Foundation	fundament	fundament	fundament	fundament
Measurements				
height of the module(m)	4,1	4,1	4,1	6,3
height of the lamp(s) (m)	3,4	3,4	3,4	5,5
length x width(m)	0,6 x 0,3	0,9 x 0,9	0,6 x 0,3	1,6 x 0,8
weight(kg)	56	70	72	250
Miscellaneous				
light allocation available	yes	yes	yes	yes
operating temperature(°C)	- 20 - 50	-20 - 50	- 20 - 50	-20 - 50
maximum air humidity(%)	90	90	90	90
protection category	IP 55	IP 55	IP 55	IP 55
certificates	CE	CE	CE	CE
guarantee(years)	2	2	2	2
price(net €)	2.990	3.062	3.800	3.666
comment				



Manufacturer	Engcotec GmbH	Engcotec GmbH	Engcotec GmbH	EPS Soltec Solartechnik GmbH
Model	Horus 75	Horus 100	Horus 150	Streetsun
Area of application	courtyard, street, car park	courtyard, street, car park	courtyard, street, car park	side street, pavement, car park, golf course, hotel complex
Max. light time per charged battery (h)	n.s.	n.s.	n.s.	40
Light source				
Type	energy-efficient lamp, white	energy-efficient lamp, white	energy-efficient lamp, white	LED
Number	1 x 9W + 1 x 18W / 2 x 18W	1 x 9W + 1 x 18W / 2 x 18W	1 x 9W + 1 x 18W / 2 x 18W	12
Input while in full use(W)	27 / 36	27 / 36	27 / 36	n.s.
Input while dimmed(W)	n.s.	n.s.	n.s.	n/a
Luminous flux(lm)	1.800	1.800	1.800	320 - 420
Durability (h)	10.000	10.000	10.000	> 50.000
Control mechanism				
Movement sensor	yes	yes	yes	no
Dusk sensor	no	no	no	yes
astronomical clock	no	no	no	no
programmed cycle time	yes	yes	yes	yes
enabled control of a group of the lamps	no	no	no	no
Battery				
Type	lead	lead	lead	nickel metal hydride
Number	1	1	1	1
Battery capacity(Ah)	75	90	100	13
Battery voltage(V)	12	12	12	9,6
Manufacturer	Exide Technologies	Exide Technologies	Exide Technologies	Panasonic Corp., Saft SA
Charge cycles	n.s.	n.s.	n.s.	500
Battery location	lamp pole	lamp pole	lamp pole	in battery shaft under solar module and above lamp
charge controller	yes	yes	yes	yes
Solar module				
maximum output(W)	75	100 or 120	150	25
voltage in MPP	12	12	12	14
type	monocrystalline	monocrystalline	monocrystalline	monocrystalline
manufacturer	Engcotec GmbH, Webel-SL Energy Systems Limited	Engcotec GmbH, Webel-SL Energy Systems Limited	Engcotec GmbH, Webel-SL Energy Systems Limited	EPS Soltec Solartechnik GmbH
average battery charge time in winter(h)	n.s.	n.s.	n.s.	n.s.
Lamp pole				
Material	electroplated and hot-dip galvanised steel	electroplated and hot-dip galvanised steel	electroplated and hot-dip galvanised steel	powder-coated aluminium
Foundation	fundament	fundament	fundament	pipe fundament, screw connect
Measurements				
height of the module(m)	1,2	1,2	1,2	4
height of the lamp(s) (m)	4,30 / 5 - 8	4,30 / 5 - 8	4,30 / 5 - 8	4
length x width(m)	n.s.	n.s.	n.s.	0,328 x 0,506
weight(kg)	130	145	140	32
Miscellaneous				
light allocation available	yes	yes	yes	yes
operating temperature(°C)	- 20 - 50	- 20 - 50	- 20 - 50	40/60 (max. temperature)
maximum air humidity(%)	n.s.	n.s.	n.s.	90
protection category	IP 60	IP 60	IP 60	IP 65
certificates	n.s.	n.s.	n.s.	no
guarantee(years)	1	1	1	2
price(net €)	2.110	2.330	2.510	2.480
comment				



Manufacturer	HEI Consulting GmbH	HEI Consulting GmbH	HEI Consulting GmbH	Helios Technology SpA
Model	Champ 190	Mira 190	Mira S 100	Helios SOX26-275 Vario K BTP
Area of application	plaza, promenade	street	cycle track, pavement	residential and main street
Max. light time per charged battery (h)	30 under max. capacity 300 in energy saving mode	30 under max. capacity 300 in energy saving mode	27 under max. capacity 270 in energy saving mode	n.s.
Light source				
Type	high capacity LED	high capacity LED	high capacity LED	low pressure sodium discharge lamp
Number	24	24 (optionally 36)	12 (optionally 18)	1
Input while in full use(W)	24	24 (optionally 36)	12 (optionally 18)	26
Input while dimmed(W)	0,07	0,07	0,07	n/a
Luminous flux(lm)	2.200 (optionally < 2.880)	2 200 (optionally < 4.320)	1.080 (optionally up to 2.160)	3.700
Durability (h)	>75. 000	> 75.000	> 75.000	22.000
Control mechanism				
Movement sensor	yes	yes	yes	no
Dusk sensor	yes	yes	yes	yes
astronomical clock	yes	yes	yes	n.s.
programmed cycle time	yes	yes	yes	yes
enabled control of a group of the lamps	from 2010	from 2010	from 2010	no
Battery				
Type	lead gel	lead gel	lead gel	lead gel
Number	6	6	4	2
Battery capacity(Ah)	72	72	32	110
Battery voltage(V)	12	12	12	12
Manufacturer	Multipower, Panasonic Corp.	Multipower, Panasonic Corp.	Multipower, Panasonic Corp	Fullriver Battery Manufacture Co. Ltd.
Charge cycles	1.800	1.800	1.800	1.000
Battery location	lamp pole	lamp pole	lamp pole	steel container
charge controller	yes	yes	yes	yes
Solar module				
maximum output(W)	192	192	99	2 x 75
voltage in MPP	9	9	6,2	17,70
type	monocrystalline	monocrystalline	monocrystalline	monocrystalline
manufacturer	HEI Consulting GmbH	HEI Consulting GmbH	HEI Consulting GmbH	Helios Technology SpA
average battery charge time in winter(h)	2 - 3	2 - 3	2 - 3	n.s.
Lamp pole				
Material	lacquered, hot-dip galvanised steel (optionally aluminium or st. Steel)	lacquered, hot-dip galvanised steel (optionally aluminium or st. Steel)	lacquered, hot-dip galvanised steel (optionally aluminium or st. Steel)	steel (not provided)
Foundation	fundament (optionally base plate)	fundament (optionally base plate)	fundament (optionally base plate)	concrete base
Measurements				
height of the module(m)	2,16	2,16	1,5	8
height of the lamp(s) (m)	5,7	5,8	4,65	7
length x width(m)	0,18 x 0,18	0,18 x 0,18	0,14 x 0,14	1,076 x n.s.
weight(kg)	120	160	120	130
Miscellaneous				
light allocation available	yes	yes	yes	n.s.
operating temperature(°C)	-15 - 50	-15 - 50	-15 - 50	-15 - 40
maximum air humidity(%)	100 (rain)	100	100	100
protection category	IP 65	IP 65	IP 65	IP 23
certificates	EN 40-5, EN 40-3-1, ISO 1461 erfüllt EMV: EN 55015, EN 61547 erfüllt Photovoltaiknorm EN 61215 (adaptiert)	EN 40-5, EN 40-3-1, ISO 1461 erfüllt EMV: EN 55015, EN 61547 erfüllt Photovoltaiknorm EN 61215 (adaptiert)	EN 40-5, EN 40-3-1, ISO 1461 erfüllt EMV: EN 55015, EN 61547 erfüllt Photovoltaiknorm EN 61215 (adaptiert)	CE
guarantee(years)	2, optionally 5	2, optionally 5	2, optionally 5	2
price(net €)	4.500 - 6.000	4.500 - 6.000	4.500 - 6.000	2.466
comment				



Manufacturer	Helios Technology SpA	Helios Technology SpA	Helios Technology SpA	Himin Solar Energy Group
Model	Helios SOX26-285 Vario K BTP	Helios SOX36-275 Vario K BI	Helios SOX36-285 Vario K BI	HMJ & HZT Series
Area of application	residential and main street	residential and main street	residential and main street	courtyard, residential street
Max. light time per charged battery (h)	n.s.	n.s.	n.s.	6 - 10
Light source				
Type	low pressure sodium discharge lamp	low pressure sodium discharge lamp	low pressure sodium discharge lamp	LED, energy-efficient lamp
Number	1	1	1	1 or 2
Input while in full use(W)	26	36	36	1 or 2
Input while dimmed(W)	n/a	n/a	n/a	n.s.
Luminous flux(lm)	3.700	6.160	6.160	n.s.
Durability (h)	22.000	22.000	22.000	n.s.
Control mechanism				
Movement sensor	no	no	no	no
Dusk sensor	yes	yes	yes	yes
astronomical clock	n.s.	n.s.	n.s.	n.s.
programmed cycle time	yes	yes	yes	yes
enabled control of a group of the lamps	no	no	no	yes
Battery				
Type	lead gel	lead gel	lead gel	lead / lead gel
Number	2	2	2	1
Battery capacity(Ah)	110	150	150	24 - 50
Battery voltage(V)	12	12	12	12
Manufacturer	Fullriver Battery Manufacture Co. Ltd.	Fullriver Battery Manufacture Co. Ltd.	Fullriver Battery Manufacture Co. Ltd.	n.s.
Charge cycles	1.000	1.000	1.000	n.s.
Battery location	steel container	separate container(not provided)	separate container (not provided)	separate waterproof container
charge controller	yes	yes	yes	yes
Solar module				
maximum output(W)	2 x 85	2 x 75	2 x 85	20 - 40
voltage in MPP	18,30	17,70	18,30	18
type	monocrystalline	monocrystalline	monocrystalline	mono- and polycrystalline
manufacturer	Helios TechnologySpA	Helios Technology SpA	Helios Technology SpA	Himin Solar Energy Group
average battery charge time in winter(h)	n.s.	n.s.	n.s.	n.s.
Lamp pole				
Material	steel (not provided)	steel (not provided)	steel (not provided)	hot-dip galvanised steel
Foundation	cement base	cement base	cement base	n.s.
Measurements				
height of the module(m)	8	8	8	n.s.
height of the lamp(s) (m)	7	7	7	2,5 - 3,5
length x width(m)	1,076 x n.s.	1,076 x n.s.	1,076 x n.s.	n.s.
weight(kg)	130	34	34	n.s.
Miscellaneous				
light allocation available	n.s.	n.s.	n.s.	yes
operating temperature(°C)	- 15 - 40	-15 - 40	-15 - 40	n.s.
maximum air humidity(%)	100	100	100	n.s.
protection category	IP 23	IP 23	IP 23	IP 60
certificates	CE	CE	CE	TÜV, CE
guarantee(years)	2	2	2	2
price(net €)	2.564	2.661	2.759	550 - 850
comment				



Manufacturer	Himin Solar Energy Group	Kopf Solarschiff GmbH	Kopf Solarschiff GmbH	Kopf Solarschiff GmbH
Model	HML & HZL Series	Typ Quadra 1	Typ Quadra 2	Typ Tulip
Area of application	street	courtyard, cycle track, street, pavement, factory premises	courtyard, cycle track, street, pavement, factory premises	courtyard, cycle track, street, pavement, factory premises
Max. light time per charged battery (h)	4 - 12	35 with 9W/li-ions, 17,5h with 18W/li-ions, 55h with 9W/lead, 27,5h with 18W/lead	35 with 9W/li-ions, 17,5h with 18W/li-ions, 55h with 9W/lead, 27,5h with 18W/lead	35 with 9W/li-ions, 17,5h with 18W/li-ions, 55h with 9W/lead, 27,5h with 18W/lead
Light source				
Type	LED, energy saving lamp, sodium discharge lamp	LED	LED	LED
Number	1 or 2	3	3	3
Input while in full use(W)	23 - 300	9, optionally 18	9, optionally 18	9, optionally 18
Input while dimmed(W)	n.s.	n.s.	n.s.	n.s.
Luminous flux(lm)	n.s.	300, optionally 600	300, optionally 600	300, optionally 600
Durability (h)	n.s.	> 50.000	> 50.000	> 50.000
Control mechanism				
Movement sensor	no	optional	optional	optional
Dusk sensor	yes	yes	yes	yes
astronomical clock	n.s.	no	no	no
programmed cycle time	yes	yes	yes	yes
enabled control of a group of the lamps	yes	optionally with wireless	optionally with wireless	optionally with wireless
Battery				
Type	lead/lead gel	lithium-ions, optionally lead or lead gel	lithium-ions, optionally lead or lead gel	lithium-ions, optionally lead or lead gel
Number	2	1	1	1
Battery capacity(Ah)	50 - 150	30 with li-ions, 65 with lead	30 with li-ions, 65 with lead	30 with li-ions, 65 with lead
Battery voltage(V)	12	11,4 with li-ions, 12 with lead	11,4 with li-ions, 12 with lead	11,4 with li-ions, 12 with lead
Manufacturer	n.s.	various	various	various
Charge cycles	n.s.	n.s.	n.s.	n.s.
