

# SUMMARY INFORMATION SHEET

FLORIDA SOLAR ENERGY CENTER

300 STATE ROAD 401, CAPE CANAVERAL, FLORIDA 32920-4099, (407) 783-0300



October 1993  
FSEC # 93033C

## MANUFACTURER

Aquatherm Industries, Inc.  
1985 Rutgers University Blvd.  
Lakewood, New Jersey 08701

Collector Model  
Ecosun 16104-8

This solar collector was evaluated by the Florida Solar Energy Center (FSEC) in accordance with prescribed methods and was found to meet the minimum standards established by FSEC. This evaluation was based on solar collector tests performed at the Florida Solar Energy Center, Cape Canaveral, Florida. The purpose of the tests is to verify initial performance conditions and quality of construction only. The resulting certification is not a guarantee of long term performance or durability.

## DESCRIPTION

Gross Length	2.451 meters	8.04 feet
Gross Width	1.195 meters	3.92 feet
Gross Depth	0.009 meters	0.03 feet
Gross Area	2.928 square meters	31.52 square feet
Transparent Frontal Area	2.928 square meters	31.52 square feet
Volumetric Capacity	9.5 liters	2.5 gallons
Weight (empty)	6.8 kilograms	15.1 pounds
Recommended Flow Rate	208 ml/s	3.3 gpm
Maximum Operating Pressure	241 kPag	35 psig
Maximum Wind Load	Not Applicable	
Number of Cover Plates	None	
Flow Pattern	Parallel	Forced circulation
Number of Flow Tubes	Multitube mat	

## MATERIALS

Enclosure	None
Glazing	None
Absorber	Polypropylene with UV stabilization
Absorber Coating	None
Insulation	None

## THERMAL PERFORMANCE

Tested per ASHRAE 96-1980 (RA 1989)

$$\text{Incident Angle Modifier } K_{\tau\alpha} = 1.0 - 0.03 \left( \frac{1}{\cos\theta} - 1 \right)$$

Efficiency Equations

$$\eta = 86.6 - 1978 (Ti-Ta)/I$$

$$\eta = 86.6 - 348 (Ti-Ta)/I$$

$$\eta = 87.3 - 1754 (Ti-Ta)/I - 10901 [(Ti-Ta)/I]^2 \quad \eta = 87.3 - 309 (Ti-Ta)/I - 338 [(Ti-Ta)/I]^2$$

Units of  $Ti-Ta/I$  are  $^{\circ}\text{C}/\text{Watt}/\text{m}^2$

Units of  $Ti-Ta/I$  are  $^{\circ}\text{F}/\text{Btu}/\text{hr ft}^2$

## RATING

The collector has been rated for energy output on measured performance and an assumed standard day. Total solar energy available for the standard day is 5045 watt-hours/ $\text{m}^2$  (1600 Btu/ $\text{ft}^2$ ) distributed over a 10 hour period.

Output energy ratings for this collector based on the second-order efficiency curve are:

Collector Temperature	Energy Output	
Low Temperature, 35 $^{\circ}\text{C}$ (95 $^{\circ}\text{F}$ )	33,600 Kilojoules/day	31,800 Btu/day
Intermediate Temperature, 50 $^{\circ}\text{C}$ (122 $^{\circ}\text{F}$ )	12,100 Kilojoules/day	11,500 Btu/day
High Temperature, 100 $^{\circ}\text{C}$ (212 $^{\circ}\text{F}$ )	0 Kilojoules/day	0 Btu/day

Reference 92042

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FLORIDA SOLAR ENERGY CENTER

300 STATE ROAD 401, CAPE CANAVERAL, FLORIDA 32920-4099, (+07) 783-0300



October 1993

FSEC # 93034C

## MANUFACTURER

Aquatherm Industries, Inc.  
1985 Rutgers University Blvd.  
Lakewood, New Jersey 08701

Collector Model

Ecosun 16104-10

This solar collector was evaluated by the Florida Solar Energy Center (FSEC) in accordance with prescribed methods and was found to meet the minimum standards established by FSEC. This evaluation was based on solar collector tests performed at the Florida Solar Energy Center, Cape Canaveral, Florida. The purpose of the tests is to verify initial performance conditions and quality of construction only. The resulting certification is not a guarantee of long term performance or durability.

## DESCRIPTION

Gross Length	3.060 meters	10.04 feet
Gross Width	1.195 meters	3.92 feet
Gross Depth	0.009 meters	0.03 feet
Gross Area	3.657 square meters	39.36 square feet
Transparent Frontal Area	3.657 square meters	39.36 square feet
Volumetric Capacity	11.0 liters	2.9 gallons
Weight (empty)	8.2 kilograms	18.0 pounds
Recommended Flow Rate	252 ml/s	4.0 gpm
Maximum Operating Pressure	241 kPag	35 psig
Maximum Wind Load	Not Applicable	
Number of Cover Plates	None	
Flow Pattern	Parallel	Forced circulation
Number of Flow Tubes	Multitube mat	

