

# Design 1,0 TS CZ\_ZOO\_Liberec, 50.777843846088686, 15.080924494186052

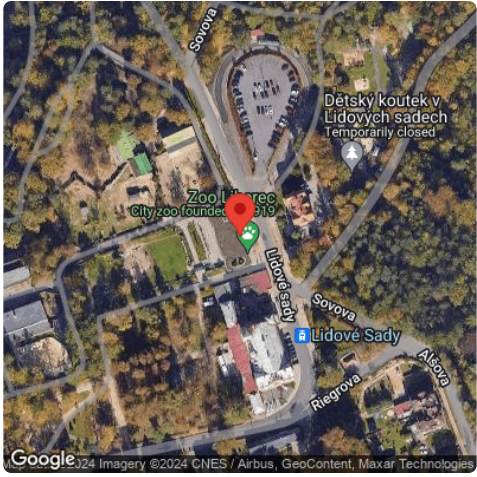
 Report

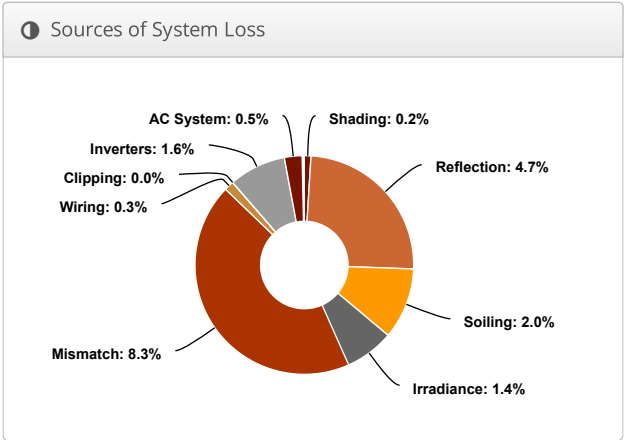
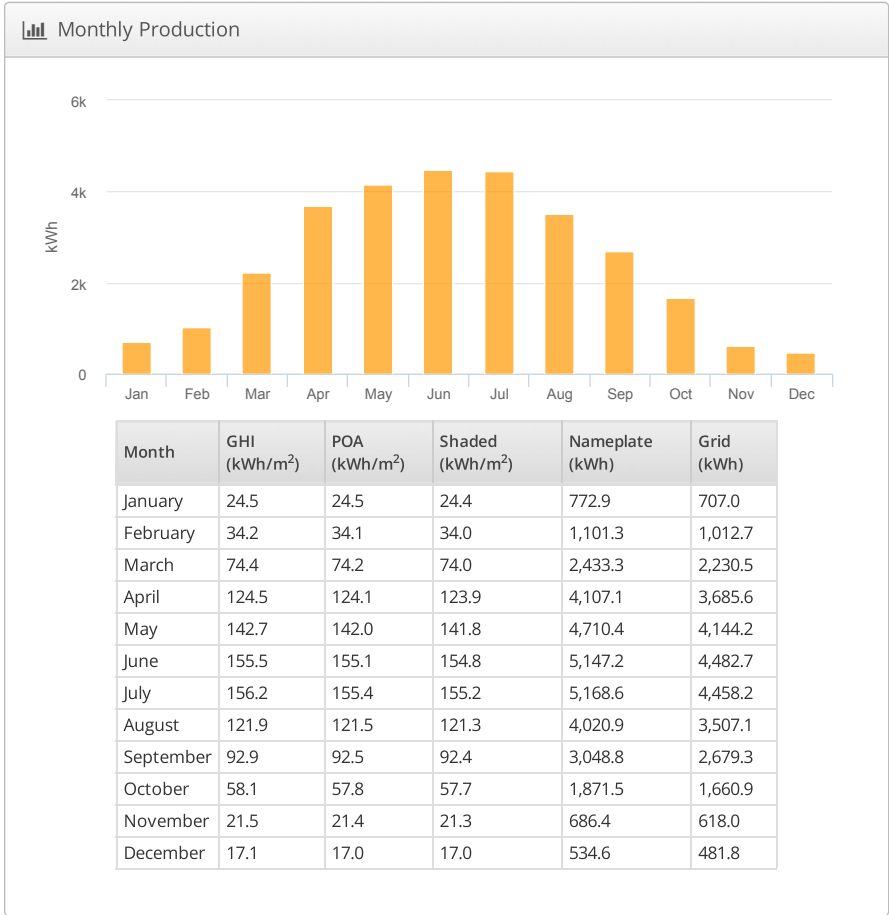
|                 |                                        |
|-----------------|----------------------------------------|
| Project Name    | CZ_ZOO_Liberec                         |
| Project Address | 50.777843846088686, 15.080924494186052 |
| Prepared By     | Photon Energy<br>it@photonenergy.com   |

