

Design study of SunOyster 8
Model Alu

Data Sheet

SunOyster 8

Note: Indicative data only. SunOyster Systems reserves the right to change specifications.



Introduction:

The **SunOyster 8** (SO 8) is a patented concentrating solar collector with roughly 7 m² gross mirror surface. It tracks the sun bi-axially to generate heat and potentially electricity. The SO 8 comes in **4 versions**:

- The purely thermal **SO 8 heat** generates up to 5.5 kW of thermal power.
- The **SO 8 hybrid** generates in its receiver both up to 2 kW of electricity and 3.5 kW of heat.
- Both versions of the SO 8 can in the **SO pvplus** be combined with 3 photovoltaic (PV) modules with an additional output of up to 1.2 kW of electric power.

Installation:

The SO 8 does not require a horizontal surface or platform for installation. It can be installed on any tilted surfaces including slanted roofs up to an angle of up to 45°. The sub-structure of the SO 8 can be e.g. naked earth or gravel, a concrete or asphalt surface, concrete plates, ground anchors or steel beams, garages, pergolas, tile or metal roof.

Space demand, mechanics and weight:

- Space: The diameter of the swept area is 5.2 m, corresponding to a circular surface of 21.2 m². In a square, the surface is 27 m². The total height of the SunOyster mirrors is 2 m, of the mast 2.5 m.

- Ring profile: The ring profile on which the SO is turning has a diameter of 2.3 m (outer point to outer point.) It is made of alu. For special conditions, it can have a sub-structure for better spreading the load.
- Main frame: Triangular structure on three wheel groups.
- Other metal parts: Mainly anodized aluminum profiles. Exceptionally hot-dip-galvanized steel parts.
- Torque tube: 2 torque tubes attached to the elevation drive made out of 6082 alu and positioned in the center of the mirror at a height of 1.2 m above the bottom of the ring profile.
- Mirrors: The mirrors of the SO 8 have a height of 1.62 m and a width of 2 times 2 m, with a 25 cm gap in between. They consist of thin (1 mm) glass mirrors, glued on a sandwich structure. They reach more than 95 % reflectivity. Concentration factor ≥ 40 suns.

Warning – avoid concentrated radiation in eyes, on the skin or clothes!

- Weight: The total weight of the SO 8 Model White is below 400 kg.
- *pvplus*: In the front of the mirrors are 3 PV modules with a size of approx. 1.6 m height and 1 m width and +/- 5 cm flexible mounting positions. They are fixed at an angle of 10° to the ground and tracking the sun together with the SO from East to West. The weight of the support structure of the modules is up to 50 kg, the weight of typical modules is altogether 54 kg. For details of the modules see their data sheet.

Tracking: Two-axis in Azimuth and Elevation:

Azimuth tracking from East to West 450° rotation angle; planetary gear drive with tooth belt. Elevation drive with planetary and worm gears.

Warning – beware of moving parts!

Expected power output of SO 8:

Type	Max. heat output	Max. electricity output ¹	<i>pvplus</i>
SO 8 <i>heat</i>	5.5 kW _{th}	-	+ 1.2 kW _p
SO 8 <i>hybrid</i>	3.5 kW _{th}	2 kW _p	+ 1.2 kW _p

Please note that the power output of later serial products shall be even higher.

SO 8 *heat* - thermal receiver:

Insulated and protected by a 3 mm borosilicate glass tube with 150 mm outer diameter and anti-reflective coating, the thermal receiver features inside an extruded aluminum profile with absorber coating.

SO 8 *hybrid* - hybrid receiver:

Insulated and protected by a 3 mm borosilicate glass tube with anti-reflective coating, the thermal receiver features inside an extruded aluminum profile with absorber coating. On this, glass lenses – the so-called “SunOyster Crystal” – concentrates the light a second time onto the multi-junction concentrator PV (CPV) cells which have up to 44 % cell efficiency.

Temperature co-efficient for power: -0.1 %/K.

SO 8 *pvplus* – PV modules:

The SO 8 can carry 3 modules with a size of approx. 1 m x 1.6 m each. See separate data sheet of the PV modules.

Warning – both the hybrid receiver and the PV modules create electric hazards!

PV Inverter System:

- ABB UNO DM 3.3 TL PLUS SB with integrated DC Disconnect Switch.
- Max. efficiency: 97 %.
- Grid connection type: AC Single Phase (L / N / PE).
- Rated AC voltage: 230 V.
- Rated output frequency: 50 Hz or 60 Hz.
- Anti-islanding protection: According to local standards.

Electric Interconnection:

Junction box with clamp terminals for the grid connection cable (max. wire size 2.5 mm²). Recommended external AC overcurrent protection: 16 A.



Regional Economic Programme: Funded by the European Union - European Regional Development Fund (ERDF), the Federal Government and Land Schleswig-Holstein

Control System:

- Customized and highly integrated control system with two independent motor controllers.
- Redundant safety system regarding wind speeds, fluid and receiver temperature and pressure.
- Integrated uninterrupted power supply system for closing the SunOyster during main grid failure.
- Local or central weather station equipped with at least the following sensors:
 - Anemometer and
 - Radiation sensor and
 - Ambient temperature sensor.
- Integrated inclination sensor and radiation sensors improve the tracking and allow an auto-commissioning of the SO.
- Optionally, a camera and additional weather sensors are available on request.

