



# **SOLAR OVEN**

## **PSO-01**

### **USER MANUAL**

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### Basic parameters of the PSO-01solar oven:

- weight: 7.4 kg
- chamber volume: 25 liters
- package: 62 x 52 x 40 cm
- maximum temperature reached for the latitudes of Bulgaria: 140°C

### SOLAR OVEN PSO-01



With no additional reflectors



With additional reflectors

Despite its peculiarities the use of solar oven is much easier than you may have expected. The simplest way to learn how to use your SO is starting to cook in practice. After using it a few times, you will become more confident.

Do not limit your ideas, experiment! The solar oven is much more favorable to your mistakes than conventional electric or gas stove - nothing is going to burn here.

### Deployment

Put your solar oven on a sunny place that is not threatened by shadowing of trees, buildings and others. Remember that the area that is now lit by the sun, may later in the day be overshadowed by trees, buildings and other large objects as the sun moves through the sky.

### Installation

Detach the strap that holds the reflectors together. Lift and unfold the reflectors and place them onto the wooden frame.

The lock that holds the glass lid is closed tight before delivery - loose it from  $\frac{1}{4}$  to  $\frac{1}{2}$  turn to operate more easily.

## **Focusing**

Point the front of the solar oven to the sun. Stand behind the SO and check shadows on both sides - shadows must be equal. Tilt SO forward enough to eliminate shadows in the front and the rear part of the chamber. Hold this position by placing the Rear Support Rod (RSR) in the proper hole. Check again whether the oven is properly oriented to the sun (permissible is minimal side-shading of the inner chamber). Except RSR, an ordinary piece of wood or other suitable object could also be used.



With the progress of the cooking process it is necessary from time to time to readjust the orientation of the solar oven to the sun. We recommend slight correction every 30 minutes to eliminate shadows in the chamber. If you can not correct targeting for an extended period of time, orientate to where the sun will be located in the strongest period (between 11 am and 2 pm.).

The solar oven works best in clear sunny days. Passing clouds can slow, but not stop the cooking process.

## **Preheating and precleaning**

In the first use of a solar oven and before food being put, leave the oven in the sun for 60 to 90 minutes, with tightly closed and locked glass cover. After the temperature of 120 °C is reached, leave to cool and thoroughly clean the chamber and the glass cover with a nonabrasive detergent. Thoroughly clean the portion of the glass cover, which lies on the black obturator. Now you are ready to start cooking.

## **Cooking**

Place a cooking vessel with food onto the sway-tray in the inner chamber. Close and lock the glass lid. Use mittens to remove the vessel.

### **General cooking tips**

Cooking in the SO is a natural and subtle method that requires much less liquid than conventional methods. Food internal juices play this role - the result is that food prepared this way has an extraordinary juicy taste. Therefore the liquid should be reduced by at least a third compared to what conventionally is used in cooking rice, stews or sauces.

The food in SO burns not, so you do not need to stir.

### **After-cooking actions**

Upon completion of the cooking process remove the moisture from inside the oven by wiping with a dry cloth. When not in use, it is recommended not to close tightly and not to lock the glass lid.

### **Maintenance**

The maintenance of a solar oven is minimal. You need to use non-abrasive detergent to maintain the reflectors and glass cover clean. If the reflector and glass surfaces are not properly cleaned, the solar oven could not reach the proper temperature.

## **Frequently Asked Questions**

### **What temperature is achieved in the solar oven?**

Given Solar oven, the cooking temperature depends on geographical factors and the mode of operation:

#### **geographical factors**

- Latitude;
- Day of the year;
- Time of the day;
- Physical state of the atmosphere - humidity, pollution, clouds;
- Altitude;

#### **mode of operation**

- Targeting (focusing) the solar oven to the sun;
- Cleaning of the reflectors and the glass cover.

Given place and day of the year, the maximum temperature of the solar oven is reached by the simultaneous fulfillment of the following four conditions:

- cloudless and dry weather;
- the sun being in its climax - which occurs at noon;
- properly targeted (focused) solar oven;
- well cleaned reflectors and glass cover.

The maximum operating temperature of the air reached inside the chamber is 140 °C for the latitudes of Bulgaria.

### **What meal types can be cooked in a solar oven?**

With the exception of frying, you can cook in a solar oven anything you can cook on gas, electric, solid fuel stove or cooker. You can boil, bake and stew. Frying requires stirring of the food, which is not applicable in the solar oven.