## MATERIALS

Enclosure	None
Glazing	None
Absorber	Polypropylene with UV stabilization
Absorber Coating	None
Insulation	None

## THERMAL PERFORMANCE

Tested per ASHRAE 96-1980 (RA 1989)

Incident Angle Modifier  $K_{\tau\alpha} = 1.0 - 0.03 \left( \frac{1}{\cos\theta} - 1 \right)$

Efficiency Equations

$$\eta = 86.6 - 1978 (T_i - T_a)/I$$

$$\eta = 86.6 - 348 (T_i - T_a)/I$$

$$\eta = 87.3 - 1754 (T_i - T_a)/I - 10901 [(T_i - T_a)/I]^2$$

$$\eta = 87.3 - 309 (T_i - T_a)/I - 338 [(T_i - T_a)/I]^2$$

Units of  $T_i - T_a/I$  are  $^{\circ}\text{C}/\text{Watt}/\text{m}^2$

Units of  $T_i - T_a/I$  are  $^{\circ}\text{F}/\text{Btu}/\text{hr ft}^2$

## RATING

The collector has been rated for energy output on measured performance and an assumed standard day. Total solar energy available for the standard day is 5045 watti-hours/m<sup>2</sup> (1600 Btu/ft<sup>2</sup>) distributed over a 10 hour period.

Output energy ratings for this collector based on the second-order efficiency curve are:

Collector Temperature	Energy Output	
Low Temperature, 35°C (95°F)	41,900 Kilojoules/day	39,800 Btu/day
Intermediate Temperature, 50°C (122°F)	15,100 Kilojoules/day	14,300 Btu/day
High Temperature, 100°C (212°F)	0 Kilojoules/day	0 Btu/day

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300 STATE ROAD 401, CAPE CANAVERAL, FLORIDA 32920-4099. (407) 783-0300



October 1993  
FSEC # 93035C

## MANUFACTURER

Aquatherm Industries, Inc.  
1985 Rutgers University Blvd.  
Lakewood, New Jersey 08701

Collector Model  
Ecosun 16104-12

This solar collector was evaluated by the Florida Solar Energy Center (FSEC) in accordance with prescribed methods and was found to meet the minimum standards established by FSEC. This evaluation was based on solar collector tests performed at the Florida Solar Energy Center, Cape Canaveral, Florida. The purpose of the tests is to verify initial performance conditions and quality of construction only. The resulting certification is not a guarantee of long term performance or durability.

## DESCRIPTION

Gross Length	3.670 meters	12.04 feet
Gross Width	1.195 meters	3.92 feet
Gross Depth	0.009 meters	0.03 feet
Gross Area	4.385 square meters	47.20 square feet
Transparent Frontal Area	4.385 square meters	47.20 square feet
Volumetric Capacity	12.1 liters	3.2 gallons
Weight (empty)	9.8 kilograms	21.7 pounds
Recommended Flow Rate	303 ml/s	4.8 gpm
Maximum Operating Pressure	241 kPag	35 psig
Maximum Wind Load	Not Applicable	
Number of Cover Plates	None	
Flow Pattern	Parallel	Forced circulation
Number of Flow Tubes	Multitube mat	

## MATERIALS

Enclosure	None
Glazing	None
Absorber	Polypropylene with UV stabilization
Absorber Coating	None
Insulation	None

## THERMAL PERFORMANCE

Tested per ASHRAE 96-1980 (RA 1989)

$$\text{Incident Angle Modifier } K_{\tau\alpha} = 1.0 - 0.03 \left( \frac{1}{\cos\theta} - 1 \right)$$

### Efficiency Equations

$$\eta = 86.6 - 1978 (T_i - T_a)/I$$

$$\eta = 86.6 - 348 (T_i - T_a)/I$$

$$\eta = 87.3 - 1754 (T_i - T_a)/I - 10901 [(T_i - T_a)/I]^2$$

$$\eta = 87.3 - 309 (T_i - T_a)/I - 338 [(T_i - T_a)/I]^2$$

Units of  $T_i - T_a/I$  are  $^{\circ}\text{C}/\text{Watt}/\text{m}^2$

Units of  $T_i - T_a/I$  are  $^{\circ}\text{F}/\text{Btu}/\text{hr ft}^2$

## RATING

The collector has been rated for energy output on measured performance and an assumed standard day. Total solar energy available for the standard day is 5045 watt-hours/ $\text{m}^2$  (1600 Btu/ $\text{ft}^2$ ) distributed over a 10 hour period.

Output energy ratings for this collector based on the second-order efficiency curve are:

### Collector Temperature

### Energy Output

Low Temperature, 35 $^{\circ}\text{C}$ (95 $^{\circ}\text{F}$ )	50,300 Kilojoules/day	47,700 Btu/day
Intermediate Temperature, 50 $^{\circ}\text{C}$ (122 $^{\circ}\text{F}$ )	18,100 Kilojoules/day	17,200 Btu/day
High Temperature, 100 $^{\circ}\text{C}$ (212 $^{\circ}\text{F}$ )	0 Kilojoules/day	0 Btu/day

Reference 92042