WESTERN CO. PV street-lamp must be composed of:

- Crystalline PV module;
- Charge controller - light sensor working with time bands through PV module sensor with timed turning off programmable by n° 4 internal switches;
- Control electronics for LED with flux reduction;
- Pb sealed batteries without maintenance;
- UV kit of cables;
- Steel top-of-pole mounting structure with side opening battery box with fixed tilt (according to the latitude of installation - section 3 of this technical description);
- LED luminaire (power indicated in the section 10 of this technical description);
- Lamp-bracket.

System description:

The PV street-lamp is dimensioned to work with programmed turning ON up to 12 hours per night with reduced luminous flux and autonomy of 4 days in case of NO SUN condition. The electronic circuit, with 12V/24V nominal voltage (auto detect), has got the function of charge controller with MPPT technology. It makes the research of the point of the module's maximum power (MPPT) and it allows the regulation of activation hours according to the produced energy (auto-management algorithm). The control electronics of the PV street-lamp must have on the same printed circuit board the possibility to connect a hardware module for setting and system control through a RADIO or GSM communication.
Technical description of each component

**1. Western CO. charge controller for PV lighting:**

SPB-LB-V2 charge controller has been planned to be used in off-grid PV lighting systems; in fact, thanks to its IP65 metal case, it is indicated for use in environments exposed to the elements. SPB-LB-V2 has got a very efficient charge circuit with an algorithm of search of the maximum PV modules' power (MPPT); it has got a wide input range (up to 100V) so to adapt to the different types of PV modules. SPB-LB-V2 is suitable for 12V and 24V systems (auto detect) both for sealed and flooded lead acid batteries and it can manage a maximum PV power of respectively 225W and 450W. Charge is compensated in temperature (external sensor). SPB-LB-V2 manages intelligently an installation with remote battery (at the bottom of the pole ~10mt) without using additional connections and it has got many protections: battery polarity inversion, overload, overvoltage, over temperature, low battery. The latter threshold can be selected for a use of the battery bank with depth of discharge (DoD) of 30% or 70%. SPB-LBV2 manages an output for a load with currents up to 8A able to drive our SOX-E ballast (for LPS lamps) and the drivers for LED lamps. Another output called DIMMER is always dedicated for our products in order to handle even the lamp flux reduction. This feature allows to reduce consumptions during the hours in which maximum lighting is not needed. Load activation and flux reduction can be programmed through dip-switches as shown in the table. Day/night detection is executed according to the PV module voltage; therefore it’s not necessary to connect further sensors to the charge controller. The choice to use terminals with quick connection (no screws model “cage clamp”) for connections is dictated by the simplicity and reliability of the contact that no longer depends on screw tightening. The wide box assures an easy cabling thanks also to the protective barriers for the most delicate electronic components. Status LED, switches and screen printing indications facilitate the system configuration, the working analysis and diagnostics.

- Western CO. code **SPB-LB-V2**
- MPPT charge.
- Wide range of input voltage of the PV module (up to 100V).
- Max power of PV module: 225W @ 12V and 450W @ 24V.
- Integrated blocking diode.
- 12/24V autodetect.
- Switch for battery selection: sealed, GEL or flooded lead acid.
- Switch for selection of battery distance: 1mt or 10mt (base of pole).
- Switch for setting depth of discharge (DoD) 30% or 70%.
- Battery charge compensated in temperature
- Integrated light sensor (through PV module).
- Possible load activation with flux reduction.
- Switch to program the hours of load activation.
- Auto-management for hours of lamp activation.
- Protection for battery polarity inversion.
- Overload and overtemperature protection.
- Low battery protection.
- LEDs for the following indications: 12/24V; on/off load; on/off flux reduction; current from PV; protections.
- IP65 metal box for outdoor application.
## 2. PV module

The PV modules must be properly dimensioned according to the place / latitude of installation and the requested hours of lamp activation per night.

