Solar pumping project

**Parameter**

<table>
<thead>
<tr>
<th>Location:</th>
<th>Serbia, Pozarevac (44° North; 21° East)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water temperature:</td>
<td>15 °C</td>
</tr>
<tr>
<td>Required daily output:</td>
<td>40 m³; Sizing for custom season</td>
</tr>
<tr>
<td>Dirt loss:</td>
<td>5.0 %</td>
</tr>
<tr>
<td>Motor cable:</td>
<td>20 m</td>
</tr>
<tr>
<td>Pipe type:</td>
<td>-</td>
</tr>
<tr>
<td>Total dynamic head:</td>
<td>35 m</td>
</tr>
<tr>
<td>Pipe length:</td>
<td>-</td>
</tr>
</tbody>
</table>

**Products**

| PS2-1800 C-SJ5-12 | 1 pc. | Submersible pump system including controller with DataModule, motor and pump end |
| Luxor LX -160M | 18 pc. | 2,880 Wp; 6 x 3 modules; 25 ° tilted |

**Motor cable**

| 20 m | 2.5 mm² | 3-phase cable for power and 1-phase cable for ground |

**Accessories**


**Sun Sensor setting in PumpScanner**

min. 150 W/m²

**Daily output in custom season (May, June, July, August)** 53 m³

### Daily values

<table>
<thead>
<tr>
<th>Output [m³]</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Av.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output [m³]</td>
<td>28</td>
<td>37</td>
<td>44</td>
<td>48</td>
<td>53</td>
<td>55</td>
<td>55</td>
<td>51</td>
<td>45</td>
<td>39</td>
<td>28</td>
<td>22</td>
<td>53</td>
</tr>
<tr>
<td>Energy [kWh]</td>
<td>5.6</td>
<td>8.4</td>
<td>11</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>15</td>
<td>14</td>
<td>11</td>
<td>8.7</td>
<td>5.5</td>
<td>4.4</td>
<td>15</td>
</tr>
<tr>
<td>Irradiation [kWh/m²]</td>
<td>1.9</td>
<td>2.9</td>
<td>4.0</td>
<td>4.6</td>
<td>5.4</td>
<td>5.8</td>
<td>6.0</td>
<td>5.7</td>
<td>4.4</td>
<td>3.2</td>
<td>1.9</td>
<td>1.5</td>
<td>5.7</td>
</tr>
<tr>
<td>Rainfall [mm]</td>
<td>1.4</td>
<td>1.4</td>
<td>1.4</td>
<td>1.9</td>
<td>2.4</td>
<td>2.8</td>
<td>2.3</td>
<td>1.8</td>
<td>1.7</td>
<td>1.5</td>
<td>1.6</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Ambient temp. [°C]</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>11</td>
<td>16</td>
<td>20</td>
<td>22</td>
<td>22</td>
<td>18</td>
<td>12</td>
<td>6</td>
<td>1</td>
<td>11</td>
</tr>
</tbody>
</table>

### Hourly values

<table>
<thead>
<tr>
<th>6:00</th>
<th>7:00</th>
<th>8:00</th>
<th>9:00</th>
<th>10:00</th>
<th>11:00</th>
<th>12:00</th>
<th>13:00</th>
<th>14:00</th>
<th>15:00</th>
<th>16:00</th>
<th>17:00</th>
<th>18:00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output [m³/h]</td>
<td>1.9</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>3.7</td>
<td>1.9</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Energy [kWh]</td>
<td>0.36</td>
<td>0.79</td>
<td>1.2</td>
<td>1.5</td>
<td>1.7</td>
<td>1.8</td>
<td>1.8</td>
<td>1.6</td>
<td>1.4</td>
<td>1.1</td>
<td>0.71</td>
<td>0.35</td>
</tr>
<tr>
<td>Irradiation [kWh/m²]</td>
<td>0.13</td>
<td>0.29</td>
<td>0.46</td>
<td>0.59</td>
<td>0.68</td>
<td>0.73</td>
<td>0.72</td>
<td>0.66</td>
<td>0.55</td>
<td>0.43</td>
<td>0.28</td>
<td>0.13</td>
</tr>
<tr>
<td>Ambient temp. [°C]</td>
<td>17</td>
<td>17</td>
<td>18</td>
<td>20</td>
<td>22</td>
<td>24</td>
<td>26</td>
<td>27</td>
<td>27</td>
<td>27</td>
<td>27</td>
<td>26</td>
</tr>
</tbody>
</table>
**Solar pumping project**

**System characteristic**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>800 W/m², 20 °C</th>
<th>Max./STC*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PV generator</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cell temperature</td>
<td>[°C]</td>
<td>46</td>
<td>25</td>
</tr>
<tr>
<td>Temperature loss</td>
<td>[%]</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>Dirt loss</td>
<td>[%]</td>
<td>5.0</td>
<td>-</td>
</tr>
<tr>
<td>Pmax</td>
<td>[Wp]</td>
<td>1,965</td>
<td>2,880</td>
</tr>
<tr>
<td>Vmp</td>
<td>[V]</td>
<td>103</td>
<td>115</td>
</tr>
<tr>
<td>Imp</td>
<td>[A]</td>
<td>19</td>
<td>25</td>
</tr>
<tr>
<td>Voc</td>
<td>[V]</td>
<td>126</td>
<td>139</td>
</tr>
<tr>
<td>Isc</td>
<td>[A]</td>
<td>21</td>
<td>27</td>
</tr>
<tr>
<td>Pout</td>
<td>[W]</td>
<td>1,035</td>
<td>-</td>
</tr>
<tr>
<td>Vout</td>
<td>[V]</td>
<td>121</td>
<td>-</td>
</tr>
<tr>
<td>Iout</td>
<td>[A]</td>
<td>8.9</td>
<td>-</td>
</tr>
<tr>
<td><strong>Motor cable</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power loss</td>
<td>[%]</td>
<td>1.1</td>
<td>3.5</td>
</tr>
<tr>
<td><strong>Pump systems</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor power</td>
<td>[W]</td>
<td>105</td>
<td>985</td>
</tr>
<tr>
<td>Motor voltage</td>
<td>[V EC]</td>
<td>57</td>
<td>98</td>
</tr>
<tr>
<td>Motor current</td>
<td>[A]</td>
<td>1.8</td>
<td>10</td>
</tr>
<tr>
<td>Motor speed</td>
<td>[rpm]</td>
<td>1,985</td>
<td>2,610</td>
</tr>
<tr>
<td>Flow rate</td>
<td>[m³/h]</td>
<td>0</td>
<td>5.0</td>
</tr>
<tr>
<td>Efficiency</td>
<td>[%]</td>
<td>0</td>
<td>46</td>
</tr>
</tbody>
</table>

*STC: Standard test conditions for photovoltaic modules, 1000 W/m² solar irradiance, 25 °C cell temperature

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All specifications and information are given with good intent, errors are possible and products may be subject to change without notice.
Solar pumping project

Wiring diagram

Grounding should be done according to the instructions of the module manufacturer.

6 modules per string

3 strings in parallel
Solar pumping project

System Layout

1: PS2 Controller
2: Submersible Pump
3: Flow Sleeve
4: Well Probe
5: Cable Splice Kit
6: Grounding Rod
7: Surge Protector*
8: Safety Rope
9: Water Meter
10: Pressure Sensor
11: Float Switch
12: Sun Switch
13: PV Disconnect
14: Lightning Surge Protector
15: PV Generator

*It is recommended to install a Surge Protector at each controller sensor input.
Solar pumping project

Sizing Layout

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H (Static head):</td>
<td>Vertical height from the dynamic water level to the highest point of delivery.</td>
</tr>
<tr>
<td>B (Drawdown):</td>
<td>Lowering of water level depending on flow rate and recovery rate of the well.</td>
</tr>
<tr>
<td>D (Pipeline inner diameter):</td>
<td>Entire pipeline from the pump outlet to the point of delivery. Elbows and armatures must be added as an equivalent length of pipeline.</td>
</tr>
<tr>
<td>L (Pipe length):</td>
<td>The cable between controller and pump unit.</td>
</tr>
<tr>
<td>M (Motor cable):</td>
<td>Angle of the PV generator surface from the horizontal plane.</td>
</tr>
<tr>
<td>T (Tilt angle):</td>
<td></td>
</tr>
</tbody>
</table>
**PS2-1800 C-SJ5-12**
Solar Submersible Pump System for 4" wells

### System Overview
- **Head**: max. 70 m
- **Flow rate**: max. 7.6 m³/h

### Technical Data
**Controller PS2-1800**
- Controlling and monitoring
- Control inputs for dry running protection, remote control etc.
- Protected against reverse polarity, overload and overtemperature
- Integrated MPPT (Maximum Power Point Tracking)
- Battery operation: Integrated low voltage disconnect
- Integrated Sun Sensor

#### Power
- **Max. power**: 1.8 kW
- **Input voltage**: max. 200 V
- **Optimum Vmp****: > 102 V
- **Motor current**: max. 14 A
- **Efficiency**: 98%
- **Ambient temp.**: -40...50 °C
- **Enclosure class**: IP68

#### Motor ECDRIVE 1200-C / ECDRIVE 1800-C
- Maintenance-free brushless DC motor
- Water filled
- Premium materials, stainless steel: AISI 304/316
- No electronics in the motor
- **Rated power**: 1.7 kW
- **Efficiency**: 92%
- **Motor speed**: 900...3,300 rpm
- **Insulation class**: IP68
- **Enclosure class**: F
- **Submersion**: max. 150 m

#### Pump End PE C-SJ5-12
- Non-return valve
- Premium materials, stainless steel: AISI 304
- Centrifugal pump
- **Efficiency**: 65%

#### Pump Unit PU1800 C-SJ5-12 (Motor, Pump End)
- **Borehole diameter**: min. 4.0 in
- **Water temperature**: max. 50 °C

### Standards
- CE
- 2006/42/EC, 2004/108/EC, 2006/95/EC
- IEC/EN 61702:1995

The logos shown reflect the approvals that have been granted for this product family. Products are ordered and supplied with the approvals specific to the market requirements.

**Vmp**: MPP-voltage under Standard Test Conditions (STC): 1000 W/m² solar irradiance, 25 °C cell temperature.
PS2-1800 C-SJ5-12
Solar Submersible Pump System for 4" wells

Controller
H1 = 352 mm
H2 = 333 mm
W1 = 207 mm
W2 = 170 mm
W3 = 164 mm
D1 = 124 mm

Pump Unit
A = 611 mm
B = 185 mm
C = 426 mm
D = 98 mm
E = 98 mm
S = 1.5 in

Dimensions and Weights

Controller
Net weight: 6.0 kg

Pump Unit
Net weight: 14 kg

Motor
Net weight: 7.0 kg

Pump End
Net weight: 6.5 kg

*Vmp: MPP-voltage under Standard Test Conditions (STC): 1000 W/m² solar irradiance, 25 °C cell temperature
Well Probe
Mechanically Activated Device for Dry Run Protection in Applications with LORENTZ Solar Pump Systems

The switch can be used to detect the water level within a well. When the water level in the well dropped below the level of the well probe, the LORENTZ Controller will stop the pump and indicates Source Low LED.

ORDER INFORMATION

- Item no.: 19-000000  product name: Well probe sensor

FEATURES

- Reliable dry run protection
- Simple to install
- Trouble free operation
- Corrosion-free
- Splicing kit included

TECHNICAL DATA

- Max. operating temperature 55 °C
- Enclosure class: IP68
  Submersion depth: max 50 m
- Cable length: 1.5m
- Wire size: 2x 0.75mm² or AWG 19, waterproofed
- Mounted in vertical position
- Meets the requirements for CE

DIMENSION/WEIGHT

- Packaging dimensions: 260 x 170 x 40 mm
  10.3 x 6.7 x 1.6 in
- Total weight: 0.1 kg / 0.2 lbs
Liquid Pressure Sensor

Sensor for measuring the pressure of liquid in a pipe or vessel

USE / PURPOSE
The sensors are commonly used to measure the pressure in the delivery pipeline or in a vessel. The pressure signal is used with a suitable LORENTZ pump controller to measure pressure and for pressure switching or constant pressure applications. The liquid pressure sensor must be used with a compatible LORENTZ Controller (see requirements).

FEATURES
- Gauge pressure sensor, pressure measurement relative to atmosphere
- For measuring pressure in a pipe or vessel
- Accurate, robust sensor
- For use with LORENTZ PumpScanner and pumpMANAGER

REQUIREMENTS
- LORENTZ PS2 controller, LORENTZ PSk2 controller or PS Controller equipped with a licensed PS DataModule
- Care must be taken to position the sensor without turbulent water to ensure accurate measurement
- G1/4” or G1/2” female threaded filling / air vent hole is required to mount the sensor

TECHNICAL DATA
- Sensor type: 2 wire gauge sensor
- Enclosure class: IP65
- Sensor housing: stainless steel
- Connects to LORENTZ PS DataModule
- 5m/10m (16ft/33ft) cable length
- Overpressure: 1.5x full scale
- Output signal: 4-20 mA
- Voltage: 11-28 VDC
- Application temp.: -30 to 80°C
- Accuracy class: 0.5% full scale
- Thread type: G1/2” male (G1/4” with adapter)
- Meets the requirements for CS

ORDER INFORMATION

<table>
<thead>
<tr>
<th>Item #</th>
<th>Product</th>
<th>Pressure range</th>
</tr>
</thead>
<tbody>
<tr>
<td>19-004450</td>
<td>Liquid Pressure Sensor, LPS-500</td>
<td>0-500 kPa 0 to 5 bar / 0 to 72.5 psi</td>
</tr>
<tr>
<td>19-004460</td>
<td>Liquid Pressure Sensor, LPS-1000</td>
<td>0-1000 kPa 0 to 10 bar / 0 to 145 psi</td>
</tr>
<tr>
<td>19-002760</td>
<td>Liquid Pressure Sensor, LPS-2000</td>
<td>0-2000 kPa 0 to 20 bar / 0 to 290 psi</td>
</tr>
</tbody>
</table>

DIMENSION/WEIGHT
- Packing dimensions: 190 x 180 x 80 mm
- Weight: 0.6 kg / 1.3 lbs
Surge Protector
Device to Protect LORENTZ Pump Accessories from Voltage Spikes

ORDER INFORMATION

- Item no.: 19-000280  product name: Surge Protector

FEATURES

- Reliable surge protection for all LORENTZ pump accessories
- Can be installed inside the PS Controller

TECHNICAL DATA

- Max. voltage: 14 VDC
- Max current 8/20µs: 500 A
- Enclosure class: IP65
- Ambient temperature: max. 50°C
- Wire size: 2x 1.5mm² or AWG 16
- Meets the requirements for CE

DIMENSION/WEIGHT

- Packing dimensions: 70 x 45 x 20 mm
  2.8 x 1.8 x 0.8 in
- Total weight 0.1 kg / 0.2 lbs
PV Disconnect 440-40-3
Box with DC Disconnect Switch and optional lightning surge protection

ORDER INFORMATION

- Item no.: 19-000138  product name: PV Disconnect 440-40-3
- Item no.: 19-002120  product name: MNSPD-115
- Item no.: 19-002130  product name: MNSPD-300
- Item no.: 19-002140  product name: MNSPD-600

Lightning surge protectors must be ordered separately

FEATURES

- Designed for PS2-150 to PS2-4000
- For professional installation of pumping systems

TECHNICAL DATA

- DC rated disconnect switch enclosed
- Enclosure class IP 54
- Meets the requirements for CE

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. voltage</td>
<td>440 V DC</td>
</tr>
<tr>
<td>Max. current per string</td>
<td>15 A</td>
</tr>
<tr>
<td>Max. total current</td>
<td>40 A</td>
</tr>
<tr>
<td>Max. no. of strings</td>
<td>3</td>
</tr>
<tr>
<td>String cable size</td>
<td>2.5 - 4 mm²</td>
</tr>
<tr>
<td>Output cable size</td>
<td>4 - 10 mm²</td>
</tr>
</tbody>
</table>

Optional lightning surge protector

- Connects through an existing mounting hole in the PV connect housing
- Proper grounding of the device is mandatory to achieve protection

<table>
<thead>
<tr>
<th>Controller</th>
<th>MidNite surge protector</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS2 150 – PS2 200</td>
<td>MNSPD115</td>
</tr>
<tr>
<td>PS2 600 – PS2 1800</td>
<td>MNSPD300</td>
</tr>
<tr>
<td>PS2 4000</td>
<td>MNSPD600</td>
</tr>
</tbody>
</table>

DIMENSION/WEIGHT [mm]

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PG cable glands</td>
<td>(2x PG11 7x M16)</td>
</tr>
<tr>
<td>Mounting hole</td>
<td>(1x PG16 cap)</td>
</tr>
<tr>
<td>Optional lightning</td>
<td>PG cable glands (2x PG11 7x M16)</td>
</tr>
<tr>
<td>Net. Weight: 1,6kg (+0,35kg)</td>
<td>Mounting hole (1x PG16 cap)</td>
</tr>
<tr>
<td>Optional lightning</td>
<td>PG cable glands (2x PG11 7x M16)</td>
</tr>
</tbody>
</table>

BERNT LORENTZ GmbH & Co. KG
Siebenstuecken 24, 24558 Henstedt-Ulzburg, Germany
Tel +49 (0)4193 8806-700, www.lorentz.de

All specifications and information are given with good intent, errors are possible and products may be subject to change without notice. Pictures may differ from actual products depending on local market requirements and regulations.
**PP2000 AC Power Pack**

AC/DC Converter to Supply PS1200C and specific PS1800 Pump Systems with Backup Power from a Generator or Mains Supply

**ORDER INFORMATION**

- **Item no.:** 19-001050  **product name:** Power Pack 2000, UL
- **Item no.:** 19-001070  **product name:** Power Pack 2000 SS, UL (SS stainless steel enclosure)

**TECHNICAL DATA**

- AC input: 240V (±15 %), 47 to 63Hz
- AC input current: 6.2A
- PV input voltage: $V_{mp}$: 110V - 140V DC, depending on pump controller max. voltages
- PV max open circuit voltage: 200V DC depending on pump controller max. voltages
- DC output max.: 180V DC, 1,500W
- Overload protection: internal fuse, 15A
- Enclosure: steel, gasket-sealed, indoor-use, hinged front cover with key-lock
- Must be protected from direct mid-day sun
- Enclosure class: IP22
- Ambient temperature: max. 45°C
- All wires must be #14 AWG (2.5 mm²) or larger
- Manual with further information is available in PartnerNet
- Meets the requirements for CE

**DIMENSION/WEIGHT**

- Packaging dimensions: 450 x 300 x 140 mm  
  17.7 x 11.8 x 5.5 in
- Total weight: 23.5kg / 52lbs