1. **Boiling** by immersion of the food stuff in a liquid heatcarrier at normal atmospheric pressure in a vessel with a lid.

Heatcarrier: water, bouillon, milk, sugar syrup, etc. Heatcarrier temperature: 90-110 degrees. Types of products subject to heat treatment in this model: vegetables, grains and legumes, pasta, meat, poultry, fish, eggs and others.

This is the most universal method of a heat treatment.

Boiling in the solar oven could also be used as a first stage before baking. Meat is boiled in a pot in SO, then transferred to a baking tray, with rice and spice being added, and all that shoved again for baking in the solar oven.

### **2. Low temperature baking.**

Heatcarrier: air.

Heatcarrier temperature in the solar oven: up to 140 degrees.

The method of baking at low temperature is suitable for lean meats. Knuckle for example, could not be baked at low temperature, therefore is unsuitable for solar oven.

Doughstuff with no yeast could also be baked in SO.

3. **Stewing** food in a little liquid or in its own juice in a vessel with a lid.

Heat carrier: water, bouillon, milk, the own juice, steam - generated from the boiling liquid.

Heat carrier temperature: 100-102 °C.

The method is suitable for vegetables, meat, fish.

### **How much food could be prepared in a solar oven?**

This question has no simple answer. The amount of food that could be prepared in a reasonable time should be established by experience.

### **How long does cooking in a solar oven take?**

The cooking time is greater than in a conventional oven. The slower cooking is compensated by the advantages of SO - preserving nutrients, juiciness and excellent taste.

Cooking time depends primarily on the intensity of solar radiation (and that intensity in turn depends primarily on geographical factors), the meal type and its quantity, the proper SO handling.

The more number of times you open a SO, the longer the cooking takes. Each opening of the solar oven adds 10-15 minutes to the cooking duration.

### **Do I need to control the cooking process permanently?**

You can cook the food in SO in two ways. If refocusing SO every half an hour, the duration of the cooking process will be shorter.

The other way is to prepare your lunch in SO in your absence. Many users direct the SO in such a way as to be focused at lunch time, then go to their work. When the sun approaches climax, the chamber temperature gradually rises and the cooking begins. When the user is back, his lunch is already ready. Even if you are late, the excellent insulation of SO keeps the food warm for hours; the natural taste of the so prepared food is also preserved.

### **Is the taste of food the same as in a conventional oven?**

The slow temperature increase in SO and as a result the lengthy process make it possible to preserve the natural taste of the food. Therefore, the food cooked in a solar oven as compared to the prepared with conventional methods is more juicy and has a natural and refined taste.

### **Could I cook two meals simultaneously in PSO-01 solar oven?**

The answer is Yes. PSO-01 is designed so as to enable the simultaneous use of several vessels. Several (two or three) small baking-trays or pots could be placed on one another for simultaneously cooking different meals, incl. baking different forms from the same dough.

Also, on the sway-tray can be placed two small pots together. You can even remove the tray to maximize the useful volume of the chamber. If you remove the sway-tray, place the vessel on a trivet. If you place the vessel directly on the

floor of the chamber, proper circulation of the air flow would be not possible and the vessel will be heated unevenly.

**What kind of cooking vessels should be used in the solar oven?**



Vessel dimensions should match the dimensions of the inner chamber. In the model PSO-01 the maximum permissible diameter of the pot is 28 cm provided the height is 13.5 cm and the vessel is placed on the sway-tray. The smaller the height the bigger the diameter of the vessel. If the sway-tray is removed, still bigger vessels could be placed.

Metallic vessels are permitted to be thin-walled as well as thick-walled. The metallic lid of a vessel is recommended to be of a black color. If the metallic vessel has a transparent lid, the metal part of the vessel should be black both outside and inside.

Plastic vessels are not allowed.

For baking should be used dark coloured metal trays or pans.

Vessels of bright shiny materials should be avoided. The high reflectivity of such materials reduces the effectiveness of SO.

When boiling or steaming food, covered vessels should be used. Under the influence of heat, the water contained in the vessel and in the food itself evaporates and if no cover the steam fogs the glass lid of SO and thus lowers the temperature in the chamber.

Pyrex-type vessels can also be used - both colorless and colored.

Dough-products should be baked in no-lid-vessels.

The best thing is to keep the glass cover of the solar oven tightly closed (locked) until boiling, then unlock -so fogging the cover will be prevented.

### **Do I need to stir the food?**

In a conventional oven stirring the food is needed to avoid food-burning and vessel-scorching, especially by fast temperature grow and when frying. In SO food temperature and vessel temperature grow slowly and evenly, moreover no frying is practised - so stirring is not necessary.