<table>
<thead>
<tr>
<th>PV module type and dimensions</th>
<th>Pmax (Wp)</th>
<th>Imp (A)</th>
<th>Vmp (V)</th>
<th>Isc (A)</th>
<th>Voc (V)</th>
<th>Peso (Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 Wp (958x680x34mm)</td>
<td><strong>88</strong></td>
<td>4,49</td>
<td>17,9</td>
<td>4,78</td>
<td>21,9</td>
<td>7,6</td>
</tr>
<tr>
<td>100 Wp (1325x655x34mm)</td>
<td>100</td>
<td>6,1</td>
<td>16</td>
<td>6,88</td>
<td>20</td>
<td>10,8</td>
</tr>
<tr>
<td>130 Wp (1508x680x34mm)</td>
<td><strong>130</strong></td>
<td>7,49</td>
<td>21,5</td>
<td>7,99</td>
<td>21,5</td>
<td>11,8</td>
</tr>
</tbody>
</table>

**SOLARWORLD® PV modules**
3. Top-of-pole mounting structure

- Western CO. codes **WTP20 (20°) - WTP30 (30°) - WTP55 (55°)**
- Hot galvanized structure
- Box with slits for ventilation
- Box with rear opening
- Rear door can be opened through blocking screw
- Fixing for pole - diameter 102mm - with blocking screws
- Box for batteries and charge controller

4. Kit of supports

- Western CO. Type
- Steel structure
- Fixing for top-of-pole mounting structure
- Length according to the PV modules
5. Lamp-bracket

- Steel tubular lamp-bracket - diameter 60mm and length 1000mm with tilt 10° respect to the horizontal
- Joint to pole - diameter 102mm - welded to the lamp-bracket
- Slots for cable passage between joint and lamp-bracket
- Hot dip galvanizing
- Western CO. code BZ100/60T

6. Pole

- Hot-galvanized tapered pole - height 7 meters above ground type Western Co. code RDI7800/4
- H.tot 7.8m
- Diameter at the bottom = 168mm
- Diameter on the top = 102mm
- Metal thickness = 4mm

7. Batteries / Accumulators

Batteries must be of 12V nominal voltage - lead - for cyclic use of charge and discharge, with low auto-discharge, realized in AGM/VRLA technology (with absorbed electrolyte and valves-regulated), in airtight box with safety valves, without maintenance.

- Voltage: 12V
- Capacity: 100/150 Ah in C20
- Pb sealed AGM/VRLA without maintenance
- Low auto-discharge
- For cyclic use of charge and discharge

8. KIT of cables

- Type Western Co. code K.CAVI/SSL/UV
- UV resistant kit of cables for outdoor applications
- Cables for PV modules
- Cables with terminals for batteries
9. LED luminaire for PV street-lighting suitable for bracket or top-pole installation

The supporting structure of the luminaire, which acts as a heat sink too, is made of extruded aluminium alloy EN AW 6060 T5 EN - T6 state, thickness 6mm, dim. 233/380x300mm, height 79mm. It is made up of a suitable number of fins exchanging the heat produced by the lighting body with the external environment in order to keep the LEDs’ junction temperature at a value that ensures a life longer than 60,000 hours LM70 @700mA at 25°C ambient temperature (critical failures included). The anodising treatment is able to ensure resistance to the external environment and promotes heat dissipation.

The perfectly flat lower section of the frame is used to secure optics light sources.

Universal attack to bracket or top-pole made of hot galvanized and painted steel Ø 60 mm. Adjustable tilting system which allows an inclination of 0° / -5° / -10° / -30° for bracket installation and of 0° for top-pole installation.

The color of the side caps, of the glass-stop and of the attack is: “starry silver”.

The luminaire has an interior air exchange filter.

The photometric measure complies with UNI EN 11356 and LM-79-08. “Cut-off” photometric emission in compliance with regional laws for light pollution. The optical system is composed of optical modules with high optical efficiency (about 92%) made of polymethylmethacrylate (PMMA).

Luminous source constituted of high efficiency LED (133 lm/W – If=350mA & Tj=25°C) with 4500K color temperature and CRI 70. The LEDs are mounted on printed circuit boards manufactured with a layer of aluminum support, ceramic insulation layer and copper conductive layer, total thickness of 1,6 mm. Between the dissipating part and the LED circuit there is a layer of thermo-conductive material so to improve the thermal continuity between the parties.

LED 5mm – 15° blue color with decorative function installed in the street side cap.

Power supply composed of electronic LED Driver (92% typical) - Class of Insulation III, entirely located inside the wiring compartment, that has to ensure the continuity of the LED modules’ power supplying, fixed with screws on housing obtained on the luminaire extruded body and connected to LED modules through cables fixed on the output terminal. 12/24 VDC supplying voltage. Thermal protection, overload / short-circuit and overvoltage protections. Possibility to make the luminaire work at reduced flux of 30% according to the settings on the external Western Co charge regulator or automatically.

H07RN-F 3x1.5 mmq. neoprene black supply cable (+Vin, -Vin, Dimmer) outgoing from the luminaire.

IP68 external connector for cable with max section 4mm2 and max external diameter of 13,5mm.

**Altre caratteristiche**

Dimensions: 300 x 299/446 mm.
Height: 84mm.
Protection degree of optical and wiring compartments: IP65.
Weight: 8,25/10,35 kg.
Superficie esposta al vento laterale: 0,03/0,05 m².
Superficie esposta al vento in pianta: 0,10/ 0,15m².
Class of insulation: III (SELV).
Warranty: 5 anni.
Photometric data were measured in the laboratory according to standard: UNI11356 and LM79-08.

<table>
<thead>
<tr>
<th>CODE</th>
<th>NUMBER OF LEDs</th>
<th>POWER [W]*</th>
<th>LED CURRENT [mA]</th>
<th>INITIAL LUMINAIRE FLUX [lm]*</th>
<th>A [mm]</th>
<th>WEIGHT [kg]</th>
<th>SIDE-TOP SURFACE [mm²]</th>
</tr>
</thead>
<tbody>
<tr>
<td>WL20-620</td>
<td>10</td>
<td>20</td>
<td>620</td>
<td>1830</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WL24-620</td>
<td>12</td>
<td>24</td>
<td>620</td>
<td>2170</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WL30-900</td>
<td>10</td>
<td>30</td>
<td>900</td>
<td>2400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WL36-900</td>
<td>12</td>
<td>36</td>
<td>900</td>
<td>2860</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WL40-1200</td>
<td>10</td>
<td>40</td>
<td>1200</td>
<td>2810</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WL48-1200</td>
<td>12</td>
<td>48</td>
<td>1200</td>
<td>3330</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WL60-900</td>
<td>20</td>
<td>60</td>
<td>900</td>
<td>4760</td>
<td>299</td>
<td>8,25</td>
<td>0,03 - 0,10</td>
</tr>
<tr>
<td>WL72-900</td>
<td>24</td>
<td>72</td>
<td>900</td>
<td>5650</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WL80-1200</td>
<td>20</td>
<td>80</td>
<td>1200</td>
<td>5550</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WL96-1200</td>
<td>24</td>
<td>96</td>
<td>1200</td>
<td>6580</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Ta: ambient temperature = 25°C

Technical Drawings

WTP_20 (tilt 20°)

WTP_30 (tilt 30°)
The study and the calculation of the size of the plinth for the fixing of the PV street-lamp must be made by the system designer and it must take into consideration also the soil type and the location of installation. In the entered data there are standard indications.

**MINIMUM CEMENT BASEMENT (You must design the plinth by the type of soil in the place of installation).**

**FOUNDATIONS - MINIMUM PLINTH**

- Concrete casting with typical resistance Rck=250 daN/cm² reinforced with reinforcing bars having an improved adhesion - steel Fe844k not controlled.
- Length of the pole inside the ground-foundations: 80cm.
- If the ground is able to absorb a long-duration tension of 0.8 - 1.0 daN/cm² and very short-duration tensions of 1.4 - 1.8 daN/cm² there is no need of sub-foundations. Instead, if the ground has a quality, you have to cast under the plinth a layer of lean clay (magrone) enough large to bring back the tension on the ground within the limit values.
- Stresses at the bottom of the standard pole (Trieste - Italy with ct = 1) in all directions: \( N = 250 \text{ daN (Normal effort)}; \ M = 2167 \text{ daN m bending moment}, \ V = 351 \text{ daN (cut)}. \)

The dimensioning is valid for any Italian place (including the zone 8 of Trieste), with roughness class D (open countryside), for topography coefficients \( ct = 1 \) (ordinary situations).

- In case of exceptional situations such as hilly crests or mountains the foundation will be properly increased.