



P7140 Typical illustration above

## APPLICATIONS

- ◆ Measures output and efficiency against solar energy input
- ◆ Effect of different absorbent surfaces
- ◆ Effect of ambient temperature, wind velocity and the effect of cooling the glass cover
- ◆ Effect of insulation thickness
- ◆ Investigate the effects of varying the inclination of the absorption surface and the flow rate of the water,
- ◆ To perform a heat balance for the overall system

## FEATURES

- ◆ Temperature measurement at eight points
- ◆ USB data logger and PC (Optional extra)
- ◆ Removable solar radiation mat
- ◆ Extendable tray angles and hence flow rates
- ◆ Variable angle of incidence of sunlight on the absorbing pad
- ◆ Variable thermal insulation material mounted horizontally on a rigid steel stand
- ◆ Ability to tilt base continuously by  $+10^\circ$  and  $-10^\circ$  to the horizontal
- ◆ Horizontal rotation of basin through  $180^\circ$
- ◆ Non corrosive materials used in all critical areas

## P7140/P7141 SOLAR ENERGY APPARATUS

### INTRODUCTION

The solar energy demonstration unit allows students to gain an appreciation of the total heat capture of a solar energy unit and an indication of their relative efficiency.

Students are able to vary the flow rate and angle of incidence of the unit to measure the change in energy collection performance.

### DESCRIPTION

#### P7140 SOLAR ENERGY DEMONSTRATION

This experiment includes a shallow heat collection tray approximately 1.2 m by 1m, the base of which is fitted with removable heat capture material. This material assists in the heat transfer process. The heat capture and transfer plate is itself covered by a sheet of flat plate glass, which captures the radiation and reflects light back to the heat .

Water is pumped through the heat transfer plate, on the tray, and is returned to an insulated reservoir mounted on the base of the unit. The water is continuously re-circulated through the transfer plate so that the temperature in the reservoir gradually builds up.

A heat exchanger coil is built into the reservoir such that the water temperature within the reservoir can be controlled by allowing cooler mains water to flow through the heat exchanger coil.

An inclinometer to indicate the degree of tilt is available as an optional extra.

Temperature measurement by multi-point thermocouple instrument is provided at the following points:- reservoir water, water onto and off the heat transfer plate, ambient, glass (outside), centre of tray (under mat), mat (top side). An optional pen recorder is available to continuously record these temperatures or the P7141 data capture device can be used.

Feed water flow rate is measurable and variable. This allows different durations of water exposure to the heat tray. Optionally water pressure can be measured.

The unit is mounted so that the base can be tilted continuously by between +10° and -10° to the horizontal allowing adjustment of the tray to the sunlight.

The whole top section of the still may be turned horizontally through 180°, so making it possible to alter the angle of incidence of sunlight on the absorbing pad, while keeping the film flow slope constant, as well as extending the range of tray angles and hence flow rates available.

Should natural sunlight not be available an optional 1kW light source can be used to simulate sunlight. The light source is mounted on a tripod giving some adjustment to height and angle of the light.

#### **P7141 DATA CAPTURE DEVICE (optional)**

The data logger comprised of an encoder converting temperature, flow rate and pressure sensors into digital inputs. The data logger transfers data into a personal computer through a USB port. Software provides the ability to organise and display the data.

### **OPTIONAL EQUIPMENT**

**P7131 SOLARIMETER** for use with the solar apparatus range (lux meter).

**P7132 ANEMOMETER** for use with solar apparatus range.

**P7133 INCLINOMETER** for use with thin film type solar distillation apparatus.

**P7134 12 POINT PEN RECORDER** for use with both basin and thin film type solar distillation apparatus.

**P7142 LIGHT SOURCE.** 1 kW light source for use with solar apparatus range providing variable light and adjustable height and angle.

### **TENDER SPECIFICATIONS**

#### **P7140 SOLAR ENERGY APPARATUS**

Flat tray of surface area 1.2 x 1 m sq. made from self-coloured glass fibre re-inforced polyester resin, covered and sealed by a clear glass sheet and can be rotated horizontally through 180°.

The tray is covered by a removable solar radiation mat, on which heat transferring water pipes are laid. The unit is to be furnished with variable thermal insulation material beneath.

Temperature measurement at eight different points is provided by a thermocouple instrument, which is included.

Furnished with insulated cubic reservoir and mains powered feed circulating pump delivering approximately 10 litres/minute, feeding into the surface heat transfer pipes and then returning to the insulated reservoir. The unit is to be provided with flow control valve and feed flow measurement. Excess heat is to be removed from the reservoir by the use of a mains water heat exchanging coil.

Temperature measurement at eight different points is provided by a thermocouple instrument, which is included.

#### **P7141 DATA CAPTURE DEVICE**

A USB data logger device suitable for encoding the temperature, flow rate and pressures within the P7140 apparatus, together with a current production personal computer, and software suitable for some analysis of the data recorded.

### **SERVICES**

*Electrical supply:-* 240 volts 50/60Hz single phase operation.

*Water supply:-* Suitable water mains feed to absorb generated solar heat.

### **SHIPPING DETAILS**

P7140	Gross 525 Kgs Nett 210 Kgs 166 cm long x 122 cm wide x 170 cm high
P7141	Gross 50 Kgs Nett 60 Kgs 60 cm long x 80 cm wide x 100 cm high

**Cussons Technology Ltd.**

102 Great Clowes Street, Manchester M7 1RH, England

Tel. +(44)161 833 0036

Fax. +(44)161 834 4688

E-mail: sales@cussons.co.uk Web: www.cussons.co.uk

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