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# **DIRECTORY OF SRCC CERTIFIED SOLAR COLLECTOR RATINGS**

**January 21, 2007**

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## ABOUT SRCC, RATING AND CERTIFICATION

The Solar Rating and Certification Corporation (SRCC) is an independent third-party certification organization that administers national certification and rating programs for solar energy equipment. The SRCC was incorporated in October 1980 as a non-profit corporation. It is governed by a twelve-member board of Directors with representation from the public, private, and generalist Sectors.

The SRCC currently operates three major solar programs: collector certification (OG-100), water heating system certification (OG-300) and a swimming pool heating system certification (OG-400). The OG-100 collector certification program applies to that part of a solar energy system that is exposed to the sun and collects the sun's heat. The collectors can be used to heat water, air or other heat transfer media. The OG-300 rating and certification program for solar hot water systems integrates results of collector tests with a performance model for the entire systems and determines whether systems meet minimum standards for system durability, reliability, safety and operation. Factors affecting total system design, installation, maintenance and service are also evaluated. The OG-400 certification program provides minimum requirements for solar swimming pool heating system design and installation procedures.

A direct comparison of an SRCC rated collector to an SRCC rated solar water heating system is not possible. The reason for this is two-fold. First, the collector rating shows the performance of one component in the solar package while the system rating shows the performance of an entire solar package. Second, each rating, whether a collector rating or a system rating, is developed using a separate set of assumed conditions.

This directory contains information about solar collectors that have been certified and rated by SRCC.

The information in this directory will provide you with reliable and comparable data for solar water heating collectors you may be considering buying. The rating information is a helpful tool for comparing the efficiency of the various solar collectors on the market. While you can, and should, compare collector ratings, you cannot compare collector ratings with system ratings. All collectors which have been certified by SRCC will bear the SRCC label, which is your assurance that an independent party has verified the performance and basic durability of the solar product you are considering. Copies of SRCC labels are shown in this directory.

The directory contains descriptive information about the solar collectors and also "performance" information about them. "Performance" data relates to the energy output of the collector. The SRCC performance information contained in this directory provides a way to compare the **relative** performance of different solar water heating collectors, not the **actual** performance you can expect from a given collector. This is because the collectors and systems are tested under standard laboratory conditions which are certain to be different from those in your home. **Think of the SRCC ratings as you do the MPG ratings for cars -- a benchmark, but not necessarily the same performance you will experience.** Remember, too, that performance (or energy output) is only one criteria in choosing a solar energy collector. Quality of installation, cost, availability of service and parts, and the expected life of the equipment are also important points to consider. Equipment which is well-designed and well-built, but poorly installed, cannot perform according to the manufacturer's specifications.

# **Directory of Solar Collector Ratings**

## **OG 100**

**Certified By**

**The Solar Rating & Certification Corporation**

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This directory lists all solar collectors certified and rated under the OG 100 protocol by the SRCC. All ratings published in this edition supersede any previously published ratings. Collector models appearing in previous editions or supplements of this directory but which are not listed herein are no longer certified by the Corporation. Separate pages and/or sections may be updated from time to time.

Notice: Check with SRCC for status of revisions.

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### **SRCC CERTIFICATION LABELS**

### **UNGLAZED SOLAR COLLECTORS**

- Dawn Solar Systems, Inc.
- Fafco, Inc.
- Heliocol USA, Inc.
- Sealed Air Corporation
- SolarTech International LLC
- Suntrek Industries, Inc.
- Techno-Solis, Inc.

### **GLAZED SOLAR COLLECTORS**

- ACR Solar International
- Alternate Energy Technologies, Inc
- American Solar Works Holdings
- Apricus Solar Co., Ltd.
- Beijing Sunda Solar Energy Technologies Co. Ltd.
- BTF, Ltd.
- EnerWorks, Inc.
- Genersys PLC
- Heliodyne, Inc
- King Solar Products
- Mr. Sun Solar
- R&R Solar Supply
- Radco Products, Inc
- Rheem Water Heaters
- Schuco International KG
- Sealed Air Corporation
- Solahart Industries Pty Ltd
- Solar Development, Inc.

Solar Energy, Inc.  
Solar Mining Company  
Solargenix Energy, LLC  
Solene  
Stiebel Eltron  
SunBank Solar  
SunEarth, Inc  
Sunsiaray Solar Mfg., Inc  
Synergy Solar  
Thermo Technologies  
Thermomax Industries Ltd.  
Viessmann Manufacturing Company (US) Inc.

## A NOTE TO CONSUMERS ABOUT THE RATING OF SOLAR COLLECTORS

### HOW COLLECTORS ARE RATED

Each time SRCC allows a solar manufacturer to attach the SRCC label to its product, very specific steps have been followed to assure consumers that the product meets SRCC's approval and that the performance information provided to you is correct. First, SRCC selects a solar collector at random from the manufacturer's facility. The collector is then sent for testing to an independent laboratory accredited by SRCC. When the collector is received by the lab, it is inspected to document the materials used. (You will see much of this information in the directory pages that follow.) Then, the collector is subjected to a variety of durability tests to reveal any leaks, to check the integrity of construction, and to assess the collector's resistance to sudden expansion and contraction and changes in water temperature. Following the durability tests, the energy output of the collector is measured to determine the performance of the collector under the standard laboratory conditions. These measurements result in the performance figures found in the box at the top of each collector's rating page in this directory. Finally, when the testing is complete, the lab partially disassembles the collector and inspects it for any hidden problems.

When the last inspection is completed, the lab sends the test report to the SRCC for review and calculation of the figures which appear in the rating directory. The SRCC also checks the collector design for reliability and durability. When the collector is certified, the manufacturer is notified and required to begin affixing the SRCC label to the solar collector. Also, the manufacturer must provide a copy of the Certification Award with each certified collector.

### TYPES OF SOLAR COLLECTORS

As you shop for a solar collector, you may see several different types. They are:

1. **Unglazed liquid-type collectors** are those in which a liquid is heated by the sun in a stationary collector which does not have glass or other transparent covering. These collectors are commonly used for swimming pool heating systems, but are also used in domestic water heating systems.
2. **Glazed liquid-type solar collectors** are those in which a liquid is heated by the sun in a stationary collector which has a cover of glass or other transparent material. They are the most common type of collectors, and are often used for domestic water heating and space heating systems.
3. **Air-type collectors** are those in which the sun heats air rather than water in the collector. They are most commonly used for space heating applications.

All three types of collectors work well and can be compared with others of the same type, using the data in this directory.

### HOW TO USE THIS DIRECTORY

SRCC has divided the collectors in this directory into two categories: unglazed and glazed. At the top of each page is the performance data. The remainder of the information on each rating page describes the equipment.

## **PERFORMANCE DATA**

The performance data about a given collector appears in the box at the top of each rating page. The data on the left is in metric (or SI units) and the data on the right is in English (or Inch-Pound units). The data, whether you read it in metric or English units, provides the total energy produced by that collector in a standard "rating day," that is, under the test conditions used to define a day.

Across the top of the chart are three categories which represent various weather conditions and seasons of the year. See Table 1 for a listing of average daily total solar radiation in several U.S. Cities. The amount of sunlight striking the collector (or "irradiance") is an important factor in how much energy the collector can produce. Also important is how much the energy output of the collector declines as the sunlight declines. Irradiance is measured in megajoules per square meter per day (or in Btu per square foot per day). Generally, a clear sky would be characterized by the 23 MJ/(m<sup>2</sup> d) [2,000 Btu/(ft<sup>2</sup> day)] column, while a cloudy sky would be characterized by the 11 MJ/(m<sup>2</sup> d) [1,000 Btu/(ft<sup>2</sup> day)] column. The 17 MJ/(m<sup>2</sup> d) [1,500 Btu/(ft<sup>2</sup> day)] column characterizes a mildly cloudy conditions.

Once you have determined the correct weather column, you will need to choose the correct category. The categories are listed down the left side of the box, using letters A through E. The accompanying numbers are the difference between the temperature of the water or air entering the collector and the temperature of the air around the collector. These temperature differences are important factors in the ability of the solar collector to produce energy. To use the rating chart, it is easier to refer to the following table for the correct category:

<b><u>CATEGORY</u></b>	<b><u>APPLICATION</u></b>	
A	-5°C (-9°F)	Certain types of solar assisted heat pumps. Swimming pool heating.
B	5°C (9°F)	Liquid collectors with certain types of solar assisted heat pumps. Swimming pool heating. Space heating - air systems.
C	20°C (36°F)	Service hot water systems. Space heating - air systems.
D	50°C (90°F)	Service hot water systems. Space heating - liquid systems. Air conditioning.
E	80°C (144°F)	Space heating - liquid systems. Air conditioning. Industrial process heat.

The collector with the higher number in the box which reflects your climate and category produces more energy than those with lower numbers. While such a comparison should not be the only basis for your choice of a solar energy system, you may find it helpful. Remember, too, that the energy output of these collectors in the directory has been measured under test conditions, which are almost certainly not the same as the collector will be subjected to in your home. The remainder of the system and the quality of the installation are also critically important factors in how well your solar system works, and how much energy and money you save.

Table 1 Average Daily Total Solar Radiation for U.S. Cities

City	MJ/m <sup>2</sup> -day		Btu/ft <sup>2</sup> -day	
	23° Tilt	45° Tilt	23° Tilt	45° Tilt
Albuquerque, NM	23.58	23.42	2076	2062
Apalachicola, FL	18.13	17.50	1596	1541
Atlanta, GA	16.62	16.12	1463	1420
Baltimore, MD/ DC	14.79	14.75	1302	1299
Billings, MT	15.91	16.58	1401	1460
Birmingham, AL	16.25	15.76	1431	1388
Boise, ID	17.54	17.91	1545	1578
Boston, MA	11.41	11.62	1005	1023
Burlington, VT	12.87	13.07	1134	1151
Casper, WY	18.96	19.80	1669	1743
Charleston, SC	14.91	14.73	1313	1297
Charleston, WV	13.12	12.81	1155	1128
Charlotte, NC	16.96	16.67	1493	1468
Chicago, IL	14.74	14.80	1298	1302
Cincinnati, OH	13.50	13.20	1189	1164
Concord, NH	12.00	12.09	1057	1064
Dallas/Fort Worth, TX	17.42	17.44	1533	1536
Denver, CO	20.24	20.89	1782	1839
Des Moines, IA	14.87	15.25	1310	1343
Detroit, MI	12.78	12.72	1125	1120
Fairbanks, AK	2.62	3.04	231	268
Farqo, ND	14.46	14.90	1273	1319
Greenville, SC	17.08	16.79	1503	1478
Hartford, CT	12.35	12.37	1087	1089
Honolulu, HI	19.24	17.67	1694	1556
Houston, TX	16.28	15.49	1434	1364
Indianapolis, IN	13.71	13.52	1208	1191
Jackson, MS	17.17	16.61	1512	1463
Las Vegas, NV	24.16	24.14	2127	2126
Little rock, AR	17.31	16.94	1524	1492
Los Angeles, CA	20.18	19.87	1777	1749
Louisville, KY	15.16	14.86	1335	1309
Memphis, TN	16.76	16.30	1476	1436
Miami, FL	17.70	16.81	1559	1480
Milwaukee, WI	13.46	13.70	1185	1206
Minneapolis, MN	13.73	14.08	1209	1240
New Orleans, LA	17.15	16.41	1510	1445
Newark, NJ/ New York, NY	14.16	14.12	1247	1244
Norfolk, VA	16.57	16.30	1459	1435
Oklahoma City, OK	18.40	18.16	1620	1599
Omaha, NE	16.45	16.89	1449	1485
Philadelphia, PA	13.96	13.87	1229	1221
Phoenix, AZ	23.55	23.08	2073	2033
Portland, ME	11.97	12.24	1054	1078
Portland, OR	12.00	11.94	1057	1051
Providence, RI	13.00	13.10	1145	1153
Sacramento, CA	18.80	18.69	1655	1646
St. Louis, MO	16.10	16.02	1418	1411
Salt Lake City, UT	19.06	19.47	1679	1714
Seattle, WA	11.65	11.63	1026	1024
Shreveport, LA	17.39	16.79	1531	1478
Sioux Falls, SD	15.12	15.63	1331	1376
Syracuse, NY	11.40	11.29	1007	995
Topeka, KS	16.83	16.91	1482	1489
Wilmington, DE	14.49	14.44	1276	1271

NOTE:

The values listed in this table are based upon TMY data for each of the cities listed. The data for the tilted surface radiation was processed using the TRNSYS 13.1 radiation processor with the Hay and Davies tilted surface radiation model.

## **DESCRIPTIVE INFORMATION**

Included in the descriptive information is the size of the collector. The Gross Area is the size of the top face of the collector; the Net Aperture is the size of the glass or other glazing material that sunlight can enter. The size of the collector may be relevant when comparing energy output and price.

Also, the “dry weight” of the collector combined with the “fluid capacity” (for liquid systems; a gallon of water weighs 8.3 pounds) will give you a rough idea of how much weight the solar system will be adding to your roof, if that is where the system is to be installed. Remember to multiply the dry weight plus the fluid weight by the number of collectors in the system.

## **COMPARING COLLECTOR EFFICIENCY AND COST**

With the ratings discussed above, it is easy to compare the energy output of one collector to another. It can be difficult however, to take into account the price of the different collectors.

One method is to compare the energy output for each dollar spent on different collectors. Or, in other words, how many Btu (or MJ) does a dollar buy if spent on Collector #1 versus Collector #2? This question can be answered by dividing the energy output by the cost of the collector. For example, you are considering a solar water heating application. Collector #1 has a rating in Category C (for water heating) under the correct climate column of 29 MJ (per collector per day) or 21,000 Btu (per collector panel per day). Collector #1 sells for \$387. Collector #2 is rated at 35 MJ or 33,000 Btu; it sells for \$675. Thus:

Collector #1

$$\frac{29 \text{ MJ}}{\$ 387} = 0.07 \text{ MJ} / \$ \quad \text{or} \quad \frac{21,000 \text{ Btu}}{\$ 387} = 54.26 \text{ Btu} / \$$$

Collector #2

$$\frac{35 \text{ MJ}}{\$ 675} = 0.05 \text{ MJ} / \$ \quad \text{or} \quad \frac{33,000 \text{ Btu}}{\$ 675} = 48.89 \text{ Btu} / \$$$

Collector #1 is the better buy, based on performance under the test conditions alone. The higher the number of MJ's or Btu per dollar, the more cost-effective the collector is...all other things being equal. Remember, though, that the design and quality of the rest of the system and the installation are also critical to a good solar energy system.

# TECHNICAL EXPLANATION OF THE COLLECTOR TESTING AND RATING PROGRAM

## SOLAR COLLECTOR TESTING AND RATING

The SRCC solar collector thermal performance test is based on the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 96-1980, *Methods of Testing to Determine the Thermal Performance of Unglazed Flat-Plate Liquid-Type Solar Collectors*, for unglazed liquid collectors and on ASHRAE Standard 93-1986, *Methods of Testing to Determine the Thermal Performance of Solar Collectors*, for glazed flat-plate liquid collectors, air collectors, linear tracking concentrators, and other collector devices which fall within the scope of the test standard. Based on the thermal performance data derived from the ASHRAE 96-1980 or ASHRAE 93-1986 test methods, SRCC then calculates the collector ratings according to SRCC Document RM-1, *Methodology for Determining the Thermal Performance Rating for Solar Collectors*. This rating methodology accounts for diffuse irradiance, which is assumed to be distributed isotropically throughout the view of the collector. The methodology is applicable to all non-tracking collector panels.

Before a collector model is issued certification and ratings, SRCC requires that an individual collector be selected at random from the manufacturer's inventory. That unit is then sent to an independent laboratory accredited by SRCC for testing according to SRCC Standard 100-81, *Test Methods and Minimum Standards for Certifying Solar Collectors*. The SRCC test sequence for collectors is a combination of durability and performance tests. The required tests and the purpose of each are described below:

- **Receiving Inspection.** To inspect and document the condition of the collector prior to formal testing.
- **Static Pressure Test.** To determine if a loss of pressure occurs or evidence of fluid leakage or fluid path deterioration.
- **30-Day Exposure Test.** To verify integrity of construction after at least 30 days exposure to adverse conditions.
- **Thermal Shock/Water Spray Test.** To verify that the collector structure and performance will not be degraded due to sudden thermal expansion or contraction.
- **Thermal Shock/Cold Fill Test.** To determine the reaction of a hot collector after the introduction of cold water.
- **Post Exposure Static Pressure Test.** To determine if a loss of pressure occurs or evidence of fluid leakage or fluid path deterioration after a collector has been stagnated under worst case conditions.
- **Time Constant Determination Test.** To determine the transient behavior of the collector or the time required to respond to abrupt changes in either insolation or inlet temperature.
- **Thermal Performance Test.** To determine the instantaneous efficiency of the collector over a wide range of operating temperatures. ("Efficiency" is defined as the ratio of collected energy to the available energy falling on the entire collector area.)
- **Incident Angle Modifier Test.** The incident angle modifier needs to be determined in order to predict collector performance over a wide range of conditions. The modifier algorithm is used to modify the efficiency curve to account for changes in performance as a function of the sun's incidence angle.
- **Disassembly and Final Inspection.** To visually inspect the major components and subassemblies and to report their conditions after testing has been completed.

Once the collector test unit has completed the above sequence of tests, the results are sent to SRCC for evaluation and computation of the thermal performance ratings. A collector is judged by SRCC to have successfully completed the durability-type tests if none of the following conditions occurred during the testing:

- Severe deformation of the absorber.
- Severe deformation of the fluid flow passages.
- Loss of bonding between fluid flow passages and absorber plates.
- Leakage from fluid flow passages or connections.
- Loss of mounting integrity.
- Severe corrosion or other deterioration caused by chemical action.
- Cracking, cracking, blistering or flaking of the absorber coating or delamination of reflective surface.
- Retention of water in the insulation.
- Excessive retention of water anywhere in the collector.
- Swelling, severe outgassing or other detrimental changes in collector insulation which adversely affect the collector performance.
- Leakage or damage to hoses inside the collector enclosure or leakage from mechanical connections.
- Cracking, crazing, permanent warping or buckling of the cover plate.
- Cracking or warping of the collector enclosure material.

In addition, in order to qualify for collector certification and ratings, manufacturers must document to SRCC that their collectors meet the SRCC requirements for durability in design and construction. For examples, all collectors must be designed to prevent condensation build-up and all glass cover plates must be of a non shattering or tempered type.

## **A WORD ABOUT FLOW RATES**

**The SRCC solar collector thermal performance ratings are valid only for the fluid and flow rate used to generate the ASHRAE test data.**


Since performance of a collector may vary with changes in flow rate, in order to allow for an even more direct comparison of the thermal performance of various collector models, SRCC adopted the requirement beginning in April of 1983 that all thermal performance testing of solar collectors be conducted at the ASHRAE standard recommended flow rates except as noted below.

For unglazed flat-plate liquid-type solar collectors, the ASHRAE standard flow rate per unit area (transparent frontal or aperture) is  $0.07 \text{ kg}/(\text{s m}^2)$  [ $51.5 \text{ lb}/(\text{hr ft}^2)$ ]. For glazed flat-plate liquid-type solar collectors the ASHRAE standard flow rate per unit area (transparent frontal or aperture) is  $0.02 \text{ kg}/(\text{s m}^2)$  [ $14.7 \text{ lb}/(\text{hr ft}^2)$ ]. When air is the transfer fluid, the ASHRAE standard flow rate is  $0.01 \text{ m}^3/(\text{s m}^2)$  [ $2 \text{ cfm}/\text{ft}^2$ ] or  $0.03 \text{ m}^3/(\text{s m}^2)$  [ $6 \text{ cfm}/\text{ft}^2$ ], inclusive.

For those collectors which have been designed for a specific flow rate other than the ASHRAE standard recommended flow rate, the manufacturer may petition to have the collector rated at its design flow rate. The flow rate at which each solar collector model was tested is provided on each directory listing.

## SRCC CERTIFICATION LABELS


All solar products certified by SRCC are required to be labeled with an approved SRCC certification label within sixty (60) days of receipt of certification. The label shown below should be on each collector certified under SRCC's OG 100 protocol.

 <p>The logo is a circular emblem. The word "SOLAR" is written in a semi-circle at the top. In the center, the letters "SRCC" are prominently displayed in a bold, sans-serif font. Below "SRCC", the word "CERTIFICATION" is written in a semi-circle, followed by a registered trademark symbol (®).</p>	<p>This product certified by the <b>Solar Rating and Certification Corporation</b> c/o FSEC, 1679 Clearlake Road Cocoa, FL 32922 (321)638-1537 <a href="http://www.solar-rating.org">www.solar-rating.org</a></p> <p>SRCC Document OG-100</p>	<p><b>Sample Solar Corporation</b> <b>P.O. Box 12345</b> <b>Anytown, CA 97402</b></p> <p><b>Model No.: Super Sample</b> <b>Gross Area: 3.72 m<sup>2</sup> (40.00 ft<sup>2</sup>)</b></p> <p><b>Serial Number:</b> _____</p>	<p><b>Mildly Cloudy Day</b> <b>Rating in Category C</b></p> <p><b>31 MJ/day</b> <b>29 Mbtu/day</b></p>
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## SECTION 1:

# UNGLAZED LIQUID-TYPE SOLAR COLLECTORS

**NOTE:** Collectors listed in this section have been certified by SRCC as having met the test methods and minimum standards for certifying solar collectors. Collectors in this section have been tested for thermal performance in accordance with ASHRAE Standard 96, *Methods of Testing to Determine the Thermal Performance of Unglazed Flat Plate Liquid-Type Solar Collectors*. The SRCC collector ratings contained in this section have been calculated according to SRCC Document RM-1, *Methodology for Determining the Thermal Performance Rating for Solar Collectors*.

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p><b><u>CERTIFIED SOLAR COLLECTOR(S)</u></b></p> <p><b>SUPPLIER:</b>    <b>Dawn Solar Systems, Inc.</b>  183 Route 125, Unit A-7  Brentwood, NH 03833</p> <p><b>MODEL:</b>                      Dawn Solar 3004-CT  <b>COLLECTOR TYPE:</b>      Unglazed Flat-Plate  <b>CERTIFICATION #:</b>      100-2006-018A</p>
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ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Square Meter Per Day</b>				<b>Thousands of Btu Per Square Foot Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5 °C)	2.0	1.6	1.3	A (-9 °F)	0.2	0.1	0.1
B (5 °C)	1.0	0.6	0.3	B (9 °F)	0.1	0.1	0.0
C (20 °C)	0.1			C (36 °F)	0.0		
D (50 °C)				D (90 °F)			
E (80 °C)				E (144 °F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: November 6, 2006

#### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

					<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b>	$\eta = 0.0740$	$-2.8751 (P)/I$	$+0.0076 (P)^2/I$		0.0740	-2.7800	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.0740$	$-0.5067 (P)/I$	$0.0000 (P)^2/I$		0.0740	-0.4899	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

<b>K<sub>αr</sub></b> =	Not conducted	(S)
<b>K<sub>αr</sub></b> =		(S) (Linear Fit)

**Model Tested:** 3004-CT

**Test Fluid:** Water

**Test Flow Rate:** 3 ml/s-m<sup>2</sup>      0.005 gpm/ft<sup>2</sup>

#### TESTED COLLECTOR SPECIFICATIONS

<b>Gross Area:</b>	9.641 m <sup>2</sup>	103.78 ft <sup>2</sup>
<b>Dry Weight:</b>	kg	lb
<b>Test Pressure:</b>	1103 kPa	160 psig

**Fluid Capacity:** 8.3 l      2.2 gal

#### COLLECTOR MATERIALS

<b>Frame:</b>	Aluminum and wood
<b>Absorber</b>	Tube - PEX
<b>Material:</b>	Plate - Dark concrete tile
<b>Absorber Coating:</b>	None
<b>Insulation:</b>	None

#### TESTED MODEL PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O

#### REMARKS:


This collector is integrated into the roof. The ratings listed above are based on the gross area of the tested collector. Collector weight and incident angle modifier were not measured.

January 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR(S)</u></b></p> <p><b>SUPPLIER:</b>    <b>Dawn Solar Systems, Inc.</b>  183 Route 125, Unit A-7  Brentwood, NH 03833</p> <p><b>MODEL:</b>                      Dawn Solar 3004L  <b>COLLECTOR TYPE:</b>      Unglazed Flat-Plate  <b>CERTIFICATION #:</b>      100-2004-009A</p>
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ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Square Meter Per Day</b>				<b>Thousands of Btu Per Square Foot Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5 °C)	2.4	1.9	1.3	A (-9 °F)	0.2	0.2	0.1
B (5 °C)	1.7	1.2	0.6	B (9 °F)	0.1	0.1	0.1
C (20 °C)	0.3	0.0	0.0	C (36 °F)	0.0	0.0	0.0
D (50 °C)	0.0	0.0	0.0	D (90 °F)	0.0	0.0	0.0
E (80 °C)	0.0	0.0	0.0	E (144 °F)	0.0	0.0	0.0

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: June 10, 2005

#### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

						<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b>	$\eta$	0.1250	-1.8670 (P)/I	-0.0806 (P) <sup>2</sup> /I		0.1260	-3.6690	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta$	0.1250	-0.3290 (P)/I	-0.0079 (P) <sup>2</sup> /I		0.1260	-0.6466	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

<b>K<sub>α</sub></b>	=	1.0	-0.2119 (S)	+0.1184 (S) <sup>2</sup>
<b>K<sub>α</sub></b>	=	1.0	-0.09 (S)	(Linear Fit)

**Model Tested:** 3004L

**Test Fluid:** Water

**Test Flow Rate:** 3 ml/s-m<sup>2</sup>      0.005 gpm/ft<sup>2</sup>

#### TESTED COLLECTOR SPECIFICATIONS

<b>Gross Area:</b>	9.302 m <sup>2</sup>	100.14 ft <sup>2</sup>
<b>Dry Weight:</b>	kg	lb
<b>Test Pressure:</b>	1104 kPa	160 psig

**Fluid Capacity:** 8.2 l      2.2 gal

#### COLLECTOR MATERIALS

<b>Frame:</b>	Galvanized Steel
<b>Absorber</b>	Tube - PEX
<b>Material:</b>	Plate - Steel
<b>Absorber Coating:</b>	Dark Green Fluorocarbon
<b>Insulation:</b>	Plywood

#### TESTED MODEL PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	2523	10.13
50	0.79	14934	59.96
80	1.27	27363	109.85


**REMARKS:** This collector is integrated into the roof. The ratings listed above are based on the gross area of the tested collector. Collector weight was not measured.

January 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR(S)</u></b></p> <p><b>SUPPLIER: Fafco, Inc.</b> 435 Otterson Dr. Chico, CA 95928</p> <p><b>MODEL:</b> Sunsaver <b>COLLECTOR TYPE:</b> Unglazed Flat-Plate <b>CERTIFICATION #:</b> 100-2005-010A</p>
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ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Square Meter Per Day</b>				<b>Thousands of Btu Per Square Foot Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5 °C)	18.3	14.5	10.6	A (-9 °F)	1.6	1.3	0.9
B (5 °C)	13.0	9.2	5.5	B (9 °F)	1.1	0.8	0.5
C (20 °C)	6.0	2.7	0.3	C (36 °F)	0.5	0.2	0.0
D (50 °C)				D (90 °F)			
E (80 °C)				E (144 °F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: December 18, 2006

#### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

					<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b>	$\eta = 0.8280$	$-13.3685 (P)/I$	$-0.1050 (P)^2/I$		0.8210	-15.4750	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.8280$	$-2.3559 (P)/I$	$-0.0103 (P)^2/I$		0.8210	-2.7271	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

<b>K<sub>arr</sub></b> =	1.0	-0.0799 (S)	+0.0562 (S) <sup>2</sup>
<b>K<sub>arr</sub></b> =	1.0	-0.02 (S)	(Linear Fit)

**Model Tested:** SunSaver 912

**Test Fluid:** Water

**Test Flow Rate:** 70 ml/s-m<sup>2</sup>      0.10 gpm/ft<sup>2</sup>

#### TESTED COLLECTOR SPECIFICATIONS

<b>Gross Area:</b>	4.441 m <sup>2</sup>	47.81 ft <sup>2</sup>
<b>Dry Weight:</b>	8.85 kg	20 lb
<b>Test Pressure:</b>	414 kPa	60 psig

**Fluid Capacity:** 18.9 l      5.0 gal

#### COLLECTOR MATERIALS

<b>Frame:</b>	None
<b>Absorber Material:</b>	Tube - UV Stabilized Plastic Polymer
	Plate - None
<b>Absorber Coating:</b>	None
<b>Insulation:</b>	None

#### TESTED MODEL PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O
303	4.80	1000	4.01
0	0.00	0	0.00
0	0.00	0	0.00


**REMARKS:** Tests conducted outdoors.

January 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR(S)</u></b></p> <p><b>SUPPLIER: Fafco, Inc.</b> 435 Otterson Dr. Chico, CA 95928</p> <p><b>MODEL:</b> Revolution <b>COLLECTOR TYPE:</b> Unglazed Flat-Plate <b>CERTIFICATION #:</b> 100-2005-011A</p>
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ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Square Meter Per Day</b>				<b>Thousands of Btu Per Square Foot Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5 °C)	21.0	16.4	11.8	A (-9 °F)	1.9	1.4	1.0
B (5 °C)	15.1	10.6	6.1	B (9 °F)	1.3	0.9	0.5
C (20 °C)	8.0	4.0	0.7	C (36 °F)	0.7	0.4	0.1
D (50 °C)	0.1			D (90 °F)	0.0		
E (80 °C)				E (144 °F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: February 18, 2006

#### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

						<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b>	$\eta =$	0.8610	-15.4491	(P)/I	+0.0266	(P) <sup>2</sup> /I	0.8630	-14.8430 W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta =$	0.8610	-2.7226	(P)/I	0.0000	(P) <sup>2</sup> /I	0.8630	-2.6158 Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

<b>K<sub>α</sub></b> =	1.0	-0.1410	(S)	+0.0228	(S) <sup>2</sup>
<b>K<sub>α</sub></b> =	1.0	-0.11	(S)	(Linear Fit)	

**Model Tested:** Revolution 912R

**Test Fluid:** Water

**Test Flow Rate:** 70 ml/s-m<sup>2</sup>      0.10 gpm/ft<sup>2</sup>

#### TESTED COLLECTOR SPECIFICATIONS

<b>Gross Area:</b>	4.408	m <sup>2</sup>	47.45	ft <sup>2</sup>
<b>Dry Weight:</b>	9.1	kg	20	lb
<b>Test Pressure:</b>	465	kPa	67	psig

**Fluid Capacity:** 18.9 l      5.0 gal

#### COLLECTOR MATERIALS

<b>Frame:</b>	None
<b>Absorber Material:</b>	Tube - UV Stabilized Plastic Polymer
	Plate - None
<b>Absorber Coating:</b>	None
<b>Insulation:</b>	None

#### TESTED MODEL PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O
150	2.38	3677	14.76
250	3.97	9305	37.36
350	5.55	176596	708.97


**REMARKS:** Tests conducted outdoors.

January 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR(S)</u></b></p> <p><b>SUPPLIER: Fafco, Inc.</b> 435 Otterson Dr. Chico, CA 95928</p> <p><b>MODEL:</b> Sunsaver ST <b>COLLECTOR TYPE:</b> Unglazed Flat-Plate <b>CERTIFICATION #:</b> 100-2005-012A</p>
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ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Square Meter Per Day</b>				<b>Thousands of Btu Per Square Foot Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5 °C)	21.5	17.1	12.7	A (-9 °F)	1.9	1.5	1.1
B (5 °C)	13.2	8.9	4.6	B (9 °F)	1.2	0.8	0.4
C (20 °C)	3.3	0.6		C (36 °F)	0.3	0.1	
D (50 °C)				D (90 °F)			
E (80 °C)				E (144 °F)			

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: February 18, 2006

#### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

						<u><b>Y Intercept</b></u>	<u><b>Slope</b></u>	
<b>S I Units:</b>	$\eta = 0.8110$	$-21.4446 (P)/I$	$-0.0993 (P)^2/I$			0.8110	-22.4410	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.8110$	$-3.7791 (P)/I$	$-0.0097 (P)^2/I$			0.8110	-3.9547	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

$K_{\alpha} =$	1.0	-0.2340 (S)	+0.1480 (S) <sup>2</sup>
$K_{\alpha} =$	1.0	-0.08 (S)	(Linear Fit)

**Model Tested:** SunSaver St 948

**Test Fluid:** Water

**Test Flow Rate:** 74 ml/s-m<sup>2</sup> 0.11 gpm/ft<sup>2</sup>

#### TESTED COLLECTOR SPECIFICATIONS

<b>Gross Area:</b>	2.934 m <sup>2</sup>	31.59 ft <sup>2</sup>
<b>Dry Weight:</b>	6 kg	13 lb
<b>Test Pressure:</b>	414 kPa	60 psig

**Fluid Capacity:** 15.5 l 4.1 gal

#### COLLECTOR MATERIALS

<b>Frame:</b>	None
<b>Absorber Material:</b>	Tube - UV Stabilized Plastic Polymer
	Plate - None
<b>Absorber Coating:</b>	None
<b>Insulation:</b>	None

#### TESTED MODEL PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O
150	2.38	3683	14.79
250	3.97	6363	25.55
350	5.55	10442	41.92


**REMARKS:** Tests conducted outdoors.

January 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p><b><u>CERTIFIED SOLAR COLLECTOR(S)</u></b></p> <p><b>SUPPLIER:</b>   <b>Heliocol USA, Inc.</b>  927 Fern Street  Suite 1500  Altamonte Springs, FL 32701</p> <p><b>MODEL:</b>                   Heliocol HC  <b>COLLECTOR TYPE:</b>   Unglazed Flat-Plate  <b>CERTIFICATION #:</b>   100-1983-006A</p>
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**ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.**

<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Square Meter Per Day</b>				<b>Thousands of Btu Per Square Foot Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5 °C)	22.9	18.1	13.3	A (-9 °F)	2.0	1.6	1.2
B (5 °C)	14.8	10.4	5.5	B (9 °F)	1.3	0.9	0.5
C (20 °C)	5.2	1.8		C (36 °F)	0.5	0.2	
D (50 °C)				D (90 °F)			
E (80 °C)				E (144 °F)			

**A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning**

Original Certification Date: August 1, 1985

#### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

					<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b>	$\eta = 0.8730$	$-20.6200 (P)/I$	$-0.0430 (P)^2/I$		0.8710	-21.3100	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.8730$	$-3.6338 (P)/I$	$-0.0042 (P)^2/I$		0.8710	-3.7554	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

<b>K<sub>arr</sub></b> =	1.0	-0.0316 (S)	-0.0104 (S) <sup>2</sup>
<b>K<sub>arr</sub></b> =	1.0	-0.04 (S)	(Linear Fit)

**Model Tested:**                   HC-30

**Test Fluid:**                   Water

**Test Flow Rate:**   70 ml/s·m<sup>2</sup>                   0.10 gpm/ft<sup>2</sup>

#### TESTED COLLECTOR SPECIFICATIONS

<b>Gross Area:</b>	2.703 m <sup>2</sup>	29.10 ft <sup>2</sup>
<b>Dry Weight:</b>	7 kg	15 lb
<b>Test Pressure:</b>	621 kPa	90 psig

**Fluid Capacity:**                   9.1 l                   2.4 gal

#### COLLECTOR MATERIALS

<b>Frame:</b>	None
<b>Absorber Material:</b>	Tube - Polypropylene with UV Stabilization
	Plate - None
<b>Absorber Coating:</b>	None
<b>Insulation:</b>	None

#### TESTED MODEL PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O


**REMARKS:**                   Thermal performance tests were done indoors with a solar irradiance simulator.

January 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p><b><u>CERTIFIED SOLAR COLLECTOR(S)</u></b></p> <p><b>SUPPLIER: Sealed Air Corporation</b> 3433 Arden Road Hayward, CA 94545</p> <p><b>MODEL: FP</b> <b>COLLECTOR TYPE: Unglazed Flat-Plate</b> <b>CERTIFICATION #: 100-1997-010A</b></p>
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ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Square Meter Per Day</b>				<b>Thousands of Btu Per Square Foot Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5 °C)	19.7	15.6	11.2	A (-9 °F)	1.7	1.4	1.0
B (5 °C)	13.5	9.4	5.3	B (9 °F)	1.2	0.8	0.5
C (20 °C)	6.2	2.8	0.2	C (36 °F)	0.5	0.2	0.0
D (50 °C)				D (90 °F)			
E (80 °C)				E (144 °F)			