Data Interconnection:

- WLAN 802.11 b/g/n/ac (2.4 + 5.0 GHz)
- Bluetooth 4.2 (only for service)
- Optionally, LAN via RJ45 Connector with 10/100/1000 MBit

Thermal Properties:

- Heat transfer medium in areas without freezing temperatures: De-mineralized water. In other areas: solar fluid, i.e. water with corrosion protection additives. Standard version max. temperature of working fluid: 110°C.
- System pressure: min. 3 bar (2 bar gauge pressure) and max. 7 bar (6 bar gauge pressure).
- Flow Rate: Minimum flow of 200 l/h, at full radiation 550 l/h, maximum flow 1.500 l/h.
- Pressure loss: ≤ 0.3 bar at 550 l/h.

Warning – the high fluid temperature can cause burning hazards!

Thermal Interconnection:

Pipes for fluid should be installed to the ring profile. Pipes on the SunOyster are stainless steel pipes. Therefore, stainless steel is preferred for connecting pipes. The pipes should have a minimum inner diameter of 25 mm (1 inch) – preferably larger for long runs.

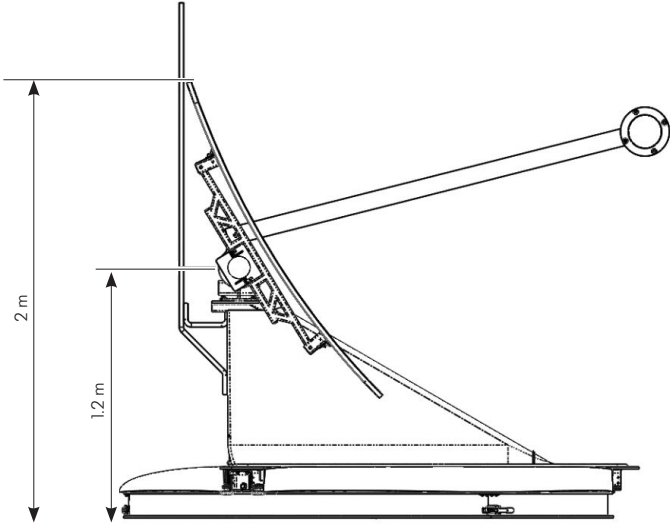
Environmental limits:

- Operational temperatures: - 30°C to + 45°C.
- Survival temperatures: -40°C to +60°C.
- Air humidity: 0-100 %, condensing.
- Wind: normal operation up to 55 km/h. Survival in safety position with normal turbulence up to 150 km/h.
- Snow: German load zone 2 up to 600 m (city of Freiburg).

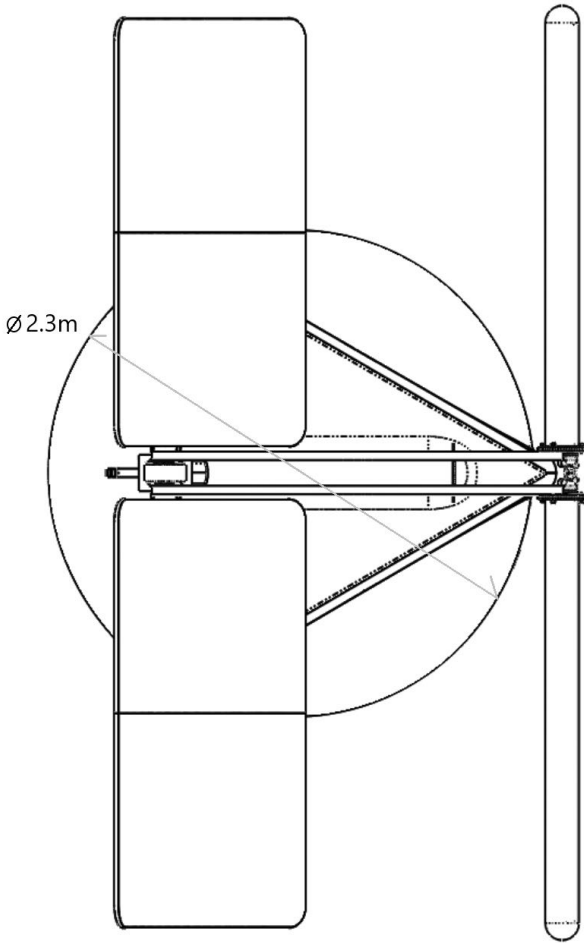


¹ Nominal power of generator under Concentrator Standard Test Conditions CSTC acc. IEC 62670-1:2013:1.000W/m², (25±2)°C, AM 1.5 acc. EN 60904-3

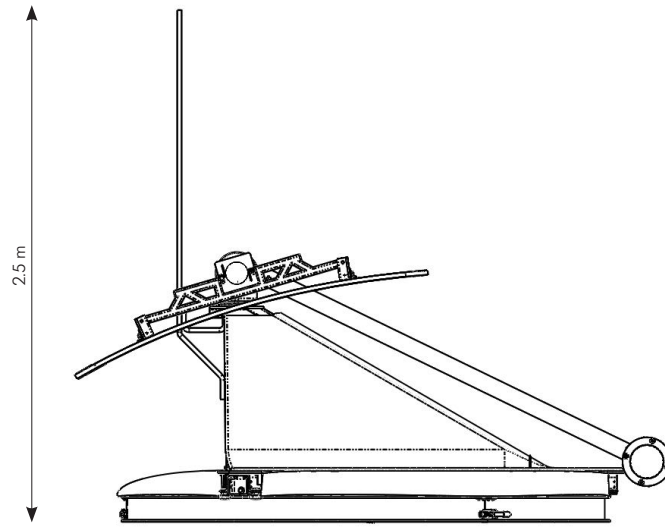
SunOyster 8 side view open:



SunOyster 8 top view open:



SunOyster 8 side view closed:



SunOyster 8 top view closed:

