DIRECTORY OF SRCC CERTIFIED SOLAR COLLECTOR RATINGS

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www.solar-rating.org

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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 0G 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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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^2 d) [2,000 Btu/(ft^2 day)] column, while a cloudy sky would be characterized by the 11 MJ/(m^2 d) [1,000 Btu/(ft^2 day)] column. The 17 MJ/(m^2 d) [1,500 Btu/(ft^2 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:

CATEGORY			APPLICATION
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/m²·day 23° Tilt	MJ/m²·day 45° Tilt	Btu/ft²·day 23° Tilt	Btu/ft²·day 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
Fargo, 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

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

Collector #2

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

Collector #1 is the better buy, based on performance under the test conditions alone. The higher the number of MJs 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.
- Crazing, 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 kg/(s m^2) [51.5 lb/(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 kg/(s m^2) [14.7 lb/(hr ft^2)]. When air is the transfer fluid, the ASHRAE standard flow rate is 0.01 m^3/(s m^2) [2 cfm/ft^2] or 0.03 m^3/(s m^2) [6 cfm/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.

	**This product certified by the** **Solar Rating and Certification Corporation** **c/o FSEC, 1679 Clearlake Road** **Cocoa, FL 32922** **(321)638-1537** **www.solar-rating.org** **SRCC Document OG-100**	**Sample Solar Corporation** **P.O. Box 12345** **Anytown, CA 97402** **Model No.: Super Sample** **Gross Area: 3.72 m^2 (40.00 ft^2)** **Serial Number:_____**	**Mildly Cloudy Day** **Rating in Category C** **31 MJ/day** **29 Mbtu/day**

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*.

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR(S)

SUPPLIER: **Dawn Solar Systems, Inc.**
183 Route 125, Unit A-7
Brentwood, NH 03833

MODEL: Dawn Solar 3004-CT
COLLECTOR TYPE: Unglazed Flat-Plate
CERTIFICATION #: 100-2006-018A

ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Square Meter Per Day				Thousands of Btu Per Square Foot Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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]

							Y Intercept	Slope	
S I Units:	η =	0.0740	-2.8751	(P)/I	+0.0076	(P)^2/I	0.0740	-2.7800	W/m^2·°C
I P Units:	η =	0.0740	-0.5067	(P)/I	0.0000	(P)^2/I	0.0740	-0.4899	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = Not conducted (S)

$K_{\alpha\tau}$ = (S) (Linear Fit)

Model Tested: 3004-CT
Test Fluid: Water
Test Flow Rate: 3 ml/s-m^2 0.005 gpm/ft^2

TESTED COLLECTOR SPECIFICATIONS

Gross Area:	9.641	m^2	103.78	ft^2	**Fluid Capacity:**	8.3 l	2.2 gal
Dry Weight:		kg		lb			
Test Pressure:	1103	kPa	160	psig			

COLLECTOR MATERIALS

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

TESTED MODEL PRESSURE DROP

Flow		Δ P	
ml/s	gpm	Pa	in H_2O

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.

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR(S)

SUPPLIER: **Dawn Solar Systems, Inc.**
183 Route 125, Unit A-7
Brentwood, NH 03833

MODEL: Dawn Solar 3004L
COLLECTOR TYPE: Unglazed Flat-Plate
CERTIFICATION #: 100-2004-009A

ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Square Meter Per Day				Thousands of Btu Per Square Foot Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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]

						Y Intercept	Slope	
S I Units:	η = 0.1250	-1.8670	(P)/I	-0.0806	(P)^2/I	0.1260	-3.6690	W/m^2·°C
I P Units:	η = 0.1250	-0.3290	(P)/I	-0.0079	(P)^2/I	0.1260	-0.6466	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.2119	(S)	+0.1184	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.09	(S)	(Linear Fit)	

Model Tested: 3004L
Test Fluid: Water
Test Flow Rate: 3 ml/s-m^2 0.00 gpm/ft^2

TESTED COLLECTOR SPECIFICATIONS

Gross Area:	9.302	m^2	100.14	ft^2	**Fluid Capacity:**	8.2	l	2.2 gal
Dry Weight:	0	kg		lb				
Test Pressure:	1104	kPa	160	psig				

COLLECTOR MATERIALS

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

TESTED MODEL PRESSURE DROP

Flow		Δ P	
ml/s	gpm	Pa	in H_2O
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.

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR(S)

SUPPLIER: **Fafco, Inc.**
435 Otterson Dr.
Chico, CA 95928

MODEL: Revolution
COLLECTOR TYPE: Unglazed Flat-Plate
CERTIFICATION #: 100-2005-011A

ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Square Meter Per Day				Thousands of Btu Per Square Foot Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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]

						Y Intercept	Slope	
S I Units:	η = 0.8610	-15.4491	(P)/I	+0.0266	(P)^2/I	0.8630	-14.8430	W/m^2·°C
I P Units:	η = 0.8610	-2.7226	(P)/I	0.0000	(P)^2/I	0.8630	-2.6158	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.1410	(S)	+0.0228	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.11	(S)	(Linear Fit)	

Model Tested: Revolution 912R
Test Fluid: Water
Test Flow Rate: 70 ml/s-m^2 0.10 gpm/ft^2

TESTED COLLECTOR SPECIFICATIONS

Gross Area:	4.408	m^2	47.45	ft^2	**Fluid Capacity:**	18.9	l	5.0 gal
Dry Weight:	9.1	kg	20	lb				
Test Pressure:	465	kPa	67	psig				

COLLECTOR MATERIALS

Frame: None
Absorber Material: Tube - UV Stabilized Plastic Polymer
Plate - None
Absorber Coating: None
Insulation: None

TESTED MODEL PRESSURE DROP

Flow		Δ P	
ml/s	gpm	Pa	in H_2O
150	2.38	3677	14.76
250	3.97	9305	37.36
350	5.55	176596	708.97

REMARKS: Tests conducted outdoors.

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR(S)

SUPPLIER: **Fafco, Inc.**
435 Otterson Dr.
Chico, CA 95928

MODEL: Sunsaver
COLLECTOR TYPE: Unglazed Flat-Plate
CERTIFICATION #: 100-2005-010A

ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Square Meter Per Day				Thousands of Btu Per Square Foot Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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]

							Y Intercept	Slope	
S I Units:	η =	0.8280	-13.3685	(P)/I	-0.1050	(P)^2/I	0.8210	-15.4750	W/m^2·°C
I P Units:	η =	0.8280	-2.3559	(P)/I	-0.0103	(P)^2/I	0.8210	-2.7271	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0799	(S)	+0.0562	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.02	(S)	(Linear Fit)	

Model Tested: SunSaver 912
Test Fluid: Water
Test Flow Rate: 70 ml/s-m^2 0.10 gpm/ft^2

TESTED COLLECTOR SPECIFICATIONS

Gross Area:	4.441	m^2	47.81	ft^2	**Fluid Capacity:**	18.9 l	5.0 gal
Dry Weight:	8.85	kg	20	lb			
Test Pressure:	414	kPa	60	psig			

COLLECTOR MATERIALS

Frame: None
Absorber Material: Tube - UV Stabilized Plastic Polymer
Plate - None
Absorber Coating: None
Insulation: None

TESTED MODEL PRESSURE DROP

Flow		Δ P	
ml/s	gpm	Pa	in H_2O
303	4.80	1000	4.01
0	0.00	0	0.00
0	0.00	0	0.00

REMARKS: Tests conducted outdoors.