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: April 1, 1997

#### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

					<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b>	$\eta = 0.7940$	$-15.7800$	$(P)/I$	$-0.0091$	$(P)^2/I$	$0.7940$	$-15.9400$ W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.7940$	$-2.7809$	$(P)/I$	$-0.0009$	$(P)^2/I$	$0.7940$	$-2.8091$ Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

<b>K<sub>αr</sub></b> =	(S)	(S) <sup>2</sup>
<b>K<sub>αr</sub></b> =	(S)	(Linear Fit)

**Model Tested:** FP-48

**Test Fluid:** Water

**Test Flow Rate:** 70 ml/s-m<sup>2</sup> 0.10 gpm/ft<sup>2</sup>

#### TESTED COLLECTOR SPECIFICATIONS

<b>Gross Area:</b>	4.359 m <sup>2</sup>	46.92 ft <sup>2</sup>
<b>Dry Weight:</b>	13.4 kg	30 lb
<b>Test Pressure:</b>	207 kPa	30 psig

**Fluid Capacity:** 11.7 l 3.1 gal

#### COLLECTOR MATERIALS

<b>Frame:</b>	None
<b>Absorber</b>	Tube - Co-polymer plastic
<b>Material:</b>	Plate - Co-polymer plastic
<b>Absorber Coating:</b>	None
<b>Insulation:</b>	None

#### TESTED MODEL PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O


**REMARKS:** Tests conducted outdoors.

January 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p><b><u>CERTIFIED SOLAR COLLECTOR(S)</u></b></p> <p><b>SUPPLIER: Sealed Air Corporation</b> 3433 Arden Road Hayward, CA 94545</p> <p><b>MODEL: FS</b> <b>COLLECTOR TYPE: Unglazed Flat-Plate</b> <b>CERTIFICATION #: 100-1997-010B</b></p>
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ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Square Meter Per Day</b>				<b>Thousands of Btu Per Square Foot Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5 °C)	19.1	15.0	10.9	A (-9 °F)	1.7	1.3	1.0
B (5 °C)	13.2	9.3	5.2	B (9 °F)	1.2	0.8	0.5
C (20 °C)	6.4	2.7	0.2	C (36 °F)	0.6	0.2	0.0
D (50 °C)				D (90 °F)			
E (80 °C)				E (144 °F)			

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: April 1, 1997

#### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

						<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b>	$\eta = 0.7820$	$-15.0400$	$(P)/I$	$-0.0102$	$(P)^2/I$	0.7810	-15.2200	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.7820$	$-2.6505$	$(P)/I$	$-0.0010$	$(P)^2/I$	0.7810	-2.6822	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

<b>K<sub>air</sub> =</b>	(S)	(S) <sup>2</sup>
<b>K<sub>air</sub> =</b>	(S)	(Linear Fit)

**Model Tested:** FS-48

**Test Fluid:** Water

**Test Flow Rate:** 65 ml/s-m<sup>2</sup>      0.10 gpm/ft<sup>2</sup>

#### TESTED COLLECTOR SPECIFICATIONS

<b>Gross Area:</b>	4.404	m <sup>2</sup>	47.41	ft <sup>2</sup>
<b>Dry Weight:</b>	29	kg	64	lb
<b>Test Pressure:</b>	207	kPa	30	psig

**Fluid Capacity:** 11.7 l      3.1 gal

#### COLLECTOR MATERIALS

<b>Frame:</b>	Galvanized steel with fiber reinforced back
<b>Absorber</b>	Tube - Co-polymer plastic
<b>Material:</b>	Plate - Co-polymer plastic
<b>Absorber Coating:</b>	None
<b>Insulation:</b>	None

#### TESTED MODEL PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O


**REMARKS:** Tests conducted outdoors.

January 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

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<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p><b><u>CERTIFIED SOLAR COLLECTOR(S)</u></b></p> <p><b>SUPPLIER:</b>   <b>SolarTech International LLC</b>  2913 E. 19th St.  Tucson, AZ 85716</p> <p><b>MODEL:</b>                   SolarTech ST-300  <b>COLLECTOR TYPE:</b>   Unglazed Flat-Plate  <b>CERTIFICATION #:</b>   100-2004-010A</p>
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ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Square Meter Per Day</b>				<b>Thousands of Btu Per Square Foot Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5 °C)	19.8	15.9	12.0	A (-9 °F)	1.7	1.4	1.1
B (5 °C)	11.4	7.6	3.8	B (9 °F)	1.0	0.7	0.3
C (20 °C)	2.6	0.2	0.0	C (36 °F)	0.2	0.0	0.0
D (50 °C)	0.0	0.0	0.0	D (90 °F)	0.0	0.0	0.0
E (80 °C)	0.0	0.0	0.0	E (144 °F)	0.0	0.0	0.0

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: March 6, 2006

#### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

					<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b>	$\eta = 0.6960$	$-23.3641 (P)/I$	$-0.1319 (P)^2/I$		0.7090	-21.9887	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.6960$	$-4.1174 (P)/I$	$-0.0129 (P)^2/I$		0.7090	-3.8750	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

<b>K<sub>α</sub></b> =	1.0	-0.1604 (S)	-0.2656 (S) <sup>2</sup>
<b>K<sub>α</sub></b> =	1.0	-0.16 (S)	(Linear Fit)

**Model Tested:**                   ST-300

**Test Fluid:**                   Water

**Test Flow Rate:**   63 ml/s-m<sup>2</sup>                   0.09 gpm/ft<sup>2</sup>

#### TESTED COLLECTOR SPECIFICATIONS

<b>Gross Area:</b>	3.229 m <sup>2</sup>	34.76 ft <sup>2</sup>
<b>Dry Weight:</b>	12.7 kg	28 lb
<b>Test Pressure:</b>	517 kPa	75 psig

**Fluid Capacity:**                   26.1 l                   6.9 gal

#### COLLECTOR MATERIALS

<b>Frame:</b>	None
<b>Absorber</b>	Tube - Polyethylene
<b>Material:</b>	Plate - None
<b>Absorber Coating:</b>	None
<b>Insulation:</b>	None

#### TESTED MODEL PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O
150	2.38	17250	69.25
250	3.97	43750	175.64
350	5.55	82250	330.20


**REMARKS:**                   Tests conducted outdoors.

January 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR(S)</u></b></p> <p><b>SUPPLIER:</b>    <b>Suntrek Industries, Inc.</b>  5 Holland, Building 215  Irvine, CA 92618</p> <p><b>MODEL:</b>                      SunTrek  <b>COLLECTOR TYPE:</b>    Unglazed Flat-Plate  <b>CERTIFICATION #:</b>    100-2005-004A</p>
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ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Square Meter Per Day</b>				<b>Thousands of Btu Per Square Foot Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5 °C)	19.7	15.7	11.8	A (-9 °F)	1.7	1.4	1.0
B (5 °C)	12.7	8.9	5.1	B (9 °F)	1.1	0.8	0.4
C (20 °C)	5.5	2.2	0.0	C (36 °F)	0.5	0.2	0.0
D (50 °C)	0.0	0.0	0.0	D (90 °F)	0.0	0.0	0.0
E (80 °C)	0.0	0.0	0.0	E (144 °F)	0.0	0.0	0.0

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: June 10, 2005

#### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

					<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b>	$\eta = 0.8560$	$-17.9339 (P)/I$	$+0.0386 (P)^2/I$		0.8600	$-17.6784$	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.8560$	$-3.1605 (P)/I$	$0.0000 (P)^2/I$		0.8600	$-3.1154$	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{\alpha} =$	1.0	$-0.0827 (S)$	$+0.0594 (S)^2$
$K_{\alpha} =$	1.0	$-0.03 (S)$	(Linear Fit)

**Model Tested:** SunTrek

**Test Fluid:** Water

**Test Flow Rate:** 70 ml/s-m<sup>2</sup>                      0.10 gpm/ft<sup>2</sup>

#### TESTED COLLECTOR SPECIFICATIONS

<b>Gross Area:</b>	3.869 m <sup>2</sup>	41.65 ft <sup>2</sup>
<b>Dry Weight:</b>	21.3 kg	47 lb
<b>Test Pressure:</b>	414 kPa	60 psig

**Fluid Capacity:** 8.7 l                      2.3 gal

#### COLLECTOR MATERIALS

<b>Frame:</b>	None
<b>Absorber</b>	Tube - EPDM
<b>Material:</b>	
	Plate - None
<b>Absorber Coating:</b>	None
<b>Insulation:</b>	None

#### TESTED MODEL PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O


**REMARKS:** Tests conducted outdoors.

January 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

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<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR(S)</u></b></p> <p><b>SUPPLIER: Techno-Solis, Inc.</b> 301 20th Street South St. Petersburg, FL 33712</p> <p><b>MODEL:</b> Swimmaster SM / C20TS10 <b>COLLECTOR TYPE:</b> Unglazed Flat-Plate <b>CERTIFICATION #:</b> 100-2004-004A</p>
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ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Square Meter Per Day</b>				<b>Thousands of Btu Per Square Foot Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5 °C)	17.8	14.2	10.5	A (-9 °F)	1.6	1.2	0.9
B (5 °C)	11.7	8.2	4.7	B (9 °F)	1.0	0.7	0.4
C (20 °C)	4.9	1.9	0.0	C (36 °F)	0.4	0.2	0.0
D (50 °C)				D (90 °F)			
E (80 °C)				E (144 °F)			

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: May 20, 2004

#### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

					<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b>	$\eta = 0.8050$	$-15.4679 (P)/I$	$-0.0481 (P)^2/I$		0.8020	-16.3909	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.8050$	$-2.7259 (P)/I$	$-0.0047 (P)^2/I$		0.8020	-2.8885	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

<b>K<sub>air</sub></b> =	1.0	-0.1306 (S)	+0.0083 (S) <sup>2</sup>
<b>K<sub>air</sub></b> =	1.0	-0.12 (S)	(Linear Fit)

**Model Tested:** TS-40-A

**Test Fluid:** Water

**Test Flow Rate:** 71 ml/s-m<sup>2</sup>      0.10 gpm/ft<sup>2</sup>

#### TESTED COLLECTOR SPECIFICATIONS

<b>Gross Area:</b>	3.964 m <sup>2</sup>	42.67 ft <sup>2</sup>
<b>Dry Weight:</b>	12 kg	26 lb
<b>Test Pressure:</b>	365 kPa	53 psig

**Fluid Capacity:** 12.5 l      3.3 gal

#### COLLECTOR MATERIALS

<b>Frame:</b>	None
<b>Absorber</b>	Tube - Co-polymer plastic
<b>Material:</b>	Plate - Co-polymer plastic
<b>Absorber Coating:</b>	None
<b>Insulation:</b>	None

#### TESTED MODEL PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O
252	4.00	2242	9.00

**REMARKS:** Tests conducted outdoors.

January 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

## SECTION 2:

# GLAZED SOLAR COLLECTORS

**NOTE:** Collectors listed in this section have been certified by SRCC as having met the test methods and minimum standards for certifying solar collectors. Collectors in this section have been tested for thermal performance in accordance with ASHRAE Standard 93, *Methods of Testing to Determine the Thermal Performance of Solar Collectors*. The SRCC collector ratings contained in this section have been calculated according to SRCC Document RM-1, *Methodology for Determining the Thermal Performance Rating for Solar Collectors*.

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **ACR Solar International**  
5840 Gibbons Dr.  
Suite G  
Carmichael, CA 95608

**MODEL:** Skyline 10-01  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2001-002B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	12	9	6	A (-9°F)	11	9	6
B (5°C)	11	8	5	B (9°F)	10	7	5
C (20°C)	9	6	3	C (36°F)	8	6	3
D (50°C)	5	3	1	D (90°F)	5	3	1
E (80°C)	3	1		E (144°F)	3	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: September 22, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 0.933 m<sup>2</sup> 10.04 ft<sup>2</sup>  
**Dry Weight:** 8.62 kg 19 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 0.847 m<sup>2</sup> 9.12 ft<sup>2</sup>  
**Fluid Capacity:** 0.6 l 0.2 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Lexan Polycarbonate  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.603$	$-3.8665 (P)/I$	$+0.0015 (P)^2/I$	<b>Y Intercept</b>	0.602	<b>Slope</b>	-3.764	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.603$	$-0.6814 (P)/I$	$0.0000 (P)^2/I$		0.602		-0.663	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{ar} = 1.0$  -0.1944 (S) -0.0186 (S)<sup>2</sup>  
 $K_{ar} = 1.0$  -0.21 (S) (Linear Fit)

**Model Tested:** Skyline 20-01

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.50 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **ACR Solar International**  
5840 Gibbons Dr.  
Suite G  
Carmichael, CA 95608

**MODEL:** Skyline 20-01  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2001-002A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	24	18	13	A (-9°F)	23	17	12
B (5°C)	21	16	10	B (9°F)	20	15	9
C (20°C)	18	12	6	C (36°F)	17	11	6
D (50°C)	11	6	1	D (90°F)	10	6	1
E (80°C)	6	2		E (144°F)	6	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: March 14, 2002

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.865 m<sup>2</sup> 20.08 ft<sup>2</sup>  
**Dry Weight:** 17.2 kg 38 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.720 m<sup>2</sup> 18.51 ft<sup>2</sup>  
**Fluid Capacity:** 1.8 l 0.5 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Lexan Polycarbonate  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	1291	5.18
40	0.63	4663	18.72
60	0.95	9795	39.32

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.605$	$-3.8370 (P)/I$	$+0.0017 (P)^2/I$	<b>Y Intercept</b>	0.604	<b>Slope</b>	-3.73	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.605$	$-0.6762 (P)/I$	$0.0000 (P)^2/I$		0.604		-0.657	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{ar} = 1.0$  -0.1944 (S) -0.0186 (S)<sup>2</sup>  
 $K_{ar} = 1.0$  -0.21 (S) (Linear Fit)

**Model Tested:** Skyline 20-01

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.50 gpm


**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p>SRCC OG-100</p>	<p><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>   <b>Alternate Energy Technologies</b>                      1057 N. Ellis Road                      Jacksonville, FL 32254</p> <p><b>MODEL:</b>                   Alternate Energy AE-21  <b>COLLECTOR TYPE:</b>   Glazed Flat-Plate  <b>CERTIFICATION #:</b>   100-2002-001A</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	29	22	15	A (-9°F)	27	20	14
B (5°C)	26	19	12	B (9°F)	25	18	11
C (20°C)	22	15	8	C (36°F)	21	14	8
D (50°C)	13	7	2	D (90°F)	12	7	1
E (80°C)	5	1		E (144°F)	5	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: November 22, 2002

### COLLECTOR SPECIFICATIONS

**Gross Area:**           1.931 m<sup>2</sup>   20.79 ft<sup>2</sup>  
**Dry Weight:**         33.6 kg     74 lb  
**Test Pressure:**      1103 kPa   160 psig

**Net Aperture Area:**   1.783 m<sup>2</sup>   19.19 ft<sup>2</sup>  
**Fluid Capacity:**       3.0 l       0.8 gal

### COLLECTOR MATERIALS

**Frame:**               Anodized Aluminum  
**Cover (Outer):**       Low Iron Tempered Glass  
**Cover (Inner):**       None  
**Absorber Material:**   Tube - Copper / Plate - Copper Fin  
**Absorber Coating:**   Selective Coating  
**Insulation (Side):**   Polyisocyanurate  
**Insulation (Back):**   Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	18	0.07
50	0.79	116	0.47
80	1.27	301	1.21

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.691</b>	<b>-3.3960 (P)/I</b>	<b>-0.0197 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.706	-4.9099	W/m <sup>2</sup> ·°C
	<b>I P Units:</b>	<b>η = 0.691</b>	<b>-0.5985 (P)/I</b>	<b>-0.0019 (P)<sup>2</sup>/I</b>	0.706	-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0   -0.1939 (S)   -0.0055 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0   -0.20 (S)   (Linear Fit)

**Model Tested:**   AE-21

**Test Fluid:**       Water

**Test Flow Rate:**   39 ml/s   0.62 gpm

### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Alternate Energy Technologies**  
1057 N. Ellis Road  
Jacksonville, FL 32254

**MODEL:** American Energy AE-21E  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-001A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	28	21	15	A (-9°F)	27	20	14
B (5°C)	25	18	11	B (9°F)	24	17	11
C (20°C)	20	13	6	C (36°F)	19	12	6
D (50°C)	9	3		D (90°F)	8	3	
E (80°C)				E (144°F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: June 15, 1999

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.926 m<sup>2</sup> 20.73 ft<sup>2</sup>  
**Dry Weight:** 40.8 kg 90 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.776 m<sup>2</sup> 19.12 ft<sup>2</sup>  
**Fluid Capacity:** 3.0 l 0.8 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	55	0.22
50	0.79	306	1.23
80	1.27	745	2.99

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.638</b>	<b>-4.2645 (P)/I</b>	<b>-0.0297 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.66	-6.37	W/m <sup>2</sup> ·°C
					0.66	-1.123	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0248 (S) -0.0861 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.05 (S) (Linear Fit)

**Model Tested:** AE-21E

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.61 gpm


**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>    <b>Alternate Energy Technologies</b>  1057 N. Ellis Road  Jacksonville, FL 32254</p> <p><b>MODEL:</b>                      Alternate Energy AE-24  <b>COLLECTOR TYPE:</b>      Glazed Flat-Plate  <b>CERTIFICATION #:</b>      100-2002-001B</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	33	25	17	A (-9°F)	31	23	16
B (5°C)	30	22	14	B (9°F)	28	21	13
C (20°C)	25	17	9	C (36°F)	24	16	9
D (50°C)	15	8	2	D (90°F)	14	8	2
E (80°C)	6	1		E (144°F)	6	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: November 22, 2002

### COLLECTOR SPECIFICATIONS

**Gross Area:**                      2.212 m<sup>2</sup>                      23.81 ft<sup>2</sup>  
**Dry Weight:**                      38.1 kg                      84 lb  
**Test Pressure:**                      1103 kPa                      160 psig

**Net Aperture Area:**                      2.043 m<sup>2</sup>                      21.99 ft<sup>2</sup>  
**Fluid Capacity:**                      3.4 l                      0.9 gal

### COLLECTOR MATERIALS

**Frame:**                      Anodized Aluminum  
**Cover (Outer):**                      Low Iron Tempered Glass  
**Cover (Inner):**                      None  
**Absorber Material:**                      Tube - Copper / Plate - Copper Fin  
**Absorber Coating:**                      Selective Coating  
**Insulation (Side):**                      Polyisocyanurate  
**Insulation (Back):**                      Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.691$	$-3.3960 (P)/I$	$-0.0197 (P)^2/I$	<b>Y Intercept</b>	0.706	<b>Slope</b>	-4.9099	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.691$	$-0.5985 (P)/I$	$-0.0019 (P)^2/I$		0.706		-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{arr} = 1.0$      $-0.1939 (S)$                        $-0.0055 (S)^2$   
 $K_{arr} = 1.0$      $-0.20 (S)$                       (Linear Fit)

**Model Tested:**                      AE-21

**Test Fluid:**                      Water

**Test Flow Rate:**                      39 ml/s                      0.62 gpm

### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Alternate Energy Technologies**  
1057 N. Ellis Road  
Jacksonville, FL 32254

**MODEL:** American Energy AE-24E  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-001B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	32	24	17	A (-9°F)	31	23	16
B (5°C)	29	21	13	B (9°F)	27	20	12
C (20°C)	23	15	7	C (36°F)	21	14	7
D (50°C)	10	4		D (90°F)	10	4	
E (80°C)				E (144°F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: June 15, 1999

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.212 m<sup>2</sup> 23.81 ft<sup>2</sup>  
**Dry Weight:** 43.1 kg 95 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.043 m<sup>2</sup> 21.99 ft<sup>2</sup>  
**Fluid Capacity:** 3.4 l 0.9 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.638$	-4.2645 (P)/I	-0.0297 (P) <sup>2</sup> /I	<b>Y Intercept</b>	0.655	<b>Slope</b>	-6.37	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.638$	-0.7515 (P)/I	-0.0029 (P) <sup>2</sup> /I		0.655		-1.123	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

$K_{arr} = 1.0 + 0.0248 (S) - 0.0861 (S)^2$   
 $K_{arr} = 1.0 - 0.05 (S)$  (Linear Fit)

**Model Tested:** AE-21E

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.61 gpm


**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>    <b>Alternate Energy Technologies</b>  1057 N. Ellis Road  Jacksonville, FL 32254</p> <p><b>MODEL:</b>                      Alternate Energy AE-26  <b>COLLECTOR TYPE:</b>      Glazed Flat-Plate  <b>CERTIFICATION #:</b>      100-2002-001C</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY ( Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY ( Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	35	26	18	A (-9°F)	33	25	17
B (5°C)	32	23	15	B (9°F)	30	22	14
C (20°C)	27	18	10	C (36°F)	25	17	9
D (50°C)	16	8	2	D (90°F)	15	8	2
E (80°C)	6	1		E (144°F)	6	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: November 22, 2002

### COLLECTOR SPECIFICATIONS

**Gross Area:**                      2.355 m<sup>2</sup>                      25.35 ft<sup>2</sup>  
**Dry Weight:**                      40.8 kg                      90 lb  
**Test Pressure:**                      1103 kPa                      160 psig

**Net Aperture Area:**                      2.197 m<sup>2</sup>                      23.65 ft<sup>2</sup>  
**Fluid Capacity:**                      3.8 l                      1.0 gal

### COLLECTOR MATERIALS

**Frame:**                      Anodized Aluminum  
**Cover (Outer):**                      Low Iron Tempered Glass  
**Cover (Inner):**                      None  
**Absorber Material:**                      Tube - Copper / Plate - Copper Fin  
**Absorber Coating:**                      Selective Coating  
**Insulation (Side):**                      Polyisocyanurate  
**Insulation (Back):**                      Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.691</b>	<b>-3.3960 (P)/I</b>	<b>-0.0197 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.706	-4.9099	W/m <sup>2</sup> ·°C
					0.706	-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0                      -0.1939 (S)                      -0.0055 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0                      -0.20 (S)                      (Linear Fit)

**Model Tested:**                      AE-21

**Test Fluid:**                      Water

**Test Flow Rate:**                      39 ml/s                      0.62 gpm

### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Alternate Energy Technologies**  
1057 N. Ellis Road  
Jacksonville, FL 32254

**MODEL:** American Energy AE-26E  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-001H

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	34	26	18	A (-9°F)	33	25	17
B (5°C)	30	22	14	B (9°F)	29	21	13
C (20°C)	24	16	8	C (36°F)	23	15	8
D (50°C)	11	4		D (90°F)	10	4	
E (80°C)				E (144°F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: February 12, 2001

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.355 m<sup>2</sup> 25.35 ft<sup>2</sup>  
**Dry Weight:** 45.4 kg 100 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.197 m<sup>2</sup> 23.65 ft<sup>2</sup>  
**Fluid Capacity:** 3.8 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.638 - 4.2645 (P)/I - 0.0297 (P)^2/I$	0.655	-6.37	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.638 - 0.7515 (P)/I - 0.0029 (P)^2/I$	0.655	-1.123	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

$K_{arr} = 1.0 + 0.0248 (S) - 0.0861 (S)^2$   
 $K_{arr} = 1.0 - 0.05 (S)$  (Linear Fit)

**Model Tested:** AE-21E

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.61 gpm


**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>    <b>Alternate Energy Technologies</b>  1057 N. Ellis Road  Jacksonville, FL 32254</p> <p><b>MODEL:</b>                      Alternate Energy AE-28  <b>COLLECTOR TYPE:</b>      Glazed Flat-Plate  <b>CERTIFICATION #:</b>      100-2002-001D</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	39	29	20	A (-9°F)	37	28	19
B (5°C)	35	26	16	B (9°F)	33	24	15
C (20°C)	29	20	11	C (36°F)	28	19	10
D (50°C)	18	9	2	D (90°F)	17	9	2
E (80°C)	7	1		E (144°F)	6	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: November 22, 2002

### COLLECTOR SPECIFICATIONS

**Gross Area:**                      2.599 m<sup>2</sup>                      27.98 ft<sup>2</sup>  
**Dry Weight:**                      44.9 kg                      99 lb  
**Test Pressure:**                      1103 kPa                      160 psig

**Net Aperture Area:**                      2.430 m<sup>2</sup>                      26.16 ft<sup>2</sup>  
**Fluid Capacity:**                      4.2 l                      1.1 gal

### COLLECTOR MATERIALS

**Frame:**                      Anodized Aluminum  
**Cover (Outer):**                      Low Iron Tempered Glass  
**Cover (Inner):**                      None  
**Absorber Material:**                      Tube - Copper / Plate - Copper Fin  
**Absorber Coating:**                      Selective Coating  
**Insulation (Side):**                      Polyisocyanurate  
**Insulation (Back):**                      Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.691</b>	<b>-3.3960 (P)/I</b>	<b>-0.0197 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.706	-4.9099	W/m <sup>2</sup> ·°C
	<b>I P Units:</b>	<b>η = 0.691</b>	<b>-0.5985 (P)/I</b>	<b>-0.0019 (P)<sup>2</sup>/I</b>	0.706	-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0                      -0.1939 (S)                      -0.0055 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0                      -0.20 (S)                      (Linear Fit)

**Model Tested:**                      AE-21

**Test Fluid:**                      Water

**Test Flow Rate:**                      39 ml/s                      0.62 gpm

### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Alternate Energy Technologies**  
1057 N. Ellis Road  
Jacksonville, FL 32254

**MODEL:** American Energy AE-28E  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-001F

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	38	29	20	A (-9°F)	36	27	19
B (5°C)	34	24	15	B (9°F)	32	23	15
C (20°C)	26	18	9	C (36°F)	25	17	8
D (50°C)	12	5		D (90°F)	11	4	
E (80°C)				E (144°F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 1, 2000

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.599 m<sup>2</sup> 27.98 ft<sup>2</sup>  
**Dry Weight:** 47.6 kg 105 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.430 m<sup>2</sup> 26.16 ft<sup>2</sup>  
**Fluid Capacity:** 4.2 l 1.1 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.638$	$-4.2645 (P)/I$	$-0.0297 (P)^2/I$	<b>Y Intercept</b>	0.655	<b>Slope</b>	-6.37	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.638$	$-0.7515 (P)/I$	$-0.0029 (P)^2/I$		0.655		-1.123	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{arr} = 1.0 + 0.0248 (S) - 0.0861 (S)^2$   
 $K_{arr} = 1.0 - 0.05 (S) \quad (\text{Linear Fit})$

**Model Tested:** AE-21E

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.61 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Alternate Energy Technologies**  
1057 N. Ellis Road  
Jacksonville, FL 32254

**MODEL:** Alternate Energy AE-32  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2002-001E

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	44	33	23	A (-9°F)	42	31	21
B (5°C)	40	29	19	B (9°F)	38	28	18
C (20°C)	33	23	13	C (36°F)	32	22	12
D (50°C)	20	11	2	D (90°F)	19	10	2
E (80°C)	8	1		E (144°F)	7	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: November 22, 2002

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.965 m<sup>2</sup> 31.92 ft<sup>2</sup>  
**Dry Weight:** 51.2 kg 113 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.781 m<sup>2</sup> 29.94 ft<sup>2</sup>  
**Fluid Capacity:** 4.9 l 1.3 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.691$	$-3.3960 (P)/I$	$-0.0197 (P)^2/I$	<b>Y Intercept</b>	0.706	<b>Slope</b>	-4.9099	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.691$	$-0.5985 (P)/I$	$-0.0019 (P)^2/I$		0.706		-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

$K_{arr} = 1.0$  -0.1939 (S) -0.0055 (S)<sup>2</sup>  
 $K_{arr} = 1.0$  -0.20 (S) (Linear Fit)

**Model Tested:** AE-21

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.62 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Alternate Energy Technologies**  
1057 N. Ellis Road  
Jacksonville, FL 32254

**MODEL:** American Energy AE-32E  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-001I

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	43	33	23	A (-9°F)	41	31	21
B (5°C)	38	28	18	B (9°F)	36	26	17
C (20°C)	30	20	10	C (36°F)	29	19	9
D (50°C)	13	5		D (90°F)	13	5	
E (80°C)	1			E (144°F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: February 12, 2001

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.965 m<sup>2</sup> 31.92 ft<sup>2</sup>  
**Dry Weight:** 50.8 kg 112 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.781 m<sup>2</sup> 29.94 ft<sup>2</sup>  
**Fluid Capacity:** 4.9 l 1.3 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.638$	$-4.2645 (P)/I$	$-0.0297 (P)^2/I$	<b>Y Intercept</b>	0.655	<b>Slope</b>	-6.37	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.638$	$-0.7515 (P)/I$	$-0.0029 (P)^2/I$		0.655		-1.123	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{arr} = 1.0 + 0.0248 (S) - 0.0861 (S)^2$   
 $K_{arr} = 1.0 - 0.05 (S) \quad (\text{Linear Fit})$

**Model Tested:** AE-21E

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.61 gpm


**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>    <b>Alternate Energy Technologies</b>  1057 N. Ellis Road  Jacksonville, FL 32254</p> <p><b>MODEL:</b>                      Alternate Energy AE-40  <b>COLLECTOR TYPE:</b>      Glazed Flat-Plate  <b>CERTIFICATION #:</b>      100-2002-001F</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	55	41	28	A (-9°F)	52	39	27
B (5°C)	50	36	23	B (9°F)	47	35	22
C (20°C)	42	29	16	C (36°F)	40	27	15
D (50°C)	25	13	3	D (90°F)	24	13	3
E (80°C)	10	1		E (144°F)	9	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: November 22, 2002

### COLLECTOR SPECIFICATIONS

**Gross Area:**                      3.696 m<sup>2</sup>                      39.78 ft<sup>2</sup>  
**Dry Weight:**                      69.4 kg                      153 lb  
**Test Pressure:**                      1103 kPa                      160 psig

**Net Aperture Area:**                      3.481 m<sup>2</sup>                      37.47 ft<sup>2</sup>  
**Fluid Capacity:**                      6.1 l                      1.6 gal

### COLLECTOR MATERIALS

**Frame:**                      Anodized Aluminum  
**Cover (Outer):**                      Low Iron Tempered Glass  
**Cover (Inner):**                      None  
**Absorber Material:**                      Tube - Copper / Plate - Copper Fin  
**Absorber Coating:**                      Selective Coating  
**Insulation (Side):**                      Polyisocyanurate  
**Insulation (Back):**                      Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.691$	$-3.3960 (P)/I$	$-0.0197 (P)^2/I$	<b>Y Intercept</b>	0.706	<b>Slope</b>	-4.9099	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.691$	$-0.5985 (P)/I$	$-0.0019 (P)^2/I$		0.706		-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{arr} = 1.0$      $-0.1939 (S)$                        $-0.0055 (S)^2$   
 $K_{arr} = 1.0$      $-0.20 (S)$                       (Linear Fit)

**Model Tested:**                      AE-21

**Test Fluid:**                      Water

**Test Flow Rate:**                      39 ml/s                      0.62 gpm

### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Alternate Energy Technologies**  
1057 N. Ellis Road  
Jacksonville, FL 32254

**MODEL:** American Energy AE-40E  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-001C

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	54	41	28	A (-9°F)	51	39	27
B (5°C)	48	35	22	B (9°F)	45	33	21
C (20°C)	38	25	12	C (36°F)	36	24	12
D (50°C)	17	6		D (90°F)	16	6	
E (80°C)	1			E (144°F)	1		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: June 15, 1999

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.696 m<sup>2</sup> 39.78 ft<sup>2</sup>  
**Dry Weight:** 65.3 kg 144 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 3.481 m<sup>2</sup> 37.47 ft<sup>2</sup>  
**Fluid Capacity:** 6.1 l 1.6 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.638$	-4.2645 (P)/I	-0.0297 (P) <sup>2</sup> /I	<b>Y Intercept</b>	0.655	<b>Slope</b>	-6.37	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.638$	-0.7515 (P)/I	-0.0029 (P) <sup>2</sup> /I		0.655		-1.123	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0248 (S) -0.0861 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.05 (S) (Linear Fit)

**Model Tested:** AE-21E

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.61 gpm


**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>    <b>Alternate Energy Technologies</b>  1057 N. Ellis Road  Jacksonville, FL 32254</p> <p><b>MODEL:</b>                    Alternate Energy AE-50  <b>COLLECTOR TYPE:</b>    Glazed Flat-Plate  <b>CERTIFICATION #:</b>    100-2002-001H</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	69	52	35	A (-9°F)	66	50	34
B (5°C)	63	46	29	B (9°F)	60	44	28
C (20°C)	53	36	20	C (36°F)	50	34	19
D (50°C)	32	17	4	D (90°F)	30	16	4
E (80°C)	12	2		E (144°F)	12	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: August 5, 2005

### COLLECTOR SPECIFICATIONS

**Gross Area:**            4.664 m<sup>2</sup>        50.20 ft<sup>2</sup>  
**Dry Weight:**            82.54 kg        182 lb  
**Test Pressure:**            1103 kPa        160 psig

**Net Aperture Area:**    4.400 m<sup>2</sup>        47.36 ft<sup>2</sup>  
**Fluid Capacity:**            6.4 l            1.7 gal

### COLLECTOR MATERIALS

**Frame:**                    Anodized Aluminum  
**Cover (Outer):**            Low Iron Tempered Glass  
**Cover (Inner):**            None  
**Absorber Material:**        Tube - Copper / Plate - Copper Fin  
**Absorber Coating:**        Selective Coating  
**Insulation (Side):**        Polyisocyanurate  
**Insulation (Back):**        Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.691</b>	<b>-3.3960 (P)/I</b>	<b>-0.0197 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.706	-4.9099	W/m <sup>2</sup> ·°C
					0.706	-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0    -0.1939 (S)            -0.0055 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0    -0.20 (S)            (Linear Fit)

**Model Tested:**        AE-21

**Test Fluid:**            Water

**Test Flow Rate:**        39 ml/s            0.62 gpm


### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>     <b>Alternate Energy Technologies</b>  1057 N. Ellis Road  Jacksonville, FL 32254</p> <p><b>MODEL:</b>                     Alternate Energy AE-56  <b>COLLECTOR TYPE:</b>     Glazed Flat-Plate  <b>CERTIFICATION #:</b>     100-2002-001G</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	77	58	39	A (-9°F)	73	55	37
B (5°C)	70	51	32	B (9°F)	66	48	31
C (20°C)	58	40	22	C (36°F)	55	38	21
D (50°C)	35	19	4	D (90°F)	33	18	4
E (80°C)	14	2		E (144°F)	13	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: April 12, 2004

### COLLECTOR SPECIFICATIONS

**Gross Area:**                     5.175 m<sup>2</sup>                     55.71 ft<sup>2</sup>  
**Dry Weight:**                     92.5 kg                     204 lb  
**Test Pressure:**                     1103 kPa                     160 psig

**Net Aperture Area:**                     4.898 m<sup>2</sup>                     52.72 ft<sup>2</sup>  
**Fluid Capacity:**                     6.8 l                     1.8 gal

### COLLECTOR MATERIALS

**Frame:**                     Anodized Aluminum  
**Cover (Outer):**                     Low Iron Tempered Glass  
**Cover (Inner):**                     None  
**Absorber Material:**                     Tube - Copper / Plate - Copper Fin  
**Absorber Coating:**                     Selective Coating  
**Insulation (Side):**                     Polyisocyanurate  
**Insulation (Back):**                     Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.691 - 3.3960 (P)/I - 0.0197 (P)^2/I$	<b>Y Intercept</b>	0.706	<b>Slope</b>	-4.9099	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.691 - 0.5985 (P)/I - 0.0019 (P)^2/I$		0.706		-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{arr} = 1.0 - 0.1939 (S) - 0.0055 (S)^2$   
 $K_{arr} = 1.0 - 0.20 (S) \quad \text{(Linear Fit)}$