Battery location	separate waterproof container	li-ions in the pole, lead in a sepearate buried container	li-ions in the pole, lead in a separate buried container	li-ions in the pole, lead in a separate buried container
charge controller	yes	yes	yes	yes
Solar module				
maximum output(W)	64 - 200	85	85	75
voltage in MPP	18	12	12	12
type	mono- and polycrystalline	polycrystalline	polycrystalline	polycrystalline
manufacturer	Himin Solar Energy Group	n.s.	n.s.	n.s.
average battery charge time in winter(h)	n.s.	approx. 8	approx. 8	approx. 8
Lamp pole				
Material	hot-dip galvanised steel	steel, optionally others	steel, optionally others	steel, optionally others
Foundation	n.s.	fundament, optionally others	fundament, optionally others	fundament, optionally others
Measurements				
height of the module(m)	n.s.	4, optionally other heights	4, optionally other heights	5, optionally other heights
height of the lamp(s) (m)	5 - 7	3, depends on module height	3, depends on module height	4, depends on module height
length x width(m)	n.s.	0,9 x 0,9, height: 5,30	0,9 x 0,9, height: 5,30	0,9 x 0,9
weight(kg)	n.s.	60	60	60
Miscellaneous				
light allocation available	yes	yes	yes	yes
operating temperature(°C)	n.s.	n.s.	n.s.	n.s.
maximum air humidity(%)	n.s.	n.s.	n.s.	n.s.
protection category	IP 60	n.s.	n.s.	n.s.
certificates	TÜV, CE	n.s.	n.s.	n.s.
guarantee(years)	2	2	2	2
price(net €)	1.200 - 3.000	2.260 with li-ions, 2.160 with lead, 2.060 with lead gel	2.260 with li-ions, 2.160 with lead, 2.060 with lead gel	2.360 with li-ions, 2.260 with led, 2.160 with lead gel
comment				



Manufacturer	Leuchten GmbH Pasewalk	Leuchten GmbH Pasewalk	NET Neue Energie Technik GmbH	NET Neue Energie Technik GmbH
Model	Solarsystem »Derben«	Solarsystem »Sigma«	Madrid	Amsterdam
Area of application	residential environment, park	main street, park	street	pavement
Max. light time per charged battery (h)	120	120	n.s.	depends on design/size of battery
Light source				
Type	LED	LED	LED or others by request	LED or others by request
Number	1 - 2, optionally more	1 - 2, optionally more	n.s.	variable
Input while in full use(W)	3 - 6, optionally more	3 - 6, optionally more	100, 50, 36	12
Input while dimmed(W)	< 1	< 1	n/a	n/a
Luminous flux(lm)	600	600	n.s.	n.s.
Durability (h)	50.000	50.000	50.000	50.000
Control mechanism				
Movement sensor	yes	yes	optional	optional
Dusk sensor	yes	yes	yes	yes
astronomical clock	available as accessory	available as accessory	optional	optional
programmed cycle time	yes	yes	optional	optional
enabled control of a group of the lamps	in preparation	in preparation	yes	yes
Battery				
Type	lead gel	lead gel	lead acid	nickel metal hydride, lithium ions
Number	1 - 2, optionally more	1 - 2 optionally more	differs in different regions	variable
Battery capacity(Ah)	35 - 122	35 - 122	variable	variable
Battery voltage(V)	12	12	24	12
Manufacturer	german Manufacturer	german Manufacturer	Varta AG	Varta AG
Charge cycles	4.000 - 6.000	4.000 - 6.000	> 3.000	>3.000
Battery location	in a container on the mast	in a container on the mast	n.s.	variable
charge controller	yes	yes	yes	yes
Solar module				
maximum output(W)	25 - 125	25 - 125	175 - 700	50 - 100
voltage in MPP	17	17	24	12
type	polycrystalline	polycrystalline	monocrystalline	monocrystalline
manufacturer	n.s.	n.s.	Sharp Corp.	Helios Technology SpA and others
average battery charge time in winter(h)	n.s.	n.s.	< 4	< 4
Lamp pole				
Material	zinc-plated steel pipe	zinc-plated steel pipe	steel pipe	steel pipe/ Alu / stainless steel
Foundation	fundament, screws optional	fundament, screws optional	fundament, possibly with a battery fundament	fundament, possible with battery fundament and/or screws
Measurements				
height of the module(m)	5,5	5,5		3,3
height of the lamp(s) (m)	4,5	4,5	4 - 10	3,5
length x width(m)	1,20 x 1	1,20 x 1	variable	variable
weight(kg)	> 200	> 200	variable	variable
Miscellaneous				
light allocation available	yes	yes	n.s.	n.s.
operating temperature(°C)	-15 - 50	-15 - 50	-35 - 60	-35 - 60
maximum air humidity(%)	75	75	90	90
protection category	IP 60	IP 60	IP 54	n.s.
certificates	n.s.	n.s.	n.s.	n.s.
guarantee(years)	2	2	n.s.	n.s.
price(net €)	from 2.000	from 2.000	n.s.	3.690
comment			individual compilation possible, other designs available	individual compilation possible, other designs available



Manufacturer	PSC Industries Ltd.	Sharp Corp.	Sharp Corp.	Sol Inc.
Model	DF 03 30W/60W LED	LN-LX1-S	LN-LS1A1-S	PM und TPM Series
area of application	residential and main street	residential street, car park	residential street, car park	residential street, highway, complex
Max. light time per charged battery (h)	72	n.s.	n.s.	60
Light source				
Type	LED	LED	LED	LED
Number	4 - 8 slabs	1 LED-module	1 LED-module	2 - 4 modules with 192 LEDs
Input while in full use(W)	100	32	n.s.	3 - 65
Input while dimmed(W)	n.s.	n.s.	n.s.	n.s.
Luminous flux(lm)	15.000	1.800	570	n.s.
Durability (h)	90.000 - 130.000	40.000	40.000	100.000
Control mechanism				
Movement sensor	no	no	no	optional
Dusk sensor	yes	no	no	no
astronomical clock	no	yes	yes	no
programmed cycle time	yes	yes	yes	optional
enabled control of a group of the lamps	no	no	no	optional
Battery				
Type	variable	n.s.	n.s.	lead gel
Number	1 / 2	3	5	1 - 4
Battery capacity(Ah)	100	38	12	80 - 100
Battery voltage(V)	12 or 24	12	12	12
Manufacturer	n.s.	n.s.	n.s.	Sol NRGLife
Charge cycles	n.s.	n.s.	n.s.	variable
Battery location	separate container	seperate container (fixed onto the pole)	inside the pole	in an aluminium casing
charge controller	yes	yes	yes	yes
Solar module				
maximum output(W)	165	120	34,3	80 - 390
voltage in MPP	12 / 24	n.s.	n.s.	17,4
type	crystalline	polycrystalline	polycrystalline	polycrystalline
manufacturer	PSC Industries Ltd.	Sharp Corp.	Sharp Corp.	Sol Inc.
average battery charge time in winter(h)	5	n.s.	n.s.	8
Lamp pole				
Material	zinc-plated steel	aluminium	aluminium	variable
Foundation	screw connect	cement fundament	cement fundament	variable
Measurements				
height of the module(m)	n.s.	3,96	3,642	5,49 - 9,14
height of the lamp(s) (m)	7	3	3	5,49 - 9,14
length x width(m)	1,60 x 0,69	n.s.	n.s.	0,685 x 0,305 / 0,337 x 0,4
weight(kg)	12 (only the lamp head)	131	69	n.s.
Miscellaneous				
light allocation available	yes	n.s.	n.s.	yes
operating temperature(°C)	0 - 60	-15 - 40	-15 - 40	-40 - 49
maximum air humidity(%)	n.s.	95	95	100
protection category	n.s.	n.s.	n.s.	n.s.
certificates	n.s.	JIL	JIL	Dark Sky
guarantee(years)	10	n.s.	n.s.	5
price(net €)	approx. 1.335 (1.799 US-\$)	7.690 (1.000.000¥)	6.152 (800.000¥)	n.s.
comment		at the moment only available on the japanese market	at the moment only available on the japanese market	other height settings for module and lamp are possible



Manufacturer	Sol Inc.	Tianjin Hanteng Energy Saving Equipment Co. Ltd.	Tianjin Hauteng Energy Saving Equipment Co. Ltd.	Tianjin Hauteng Energy Saving Equipment Co. Ltd.
Model	Greenway Series	HTU-DL-112	HTU-DL-116	HTU-DL-121
Area of application	pavement, park	residential street, highway, complex	residential street, highway, complex	residential street, highway, complex
Max. light time per charged battery (h)	adjusts to night	18 - 60	18 - 60	18 - 60
Light source				
Type	LED	LED	LED	LED
Number	1 module with 192 LEDs	1	1	1
Input while in full use(W)	11,8 / 18,9	32	36	56
Input while dimmed(W)	n.s.	n.s.	n.s.	n.s.
Luminous flux(lm)	n.s.	2.560	2.880	4.480
Durability (h)	100.000	50.000	50.000	50.000
Control mechanism				
Movement sensor	optional	yes	yes	yes
Dusk sensor	no	n.s.	n.s.	n.s.
astronomical clock	no	yes	yes	yes
programmed cycle time	optional	yes	yes	yes
enabled control of a group of the lamps	optional	yes	yes	yes
Battery				
Type	lead gel	lead gel	lead gel	lead gel
Number	1	1	1	2
Battery capacity(Ah)	80 - 105	65	100	160
Battery voltage(V)	12	12	12	24
Manufacturer	Sol NRGLife	n.s.	n.s.	n.s.
Charge cycles	variable	1.500	1.500	1.500
Battery location	in an aluminium casing	separate container	separate container	separate container
charge controller	yes	yes	yes	yes
Solar module				
maximum output(W)	80 - 125	65	100	150
voltage in MPP	17,4	12	12	12
type	polycrystalline	monocrystalline	monocrystalline	monocrystalline
manufacturer	Sol Inc.	n.s.	n.s.	n.s.
average battery charge time in winter(h)	8	4,5	4,5	4,5
Lamp pole				
Material	aluminium	steel	steel	steel
Foundation	earth fundament	earth fundament, cement fundame screw connect	earth fundament, cement fundame screw connect	earth fundament, cement funda- ment, screw connect
Measurements				
height of the module(m)	3,66 - 4,57	n.s.	n.s.	n.s.
height of the lamp(s) (m)	3,66 - 4,57	6	6	8
length x width(m)	0,279 x 0,133	n.s.	n.s.	n.s.
weight(kg)	n.s.	n.s.	n.s.	n.s.
Miscellaneous				
light allocation available	yes	yes	yes	yes
operating temperature(°C)	-40 - 49	-25 - 70	-25 - 70	-25 - 70
maximum air humidity(%)	100	80	80	80
protection category	n.s.	IP 66	IP 66	IP 66
certificates	Dark Sky	CE	CE	CE
guarantee(years)	5	2	2	2
price(net €)	n.s.	491 (652 US-\$)	629 (835 US-\$)	916 (1.216 US-\$)
comment	other height settings for the module and lamp are possible	price varies depending on the configurations	price varies depending on the configurations	price varies depending on the configurations



Manufacturer	Tianjin Hauteng Energy Saving Equipment Co. Ltd	Tianjin Hauteng Energy Saving Equipment Co. Ltd.	Verysol GmbH	Verysol GmbH
Model	HTU-DL-155	HTU-DL-123	VS-48L	VS-56L
Area of application	residential street, highway, complex	residential street, highway, complex	residential and main street, car park, courtyard	residential street, car park, courtyard, stopover
Max. light time per charged battery (h)	18 - 60	18 - 60	35	24
Light source				
Type	LED	LED	high power LED	high power LED
Number	2	2	48	56
Input while in full use(W)	112	87	55	66
Input while dimmed(W)	n.s.	n.s.	n.s.	n.s.
Luminous flux(lm)	8.960	6.960	5.100	4.200
Durability (h)	50.000	50.000	> 50.000	> 50.000
Control mechanism				
Movement sensor	yes	yes	optional	optional
Dusk sensor	n.s.	n.s.	optional	optional
astronomical clock	yes	yes	no	no
programmed cycle time	yes	yes	yes	yes
enabled control of a group of the lamps	yes	yes	optional	optional
Battery				
Type	lead gel	lead gel	lead gel	lead gel
Number	2	2	1	1
Battery capacity(Ah)	300	300	230	230
Battery voltage(V)	24	24	12	12
Manufacturer	n.s.	n.s.	Exide Technologies	Exide Technologies
Charge cycles	1.500	1.500	800 cycles	800 cycles
Battery location	separate container	seperate container	separate container or in the pole	separate container or in the pole
charge controller	yes	yes	yes	yes
Solar module				
maximum output(W)	300	280	220	250
voltage in MPP	12	12	12	12
type	monocrystalline	monocrystalline	mono- and polycrystalline	mono- and polycrystalline
manufacturer	n.s.	n.s.	Solara GmbH	Solara GmbH
average battery charge time in winter(h)	4,5	4,5	3	3
Lamp pole				
Material	steel	steel	hot-dip galvanised steel pipe	hot-dip galvanised steel pipe
Foundation	earth fundament, cement fundame screw connect	earth fundament, cement fundame screw connect	fundament	fundament
Measurements				
height of the module(m)	n.s.	n.s.	9	8
height of the lamp(s) (m)	10	10	8	7
length x width(m)	n.s.	n.s.	n.s. x 1,6	n.s. x 1,6
weight(kg)	n.s.	n.s.	125 (without pole)	125 (without pole)
Miscellaneous				
light allocation available	yes	yes	no	yes
operating temperature(°C)	-25 - 70	-25 - 70	30 - 60	30 - 60
maximum air humidity(%)	80	80	90	90
protection category	IP 66	IP 66	IP 65	IP 65
certificates	CE	CE	IEC 61215, SKII, IEC 896-2, ROHS, CE	IEC 61215, SKII, IEC 896-2, ROHS, CE
guarantee(years)	2	2	3	3
price(net €)	1.460 (1.984 US-\$)	1.510 (2.050 US-\$)	1.899	1.799
comment	price varies depending on the configurations	price varies depending on the configuraions	all lanterns are designed to shine continuously from dusk till dawn	all laterns are designed to shine continuously from dusk till dawn



Manufacturer	Verysol GmbH	VP Solar Srl	VP Solar Srl	VP Solar Srl
Model	VS-28L	Aquilone	813	Giro
Area of application	residential street, car park, courtyard pavement, stopover	residential street, car park, garden pavement	residential street, car park, garden pavement	residential street, car park, garden, pavement
Max. light time per charged battery (h)	35	134	86	86
Light source				
Type	high power LED	LED	LED	LED
Number	28	2	12	12
Input while in full use(W)	34	10	15,6	15,6
Input while dimmed(W)	n.s.	n.s.	n.s.	n.s.
Luminous flux(lm)	2.200	n.s.	1.248	1.248
Durability (h)	> 50.000	50.000	50.000	50.000
Control mechanism				
Movement sensor	optional	no	no	no
Dusk sensor	optional	yes	yes	yes
astronomical clock	no	yes	yes	yes
programmed cycle time	yes	yes	yes	yes
enabled control of a group of the lamps	optional	no	no	no
Battery				
Type	lead gel	lead	lead	lead
Number	1	2	2	2
Battery capacity(Ah)	130	160	160	160
Battery voltage(V)	12	12	12	12
Manufacturer	Exide Technologies	Fiamm	Fiamm	Fiamm
Charge cycles	800 cycles	n.s.	n.s.	n.s.
Battery location	separate container or inside the pole	n.s.	n.s.	n.s.
charge controller	yes	yes	yes	yes
Solar module				
maximum output(W)	180	54	60	54
voltage in MPP	12	21,7	21,96	21,7
type	mono- and polycrystalline	polycrystalline	polycrystalline	polycrystalline
manufacturer	Solara GmbH	Kyocera Corp.	ET Solar	Kyocera Corp
average battery charge time in winter(h)	3	9	7	7
Lamp pole				
Material	hot-dip galvanised steel pipe	zinc coated steel, aluminium	fundament and pole : INOX steel fundament cover and steel lamp: zinc coated steel	fundament and pole : INOX steel fundament cover and steel lamp: zinc coated steel
Foundation	fundament	variable	variable	variable
Measurements				
height of the module(m)	7	5,8	5,2	4,8
height of the lamp(s) (m)	6	4,7	4	4,7
length x width(m)	n.s. x 1,6	1,35 x 1,2	0,42 x 0,42	0,42 x 0,42
weight(kg)	98 (without pole)	n.s.	n.s.	n.s.
Miscellaneous				
light allocation available	yes	n.s.	n.s.	n.s.
operating temperature(°C)	30 - 60	-20 - 50	-20 - 50	-20 - 50
maximum air humidity(%)	90	n.s.	n.s.	n.s.
protection category	IP 65	n.s.	n.s.	n.s.
certificates	IEC 61215, SKII, IEC 896-2, ROHS, CE	n.s.	n.s.	n.s.
guarantee(years)	3	2	2	2
price(net €)	1.399	from 1.000	from 1.000	from 1.000
comment	all lanterns are designed to shine continuously from dusk till dawn			



Manufacturer	VP Solar Srl	VP Solar Srl	Zytech Solar - Zueco y Technology SL	Zytech Solar - Zueco y Technology SL
Model	Atollo 4000	Atollo 6000	ZT60SL	ZT30Sh
Area of application	large park	large park	residential street	residential street
Max. light time per charged battery (h)	86	86	6	6
Light source				
Type	LED	LED	LED	LED
Number	15	30	1	1
Input while in full use(W)	19,5	39	60	30
Input while dimmed(W)	n.s.	n.s.	30	15
Luminous flux(lm)	1.560	3.120	> 5.000	1.550
Durability (h)	50.000	50.000	> 6.000	> 6.000
Control mechanism				
Movement sensor	no	no	yes	yes
Dusk sensor	yes	yes	yes	yes
astronomical clock	yes	yes	yes	yes
programmed cycle time	yes	yes	yes	yes
enabled control of a group of the lamps	no	no	no	no
Battery				
Type	lead	lead	lead gel	lead gel
Number	2	2	1	1
Battery capacity(Ah)	200	400	150	100
Battery voltage(V)	12	12	12	12
Manufacturer	Fiamm	Fiamm	Fengfan Co. Ltd.	Fengfan Co. Ltd.
Charge cycles	n.s.	n.s.	n.s.	n.s.
Battery location	n.s.	n.s.	separate container	lamp pole
charge controller	yes	yes	yes	yes
Solar module				
maximum output(W)	130	260	160	120
voltage in MPP	21,9	21,9	12	12
type	polycrystalline	polycrystalline	monocrystalline	monocrystalline
manufacturer	Kyocera Corp.	Kyocera Corp.	Zytech Solar - Zueco y Technology SL	Zytech Solar - Zueco y Technology SL
average battery charge time in winter(h)	13	13	3	3
Lamp pole				
Material	body: iron	body: iron	steel	steel
Foundation	variable	variable	fundament	fundament
Measurements				
height of the module(m)	3	5	7	7
height of the lamp(s) (m)	4	6	6	5,5
length x width(m)	0,88 x 0,65	0,88 x 0,65	0,8 x 1,5	0,8 x 1,5
weight(kg)	n.s.	n.s.	163	159
Miscellaneous				
light allocation available	n.s.	n.s.	yes	yes
operating temperature(°C)	-20 - 50	-20 - 50	-15 - 60	- 15 - 60
maximum air humidity(%)	n.s.	n.s.	> 90	> 90
protection category	n.s.	n.s.	IP 65	IP 65
certificates	n.s.	n.s.	n.s.	n.s.
guarantee(years)	2	2	3	3
price(net €)	from 1.000	from 1.000	n.s.	n.s.
comment				



Manufacturer	Zytech Solar - Zueco y Technology SL	Zytech Solar - Zueco y Technology SL
Model	ZT60Sh	ZT90Sh
Area of application	residential street	residential street
Max. light time per charged battery (h)	6	6
Light source		
Type	LED	LED
Number	1	1
Input while in full use(W)	60	90
Input while dimmed(W)	30	45
Luminous flux(lm)	3.100	4.650
Durability (h)	> 6.000	> 6.000
Control mechanism		
Movement sensor	yes	yes
Dusk sensor	yes	yes
astronomical clock	yes	yes
programmed cycle time	yes	yes
enabled control of a group of the lamps	no	no
Battery		
Type	lead gel	lead gel
Number	1	1
Battery capacity(Ah)	150	250
Battery voltage(V)	12	24
Manufacturer	Fengfan Co. Ltd.	Fengfan Co. Ltd.
Charge cycles	n.s.	n.s.
Battery location	lamp pole	separate container
charge controller	yes	yes
Solar module		
maximum output(W)	160	260
voltage in MPP	12	24
type	monocrystalline	monocrystalline
manufacturer	Zytech Solar - Zueco y Technology SL	Zytech Solar - Zueco y Technology SL
average battery charge time in winter(h)	3	3
Lamp pole		
Material	steel	steel
Foundation	fundament	fundament
Measurements		
height of the module(m)	7	7
height of the lamp(s) (m)	6	5,5
length x width(m)	0,8 x 1,5	0,8 x 1,5
weight(kg)	159	175
Miscellaneous		
light allocation available	yes	yes
operating temperature(°C)	-15 - 65	-15 - 65
maximum air humidity(%)	> 90	> 90
protection category	IP 65	IP 65
certificates	n.s.	n.s.
guarantee(years)	3	3
price(net €)	n.s.	n.s.
comment		