### **Could brown crusted meat be achieved?**

In order poultry and other meat types to get crusted golden brown, sprinkle a little sugar or spread honey before baking, then sprinkle red pepper.

### **How to refocus the solar oven so that the food does not spill?**

PSO-O1 has a built-in camera leveler (representing a sway-tray fixed by two screws and carrying the cooking vessel). The sway-tray prevents spillage when the oven is tilted back and forth. Remember that the leveler does not protect against spillage when tilted sidewise - so that tilt type should be avoided.

### **Is there a risk of burning myself while operating solar oven?**

The inner chamber, the cooking vessel and the glass cover of the oven are heated up to a high temperature. Always use mittens when removing the cooking vessel. Reflectors and the outer part of the cage are not substantially heated and could be operated without risk of burning.

### **What is the durability of SO?**

Designed durability of SO is 15 years, but with carefull usage could be prolonged to lifetime.

### **What materials is the solar oven PSO-01 made of?**

Different parts of the SO are made of different materials. The reflectors and inner walls are made of aluminium deposited electrolytically, which could not corrode or be oxidized. The lid is of a tempered glass, outer casing - from poplar tree and plastic. Between the inner and outer walls of the SO there is a thick layer of fiberglass, serving as a heat insulator.

### **Could PSO-01 solar oven be used in the winter?**

The solar oven could be used for cooking on a clear winter day. The intensity of solar radiation is more important for successful cooking than the ambient temperature. In winter, the air humidity is reduced and this further increases the solar intensity as the absorption by the atmosphere is reduced.

Another important factor is the altitude - the greater the altitude, the larger the solar intensity. In winter SO is most effective in the mountains. Solar ovens are used with success in very cold places such as base camp at Everest ascent.

Regarding the suitable for solar cooking part of the day, summer cooking time for Bulgaria is from 8am to 5 pm, while in winter the effective period is reduced to 10am-2pm. In the high mountain up to 3pm.

### **Could PSO-01 be used for drying or dehydrating food?**

PSO-01 acts as a very good solar dryer. If you place the glass cover of the oven on the metal lock so as to form a gap of about 1 cm, moist air will come out from inside. At the same time the temperature in the chamber will be not so high as to start cooking process.



solar drying of ginger

### **Could PSO-01 be combined with a solar parabolic cooker?**

Yes, could be. The parabolic solar cooker is more powerful than the solar oven and faster boils the same amount of food. So meat could be boiled first in the parabolic in a covered pot, then transferred for baking in the solar oven in a baking tray.

## Could PSO-01 be used as a thermal box or thermal cooker - without sun?

The solar oven PSO-01 can successfully implement two extra functions with no sun needed:

1. To keep hot (over 50 °C) already cooked meal for 3 hours and more, being in the role of a thermal box. This is achieved by putting a special isolating cushion between the pot and the glass lid.
2. To bring to an end cooking process that has already begun – with easy to cook stuff as potatoes, vegetables, pasta – by the process of stewing. In this function the solar oven plays the role of the so called “fireless cooker”.

*Cooking sequence for preparing a dish as fireless cooker:*

**Step 1.** The pot with easy foodstuff is boiled for 1-2 minutes – on electrical-, gas-, wood stove, parabolic solar cooker.

**Step 2.** The pot is removed from the stove (or PSC) and placed at the bottom of the solar oven. Cover with insulating cushion. The oven being finally closed with the glass lid.

**Step 3.** The pot is pulled out after the required cooking time of 30-40 minutes. If you are still not ready to eat, you can leave the pot in the oven, where the food remains hot for hours as in a thermal box.

*Directions for usage of the solar oven as thermal box or fireless cooker:*

1. Recommendable pot filling with **water** and **foodstuff** above 50% and up to 80% of the pot volume.
2. The greater the food amount, the longer it remains hot. Small pots cool down faster than large ones.
3. The solar oven can be placed in the kitchen.
4. SO as fireless cooker could be combined with parabolic solar cooker for preheating of easy to cook stuff, thus increasing the capacity of the PSC.
5. Use a pot of up to 10.5 cm height, including the pot lid, to allow space for the cushion.

**Advantages of thermal cooking** are many. The major of them: saves energy and increases the capacity of the main cooking appliance – electrical-, gas-, solar parabolic cooker.

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Solar oven PSO-01 used as thermal box or fireless cooker