**Model Tested:**                     AE-21

**Test Fluid:**                     Water

**Test Flow Rate:**                     39 ml/s                     0.62 gpm


### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>    <b>Alternate Energy Technologies</b>  1057 N. Ellis Road  Jacksonville, FL 32254</p> <p><b>MODEL:</b>                      Morning Star MSC-21  <b>COLLECTOR TYPE:</b>      Glazed Flat-Plate  <b>CERTIFICATION #:</b>       100-2002-002A</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	30	22	15	A (-9°F)	28	21	14
B (5°C)	27	20	12	B (9°F)	26	19	12
C (20°C)	23	15	8	C (36°F)	21	15	8
D (50°C)	14	7	2	D (90°F)	13	7	2
E (80°C)	5	1		E (144°F)	5	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: November 22, 2002

### COLLECTOR SPECIFICATIONS

**Gross Area:**                      1.997 m<sup>2</sup>                      21.50 ft<sup>2</sup>  
**Dry Weight:**                      37.2 kg                      82 lb  
**Test Pressure:**                      1103 kPa                      160 psig

**Net Aperture Area:**                      1.760 m<sup>2</sup>                      18.95 ft<sup>2</sup>  
**Fluid Capacity:**                      3.2 l                      0.8 gal

### COLLECTOR MATERIALS

**Frame:**                      Anodized Aluminum  
**Cover (Outer):**                      Low Iron Tempered Glass  
**Cover (Inner):**                      None  
**Absorber Material:**                      Tube - Copper / Plate - Copper Fin  
**Absorber Coating:**                      Selective Coating  
**Insulation (Side):**                      Polyisocyanurate  
**Insulation (Back):**                      Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.691</b>	<b>-3.3960 (P)/I</b>	<b>-0.0197 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.706	-4.9099	W/m <sup>2</sup> ·°C
	<b>I P Units:</b>	<b>η = 0.691</b>	<b>-0.5985 (P)/I</b>	<b>-0.0019 (P)<sup>2</sup>/I</b>	0.706	-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0                      -0.1939 (S)                      -0.0055 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0                      -0.20 (S)                      (Linear Fit)

**Model Tested:**                      AE-21

**Test Fluid:**                      Water

**Test Flow Rate:**                      39 ml/s                      0.62 gpm

### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Alternate Energy Technologies**  
1057 N. Ellis Road  
Jacksonville, FL 32254

**MODEL:** Morning Star MSC-21E  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-001D

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	29	22	15	A (-9°F)	28	21	14
B (5°C)	26	19	12	B (9°F)	24	18	11
C (20°C)	20	14	7	C (36°F)	19	13	6
D (50°C)	9	3		D (90°F)	9	3	
E (80°C)				E (144°F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: June 15, 1999

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.999 m<sup>2</sup> 21.52 ft<sup>2</sup>  
**Dry Weight:** 47.6 kg 105 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.748 m<sup>2</sup> 18.82 ft<sup>2</sup>  
**Fluid Capacity:** 3.0 l 0.8 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	55	0.22
50	0.79	306	1.23
80	1.27	745	2.99

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.638$	$-4.2645 (P)/I$	$-0.0297 (P)^2/I$	<b>Y Intercept</b>	0.655	<b>Slope</b>	-6.37	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.638$	$-0.7515 (P)/I$	$-0.0029 (P)^2/I$		0.655		-1.123	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{arr} = 1.0 + 0.0248 (S) - 0.0861 (S)^2$   
 $K_{arr} = 1.0 - 0.05 (S) \quad (\text{Linear Fit})$

**Model Tested:** AE-21E

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.61 gpm


**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p>SRCC OG-100</p>	<p><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>    <b>Alternate Energy Technologies</b>  1057 N. Ellis Road  Jacksonville, FL 32254</p> <p><b>MODEL:</b>                      Morning Star MSC-24  <b>COLLECTOR TYPE:</b>      Glazed Flat-Plate  <b>CERTIFICATION #:</b>      100-2002-002B</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	34	25	17	A (-9°F)	32	24	16
B (5°C)	31	22	14	B (9°F)	29	21	13
C (20°C)	26	18	10	C (36°F)	24	17	9
D (50°C)	15	8	2	D (90°F)	15	8	2
E (80°C)	6	1		E (144°F)	6	1	

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: November 22, 2002

### COLLECTOR SPECIFICATIONS

**Gross Area:**                      2.276 m<sup>2</sup>      24.50 ft<sup>2</sup>  
**Dry Weight:**                      46.3 kg      102 lb  
**Test Pressure:**                      1103 kPa      160 psig

**Net Aperture Area:**      2.015 m<sup>2</sup>      21.69 ft<sup>2</sup>  
**Fluid Capacity:**                      3.4 l      0.9 gal

### COLLECTOR MATERIALS

**Frame:**                      Anodized Aluminum  
**Cover (Outer):**                      Low Iron Tempered Glass  
**Cover (Inner):**                      None  
**Absorber Material:**                      Tube - Copper / Plate - Copper Fin  
**Absorber Coating:**                      Selective Coating  
**Insulation (Side):**                      Polyisocyanurate  
**Insulation (Back):**                      Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.691 - 3.3960 (P)/I - 0.0197 (P)^2/I$	0.706	-4.9099	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.691 - 0.5985 (P)/I - 0.0019 (P)^2/I$	0.706	-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0      -0.1939 (S)      -0.0055 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0      -0.20 (S)      (Linear Fit)

**Model Tested:**      AE-21

**Test Fluid:**      Water

**Test Flow Rate:**      39 ml/s      0.62 gpm


### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

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<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>    <b>Alternate Energy Technologies</b>  1057 N. Ellis Road  Jacksonville, FL 32254</p> <p><b>MODEL:</b>                      Morning Star MSC-24E  <b>COLLECTOR TYPE:</b>      Glazed Flat-Plate  <b>CERTIFICATION #:</b>      100-1999-001E</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	33	25	17	A (-9°F)	31	24	16
B (5°C)	29	21	13	B (9°F)	28	20	13
C (20°C)	23	15	8	C (36°F)	22	15	7
D (50°C)	10	4		D (90°F)	10	4	
E (80°C)				E (144°F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: June 15, 1999

### COLLECTOR SPECIFICATIONS

**Gross Area:**                      2.265 m<sup>2</sup>      24.38 ft<sup>2</sup>  
**Dry Weight:**                      49.9 kg      110 lb  
**Test Pressure:**                      1103 kPa      160 psig

**Net Aperture Area:**      2.002 m<sup>2</sup>      21.55 ft<sup>2</sup>  
**Fluid Capacity:**                      3.4 l      0.9 gal

### COLLECTOR MATERIALS

**Frame:**                      Anodized Aluminum  
**Cover (Outer):**                      Low Iron Tempered Glass  
**Cover (Inner):**                      None  
**Absorber Material:**                      Tube - Copper / Plate - Copper Fin  
**Absorber Coating:**                      Moderately Selective Black Paint  
**Insulation (Side):**                      Polyisocyanurate  
**Insulation (Back):**                      Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.638$	$-4.2645 (P)/I$	$-0.0297 (P)^2/I$	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
				0.655	-6.37	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.638$	$-0.7515 (P)/I$	$-0.0029 (P)^2/I$	0.655	-1.123	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{arr} = 1.0 + 0.0248 (S) - 0.0861 (S)^2$   
 $K_{arr} = 1.0 - 0.05 (S) \quad \text{(Linear Fit)}$

**Model Tested:**                      AE-21E  
**Test Fluid:**                      Water  
**Test Flow Rate:**                      39 ml/s      0.61 gpm


### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>    <b>Alternate Energy Technologies</b>  1057 N. Ellis Road  Jacksonville, FL 32254</p> <p><b>MODEL:</b>                      Morning Star MSC-26  <b>COLLECTOR TYPE:</b>      Glazed Flat-Plate  <b>CERTIFICATION #:</b>      100-2002-002C</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	36	27	18	A (-9°F)	34	26	17
B (5°C)	33	24	15	B (9°F)	31	23	14
C (20°C)	27	19	10	C (36°F)	26	18	10
D (50°C)	16	9	2	D (90°F)	16	8	2
E (80°C)	6	1		E (144°F)	6	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: November 22, 2002

### COLLECTOR SPECIFICATIONS

**Gross Area:**                      2.416 m<sup>2</sup>                      26.01 ft<sup>2</sup>  
**Dry Weight:**                      46.3 kg                      102 lb  
**Test Pressure:**                      1103 kPa                      160 psig

**Net Aperture Area:**                      2.171 m<sup>2</sup>                      23.37 ft<sup>2</sup>  
**Fluid Capacity:**                      4.2 l                      1.1 gal

### COLLECTOR MATERIALS

**Frame:**                      Anodized Aluminum  
**Cover (Outer):**                      Low Iron Tempered Glass  
**Cover (Inner):**                      None  
**Absorber Material:**                      Tube - Copper / Plate - Copper Fin  
**Absorber Coating:**                      Selective Coating  
**Insulation (Side):**                      Polyisocyanurate  
**Insulation (Back):**                      Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.691$	$-3.3960 (P)/I$	$-0.0197 (P)^2/I$	<b>Y Intercept</b>	0.706	<b>Slope</b>	-4.9099	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.691$	$-0.5985 (P)/I$	$-0.0019 (P)^2/I$		0.706		-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{arr} = 1.0$     -0.1939 (S)    -0.0055 (S)<sup>2</sup>  
 $K_{arr} = 1.0$     -0.20 (S)    (Linear Fit)

**Model Tested:**                      AE-21

**Test Fluid:**                      Water

**Test Flow Rate:**                      39 ml/s                      0.62 gpm

### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Alternate Energy Technologies**  
1057 N. Ellis Road  
Jacksonville, FL 32254

**MODEL:** Morning Star MSC-26E  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-001J

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	35	27	18	A (-9°F)	33	25	17
B (5°C)	31	23	14	B (9°F)	29	21	13
C (20°C)	24	16	8	C (36°F)	23	15	8
D (50°C)	11	4		D (90°F)	10	4	
E (80°C)				E (144°F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: February 12, 2001

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.405 m<sup>2</sup> 25.89 ft<sup>2</sup>  
**Dry Weight:** 52.2 kg 115 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.158 m<sup>2</sup> 23.23 ft<sup>2</sup>  
**Fluid Capacity:** 3.8 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.638</b>	<b>-4.2645 (P)/I</b>	<b>-0.0297 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.655	-6.37	W/m <sup>2</sup> ·°C
					0.655	-1.123	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0248 (S) -0.0861 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.05 (S) (Linear Fit)

**Model Tested:** AE-21E

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.61 gpm


**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p>SRCC OG-100</p>	<p><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>    <b>Alternate Energy Technologies</b>  1057 N. Ellis Road  Jacksonville, FL 32254</p> <p><b>MODEL:</b>                      Morning Star MSC-28  <b>COLLECTOR TYPE:</b>      Glazed Flat-Plate  <b>CERTIFICATION #:</b>      100-2002-002D</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	39	30	20	A (-9°F)	37	28	19
B (5°C)	36	26	17	B (9°F)	34	25	16
C (20°C)	30	21	11	C (36°F)	29	20	11
D (50°C)	18	10	2	D (90°F)	17	9	2
E (80°C)	7	1		E (144°F)	7	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: November 22, 2002

### COLLECTOR SPECIFICATIONS

**Gross Area:**                      2.663 m<sup>2</sup>                      28.67 ft<sup>2</sup>  
**Dry Weight:**                      54.4 kg                      120 lb  
**Test Pressure:**                      1103 kPa                      160 psig

**Net Aperture Area:**                      2.403 m<sup>2</sup>                      25.87 ft<sup>2</sup>  
**Fluid Capacity:**                      4.5 l                      1.2 gal

### COLLECTOR MATERIALS

**Frame:**                      Anodized Aluminum  
**Cover (Outer):**                      Low Iron Tempered Glass  
**Cover (Inner):**                      None  
**Absorber Material:**                      Tube - Copper / Plate - Copper Fin  
**Absorber Coating:**                      Selective Coating  
**Insulation (Side):**                      Polyisocyanurate  
**Insulation (Back):**                      Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.691</b>	<b>-3.3960 (P)/I</b>	<b>-0.0197 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.706	-4.9099	W/m <sup>2</sup> ·°C
					0.706	-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0                      -0.1939 (S)                      -0.0055 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0                      -0.20 (S)                      (Linear Fit)

**Model Tested:**                      AE-21

**Test Fluid:**                      Water

**Test Flow Rate:**                      39 ml/s                      0.62 gpm


### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>    <b>Alternate Energy Technologies</b>  1057 N. Ellis Road  Jacksonville, FL 32254</p> <p><b>MODEL:</b>                      Morning Star MSC-28E  <b>COLLECTOR TYPE:</b>      Glazed Flat-Plate  <b>CERTIFICATION #:</b>       100-1999-001G</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	39	29	20	A (-9°F)	37	28	19
B (5°C)	34	25	16	B (9°F)	32	24	15
C (20°C)	27	18	9	C (36°F)	26	17	8
D (50°C)	12	5		D (90°F)	11	4	
E (80°C)				E (144°F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 1, 2000

### COLLECTOR SPECIFICATIONS

**Gross Area:**                      2.652 m<sup>2</sup>      28.55 ft<sup>2</sup>  
**Dry Weight:**                      54.4 kg      120 lb  
**Test Pressure:**                      1103 kPa      160 psig

**Net Aperture Area:**      2.389 m<sup>2</sup>      25.72 ft<sup>2</sup>  
**Fluid Capacity:**                      4.2 l      1.1 gal

### COLLECTOR MATERIALS

**Frame:**                      Aluminum Extrusion  
**Cover (Outer):**                      Low Iron Tempered Glass  
**Cover (Inner):**                      None  
**Absorber Material:**                      Tube - Copper / Plate - Copper Fin  
**Absorber Coating:**                      Moderately Selective Black Paint  
**Insulation (Side):**                      Polyisocyanurate  
**Insulation (Back):**                      Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.638$	-4.2640 (P)/I	-0.0297 (P) <sup>2</sup> /I	<b><u>Y Intercept</u></b>	0.655	<b><u>Slope</u></b>	-6.37	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.638$	-0.7514 (P)/I	-0.0029 (P) <sup>2</sup> /I		0.655		-1.123	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0      +0.0248 (S)      -0.0861 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0      -0.05 (S)      (Linear Fit)

**Model Tested:**                      AE-21E  
**Test Fluid:**                      Water  
**Test Flow Rate:**                      39 ml/s      0.61 gpm


### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p>SRCC OG-100</p>	<p><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>   <b>Alternate Energy Technologies</b> 1057 N. Ellis Road Jacksonville, FL 32254</p> <p><b>MODEL:</b>                   Morning Star MSC-32 <b>COLLECTOR TYPE:</b>   Glazed Flat-Plate <b>CERTIFICATION #:</b>   100-2002-002E</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
<b>CATEGORY ( Ti-Ta)</b>	<b>CLEAR DAY 23 MJ/m<sup>2</sup>·d</b>	<b>MILDLY CLOUDY 17 MJ/m<sup>2</sup>·d</b>	<b>CLOUDY DAY 11 MJ/m<sup>2</sup>·d</b>	<b>CATEGORY ( Ti-Ta)</b>	<b>CLEAR DAY 2000 Btu/ft<sup>2</sup>·d</b>	<b>MILDLY CLOUDY 1500 Btu/ft<sup>2</sup>·d</b>	<b>CLOUDY DAY 1000 Btu/ft<sup>2</sup>·d</b>
A (-5°C)	45	34	23	A (-9°F)	43	32	22
B (5°C)	41	30	19	B (9°F)	39	28	18
C (20°C)	34	23	13	C (36°F)	32	22	12
D (50°C)	21	11	2	D (90°F)	20	10	2
E (80°C)	8	1		E (144°F)	8	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: November 22, 2002

### COLLECTOR SPECIFICATIONS

**Gross Area:**           3.035 m<sup>2</sup>   32.67 ft<sup>2</sup>  
**Dry Weight:**           60.3 kg   133 lb  
**Test Pressure:**       1103 kPa   160 psig

**Net Aperture Area:**   2.750 m<sup>2</sup>   29.60 ft<sup>2</sup>  
**Fluid Capacity:**       4.9 l   1.3 gal

### COLLECTOR MATERIALS

**Frame:**                   Anodized Aluminum  
**Cover (Outer):**       Low Iron Tempered Glass  
**Cover (Inner):**       None  
**Absorber Material:**   Tube - Copper / Plate - Copper Fin  
**Absorber Coating:**   Selective Coating  
**Insulation (Side):**   Polyisocyanurate  
**Insulation (Back):**   Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
<b>ml/s</b>	<b>gpm</b>	<b>Pa</b>	<b>in H<sub>2</sub>O</b>

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.691 - 3.3960 (P)/I - 0.0197 (P)^2/I$	0.706	-4.9099	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.691 - 0.5985 (P)/I - 0.0019 (P)^2/I$	0.706	-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0   -0.1939 (S)   -0.0055 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0   -0.20 (S)   (Linear Fit)

**Model Tested:**   AE-21

**Test Fluid:**       Water

**Test Flow Rate:**   39 ml/s   0.62 gpm


### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

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<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>    <b>Alternate Energy Technologies</b>  1057 N. Ellis Road  Jacksonville, FL 32254</p> <p><b>MODEL:</b>                      Morning Star MSC-32E  <b>COLLECTOR TYPE:</b>      Glazed Flat-Plate  <b>CERTIFICATION #:</b>      100-1999-001K</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	44	34	23	A (-9°F)	42	32	22
B (5°C)	39	28	18	B (9°F)	37	27	17
C (20°C)	31	20	10	C (36°F)	29	19	10
D (50°C)	14	5		D (90°F)	13	5	
E (80°C)	1			E (144°F)	1		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: February 12, 2001

### COLLECTOR SPECIFICATIONS

**Gross Area:**                      3.023 m<sup>2</sup>                      32.54 ft<sup>2</sup>  
**Dry Weight:**                      57.6 kg                      127 lb  
**Test Pressure:**                      1103 kPa                      160 psig

**Net Aperture Area:**                      2.736 m<sup>2</sup>                      29.45 ft<sup>2</sup>  
**Fluid Capacity:**                      4.9 l                      1.3 gal

### COLLECTOR MATERIALS

**Frame:**                      Anodized Aluminum  
**Cover (Outer):**                      Low Iron Tempered Glass  
**Cover (Inner):**                      None  
**Absorber Material:**                      Tube - Copper / Plate - Copper Fin  
**Absorber Coating:**                      Moderately Selective Black Paint  
**Insulation (Side):**                      Polyisocyanurate  
**Insulation (Back):**                      Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

**S I Units:**                       $\eta = 0.638 - 4.2645 (P)/I - 0.0297 (P)^2/I$   
**I P Units:**                       $\eta = 0.638 - 0.7515 (P)/I - 0.0029 (P)^2/I$

**Y Intercept**

**Slope**

0.655                      -6.37 W/m<sup>2</sup>·°C  
0.655                      -1.123 Btu/hr·ft<sup>2</sup>·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0                      +0.0248 (S)                      -0.0861 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0                      -0.05 (S)                      (Linear Fit)

**Model Tested:**                      AE-21E

**Test Fluid:**                      Water

**Test Flow Rate:**                      39 ml/s                      0.61 gpm


### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p>SRCC OG-100</p>	<p><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>   <b>Alternate Energy Technologies</b>                      1057 N. Ellis Road                      Jacksonville, FL 32254</p> <p><b>MODEL:</b>                   Morning Star MSC-40  <b>COLLECTOR TYPE:</b>   Glazed Flat-Plate  <b>CERTIFICATION #:</b>   100-2002-002F</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	58	44	30	A (-9°F)	55	42	28
B (5°C)	53	39	24	B (9°F)	50	37	23
C (20°C)	44	30	17	C (36°F)	42	29	16
D (50°C)	27	14	3	D (90°F)	25	13	3
E (80°C)	10	1		E (144°F)	10	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: November 22, 2002

### COLLECTOR SPECIFICATIONS

**Gross Area:**           3.916 m<sup>2</sup>   42.15 ft<sup>2</sup>  
**Dry Weight:**           72.1 kg   159 lb  
**Test Pressure:**       1103 kPa   160 psig

**Net Aperture Area:**   3.580 m<sup>2</sup>   38.54 ft<sup>2</sup>  
**Fluid Capacity:**       6.1 l   1.6 gal

### COLLECTOR MATERIALS

**Frame:**                   Anodized Aluminum  
**Cover (Outer):**       Low Iron Tempered Glass  
**Cover (Inner):**       None  
**Absorber Material:**   Tube - Copper / Plate - Copper Fin  
**Absorber Coating:**   Selective Coating  
**Insulation (Side):**   Polyisocyanurate  
**Insulation (Back):**   Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.691 - 3.3960 (P)/I - 0.0197 (P)^2/I$	0.706	-4.9099	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.691 - 0.5985 (P)/I - 0.0019 (P)^2/I$	0.706	-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0   -0.1939 (S)   -0.0055 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0   -0.20 (S)   (Linear Fit)

**Model Tested:**   AE-21

**Test Fluid:**       Water

**Test Flow Rate:**   39 ml/s   0.62 gpm


### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

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<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>    <b>Alternate Energy Technologies</b>  1057 N. Ellis Road  Jacksonville, FL 32254</p> <p><b>MODEL:</b>                      Morning Star MSC-40E  <b>COLLECTOR TYPE:</b>      Glazed Flat-Plate  <b>CERTIFICATION #:</b>       100-1999-001L</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	55	42	29	A (-9°F)	52	40	27
B (5°C)	49	35	22	B (9°F)	46	34	21
C (20°C)	38	25	13	C (36°F)	36	24	12
D (50°C)	17	7		D (90°F)	16	6	
E (80°C)	1			E (144°F)	1		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: February 12, 2001

### COLLECTOR SPECIFICATIONS

**Gross Area:**                      3.764 m<sup>2</sup>                      40.52 ft<sup>2</sup>  
**Dry Weight:**                      76.6 kg                      169 lb  
**Test Pressure:**                      1103 kPa                      160 psig

**Net Aperture Area:**                      3.428 m<sup>2</sup>                      36.90 ft<sup>2</sup>  
**Fluid Capacity:**                      6.1 l                      1.6 gal

### COLLECTOR MATERIALS

**Frame:**                      Anodized Aluminum  
**Cover (Outer):**                      Low Iron Tempered Glass  
**Cover (Inner):**                      None  
**Absorber Material:**                      Tube - Copper / Plate - Copper Fin  
**Absorber Coating:**                      Moderately Selective Black Paint  
**Insulation (Side):**                      Polyisocyanurate  
**Insulation (Back):**                      Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

**S I Units:**                       $\eta = 0.638 - 4.2645 (P)/I - 0.0297 (P)^2/I$   
**I P Units:**                       $\eta = 0.638 - 0.7515 (P)/I - 0.0029 (P)^2/I$

**Y Intercept**

**Slope**

0.655                      -6.37 W/m<sup>2</sup>·°C  
0.655                      -1.123 Btu/hr·ft<sup>2</sup>·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0                      +0.0248 (S)                      -0.0861 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0                      -0.05 (S)                      (Linear Fit)

**Model Tested:**                      AE-21E

**Test Fluid:**                      Water

**Test Flow Rate:**                      39 ml/s                      0.61 gpm


### REMARKS:

January, 2007

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<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>    <b>Alternate Energy Technologies</b>  1057 N. Ellis Road  Jacksonville, FL 32254</p> <p><b>MODEL:</b>                      Starfire ST-21E  <b>COLLECTOR TYPE:</b>      Glazed Flat-Plate  <b>CERTIFICATION #:</b>      100-1999-002A</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	29	22	15	A (-9°F)	28	21	14
B (5°C)	26	18	12	B (9°F)	24	18	11
C (20°C)	20	13	6	C (36°F)	19	13	6
D (50°C)	10	4		D (90°F)	9	4	
E (80°C)	1			E (144°F)	1		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: June 15, 1999

### COLLECTOR SPECIFICATIONS

**Gross Area:**                      1.967 m<sup>2</sup>                      21.17 ft<sup>2</sup>  
**Dry Weight:**                      38.6 kg                      85 lb  
**Test Pressure:**                      552 kPa                      80 psig

**Net Aperture Area:**                      1.876 m<sup>2</sup>                      20.19 ft<sup>2</sup>  
**Fluid Capacity:**                      1.8 l                      0.5 gal

### COLLECTOR MATERIALS

**Frame:**                      Stainless Steel  
**Cover (Outer):**                      Low Iron Tempered Glass  
**Cover (Inner):**                      None  
**Absorber Material:**                      Tube - Copper / Plate - Copper  
**Absorber Coating:**                      Moderately Selective Black Paint  
**Insulation (Side):**                      Polyisocyanurate  
**Insulation (Back):**                      Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
<b>ml/s</b>	<b>gpm</b>	<b>Pa</b>	<b>in H<sub>2</sub>O</b>
20	0.32	78	0.31
50	0.79	338	1.36
80	1.27	768	3.08

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.665$	$-4.7160 (P)/I$	$-0.0185 (P)^2/I$	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
				0.674	-6.02	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.665$	$-0.8311 (P)/I$	$-0.0018 (P)^2/I$	0.674	-1.061	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0                      -0.0476 (S)                      -0.1212 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0                      -0.15 (S)                      (Linear Fit)

**Model Tested:**                      ST-21E

**Test Fluid:**                      Water

**Test Flow Rate:**                      39 ml/s                      0.61 gpm


### REMARKS:

January, 2007

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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	53	40	28	A (-9°F)	50	38	26
B (5°C)	46	34	21	B (9°F)	44	32	20
C (20°C)	36	24	12	C (36°F)	35	23	11
D (50°C)	18	7		D (90°F)	17	7	
E (80°C)	3			E (144°F)	2		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: June 15, 1999

### COLLECTOR SPECIFICATIONS

**Gross Area:**                      3.575 m<sup>2</sup>                      38.48 ft<sup>2</sup>  
**Dry Weight:**                      79.5 kg                      175 lb  
**Test Pressure:**                      552 kPa                      80 psig

**Net Aperture Area:**                      3.468 m<sup>2</sup>                      37.33 ft<sup>2</sup>  
**Fluid Capacity:**                      6.1 l                      1.6 gal

### COLLECTOR MATERIALS

**Frame:**                      Stainless Steel  
**Cover (Outer):**                      Low Iron Tempered Glass  
**Cover (Inner):**                      None  
**Absorber Material:**                      Tube - Copper / Plate - Copper  
**Absorber Coating:**                      Moderately Selective Black Paint  
**Insulation (Side):**                      Polyisocyanurate  
**Insulation (Back):**                      Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.665$	$-4.7160 (P)/I$	$-0.0185 (P)^2/I$	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
				0.674	-6.02	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.665$	$-0.8311 (P)/I$	$-0.0018 (P)^2/I$	0.674	-1.061	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{arr} = 1.0$      $-0.0476 (S)$                        $-0.1212 (S)^2$   
 $K_{arr} = 1.0$      $-0.15 (S)$                       (Linear Fit)

**Model Tested:**                      ST-21E

**Test Fluid:**                      Water

**Test Flow Rate:**                      39 ml/s                      0.61 gpm

### REMARKS:

January, 2007

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** American Solar Works Holdings  
295 Princeton Hightstown Road, Unit 251  
West Windsot, NJ 08550

**MODEL:** American Solar Works ASW52B  
**COLLECTOR TYPE:** Tubular  
**CERTIFICATION #:** 100-2006-009A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	26	19	13	A (-9°F)	24	18	12
B (5°C)	25	18	12	B (9°F)	23	17	11
C (20°C)	23	16	10	C (36°F)	22	16	10
D (50°C)	18	12	6	D (90°F)	17	11	6
E (80°C)	13	7	1	E (144°F)	12	6	1

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: January 18, 2007

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.864 m<sup>2</sup> 30.83 ft<sup>2</sup>  
**Dry Weight:** 62.6 kg 138 lb  
**Test Pressure:** 827 kPa 120 psig

**Net Aperture Area:** 2.466 m<sup>2</sup> 26.54 ft<sup>2</sup>  
**Fluid Capacity:** 1.3 l 0.3 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Glass Vacuum Tube  
**Cover (Inner):**  
**Absorber Material:** Tube - Copper / Plate - Aluminum  
**Absorber Coating:** Sputtered aluminium nitride  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	62	0.25
50	0.79	284	1.14
80	1.27	660	2.65

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.474$	$-0.8937 (P)/I$	$-0.0118 (P)^2/I$	<b>Y Intercept</b>	0.481	<b>Slope</b>	-1.6522	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.474$	$-0.1575 (P)/I$	$-0.0012 (P)^2/I$		0.481		-0.291	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{arr} = 1.0 + 0.7534 (S) - 1.1963 (S)^2$   
 $K_{arr} = 1.0 - 0.50 (S) \quad (\text{Linear Fit})$

**Model Tested:** ASW52B

**Test Fluid:** Water

**Test Flow Rate:** 57 ml/s 0.90 gpm

**REMARKS:** Tested with long axis of tubes oriented No-So. IAM perpendicular to the tubes is listed above. IAM parallel to the tubes = 1.0 - 0.59 (S)

January, 2007

Certification must be renewed annually. For current status contact:

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Apricus Solar Co., Ltd.**  
402 Building 8 East  
Pukou New and High Tech Development Zone  
Nanjing, 210061

**MODEL:** Apricus AP-10  
**COLLECTOR TYPE:** Tubular  
**CERTIFICATION #:** 100-2004-003C

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	13	10	7	A (-9°F)	13	10	7
B (5°C)	13	10	6	B (9°F)	12	9	6
C (20°C)	12	9	6	C (36°F)	12	8	5
D (50°C)	11	7	4	D (90°F)	10	7	4
E (80°C)	9	6	3	E (144°F)	8	5	2

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: July 1, 2004

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.342 m<sup>2</sup> 14.45 ft<sup>2</sup>  
**Dry Weight:** 34.8 kg 77 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.169 m<sup>2</sup> 12.58 ft<sup>2</sup>  
**Fluid Capacity:** 0.3 l 0.1 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper & steel / Plate - Glass  
**Absorber Coating:** Sputtered aluminum nitride  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.416 - 0.9646 (P)/I - 0.0023 (P)^2/I$	0.418	-1.17	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.416 - 0.1700 (P)/I - 0.0002 (P)^2/I$	0.418	-0.206	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{ar} = 1.0 + 1.1718 (S) - 0.8470 (S)^2$   
 $K_{ar} = 1.0 + 0.29 (S)$  (Linear Fit)

**Model Tested:** AP-20

**Test Fluid:** Water

**Test Flow Rate:** 55 ml/s 0.86 gpm

**REMARKS:** Collector tested with long axis of tubes oriented north-south. IAM perpendicular to the tubes is listed above. IAM parallel to the tubes = 1.0 - 0.13(S); Absorber is a heat pipe.

January, 2007

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Apricus Solar Co., Ltd.**  
402 Building 8 East  
Pukou New and High Tech Development Zone  
Nanjing, 210061

**MODEL:** Apricus AP-20  
**COLLECTOR TYPE:** Tubular  
**CERTIFICATION #:** 100-2004-003A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	27	21	14	A (-9°F)	26	19	13
B (5°C)	26	20	13	B (9°F)	25	19	12
C (20°C)	25	18	11	C (36°F)	23	17	11
D (50°C)	21	15	8	D (90°F)	20	14	8
E (80°C)	18	11	5	E (144°F)	17	11	5

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: March 11, 2004

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.709 m<sup>2</sup> 29.16 ft<sup>2</sup>  
**Dry Weight:** 56.9 kg 125 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.378 m<sup>2</sup> 25.60 ft<sup>2</sup>  
**Fluid Capacity:** 0.5 l 0.1 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper & steel / Plate - Glass  
**Absorber Coating:** Sputtered aluminum nitride  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
55	0.86	700	2.81

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.416 - 0.9646 (P)/I - 0.0023 (P)^2/I$	0.418	-1.17	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.416 - 0.1700 (P)/I - 0.0002 (P)^2/I$	0.418	-0.206	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{ar} = 1.0 + 1.1718 (S) - 0.8470 (S)^2$   
 $K_{ar} = 1.0 + 0.29 (S)$  (Linear Fit)

**Model Tested:** AP-20

**Test Fluid:** Water

**Test Flow Rate:** 55 ml/s 0.86 gpm

**REMARKS:** Collector tested with long axis of tubes oriented north-south. IAM perpendicular to the tubes is listed above. IAM parallel to the tubes = 1.0 - 0.13(S); Absorber is a heat pipe.

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Apricus Solar Co., Ltd.**  
402 Building 8 East  
Pukou New and High Tech Development Zone  
Nanjing, 210061

**MODEL:** Apricus AP-22  
**COLLECTOR TYPE:** Tubular  
**CERTIFICATION #:** 100-2004-003D

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	30	23	15	A (-9°F)	28	21	14
B (5°C)	29	21	14	B (9°F)	27	20	13
C (20°C)	27	20	12	C (36°F)	26	19	12
D (50°C)	24	16	9	D (90°F)	22	15	9
E (80°C)	20	13	6	E (144°F)	19	12	5

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: July 1, 2004

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.983 m<sup>2</sup> 32.11 ft<sup>2</sup>  
**Dry Weight:** 71.3 kg 157 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.620 m<sup>2</sup> 28.20 ft<sup>2</sup>  
**Fluid Capacity:** 0.6 l 0.2 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper & steel / Plate - Glass  
**Absorber Coating:** Sputtered aluminum nitride  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.416 - 0.9646 (P)/I - 0.0023 (P)^2/I$	0.418	-1.17	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.416 - 0.1700 (P)/I - 0.0002 (P)^2/I$	0.418	-0.206	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{ar} = 1.0 + 1.1718 (S) - 0.8470 (S)^2$   
 $K_{ar} = 1.0 + 0.29 (S)$  (Linear Fit)

**Model Tested:** AP-20

**Test Fluid:** Water

**Test Flow Rate:** 55 ml/s 0.86 gpm

**REMARKS:** Collector tested with long axis of tubes oriented north-south. IAM perpendicular to the tubes is listed above. IAM parallel to the tubes = 1.0 - 0.13(S); Absorber is a heat pipe.

January, 2007

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Apricus Solar Co., Ltd.**  
402 Building 8 East  
Pukou New and High Tech Development Zone  
Nanjing, 210061

**MODEL:** Apricus AP-30  
**COLLECTOR TYPE:** Tubular  
**CERTIFICATION #:** 100-2004-003B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	41	31	21	A (-9°F)	39	29	20
B (5°C)	39	29	19	B (9°F)	37	28	18
C (20°C)	37	27	17	C (36°F)	35	25	16
D (50°C)	32	22	12	D (90°F)	30	21	12
E (80°C)	27	17	8	E (144°F)	26	16	7

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: March 11, 2004

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 4.053 m<sup>2</sup> 43.63 ft<sup>2</sup>  
**Dry Weight:** 82.5 kg 182 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 3.795 m<sup>2</sup> 40.85 ft<sup>2</sup>  
**Fluid Capacity:** 0.7 l 0.2 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper & steel / Plate - Glass  
**Absorber Coating:** Sputtered aluminum nitride  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.416 - 0.9646 (P)/I - 0.0023 (P)^2/I$	0.418	-1.17	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.416 - 0.1700 (P)/I - 0.0002 (P)^2/I$	0.418	-0.206	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{ar} = 1.0 + 1.1718 (S) - 0.8470 (S)^2$   
 $K_{ar} = 1.0 + 0.29 (S)$  (Linear Fit)

**Model Tested:** AP-20

**Test Fluid:** Water

**Test Flow Rate:** 55 ml/s 0.86 gpm

**REMARKS:** Collector tested with long axis of tubes oriented north-south. IAM perpendicular to the tubes is listed above. IAM parallel to the tubes = 1.0 - 0.13(S); Absorber is a heat pipe.