 System Metrics

|                       |                                             |
|-----------------------|---------------------------------------------|
| Design                | Design 1,0 TS                               |
| Module DC Nameplate   | 35.3 kW                                     |
| Inverter AC Nameplate | 33.0 kW<br>Load Ratio: 1.07                 |
| Annual Production     | 29.67 MWh                                   |
| Performance Ratio     | 82.3%                                       |
| kWh/kWp               | 839.5                                       |
| Weather Dataset       | TMY, 10km Grid, meteonorm (meteonorm)       |
| Simulator Version     | a54221b52c-82e323475c-37a93fd6dd-9149675113 |

 Project Location





| ⚡ Annual Production         |                                     |          |         |
|-----------------------------|-------------------------------------|----------|---------|
|                             | Description                         | Output   | % Delta |
| Irradiance (kWh/m²)         | Annual Global Horizontal Irradiance | 1,023.3  |         |
|                             | POA Irradiance                      | 1,019.6  | -0.4%   |
|                             | Shaded Irradiance                   | 1,017.7  | -0.2%   |
|                             | Irradiance after Reflection         | 970.2    | -4.7%   |
|                             | Irradiance after Soiling            | 950.8    | -2.0%   |
|                             | Total Collector Irradiance          | 950.9    | 0.0%    |
| Energy (kWh)                | Nameplate                           | 33,603.0 |         |
|                             | Output at Irradiance Levels         | 33,123.1 | -1.4%   |
|                             | Output at Cell Temperature Derate   | 33,142.3 | 0.1%    |
|                             | Output After Mismatch               | 30,384.3 | -8.3%   |
|                             | Optimal DC Output                   | 30,302.1 | -0.3%   |
|                             | Constrained DC Output               | 30,302.1 | 0.0%    |
|                             | Inverter Output                     | 29,817.2 | -1.6%   |
|                             | Energy to Grid                      | 29,668.2 | -0.5%   |
| Temperature Metrics         |                                     |          |         |
| Avg. Operating Ambient Temp |                                     | 10.0 °C  |         |
| Avg. Operating Cell Temp    |                                     | 15.3 °C  |         |
| Simulation Metrics          |                                     |          |         |
| Operating Hours             |                                     |          | 4546    |
| Solved Hours                |                                     |          | 4546    |

| ☁ Condition Set              |                                           |   |   |       |   |         |             |              |                                  |   |   |   |
|------------------------------|-------------------------------------------|---|---|-------|---|---------|-------------|--------------|----------------------------------|---|---|---|
| Description                  | Condition Set 1                           |   |   |       |   |         |             |              |                                  |   |   |   |
| Weather Dataset              | TMY, 10km Grid, meteonorm (meteonorm)     |   |   |       |   |         |             |              |                                  |   |   |   |
| Solar Angle Location         | Meteo Lat/Lng                             |   |   |       |   |         |             |              |                                  |   |   |   |
| Transposition Model          | Perez Model                               |   |   |       |   |         |             |              |                                  |   |   |   |
| Temperature Model            | Sandia Model                              |   |   |       |   |         |             |              |                                  |   |   |   |
| Temperature Model Parameters | Rack Type                                 |   |   | a     |   | b       |             |              | Temperature Delta                |   |   |   |
|                              | Fixed Tilt                                |   |   | -3.56 |   | -0.075  |             |              | 3°C                              |   |   |   |
|                              | Flush Mount                               |   |   | -2.81 |   | -0.0455 |             |              | 0°C                              |   |   |   |
|                              | East-West                                 |   |   | -3.56 |   | -0.075  |             |              | 3°C                              |   |   |   |
|                              | Carport                                   |   |   | -3.56 |   | -0.075  |             |              | 3°C                              |   |   |   |
| Soiling (%)                  | J                                         | F | M | A     | M | J       | J           | A            | S                                | O | N | D |
|                              | 2                                         | 2 | 2 | 2     | 2 | 2       | 2           | 2            | 2                                | 2 | 2 | 2 |
| Irradiation Variance         | 5%                                        |   |   |       |   |         |             |              |                                  |   |   |   |
| Cell Temperature Spread      | 4° C                                      |   |   |       |   |         |             |              |                                  |   |   |   |
| Module Binning Range         | -2.5% to 2.5%                             |   |   |       |   |         |             |              |                                  |   |   |   |
| AC System Derate             | 0.50%                                     |   |   |       |   |         |             |              |                                  |   |   |   |
| Trackers                     | Maximum Angle                             |   |   |       |   |         |             | Backtracking |                                  |   |   |   |
|                              | 60°                                       |   |   |       |   |         |             | Enabled      |                                  |   |   |   |
| Module Characterizations     | Module                                    |   |   |       |   |         | Uploaded By |              | Characterization                 |   |   |   |
|                              | JAM72S20-465/MR (1000V) (2021) (JA Solar) |   |   |       |   |         | HelioScope  |              | Spec Sheet Characterization, PAN |   |   |   |
| Component Characterizations  | Device                                    |   |   |       |   |         | Uploaded By |              | Characterization                 |   |   |   |
|                              | SUN2000-30KTL-M3 (Huawei)                 |   |   |       |   |         | HelioScope  |              | Spec Sheet                       |   |   |   |

| 📦 Components |                                                 |              |
|--------------|-------------------------------------------------|--------------|
| Component    | Name                                            | Count        |
| Inverters    | SUN2000-30KTL-M3 (Huawei)                       | 1 (33.0 kW)  |
| Strings      | 10 AWG (Copper)                                 | 4 (76.3 m)   |
| Module       | JA Solar, JAM72S20-465/MR (1000V) (2021) (465W) | 76 (35.3 kW) |

| 🔌 Wiring Zones |                |             |                    |
|----------------|----------------|-------------|--------------------|
| Description    | Combiner Poles | String Size | Stringing Strategy |
| Wiring Zone    | -              | 5-19        | Along Racking      |

| 🏠 Field Segments |           |                        |      |           |                  |            |        |         |         |
|------------------|-----------|------------------------|------|-----------|------------------|------------|--------|---------|---------|
| Description      | Racking   | Orientation            | Tilt | Azimuth   | Intrarow Spacing | Frame Size | Frames | Modules | Power   |
| Field Segment 2  | East-West | Landscape (Horizontal) | 10°  | 161.5222° | 0.2 m            | 1x1        | 21     | 42      | 19.5 kW |
| Field Segment 3  | East-West | Landscape (Horizontal) | 10°  | 161°      | 0.2 m            | 1x1        | 17     | 34      | 15.8 kW |

 Detailed Layout



**Mono**

## 470W MBB Half-Cell Module

JAM72S20 445-470/MR Series

### Introduction

Assembled with multi-busbar PERC cells, the half-cell configuration of the modules offers the advantages of higher power output, better temperature-dependent performance, reduced shading effect on the energy generation, lower risk of hot spot, as well as enhanced tolerance for mechanical loading.



Higher output power



Lower LCOE



Less shading and lower resistive loss

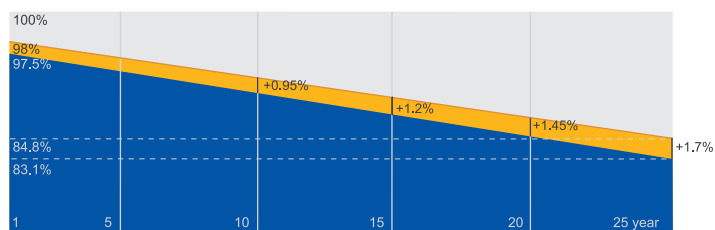


Better mechanical loading tolerance

### Superior Warranty

- 12-year product warranty
- 25-year linear power output warranty

0.55% Annual Degradation  
Over 25 years



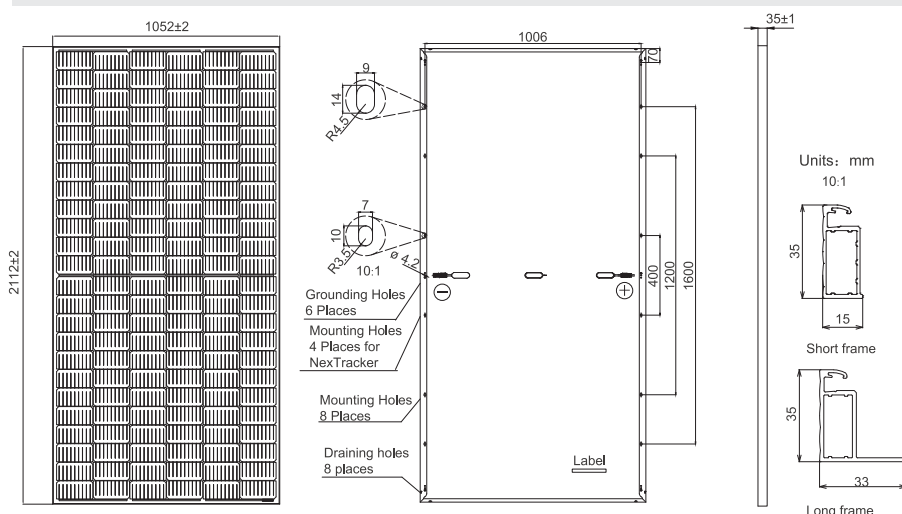
■ New linear power warranty ■ Standard module linear power warranty

### Comprehensive Certificates

- IEC 61215, IEC 61730, UL 61215, UL 61730
- ISO 9001: 2015 Quality management systems
- ISO 14001: 2015 Environmental management systems
- ISO 45001: 2018 Occupational health and safety management systems
- IEC 62941: 2019 Terrestrial photovoltaic (PV) modules - Quality system for PV module manufacturing



## MECHANICAL DIAGRAMS



Remark: customized frame color and cable length available upon request

## SPECIFICATIONS

|                                       |                                                                |
|---------------------------------------|----------------------------------------------------------------|
| Cell                                  | Mono                                                           |
| Weight                                | 24.5kg                                                         |
| Dimensions                            | 2112±2mm×1052±2mm×35±1mm                                       |
| Cable Cross Section Size              | 4mm <sup>2</sup> (IEC) , 12 AWG(UL)                            |
| No. of cells                          | 144 (6×24)                                                     |
| Junction Box                          | IP68, 3 diodes                                                 |
| Connector                             | MC4-EVO2/ QC 4.10-35                                           |
| Cable Length<br>(Including Connector) | Portrait: 300mm(+)/400mm(-);<br>Landscape: 1200mm(+)/1200mm(-) |
| Packaging Configuration               | 31pcs/pallet<br>682pcs/40ft Container                          |

## ELECTRICAL PARAMETERS AT STC

| TYPE                                                            | JAM72S20<br>-445/MR                                             | JAM72S20<br>-450/MR | JAM72S20<br>-455/MR | JAM72S20<br>-460/MR | JAM72S20<br>-465/MR | JAM72S20<br>-470/MR |
|-----------------------------------------------------------------|-----------------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Rated Maximum Power(P <sub>max</sub> ) [W]                      | 445                                                             | 450                 | 455                 | 460                 | 465                 | 470                 |
| Open Circuit Voltage(V <sub>oc</sub> ) [V]                      | 49.56                                                           | 49.70               | 49.85               | 50.01               | 50.15               | 50.31               |
| Maximum Power Voltage(V <sub>mp</sub> ) [V]                     | 41.21                                                           | 41.52               | 41.82               | 42.13               | 42.43               | 42.69               |
| Short Circuit Current(I <sub>sc</sub> ) [A]                     | 11.32                                                           | 11.36               | 11.41               | 11.45               | 11.49               | 11.53               |
| Maximum Power Current(I <sub>mp</sub> ) [A]                     | 10.80                                                           | 10.84               | 10.88               | 10.92               | 10.96               | 11.01               |
| Module Efficiency [%]                                           | 20.0                                                            | 20.3                | 20.5                | 20.7                | 20.9                | 21.2                |
| Power Tolerance                                                 | 0~+5W                                                           |                     |                     |                     |                     |                     |
| Temperature Coefficient of I <sub>sc</sub> (α <sub>Isc</sub> )  | +0.044%/°C                                                      |                     |                     |                     |                     |                     |
| Temperature Coefficient of V <sub>oc</sub> (β <sub>Voc</sub> )  | -0.272%/°C                                                      |                     |                     |                     |                     |                     |
| Temperature Coefficient of P <sub>max</sub> (γ <sub>Pmp</sub> ) | -0.350%/°C                                                      |                     |                     |                     |                     |                     |
| STC                                                             | Irradiance 1000W/m <sup>2</sup> , cell temperature 25°C, AM1.5G |                     |                     |                     |                     |                     |

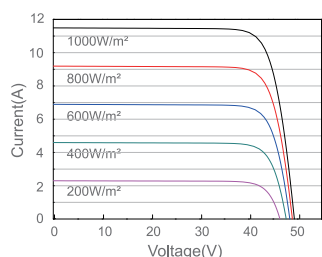
Remark: Electrical data in this catalog do not refer to a single module and they are not part of the offer. They only serve for comparison among different module types.

## ELECTRICAL PARAMETERS AT NOCT

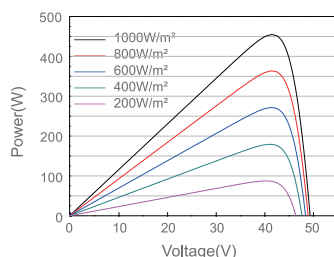
| TYPE                           | JAM72S20<br>-445/MR                                                 | JAM72S20<br>-450/MR | JAM72S20<br>-455/MR | JAM72S20<br>-460/MR | JAM72S20<br>-465/MR | JAM72S20<br>-470/MR | Maximum System Voltage                                  | 1000V/1500V DC                          |
|--------------------------------|---------------------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------------------------------------------|-----------------------------------------|
| Rated Max Power(Pmax) [W]      | 336                                                                 | 340                 | 344                 | 348                 | 352                 | 355                 | Operating Temperature                                   | -40℃~+85℃                               |
| Open Circuit Voltage(Voc) [V]  | 46.65                                                               | 46.90               | 47.15               | 47.38               | 47.61               | 47.84               | Maximum Series Fuse Rating                              | 20A                                     |
| Max Power Voltage(Vmp) [V]     | 38.95                                                               | 39.19               | 39.44               | 39.68               | 39.90               | 40.10               | Maximum Static Load,Front*<br>Maximum Static Load,Back* | 5400Pa(112 lb/ft²)<br>2400Pa(50 lb/ft²) |
| Short Circuit Current(Isc) [A] | 9.20                                                                | 9.25                | 9.29                | 9.33                | 9.38                | 9.42                | NOCT                                                    | 45±2℃                                   |
| Max Power Current(Imp) [A]     | 8.64                                                                | 8.68                | 8.72                | 8.76                | 8.81                | 8.86                | Safety Class                                            | Class II                                |
| NOCT                           | Irradiance 800W/m², ambient temperature 20℃,wind speed 1m/s, AM1.5G |                     |                     |                     |                     |                     | Fire Performance                                        | UL Type 1                               |

## CHARACTERISTICS

Current-Voltage Curve JAM72S20-455/MR



Power-Voltage Curve JAM72S20-455/MR



Current-Voltage Curve JAM72S20-455/MR