January, 2007

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SOLAR COLLECTOR  
CERTIFICATION AND RATING

SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Beijing Sunda Solar Energy Technology Co Ltd  
No. 3 Hua Yuan Road  
Haidian District  
Beijing, 100083

**MODEL:** SUNDA SEIDO 10-10AS/AB  
**COLLECTOR TYPE:** Tubular  
**CERTIFICATION #:** 100-2006-010A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	17	13	9	A (-9°F)	16	12	8
B (5°C)	16	12	8	B (9°F)	15	11	7
C (20°C)	15	10	6	C (36°F)	14	10	6
D (50°C)	12	8	4	D (90°F)	11	7	4
E (80°C)	9	5	2	E (144°F)	8	5	1

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: October 11, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.679 m<sup>2</sup> 18.07 ft<sup>2</sup>  
**Dry Weight:** 40 kg 88 lb  
**Test Pressure:** 1000 kPa 145 psig

**Net Aperture Area:** 1.487 m<sup>2</sup> 16.01 ft<sup>2</sup>  
**Fluid Capacity:** 0.4 l 0.1 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Aluminum  
**Absorber Coating:** Sputtered aluminum nitrate  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	117	0.47
50	0.79	520	2.09
80	1.27	1195	4.80

**TECHNICAL INFORMATION****Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

**S I Units:**  $\eta = 0.46 - 1.2893 (P)/I - 0.0043 (P)^2/I$

**I P Units:**  $\eta = 0.46 - 0.2272 (P)/I - 0.0004 (P)^2/I$

**Y Intercept**

0.462

**Slope**-1.565 W/m<sup>2</sup>·°C-0.276 Btu/hr·ft<sup>2</sup>·°F**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{ar} = 1.0 + 0.1174 (S) - 0.1400 (S)^2$

$K_{ar} = 1.0 - 0.03 (S)$  (Linear Fit)

**Model Tested:** SEIDO 10-10AS/AB**Test Fluid:** Water**Test Flow Rate:** 34 ml/s 0.54 gpm

**REMARKS:** Tested with long axis of tubes oriented No-So. IAM perpendicular to the tubes is listed above. IAM parallel to the tubes = 1.0 - 0.09 (S)

January, 2007

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SOLAR COLLECTOR  
CERTIFICATION AND RATING

SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Beijing Sunda Solar Energy Technology Co Ltd  
No. 3 Hua Yuan Road  
Haidian District  
Beijing, 100083

**MODEL:** SUNDA SEIDO 10-20AS/AB  
**COLLECTOR TYPE:** Tubular  
**CERTIFICATION #:** 100-2006-010B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	34	26	17	A (-9°F)	32	24	16
B (5°C)	32	24	16	B (9°F)	31	23	15
C (20°C)	30	21	13	C (36°F)	28	20	12
D (50°C)	24	16	8	D (90°F)	23	15	7
E (80°C)	18	10	3	E (144°F)	17	10	3

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: October 11, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.394 m<sup>2</sup> 36.53 ft<sup>2</sup>  
**Dry Weight:** 75 kg 165 lb  
**Test Pressure:** 1000 kPa 145 psig

**Net Aperture Area:** 3.008 m<sup>2</sup> 32.38 ft<sup>2</sup>  
**Fluid Capacity:** 0.8 l 0.2 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Aluminum  
**Absorber Coating:** Sputtered aluminum nitrate  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION****Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.46 - 1.2893 (P)/I - 0.0043 (P)^2/I$	<b>Y Intercept</b>	0.462	<b>Slope</b>	-1.565 W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.46 - 0.2272 (P)/I - 0.0004 (P)^2/I$		0.462		-0.276 Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{ar} = 1.0 + 0.1174 (S) - 0.1400 (S)^2$   
 $K_{ar} = 1.0 - 0.03 (S)$  (Linear Fit)

**Model Tested:** SEIDO 10-10AS/AB**Test Fluid:** Water**Test Flow Rate:** 34 ml/s 0.54 gpm


**REMARKS:** Tested with long axis of tubes oriented No-So. IAM perpendicular to the tubes is listed above. IAM parallel to the tubes = 1.0 - 0.09 (S)

January, 2007

Certification must be renewed annually. For current status contact:

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<p><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p>SRCC OG-100</p>	<p><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b> <b>Beijing Sunda Solar Energy Technology Co Ltd</b> No. 3 Hua Yuan Road Haidian District Beijing, 100083</p> <p><b>MODEL:</b> SUNDA SEIDO 1-16 <b>COLLECTOR TYPE:</b> Tubular <b>CERTIFICATION #:</b> 100-2004-001B</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
<b>CATEGORY (Ti-Ta)</b>	<b>CLEAR DAY 23 MJ/m<sup>2</sup>·d</b>	<b>MILDLY CLOUDY 17 MJ/m<sup>2</sup>·d</b>	<b>CLOUDY DAY 11 MJ/m<sup>2</sup>·d</b>	<b>CATEGORY (Ti-Ta)</b>	<b>CLEAR DAY 2000 Btu/ft<sup>2</sup>·d</b>	<b>MILDLY CLOUDY 1500 Btu/ft<sup>2</sup>·d</b>	<b>CLOUDY DAY 1000 Btu/ft<sup>2</sup>·d</b>
A (-5°C)	43	33	23	A (-9°F)	41	31	21
B (5°C)	41	31	21	B (9°F)	39	29	19
C (20°C)	37	27	17	C (36°F)	35	26	16
D (50°C)	32	22	12	D (90°F)	30	21	11
E (80°C)	26	16	6	E (144°F)	25	15	6

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: March 4, 2004

### COLLECTOR SPECIFICATIONS

**Gross Area:** 3.994 m<sup>2</sup> 42.99 ft<sup>2</sup>  
**Dry Weight:** 100.2 kg 221 lb  
**Test Pressure:** 1000 kPa 145 psig

**Net Aperture Area:** 3.619 m<sup>2</sup> 38.96 ft<sup>2</sup>  
**Fluid Capacity:** 1.1 l 0.3 gal

### COLLECTOR MATERIALS

**Frame:** Stainless Steel  
**Cover (Outer):** Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Aluminum  
**Absorber Coating:** Sputtered aluminium nitride  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
<b>ml/s</b>	<b>gpm</b>	<b>Pa</b>	<b>in H<sub>2</sub>O</b>

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.526 - 1.3253 (P)/I - 0.0042 (P)^2/I$	<b>Y Intercept</b>	0.529	<b>Slope</b>	-1.697	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.526 - 0.2336 (P)/I - 0.0004 (P)^2/I$		0.529		-0.299	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{\alpha r} = 1.0 + 0.3023 (S) - 0.3057 (S)^2$   
 $K_{\alpha r} = 1.0 + 0.00 (S) \quad (\text{Linear Fit})$

**Model Tested:** SEIDO1-8

**Test Fluid:** Water

**Test Flow Rate:** 36 ml/s 0.57 gpm

**REMARKS:** Collector tested with long axis of tubes oriented north-south. IAM perpendicular to the tubes is listed above.  
IAM parallel to the tubes = 1.0 - 0.08(S) or 1.0 + 0.0126(S) - 0.094(S)<sup>2</sup>

January, 2007

Certification must be renewed annually. For current status contact:

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Beijing Sunda Solar Energy Technology Co Ltd**  
 No. 3 Hua Yuan Road  
 Haidian District  
 Beijing, 100083

**MODEL:** SUNDA SEIDO 1-8  
**COLLECTOR TYPE:** Tubular  
**CERTIFICATION #:** 100-2004-001A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	21	16	11	A (-9°F)	20	16	11
B (5°C)	20	15	10	B (9°F)	19	15	10
C (20°C)	19	14	9	C (36°F)	18	13	8
D (50°C)	16	11	6	D (90°F)	15	10	6
E (80°C)	13	8	3	E (144°F)	12	8	3

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: March 4, 2004

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.997 m<sup>2</sup> 21.50 ft<sup>2</sup>  
**Dry Weight:** 47 kg 104 lb  
**Test Pressure:** 1000 kPa 145 psig

**Net Aperture Area:** 1.810 m<sup>2</sup> 19.48 ft<sup>2</sup>  
**Fluid Capacity:** 0.7 l 0.2 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Aluminum  
**Absorber Coating:** Sputtered aluminium nitride  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	75	0.30
50	0.79	551	2.21
80	1.27	1367	5.49

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.5255$	$-1.3253 (P)/I$	$-0.0042 (P)^2/I$	<b>Y Intercept</b>	<b>Slope</b>	
				0.529	-1.697	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.5255$	$-0.2336 (P)/I$	$-0.0004 (P)^2/I$	0.529	-0.299	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{\alpha r} = 1.0 + 0.3023 (S) - 0.3057 (S)^2$   
 $K_{\alpha r} = 1.0 + 0.00 (S) \quad (\text{Linear Fit})$

**Model Tested:** SEIDO1-8

**Test Fluid:** Water

**Test Flow Rate:** 36 ml/s 0.57 gpm

**REMARKS:** Collector tested with long axis of tubes oriented north-south. IAM perpendicular to the tubes is listed above.  
 IAM parallel to the tubes = 1.0 - .08(S) or 1.0 + 0.0126(S) - 0.094(S)<sup>2</sup>

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Beijing Sunda Solar Energy Technology Co Ltd  
No. 3 Hua Yuan Road  
Haidian District  
Beijing, 100083

**MODEL:** SUNDA SEIDO 5-16 AS/AB  
**COLLECTOR TYPE:** Tubular  
**CERTIFICATION #:** 100-2006-026B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	45	34	23	A (-9°F)	43	32	22
B (5°C)	42	31	20	B (9°F)	40	30	19
C (20°C)	38	27	17	C (36°F)	36	26	16
D (50°C)	31	20	10	D (90°F)	29	19	9
E (80°C)	23	13	3	E (144°F)	22	12	3

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: October 11, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 4.097 m<sup>2</sup> 44.10 ft<sup>2</sup>  
**Dry Weight:** 105 kg 232 lb  
**Test Pressure:** 1000 kPa 145 psig

**Net Aperture Area:** 3.634 m<sup>2</sup> 39.12 ft<sup>2</sup>  
**Fluid Capacity:** 1.0 l 0.3 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Aluminum  
**Absorber Coating:** Sputtered aluminium nitride  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.4886 - 1.5855 (P)/I - 0.0052 (P)^2/I$	0.4916	-1.9242	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.4886 - 0.2794 (P)/I - 0.0005 (P)^2/I$	0.4916	-0.339	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{ar} = 1.0 + 0.9474 (S) - 1.0762 (S)^2$   
 $K_{ar} = 1.0 - 0.18 (S) \quad (\text{Linear Fit})$

**Model Tested:** SEIDO 5-8 AS/AB

**Test Fluid:** Water

**Test Flow Rate:** 41 ml/s 0.65 gpm

**REMARKS:** Tested with long axis of tubes oriented No-So. IAM perpendicular to the tubes is listed above. IAM parallel to the tubes = 1.0 - 0.32(S)

January, 2007

Certification must be renewed annually. For current status contact:

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SOLAR COLLECTOR  
CERTIFICATION AND RATING

SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Beijing Sunda Solar Energy Technology Co Ltd  
No. 3 Hua Yuan Road  
Haidian District  
Beijing, 100083

**MODEL:** SUNDA SEIDO 5-8 AS/AB  
**COLLECTOR TYPE:** Tubular  
**CERTIFICATION #:** 100-2006-026A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	22	17	11	A (-9°F)	21	16	11
B (5°C)	21	16	10	B (9°F)	20	15	10
C (20°C)	19	14	8	C (36°F)	18	13	8
D (50°C)	15	10	5	D (90°F)	14	9	4
E (80°C)	11	6	1	E (144°F)	11	6	1

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: October 11, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.028 m<sup>2</sup> 21.83 ft<sup>2</sup>  
**Dry Weight:** 49.2 kg 108 lb  
**Test Pressure:** 1000 kPa 145 psig

**Net Aperture Area:** 1.830 m<sup>2</sup> 19.70 ft<sup>2</sup>  
**Fluid Capacity:** 0.5 l 0.1 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Aluminum  
**Absorber Coating:** Sputtered aluminium nitride  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	73	0.29
50	0.79	458	1.84
80	1.27	1173	4.71

**TECHNICAL INFORMATION****Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.4886</b>	<b>-1.5855 (P)/I</b>	<b>-0.0052 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.4916	-1.9242	W/m <sup>2</sup> ·°C
					0.4916	-0.339	Btu/hr·ft <sup>2</sup> ·°F

**I P Units:** η = 0.4886 -0.2794 (P)/I -0.0005 (P)<sup>2</sup>/I**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.9474 (S) -1.0762 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.18 (S) (Linear Fit)

**Model Tested:** SEIDO 5-8 AS/AB**Test Fluid:** Water**Test Flow Rate:** 41 ml/s 0.65 gpm

**REMARKS:** Tested with long axis of tubes oriented No-So. IAM perpendicular to the tubes is listed above. IAM parallel to the tubes = 1.0 - 0.32(S)

January, 2007

Certification must be renewed annually. For current status contact:

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **BTF, Ltd.**  
P.O. Box 409  
Fennville, MI 49408

**MODEL:** Solar Patriot SP-20  
**COLLECTOR TYPE:** Tubular  
**CERTIFICATION #:** 100-2004-013A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	28	21	14	A (-9°F)	26	20	13
B (5°C)	26	20	13	B (9°F)	25	19	12
C (20°C)	25	18	11	C (36°F)	23	17	11
D (50°C)	21	14	7	D (90°F)	20	13	7
E (80°C)	16	10	3	E (144°F)	15	9	3

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: January 7, 2005

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.075 m<sup>2</sup> 33.10 ft<sup>2</sup>  
**Dry Weight:** 55.4 kg 122 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.336 m<sup>2</sup> 25.15 ft<sup>2</sup>  
**Fluid Capacity:** 1.3 l 0.3 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Glass Vacuum Tube  
**Cover (Inner):** Glass tube  
**Absorber Material:** Tube - Glass / Plate - Aluminum  
**Absorber Coating:** Sputtered aluminum nitride  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	21	0.08
50	0.79	172	0.69
80	1.27	482	1.93

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.342$	$-0.8539 (P)/I$	$-0.0050 (P)^2/I$	<b>Y Intercept</b>	0.345	<b>Slope</b>	-1.153	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.342$	$-0.1505 (P)/I$	$-0.0005 (P)^2/I$		0.345		-0.203	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

$K_{arr} = 1.0 + 1.1787 (S) - 0.6569 (S)^2$   
 $K_{arr} = 1.0 + 0.49 (S)$  (Linear Fit)

**Model Tested:** SP-20

**Test Fluid:** Water

**Test Flow Rate:** 55 ml/s 0.87 gpm

**REMARKS:** Collector tested with long axis of tubes oriented north-south. IAM perpendicular to the tubes is listed above. IAM parallel to the tubes = 1.0 - 0.04(S); Absorber is a heat pipe.

January, 2007

Certification must be renewed annually. For current status contact:

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**

SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Enerworks, Inc.**  
PO Box 9, 252 Hamilton Crescent  
Dorchester, ON NOL 1G0

**MODEL:** Commercial Collector COL-4X8-NL-SG1-  
**COLLECTOR TYPE:** SH10US  
**CERTIFICATION #:** Glazed Flat-Plate  
100-2006-006A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	48	36	25	A (-9°F)	46	35	23
B (5°C)	45	33	21	B (9°F)	42	31	20
C (20°C)	39	27	15	C (36°F)	37	26	15
D (50°C)	27	16	5	D (90°F)	25	15	5
E (80°C)	15	6		E (144°F)	15	5	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: September 14, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.873 m<sup>2</sup> 30.93 ft<sup>2</sup>  
**Dry Weight:** 50.4 kg 111 lb  
**Test Pressure:** 517 kPa 75 psig

**Net Aperture Area:** 2.691 m<sup>2</sup> 28.97 ft<sup>2</sup>  
**Fluid Capacity:** 1.9 l 0.5 gal

**COLLECTOR MATERIALS**

**Frame:** Galvanized Steel  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Aluminum  
**Absorber Coating:** Vapor Deposition Selective Coating  
**Insulation (Side):** Isocyanurate Foam  
**Insulation (Back):** Mineral Wool

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	14184	56.94
50	0.79	42171	169.30
80	1.27	78210	313.98

**TECHNICAL INFORMATION****Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

**S I Units:**  $\eta = 0.7622 - 3.2787 (P)/I - 0.0129 (P)^2/I$

**I P Units:**  $\eta = 0.7622 - 0.5778 (P)/I - 0.0013 (P)^2/I$

**Y Intercept**

0.7683

**Slope**-4.0348 W/m<sup>2</sup>·°C-0.711 Btu/hr·ft<sup>2</sup>·°F**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{ar} = 1.0 + 0.0566 (S) - 0.2167 (S)^2$

$K_{ar} = 1.0 - 0.17 (S)$  (Linear Fit)

**Model Tested:** COL-4x8-NL-SGI-SH10US**Test Fluid:** Propylene Glycol & Water**Test Flow Rate:** 53 ml/s 0.84 gpm**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**

SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Enerworks, Inc.**  
PO Box 9, 252 Hamilton Crescent  
Dorchester, ON NOL 1G0

**MODEL:** Residential Collector COL-4x8-TL-SG1-  
**COLLECTOR TYPE:** SD10US  
**CERTIFICATION #:** Glazed Flat-Plate  
100-2005-014A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	45	34	23	A (-9°F)	43	32	22
B (5°C)	41	30	19	B (9°F)	39	28	18
C (20°C)	33	23	12	C (36°F)	32	22	11
D (50°C)	19	10	2	D (90°F)	18	9	1
E (80°C)	7			E (144°F)	6		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: September 14, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.874 m<sup>2</sup> 30.94 ft<sup>2</sup>  
**Dry Weight:** 50.4 kg 111 lb  
**Test Pressure:** 517 kPa 75 psig

**Net Aperture Area:** 2.691 m<sup>2</sup> 28.97 ft<sup>2</sup>  
**Fluid Capacity:** 1.2 l 0.3 gal

**COLLECTOR MATERIALS**

**Frame:** Galvanized Steel  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Aluminum  
**Absorber Coating:** Vapor Deposition Selective Coating  
**Insulation (Side):** Isocyanurate  
**Insulation (Back):** Mineral Wool

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	17078	68.56
50	0.79	46648	187.27
80	1.27	80959	325.02

**TECHNICAL INFORMATION****Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.7166 - 4.0141 (P)/I - 0.0187 (P)^2/I$	0.7256	-5.1127	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.7166 - 0.7074 (P)/I - 0.0018 (P)^2/I$	0.7256	-0.901	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1100 (S) -0.0506 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.16 (S) (Linear Fit)


**Model Tested:** COL-4x8-TL-SGI-SD10US**Test Fluid:** Polylyene Glycol & Water**Test Flow Rate:** 56 ml/s 0.89 gpm**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

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<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER: Genersys PLC</b> 37 Queen Anne Street London, W1G 9JB</p> <p><b>MODEL:</b> Genersys 1000-10 <b>COLLECTOR TYPE:</b> Glazed Flat-Plate <b>CERTIFICATION #:</b> 100-2005-001A</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	27	20	14	A (-9°F)	25	19	13
B (5°C)	24	17	11	B (9°F)	23	16	10
C (20°C)	20	13	7	C (36°F)	19	13	7
D (50°C)	12	6	1	D (90°F)	11	6	1
E (80°C)	5	1		E (144°F)	5	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: November 21, 2005

### COLLECTOR SPECIFICATIONS

**Gross Area:** 2.035 m<sup>2</sup> 21.91 ft<sup>2</sup>  
**Dry Weight:** 39 kg 86 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.780 m<sup>2</sup> 19.16 ft<sup>2</sup>  
**Fluid Capacity:** 1.6 l 0.4 gal

### COLLECTOR MATERIALS

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Aluminum  
**Absorber Coating:** Metallic Oxide  
**Insulation (Side):** Mineral Wool  
**Insulation (Back):** Mineral Wool

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	10957	43.99
50	0.79	35106	140.94
80	1.27	68509	275.04

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.588 - 3.5677 (P)/I - 0.0071 (P)^2/I$	<b>Y Intercept</b>	0.5913	<b>Slope</b>	-3.992 W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.588 - 0.6287 (P)/I - 0.0007 (P)^2/I$		0.5913		-0.704 Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{arr} = 1.0 - 0.0415 (S) - 0.1007 (S)^2$   
 $K_{arr} = 1.0 - 0.15 (S) \quad \text{(Linear Fit)}$

**Model Tested:** 1000-10  
**Test Fluid:** Propylene Glycol  
**Test Flow Rate:** 13 ml/s 0.21 gpm

### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Heliodyne, Inc.**  
4910 Seaport Avenue  
Richmond, CA 94804

**MODEL:** Heliodyne Gobi 308  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-085E

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	36	27	18	A (-9°F)	34	25	17
B (5°C)	33	24	15	B (9°F)	31	23	14
C (20°C)	28	19	10	C (36°F)	26	18	10
D (50°C)	16	9	2	D (90°F)	16	8	2
E (80°C)	6	1		E (144°F)	6	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: April 1, 1995

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.238 m<sup>2</sup> 24.09 ft<sup>2</sup>  
**Dry Weight:** 43.584 kg 96 lb  
**Test Pressure:** 1034 kPa 150 psig

**Net Aperture Area:** 2.043 m<sup>2</sup> 21.99 ft<sup>2</sup>  
**Fluid Capacity:** 3.0 l 0.8 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Isocyanurate Foam  
**Insulation (Back):** Isocyanurate Foam & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	$\eta = 0.721$	-3.3220 (P)/I	-0.0247 (P) <sup>2</sup> /I	<b>Y Intercept</b>	<b>Slope</b>	
					0.733	-4.74	W/m <sup>2</sup> ·°C
					0.733	-0.835	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0900 (S) 0.0000 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.09 (S) (Linear Fit)

**Model Tested:** Gobi 408

**Test Fluid:** Water

**Test Flow Rate:** 56 ml/s 0.89 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Heliodyne, Inc.**  
4910 Seaport Avenue  
Richmond, CA 94804

**MODEL:** Heliodyne Gobi 3366  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-085F

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	40	31	21	A (-9°F)	38	29	20
B (5°C)	37	27	17	B (9°F)	35	26	17
C (20°C)	31	22	12	C (36°F)	30	21	12
D (50°C)	19	10	3	D (90°F)	18	10	3
E (80°C)	7	1		E (144°F)	7	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: November 20, 1999

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.489 m<sup>2</sup> 26.79 ft<sup>2</sup>  
**Dry Weight:** 49 kg 108 lb  
**Test Pressure:** 1034 kPa 150 psig

**Net Aperture Area:** 2.295 m<sup>2</sup> 24.70 ft<sup>2</sup>  
**Fluid Capacity:** 3.6 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Isocyanurate Foam  
**Insulation (Back):** Isocyanurate Foam & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.722 - 3.2760 (P)/I - 0.0250 (P)^2/I$	0.734	-4.68	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.722 - 0.5773 (P)/I - 0.0024 (P)^2/I$	0.734	-0.825	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.2646 (S) +0.1656 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.09 (S) (Linear Fit)

**Model Tested:** Gobi 408

**Test Fluid:** Water

**Test Flow Rate:** 56 ml/s 0.89 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Heliodyne, Inc.**  
4910 Seaport Avenue  
Richmond, CA 94804

**MODEL:** Heliodyne Gobi 408  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-085A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	49	37	25	A (-9°F)	46	35	24
B (5°C)	45	33	21	B (9°F)	43	32	20
C (20°C)	39	27	15	C (36°F)	37	25	14
D (50°C)	24	14	4	D (90°F)	23	13	4
E (80°C)	10	2		E (144°F)	10	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: August 1, 1983

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.996 m<sup>2</sup> 32.25 ft<sup>2</sup>  
**Dry Weight:** 60.382 kg 133 lb  
**Test Pressure:** 1034 kPa 150 psig

**Net Aperture Area:** 2.771 m<sup>2</sup> 29.83 ft<sup>2</sup>  
**Fluid Capacity:** 3.0 l 0.8 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Isocyanurate Foam  
**Insulation (Back):** Isocyanurate Foam & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	$\eta = 0.725$	-3.2000 (P)/I	-0.0220 (P) <sup>2</sup> /I	<b>Y Intercept</b>	<b>Slope</b>	
					0.737	-4.57	W/m <sup>2</sup> ·°C
					0.737	-0.805	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0900 (S) 0.0000 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.09 (S) (Linear Fit)

**Model Tested:** Gobi 408

**Test Fluid:** Water

**Test Flow Rate:** 56 ml/s 0.89 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Heliodyne, Inc.**  
4910 Seaport Avenue  
Richmond, CA 94804

**MODEL:** Heliodyne Gobi 410  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-085B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	61	52	31	A (-9°F)	58	49	29
B (5°C)	56	42	27	B (9°F)	53	40	26
C (20°C)	48	33	19	C (36°F)	46	31	18
D (50°C)	30	17	5	D (90°F)	28	16	5
E (80°C)				E (144°F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: August 1, 1983

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.744 m<sup>2</sup> 40.30 ft<sup>2</sup>  
**Dry Weight:** 72.64 kg 160 lb  
**Test Pressure:** 1034 kPa 150 psig

**Net Aperture Area:** 3.558 m<sup>2</sup> 38.30 ft<sup>2</sup>  
**Fluid Capacity:** 3.8 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Isocyanurate Foam  
**Insulation (Back):** Isocyanurate Foam & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.725 - 3.2000 (P)/I - 0.0220 (P)^2/I$	0.737	-4.57	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.725 - 0.5639 (P)/I - 0.0022 (P)^2/I$	0.737	-0.805	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0900 (S) 0.0000 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.09 (S) (Linear Fit)

**Model Tested:** Gobi 408  
**Test Fluid:** Water  
**Test Flow Rate:** 56 ml/s 0.89 gpm


**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<p align="center"><b>SOLAR COLLECTOR CERTIFICATION AND RATING</b></p>  <p align="center"><b>SRCC OG-100</b></p>	<p align="center"><b><u>CERTIFIED SOLAR COLLECTOR</u></b></p> <p><b>SUPPLIER:</b>   <b>Heliodyne, Inc.</b>  4910 Seaport Avenue  Richmond, CA 94804</p> <p><b>MODEL:</b>                   Heliodyne Mojave 408  <b>COLLECTOR TYPE:</b>   Glazed Flat-Plate  <b>CERTIFICATION #:</b>   100-1981-085C</p>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
CATEGORY ( Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY ( Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	49	38	26	A (-9°F)	46	36	25
B (5°C)	43	31	20	B (9°F)	41	29	19
C (20°C)	34	22	11	C (36°F)	32	21	10
D (50°C)	17	7		D (90°F)	16	7	
E (80°C)				E (144°F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: August 1, 1983

### COLLECTOR SPECIFICATIONS

**Gross Area:**           3.000 m<sup>2</sup>   32.29 ft<sup>2</sup>  
**Dry Weight:**       60.382 kg   133 lb  
**Test Pressure:**     1034 kPa   150 psig

**Net Aperture Area:**   2.771 m<sup>2</sup>   29.83 ft<sup>2</sup>  
**Fluid Capacity:**       3.0 l   0.8 gal

### COLLECTOR MATERIALS

**Frame:**               Aluminum Extrusion  
**Cover (Outer):**       Low Iron Tempered Glass  
**Cover (Inner):**       None  
**Absorber Material:**   Tube - Copper / Plate - Copper  
**Absorber Coating:**   Polyester Flat Black Paint  
**Insulation (Side):**   Isocyanurate Foam  
**Insulation (Back):**   Isocyanurate Foam & Fiberglass

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
ml/s	gpm	Pa	in H <sub>2</sub> O

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.719 - 5.3100 (P)/I - 0.0100 (P)^2/I$	<b>Y Intercept</b>	0.726	<b>Slope</b>	-6.08	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.719 - 0.9358 (P)/I - 0.0010 (P)^2/I$		0.726		-1.071	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0   -0.0900 (S)   0.0000 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0   -0.12 (S)   (Linear Fit)

**Model Tested:**       Mojave 408

**Test Fluid:**          Water

**Test Flow Rate:**   55 ml/s   0.87 gpm

### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Heliodyne, Inc.**  
4910 Seaport Avenue  
Richmond, CA 94804

**MODEL:** Heliodyne Mojave 410  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-085D

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	61	47	32	A (-9°F)	58	45	30
B (5°C)	54	39	24	B (9°F)	51	37	23
C (20°C)	42	28	14	C (36°F)	40	27	13
D (50°C)	22	9	1	D (90°F)	21	9	1
E (80°C)				E (144°F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: August 1, 1983

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.727 m<sup>2</sup> 40.12 ft<sup>2</sup>  
**Dry Weight:** 72.64 kg 160 lb  
**Test Pressure:** 1034 kPa 150 psig

**Net Aperture Area:** 3.558 m<sup>2</sup> 38.30 ft<sup>2</sup>  
**Fluid Capacity:** 3.8 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Polyester Flat Black Paint  
**Insulation (Side):** Isocyanurate Foam  
**Insulation (Back):** Isocyanurate Foam & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	$\eta = 0.719$	-5.3100 (P)/I	-0.0100 (P) <sup>2</sup> /I	<b>Y Intercept</b>	0.726	<b>Slope</b>	-6.08	W/m <sup>2</sup> ·°C
	<b>I P Units:</b>	$\eta = 0.719$	-0.9358 (P)/I	-0.0010 (P) <sup>2</sup> /I	0.726		-1.071	Btu/hr·ft <sup>2</sup> ·°F	

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0900 (S) 0.0000 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.12 (S) (Linear Fit)

**Model Tested:** Mojave 408

**Test Fluid:** Water

**Test Flow Rate:** 56 ml/s 0.89 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** King Solar Products  
One World Trade Center  
121 SW Salmon Street, Suite 1100  
Portland, OR 97204

**MODEL:** King Solar Products Inc. (AET) KS-32  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2006-029A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	44	33	23	A (-9°F)	42	31	21
B (5°C)	40	29	19	B (9°F)	38	28	18
C (20°C)	33	23	13	C (36°F)	32	22	12
D (50°C)	20	11	2	D (90°F)	19	10	2
E (80°C)	8	1		E (144°F)	7	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: August 31, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.965 m<sup>2</sup> 31.92 ft<sup>2</sup>  
**Dry Weight:** 51.2 kg 113 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.781 m<sup>2</sup> 29.94 ft<sup>2</sup>  
**Fluid Capacity:** 4.9 l 1.3 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.691 - 3.3960 (P)/I - 0.0197 (P)^2/I$	0.706	-4.9099	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.691 - 0.5985 (P)/I - 0.0019 (P)^2/I$	0.706	-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{ar} = 1.0 - 0.1939 (S) - 0.0055 (S)^2$   
 $K_{ar} = 1.0 - 0.20 (S)$  (Linear Fit)

**Model Tested:** 100-2002-001A

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.62 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** King Solar Products  
One World Trade Center  
121 SW Salmon Street, Suite 1100  
Portland, OR 97204

**MODEL:** King Solar Products Inc. (AET) KS-40  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2006-029B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	55	41	28	A (-9°F)	52	39	27
B (5°C)	50	36	23	B (9°F)	47	35	22
C (20°C)	42	29	16	C (36°F)	40	27	15
D (50°C)	25	13	3	D (90°F)	24	13	3
E (80°C)	10	1		E (144°F)	9	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: August 31, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.696 m<sup>2</sup> 39.78 ft<sup>2</sup>  
**Dry Weight:** 69.4 kg 153 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 3.481 m<sup>2</sup> 37.47 ft<sup>2</sup>  
**Fluid Capacity:** 6.1 l 1.6 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.691 - 3.3960 (P)/I - 0.0197 (P)^2/I$	0.706	-4.9099	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.691 - 0.5985 (P)/I - 0.0019 (P)^2/I$	0.706	-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{ar} = 1.0 - 0.1939 (S) - 0.0055 (S)^2$   
 $K_{ar} = 1.0 - 0.20 (S)$  (Linear Fit)

**Model Tested:** 100-2002-001A

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.62 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER: Mr. Sun Solar**  
6125 NE Portland Highway  
Portland, OR 97218

**MODEL:** Sol-Reliant AE-40  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2004-008B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	55	41	28	A (-9°F)	52	39	27
B (5°C)	50	36	23	B (9°F)	47	35	22
C (20°C)	42	29	16	C (36°F)	40	27	15
D (50°C)	25	13	3	D (90°F)	24	13	3
E (80°C)	10	1		E (144°F)	9	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: February 27, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.696 m<sup>2</sup> 39.78 ft<sup>2</sup>  
**Dry Weight:** 69.4 kg 153 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 3.481 m<sup>2</sup> 37.47 ft<sup>2</sup>  
**Fluid Capacity:** 6.1 l 1.6 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.691$	$-3.3960 (P)/I$	$-0.0197 (P)^2/I$	<b>Y Intercept</b>	0.706	<b>Slope</b>	-4.9099	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.691$	$-0.5985 (P)/I$	$-0.0019 (P)^2/I$		0.706		-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{arr} = 1.0$      $-0.1939 (S)$      $-0.0055 (S)^2$   
 $K_{arr} = 1.0$      $-0.20 (S)$     (Linear Fit)

**Model Tested:** 100-2002-001A

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s    0.62 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER: Mr. Sun Solar**  
6125 NE Portland Highway  
Portland, OR 97218

**MODEL:** Sol-Reliant AE-50  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2004-008C

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	69	52	35	A (-9°F)	66	50	34
B (5°C)	63	46	29	B (9°F)	60	44	28
C (20°C)	53	36	20	C (36°F)	50	34	19
D (50°C)	32	17	4	D (90°F)	30	16	4
E (80°C)	12	2		E (144°F)	12	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: February 27, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 4.664 m<sup>2</sup> 50.20 ft<sup>2</sup>  
**Dry Weight:** 82.54 kg 182 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 4.400 m<sup>2</sup> 47.36 ft<sup>2</sup>  
**Fluid Capacity:** 6.4 l 1.7 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.691$	$-3.3960 (P)/I$	$-0.0197 (P)^2/I$	<b>Y Intercept</b>	0.706	<b>Slope</b>	-4.9099	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.691$	$-0.5985 (P)/I$	$-0.0019 (P)^2/I$		0.706		-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

$K_{arr} = 1.0$  -0.1939 (S) -0.0055 (S)<sup>2</sup>  
 $K_{arr} = 1.0$  -0.20 (S) (Linear Fit)

**Model Tested:** 100-2002-001A

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.62 gpm


**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<b>SOLAR COLLECTOR CERTIFICATION AND RATING</b>    <b>SRCC OG-100</b>	<b><u>CERTIFIED SOLAR COLLECTOR</u></b>  <b>SUPPLIER: Mr. Sun Solar</b> 6125 NE Portland Highway Portland, OR 97218  <b>MODEL:</b> Sol-Reliant AE-56 <b>COLLECTOR TYPE:</b> Glazed Flat-Plate <b>CERTIFICATION #:</b> 100-2004-008A
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
<b>CATEGORY (Ti-Ta)</b>	<b>CLEAR DAY 23 MJ/m<sup>2</sup>·d</b>	<b>MILDLY CLOUDY 17 MJ/m<sup>2</sup>·d</b>	<b>CLOUDY DAY 11 MJ/m<sup>2</sup>·d</b>	<b>CATEGORY (Ti-Ta)</b>	<b>CLEAR DAY 2000 Btu/ft<sup>2</sup>·d</b>	<b>MILDLY CLOUDY 1500 Btu/ft<sup>2</sup>·d</b>	<b>CLOUDY DAY 1000 Btu/ft<sup>2</sup>·d</b>
A (-5°C)	77	58	39	A (-9°F)	73	55	37
B (5°C)	70	51	32	B (9°F)	66	48	31
C (20°C)	58	40	22	C (36°F)	55	38	21
D (50°C)	35	19	4	D (90°F)	33	18	4
E (80°C)	14	2		E (144°F)	13	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: August 26, 2004

### COLLECTOR SPECIFICATIONS

**Gross Area:** 5.175 m<sup>2</sup> 55.71 ft<sup>2</sup>  
**Dry Weight:** 92.5 kg 204 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 4.898 m<sup>2</sup> 52.72 ft<sup>2</sup>  
**Fluid Capacity:** 6.8 l 1.8 gal

### COLLECTOR MATERIALS

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
<b>ml/s</b>	<b>gpm</b>	<b>Pa</b>	<b>in H<sub>2</sub>O</b>

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.691$	$-3.3960 (P)/I$	$-0.0019 (P)^2/I$	<b>Y Intercept</b>	0.706	<b>Slope</b>	-4.9099	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.691$	$-0.5985 (P)/I$	$-0.0002 (P)^2/I$		0.706		-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{arr} = 1.0$      $-0.1939 (S)$      $-0.0055 (S)^2$   
 $K_{arr} = 1.0$      $-0.20 (S)$     (Linear Fit)

**Model Tested:** 100-2002-001A

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s    0.62 gpm

### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: R&R Solar Supply**

 922 Austin Lane  
 Building D  
 Honolulu, HI 96817

**MODEL:** Copper Star 21 EPI-308CU(3'x7')  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-003D

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	30	23	15	A (-9°F)	28	21	15
B (5°C)	26	19	12	B (9°F)	25	18	11
C (20°C)	21	14	7	C (36°F)	20	13	6
D (50°C)	10	4		D (90°F)	10	4	
E (80°C)	2			E (144°F)	2		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: June 24, 1999

**COLLECTOR SPECIFICATIONS**
**Gross Area:** 1.901 m<sup>2</sup> 20.46 ft<sup>2</sup>  
**Dry Weight:** 44 kg 97 lb  
**Test Pressure:** 552 kPa 80 psig

**Net Aperture Area:** 1.745 m<sup>2</sup> 18.78 ft<sup>2</sup>  
**Fluid Capacity:** 7.0 l 1.8 gal

**COLLECTOR MATERIALS**
**Frame:** Copper  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Fiberglass Board  
**Insulation (Back):** Fiberglass Board

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.697 - 4.8300 (P)/I - 0.0186 (P)^2/I$	0.708	-6.11	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.697 - 0.8512 (P)/I - 0.0018 (P)^2/I$	0.708	-1.077	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

<b>K<sub>arr</sub></b> = 1.0	-0.1297 (S)	+0.0214 (S) <sup>2</sup>
<b>K<sub>arr</sub></b> = 1.0	-0.11 (S)	(Linear Fit)

**Model Tested:** EPI-308SS(3'x7')

**Test Fluid:** Water

**Test Flow Rate:** 35 ml/s 0.55 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: R&R Solar Supply**

 922 Austin Lane  
 Building D  
 Honolulu, HI 96817

**MODEL:** Copper Star 24 EPI-308CU(3'x8')  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-003E

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	34	26	18	A (-9°F)	32	24	17
B (5°C)	30	22	14	B (9°F)	28	20	13
C (20°C)	24	16	8	C (36°F)	22	15	7
D (50°C)	12	5		D (90°F)	11	5	
E (80°C)	2			E (144°F)	2		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: June 24, 1999

**COLLECTOR SPECIFICATIONS**
**Gross Area:** 2.169 m<sup>2</sup> 23.35 ft<sup>2</sup>  
**Dry Weight:** 48.5 kg 107 lb  
**Test Pressure:** 552 kPa 80 psig

**Net Aperture Area:** 2.002 m<sup>2</sup> 21.55 ft<sup>2</sup>  
**Fluid Capacity:** 6.9 l 1.8 gal

**COLLECTOR MATERIALS**
**Frame:** Copper  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Fiberglass Board  
**Insulation (Back):** Fiberglass Board

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.697$	$-4.8300 (P)/I$	$-0.0186 (P)^2/I$	<b>Y Intercept</b>	0.708	<b>Slope</b>	-6.11	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.697$	$-0.8512 (P)/I$	$-0.0018 (P)^2/I$		0.708		-1.077	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

<b>K<sub>arr</sub></b>	= 1.0	-0.1297 (S)	+0.0214 (S) <sup>2</sup>
<b>K<sub>br</sub></b>	= 1.0	-0.11 (S)	(Linear Fit)

**Model Tested:** EPI-308SS(3'x7')

**Test Fluid:** Water

**Test Flow Rate:** 35 ml/s 0.55 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: R&R Solar Supply**

 922 Austin Lane  
 Building D  
 Honolulu, HI 96817

**MODEL:** Copper Star 32 EPI-308CU(4'x8')  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-003F

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	46	35	24	A (-9°F)	43	33	23
B (5°C)	40	29	18	B (9°F)	38	28	17
C (20°C)	32	21	10	C (36°F)	30	20	10
D (50°C)	16	7		D (90°F)	15	6	
E (80°C)	3			E (144°F)	3		

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: June 24, 1999

**COLLECTOR SPECIFICATIONS**
**Gross Area:** 2.918 m<sup>2</sup> 31.41 ft<sup>2</sup>  
**Dry Weight:** 68.5 kg 151 lb  
**Test Pressure:** 552 kPa 80 psig

**Net Aperture Area:** 2.736 m<sup>2</sup> 29.45 ft<sup>2</sup>  
**Fluid Capacity:** 8.8 l 2.3 gal

**COLLECTOR MATERIALS**
**Frame:** Copper  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Fiberglass Board  
**Insulation (Back):** Fiberglass Board

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.697$	$-4.8300 (P)/I$	$-0.0186 (P)^2/I$	<b>Y Intercept</b>	0.708	<b>Slope</b>	-6.11	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.697$	$-0.8512 (P)/I$	$-0.0018 (P)^2/I$		0.708		-1.077	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

<b>K<sub>arr</sub></b>	= 1.0	-0.1297 (S)	+0.0214 (S) <sup>2</sup>
<b>K<sub>br</sub></b>	= 1.0	-0.11 (S)	(Linear Fit)

**Model Tested:** EPI-308SS(3'x7')

**Test Fluid:** Water

**Test Flow Rate:** 35 ml/s 0.55 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: R&R Solar Supply**

 922 Austin Lane  
 Building D  
 Honolulu, HI 96817

**MODEL:** Sunlast 21 EPI-308SS(3'x7')

**COLLECTOR TYPE:** Glazed Flat-Plate

**CERTIFICATION #:** 100-1999-003A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	30	23	15	A (-9°F)	28	21	15
B (5°C)	26	19	12	B (9°F)	25	18	11
C (20°C)	21	14	7	C (36°F)	20	13	6
D (50°C)	10	4		D (90°F)	10	4	
E (80°C)	2			E (144°F)	2		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: June 24, 1999

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.901 m<sup>2</sup> 20.46 ft<sup>2</sup>  
**Dry Weight:** 40.6 kg 90 lb  
**Test Pressure:** 552 kPa 80 psig

**Net Aperture Area:** 1.745 m<sup>2</sup> 18.78 ft<sup>2</sup>  
**Fluid Capacity:** 7.0 l 1.8 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Fiberglass Board  
**Insulation (Back):** Fiberglass Board

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	43	0.17
40	0.63	149	0.60
60	0.95	319	1.28

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.697 - 4.8300 (P)/I - 0.0186 (P)^2/I$	0.708	-6.11	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.697 - 0.8512 (P)/I - 0.0018 (P)^2/I$	0.708	-1.077	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1297 (S) +0.0214 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.11 (S) (Linear Fit)

**Model Tested:** EPI-308SS(3'x7')

**Test Fluid:** Water

**Test Flow Rate:** 35 ml/s 0.55 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: R&R Solar Supply**

 922 Austin Lane  
 Building D  
 Honolulu, HI 96817

**MODEL:** Sunlast 24 EPI-308SS(3'x8')

**COLLECTOR TYPE:** Glazed Flat-Plate

**CERTIFICATION #:** 100-1999-003B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	34	26	18	A (-9°F)	32	24	17
B (5°C)	30	22	14	B (9°F)	28	20	13
C (20°C)	24	16	8	C (36°F)	22	15	7
D (50°C)	12	5		D (90°F)	11	5	
E (80°C)	2			E (144°F)	2		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: June 24, 1999

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.169 m<sup>2</sup> 23.35 ft<sup>2</sup>  
**Dry Weight:** 43.6 kg 96 lb  
**Test Pressure:** 552 kPa 80 psig

**Net Aperture Area:** 2.002 m<sup>2</sup> 21.55 ft<sup>2</sup>  
**Fluid Capacity:** 6.9 l 1.8 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Fiberglass Board  
**Insulation (Back):** Fiberglass Board

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.697 - 4.8300 (P)/I - 0.0186 (P)^2/I$	0.708	-6.11	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.697 - 0.8512 (P)/I - 0.0018 (P)^2/I$	0.708	-1.077	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1297 (S) +0.0214 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.11 (S) (Linear Fit)

**Model Tested:** EPI-308SS(3'x7')

**Test Fluid:** Water

**Test Flow Rate:** 35 ml/s 0.55 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: R&R Solar Supply**

 922 Austin Lane  
 Building D  
 Honolulu, HI 96817

**MODEL:** Sunlast 32 EPI-308SS(4'x8')

**COLLECTOR TYPE:** Glazed Flat-Plate

**CERTIFICATION #:** 100-1999-003C

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	46	35	24	A (-9°F)	43	33	23
B (5°C)	40	29	18	B (9°F)	38	28	17
C (20°C)	32	21	10	C (36°F)	30	20	10
D (50°C)	16	7		D (90°F)	15	6	
E (80°C)	3			E (144°F)	3		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: June 24, 1999

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.918 m<sup>2</sup> 31.41 ft<sup>2</sup>  
**Dry Weight:** 62.6 kg 138 lb  
**Test Pressure:** 552 kPa 80 psig

**Net Aperture Area:** 2.736 m<sup>2</sup> 29.45 ft<sup>2</sup>  
**Fluid Capacity:** 8.8 l 2.3 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Fiberglass Board  
**Insulation (Back):** Fiberglass Board

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.697 - 4.8300 (P)/I - 0.0186 (P)^2/I$	0.708	-6.11	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.697 - 0.8512 (P)/I - 0.0018 (P)^2/I$	0.708	-1.077	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1297 (S) +0.0214 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.11 (S) (Linear Fit)

**Model Tested:** EPI-308SS(3'x7')

**Test Fluid:** Water

**Test Flow Rate:** 35 ml/s 0.55 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: R&R Solar Supply**

 922 Austin Lane  
 Building D  
 Honolulu, HI 96817

**MODEL:** Sunpro Sunpro 21

**COLLECTOR TYPE:** Glazed Flat-Plate

**CERTIFICATION #:** 100-2001-001A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	30	23	16	A (-9°F)	29	22	15
B (5°C)	26	19	12	B (9°F)	25	18	11
C (20°C)	21	14	7	C (36°F)	20	13	6
D (50°C)	10	4		D (90°F)	10	4	
E (80°C)	2			E (144°F)	2		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: July 2, 2001

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.900 m<sup>2</sup> 20.45 ft<sup>2</sup>  
**Dry Weight:** 39.9 kg 88 lb  
**Test Pressure:** 552 kPa 80 psig

**Net Aperture Area:** 1.748 m<sup>2</sup> 18.82 ft<sup>2</sup>  
**Fluid Capacity:** 7.0 l 1.8 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Fiberglass Board  
**Insulation (Back):** Fiberglass Board

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	43	0.17
40	0.63	149	0.60
60	0.95	319	1.28

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.697</b>	<b>-4.8300 (P)/I</b>	<b>-0.0186 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.708	-6.11	W/m <sup>2</sup> ·°C
	<b>I P Units:</b>	<b>η = 0.697</b>	<b>-0.8512 (P)/I</b>	<b>-0.0018 (P)<sup>2</sup>/I</b>	0.708	-1.077	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1297 (S) +0.0214 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.11 (S) (Linear Fit)

**Model Tested:** EPI-308SS(3'x7')

**Test Fluid:** Water

**Test Flow Rate:** 35 ml/s 0.55 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: R&R Solar Supply**

 922 Austin Lane  
 Building D  
 Honolulu, HI 96817

**MODEL:** Sunpro Sunpro 24  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2001-001B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	34	26	18	A (-9°F)	33	25	17
B (5°C)	30	22	14	B (9°F)	29	21	13
C (20°C)	24	16	8	C (36°F)	23	15	7
D (50°C)	12	5		D (90°F)	11	5	
E (80°C)	2			E (144°F)	2		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: July 2, 2001

**COLLECTOR SPECIFICATIONS**
**Gross Area:** 2.169 m<sup>2</sup> 23.35 ft<sup>2</sup>  
**Dry Weight:** 44 kg 97 lb  
**Test Pressure:** 552 kPa 80 psig

**Net Aperture Area:** 2.002 m<sup>2</sup> 21.55 ft<sup>2</sup>  
**Fluid Capacity:** 6.9 l 1.8 gal

**COLLECTOR MATERIALS**
**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Fiberglass Board  
**Insulation (Back):** Fiberglass Board

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.697 - 4.8300 (P)/I - 0.0186 (P)^2/I$	0.708	-6.11	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.697 - 0.8512 (P)/I - 0.0018 (P)^2/I$	0.708	-1.077	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

<b>K<sub>arr</sub></b> = 1.0	-0.1297 (S)	+0.0214 (S) <sup>2</sup>
<b>K<sub>arr</sub></b> = 1.0	-0.11 (S)	(Linear Fit)

**Model Tested:** EPI-308SS(3'x7')

**Test Fluid:** Water

**Test Flow Rate:** 35 ml/s 0.55 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: R&R Solar Supply**

 922 Austin Lane  
 Building D  
 Honolulu, HI 96817

**MODEL:** Sunpro Sunpro 32  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2001-001C

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	46	35	24	A (-9°F)	44	33	23
B (5°C)	40	29	18	B (9°F)	38	28	17
C (20°C)	32	21	10	C (36°F)	30	20	10
D (50°C)	16	7		D (90°F)	15	6	
E (80°C)	3			E (144°F)	3		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: July 2, 2001

**COLLECTOR SPECIFICATIONS**
**Gross Area:** 2.918 m<sup>2</sup> 31.41 ft<sup>2</sup>  
**Dry Weight:** 55.8 kg 123 lb  
**Test Pressure:** 552 kPa 80 psig

**Net Aperture Area:** 2.736 m<sup>2</sup> 29.45 ft<sup>2</sup>  
**Fluid Capacity:** 8.9 l 2.4 gal

**COLLECTOR MATERIALS**
**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Fiberglass Board  
**Insulation (Back):** Fiberglass Board

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.697 - 4.8300 (P)/I - 0.0186 (P)^2/I$	0.708	-6.11	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.697 - 0.8512 (P)/I - 0.0018 (P)^2/I$	0.708	-1.077	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

<b>K<sub>arr</sub></b> = 1.0	-0.1297 (S)	+0.0214 (S) <sup>2</sup>
<b>K<sub>arr</sub></b> = 1.0	-0.11 (S)	(Linear Fit)

**Model Tested:** EPI-308SS(3'x7')

**Test Fluid:** Water

**Test Flow Rate:** 35 ml/s 0.55 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: R&R Solar Supply**

 922 Austin Lane  
 Building D  
 Honolulu, HI 96817

**MODEL:** Sunpro Sunpro 40  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2001-001D

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	58	44	30	A (-9°F)	55	41	28
B (5°C)	50	37	23	B (9°F)	48	35	22
C (20°C)	40	26	13	C (36°F)	38	25	12
D (50°C)	20	8		D (90°F)	19	8	
E (80°C)	4			E (144°F)	3		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: July 2, 2001

**COLLECTOR SPECIFICATIONS**
**Gross Area:** 3.642 m<sup>2</sup> 39.20 ft<sup>2</sup>  
**Dry Weight:** 77.1 kg 170 lb  
**Test Pressure:** 552 kPa 80 psig

**Net Aperture Area:** 3.428 m<sup>2</sup> 36.90 ft<sup>2</sup>  
**Fluid Capacity:** 10.8 l 2.9 gal

**COLLECTOR MATERIALS**
**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Fiberglass Board  
**Insulation (Back):** Fiberglass Board

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.697 - 4.8300 (P)/I - 0.0186 (P)^2/I$	0.708	-6.11	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.697 - 0.8512 (P)/I - 0.0018 (P)^2/I$	0.708	-1.077	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

<b>K<sub>arr</sub></b> = 1.0	-0.1297 (S)	+0.0214 (S) <sup>2</sup>
<b>K<sub>arr</sub></b> = 1.0	-0.11 (S)	(Linear Fit)

**Model Tested:** EPI-308SS(3'x7')

**Test Fluid:** Water

**Test Flow Rate:** 35 ml/s 0.55 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER: Radco Products, Inc.**  
2877 Industrial Parkway  
Santa Maria, CA 93455

**MODEL:** Radco 308C-HP  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1985-030J

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	36	27	19	A (-9°F)	34	26	18
B (5°C)	33	24	15	B (9°F)	31	23	14
C (20°C)	28	19	10	C (36°F)	26	18	10
D (50°C)	17	9	2	D (90°F)	16	9	2
E (80°C)	8	2		E (144°F)	8	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: April 10, 2000

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.201 m<sup>2</sup> 23.69 ft<sup>2</sup>  
**Dry Weight:** 35.5 kg 78 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.054 m<sup>2</sup> 22.11 ft<sup>2</sup>  
**Fluid Capacity:** 3.3 l 0.9 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>
<b>S I Units:</b> $\eta = 0.772 - 4.3800 (P)/I - 0.0102 (P)^2/I$	0.778	-4.964 W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.772 - 0.7719 (P)/I - 0.0010 (P)^2/I$	0.778	-0.875 Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0520 (S) -0.1585 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.22 (S) (Linear Fit)

**Model Tested:** 408C-HP

**Test Fluid:** Water

**Test Flow Rate:** 56 ml/s 0.89 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Radco Products, Inc.  
2877 Industrial Parkway  
Santa Maria, CA 93455

**MODEL:** Radco 308P-HP  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1985-030G

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	38	29	21	A (-9°F)	36	27	20
B (5°C)	32	23	15	B (9°F)	30	22	14
C (20°C)	24	16	8	C (36°F)	23	15	8
D (50°C)	10	4		D (90°F)	9	4	
E (80°C)				E (144°F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: August 1, 1994

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.201 m<sup>2</sup> 23.69 ft<sup>2</sup>  
**Dry Weight:** 34 kg 75 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.054 m<sup>2</sup> 22.11 ft<sup>2</sup>  
**Fluid Capacity:** 3.3 l 0.9 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Flat Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>
<b>S I Units:</b> $\eta = 0.759 - 6.8820 (P)/I - 0.1112 (P)^2/I$	0.764	-7.51 W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.759 - 1.2128 (P)/I - 0.0109 (P)^2/I$	0.764	-1.323 Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1230 (S) -0.1030 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -99.00 (S) (Linear Fit)

**Model Tested:** 408P-HP

**Test Fluid:** Water

**Test Flow Rate:** 56 ml/s 0.89 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Radco Products, Inc.  
2877 Industrial Parkway  
Santa Maria, CA 93455

**MODEL:** Radco 408C-HP  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1985-030A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	51	38	26	A (-9°F)	48	36	25
B (5°C)	46	33	21	B (9°F)	43	32	20
C (20°C)	38	26	14	C (36°F)	36	25	13
D (50°C)	24	13	4	D (90°F)	23	13	3
E (80°C)	12	3		E (144°F)	11	3	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: December 18, 1985

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.000 m<sup>2</sup> 32.29 ft<sup>2</sup>  
**Dry Weight:** 47.6 kg 105 lb  
**Test Pressure:** 1102 kPa 160 psig

**Net Aperture Area:** 2.806 m<sup>2</sup> 30.20 ft<sup>2</sup>  
**Fluid Capacity:** 2.9 l 0.8 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
56	0.89	498	2.00
126	2.00	2117	8.50
252	3.99	7844	31.49

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.774</b>	<b>-4.2000 (P)/I</b>	<b>-0.0090 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.779	-4.77	W/m <sup>2</sup> ·°C
	<b>I P Units:</b>	<b>η = 0.774</b>	<b>-0.7402 (P)/I</b>	<b>-0.0009 (P)<sup>2</sup>/I</b>	0.779	-0.841	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0520 (S) -0.1585 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.22 (S) (Linear Fit)

**Model Tested:** 408C-HP

**Test Fluid:** Water

**Test Flow Rate:** 56 ml/s 0.89 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Radco Products, Inc.  
2877 Industrial Parkway  
Santa Maria, CA 93455

**MODEL:** Radco 408P-HP  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1985-030D

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	51	39	27	A (-9°F)	48	37	26
B (5°C)	43	31	19	B (9°F)	41	29	18
C (20°C)	32	21	9	C (36°F)	30	20	9
D (50°C)	14	5		D (90°F)	13	5	
E (80°C)	2			E (144°F)	2		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: December 18, 1985

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.999 m<sup>2</sup> 32.28 ft<sup>2</sup>  
**Dry Weight:** 46.3 kg 102 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.806 m<sup>2</sup> 30.20 ft<sup>2</sup>  
**Fluid Capacity:** 4.7 l 1.2 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Flat Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
56	0.89	498	2.00
126	2.00	2117	8.50
252	3.99	7844	31.49

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.763$	$-6.6200 (P)/I$	$-0.0100 (P)^2/I$	<b>Y Intercept</b>	0.768	<b>Slope</b>	-7.24	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.763$	$-1.1666 (P)/I$	$-0.0010 (P)^2/I$		0.768		-1.276	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{arr} = 1.0$     -0.1230 (S)    -0.1030 (S)<sup>2</sup>  
 $K_{arr} = 1.0$     (S)    (Linear Fit)

**Model Tested:** 408P-HP

**Test Fluid:** Water

**Test Flow Rate:** 56 ml/s    0.89 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Radco Products, Inc.  
2877 Industrial Parkway  
Santa Maria, CA 93455

**MODEL:** Radco 410C-HP  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1985-030B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	62	47	32	A (-9°F)	59	45	30
B (5°C)	56	41	26	B (9°F)	53	39	25
C (20°C)	47	32	17	C (36°F)	45	30	16
D (50°C)	30	16	4	D (90°F)	28	15	4
E (80°C)	15	4		E (144°F)	14	4	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: December 18, 1985

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.708 m<sup>2</sup> 39.91 ft<sup>2</sup>  
**Dry Weight:** 58.566 kg 129 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 3.488 m<sup>2</sup> 37.55 ft<sup>2</sup>  
**Fluid Capacity:** 3.3 l 0.9 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.774 - 4.2000 (P)/I - 0.0090 (P)^2/I$	0.779	-4.77	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.774 - 0.7402 (P)/I - 0.0009 (P)^2/I$	0.779	-0.841	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0520 (S) -0.1585 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.22 (S) (Linear Fit)

**Model Tested:** 408C-HP

**Test Fluid:** Water

**Test Flow Rate:** 56 ml/s 0.89 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Radco Products, Inc.**  
2877 Industrial Parkway  
Santa Maria, CA 93455

**MODEL:** Radco 410P-HP  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1985-030E

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	63	48	33	A (-9°F)	60	46	31
B (5°C)	53	38	24	B (9°F)	50	36	23
C (20°C)	40	26	12	C (36°F)	38	25	11
D (50°C)	17	6		D (90°F)	16	6	
E (80°C)	2			E (144°F)	2		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: December 18, 1985

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.708 m<sup>2</sup> 39.91 ft<sup>2</sup>  
**Dry Weight:** 56.75 kg 125 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 3.488 m<sup>2</sup> 37.55 ft<sup>2</sup>  
**Fluid Capacity:** 5.7 l 1.5 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Flat Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.763 - 6.6200 (P)/I - 0.0100 (P)^2/I$	0.768	-7.24	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.763 - 1.1666 (P)/I - 0.0010 (P)^2/I$	0.768	-1.276	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1230 (S) -0.1030 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 (S) (Linear Fit)

**Model Tested:** 408P-HP

**Test Fluid:** Water

**Test Flow Rate:** 56 ml/s 0.89 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Radco Products, Inc.  
2877 Industrial Parkway  
Santa Maria, CA 93455

**MODEL:** Radco 412C-HP  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1985-030C

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	76	57	39	A (-9°F)	72	54	37
B (5°C)	68	50	31	B (9°F)	64	47	29
C (20°C)	57	39	21	C (36°F)	54	37	20
D (50°C)	36	20	5	D (90°F)	34	19	5
E (80°C)	18	5		E (144°F)	17	5	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: December 18, 1985

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 4.490 m<sup>2</sup> 48.33 ft<sup>2</sup>  
**Dry Weight:** 70.37 kg 155 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 4.212 m<sup>2</sup> 45.34 ft<sup>2</sup>  
**Fluid Capacity:** 3.7 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	$\eta = 0.774$	-4.2000 (P)/I	-0.0090 (P) <sup>2</sup> /I	<b>Y Intercept</b>	0.779	<b>Slope</b>	-4.77	W/m <sup>2</sup> ·°C
	<b>I P Units:</b>	$\eta = 0.774$	-0.7402 (P)/I	-0.0009 (P) <sup>2</sup> /I	0.779		-0.841	Btu/hr·ft <sup>2</sup> ·°F	

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0520 (S) -0.1585 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.22 (S) (Linear Fit)

**Model Tested:** 408C-HP

**Test Fluid:** Water

**Test Flow Rate:** 56 ml/s 0.89 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Radco Products, Inc.  
2877 Industrial Parkway  
Santa Maria, CA 93455

**MODEL:** Radco 412P-HP  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1985-030F

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	76	58	40	A (-9°F)	72	55	38
B (5°C)	65	47	29	B (9°F)	62	45	27
C (20°C)	49	31	14	C (36°F)	46	29	13
D (50°C)	21	7		D (90°F)	20	7	
E (80°C)	3			E (144°F)	3		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: December 18, 1985

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 4.490 m<sup>2</sup> 48.33 ft<sup>2</sup>  
**Dry Weight:** 68.1 kg 150 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 4.212 m<sup>2</sup> 45.34 ft<sup>2</sup>  
**Fluid Capacity:** 6.7 l 1.8 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Flat Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>
<b>S I Units:</b> $\eta = 0.763 - 6.6200 (P)/I - 0.0100 (P)^2/I$	0.768	-7.24 W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.763 - 1.1666 (P)/I - 0.0010 (P)^2/I$	0.768	-1.276 Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1230 (S) -0.1030 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 (S) (Linear Fit)

**Model Tested:** 408P-HP

**Test Fluid:** Water

**Test Flow Rate:** 56 ml/s 0.89 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

SOLAR COLLECTOR  
CERTIFICATION AND RATING

SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

SUPPLIER: **Rheem Water Heaters**  
101 Bell Rd  
Montgomery, AL 36117

MODEL: Rheem RS21-BC  
COLLECTOR TYPE: Glazed Flat-Plate  
CERTIFICATION #: 100-2005-022A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	31	24	16	A (-9°F)	30	22	15
B (5°C)	29	21	14	B (9°F)	27	20	13
C (20°C)	24	17	9	C (36°F)	23	16	9
D (50°C)	14	8	2	D (90°F)	14	7	2
E (80°C)	5			E (144°F)	4		

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: March 8, 2006

**COLLECTOR SPECIFICATIONS**

Gross Area: 1.983 m<sup>2</sup> 21.35 ft<sup>2</sup>  
Dry Weight: 40.6 kg 90 lb  
Test Pressure: 179 kPa 26 psig

Net Aperture Area: 1.867 m<sup>2</sup> 20.10 ft<sup>2</sup>  
Fluid Capacity: 3.6 l 1.0 gal

**COLLECTOR MATERIALS**

Frame: Aluminum  
Cover (Outer): Low Iron Tempered Glass  
Cover (Inner): None  
Absorber Material: Tube - None / Plate - Steel  
Absorber Coating: Black Chrome  
Insulation (Side): Glasswool  
Insulation (Back): Glasswool

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	56	0.22
50	0.79	243	0.98
80	1.27	570	2.29

**TECHNICAL INFORMATION**

Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]

	<u>Y Intercept</u>	<u>Slope</u>
S I Units: $\eta = 0.731 - 3.0411 (P)/I - 0.0325 (P)^2/I$	0.759	-5.93 W/m <sup>2</sup> ·°C
I P Units: $\eta = 0.731 - 0.5359 (P)/I - 0.0032 (P)^2/I$	0.759	-1.045 Btu/hr·ft <sup>2</sup> ·°F

Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]

$K_{arr} = 1.0 - 0.1798 (S) + 0.0214 (S)^2$   
 $K_{arr} = 1.0 - 0.16 (S)$  (Linear Fit)

Model Tested: K  
Test Fluid: Water  
Test Flow Rate: 37 ml/s 0.59 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Rheem Water Heaters  
101 Bell Rd  
Montgomery, AL 36117

**MODEL:** Rheem RS21-BP  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2005-021A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	32	25	17	A (-9°F)	31	23	16
B (5°C)	29	21	13	B (9°F)	27	20	13
C (20°C)	23	15	8	C (36°F)	22	14	7
D (50°C)	9	3		D (90°F)	9	3	
E (80°C)				E (144°F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: March 8, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.983 m<sup>2</sup> 21.35 ft<sup>2</sup>  
**Dry Weight:** 40.6 kg 90 lb  
**Test Pressure:** 179 kPa 26 psig

**Net Aperture Area:** 1.867 m<sup>2</sup> 20.10 ft<sup>2</sup>  
**Fluid Capacity:** 3.6 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - None / Plate - Steel  
**Absorber Coating:** Polyester Flat Black Paint  
**Insulation (Side):** Polyester  
**Insulation (Back):** Polyester

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	73	0.29
50	0.79	312	1.25
80	1.27	656	2.63

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.737</b>	<b>-4.4193 (P)/I</b>	<b>-0.0503 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.7724	-8.36	W/m <sup>2</sup> ·°C
					0.7724	-1.473	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1395 (S) +0.0127 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.13 (S) (Linear Fit)

**Model Tested:** J  
**Test Fluid:** Water  
**Test Flow Rate:** 37 ml/s 0.59 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Rheem Water Heaters  
101 Bell Rd  
Montgomery, AL 36117

**MODEL:** Rheem RS21-SC  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2005-023A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	34	25	17	A (-9°F)	32	24	17
B (5°C)	30	22	14	B (9°F)	28	21	13
C (20°C)	24	17	9	C (36°F)	23	16	8
D (50°C)	15	8	2	D (90°F)	14	8	2
E (80°C)	8	2		E (144°F)	7	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: March 8, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.983 m<sup>2</sup> 21.35 ft<sup>2</sup>  
**Dry Weight:** 31.5 kg 69 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.870 m<sup>2</sup> 20.13 ft<sup>2</sup>  
**Fluid Capacity:** 2.3 l 0.6 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Titanium oxide  
**Insulation (Side):** Polyester wool  
**Insulation (Back):** Glasswool

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	37	0.15
50	0.79	136	0.54
80	1.27	289	1.16

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η =</b>	<b>0.753</b>	<b>-5.2917 (P)/I</b>	<b>+0.0064 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>0.75</b>	<b>Slope</b>	<b>-4.8668</b>	<b>W/m<sup>2</sup>·°C</b>
	<b>I P Units:</b>	<b>η =</b>	<b>0.753</b>	<b>-0.9325 (P)/I</b>	<b>0.0000 (P)<sup>2</sup>/I</b>	<b>0.75</b>	<b>-0.858</b>	<b>Btu/hr·ft<sup>2</sup>·°F</b>		

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.1429 (S) -0.2362 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 +0.10 (S) (Linear Fit)

**Model Tested:** Bt  
**Test Fluid:** Water  
**Test Flow Rate:** 37 ml/s 0.59 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: Schuco International KG**

Karolinenstrasse 1-15  
Bielefeld, D-33609

**MODEL:** Premium V, H, LA

**COLLECTOR TYPE:** Glazed Flat-Plate

**CERTIFICATION #:** 100-2005-008A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	42	32	21	A (-9°F)	40	30	20
B (5°C)	38	28	18	B (9°F)	36	27	17
C (20°C)	33	23	13	C (36°F)	31	22	12
D (50°C)	21	12	3	D (90°F)	20	11	3
E (80°C)	10	2		E (144°F)	9	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: December 20, 2005

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.699 m<sup>2</sup> 29.05 ft<sup>2</sup>  
**Dry Weight:** 55 kg 121 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.504 m<sup>2</sup> 26.95 ft<sup>2</sup>  
**Fluid Capacity:** 2.0 l 0.5 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Sputtered cermet  
**Insulation (Side):** None  
**Insulation (Back):** Mineral Wool

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	2753	11.05
50	0.79	10758	43.19
80	1.27	23413	93.99

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**
**S I Units:**  $\eta = 0.708 - 3.1129 (P)/I - 0.0193 (P)^2/I$ 
**I P Units:**  $\eta = 0.708 - 0.5486 (P)/I - 0.0019 (P)^2/I$ 
**Y Intercept**

0.718

**Slope**
-4.276 W/m<sup>2</sup>·°C-0.754 Btu/hr·ft<sup>2</sup>·°F
**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**
**K<sub>arr</sub>** = 1.0 -0.0163 (S) -0.1574 (S)<sup>2</sup>
**K<sub>arr</sub>** = 1.0 -0.18 (S) (Linear Fit)

**Model Tested:** Premium V

**Test Fluid:** Water

**Test Flow Rate:** 50 ml/s 0.79 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: Schuco International KG**

Karolinenstrasse 1-15  
Bielefeld, D-33609

**MODEL:** Slimline V, LA

**COLLECTOR TYPE:** Glazed Flat-Plate

**CERTIFICATION #:** 100-2005-009A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	36	27	18	A (-9°F)	34	25	17
B (5°C)	33	24	15	B (9°F)	31	23	15
C (20°C)	28	20	11	C (36°F)	27	19	11
D (50°C)	19	11	3	D (90°F)	18	10	3
E (80°C)	9	3		E (144°F)	9	3	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: December 20, 2005

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.311 m<sup>2</sup> 24.88 ft<sup>2</sup>  
**Dry Weight:** 41 kg 90 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.141 m<sup>2</sup> 23.05 ft<sup>2</sup>  
**Fluid Capacity:** 1.5 l 0.4 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Sputtered cermet  
**Insulation (Side):** None  
**Insulation (Back):** Mineral Wool

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	1979	7.95
50	0.79	8473	34.02
80	1.27	19198	77.07

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>
<b>S I Units:</b> $\eta = 0.706 - 2.9209 (P)/I - 0.0179 (P)^2/I$	0.715	-3.994 W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.706 - 0.5147 (P)/I - 0.0018 (P)^2/I$	0.715	-0.704 Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0574 (S) -0.1117 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.17 (S) (Linear Fit)

**Model Tested:** Slimline V

**Test Fluid:** Water

**Test Flow Rate:** 43 ml/s 0.68 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: Sealed Air Corporation**

 3433 Arden Road  
Hayward, CA 94545

**MODEL: FW-48**
**COLLECTOR TYPE: Glazed Flat-Plate**
**CERTIFICATION #: 100-1997-010C**
**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	77	60	42	A (-9°F)	73	57	40
B (5°C)	61	43	26	B (9°F)	58	41	25
C (20°C)	44	27	11	C (36°F)	42	26	10
D (50°C)	26	11	1	D (90°F)	25	10	1
E (80°C)	25	11		E (144°F)	24	10	

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: April 1, 1997

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 4.403 m<sup>2</sup> 47.40 ft<sup>2</sup>  
**Dry Weight:** 33.1 kg 73 lb  
**Test Pressure:** 207 kPa 30 psig

**Net Aperture Area:** 4.098 m<sup>2</sup> 44.11 ft<sup>2</sup>  
**Fluid Capacity:** 11.7 l 3.1 gal

**COLLECTOR MATERIALS**

**Frame:** Galvanized steel with fiber reinforced back  
**Cover (Outer):** None  
**Cover (Inner):** None  
**Absorber Material:** Tube - Co-polymer plastic / Plate - Co-polymer plastic  
**Absorber Coating:** None  
**Insulation (Side):** None  
**Insulation (Back):** None

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.736$	$-9.3230 (P)/I$	$-0.0701 (P)^2/I$	<b>Y Intercept</b>	0.739	<b>Slope</b>	-8.21 W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.736$	$-1.6430 (P)/I$	$-0.0069 (P)^2/I$		0.739		-1.447 Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>ατ</sub>** = 1.0 -0.0529 (S) -0.0437 (S)<sup>2</sup>  
**K<sub>ατ</sub>** = 1.0 (S) (Linear Fit)

**Model Tested:** FW-48

**Test Fluid:** Water

**Test Flow Rate:** 284 ml/s 4.50 gpm

**REMARKS:** Tests conducted outdoors.

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Solahart Industries  
101 Bell Road  
Montgomery, AL 36117

**MODEL:** Solahart Bt  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2004-007A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	34	25	17	A (-9°F)	32	24	17
B (5°C)	30	22	14	B (9°F)	28	21	13
C (20°C)	24	17	9	C (36°F)	23	16	8
D (50°C)	15	8	2	D (90°F)	14	8	2
E (80°C)	8	2		E (144°F)	7	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 28, 2004

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.983 m<sup>2</sup> 21.35 ft<sup>2</sup>  
**Dry Weight:** 31.5 kg 69 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.870 m<sup>2</sup> 20.13 ft<sup>2</sup>  
**Fluid Capacity:** 2.3 l 0.6 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Titanium oxide  
**Insulation (Side):** Polyester wool  
**Insulation (Back):** Glasswool

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	37	0.15
50	0.79	136	0.54
80	1.27	289	1.16

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.753</b>	<b>-5.2917 (P)/I</b>	<b>+0.0064 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.75	-4.8668	W/m <sup>2</sup> ·°C
	<b>I P Units:</b>	<b>η = 0.753</b>	<b>-0.9325 (P)/I</b>	<b>0.0000 (P)<sup>2</sup>/I</b>	0.75	-0.858	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.1429 (S) -0.2362 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 +0.10 (S) (Linear Fit)

**Model Tested:** Bt  
**Test Fluid:** Water  
**Test Flow Rate:** 37 ml/s 0.59 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Solahart Industries  
101 Bell Road  
Montgomery, AL 36117

**MODEL:** Solahart J  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2000-002A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	32	25	17	A (-9°F)	31	23	16
B (5°C)	29	21	13	B (9°F)	27	20	13
C (20°C)	23	15	8	C (36°F)	22	14	7
D (50°C)	9	3		D (90°F)	9	3	
E (80°C)				E (144°F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: October 16, 2000

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.983 m<sup>2</sup> 21.35 ft<sup>2</sup>  
**Dry Weight:** 40.6 kg 90 lb  
**Test Pressure:** 179 kPa 26 psig

**Net Aperture Area:** 1.867 m<sup>2</sup> 20.10 ft<sup>2</sup>  
**Fluid Capacity:** 3.6 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - None / Plate - Steel  
**Absorber Coating:** Polyester Flat Black Paint  
**Insulation (Side):** Polyester  
**Insulation (Back):** Polyester

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	73	0.29
50	0.79	312	1.25
80	1.27	656	2.63

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.737</b>	<b>-4.4193 (P)/I</b>	<b>-0.0503 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.7724	-8.36	W/m <sup>2</sup> ·°C
	<b>I P Units:</b>	<b>η = 0.737</b>	<b>-0.7788 (P)/I</b>	<b>-0.0049 (P)<sup>2</sup>/I</b>	0.7724	-1.473	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1395 (S) +0.0127 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.13 (S) (Linear Fit)

**Model Tested:** J  
**Test Fluid:** Water  
**Test Flow Rate:** 37 ml/s 0.59 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Solahart Industries  
101 Bell Road  
Montgomery, AL 36117

**MODEL:** Solahart Kf  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2004-002A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	31	24	16	A (-9°F)	30	22	15
B (5°C)	29	21	14	B (9°F)	27	20	13
C (20°C)	24	17	9	C (36°F)	23	16	9
D (50°C)	14	8	2	D (90°F)	14	7	2
E (80°C)	5			E (144°F)	4		

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: March 5, 2004

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.983 m<sup>2</sup> 21.35 ft<sup>2</sup>  
**Dry Weight:** 40.6 kg 90 lb  
**Test Pressure:** 179 kPa 26 psig

**Net Aperture Area:** 1.867 m<sup>2</sup> 20.10 ft<sup>2</sup>  
**Fluid Capacity:** 3.6 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - None / Plate - Steel  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Glasswool  
**Insulation (Back):** Glasswool

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	56	0.22
50	0.79	243	0.98
80	1.27	570	2.29

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>
<b>S I Units:</b> $\eta = 0.731 - 3.0411 (P)/I - 0.0325 (P)^2/I$	0.759	-5.93 W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.731 - 0.5359 (P)/I - 0.0032 (P)^2/I$	0.759	-1.045 Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1798 (S) +0.0214 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.16 (S) (Linear Fit)

**Model Tested:** K  
**Test Fluid:** Water  
**Test Flow Rate:** 37 ml/s 0.59 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Solahart Industries  
101 Bell Road  
Montgomery, AL 36117

**MODEL:** Solahart L  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2000-004A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	27	20	14	A (-9°F)	25	19	13
B (5°C)	23	16	10	B (9°F)	21	15	9
C (20°C)	16	10	4	C (36°F)	15	10	4
D (50°C)	5	1		D (90°F)	5	1	
E (80°C)				E (144°F)			

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: October 16, 2000

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.983 m<sup>2</sup> 21.35 ft<sup>2</sup>  
**Dry Weight:** 31.4 kg 69 lb  
**Test Pressure:** 1104 kPa 160 psig

**Net Aperture Area:** 1.867 m<sup>2</sup> 20.10 ft<sup>2</sup>  
**Fluid Capacity:** 2.2 l 0.6 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Aluminum  
**Absorber Coating:** Polyester Flat Black Paint  
**Insulation (Side):** Polyester  
**Insulation (Back):** Polyester

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	52	0.21
50	0.79	283	1.14
80	1.27	706	2.83

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>
<b>S I Units:</b> $\eta = 0.608 - 5.4707 (P)/I - 0.0271 (P)^2/I$	0.625	-7.47 W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.608 - 0.9641 (P)/I - 0.0027 (P)^2/I$	0.625	-1.316 Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1718 (S) -0.0580 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.23 (S) (Linear Fit)

**Model Tested:** L  
**Test Fluid:** Water  
**Test Flow Rate:** 37 ml/s 0.59 gpm


**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<b>SOLAR COLLECTOR CERTIFICATION AND RATING</b>    <b>SRCC OG-100</b>	<b><u>CERTIFIED SOLAR COLLECTOR</u></b>  <b>SUPPLIER: Solahart Industries</b> 101 Bell Road Montgomery, AL 36117  <b>MODEL: Solahart M</b> <b>COLLECTOR TYPE: Glazed Flat-Plate</b> <b>CERTIFICATION #: 100-2000-005A</b>
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
<b>CATEGORY (Ti-Ta)</b>	<b>CLEAR DAY 23 MJ/m<sup>2</sup>·d</b>	<b>MILDLY CLOUDY 17 MJ/m<sup>2</sup>·d</b>	<b>CLOUDY DAY 11 MJ/m<sup>2</sup>·d</b>	<b>CATEGORY (Ti-Ta)</b>	<b>CLEAR DAY 2000 Btu/ft<sup>2</sup>·d</b>	<b>MILDLY CLOUDY 1500 Btu/ft<sup>2</sup>·d</b>	<b>CLOUDY DAY 1000 Btu/ft<sup>2</sup>·d</b>
A (-5°C)	28	21	14	A (-9°F)	26	20	14
B (5°C)	24	18	11	B (9°F)	23	17	11
C (20°C)	20	13	7	C (36°F)	19	13	6
D (50°C)	11	6	1	D (90°F)	11	5	1
E (80°C)	5	1		E (144°F)	4	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: April 18, 2000

### COLLECTOR SPECIFICATIONS

**Gross Area:** 1.983 m<sup>2</sup> 21.35 ft<sup>2</sup>  
**Dry Weight:** 31.5 kg 69 lb  
**Test Pressure:** 1104 kPa 160 psig

**Net Aperture Area:** 1.867 m<sup>2</sup> 20.10 ft<sup>2</sup>  
**Fluid Capacity:** 2.2 l 0.6 gal

### COLLECTOR MATERIALS

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyester  
**Insulation (Back):** Polyester

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
<b>ml/s</b>	<b>gpm</b>	<b>Pa</b>	<b>in H<sub>2</sub>O</b>
20	0.32	51	0.20
50	0.79	245	0.98
80	1.27	594	2.38

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.621</b>	<b>-4.1009 (P)/I</b>	<b>-0.0060 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.625	-4.53	W/m <sup>2</sup> ·°C
					0.625	-0.798	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1194 (S) -0.0121 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.13 (S) (Linear Fit)

**Model Tested:** M  
**Test Fluid:** Water  
**Test Flow Rate:** 37 ml/s 0.59 gpm

### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Solar Development, Inc.  
PO Box 13139  
North Palm Beach, FL 33408

**MODEL:** Solar Development SD8-21  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2006-042A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	29	22	15	A (-9°F)	27	20	14
B (5°C)	26	19	12	B (9°F)	25	18	11
C (20°C)	22	15	8	C (36°F)	21	14	8
D (50°C)	13	7	2	D (90°F)	12	7	1
E (80°C)	5	1		E (144°F)	5	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: December 13, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.931 m<sup>2</sup> 20.79 ft<sup>2</sup>  
**Dry Weight:** 33.6 kg 74 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.783 m<sup>2</sup> 19.19 ft<sup>2</sup>  
**Fluid Capacity:** 3.0 l 0.8 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	18	0.07
50	0.79	116	0.47
80	1.27	301	1.21

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η =</b>	<b>0.691</b>	<b>-3.3960 (P)/I</b>	<b>-0.0197 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
						0.706	-4.9099	W/m <sup>2</sup> ·°C
						0.706	-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1939 (S) -0.0055 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.20 (S) (Linear Fit)

**Model Tested:** 100-2002-001A

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.62 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Solar Development, Inc.  
PO Box 13139  
North Palm Beach, FL 33408

**MODEL:** Solar Development SD8-26  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2006-042C

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	35	26	18	A (-9°F)	33	25	17
B (5°C)	32	23	15	B (9°F)	30	22	14
C (20°C)	27	18	10	C (36°F)	25	17	9
D (50°C)	16	8	2	D (90°F)	15	8	2
E (80°C)	6	1		E (144°F)	6	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: December 13, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.355 m<sup>2</sup> 25.35 ft<sup>2</sup>  
**Dry Weight:** 40.8 kg 90 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.197 m<sup>2</sup> 23.65 ft<sup>2</sup>  
**Fluid Capacity:** 3.8 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.691</b>	<b>-3.3960 (P)/I</b>	<b>-0.0197 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.706	-4.9099	W/m <sup>2</sup> ·°C
					0.706	-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1939 (S) -0.0055 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.20 (S) (Linear Fit)

**Model Tested:** 100-2002-001A

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.62 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Solar Development, Inc.  
PO Box 13139  
North Palm Beach, FL 33408

**MODEL:** Solar Development SD8-28  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2006-042D

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	39	29	20	A (-9°F)	37	28	19
B (5°C)	35	26	16	B (9°F)	33	24	15
C (20°C)	29	20	11	C (36°F)	28	19	10
D (50°C)	18	9	2	D (90°F)	17	9	2
E (80°C)	7	1		E (144°F)	6	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: December 13, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.599 m<sup>2</sup> 27.98 ft<sup>2</sup>  
**Dry Weight:** 44.9 kg 99 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.430 m<sup>2</sup> 26.16 ft<sup>2</sup>  
**Fluid Capacity:** 4.2 l 1.1 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.691$	$-3.3960 (P)/I$	$-0.0197 (P)^2/I$	<b>Y Intercept</b>	0.706	<b>Slope</b>	-4.9099	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.691$	$-0.5985 (P)/I$	$-0.0019 (P)^2/I$		0.706		-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

$K_{arr} = 1.0$  -0.1939 (S) -0.0055 (S)<sup>2</sup>  
 $K_{arr} = 1.0$  -0.20 (S) (Linear Fit)

**Model Tested:** 100-2002-001A

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.62 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Solar Development, Inc.  
PO Box 13139  
North Palm Beach, FL 33408

**MODEL:** Solar Development SD8-32  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2006-042E

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	44	33	23	A (-9°F)	42	31	21
B (5°C)	40	29	19	B (9°F)	38	28	18
C (20°C)	33	23	13	C (36°F)	32	22	12
D (50°C)	20	11	2	D (90°F)	19	10	2
E (80°C)	8	1		E (144°F)	7	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: December 13, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.965 m<sup>2</sup> 31.92 ft<sup>2</sup>  
**Dry Weight:** 51.2 kg 113 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.781 m<sup>2</sup> 29.94 ft<sup>2</sup>  
**Fluid Capacity:** 4.9 l 1.3 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	$\eta = 0.691$	$-3.3960 (P)/I$	$-0.0197 (P)^2/I$	<b>Y Intercept</b>	<b>Slope</b>	
					0.706	-4.9099	W/m <sup>2</sup> ·°C
					0.706	-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1939 (S) -0.0055 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.20 (S) (Linear Fit)

**Model Tested:** 100-2002-001A

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.62 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Solar Development, Inc.  
PO Box 13139  
North Palm Beach, FL 33408

**MODEL:** Solar Development SD8-40  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2006-042F

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	55	41	28	A (-9°F)	52	39	27
B (5°C)	50	36	23	B (9°F)	47	35	22
C (20°C)	42	29	16	C (36°F)	40	27	15
D (50°C)	25	13	3	D (90°F)	24	13	3
E (80°C)	10	1		E (144°F)	9	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: December 13, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.696 m<sup>2</sup> 39.78 ft<sup>2</sup>  
**Dry Weight:** 69.4 kg 153 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 3.481 m<sup>2</sup> 37.47 ft<sup>2</sup>  
**Fluid Capacity:** 6.1 l 1.6 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η =</b>	<b>0.691</b>	<b>-3.3960 (P)/I</b>	<b>-0.0197 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
						0.706	-4.9099	W/m <sup>2</sup> ·°C
						0.706	-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1939 (S) -0.0055 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.20 (S) (Linear Fit)

**Model Tested:** 100-2002-001A

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.62 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
SUPPLIER: **Solar Energy, Inc.**

5191 Shawland Rd.

Jacksonville, FL 32254

MODEL: SE-21

COLLECTOR TYPE: Glazed Flat-Plate

CERTIFICATION #: 100-2005-013A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	31	24	16	A (-9°F)	30	22	15
B (5°C)	28	21	13	B (9°F)	27	20	12
C (20°C)	24	16	9	C (36°F)	22	15	8
D (50°C)	15	8	2	D (90°F)	14	8	2
E (80°C)	7	1		E (144°F)	6	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: November 15, 2005

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.032 m<sup>2</sup> 21.87 ft<sup>2</sup>  
**Dry Weight:** 40.8 kg 90 lb  
**Test Pressure:** 552 kPa 80 psig

**Net Aperture Area:** 1.875 m<sup>2</sup> 20.18 ft<sup>2</sup>  
**Fluid Capacity:** 2.8 l 0.7 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyurethane Foam  
**Insulation (Back):** Polyurethane Foam

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	22	0.09
50	0.79	119	0.48
80	1.27	294	1.18

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.698$	$-3.7428 (P)/I$	$-0.0125 (P)^2/I$	<b>Y Intercept</b>	0.704	<b>Slope</b>	-4.4855	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.698$	$-0.6596 (P)/I$	$-0.0012 (P)^2/I$		0.704		-0.790	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0701 (S) -0.0957 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.17 (S) (Linear Fit)

**Model Tested:** SE-21**Test Fluid:** Water**Test Flow Rate:** 38 ml/s 0.59 gpm
**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: Solar Energy, Inc.**

5191 Shawland Rd.

Jacksonville, FL 32254

**MODEL: SE-24**
**COLLECTOR TYPE: Glazed Flat-Plate**
**CERTIFICATION #: 100-2005-013B**
**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	36	27	18	A (-9°F)	34	26	17
B (5°C)	32	23	15	B (9°F)	30	22	14
C (20°C)	27	18	10	C (36°F)	25	17	9
D (50°C)	17	9	2	D (90°F)	16	9	2
E (80°C)	7	2		E (144°F)	7	2	

**A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning**

Original Certification Date: November 15, 2005

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.312 m<sup>2</sup> 24.89 ft<sup>2</sup>  
**Dry Weight:** 46.3 kg 102 lb  
**Test Pressure:** 552 kPa 80 psig

**Net Aperture Area:** 2.163 m<sup>2</sup> 23.28 ft<sup>2</sup>  
**Fluid Capacity:** 3.3 l 0.9 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyurethane Foam  
**Insulation (Back):** Polyurethane Foam

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.698 - 3.7428 (P)/I - 0.0125 (P)^2/I$	0.704	-4.4855	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.698 - 0.6596 (P)/I - 0.0012 (P)^2/I$	0.704	-0.790	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0701 (S) -0.0957 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.17 (S) (Linear Fit)

**Model Tested:** SE-21

**Test Fluid:** Water

**Test Flow Rate:** 38 ml/s 0.59 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: Solar Energy, Inc.**

5191 Shawland Rd.

Jacksonville, FL 32254

**MODEL: SE-28**
**COLLECTOR TYPE: Glazed Flat-Plate**
**CERTIFICATION #: 100-2005-013C**
**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	39	29	20	A (-9°F)	37	28	19
B (5°C)	35	25	16	B (9°F)	33	24	15
C (20°C)	29	20	11	C (36°F)	28	19	10
D (50°C)	18	10	2	D (90°F)	17	9	2
E (80°C)	8	2		E (144°F)	8	2	

**A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning**

Original Certification Date: November 15, 2005

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.511 m<sup>2</sup> 27.03 ft<sup>2</sup>  
**Dry Weight:** 49.4 kg 109 lb  
**Test Pressure:** 552 kPa 80 psig

**Net Aperture Area:** 2.366 m<sup>2</sup> 25.47 ft<sup>2</sup>  
**Fluid Capacity:** 3.2 l 0.8 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyurethane Foam  
**Insulation (Back):** Polyurethane Foam

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.698 - 3.7428 (P)/I - 0.0125 (P)^2/I$	0.704	-4.4855	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.698 - 0.6596 (P)/I - 0.0012 (P)^2/I$	0.704	-0.790	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0701 (S) -0.0957 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.17 (S) (Linear Fit)

**Model Tested:** SE-21

**Test Fluid:** Water

**Test Flow Rate:** 38 ml/s 0.59 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: Solar Energy, Inc.**

5191 Shawland Rd.

Jacksonville, FL 32254

**MODEL: SE-32**
**COLLECTOR TYPE: Glazed Flat-Plate**
**CERTIFICATION #: 100-2005-013D**
**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	44	33	23	A (-9°F)	42	32	22
B (5°C)	40	29	18	B (9°F)	38	28	17
C (20°C)	33	23	12	C (36°F)	32	22	12
D (50°C)	21	11	3	D (90°F)	20	11	3
E (80°C)	9	2		E (144°F)	9	2	

**A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning**

Original Certification Date: November 15, 2005

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.868 m<sup>2</sup> 30.87 ft<sup>2</sup>  
**Dry Weight:** 56.2 kg 124 lb  
**Test Pressure:** 552 kPa 80 psig

**Net Aperture Area:** 2.709 m<sup>2</sup> 29.16 ft<sup>2</sup>  
**Fluid Capacity:** 3.8 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyurethane Foam  
**Insulation (Back):** Polyurethane Foam

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.698 - 3.7428 (P)/I - 0.0125 (P)^2/I$	0.704	-4.4855	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.698 - 0.6596 (P)/I - 0.0012 (P)^2/I$	0.704	-0.790	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0701 (S) -0.0957 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.17 (S) (Linear Fit)

**Model Tested:** SE-21

**Test Fluid:** Water

**Test Flow Rate:** 38 ml/s 0.59 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: Solar Energy, Inc.**

5191 Shawland Rd.

Jacksonville, FL 32254

**MODEL: SE-40**
**COLLECTOR TYPE: Glazed Flat-Plate**
**CERTIFICATION #: 100-2005-013E**
**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	55	42	28	A (-9°F)	52	40	27
B (5°C)	50	36	23	B (9°F)	47	34	22
C (20°C)	42	29	15	C (36°F)	39	27	15
D (50°C)	26	14	3	D (90°F)	24	13	3
E (80°C)	12	2		E (144°F)	11	2	

**A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning**

Original Certification Date: November 15, 2005

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.582 m<sup>2</sup> 38.56 ft<sup>2</sup>  
**Dry Weight:** 69.9 kg 154 lb  
**Test Pressure:** 552 kPa 80 psig

**Net Aperture Area:** 3.396 m<sup>2</sup> 36.56 ft<sup>2</sup>  
**Fluid Capacity:** 4.4 l 1.2 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyurethane Foam  
**Insulation (Back):** Polyurethane Foam

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.698 - 3.7428 (P)/I - 0.0125 (P)^2/I$	0.704	-4.4855	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.698 - 0.6596 (P)/I - 0.0012 (P)^2/I$	0.704	-0.790	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0701 (S) -0.0957 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.17 (S) (Linear Fit)

**Model Tested:** SE-21

**Test Fluid:** Water

**Test Flow Rate:** 38 ml/s 0.59 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Solar Mining Company  
826 Vanderbraak Street  
Green Bay, WI 54308

**MODEL:** SMC/AET 26  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2006-020A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	35	26	18	A (-9°F)	33	25	17
B (5°C)	32	23	15	B (9°F)	30	22	14
C (20°C)	27	18	10	C (36°F)	25	17	9
D (50°C)	16	8	2	D (90°F)	15	8	2
E (80°C)	6	1		E (144°F)	6	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: August 9, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.355 m<sup>2</sup> 25.35 ft<sup>2</sup>  
**Dry Weight:** 40.8 kg 90 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.197 m<sup>2</sup> 23.65 ft<sup>2</sup>  
**Fluid Capacity:** 3.8 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.691 - 3.3960 (P)/I - 0.0197 (P)^2/I$	0.706	-4.9099	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.691 - 0.5985 (P)/I - 0.0019 (P)^2/I$	0.706	-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1939 (S) -0.0055 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.20 (S) (Linear Fit)

**Model Tested:** 100-2002-001A

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.62 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Solar Mining Company  
826 Vanderbraak Street  
Green Bay, WI 54308

**MODEL:** SMC/AET 32  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2006-020B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	44	33	23	A (-9°F)	42	31	21
B (5°C)	40	29	19	B (9°F)	38	28	18
C (20°C)	33	23	13	C (36°F)	32	22	12
D (50°C)	20	11	2	D (90°F)	19	10	2
E (80°C)	8	1		E (144°F)	7	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: August 9, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.965 m<sup>2</sup> 31.92 ft<sup>2</sup>  
**Dry Weight:** 51.2 kg 113 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.781 m<sup>2</sup> 29.94 ft<sup>2</sup>  
**Fluid Capacity:** 4.9 l 1.3 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.691 - 3.3960 (P)/I - 0.0197 (P)^2/I$	0.706	-4.9099	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.691 - 0.5985 (P)/I - 0.0019 (P)^2/I$	0.706	-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1939 (S) -0.0055 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.20 (S) (Linear Fit)

**Model Tested:** 100-2002-001A

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.62 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: Solar Mining Company**

 826 Vanderbraak Street  
Green Bay, WI 54308

**MODEL: SMC/AET 40**
**COLLECTOR TYPE: Glazed Flat-Plate**
**CERTIFICATION #: 100-2006-020C**
**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	55	41	28	A (-9°F)	52	39	27
B (5°C)	50	36	23	B (9°F)	47	35	22
C (20°C)	42	29	16	C (36°F)	40	27	15
D (50°C)	25	13	3	D (90°F)	24	13	3
E (80°C)	10	1		E (144°F)	9	1	

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: August 9, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.696 m<sup>2</sup> 39.78 ft<sup>2</sup>  
**Dry Weight:** 69.4 kg 153 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 3.481 m<sup>2</sup> 37.47 ft<sup>2</sup>  
**Fluid Capacity:** 6.1 l 1.6 gal

**COLLECTOR MATERIALS**

**Frame:** Anodized Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<u>Y Intercept</u>	<u>Slope</u>	
<b>S I Units:</b> $\eta = 0.691 - 3.3960 (P)/I - 0.0197 (P)^2/I$	0.706	-4.9099	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.691 - 0.5985 (P)/I - 0.0019 (P)^2/I$	0.706	-0.865	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1939 (S) -0.0055 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.20 (S) (Linear Fit)

**Model Tested:** 100-2002-001A

**Test Fluid:** Water

**Test Flow Rate:** 39 ml/s 0.62 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** Solargenix Energy, LLC  
2101 Westinghouse Blvd, Ste 115  
Raleigh, NC 27604

**MODEL:** Winston Series CPC WS0503  
**COLLECTOR TYPE:** Tubular  
**CERTIFICATION #:** 100-2005-003A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	29	22	15	A (-9°F)	28	21	15
B (5°C)	25	18	11	B (9°F)	24	17	11
C (20°C)	19	13	6	C (36°F)	18	12	6
D (50°C)	10	3		D (90°F)	9	3	
E (80°C)	1			E (144°F)	1		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: July 28, 2005

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.239 m<sup>2</sup> 24.10 ft<sup>2</sup>  
**Dry Weight:** 48.5 kg 107 lb  
**Test Pressure:** 827 kPa 120 psig

**Net Aperture Area:** 2.091 m<sup>2</sup> 22.51 ft<sup>2</sup>  
**Fluid Capacity:** 9.6 l 2.5 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - None  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyurethane Foam  
**Insulation (Back):** Polyurethane Foam

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	13	0.05
50	0.79	90	0.36
80	1.27	235	0.94

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.591</b>	<b>-4.5502 (P)/I</b>	<b>-0.0189 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
	<b>I P Units:</b>	<b>η = 0.591</b>	<b>-0.8019 (P)/I</b>	<b>-0.0019 (P)<sup>2</sup>/I</b>	<b>0.6</b>	<b>-5.679</b>	<b>W/m<sup>2</sup>·°C</b>
					<b>0.6</b>	<b>-1.001</b>	<b>Btu/hr·ft<sup>2</sup>·°F</b>

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = (S) (S)<sup>2</sup>  
**K<sub>arr</sub>** = (S) (Linear Fit)

**Model Tested:** WS0503

**Test Fluid:** Water

**Test Flow Rate:** 41 ml/s 0.65 gpm

**REMARKS:** Collector tested with long axis of the reflectors oriented north-south. IAM perpendicular to the reflectors is listed above. IAM parallel to the reflectors = 1.0 - 0.16(S)

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
SUPPLIER: **Solene**927 Fern Street Suite 1500  
Altamont Springs, FL 32701

MODEL: Solene-Corona SLCO-30

COLLECTOR TYPE: Glazed Flat-Plate

CERTIFICATION #: 100-2006-045A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	37	28	19	A (-9°F)	35	27	18
B (5°C)	33	24	15	B (9°F)	32	23	15
C (20°C)	28	19	10	C (36°F)	27	18	10
D (50°C)	18	10	3	D (90°F)	17	9	3
E (80°C)	10	3		E (144°F)	9	3	

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: October 20, 2006

**COLLECTOR SPECIFICATIONS**

Gross Area: 2.278 m<sup>2</sup> 24.52 ft<sup>2</sup>  
 Dry Weight: 35.3 kg 78 lb  
 Test Pressure: 1103 kPa 160 psig

Net Aperture Area: 2.179 m<sup>2</sup> 23.46 ft<sup>2</sup>  
 Fluid Capacity: 1.9 l 0.5 gal

**COLLECTOR MATERIALS**

Frame: Aluminum Extrusion  
 Cover (Outer): Low Iron Tempered Glass  
 Cover (Inner): None  
 Absorber Material: Tube - Copper / Plate - Copper Fin  
 Absorber Coating: Black Chrome  
 Insulation (Side): Polyisocyanurate  
 Insulation (Back): Polyisocyanurate

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	91	0.36
50	0.79	288	1.15
80	1.27	557	2.24

**TECHNICAL INFORMATION**

Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]

	<u>Y Intercept</u>	<u>Slope</u>
S I Units: $\eta = 0.779 - 4.2847 (P)/I - 0.0048 (P)^2/I$	0.782	-4.5996 W/m <sup>2</sup> ·°C
I P Units: $\eta = 0.779 - 0.7551 (P)/I - 0.0005 (P)^2/I$	0.782	-0.811 Btu/hr·ft <sup>2</sup> ·°F

Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]

$K_{arr} = 1.0 - 0.2947 (S) - 0.0119 (S)^2$   
 $K_{arr} = 1.0 - 0.31 (S)$  (Linear Fit)

Model Tested: SLCO-30

Test Fluid: Water

Test Flow Rate: 45 ml/s 0.71 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
SUPPLIER: **Solene**927 Fern Street Suite 1500  
Altamont Springs, FL 32701

MODEL: Solene-Corona SLCO-32

COLLECTOR TYPE: Glazed Flat-Plate

CERTIFICATION #: 100-2006-045B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	49	37	25	A (-9°F)	46	35	24
B (5°C)	44	32	20	B (9°F)	41	30	19
C (20°C)	36	25	13	C (36°F)	35	24	13
D (50°C)	24	13	4	D (90°F)	22	12	3
E (80°C)	13	4		E (144°F)	12	4	

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: October 20, 2006

**COLLECTOR SPECIFICATIONS**

Gross Area: 2.952 m<sup>2</sup> 31.78 ft<sup>2</sup>  
 Dry Weight: 48 kg 106 lb  
 Test Pressure: 1103 kPa 160 psig

Net Aperture Area: 2.836 m<sup>2</sup> 30.53 ft<sup>2</sup>  
 Fluid Capacity: 2.4 l 0.6 gal

**COLLECTOR MATERIALS**

Frame: Aluminum Extrusion  
 Cover (Outer): Low Iron Tempered Glass  
 Cover (Inner): None  
 Absorber Material: Tube - Copper / Plate - Copper Fin  
 Absorber Coating: Black Chrome  
 Insulation (Side): Polyisocyanurate  
 Insulation (Back): Polyisocyanurate

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]

	<u>Y Intercept</u>	<u>Slope</u>	
S I Units: $\eta = 0.782 - 4.2829 (P)/I - 0.0048 (P)^2/I$	0.785	-4.598	W/m <sup>2</sup> ·°C
I P Units: $\eta = 0.782 - 0.7548 (P)/I - 0.0005 (P)^2/I$	0.785	-0.810	Btu/hr·ft <sup>2</sup> ·°F

Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]

$K_{arr} = 1.0 - 0.2947 (S) - 0.0119 (S)^2$   
 $K_{arr} = 1.0 - 0.31 (S)$  (Linear Fit)

Model Tested: SLCO-30

Test Fluid: Water

Test Flow Rate: 45 ml/s 0.71 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
SUPPLIER: **Solene**927 Fern Street Suite 1500  
Altamont Springs, FL 32701

MODEL: Solene-Corona SLCO-40

COLLECTOR TYPE: Glazed Flat-Plate

CERTIFICATION #: 100-2006-045C

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	60	45	31	A (-9°F)	57	43	29
B (5°C)	53	39	24	B (9°F)	51	37	23
C (20°C)	45	30	16	C (36°F)	42	29	15
D (50°C)	29	16	4	D (90°F)	28	15	4
E (80°C)	16	5		E (144°F)	15	5	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: October 20, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.611 m<sup>2</sup> 38.87 ft<sup>2</sup>  
**Dry Weight:** 60 kg 132 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 3.478 m<sup>2</sup> 37.44 ft<sup>2</sup>  
**Fluid Capacity:** 2.6 l 0.7 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>
<b>S I Units:</b> $\eta = 0.784 - 4.2805 (P)/I - 0.0048 (P)^2/I$	0.787	-4.5961 W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.784 - 0.7543 (P)/I - 0.0005 (P)^2/I$	0.787	-0.810 Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.2947 (S) -0.0119 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.31 (S) (Linear Fit)

**Model Tested:** SLCO-30**Test Fluid:** Water**Test Flow Rate:** 45 ml/s 0.71 gpm
**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
SUPPLIER: **Solene**927 Fern Street Suite 1500  
Altamont Springs, FL 32701

MODEL: Solene/Chromagen SLCR-30

COLLECTOR TYPE: Glazed Flat-Plate

CERTIFICATION #: 100-2004-014A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	42	31	21	A (-9°F)	40	30	20
B (5°C)	40	29	19	B (9°F)	38	28	18
C (20°C)	35	24	14	C (36°F)	33	23	14
D (50°C)	21	12	3	D (90°F)	20	11	3
E (80°C)	6			E (144°F)	6		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: November 4, 2004

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.815 m<sup>2</sup> 30.30 ft<sup>2</sup>  
**Dry Weight:** 49.9 kg 110 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.608 m<sup>2</sup> 28.07 ft<sup>2</sup>  
**Fluid Capacity:** 2.7 l 0.7 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyurethane [Foil-faced]  
**Insulation (Back):** Mineral Wool & Polyurethane

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	93	0.37
50	0.79	345	1.38
80	1.27	732	2.94

**TECHNICAL INFORMATION**

Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]

	<u>Y Intercept</u>	<u>Slope</u>
<b>S I Units:</b> $\eta = 0.704 - 1.7983 (P)/I - 0.0470 (P)^2/I$	0.735	-5.365 W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.704 - 0.3169 (P)/I - 0.0046 (P)^2/I$	0.735	-0.945 Btu/hr·ft <sup>2</sup> ·°F

Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]

**K<sub>arr</sub>** = 1.0 -0.2011 (S) +0.0069 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.19 (S) (Linear Fit)

Model Tested: SLCR-30

Test Fluid: Water

Test Flow Rate: 52 ml/s 0.82 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
SUPPLIER: **Solene**927 Fern Street Suite 1500  
Altamont Springs, FL 32701

MODEL: Solene/Chromagen SLCR-32

COLLECTOR TYPE: Glazed Flat-Plate

CERTIFICATION #: 100-2004-014B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	44	33	22	A (-9°F)	42	31	21
B (5°C)	42	31	20	B (9°F)	40	29	19
C (20°C)	37	26	15	C (36°F)	35	25	14
D (50°C)	22	12	3	D (90°F)	21	12	3
E (80°C)	6			E (144°F)	6		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: November 4, 2004

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.971 m<sup>2</sup> 31.98 ft<sup>2</sup>  
**Dry Weight:** 49 kg 108 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.758 m<sup>2</sup> 29.69 ft<sup>2</sup>  
**Fluid Capacity:** 3.0 l 0.8 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyurethane [Foil-faced]  
**Insulation (Back):** Mineral Wool & Polyurethane

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.704$	$-1.7983 (P)/I$	$-0.0470 (P)^2/I$	<b>Y Intercept</b>	0.735	<b>Slope</b>	-5.365	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.704$	$-0.3169 (P)/I$	$-0.0046 (P)^2/I$		0.735		-0.945	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.2011 (S) +0.0069 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.19 (S) (Linear Fit)

**Model Tested:** SLCR-30**Test Fluid:** Water**Test Flow Rate:** 52 ml/s 0.82 gpm
**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
SUPPLIER: **Solene**927 Fern Street Suite 1500  
Altamont Springs, FL 32701

MODEL: Solene/Chromagen SLCR-40

COLLECTOR TYPE: Glazed Flat-Plate

CERTIFICATION #: 100-2004-014C

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	55	41	28	A (-9°F)	52	39	26
B (5°C)	53	39	25	B (9°F)	50	37	24
C (20°C)	46	32	19	C (36°F)	44	31	18
D (50°C)	28	15	4	D (90°F)	26	15	4
E (80°C)	8			E (144°F)	7		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: November 4, 2004

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.721 m<sup>2</sup> 40.05 ft<sup>2</sup>  
**Dry Weight:** 68.9 kg 152 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 3.469 m<sup>2</sup> 37.34 ft<sup>2</sup>  
**Fluid Capacity:** 3.8 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyurethane [Foil-faced]  
**Insulation (Back):** Mineral Wool & Polyurethane

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]

<b>S I Units:</b>	$\eta = 0.704$	$-1.7983 (P)/I$	$-0.0470 (P)^2/I$	<b>Y Intercept</b>	0.735	<b>Slope</b>	-5.365	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.704$	$-0.3169 (P)/I$	$-0.0046 (P)^2/I$		0.735		-0.945	Btu/hr·ft <sup>2</sup> ·°F

Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]

**K<sub>arr</sub>** = 1.0 -0.2011 (S) +0.0069 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.19 (S) (Linear Fit)

Model Tested: SLCR-30

Test Fluid: Water

Test Flow Rate: 52 ml/s 0.82 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

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SOLAR COLLECTOR  
CERTIFICATION AND RATING

SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

SUPPLIER: **Stiebel Eltron**  
17 West Street  
West Hatfield, MA 01088

MODEL: Stiebel Eltron Sol 25 Plus  
COLLECTOR TYPE: Glazed Flat-Plate  
CERTIFICATION #: 100-2005-016A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	41	31	21	A (-9°F)	39	29	20
B (5°C)	37	27	17	B (9°F)	35	26	16
C (20°C)	32	22	12	C (36°F)	30	21	12
D (50°C)	21	12	4	D (90°F)	20	11	3
E (80°C)	10	3		E (144°F)	10	3	

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: June 26, 2006

**COLLECTOR SPECIFICATIONS**

Gross Area: 2.734 m<sup>2</sup> 29.43 ft<sup>2</sup>  
Dry Weight: 48.9 kg 108 lb  
Test Pressure: 1103 kPa 160 psig

Net Aperture Area: 2.595 m<sup>2</sup> 27.93 ft<sup>2</sup>  
Fluid Capacity: 1.6 l 0.4 gal

**COLLECTOR MATERIALS**

Frame: Aluminum Extrusion  
Cover (Outer): Low Iron Tempered Glass  
Cover (Inner): None  
Absorber Material: Tube - Copper / Plate - Copper  
Absorber Coating: Sputtered titanium nitride  
Insulation (Side): Mineral Wool  
Insulation (Back): Mineral Wool

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	218	0.88
50	0.79	1145	4.60
80	1.27	2792	11.21

**TECHNICAL INFORMATION**

Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]

<b>S I Units:</b>	$\eta = 0.649$	$-3.1374 (P)/I$	$-0.0148 (P)^2/I$	<b>Y Intercept</b>	0.66	<b>Slope</b>	-4.287	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.649$	$-0.5529 (P)/I$	$-0.0014 (P)^2/I$		0.66		-0.755	Btu/hr·ft <sup>2</sup> ·°F

Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]

$K_{arr} = 1.0$  -0.2824 (S) -0.0111 (S)<sup>2</sup>  
 $K_{arr} = 1.0$  +0.27 (S) (Linear Fit)

Model Tested: Sol 25 Plus

Test Fluid: Water

Test Flow Rate: 55 ml/s 0.87 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunBank Solar  
PO Box 779  
Anderson, CA 96007

**MODEL:** SunBank SB10  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2006-016B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	12	9	6	A (-9°F)	11	9	6
B (5°C)	11	8	5	B (9°F)	10	7	5
C (20°C)	9	6	3	C (36°F)	8	6	3
D (50°C)	5	3	1	D (90°F)	5	3	1
E (80°C)	3	1		E (144°F)	3	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: October 12, 2006

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 0.933 m<sup>2</sup> 10.04 ft<sup>2</sup>  
**Dry Weight:** 8.6 kg 19 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 0.847 m<sup>2</sup> 9.12 ft<sup>2</sup>  
**Fluid Capacity:** 0.6 l 0.2 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Lexan Polycarbonate  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	$\eta = 0.603$	$-3.8665 (P)/I$	$+0.0015 (P)^2/I$	<b>Y Intercept</b>	<b>Slope</b>	
					0.602	-3.764	W/m <sup>2</sup> ·°C
					0.602	-0.663	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

$K_{arr} = 1.0$  -0.1944 (S) -0.0186 (S)<sup>2</sup>  
 $K_{arr} = 1.0$  -0.21 (S) (Linear Fit)

**Model Tested:** 100-2001-002A

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.50 gpm


**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<b>SOLAR COLLECTOR CERTIFICATION AND RATING</b>    <b>SRCC OG-100</b>	<b><u>CERTIFIED SOLAR COLLECTOR</u></b>  <b>SUPPLIER: SunBank Solar</b> PO Box 779 Anderson, CA 96007  <b>MODEL: SunBank SB20</b> <b>COLLECTOR TYPE: Glazed Flat-Plate</b> <b>CERTIFICATION #: 100-2006-016A</b>
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COLLECTOR THERMAL PERFORMANCE RATING							
Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	24	18	13	A (-9°F)	23	17	12
B (5°C)	21	16	10	B (9°F)	20	15	9
C (20°C)	18	12	6	C (36°F)	17	11	6
D (50°C)	11	6	1	D (90°F)	11	6	1
E (80°C)	6	2		E (144°F)	6	2	

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: June 2, 2006

### COLLECTOR SPECIFICATIONS

**Gross Area:** 1.865 m<sup>2</sup> 20.08 ft<sup>2</sup>  
**Dry Weight:** 17.2 kg 38 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.720 m<sup>2</sup> 18.51 ft<sup>2</sup>  
**Fluid Capacity:** 1.8 l 0.5 gal

### COLLECTOR MATERIALS

**Frame:** Aluminum  
**Cover (Outer):** Lexan Polycarbonate  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Selective Coating  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate

### PRESSURE DROP

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	1291	5.18
40	0.63	4663	18.72
60	0.95	9795	39.32

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.605</b>	<b>-3.8370 (P)/I</b>	<b>+0.0017 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.604	-3.73	W/m <sup>2</sup> ·°C
					0.604	-0.657	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1944 (S) -0.0186 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.21 (S) (Linear Fit)

**Model Tested:** 100-2001-002A

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.50 gpm

### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Empire EC-20  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-098A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	28	21	14	A (-9°F)	26	20	13
B (5°C)	25	19	12	B (9°F)	24	18	11
C (20°C)	22	15	8	C (36°F)	20	14	8
D (50°C)	15	8	3	D (90°F)	14	8	3
E (80°C)	8	3		E (144°F)	8	3	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 1, 1992

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.831 m<sup>2</sup> 19.71 ft<sup>2</sup>  
**Dry Weight:** 34 kg 75 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.607 m<sup>2</sup> 17.30 ft<sup>2</sup>  
**Fluid Capacity:** 2.4 l 0.6 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.702 - 3.2828 (P)/I - 0.0099 (P)^2/I$	0.714	-4.1279	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.702 - 0.5785 (P)/I - 0.0010 (P)^2/I$	0.714	-0.727	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0707 (S) -0.1687 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.25 (S) (Linear Fit)

**Model Tested:** EC-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.50 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Empire EC-21  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-0980

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	30	22	15	A (-9°F)	28	21	14
B (5°C)	27	20	13	B (9°F)	26	19	12
C (20°C)	23	16	9	C (36°F)	22	15	9
D (50°C)	16	9	3	D (90°F)	15	9	3
E (80°C)	9	3		E (144°F)	8	3	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: September 7, 1999

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.971 m<sup>2</sup> 21.22 ft<sup>2</sup>  
**Dry Weight:** 32 kg 71 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.734 m<sup>2</sup> 18.67 ft<sup>2</sup>  
**Fluid Capacity:** 2.7 l 0.7 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.702 - 3.2828 (P)/I - 0.0099 (P)^2/I$	0.714	-4.1279	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.702 - 0.5785 (P)/I - 0.0010 (P)^2/I$	0.714	-0.727	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0707 (S) -0.1687 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.25 (S) (Linear Fit)

**Model Tested:** EC-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.50 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Empire EC-24  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-098B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	35	26	18	A (-9°F)	33	25	17
B (5°C)	32	23	15	B (9°F)	30	22	14
C (20°C)	27	19	10	C (36°F)	26	18	10
D (50°C)	18	11	3	D (90°F)	17	10	3
E (80°C)	10	4		E (144°F)	10	3	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 1, 1992

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.290 m<sup>2</sup> 24.65 ft<sup>2</sup>  
**Dry Weight:** 36.7 kg 81 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.015 m<sup>2</sup> 21.69 ft<sup>2</sup>  
**Fluid Capacity:** 2.9 l 0.8 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	$\eta$	$\eta$	$(P)/I$	$(P)^2/I$	<u>Y Intercept</u>	<u>Slope</u>	
<b>S I Units:</b>	0.702	-3.2828	$(P)/I$	-0.0099 $(P)^2/I$	0.7135	-4.1279	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	0.702	-0.5785	$(P)/I$	-0.0010 $(P)^2/I$	0.7135	-0.727	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

$K_{arr} = 1.0$  -0.0707 (S) -0.1687 (S)<sup>2</sup>  
 $K_{arr} = 1.0$  -0.25 (S) (Linear Fit)

**Model Tested:** EC-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.51 gpm

**REMARKS:**

January, 2007

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Empire EC-32  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-098C

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	46	35	24	A (-9°F)	44	33	22
B (5°C)	42	31	20	B (9°F)	40	29	19
C (20°C)	36	25	14	C (36°F)	34	24	13
D (50°C)	24	14	4	D (90°F)	23	13	4
E (80°C)	14	5		E (144°F)	13	4	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 1, 1992

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.051 m<sup>2</sup> 32.84 ft<sup>2</sup>  
**Dry Weight:** 47.6 kg 105 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.750 m<sup>2</sup> 29.60 ft<sup>2</sup>  
**Fluid Capacity:** 3.9 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.702$	$-3.2828 (P)/I$	$-0.0099 (P)^2/I$	<b>Y Intercept</b>	0.714	<b>Slope</b>	-4.1279	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.702$	$-0.5785 (P)/I$	$-0.0010 (P)^2/I$		0.714		-0.727	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

$K_{arr} = 1.0$     -0.0707 (S)    -0.1687 (S)<sup>2</sup>  
 $K_{arr} = 1.0$     -0.25 (S)    (Linear Fit)

**Model Tested:** EC-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s    0.51 gpm

**REMARKS:**

January, 2007

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


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**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Empire EC-40  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-098D

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	57	43	29	A (-9°F)	54	41	28
B (5°C)	52	38	24	B (9°F)	50	36	23
C (20°C)	45	31	17	C (36°F)	42	29	16
D (50°C)	30	17	5	D (90°F)	29	17	5
E (80°C)	17	6		E (144°F)	16	6	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 1, 1992

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.796 m<sup>2</sup> 40.86 ft<sup>2</sup>  
**Dry Weight:** 62.6 kg 138 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 3.445 m<sup>2</sup> 37.08 ft<sup>2</sup>  
**Fluid Capacity:** 4.5 l 1.2 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.702 - 3.2828 (P)/I - 0.0099 (P)^2/I$	0.714	-4.1279	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.702 - 0.5785 (P)/I - 0.0010 (P)^2/I$	0.714	-0.727	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0707 (S) -0.1687 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.25 (S) (Linear Fit)

**Model Tested:** EC-20  
**Test Fluid:** Water  
**Test Flow Rate:** 32 ml/s 0.51 gpm

**REMARKS:**

January, 2007

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Empire EP-20  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-098E

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	27	20	14	A (-9°F)	25	19	13
B (5°C)	24	18	11	B (9°F)	23	17	11
C (20°C)	21	14	8	C (36°F)	19	13	7
D (50°C)	13	7	2	D (90°F)	12	7	2
E (80°C)	6	1		E (144°F)	6	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 1, 1992

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.831 m<sup>2</sup> 19.71 ft<sup>2</sup>  
**Dry Weight:** 29.5 kg 65 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.607 m<sup>2</sup> 17.30 ft<sup>2</sup>  
**Fluid Capacity:** 2.4 l 0.6 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.666 - 3.3563 (P)/I - 0.0138 (P)^2/I$	0.682	-4.5392	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.666 - 0.5915 (P)/I - 0.0014 (P)^2/I$	0.682	-0.800	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0045 (S) -0.2088 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.21 (S) (Linear Fit)

**Model Tested:** EP-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.50 gpm

**REMARKS:**

January, 2007

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Empire EP-21  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-098P

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	29	22	15	A (-9°F)	27	21	14
B (5°C)	26	19	12	B (9°F)	25	18	12
C (20°C)	22	15	8	C (36°F)	21	14	8
D (50°C)	14	8	2	D (90°F)	13	7	2
E (80°C)	6	1		E (144°F)	6	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: September 7, 1999

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.971 m<sup>2</sup> 21.22 ft<sup>2</sup>  
**Dry Weight:** 32 kg 71 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.734 m<sup>2</sup> 18.67 ft<sup>2</sup>  
**Fluid Capacity:** 2.7 l 0.7 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.666 - 3.3563 (P)/I - 0.0138 (P)^2/I$	0.682	-4.5392	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.666 - 0.5915 (P)/I - 0.0014 (P)^2/I$	0.682	-0.800	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0045 (S) -0.2088 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.21 (S) (Linear Fit)

**Model Tested:** EP-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.50 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Empire EP-24  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-098F

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	34	25	17	A (-9°F)	32	24	16
B (5°C)	30	22	14	B (9°F)	29	21	13
C (20°C)	26	18	10	C (36°F)	24	17	9
D (50°C)	16	9	2	D (90°F)	15	9	2
E (80°C)	7	2		E (144°F)	7	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 1, 1992

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.290 m<sup>2</sup> 24.65 ft<sup>2</sup>  
**Dry Weight:** 36.3 kg 80 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.015 m<sup>2</sup> 21.69 ft<sup>2</sup>  
**Fluid Capacity:** 2.9 l 0.8 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.666 - 3.3563 (P)/I - 0.0138 (P)^2/I$	0.682	-4.5392	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.666 - 0.5915 (P)/I - 0.0014 (P)^2/I$	0.682	-0.800	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0045 (S) -0.2088 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.21 (S) (Linear Fit)

**Model Tested:** EP-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.51 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Empire EP-32  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-098G

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	45	34	23	A (-9°F)	42	32	22
B (5°C)	41	30	19	B (9°F)	38	28	18
C (20°C)	34	24	13	C (36°F)	32	22	12
D (50°C)	22	12	3	D (90°F)	20	11	3
E (80°C)	10	2		E (144°F)	9	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 1, 1992

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.051 m<sup>2</sup> 32.84 ft<sup>2</sup>  
**Dry Weight:** 47.6 kg 105 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.750 m<sup>2</sup> 29.60 ft<sup>2</sup>  
**Fluid Capacity:** 3.9 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.666 - 3.3563 (P)/I - 0.0138 (P)^2/I$	0.682	-4.5392	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.666 - 0.5915 (P)/I - 0.0014 (P)^2/I$	0.682	-0.800	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0045 (S) -0.2088 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.21 (S) (Linear Fit)

**Model Tested:** EP-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.51 gpm

**REMARKS:**

January, 2007

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Empire EP-40  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-098H

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	56	42	28	A (-9°F)	53	40	27
B (5°C)	51	37	23	B (9°F)	48	35	22
C (20°C)	43	29	16	C (36°F)	40	28	15
D (50°C)	27	15	4	D (90°F)	25	14	4
E (80°C)	12	3		E (144°F)	12	3	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 1, 1992

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.796 m<sup>2</sup> 40.86 ft<sup>2</sup>  
**Dry Weight:** 62.6 kg 138 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 3.445 m<sup>2</sup> 37.08 ft<sup>2</sup>  
**Fluid Capacity:** 4.5 l 1.2 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.666 - 3.3563 (P)/I - 0.0138 (P)^2/I$	0.682	-4.5392	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.666 - 0.5915 (P)/I - 0.0014 (P)^2/I$	0.682	-0.800	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0045 (S) -0.2088 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.21 (S) (Linear Fit)

**Model Tested:** EP-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.51 gpm

**REMARKS:**

January, 2007

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Imperial IC-24  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-098I

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	35	26	18	A (-9°F)	33	25	17
B (5°C)	32	23	15	B (9°F)	30	22	14
C (20°C)	27	19	10	C (36°F)	26	18	10
D (50°C)	18	11	3	D (90°F)	17	10	3
E (80°C)	10	4		E (144°F)	10	3	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 1, 1992

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.301 m<sup>2</sup> 24.77 ft<sup>2</sup>  
**Dry Weight:** 36.7 kg 81 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.015 m<sup>2</sup> 21.69 ft<sup>2</sup>  
**Fluid Capacity:** 2.9 l 0.8 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.702 - 3.2828 (P)/I - 0.0099 (P)^2/I$	0.714	-4.1279	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.702 - 0.5785 (P)/I - 0.0010 (P)^2/I$	0.714	-0.727	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0707 (S) -0.1687 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.25 (S) (Linear Fit)

**Model Tested:** EC-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.51 gpm

**REMARKS:**

January, 2007

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Imperial IC-32  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-098J

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	46	35	24	A (-9°F)	44	33	22
B (5°C)	42	31	20	B (9°F)	40	29	19
C (20°C)	36	25	14	C (36°F)	34	24	13
D (50°C)	24	14	4	D (90°F)	23	13	4
E (80°C)	14	5		E (144°F)	13	5	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 1, 1992

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.062 m<sup>2</sup> 32.96 ft<sup>2</sup>  
**Dry Weight:** 47.6 kg 105 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.750 m<sup>2</sup> 29.60 ft<sup>2</sup>  
**Fluid Capacity:** 3.9 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.702$	$-3.2828 (P)/I$	$-0.0099 (P)^2/I$	<b>Y Intercept</b>	0.714	<b>Slope</b>	-4.1279	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.702$	$-0.5785 (P)/I$	$-0.0010 (P)^2/I$		0.714		-0.727	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

$K_{arr} = 1.0$     -0.0707 (S)    -0.1687 (S)<sup>2</sup>  
 $K_{arr} = 1.0$     -0.25 (S)    (Linear Fit)

**Model Tested:** EC-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s    0.51 gpm

**REMARKS:**

January, 2007

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Imperial IC-40  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-098K

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	58	43	29	A (-9°F)	55	41	28
B (5°C)	53	39	24	B (9°F)	50	37	23
C (20°C)	45	31	17	C (36°F)	43	30	16
D (50°C)	30	18	6	D (90°F)	29	17	5
E (80°C)	17	6		E (144°F)	16	6	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 1, 1992

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.809 m<sup>2</sup> 41.00 ft<sup>2</sup>  
**Dry Weight:** 62.6 kg 138 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 3.445 m<sup>2</sup> 37.08 ft<sup>2</sup>  
**Fluid Capacity:** 4.5 l 1.2 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.702 - 3.2828 (P)/I - 0.0099 (P)^2/I$	0.714	-4.1279	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.702 - 0.5785 (P)/I - 0.0010 (P)^2/I$	0.714	-0.727	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0707 (S) -0.1687 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.25 (S) (Linear Fit)

**Model Tested:** EC-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.51 gpm

**REMARKS:**

January, 2007

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Imperial IP-24  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-098L

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	34	25	17	A (-9°F)	32	24	16
B (5°C)	31	22	14	B (9°F)	29	21	13
C (20°C)	26	18	10	C (36°F)	24	17	9
D (50°C)	16	9	2	D (90°F)	15	9	2
E (80°C)	7	2		E (144°F)	7	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 1, 1992

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.301 m<sup>2</sup> 24.77 ft<sup>2</sup>  
**Dry Weight:** 36.3 kg 80 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.015 m<sup>2</sup> 21.69 ft<sup>2</sup>  
**Fluid Capacity:** 2.9 l 0.8 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.666 - 3.3563 (P)/I - 0.0138 (P)^2/I$	0.682	-4.5392	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.666 - 0.5915 (P)/I - 0.0014 (P)^2/I$	0.682	-0.800	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0045 (S) -0.2088 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.21 (S) (Linear Fit)

**Model Tested:** EP-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.51 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Imperial IP-32  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-098M

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	45	34	23	A (-9°F)	43	32	22
B (5°C)	41	30	19	B (9°F)	39	28	18
C (20°C)	34	24	13	C (36°F)	33	22	12
D (50°C)	22	12	3	D (90°F)	21	11	3
E (80°C)	10	2		E (144°F)	9	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 1, 1992

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.062 m<sup>2</sup> 32.96 ft<sup>2</sup>  
**Dry Weight:** 42.6 kg 94 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.750 m<sup>2</sup> 29.60 ft<sup>2</sup>  
**Fluid Capacity:** 3.9 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.666 - 3.3563 (P)/I - 0.0138 (P)^2/I$	0.682	-4.5392	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.666 - 0.5915 (P)/I - 0.0014 (P)^2/I$	0.682	-0.800	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0045 (S) -0.2088 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.21 (S) (Linear Fit)

**Model Tested:** EP-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.51 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Imperial IP-40  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1981-098N

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	56	42	29	A (-9°F)	53	40	27
B (5°C)	51	37	24	B (9°F)	48	35	22
C (20°C)	43	29	16	C (36°F)	41	28	15
D (50°C)	27	15	4	D (90°F)	26	14	4
E (80°C)	12	3		E (144°F)	12	3	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 1, 1992

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.809 m<sup>2</sup> 41.00 ft<sup>2</sup>  
**Dry Weight:** 62.6 kg 138 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 3.445 m<sup>2</sup> 37.08 ft<sup>2</sup>  
**Fluid Capacity:** 4.5 l 1.2 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.666 - 3.3563 (P)/I - 0.0138 (P)^2/I$	0.682	-4.5392	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.666 - 0.5915 (P)/I - 0.0014 (P)^2/I$	0.682	-0.800	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0045 (S) -0.2088 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.21 (S) (Linear Fit)

**Model Tested:** EP-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.51 gpm

**REMARKS:**

January, 2007

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Sunwise SC-24  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1995-002A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	35	26	18	A (-9°F)	33	25	17
B (5°C)	32	23	15	B (9°F)	30	22	14
C (20°C)	27	19	10	C (36°F)	26	18	10
D (50°C)	18	11	3	D (90°F)	17	10	3
E (80°C)	10	4		E (144°F)	10	3	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: August 1, 1995

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.290 m<sup>2</sup> 24.65 ft<sup>2</sup>  
**Dry Weight:** 36.7 kg 81 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.015 m<sup>2</sup> 21.69 ft<sup>2</sup>  
**Fluid Capacity:** 2.9 l 0.8 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	$\eta$	$(P)/I$	$(P)^2/I$	<u>Y Intercept</u>	<u>Slope</u>	
<b>S I Units:</b>	0.702	-3.2828	-0.0099	0.714	-4.1279	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	0.702	-0.5785	-0.0010	0.714	-0.727	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0707 (S) -0.1687 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.25 (S) (Linear Fit)

**Model Tested:** EC-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.51 gpm

**REMARKS:**

January, 2007

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Sunwise SC-32  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1995-002B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	46	35	24	A (-9°F)	44	33	22
B (5°C)	42	31	20	B (9°F)	40	29	19
C (20°C)	36	25	14	C (36°F)	34	24	13
D (50°C)	24	14	4	D (90°F)	23	13	4
E (80°C)	14	5		E (144°F)	13	4	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: August 1, 1995

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.051 m<sup>2</sup> 32.84 ft<sup>2</sup>  
**Dry Weight:** 47.6 kg 105 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.750 m<sup>2</sup> 29.60 ft<sup>2</sup>  
**Fluid Capacity:** 3.9 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	$\eta$	$\eta = 0.702$	$-3.2828 (P)/I$	$-0.0099 (P)^2/I$	<u>Y Intercept</u>	<u>Slope</u>	
<b>S I Units:</b>	$\eta = 0.702$	$-3.2828 (P)/I$	$-0.0099 (P)^2/I$	0.714	-4.1279	W/m <sup>2</sup> ·°C	
<b>I P Units:</b>	$\eta = 0.702$	$-0.5785 (P)/I$	$-0.0010 (P)^2/I$	0.714	-0.727	Btu/hr·ft <sup>2</sup> ·°F	

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

$K_{arr} = 1.0$  -0.0707 (S) -0.1687 (S)<sup>2</sup>  
 $K_{arr} = 1.0$  -0.25 (S) (Linear Fit)

**Model Tested:** EC-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.51 gpm

**REMARKS:**

January, 2007

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Sunwise SC-40  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1995-002C

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	57	43	29	A (-9°F)	54	41	28
B (5°C)	52	38	24	B (9°F)	50	36	23
C (20°C)	45	31	17	C (36°F)	42	29	16
D (50°C)	30	17	5	D (90°F)	29	17	5
E (80°C)	17	6		E (144°F)	16	6	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: August 1, 1995

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.796 m<sup>2</sup> 40.86 ft<sup>2</sup>  
**Dry Weight:** 62.6 kg 138 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 3.445 m<sup>2</sup> 37.08 ft<sup>2</sup>  
**Fluid Capacity:** 4.5 l 1.2 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η =</b>	<b>0.702</b>	<b>-3.2828 (P)/I</b>	<b>-0.0099 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>0.714</b>	<b>Slope</b>	<b>-4.1279</b>	<b>W/m<sup>2</sup>·°C</b>
	<b>I P Units:</b>	<b>η =</b>	<b>0.702</b>	<b>-0.5785 (P)/I</b>	<b>-0.0010 (P)<sup>2</sup>/I</b>	<b>0.714</b>	<b>-0.727</b>	<b>Btu/hr·ft<sup>2</sup>·°F</b>		

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0707 (S) -0.1687 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.25 (S) (Linear Fit)

**Model Tested:** EC-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.51 gpm

**REMARKS:**

January, 2007

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Sunwise SP-24  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1995-001A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	34	25	17	A (-9°F)	32	24	16
B (5°C)	30	22	14	B (9°F)	29	21	13
C (20°C)	26	18	10	C (36°F)	24	17	9
D (50°C)	16	9	2	D (90°F)	15	9	2
E (80°C)	7	2		E (144°F)	7	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: August 1, 1995

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.290 m<sup>2</sup> 24.65 ft<sup>2</sup>  
**Dry Weight:** 36.3 kg 80 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.015 m<sup>2</sup> 21.69 ft<sup>2</sup>  
**Fluid Capacity:** 2.9 l 0.8 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.666 - 3.3563 (P)/I - 0.0138 (P)^2/I$	0.682	-4.5392	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.666 - 0.5915 (P)/I - 0.0014 (P)^2/I$	0.682	-0.800	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0045 (S) -0.2088 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.21 (S) (Linear Fit)

**Model Tested:** EP-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.51 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Sunwise SP-32  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1995-001B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	45	34	23	A (-9°F)	42	32	22
B (5°C)	41	30	19	B (9°F)	38	28	18
C (20°C)	34	24	13	C (36°F)	32	22	12
D (50°C)	22	12	3	D (90°F)	20	11	3
E (80°C)	10	2		E (144°F)	9	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: August 1, 1995

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.051 m<sup>2</sup> 32.84 ft<sup>2</sup>  
**Dry Weight:** 47.6 kg 105 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.750 m<sup>2</sup> 29.60 ft<sup>2</sup>  
**Fluid Capacity:** 3.9 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.666 - 3.3563 (P)/I - 0.0138 (P)^2/I$	0.682	-4.5392	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.666 - 0.5915 (P)/I - 0.0014 (P)^2/I$	0.682	-0.800	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0045 (S) -0.2088 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.21 (S) (Linear Fit)

**Model Tested:** EP-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.51 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** Sunwise SP-40  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1995-001C

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	56	42	28	A (-9°F)	53	40	27
B (5°C)	51	37	23	B (9°F)	48	35	22
C (20°C)	43	29	16	C (36°F)	40	28	15
D (50°C)	27	15	4	D (90°F)	25	14	4
E (80°C)	12	3		E (144°F)	12	3	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: August 1, 1995

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.796 m<sup>2</sup> 40.86 ft<sup>2</sup>  
**Dry Weight:** 62.6 kg 138 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 3.445 m<sup>2</sup> 37.08 ft<sup>2</sup>  
**Fluid Capacity:** 4.5 l 1.2 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum Extrusion  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.666</b>	<b>-3.3563 (P)/I</b>	<b>-0.0138 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.682	-4.5392	W/m <sup>2</sup> ·°C
					0.682	-0.800	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0045 (S) -0.2088 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.21 (S) (Linear Fit)

**Model Tested:** EP-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.51 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** SolarStar SSC-21  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-005A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	28	21	14	A (-9°F)	27	20	14
B (5°C)	26	19	12	B (9°F)	24	18	11
C (20°C)	22	15	8	C (36°F)	21	14	8
D (50°C)	15	9	3	D (90°F)	14	8	3
E (80°C)	8	3		E (144°F)	8	3	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: October 28, 1999

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.860 m<sup>2</sup> 20.02 ft<sup>2</sup>  
**Dry Weight:** 37.2 kg 82 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.699 m<sup>2</sup> 18.29 ft<sup>2</sup>  
**Fluid Capacity:** 2.7 l 0.7 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.702 - 3.2828 (P)/I - 0.0099 (P)^2/I$	0.714	-4.1279	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.702 - 0.5785 (P)/I - 0.0010 (P)^2/I$	0.714	-0.727	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0707 (S) -0.1687 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.25 (S) (Linear Fit)

**Model Tested:** EC-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.50 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** SolarStar SSC-24  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-005B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	33	25	17	A (-9°F)	31	23	16
B (5°C)	30	22	14	B (9°F)	28	21	13
C (20°C)	25	18	10	C (36°F)	24	17	9
D (50°C)	17	10	3	D (90°F)	16	9	3
E (80°C)	10	3		E (144°F)	9	3	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: October 28, 1999

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.159 m<sup>2</sup> 23.24 ft<sup>2</sup>  
**Dry Weight:** 42.6 kg 94 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.992 m<sup>2</sup> 21.44 ft<sup>2</sup>  
**Fluid Capacity:** 3.0 l 0.8 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.702 - 3.2828 (P)/I - 0.0099 (P)^2/I$	0.714	-4.1279	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.702 - 0.5785 (P)/I - 0.0010 (P)^2/I$	0.714	-0.727	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0707 (S) -0.1687 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.25 (S) (Linear Fit)

**Model Tested:** EC-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.50 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** SolarStar SSC-32  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-005C

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	44	33	22	A (-9°F)	42	31	21
B (5°C)	40	29	19	B (9°F)	38	28	18
C (20°C)	34	24	13	C (36°F)	33	23	13
D (50°C)	23	13	4	D (90°F)	22	13	4
E (80°C)	13	5		E (144°F)	12	4	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: October 28, 1999

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.907 m<sup>2</sup> 31.29 ft<sup>2</sup>  
**Dry Weight:** 54.4 kg 120 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.724 m<sup>2</sup> 29.32 ft<sup>2</sup>  
**Fluid Capacity:** 3.8 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.702 - 3.2828 (P)/I - 0.0099 (P)^2/I$	0.714	-4.1279	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.702 - 0.5785 (P)/I - 0.0010 (P)^2/I$	0.714	-0.727	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0707 (S) -0.1687 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.25 (S) (Linear Fit)

**Model Tested:** EC-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.50 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** SolarStar SSC-40  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-005D

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	55	41	28	A (-9°F)	52	39	27
B (5°C)	50	37	23	B (9°F)	48	35	22
C (20°C)	43	30	17	C (36°F)	41	28	16
D (50°C)	29	17	5	D (90°F)	27	16	5
E (80°C)	16	6		E (144°F)	15	5	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: October 20, 2000

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.629 m<sup>2</sup> 39.06 ft<sup>2</sup>  
**Dry Weight:** 72.7 kg 160 lb  
**Test Pressure:** 1104 kPa 160 psig

**Net Aperture Area:** 3.415 m<sup>2</sup> 36.76 ft<sup>2</sup>  
**Fluid Capacity:** 4.5 l 1.2 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.702 - 3.2828 (P)/I - 0.0099 (P)^2/I$	0.714	-4.1279	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.702 - 0.5785 (P)/I - 0.0010 (P)^2/I$	0.714	-0.727	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.0707 (S) -0.1687 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.25 (S) (Linear Fit)

**Model Tested:** EC-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.50 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** SolarStar SSP-21  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-006A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	27	21	14	A (-9°F)	26	20	13
B (5°C)	25	18	11	B (9°F)	23	17	11
C (20°C)	21	14	8	C (36°F)	20	14	7
D (50°C)	13	7	2	D (90°F)	12	7	2
E (80°C)	6	1		E (144°F)	6	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: October 28, 1999

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.860 m<sup>2</sup> 20.02 ft<sup>2</sup>  
**Dry Weight:** 37.2 kg 82 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.699 m<sup>2</sup> 18.29 ft<sup>2</sup>  
**Fluid Capacity:** 2.7 l 0.7 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.666 - 3.3563 (P)/I - 0.0138 (P)^2/I$	0.682	-4.5392	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.666 - 0.5915 (P)/I - 0.0014 (P)^2/I$	0.682	-0.800	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0045 (S) -0.2088 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.21 (S) (Linear Fit)

**Model Tested:** EP-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.50 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** SolarStar SSP-24  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-006B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	32	24	16	A (-9°F)	30	23	15
B (5°C)	29	21	13	B (9°F)	27	20	13
C (20°C)	24	17	9	C (36°F)	23	16	9
D (50°C)	15	8	2	D (90°F)	14	8	2
E (80°C)	7	2		E (144°F)	7	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: October 28, 1999

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.159 m<sup>2</sup> 23.24 ft<sup>2</sup>  
**Dry Weight:** 42.6 kg 94 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.992 m<sup>2</sup> 21.44 ft<sup>2</sup>  
**Fluid Capacity:** 3.0 l 0.8 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	$\eta = 0.666$	$-3.3563 (P)/I$	$-0.0138 (P)^2/I$	<b>Y Intercept</b>	<b>Slope</b>	
					0.682	-4.5392	W/m <sup>2</sup> ·°C
					0.682	-0.800	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0045 (S) -0.2088 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.21 (S) (Linear Fit)

**Model Tested:** EP-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.50 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** SolarStar SSP-32  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-006C

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	43	32	22	A (-9°F)	40	30	21
B (5°C)	39	28	18	B (9°F)	37	27	17
C (20°C)	33	22	12	C (36°F)	31	21	12
D (50°C)	21	11	3	D (90°F)	20	11	3
E (80°C)	9	2		E (144°F)	9	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: October 28, 1999

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.907 m<sup>2</sup> 31.29 ft<sup>2</sup>  
**Dry Weight:** 54.4 kg 120 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.724 m<sup>2</sup> 29.32 ft<sup>2</sup>  
**Fluid Capacity:** 3.8 l 1.0 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	$\eta = 0.666$	$-3.3563 (P)/I$	$-0.0138 (P)^2/I$	<b>Y Intercept</b>	<b>Slope</b>	
					0.682	-4.5392	W/m <sup>2</sup> ·°C
	<b>I P Units:</b>	$\eta = 0.666$	$-0.5915 (P)/I$	$-0.0014 (P)^2/I$	0.682	-0.800	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

$K_{arr} = 1.0 + 0.0045 (S) - 0.2088 (S)^2$   
 $K_{arr} = 1.0 - 0.21 (S) \quad (\text{Linear Fit})$

**Model Tested:** EP-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.50 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** SunEarth, Inc.  
8425 Almeria Avenue  
Fontana, CA 92335

**MODEL:** SolarStar SSP-40  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-1999-006D

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	53	40	27	A (-9°F)	50	38	26
B (5°C)	48	35	22	B (9°F)	46	33	21
C (20°C)	41	28	15	C (36°F)	39	27	15
D (50°C)	26	14	4	D (90°F)	24	13	4
E (80°C)	12	3		E (144°F)	11	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: October 20, 2000

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 3.629 m<sup>2</sup> 39.06 ft<sup>2</sup>  
**Dry Weight:** 72.7 kg 160 lb  
**Test Pressure:** 1104 kPa 160 psig

**Net Aperture Area:** 3.415 m<sup>2</sup> 36.76 ft<sup>2</sup>  
**Fluid Capacity:** 4.5 l 1.2 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Polyisocyanurate  
**Insulation (Back):** Polyisocyanurate & Fiberglass

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.666 - 3.3563 (P)/I - 0.0138 (P)^2/I$	0.682	-4.5392	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.666 - 0.5915 (P)/I - 0.0014 (P)^2/I$	0.682	-0.800	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0045 (S) -0.2088 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.21 (S) (Linear Fit)

**Model Tested:** EP-20

**Test Fluid:** Water

**Test Flow Rate:** 32 ml/s 0.50 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

SOLAR COLLECTOR  
CERTIFICATION AND RATING

SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

SUPPLIER: **Sunsiaray Solar Manufacturing, Inc.**  
4414 Washburn Rd.  
Davison, MI 48423-8006

MODEL: Northern Comfort NC-32  
COLLECTOR TYPE: Glazed Flat-Plate  
CERTIFICATION #: 100-1986-005A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	38	30	21	A (-9°F)	36	28	20
B (5°C)	32	23	15	B (9°F)	30	22	14
C (20°C)	24	15	7	C (36°F)	23	14	7
D (50°C)	11	4		D (90°F)	10	4	
E (80°C)				E (144°F)			

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: May 23, 1986

**COLLECTOR SPECIFICATIONS**

Gross Area: 3.177 m<sup>2</sup> 34.20 ft<sup>2</sup>  
Dry Weight: 54.026 kg 119 lb  
Test Pressure: 0 kPa 0 psig

Net Aperture Area: 2.759 m<sup>2</sup> 29.70 ft<sup>2</sup>  
Fluid Capacity: 0.0 l 0.0 gal

**COLLECTOR MATERIALS**

Frame: Aluminum Extrusion  
Cover (Outer): Low Iron Tempered Glass  
Cover (Inner): None  
Absorber Material: Tube - Aluminum / Plate - Aluminum  
Absorber Coating: Black Nickel  
Insulation (Side): Polyisocyanurate  
Insulation (Back): Polyisocyanurate

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]

					<u>Y Intercept</u>	<u>Slope</u>	
S I Units:	$\eta = 0.508$	-4.8400 (P)/I	0.0000 (P) <sup>2</sup> /I		0.508	-4.84	W/m <sup>2</sup> ·°C
I P Units:	$\eta = 0.508$	-0.8529 (P)/I	0.0000 (P) <sup>2</sup> /I		0.508	-0.853	Btu/hr·ft <sup>2</sup> ·°F

Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]

$K_{arr} = 1.0$  -0.0720 (S) 0.0000 (S)<sup>2</sup>  
 $K_{arr} = 1.0$  -0.07 (S) (Linear Fit)

Model Tested: NC-32

Test Fluid: Air

Test Flow Rate: 84 l/s 178.1 scfm

**REMARKS:** Thermal performance is for the 2 module system

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Synergy Solar**  
6114 Bullard  
Suite A  
Austin, TX 78757

**MODEL:** Synergy S19.78  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2004-005A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	25	19	13	A (-9°F)	24	18	12
B (5°C)	22	16	10	B (9°F)	21	15	9
C (20°C)	17	11	5	C (36°F)	16	11	5
D (50°C)	8	3		D (90°F)	7	3	
E (80°C)	1			E (144°F)	1		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 28, 2004

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.850 m<sup>2</sup> 19.91 ft<sup>2</sup>  
**Dry Weight:** 35 kg 77 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.653 m<sup>2</sup> 17.79 ft<sup>2</sup>  
**Fluid Capacity:** 2.3 l 0.6 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Glasswool  
**Insulation (Back):** Glasswool

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	33	0.13
50	0.79	117	0.47
80	1.27	327	1.31

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.612 - 4.3317 (P)/I - 0.0206 (P)^2/I$	0.626	-6.0142	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.612 - 0.7634 (P)/I - 0.0020 (P)^2/I$	0.626	-1.060	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{ar} = 1.0 - 0.0507 (S) - 0.1253 (S)^2$   
 $K_{ar} = 1.0 - 0.18 (S)$  (Linear Fit)

**Model Tested:** S19.78

**Test Fluid:** Water

**Test Flow Rate:** 33 ml/s 0.52 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Synergy Solar**  
6114 Bullard  
Suite A  
Austin, TX 78757

**MODEL:** Synergy S26.68  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2004-005B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	33	25	17	A (-9°F)	32	24	17
B (5°C)	29	21	13	B (9°F)	28	20	13
C (20°C)	23	15	7	C (36°F)	22	14	7
D (50°C)	10	4		D (90°F)	10	4	
E (80°C)	1			E (144°F)	1		

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 28, 2004

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.479 m<sup>2</sup> 26.68 ft<sup>2</sup>  
**Dry Weight:** 47.2 kg 104 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.272 m<sup>2</sup> 24.46 ft<sup>2</sup>  
**Fluid Capacity:** 3.1 l 0.8 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Moderately Selective Black Paint  
**Insulation (Side):** Glasswool  
**Insulation (Back):** Glasswool

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.612 - 4.3317 (P)/I - 0.0206 (P)^2/I$	0.626	-6.0142	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.612 - 0.7634 (P)/I - 0.0020 (P)^2/I$	0.626	-1.060	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{ar} = 1.0 - 0.0507 (S) - 0.1253 (S)^2$   
 $K_{ar} = 1.0 - 0.18 (S)$  (Linear Fit)

**Model Tested:** S19.78

**Test Fluid:** Water

**Test Flow Rate:** 33 ml/s 0.52 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER: Synergy Solar**  
6114 Bullard  
Suite A  
Austin, TX 78757

**MODEL:** Synergy T19.78  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2004-006A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	25	19	13	A (-9°F)	24	18	12
B (5°C)	23	17	11	B (9°F)	22	16	10
C (20°C)	19	13	7	C (36°F)	18	12	7
D (50°C)	12	6	1	D (90°F)	11	6	1
E (80°C)	5	1		E (144°F)	4	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 28, 2004

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 1.851 m<sup>2</sup> 19.92 ft<sup>2</sup>  
**Dry Weight:** 37.7 kg 83 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 1.786 m<sup>2</sup> 19.22 ft<sup>2</sup>  
**Fluid Capacity:** 2.3 l 0.6 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Sputtered aluminum nitride  
**Insulation (Side):** Glasswool  
**Insulation (Back):** Glasswool

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	23	0.09
50	0.79	104	0.42
80	1.27	239	0.96

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.633 - 3.2437 (P)/I - 0.0153 (P)^2/I$	<b>Y Intercept</b>	0.647	<b>Slope</b>	-4.6653	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.633 - 0.5716 (P)/I - 0.0015 (P)^2/I$		0.647		-0.822	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{\alpha r} = 1.0 - 0.0313 (S) - 0.1424 (S)^2$   
 $K_{\alpha r} = 1.0 - 0.18 (S)$  (Linear Fit)

**Model Tested:** T19.78

**Test Fluid:** Water

**Test Flow Rate:** 33 ml/s 0.52 gpm


**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

<b>SOLAR COLLECTOR CERTIFICATION AND RATING</b>    <b>SRCC OG-100</b>	<b><u>CERTIFIED SOLAR COLLECTOR</u></b>  <b>SUPPLIER: Synergy Solar</b> 6114 Bullard Suite A Austin, TX 78757  <b>MODEL:</b> Synergy T26.68 <b>COLLECTOR TYPE:</b> Glazed Flat-Plate <b>CERTIFICATION #:</b> 100-2004-006B
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<b>COLLECTOR THERMAL PERFORMANCE RATING</b>							
<b>Megajoules Per Panel Per Day</b>				<b>Thousands of Btu Per Panel Per Day</b>			
<b>CATEGORY (Ti-Ta)</b>	<b>CLEAR DAY 23 MJ/m<sup>2</sup>·d</b>	<b>MILDLY CLOUDY 17 MJ/m<sup>2</sup>·d</b>	<b>CLOUDY DAY 11 MJ/m<sup>2</sup>·d</b>	<b>CATEGORY (Ti-Ta)</b>	<b>CLEAR DAY 2000 Btu/ft<sup>2</sup>·d</b>	<b>MILDLY CLOUDY 1500 Btu/ft<sup>2</sup>·d</b>	<b>CLOUDY DAY 1000 Btu/ft<sup>2</sup>·d</b>
A (-5°C)	34	26	17	A (-9°F)	32	24	17
B (5°C)	31	23	14	B (9°F)	29	21	14
C (20°C)	26	18	10	C (36°F)	24	17	9
D (50°C)	16	8	2	D (90°F)	15	8	2
E (80°C)	6	1		E (144°F)	6	1	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 28, 2004

### COLLECTOR SPECIFICATIONS

**Gross Area:** 2.479 m<sup>2</sup> 26.68 ft<sup>2</sup>  
**Dry Weight:** 37.7 kg 83 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.272 m<sup>2</sup> 24.46 ft<sup>2</sup>  
**Fluid Capacity:** 2.3 l 0.6 gal

### COLLECTOR MATERIALS

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Sputtered aluminum nitride  
**Insulation (Side):** Glasswool  
**Insulation (Back):** Glasswool

### PRESSURE DROP

<b>Flow</b>		<b>Δ P</b>	
<b>ml/s</b>	<b>gpm</b>	<b>Pa</b>	<b>in H<sub>2</sub>O</b>

### TECHNICAL INFORMATION

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.633 - 3.2437 (P)/I - 0.0153 (P)^2/I$	0.647	-4.6653	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.633 - 0.5716 (P)/I - 0.0015 (P)^2/I$	0.647	-0.822	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{\alpha r} = 1.0 - 0.0313 (S) - 0.1424 (S)^2$   
 $K_{\alpha r} = 1.0 - 0.18 (S)$  (Linear Fit)

**Model Tested:** T19.78

**Test Fluid:** Water

**Test Flow Rate:** 33 ml/s 0.52 gpm

### REMARKS:

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

**SUPPLIER:** **Synergy Solar**  
6114 Bullard  
Suite A  
Austin, TX 78757

**MODEL:** Synergy TC-26.52  
**COLLECTOR TYPE:** Glazed Flat-Plate  
**CERTIFICATION #:** 100-2005-007A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	37	28	19	A (-9°F)	35	27	18
B (5°C)	33	24	15	B (9°F)	32	23	15
C (20°C)	28	19	10	C (36°F)	26	18	10
D (50°C)	17	9	2	D (90°F)	16	9	2
E (80°C)	8	2		E (144°F)	7	2	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: October 3, 2005

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.480 m<sup>2</sup> 26.70 ft<sup>2</sup>  
**Dry Weight:** 49 kg 108 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.271 m<sup>2</sup> 24.45 ft<sup>2</sup>  
**Fluid Capacity:** 2.3 l 0.6 gal

**COLLECTOR MATERIALS**

**Frame:** Aluminum  
**Cover (Outer):** Low Iron Tempered Glass  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Sputtered aluminum nitride  
**Insulation (Side):** Paper-faced fiberglass  
**Insulation (Back):** Foil-faced fiberglass

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	164	0.66
50	0.79	647	2.60
80	1.27	1412	5.67

**TECHNICAL INFORMATION**

**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.688 - 3.6994 (P)/I - 0.0105 (P)^2/I$	<b>Y Intercept</b>	0.697	<b>Slope</b>	-4.573 W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.688 - 0.6519 (P)/I - 0.0010 (P)^2/I$		0.697		-0.806 Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

$K_{\alpha r} = 1.0 - 0.0558 (S) - 0.1313 (S)^2$   
 $K_{\alpha r} = 1.0 - 0.17 (S)$  (Linear Fit)

**Model Tested:** TC-26.52

**Test Fluid:** Water

**Test Flow Rate:** 51 ml/s 0.80 gpm

**REMARKS:**

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING & CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: Thermo Technologies**

 5560 Sterrett Place  
 Suite 115  
 Columbia, MD 21044

**MODEL:** Mazdon TMA-600-20  
**COLLECTOR TYPE:** Tubular  
**CERTIFICATION #:** 100-1998-001B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	31	23	16	A (-9°F)	29	22	15
B (5°C)	30	22	15	B (9°F)	28	21	14
C (20°C)	28	20	13	C (36°F)	26	19	12
D (50°C)	24	16	8	D (90°F)	22	15	8
E (80°C)	18	11	4	E (144°F)	17	11	4

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: February 14, 2002

**COLLECTOR SPECIFICATIONS**
**Gross Area:** 3.060 m<sup>2</sup> 32.94 ft<sup>2</sup>  
**Dry Weight:** 61.2 kg 135 lb  
**Test Pressure:** 1034 kPa 150 psig

**Net Aperture Area:** 2.254 m<sup>2</sup> 24.26 ft<sup>2</sup>  
**Fluid Capacity:** 0.5 l 0.1 gal

**COLLECTOR MATERIALS**
**Frame:** Stainless Steel  
**Cover (Outer):** Iron Free Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
40	0.63	624	2.51
80	1.27	2096	8.41
120	1.90	4350	17.46

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.525 - 0.8860 (P)/I - 0.0074 (P)^2/I$	<b>Y Intercept</b>	0.53	<b>Slope</b>	-1.421 W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.525 - 0.1561 (P)/I - 0.0007 (P)^2/I$		0.53		-0.250 Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

<b>K<sub>arr</sub></b>	= 1.0	-0.1441 (S)	-0.0948 (S) <sup>2</sup>
<b>K<sub>arr</sub></b>	= 1.0	-0.24 (S)	(Linear Fit)

**Model Tested:** 30

**Test Fluid:** Water

**Test Flow Rate:** 76 ml/s 1.20 gpm

**REMARKS:** Collector tested with long axis of tubes oriented north-south. IAM perpendicular to the tubes is listed above.  
 IAM parallel to the tubes = 1.0 - 0.28(S)

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: Thermo Technologies**

 5560 Sterrett Place  
 Suite 115  
 Columbia, MD 21044

**MODEL:** Mazdon TMA-600-30

**COLLECTOR TYPE:** Tubular

**CERTIFICATION #:** 100-1998-001A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	46	35	23	A (-9°F)	44	33	22
B (5°C)	45	33	22	B (9°F)	42	31	21
C (20°C)	42	30	19	C (36°F)	40	29	18
D (50°C)	35	24	13	D (90°F)	33	23	12
E (80°C)	27	17	6	E (144°F)	26	16	6

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: April 20, 1998

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 4.581 m<sup>2</sup> 49.31 ft<sup>2</sup>  
**Dry Weight:** 89.4 kg 197 lb  
**Test Pressure:** 1034 kPa 150 psig

**Net Aperture Area:** 3.381 m<sup>2</sup> 36.39 ft<sup>2</sup>  
**Fluid Capacity:** 0.7 l 0.2 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Iron Free Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
40	0.63	935	3.75
80	1.27	3128	12.56
120	1.90	6492	26.06

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.525$	$-0.8858 (P)/I$	$-0.0074 (P)^2/I$	<b>Y Intercept</b>	<b>Slope</b>	
				0.53	-1.421	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.525$	$-0.1561 (P)/I$	$-0.0007 (P)^2/I$	0.53	-0.250	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1441 (S) -0.0948 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.24 (S) (Linear Fit)

**Model Tested:** 30

**Test Fluid:** Water

**Test Flow Rate:** 76 ml/s 1.20 gpm

**REMARKS:** Collector tested with long axis of tubes oriented north-south. IAM perpendicular to the tubes is listed above.  
 IAM parallel to the tubes = 1.0 - 0.28(S)

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: Thermo Technologies**

 5560 Sterrett Place  
 Suite 115  
 Columbia, MD 21044

**MODEL:** Mazdon TMA-600-50

**COLLECTOR TYPE:** Tubular

**CERTIFICATION #:** 100-1998-001C

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	77	58	39	A (-9°F)	73	55	37
B (5°C)	74	55	36	B (9°F)	71	52	34
C (20°C)	70	50	31	C (36°F)	66	48	30
D (50°C)	59	40	21	D (90°F)	56	38	20
E (80°C)	45	28	10	E (144°F)	43	26	10

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: January 17, 2007

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 7.641 m<sup>2</sup> 82.25 ft<sup>2</sup>  
**Dry Weight:** 150.6 kg 332 lb  
**Test Pressure:** 1034 kPa 150 psig

**Net Aperture Area:** 5.635 m<sup>2</sup> 60.66 ft<sup>2</sup>  
**Fluid Capacity:** 1.2 l 0.3 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Iron Free Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
0	0.00	0	0.00
0	0.00	0	0.00
0	0.00	0	0.00

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>Y Intercept</b>	<b>Slope</b>	
<b>S I Units:</b> $\eta = 0.525 - 0.8858 (P)/I - 0.0074 (P)^2/I$	0.53	-1.421	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.525 - 0.1561 (P)/I - 0.0007 (P)^2/I$	0.53	-0.250	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1441 (S) -0.0948 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.24 (S) (Linear Fit)

**Model Tested:** 30

**Test Fluid:** Water

**Test Flow Rate:** 76 ml/s 1.20 gpm

**REMARKS:** This collector is a combination of models TMA-600-20 and TMA-600-30. It is listed for use in those systems requiring 50 tubes.

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: Thermo Technologies**

 5560 Sterrett Place  
 Suite 115  
 Columbia, MD 21044

**MODEL:** Mazdon TMA-600-70

**COLLECTOR TYPE:** Tubular

**CERTIFICATION #:** 100-1998-001D

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	108	81	55	A (-9°F)	102	77	52
B (5°C)	104	78	51	B (9°F)	99	73	48
C (20°C)	97	71	44	C (36°F)	92	67	42
D (50°C)	82	56	29	D (90°F)	78	53	28
E (80°C)	64	39	14	E (144°F)	60	37	14

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: January 17, 2007

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 10.701 m<sup>2</sup> 115.19 ft<sup>2</sup>  
**Dry Weight:** 211.8 kg 467 lb  
**Test Pressure:** 1034 kPa 150 psig

**Net Aperture Area:** 7.889 m<sup>2</sup> 84.92 ft<sup>2</sup>  
**Fluid Capacity:** 1.7 l 0.4 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Iron Free Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
0	0.00	0	0.00
0	0.00	0	0.00
0	0.00	0	0.00

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b>S I Units:</b>	<b>η = 0.525</b>	<b>-0.8858 (P)/I</b>	<b>-0.0074 (P)<sup>2</sup>/I</b>	<b>Y Intercept</b>	<b>Slope</b>	
					0.53	-1.421	W/m <sup>2</sup> ·°C
					0.53	-0.250	Btu/hr·ft <sup>2</sup> ·°F

**I P Units:** η = 0.525 -0.1561 (P)/I -0.0007 (P)<sup>2</sup>/I

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 -0.1441 (S) -0.0948 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.24 (S) (Linear Fit)

**Model Tested:** 30

**Test Fluid:** Water

**Test Flow Rate:** 76 ml/s 1.20 gpm

**REMARKS:** This collector is a combination of two model TMA-600-20 collectors and one TMA-600-30. It is listed for use in those systems requiring 70 tubes.

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: Thermo Technologies**

 5560 Sterrett Place  
 Suite 115  
 Columbia, MD 21044

**MODEL:** Mazdon TMA-600-80  
**COLLECTOR TYPE:** Tubular  
**CERTIFICATION #:** 100-1998-001E

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	123	93	62	A (-9°F)	117	88	59
B (5°C)	119	89	58	B (9°F)	113	84	55
C (20°C)	111	81	50	C (36°F)	105	77	48
D (50°C)	94	64	34	D (90°F)	89	60	32
E (80°C)	73	44	17	E (144°F)	69	42	16

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: January 17, 2007

**COLLECTOR SPECIFICATIONS**
**Gross Area:** 12.222 m<sup>2</sup> 131.56 ft<sup>2</sup>  
**Dry Weight:** 240 kg 529 lb  
**Test Pressure:** 1034 kPa 150 psig

**Net Aperture Area:** 9.016 m<sup>2</sup> 97.05 ft<sup>2</sup>  
**Fluid Capacity:** 1.9 l 0.5 gal

**COLLECTOR MATERIALS**
**Frame:** Stainless Steel  
**Cover (Outer):** Iron Free Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Black Chrome  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
0	0.00	0	0.00
0	0.00	0	0.00
0	0.00	0	0.00

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.525$	$-0.8858 (P)/I$	$-0.0074 (P)^2/I$	<b>Y Intercept</b>	<b>Slope</b>	
				0.53	-1.421	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.525$	$-0.1561 (P)/I$	$-0.0007 (P)^2/I$	0.53	-0.250	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

<b>K<sub>arr</sub></b>	= 1.0	-0.1441 (S)	-0.0948 (S) <sup>2</sup>
<b>K<sub>arr</sub></b>	= 1.0	-0.24 (S)	(Linear Fit)

**Model Tested:** 30  
**Test Fluid:** Water  
**Test Flow Rate:** 76 ml/s 1.20 gpm

**REMARKS:** This collector is a combination of two model TMA-600-30 collectors and one TMA-600-20. It is listed for use in those systems requiring 80 tubes.

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: Thermomax Industries Ltd.**

 3181 Kingsley St.  
Victoria, BC V8P4J5

**MODEL:** Solamax AST20

**COLLECTOR TYPE:** Tubular

**CERTIFICATION #:** 100-2003-004A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	31	24	17	A (-9°F)	30	23	16
B (5°C)	28	21	13	B (9°F)	27	20	13
C (20°C)	24	16	9	C (36°F)	23	16	9
D (50°C)	16	9	3	D (90°F)	16	9	3
E (80°C)	9	4		E (144°F)	9	3	

**A**-Pool Heating (Warm Climate) **B**-Pool Heating (Cool Climate) **C**-Water Heating (Warm Climate) **D**-Water Heating (Cool Climate) **E**-Air Conditioning

Original Certification Date: May 20, 2004

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 2.849 m<sup>2</sup> 30.67 ft<sup>2</sup>  
**Dry Weight:** 57.1 kg 126 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 2.496 m<sup>2</sup> 26.87 ft<sup>2</sup>  
**Fluid Capacity:** 1.4 l 0.4 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Sputtered aluminum nitride  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	50	0.20
50	0.79	257	1.03
80	1.27	608	2.44

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.573 - 2.8501 (P)/I - 0.0028 (P)^2/I$	<b>Y Intercept</b>	0.574	<b>Slope</b>	-3.0491	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.573 - 0.5023 (P)/I - 0.0003 (P)^2/I$		0.574		-0.537	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0469 (S) -0.1044 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.08 (S) (Linear Fit)

**Model Tested:** AST 20

**Test Fluid:** Water

**Test Flow Rate:** 50 ml/s 0.79 gpm

**REMARKS:** Collector tested with long axis of tubes oriented north-south. IAM perpendicular to the tubes is listed above.  
 IAM parallel to the tubes = 1.0 - 0.45(S) or 1.0 + 0.1126(S) - 0.5401(S)<sup>2</sup>

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010

**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: Thermomax Industries Ltd.**

 3181 Kingsley St.  
Victoria, BC V8P4J5

**MODEL:** Solamax AST30

**COLLECTOR TYPE:** Tubular

**CERTIFICATION #:** 100-2003-004B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	47	36	25	A (-9°F)	45	34	24
B (5°C)	42	31	20	B (9°F)	40	30	19
C (20°C)	36	25	14	C (36°F)	34	23	13
D (50°C)	25	14	4	D (90°F)	23	13	4
E (80°C)	14	5		E (144°F)	13	5	

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: May 20, 2004

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 4.280 m<sup>2</sup> 46.07 ft<sup>2</sup>  
**Dry Weight:** 85.6 kg 189 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 3.749 m<sup>2</sup> 40.36 ft<sup>2</sup>  
**Fluid Capacity:** 2.1 l 0.6 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Sputtered aluminum nitride  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.573$	$-2.8501 (P)/I$	$-0.0028 (P)^2/I$	<b>Y Intercept</b>	0.574	<b>Slope</b>	-3.0491	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.573$	$-0.5023 (P)/I$	$-0.0003 (P)^2/I$		0.574		-0.537	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0469 (S) -0.1044 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.08 (S) (Linear Fit)

**Model Tested:** AST 20

**Test Fluid:** Water

**Test Flow Rate:** 50 ml/s 0.79 gpm

**REMARKS:** Collector tested with long axis of tubes oriented north-south. IAM perpendicular to the tubes is listed above.  
 IAM parallel to the tubes = 1.0 - 0.45(S) or 1.0 + 0.1126(S) - 0.5401(S)<sup>2</sup>

January, 2007

Certification must be renewed annually. For current status contact:

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: Thermomax Industries Ltd.**

 3181 Kingsley St.  
Victoria, BC V8P4J5

**MODEL:** Solamax AST50

**COLLECTOR TYPE:** Tubular

**CERTIFICATION #:** 100-2003-004C

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	79	60	42	A (-9°F)	75	57	40
B (5°C)	71	52	34	B (9°F)	67	49	32
C (20°C)	60	41	23	C (36°F)	56	39	22
D (50°C)	41	24	7	D (90°F)	39	22	7
E (80°C)	24	9		E (144°F)	22	8	

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: June 28, 2004

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 7.129 m<sup>2</sup> 76.74 ft<sup>2</sup>  
**Dry Weight:** 142.7 kg 315 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 6.245 m<sup>2</sup> 67.22 ft<sup>2</sup>  
**Fluid Capacity:** 3.5 l 0.9 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Sputtered aluminum nitride  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

<b>S I Units:</b>	$\eta = 0.573$	$-2.8501 (P)/I$	$-0.0028 (P)^2/I$	<b>Y Intercept</b>	0.574	<b>Slope</b>	-3.0491	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.573$	$-0.5023 (P)/I$	$-0.0003 (P)^2/I$		0.574		-0.537	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0469 (S) -0.1044 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.08 (S) (Linear Fit)

**Model Tested:** AST 20

**Test Fluid:** Water

**Test Flow Rate:** 50 ml/s 0.79 gpm

**REMARKS:** This collector is a combination of models AST 20 and AST 30. It is listed for use in those systems requiring 50 tubes.

January, 2007

Certification must be renewed annually. For current status contact:

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: Thermomax Industries Ltd.**

 3181 Kingsley St.  
Victoria, BC V8P4J5

**MODEL: Solamax AST70**
**COLLECTOR TYPE: Tubular**
**CERTIFICATION #: 100-2003-004D**
**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	110	84	58	A (-9°F)	104	80	55
B (5°C)	99	73	47	B (9°F)	94	69	45
C (20°C)	83	58	32	C (36°F)	79	55	30
D (50°C)	57	33	10	D (90°F)	54	31	10
E (80°C)	33	12		E (144°F)	31	12	

**A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning**

Original Certification Date: January 17, 2007

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 9.978 m<sup>2</sup> 107.41 ft<sup>2</sup>  
**Dry Weight:** 199.8 kg 441 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 8.741 m<sup>2</sup> 94.09 ft<sup>2</sup>  
**Fluid Capacity:** 4.9 l 1.3 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Sputtered aluminum nitride  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O
0	0.00	0	0.00
0	0.00	0	0.00
0	0.00	0	0.00

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>	
<b>S I Units:</b> $\eta = 0.573 - 2.8501 (P)/I - 0.0028 (P)^2/I$	0.574	-3.0491	W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.573 - 0.5023 (P)/I - 0.0003 (P)^2/I$	0.574	-0.537	Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0469 (S) -0.1044 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.08 (S) (Linear Fit)

**Model Tested:** AST 20

**Test Fluid:** Water

**Test Flow Rate:** 50 ml/s 0.79 gpm

**REMARKS:** This collector is a combination of two model AST 20 collectors and one AST 30. It is listed for use in those systems requiring 70 tubes.

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

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**SOLAR COLLECTOR  
CERTIFICATION AND RATING**


SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**
**SUPPLIER: Thermomax Industries Ltd.**

 3181 Kingsley St.  
Victoria, BC V8P4J5

**MODEL: Solamax AST80**
**COLLECTOR TYPE: Tubular**
**CERTIFICATION #: 100-2003-004E**
**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	126	96	67	A (-9°F)	119	91	63
B (5°C)	113	83	54	B (9°F)	107	79	51
C (20°C)	95	66	37	C (36°F)	90	63	35
D (50°C)	66	38	12	D (90°F)	62	36	11
E (80°C)	38	14		E (144°F)	36	13	

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: January 17, 2007

**COLLECTOR SPECIFICATIONS**

**Gross Area:** 11.408 m<sup>2</sup> 122.80 ft<sup>2</sup>  
**Dry Weight:** 228.3 kg 503 lb  
**Test Pressure:** 1103 kPa 160 psig

**Net Aperture Area:** 9.994 m<sup>2</sup> 107.58 ft<sup>2</sup>  
**Fluid Capacity:** 5.6 l 1.5 gal

**COLLECTOR MATERIALS**

**Frame:** Stainless Steel  
**Cover (Outer):** Glass Vacuum Tube  
**Cover (Inner):** None  
**Absorber Material:** Tube - Copper / Plate - Copper Fin  
**Absorber Coating:** Sputtered aluminum nitride  
**Insulation (Side):** Vacuum  
**Insulation (Back):** Vacuum

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
0	0.00	0	0.00
0	0.00	0	0.00
0	0.00	0	0.00

**TECHNICAL INFORMATION**
**Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]**

	<b><u>Y Intercept</u></b>	<b><u>Slope</u></b>
<b>S I Units:</b> $\eta = 0.573 - 2.8501 (P)/I - 0.0028 (P)^2/I$	0.574	-3.0491 W/m <sup>2</sup> ·°C
<b>I P Units:</b> $\eta = 0.573 - 0.5023 (P)/I - 0.0003 (P)^2/I$	0.574	-0.537 Btu/hr·ft <sup>2</sup> ·°F

**Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]**

**K<sub>arr</sub>** = 1.0 +0.0469 (S) -0.1044 (S)<sup>2</sup>  
**K<sub>arr</sub>** = 1.0 -0.08 (S) (Linear Fit)

**Model Tested:** AST 20

**Test Fluid:** Water

**Test Flow Rate:** 50 ml/s 0.79 gpm

**REMARKS:** This collector is a combination of two model AST 30 collectors and one AST 20. It is listed for use in those systems requiring 80 tubes.

January, 2007

Certification must be renewed annually. For current status contact:

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SOLAR COLLECTOR  
CERTIFICATION AND RATING

SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

SUPPLIER: **Viessmann Manufacturing Company (US) Inc.**  
45 Access Road  
Warwick, RI 02886

MODEL: Vitosol 100 SV1, SH1  
COLLECTOR TYPE: Glazed Flat-Plate  
CERTIFICATION #: 100-2005-019A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	39	30	20	A (-9°F)	37	28	19
B (5°C)	36	27	17	B (9°F)	34	25	16
C (20°C)	31	22	13	C (36°F)	30	21	12
D (50°C)	23	14	5	D (90°F)	22	13	5
E (80°C)	15	6		E (144°F)	14	6	

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: July 31, 2006

**COLLECTOR SPECIFICATIONS**

Gross Area: 2.523 m<sup>2</sup> 27.16 ft<sup>2</sup>  
Dry Weight: 44.2 kg 97 lb  
Test Pressure: 897 kPa 130 psig

Net Aperture Area: 2.334 m<sup>2</sup> 25.12 ft<sup>2</sup>  
Fluid Capacity: 1.9 l 0.5 gal

**COLLECTOR MATERIALS**

Frame: Aluminum  
Cover (Outer): Tempered Glass  
Cover (Inner): None  
Absorber Material: Tube - Copper / Plate - Copper Fin  
Absorber Coating: Sputtered cermet  
Insulation (Side): Polyurethane Foam  
Insulation (Back): Mineral Wool

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	18	0.07
50	0.79	64	0.25
80	1.27	133	0.53

**TECHNICAL INFORMATION**

Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]

<b>S I Units:</b>	$\eta = 0.7162$	$-3.0562 (P)/I$	$-0.0067 (P)^2/I$	<b>Y Intercept</b>	0.7203	<b>Slope</b>	-3.4981	W/m <sup>2</sup> ·°C
<b>I P Units:</b>	$\eta = 0.7162$	$-0.5386 (P)/I$	$-0.0007 (P)^2/I$		0.7203		-0.616	Btu/hr·ft <sup>2</sup> ·°F

Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]

$K_{arr} = 1.0$  -0.0707 (S) -0.1232 (S)<sup>2</sup>  
 $K_{arr} = 1.0$  -0.20 (S) (Linear Fit)

Model Tested: Vitosol 100, SVI  
Test Fluid: Propylene Glycol & Water  
Test Flow Rate: 50 ml/s 0.79 gpm

**REMARKS:** Pressure drop shown above is for Model SV1

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

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SOLAR COLLECTOR  
CERTIFICATION AND RATING

SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

SUPPLIER: **Viessmann Manufacturing Company (US) Inc.**  
45 Access Road  
Warwick, RI 02886

MODEL: Vitosol 300 Type SP3, 2m2  
COLLECTOR TYPE: Tubular  
CERTIFICATION #: 100-2005-020A

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	31	23	16	A (-9°F)	29	22	15
B (5°C)	30	22	14	B (9°F)	28	21	14
C (20°C)	28	20	13	C (36°F)	26	19	12
D (50°C)	25	17	10	D (90°F)	23	16	9
E (80°C)	21	13	6	E (144°F)	20	13	6

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: July 31, 2006

**COLLECTOR SPECIFICATIONS**

Gross Area: 2.878 m<sup>2</sup> 30.98 ft<sup>2</sup>  
Dry Weight: 57.6 kg 127 lb  
Test Pressure: 130 kPa 19 psig

Net Aperture Area: 2.504 m<sup>2</sup> 26.95 ft<sup>2</sup>  
Fluid Capacity: 1.3 l 0.3 gal

**COLLECTOR MATERIALS**

Frame: Aluminum  
Cover (Outer): Glass Vacuum Tube  
Cover (Inner): None  
Absorber Material: Tube - Copper / Plate - Copper Fin  
Absorber Coating: Sputtered cermet  
Insulation (Side): Vacuum  
Insulation (Back): Vacuum

**PRESSURE DROP**

Flow		Δ P	
ml/s	gpm	Pa	in H <sub>2</sub> O
20	0.32	411	1.65
50	0.79	1557	6.25
80	1.27	3336	13.39

**TECHNICAL INFORMATION**

Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]

	<u>Y Intercept</u>	<u>Slope</u>	
S I Units: $\eta = 0.5079 - 0.9156 (P)/I - 0.0030 (P)^2/I$	0.5093	-1.0948	W/m <sup>2</sup> ·°C
I P Units: $\eta = 0.5079 - 0.1614 (P)/I - 0.0003 (P)^2/I$	0.5093	-0.193	Btu/hr·ft <sup>2</sup> ·°F

Incident Angle Modifier [(S) = 1/cos θ - 1, 0° ≤ θ ≤ 60°]

$K_{arr} = 1.0 + 0.5192 (S) - 0.7428 (S)^2$   
 $K_{arr} = 1.0 - 0.26 (S)$  (Linear Fit)

Model Tested: Vitosol 300, SP3, 2 m2  
Test Fluid: Propylene Glycol & Water  
Test Flow Rate: 59 ml/s 0.94 gpm

REMARKS: Collector tested with long axis of tubes oriented north-south. IAM perpendicular to the tubes is listed above.  
IAM parallel to the tubes = 1.0 - 0.31(S)

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

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SOLAR COLLECTOR  
CERTIFICATION AND RATING

SRCC OG-100

**CERTIFIED SOLAR COLLECTOR**

SUPPLIER: **Viessmann Manufacturing Company (US) Inc.**  
45 Access Road  
Warwick, RI 02886

MODEL: Vitosol 300 Type SP3, 3m2  
COLLECTOR TYPE: Tubular  
CERTIFICATION #: 100-2005-020B

**COLLECTOR THERMAL PERFORMANCE RATING**

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m <sup>2</sup> ·d	MILDLY CLOUDY 17 MJ/m <sup>2</sup> ·d	CLOUDY DAY 11 MJ/m <sup>2</sup> ·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft <sup>2</sup> ·d	MILDLY CLOUDY 1500 Btu/ft <sup>2</sup> ·d	CLOUDY DAY 1000 Btu/ft <sup>2</sup> ·d
A (-5°C)	46	34	23	A (-9°F)	43	33	22
B (5°C)	44	33	22	B (9°F)	42	31	20
C (20°C)	42	30	19	C (36°F)	39	29	18
D (50°C)	37	25	14	D (90°F)	35	24	13
E (80°C)	31	20	10	E (144°F)	29	19	9

A-Pool Heating (Warm Climate) B-Pool Heating (Cool Climate) C-Water Heating (Warm Climate) D-Water Heating (Cool Climate) E-Air Conditioning

Original Certification Date: August 9, 2006

**COLLECTOR SPECIFICATIONS**

Gross Area: 4.287 m<sup>2</sup> 46.15 ft<sup>2</sup>  
Dry Weight: 68 kg 150 lb  
Test Pressure: 130 kPa 19 psig

Net Aperture Area: 3.760 m<sup>2</sup> 40.47 ft<sup>2</sup>  
Fluid Capacity: 1.8 l 0.5 gal

**COLLECTOR MATERIALS**

Frame: Aluminum  
Cover (Outer): Glass Vacuum Tube  
Cover (Inner): None  
Absorber Material: Tube - Copper / Plate - Copper fin  
Absorber Coating: Sputtered cermet  
Insulation (Side): Vacuum  
Insulation (Back): Vacuum

**PRESSURE DROP**

Flow		$\Delta P$	
ml/s	gpm	Pa	in H <sub>2</sub> O

**TECHNICAL INFORMATION**

Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta]

S I Units:  $\eta = 0.5079 - 0.9156 (P)/I - 0.0030 (P)^2/I$ I P Units:  $\eta = 0.5079 - 0.1614 (P)/I - 0.0003 (P)^2/I$ Y Intercept0.5093 -1.0948 W/m<sup>2</sup>·°CSlope0.5093 -0.193 Btu/hr·ft<sup>2</sup>·°FIncident Angle Modifier [(S) = 1/cos  $\theta$  - 1, 0° ≤  $\theta$  ≤ 60°] $K_{arr} = 1.0 + 0.5192 (S) - 0.7428 (S)^2$  $K_{arr} = 1.0 - 0.26 (S)$  (Linear Fit)

Model Tested: Vitosol 300, SP3, 2m2

Test Fluid: Propylene Glycol &amp; Water

Test Flow Rate: ml/s 0.00 gpm

REMARKS: Collector tested with long axis of tubes oriented north-south. IAM perpendicular to the tubes is listed above.  
IAM parallel to the tubes = 1.0 - 0.31(S)

January, 2007

Certification must be renewed annually. For current status contact:

SOLAR RATING &amp; CERTIFICATION CORPORATION

c/o FSEC ♦ 1679 Clearlake Road ♦ Cocoa, FL 32922 ♦ (321) 638-1537 ♦ Fax (321) 638-1010