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR(S)

SUPPLIER: **Fafco, Inc.**
435 Otterson Dr.
Chico, CA 95928

MODEL: Sunsaver ST
COLLECTOR TYPE: Unglazed Flat-Plate
CERTIFICATION #: 100-2005-012A

ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Square Meter Per Day				Thousands of Btu Per Square Foot Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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]

						Y Intercept	Slope	
S I Units:	η = 0.8110	-21.4446	(P)/I	-0.0993	(P)^2/I	0.8110	-22.4410	W/m^2·°C
I P Units:	η = 0.8110	-3.7791	(P)/I	-0.0097	(P)^2/I	0.8110	-3.9547	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.2340	(S)	+0.1480	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.08	(S)	(Linear Fit)	

Model Tested: SunSaver St 948
Test Fluid: Water
Test Flow Rate: 74 ml/s-m^2 0.11 gpm/ft^2

TESTED COLLECTOR SPECIFICATIONS

Gross Area:	2.934	m^2	31.59	ft^2	**Fluid Capacity:**	15.5	l	4.1 gal
Dry Weight:	6	kg	13	lb				
Test Pressure:	414	kPa	60	psig				

COLLECTOR MATERIALS

Frame: None
Absorber Material: Tube - UV Stabilized Plastic Polymer
Plate - None
Absorber Coating: None
Insulation: None

TESTED MODEL PRESSURE DROP

Flow		Δ P	
ml/s	gpm	Pa	in H_2O
150	2.38	3683	14.79
250	3.97	6363	25.55
350	5.55	10442	41.92

REMARKS: Tests conducted outdoors.

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR(S)

SUPPLIER: **Heliocol USA, Inc.**
927 Fern Street
Suite 1500
Altamonte Springs, FL 32701

MODEL: Heliocol HC
COLLECTOR TYPE: Unglazed Flat-Plate
CERTIFICATION #: 100-1983-006A

ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Square Meter Per Day				Thousands of Btu Per Square Foot Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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]

						Y Intercept	Slope	
S I Units:	η =	0.8730	-20.6200	(P)/I	-0.0430 (P)^2/I	0.8710	-21.3100	W/m^2·°C
I P Units:	η =	0.8730	-3.6338	(P)/I	-0.0042 (P)^2/I	0.8710	-3.7554	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0316	(S)	-0.0104	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.04	(S)	(Linear Fit)	

Model Tested: HC-30
Test Fluid: Water
Test Flow Rate: 70 ml/s-m^2 0.10 gpm/ft^2

TESTED COLLECTOR SPECIFICATIONS

Gross Area:	2.703	m^2	29.10	ft^2
Dry Weight:	7	kg	15	lb
Test Pressure:	621	kPa	90	psig

Fluid Capacity: 9.1 l 2.4 gal

COLLECTOR MATERIALS

Frame: None
Absorber Material: Tube - Polypropylene with UV Stabilization
Plate - None
Absorber Coating: None
Insulation: None

TESTED MODEL PRESSURE DROP

Flow		Δ P	
ml/s	gpm	Pa	in H_2O

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

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR(S)

SUPPLIER: **Performance Solar**
480 Corporate Drive
Escondido, CA 92029

MODEL: Performance
COLLECTOR TYPE: Unglazed Flat-Plate
CERTIFICATION #: 100-2007-011A

ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Square Meter Per Day				Thousands of Btu Per Square Foot Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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: June 1, 2007

TECHNICAL INFORMATION

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

						Y Intercept	Slope	
S I Units:	η =	0.8280	-13.3685	(P)/I	-0.1050	(P)^2/I	0.8210	-15.4750	W/m^2·°C
I P Units:	η =	0.8280	-2.3559	(P)/I	-0.0103	(P)^2/I	0.8210	-2.7271	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0799	(S)	+0.0562	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.02	(S)	(Linear Fit)	

Model Tested: 100-2005-010A
Test Fluid: Water
Test Flow Rate: 70 ml/s-m^2 0.10 gpm/ft^2

TESTED COLLECTOR SPECIFICATIONS

Gross Area:	4.441	m^2	47.81	ft^2	**Fluid Capacity:**	18.9 l	5.0 gal
Dry Weight:	8.85	kg	20	lb			
Test Pressure:	414	kPa	60	psig			

COLLECTOR MATERIALS

Frame: None
Absorber Material: Tube - UV Stabilized Plastic Polymer
Plate - None
Absorber Coating: None
Insulation: None

TESTED MODEL PRESSURE DROP

Flow		Δ P	
ml/s	gpm	Pa	in H_2O
303	4.80	1000	4.01
0	0.00	0	0.00
0	0.00	0	0.00

REMARKS: Tests conducted outdoors.

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR(S)

SUPPLIER: **Performance Solar**
480 Corporate Drive
Escondido, CA 92029

MODEL: Performance Plus
COLLECTOR TYPE: Unglazed Flat-Plate
CERTIFICATION #: 100-2007-012A

ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Square Meter Per Day				Thousands of Btu Per Square Foot Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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: June 1, 2007

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.8610	-15.4491	(P)/I	+0.0266	(P)^2/I	0.8630	-14.8430	W/m^2·°C
I P Units:	η =	0.8610	-2.7226	(P)/I	0.0000	(P)^2/I	0.8630	-2.6158	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.1410	(S)	+0.0228	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.11	(S)	(Linear Fit)	

Model Tested: 100-2005-011A
Test Fluid: Water
Test Flow Rate: 70 ml/s-m^2 0.10 gpm/ft^2

TESTED COLLECTOR SPECIFICATIONS

Gross Area:	4.408	m^2	47.45	ft^2	**Fluid Capacity:**	18.9 l	5.0 gal
Dry Weight:	9.1	kg	20	lb			
Test Pressure:	465	kPa	67	psig			

COLLECTOR MATERIALS

Frame: None
Absorber Material: Tube - UV Stabilized Plastic Polymer
Plate - None
Absorber Coating: None
Insulation: None

TESTED MODEL PRESSURE DROP

Flow		Δ P	
ml/s	gpm	Pa	in H_2O
150	2.38	3677	14.76
250	3.97	9305	37.36
350	5.55	176596	708.97

REMARKS: Tests conducted outdoors.

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR(S)

SUPPLIER: **Performance Solar**
480 Corporate Drive
Escondido, CA 92029

MODEL: Performance ST
COLLECTOR TYPE: Unglazed Flat-Plate
CERTIFICATION #: 100-2007-013A

ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Square Meter Per Day				Thousands of Btu Per Square Foot Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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: June 1, 2007

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.8110	-21.4446	(P)/I	-0.0993	(P)^2/I	0.8110	-22.4410	W/m^2·°C
I P Units:	η =	0.8110	-3.7791	(P)/I	-0.0097	(P)^2/I	0.8110	-3.9547	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.2340	(S)	+0.1480	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.08	(S)	(Linear Fit)		

Model Tested: 100-2005-012A
Test Fluid: Water
Test Flow Rate: 74 ml/s-m^2 0.11 gpm/ft^2

TESTED COLLECTOR SPECIFICATIONS

Gross Area:	2.934	m^2	31.59	ft^2	**Fluid Capacity:**	15.5 l	4.1 gal
Dry Weight:	6	kg	13	lb			
Test Pressure:	414	kPa	60	psig			

COLLECTOR MATERIALS

Frame: None
Absorber Material: Tube - UV Stabilized Plastic Polymer
Plate - None
Absorber Coating: None
Insulation: None

TESTED MODEL PRESSURE DROP

Flow		Δ P	
ml/s	gpm	Pa	in H_2O
150	2.38	3683	14.79
250	3.97	6363	25.55
350	5.55	10442	41.92

REMARKS: Tests conducted outdoors.

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR(S)

SUPPLIER: **Sealed Air Corporation**
3433 Arden Road
Hayward, CA 94545

MODEL: FP
COLLECTOR TYPE: Unglazed Flat-Plate
CERTIFICATION #: 100-1997-010A

ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Square Meter Per Day				Thousands of Btu Per Square Foot Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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]

						Y Intercept	Slope	
S I Units:	η =	0.7940	-15.7800	(P)/I	-0.0091 (P)^2/I	0.7940	-15.9400	W/m^2·°C
I P Units:	η =	0.7940	-2.7809	(P)/I	-0.0009 (P)^2/I	0.7940	-2.8091	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	(S)	(S)^2
$K_{\alpha\tau}$ =	1.0	(S)	(Linear Fit)

Model Tested: FP-48
Test Fluid: Water
Test Flow Rate: 70 ml/s-m^2 0.10 gpm/ft^2

TESTED COLLECTOR SPECIFICATIONS

Gross Area:	4.359	m^2	46.92	ft^2
Dry Weight:	13.4	kg	30	lb
Test Pressure:	207	kPa	30	psig

Fluid Capacity: 11.7 l 3.1 gal

COLLECTOR MATERIALS

Frame: None
Absorber Material: Tube - Co-polymer plastic
Plate - Co-polymer plastic
Absorber Coating: None
Insulation: None

TESTED MODEL PRESSURE DROP

Flow		Δ P	
ml/s	gpm	Pa	in H_2O

REMARKS: Tests conducted outdoors.

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR(S)

SUPPLIER: **Sealed Air Corporation**
3433 Arden Road
Hayward, CA 94545

MODEL: FS
COLLECTOR TYPE: Unglazed Flat-Plate
CERTIFICATION #: 100-1997-010B

ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Square Meter Per Day				Thousands of Btu Per Square Foot Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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]

						Y Intercept	Slope	
S I Units:	η = 0.7820	-15.0400	(P)/I	-0.0102	(P)^2/I	0.7810	-15.2200	W/m^2·°C
I P Units:	η = 0.7820	-2.6505	(P)/I	-0.0010	(P)^2/I	0.7810	-2.6822	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	(S)	(S)^2	**Model Tested:**	FS-48		
$K_{\alpha\tau}$ =	(S)	(Linear Fit)	**Test Fluid:**	Water		
			Test Flow Rate:	65 ml/s-m^2	0.10	gpm/ft^2

TESTED COLLECTOR SPECIFICATIONS

Gross Area:	4.404	m^2	47.41	ft^2	**Fluid Capacity:**	11.7	l	3.1 gal
Dry Weight:	29	kg	64	lb				
Test Pressure:	207	kPa	30	psig				

COLLECTOR MATERIALS

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

TESTED MODEL PRESSURE DROP

Flow		Δ P	
ml/s	gpm	Pa	in H_2O

REMARKS: Tests conducted outdoors.

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR(S)

SUPPLIER: **SolarTech International LLC**
2913 E. 19th St.
Tucson, AZ 85716

MODEL: SolarTech ST-300
COLLECTOR TYPE: Unglazed Flat-Plate
CERTIFICATION #: 100-2004-010A

ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Square Meter Per Day				Thousands of Btu Per Square Foot Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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]

						Y Intercept	Slope	
S I Units:	η =	0.6960	-23.3641	(P)/I	-0.1319	(P)^2/I	0.7090	-21.9887	W/m^2·°C
I P Units:	η =	0.6960	-4.1174	(P)/I	-0.0129	(P)^2/I	0.7090	-3.8750	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.1604	(S)	-0.2656	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.16	(S)	(Linear Fit)	

Model Tested:	ST-300			
Test Fluid:	Water			
Test Flow Rate:	63	ml/s-m^2	0.09	gpm/ft^2

TESTED COLLECTOR SPECIFICATIONS

Gross Area:	3.229	m^2	34.76	ft^2	**Fluid Capacity:**	26.1	l	6.9	gal
Dry Weight:	12.7	kg	28	lb					
Test Pressure:	517	kPa	75	psig					

COLLECTOR MATERIALS

Frame:	None
Absorber Material:	Tube - Polyethylene
	Plate - None
Absorber Coating:	None
Insulation:	None

TESTED MODEL PRESSURE DROP

Flow		Δ P	
ml/s	gpm	Pa	in H_2O
150	2.38	17250	69.25
250	3.97	43750	175.64
350	5.55	82250	330.20

REMARKS: Tests conducted outdoors.

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR(S)

SUPPLIER: **Suntrek Industries, Inc.**
5 Holland, Building 215
Irvine, CA 92618

MODEL: SunTrek
COLLECTOR TYPE: Unglazed Flat-Plate
CERTIFICATION #: 100-2005-004A

ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Square Meter Per Day				Thousands of Btu Per Square Foot Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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]

						Y Intercept	Slope	
S I Units:	η = 0.8560	-17.9339	(P)/I	+0.0386	(P)^2/I	0.8600	-17.6784	W/m^2·°C
I P Units:	η = 0.8560	-3.1605	(P)/I	0.0000	(P)^2/I	0.8600	-3.1154	Btu/hr·ft^2·°F

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

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

Model Tested: SunTrek
Test Fluid: Water
Test Flow Rate: 70 ml/s-m^2 0.10 gpm/ft^2

TESTED COLLECTOR SPECIFICATIONS

Gross Area:	3.869	m^2	41.65	ft^2	**Fluid Capacity:**	8.7 l	2.3 gal
Dry Weight:	21.3	kg	47	lb			
Test Pressure:	414	kPa	60	psig			

COLLECTOR MATERIALS

Frame: None
Absorber Material: Tube - EPDM
Plate - None
Absorber Coating: None
Insulation: None

TESTED MODEL PRESSURE DROP

Flow		Δ P	
ml/s	gpm	Pa	in H_2O

REMARKS: Tests conducted outdoors.

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR(S)

SUPPLIER: **Techno-Solis, Inc.**
301 20th Street South
St. Petersburg, FL 33712

MODEL: Swimmaster SM / C20TS10
COLLECTOR TYPE: Unglazed Flat-Plate
CERTIFICATION #: 100-2004-004A

ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED.

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Square Meter Per Day				Thousands of Btu Per Square Foot Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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]

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

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

$K_{\alpha\tau}$ =	1.0	-0.1306	(S)	+0.0083	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.12	(S)	(Linear Fit)	

Model Tested: TS-40-A
Test Fluid: Water
Test Flow Rate: 71 ml/s-m^2 0.10 gpm/ft^2

TESTED COLLECTOR SPECIFICATIONS

Gross Area:	3.964	m^2	42.67	ft^2
Dry Weight:	12	kg	26	lb
Test Pressure:	365	kPa	53	psig

Fluid Capacity: 12.5 l 3.3 gal

COLLECTOR MATERIALS

Frame: None
Absorber Material: Tube - Co-polymer plastic
Plate - Co-polymer plastic
Absorber Coating: None
Insulation: None

TESTED MODEL PRESSURE DROP

Flow		Δ P	
ml/s	gpm	Pa	in H_2O
252	4.00	2242	9.00

REMARKS: Tests conducted outdoors.

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	10.04	ft^2	**Net Aperture Area:**	0.847	m^2	9.12	ft^2
Dry Weight:	8.62	kg	19	lb	**Fluid Capacity:**	0.6	l	0.2	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

$K_{\alpha\tau}$ = 1.0 -0.1944 (S) -0.0186 (S)^2

$K_{\alpha\tau}$ = 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:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	20.08	ft^2	**Net Aperture Area:**	1.720	m^2	18.51	ft^2
Dry Weight:	17.2	kg	38	lb	**Fluid Capacity:**	1.8	l	0.5	gal
Test Pressure:	1103	kPa	160	psig					

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_2O
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]

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

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

$K_{\alpha\tau}$ =	1.0	-0.1944	(S)	-0.0186	(S)^2	
$K_{\alpha\tau}$ =	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:

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-21
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2002-001A

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	20.79	ft^2	**Net Aperture Area:**	1.783	m^2	19.19	ft^2
Dry Weight:	33.6	kg	74	lb	**Fluid Capacity:**	3.0	l	0.8	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**
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]

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

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

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

Model Tested: AE-21
Test Fluid: Water
Test Flow Rate: 39 ml/s 0.62 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	20.73	ft^2	**Net Aperture Area:**	1.776	m^2	19.12	ft^2
Dry Weight:	40.8	kg	90	lb	**Fluid Capacity:**	3.0	l	0.8	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.638	-4.2645	(P)/I	-0.0297	(P)^2/I	0.66	-6.37	W/m^2·°C
I P Units:	η =	0.638	-0.7515	(P)/I	-0.0029	(P)^2/I	0.66	-1.123	Btu/hr·ft^2·°F

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

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

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

REMARKS:

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-24
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2002-001B

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	23.81	ft^2	**Net Aperture Area:**	2.043	m^2	21.99	ft^2
Dry Weight:	38.1	kg	84	lb	**Fluid Capacity:**	3.4	l	0.9	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

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

Model Tested: AE-21
Test Fluid: Water
Test Flow Rate: 39 ml/s 0.62 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	23.81	ft^2	**Net Aperture Area:**	2.043	m^2	21.99	ft^2
Dry Weight:	43.1	kg	95	lb	**Fluid Capacity:**	3.4	l	0.9	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

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

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

REMARKS:

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-26
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2002-001C

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	25.35	ft^2	**Net Aperture Area:**	2.197	m^2	23.65	ft^2
Dry Weight:	40.8	kg	90	lb	**Fluid Capacity:**	3.8	l	1.0	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

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

Model Tested: AE-21
Test Fluid: Water
Test Flow Rate: 39 ml/s 0.62 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	34	26	18
B (5°C)	30	22	14
C (20°C)	24	16	8
D (50°C)	11	4	
E (80°C)			

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	33	25	17
B (9°F)	29	21	13
C (36°F)	23	15	8
D (90°F)	10	4	
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^2	25.35	ft^2	**Net Aperture Area:**	2.197	m^2	23.65	ft^2
Dry Weight:	45.4	kg	100	lb	**Fluid Capacity:**	3.8	l	1.0	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

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

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

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

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

REMARKS:

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-28
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2002-001D

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	27.98	ft^2	**Net Aperture Area:**	2.430	m^2	26.16	ft^2
Dry Weight:	44.9	kg	99	lb	**Fluid Capacity:**	4.2	l	1.1	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

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

Model Tested: AE-21
Test Fluid: Water
Test Flow Rate: 39 ml/s 0.62 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	38	29	20
B (5°C)	34	24	15
C (20°C)	26	18	9
D (50°C)	12	5	
E (80°C)			

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	36	27	19
B (9°F)	32	23	15
C (36°F)	25	17	8
D (90°F)	11	4	
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	m²	27.98	ft²	**Net Aperture Area:**	2.430	m²	26.16	ft²
Dry Weight:	47.6	kg	105	lb	**Fluid Capacity:**	4.2	l	1.1	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.638	-4.2645	(P)/I	-0.0297	$(P)^2/I$	0.655	-6.37	W/m²·°C
I P Units:	η =	0.638	-0.7515	(P)/I	-0.0029	$(P)^2/I$	0.655	-1.123	Btu/hr·ft²·°F

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

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

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

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	31.92	ft^2	**Net Aperture Area:**	2.781	m^2	29.94	ft^2
Dry Weight:	51.2	kg	113	lb	**Fluid Capacity:**	4.9	l	1.3	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

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

Model Tested: AE-21
Test Fluid: Water
Test Flow Rate: 39 ml/s 0.62 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	43	33	23
B (5°C)	38	28	18
C (20°C)	30	20	10
D (50°C)	13	5	
E (80°C)	1		

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	41	31	21
B (9°F)	36	26	17
C (36°F)	29	19	9
D (90°F)	13	5	
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	m²	31.92	ft²	**Net Aperture Area:**	2.781	m²	29.94 ft²
Dry Weight:	50.8	kg	112	lb	**Fluid Capacity:**	4.9	l	1.3 gal
Test Pressure:	1103	kPa	160	psig				

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.638	-4.2645	(P)/I	-0.0297	$(P)^2/I$	0.655	-6.37	W/m²·°C
I P Units:	η =	0.638	-0.7515	(P)/I	-0.0029	$(P)^2/I$	0.655	-1.123	Btu/hr·ft²·°F

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

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

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

REMARKS:

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-40
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2002-001F

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	39.78	ft^2	**Net Aperture Area:**	3.481	m^2	37.47	ft^2
Dry Weight:	69.4	kg	153	lb	**Fluid Capacity:**	6.1	l	1.6	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

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

Model Tested: AE-21
Test Fluid: Water
Test Flow Rate: 39 ml/s 0.62 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	54	41	28
B (5°C)	48	35	22
C (20°C)	38	25	12
D (50°C)	17	6	
E (80°C)	1		

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	51	39	27
B (9°F)	45	33	21
C (36°F)	36	24	12
D (90°F)	16	6	
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	m²	39.78	ft²	**Net Aperture Area:**	3.481	m²	37.47	ft²
Dry Weight:	65.3	kg	144	lb	**Fluid Capacity:**	6.1	l	1.6	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.638	-4.2645	(P)/I	-0.0297	$(P)^2/I$	0.655	-6.37	W/m²·°C
I P Units:	η =	0.638	-0.7515	(P)/I	-0.0029	$(P)^2/I$	0.655	-1.123	Btu/hr·ft²·°F

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

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

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

REMARKS:

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-50
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2002-001H

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	50.20	ft^2	**Net Aperture Area:**	4.400	m^2	47.36	ft^2
Dry Weight:	82.54	kg	182	lb	**Fluid Capacity:**	6.4	l	1.7	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

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

Model Tested: AE-21
Test Fluid: Water
Test Flow Rate: 39 ml/s 0.62 gpm

REMARKS:

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-56
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2002-001G

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	55.71	ft^2	**Net Aperture Area:**	4.898	m^2	52.72	ft^2
Dry Weight:	92.5	kg	204	lb	**Fluid Capacity:**	6.8	l	1.8	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

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

Model Tested: AE-21
Test Fluid: Water
Test Flow Rate: 39 ml/s 0.62 gpm

REMARKS:

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-21
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2002-002A

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	21.50	ft^2	**Net Aperture Area:**	1.760	m^2	18.95	ft^2
Dry Weight:	37.2	kg	82	lb	**Fluid Capacity:**	3.2	l	0.8	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

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

Model Tested: AE-21
Test Fluid: Water
Test Flow Rate: 39 ml/s 0.62 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	21.52	ft^2	**Net Aperture Area:**	1.748	m^2	18.82	ft^2
Dry Weight:	47.6	kg	105	lb	**Fluid Capacity:**	3.0	l	0.8	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**
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]

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

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

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

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

REMARKS:

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-24
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2002-002B

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	24.50	ft^2	**Net Aperture Area:**	2.015	m^2	21.69	ft^2
Dry Weight:	46.3	kg	102	lb	**Fluid Capacity:**	3.4	l	0.9	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

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

Model Tested: AE-21
Test Fluid: Water
Test Flow Rate: 39 ml/s 0.62 gpm

REMARKS:

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-24E
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-1999-001E

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	24.38	ft^2	**Net Aperture Area:**	2.002	m^2	21.55	ft^2
Dry Weight:	49.9	kg	110	lb	**Fluid Capacity:**	3.4	l	0.9	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

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

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

REMARKS:

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-26
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2002-002C

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	26.01	ft^2	**Net Aperture Area:**	2.171	m^2	23.37	ft^2
Dry Weight:	46.3	kg	102	lb	**Fluid Capacity:**	4.2	l	1.1	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

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

Model Tested: AE-21
Test Fluid: Water
Test Flow Rate: 39 ml/s 0.62 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	25.89	ft^2	**Net Aperture Area:**	2.158	m^2	23.23	ft^2
Dry Weight:	52.2	kg	115	lb	**Fluid Capacity:**	3.8	l	1.0	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

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

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

REMARKS:

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-28
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2002-002D

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	28.67	ft^2	**Net Aperture Area:**	2.403	m^2	25.87	ft^2
Dry Weight:	54.4	kg	120	lb	**Fluid Capacity:**	4.5	l	1.2	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

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

Model Tested: AE-21
Test Fluid: Water
Test Flow Rate: 39 ml/s 0.62 gpm

REMARKS:

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-28E
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-1999-001G

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	28.55	ft^2	**Net Aperture Area:**	2.389	m^2	25.72	ft^2
Dry Weight:	54.4	kg	120	lb	**Fluid Capacity:**	4.2	l	1.1	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.638	-4.2640	(P)/I	-0.0297	(P)^2/I	0.655	-6.37	W/m^2·°C
I P Units:	η =	0.638	-0.7514	(P)/I	-0.0029	(P)^2/I	0.655	-1.123	Btu/hr·ft^2·°F

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

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

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

REMARKS:

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-32
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2002-002E

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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	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^2	32.67	ft^2	**Net Aperture Area:**	2.750	m^2	29.60	ft^2
Dry Weight:	60.3	kg	133	lb	**Fluid Capacity:**	4.9	l	1.3	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

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

Model Tested: AE-21
Test Fluid: Water
Test Flow Rate: 39 ml/s 0.62 gpm

REMARKS:

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-32E
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-1999-001K

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	32.54	ft^2	**Net Aperture Area:**	2.736	m^2	29.45	ft^2
Dry Weight:	57.6	kg	127	lb	**Fluid Capacity:**	4.9	l	1.3	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

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

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

REMARKS:

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-40
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2002-002F

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	42.15	ft^2	**Net Aperture Area:**	3.580	m^2	38.54	ft^2
Dry Weight:	72.1	kg	159	lb	**Fluid Capacity:**	6.1	l	1.6	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

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

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

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

Model Tested:	AE-21			
Test Fluid:	Water			
Test Flow Rate:	39	ml/s	0.62	gpm

REMARKS:

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-40E
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-1999-001L

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	40.52	ft^2	**Net Aperture Area:**	3.428	m^2	36.90	ft^2
Dry Weight:	76.6	kg	169	lb	**Fluid Capacity:**	6.1	l	1.6	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

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

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

REMARKS:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

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

MODEL: Starfire ST-21E
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-1999-002A

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	21.17	ft^2	**Net Aperture Area:**	1.876	m^2	20.19	ft^2
Dry Weight:	38.6	kg	85	lb	**Fluid Capacity:**	1.8	l	0.5	gal
Test Pressure:	552	kPa	80	psig					

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

Flow		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.665	-4.7160	(P)/I	-0.0185	(P)^2/I	0.674	-6.02	W/m^2·°C
I P Units:	η =	0.665	-0.8311	(P)/I	-0.0018	(P)^2/I	0.674	-1.061	Btu/hr·ft^2·°F

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

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

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

REMARKS:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

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

MODEL: Starfire ST-40E
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-1999-002B

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	38.48	ft^2	**Net Aperture Area:**	3.468	m^2	37.33	ft^2
Dry Weight:	79.5	kg	175	lb	**Fluid Capacity:**	6.1	l	1.6	gal
Test Pressure:	552	kPa	80	psig					

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

Flow		Δ P	
ml/s	gpm	Pa	in H_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.665	-4.7160	(P)/I	-0.0185	$(P)^2/I$	0.674	-6.02	$W/m^2 \cdot °C$
I P Units:	η =	0.665	-0.8311	(P)/I	-0.0018	$(P)^2/I$	0.674	-1.061	$Btu/hr \cdot ft^2 \cdot °F$

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

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

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

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	30.83	ft^2	**Net Aperture Area:**	2.466	m^2	26.54	ft^2
Dry Weight:	62.6	kg	138	lb	**Fluid Capacity:**	1.3	l	0.3	gal
Test Pressure:	827	kPa	120	psig					

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_2O**
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]

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

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

$K_{\alpha\tau}$ =	1.0	+0.7534	(S)	-1.1963	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.50	(S)	(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 north-south. IAM perpendicular to the tubes is listed above. IAM parallel to the tubes = 1.0 - 0.59(S)

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	14.45	ft^2	**Net Aperture Area:**	1.169	m^2	12.58	ft^2
Dry Weight:	34.8	kg	77	lb	**Fluid Capacity:**	0.3	l	0.1	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

$K_{\alpha\tau}$ = 1.0 +1.1718 (S) -0.8470 (S)^2

$K_{\alpha\tau}$ = 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)

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	29.16	ft^2	**Net Aperture Area:**	2.378	m^2	25.60	ft^2
Dry Weight:	56.9	kg	125	lb	**Fluid Capacity:**	0.5	l	0.1	gal
Test Pressure:	1103	kPa	160	psig					

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_2O
55	0.86	700	2.81

TECHNICAL INFORMATION

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

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

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

$K_{\alpha\tau}$ = 1.0 +1.1718 (S) -0.8470 (S)^2

$K_{\alpha\tau}$ = 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)

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	32.11	ft^2	**Net Aperture Area:**	2.620	m^2	28.20	ft^2
Dry Weight:	71.3	kg	157	lb	**Fluid Capacity:**	0.6	l	0.2	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

$K_{\alpha\tau}$ = 1.0 +1.1718 (S) -0.8470 (S)^2

$K_{\alpha\tau}$ = 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)

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	43.63	ft^2	**Net Aperture Area:**	3.795	m^2	40.85	ft^2
Dry Weight:	82.5	kg	182	lb	**Fluid Capacity:**	0.7	l	0.2	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

$K_{\alpha\tau}$ = 1.0 +1.1718 (S) -0.8470 (S)^2
$K_{\alpha\tau}$ = 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)

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	18.07	ft^2	**Net Aperture Area:**	1.487	m^2	16.01	ft^2
Dry Weight:	40	kg	88	lb	**Fluid Capacity:**	0.4	l	0.1	gal
Test Pressure:	1000	kPa	145	psig					

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_2O
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]

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

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

$K_{\alpha\tau}$ =	1.0	+0.1174 (S)	-0.1400 (S)^2	
$K_{\alpha\tau}$ =	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 north-south. IAM perpendicular to the tubes is listed above. IAM parallel to the tubes = 1.0 - 0.09(S)

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	36.53	ft^2	**Net Aperture Area:**	3.008	m^2	32.38	ft^2
Dry Weight:	75	kg	165	lb	**Fluid Capacity:**	0.8	l	0.2	gal
Test Pressure:	1000	kPa	145	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

$K_{\alpha\tau}$ =	1.0	+0.1174 (S)	-0.1400	(S)^2	
$K_{\alpha\tau}$ =	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)

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 1-16
COLLECTOR TYPE: Tubular
CERTIFICATION #: 100-2004-001B

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·d
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^2	42.99	ft^2	**Net Aperture Area:**	3.619	m^2	38.96	ft^2
Dry Weight:	100.2	kg	221	lb	**Fluid Capacity:**	1.1	l	0.3	gal
Test Pressure:	1000	kPa	145	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

$K_{\alpha\tau}$ =	1.0	+0.3023	(S)	-0.3057	(S)^2
$K_{\alpha\tau}$ =	1.0	0.00	(S)	(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)

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/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	21.50	ft^2	**Net Aperture Area:**	1.810	m^2	19.48	ft^2
Dry Weight:	47	kg	104	lb	**Fluid Capacity:**	0.7	l	0.2	gal
Test Pressure:	1000	kPa	145	psig					

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_2O
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]

						Y Intercept	Slope	
S I Units:	η =	0.5255	-1.3253	(P)/I	-0.0042 (P)²/I	0.529	-1.697	W/m²·°C
I P Units:	η =	0.5255	-0.2336	(P)/I	-0.0004 (P)²/I	0.529	-0.299	Btu/hr·ft²·°F

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

$K_{\alpha\tau}$ =	1.0	+0.3023	(S)	-0.3057	$(S)^2$
$K_{\alpha\tau}$ =	1.0	0.00	(S)	(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)

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	44.10	ft^2	**Net Aperture Area:**	3.634	m^2	39.12	ft^2
Dry Weight:	105	kg	232	lb	**Fluid Capacity:**	1.0	l	0.3	gal
Test Pressure:	1000	kPa	145	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

$K_{\alpha\tau}$ = 1.0 +0.9474 (S) -1.0762 (S)^2
$K_{\alpha\tau}$ = 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 north-south. IAM perpendicular to the tubes is listed above. IAM parallel to the tubes = 1.0 - 0.32(S)

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	21.83	ft^2	**Net Aperture Area:**	1.830	m^2	19.70	ft^2
Dry Weight:	49.2	kg	108	lb	**Fluid Capacity:**	0.5	l	0.1	gal
Test Pressure:	1000	kPa	145	psig					

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_2O
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]

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

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

$K_{\alpha\tau}$ =	1.0	+0.9474 (S)	-1.0762 (S)^2	
$K_{\alpha\tau}$ =	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 north-south. IAM perpendicular to the tubes is listed above. IAM parallel to the tubes = 1.0 - 0.32(S)

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	33.10	ft^2	**Net Aperture Area:**	2.336	m^2	25.15	ft^2
Dry Weight:	55.4	kg	122	lb	**Fluid Capacity:**	1.3	l	0.3	gal
Test Pressure:	1103	kPa	160	psig					

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		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**
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]

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

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

$K_{\alpha\tau}$ =	1.0	+1.1787	(S)	-0.6569	(S)^2	
$K_{\alpha\tau}$ =	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)

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Energy Conservation Services**
PO Box 393
Carlton, MN 55718

MODEL: Solarway 6000
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2006-004A

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·d
A (-5°C)	31	24	17	A (-9°F)	29	23	16
B (5°C)	24	17	10	B (9°F)	23	16	10
C (20°C)	15	9	3	C (36°F)	14	8	3
D (50°C)	2			D (90°F)	2		
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 29, 2007

COLLECTOR SPECIFICATIONS

Gross Area:	3.001	m^2	32.30	ft^2	**Net Aperture Area:**	2.703	m^2	29.10 ft^2
Dry Weight:	48.1	kg	106	lb	**Fluid Capacity:**			gal
Test Pressure:	-0.25	kPa	-0.04	psig				

COLLECTOR MATERIALS

Frame:	Sheet metal
Cover (Outer):	Fiberglass Reinforced Plastic
Cover (Inner):	None
Absorber Material:	Tube - / Plate - Fibrous mat spun fiberglass
Absorber Coating:	None
Insulation (Side):	Polyisocyanurate
Insulation (Back):	Polyisocyanurate

PRESSURE DROP

Flow		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**
25000	396.51	48	0.19
50000	793.02	186	0.75
100000	1586.04	732	2.94

TECHNICAL INFORMATION

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

						Y Intercept	Slope	
S I Units:	η =	0.4206	-5.7169	(P)/I	-0.0078 (P)^2/I	0.422	-6.01	W/m^2·°C
I P Units:	η =	0.4206	-1.0075	(P)/I	-0.0008 (P)^2/I	0.422	-1.059	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 +0.0673 (S) -0.1732 (S)^2

$K_{\alpha\tau}$ = 1.0 -0.11 (S) (Linear Fit)

Model Tested: Solarway 6000
Test Fluid: Air
Test Flow Rate: 27 l/s 58.2 scfm

REMARKS:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

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

MODEL: Commercial Collector COL-4X8-NL-SG1-SH10US
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 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/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	30.93	ft^2	**Net Aperture Area:**	2.691	m^2	28.97 ft^2
Dry Weight:	50.4	kg	111	lb	**Fluid Capacity:**	1.9	l	0.5 gal
Test Pressure:	517	kPa	75	psig				

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_2O
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]

						Y Intercept	Slope	
S I Units:	η =	0.7622	-3.2787	(P)/I	-0.0129 (P)²/I	0.7683	-4.0348	W/m²·°C
I P Units:	η =	0.7622	-0.5778	(P)/I	-0.0013 (P)²/I	0.7683	-0.711	Btu/hr·ft²·°F

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

$K_{\alpha\tau}$ = 1.0 +0.0566 (S) -0.2167 $(S)^2$

$K_{\alpha\tau}$ = 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:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

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

MODEL: Residential Collector COL-4x8-TL-SG1-SD10US
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	30.94	ft^2	**Net Aperture Area:**	2.691	m^2	28.97	ft^2
Dry Weight:	50.4	kg	111	lb	**Fluid Capacity:**	1.2	l	0.3	gal
Test Pressure:	517	kPa	75	psig					

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_2O
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]

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

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

$K_{\alpha\tau}$ = 1.0 -0.1100 (S) -0.0506 (S)^2

$K_{\alpha\tau}$ = 1.0 -0.16 (S) (Linear Fit)

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

REMARKS:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Environmental Solar Systems**
117 West Street
Methuen, MA 01844

MODEL: Sun Mate SM-14
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2006-002A

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	23	18	12
B (5°C)	20	15	9
C (20°C)	16	10	5
D (50°C)	7	3	
E (80°C)	1		

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	22	17	12
B (9°F)	19	14	9
C (36°F)	15	10	5
D (90°F)	7	2	
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: March 21, 2007

COLLECTOR SPECIFICATIONS

Gross Area:	1.742	m²	18.75	ft²	**Net Aperture Area:**	1.603	m²	17.26 ft²
Dry Weight:	39	kg	86	lb	**Fluid Capacity:**	0.0	l	0.0 gal
Test Pressure:	0	kPa	0	psig				

COLLECTOR MATERIALS

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

PRESSURE DROP

Flow		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**
25000	396.51	46	0.19
50000	793.02	188	0.75
100000	1586.04	754	3.03

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.5758	-4.4482	(P)/I	-0.0165	$(P)^2/I$	0.58	-5.138	W/m²·°C
I P Units:	η =	0.5758	-0.7839	(P)/I	-0.0016	$(P)^2/I$	0.58	-0.905	Btu/hr·ft²·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0096	(S)	-0.0971	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.09	(S)	(Linear Fit)	

Model Tested:	SM-14			
Test Fluid:	Air			
Test Flow Rate:	47	l/s	100.0	scfm

REMARKS:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Genersys PLC**
37 Queen Anne Street
London, W1G 9JB

MODEL: Genersys 1000-10
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2005-001A

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	21.91	ft^2	**Net Aperture Area:**	1.780	m^2	19.16	ft^2
Dry Weight:	39	kg	86	lb	**Fluid Capacity:**	1.6	l	0.4	gal
Test Pressure:	1103	kPa	160	psig					

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

Flow		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**
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]

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

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

$K_{\alpha\tau}$ =	1.0	-0.0415	(S)	-0.1007	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.15	(S)	(Linear Fit)	

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

REMARKS:

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/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	24.09	ft^2	**Net Aperture Area:**	2.043	m^2	21.99	ft^2
Dry Weight:	43.584	kg	96	lb	**Fluid Capacity:**	3.0	l	0.8	gal
Test Pressure:	1034	kPa	150	psig					

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		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.721	-3.3220	(P)/I	-0.0247	$(P)^2/I$	0.733	-4.74	$W/m^2 \cdot °C$
I P Units:	η =	0.721	-0.5854	(P)/I	-0.0024	$(P)^2/I$	0.733	-0.835	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.0900	(S)	0.0000	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.09	(S)	(Linear Fit)	

Model Tested: Gobi 408
Test Fluid: Water
Test Flow Rate: 56 ml/s 0.89 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	40	31	21
B (5°C)	37	27	17
C (20°C)	31	22	12
D (50°C)	19	10	3
E (80°C)	7	1	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	38	29	20
B (9°F)	35	26	17
C (36°F)	30	21	12
D (90°F)	18	10	3
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	m²	26.79	ft²	**Net Aperture Area:**	2.295	m²	24.70 ft²
Dry Weight:	49	kg	108	lb	**Fluid Capacity:**	3.6	l	1.0 gal
Test Pressure:	1034	kPa	150	psig				

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		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.722	-3.2760	(P)/I	-0.0250	$(P)^2/I$	0.734	-4.68	W/m²·°C
I P Units:	η =	0.722	-0.5773	(P)/I	-0.0024	$(P)^2/I$	0.734	-0.825	Btu/hr·ft²·°F

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

$K_{\alpha\tau}$ =	1.0	-0.2646	(S)	+0.1656	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.09	(S)	(Linear Fit)	

Model Tested: Gobi 408
Test Fluid: Water
Test Flow Rate: 56 ml/s 0.89 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	32.25	ft^2	**Net Aperture Area:**	2.771	m^2	29.83	ft^2
Dry Weight:	60.382	kg	133	lb	**Fluid Capacity:**	3.0	l	0.8	gal
Test Pressure:	1034	kPa	150	psig					

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		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.725	-3.2000	(P)/I	-0.0220	(P)^2/I	0.737	-4.57	W/m^2·°C
I P Units:	η =	0.725	-0.5639	(P)/I	-0.0022	(P)^2/I	0.737	-0.805	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0900	(S)	0.0000	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.09	(S)	(Linear Fit)		

Model Tested: Gobi 408
Test Fluid: Water
Test Flow Rate: 56 ml/s 0.89 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	40.30	ft^2	**Net Aperture Area:**	3.558	m^2	38.30	ft^2
Dry Weight:	72.64	kg	160	lb	**Fluid Capacity:**	3.8	l	1.0	gal
Test Pressure:	1034	kPa	150	psig					

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		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.725	-3.2000	(P)/I	-0.0220	(P)^2/I	0.737	-4.57	W/m^2·°C
I P Units:	η =	0.725	-0.5639	(P)/I	-0.0022	(P)^2/I	0.737	-0.805	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0900	(S)	0.0000	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.09	(S)	(Linear Fit)		

Model Tested: Gobi 408
Test Fluid: Water
Test Flow Rate: 56 ml/s 0.89 gpm

REMARKS:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

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

MODEL: Heliodyne Mojave 408
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-1981-085C

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	32.29	ft^2	**Net Aperture Area:**	2.771	m^2	29.83	ft^2
Dry Weight:	60.382	kg	133	lb	**Fluid Capacity:**	3.0	l	0.8	gal
Test Pressure:	1034	kPa	150	psig					

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		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.719	-5.3100	(P)/I	-0.0100	$(P)^2/I$	0.726	-6.08	$W/m^2 \cdot °C$
I P Units:	η =	0.719	-0.9358	(P)/I	-0.0010	$(P)^2/I$	0.726	-1.071	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.0900	(S)	0.0000	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.12	(S)	(Linear Fit)	

Model Tested: Mojave 408
Test Fluid: Water
Test Flow Rate: 55 ml/s 0.87 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	40.12	ft^2	**Net Aperture Area:**	3.558	m^2	38.30	ft^2
Dry Weight:	72.64	kg	160	lb	**Fluid Capacity:**	3.8	l	1.0	gal
Test Pressure:	1034	kPa	150	psig					

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		Δ P	
ml/s	gpm	Pa	in H_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.719	-5.3100	(P)/I	-0.0100	(P)^2/I	0.726	-6.08	W/m^2·°C
I P Units:	η =	0.719	-0.9358	(P)/I	-0.0010	(P)^2/I	0.726	-1.071	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0900	(S)	0.0000	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.12	(S)	(Linear Fit)		

Model Tested: Mojave 408
Test Fluid: Water
Test Flow Rate: 56 ml/s 0.89 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	31.92	ft^2	**Net Aperture Area:**	2.781	m^2	29.94	ft^2
Dry Weight:	51.2	kg	113	lb	**Fluid Capacity:**	4.9	l	1.3	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

$K_{\alpha\tau}$ = 1.0 -0.1939 (S) -0.0055 (S)^2

$K_{\alpha\tau}$ = 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:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	39.78	ft^2	**Net Aperture Area:**	3.481	m^2	37.47	ft^2
Dry Weight:	69.4	kg	153	lb	**Fluid Capacity:**	6.1	l	1.6	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

$K_{\alpha\tau}$ = 1.0 -0.1939 (S) -0.0055 (S)^2

$K_{\alpha\tau}$ = 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:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	39.78	ft^2	**Net Aperture Area:**	3.481	m^2	37.47	ft^2
Dry Weight:	69.4	kg	153	lb	**Fluid Capacity:**	6.1	l	1.6	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

$K_{\alpha\tau}$ =	1.0	-0.1939	(S)	-0.0055	(S)^2
$K_{\alpha\tau}$ =	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:

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/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	50.20	ft^2	**Net Aperture Area:**	4.400	m^2	47.36	ft^2
Dry Weight:	82.54	kg	182	lb	**Fluid Capacity:**	6.4	l	1.7	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

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

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

$K_{\alpha\tau}$ =	1.0	-0.1939	(S)	-0.0055	$(S)^2$
$K_{\alpha\tau}$ =	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:

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-56
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2004-008A

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	77	58	39
B (5°C)	70	51	32
C (20°C)	58	40	22
D (50°C)	35	19	4
E (80°C)	14	2	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	73	55	37
B (9°F)	66	48	31
C (36°F)	55	38	21
D (90°F)	33	18	4
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^2	55.71	ft^2	**Net Aperture Area:**	4.898	m^2	52.72	ft^2
Dry Weight:	92.5	kg	204	lb	**Fluid Capacity:**	6.8	l	1.8	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.691	-3.3960	(P)/I	-0.0019	$(P)^2/I$	0.706	-4.9099	$W/m^2 \cdot °C$
I P Units:	η =	0.691	-0.5985	(P)/I	-0.0002	$(P)^2/I$	0.706	-0.865	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.1939	(S)	-0.0055	$(S)^2$
$K_{\alpha\tau}$ =	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:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Oventrop Corporation**
29 Knipes Road
PO Box 789
East Granby, CT 06026

MODEL: Oventrop Solar OV 10-10 AS/AB
COLLECTOR TYPE: Tubular
CERTIFICATION #: 100-2006-028A

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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: April 13, 2007

COLLECTOR SPECIFICATIONS

Gross Area:	1.679	m^2	18.07	ft^2	**Net Aperture Area:**	1.174	m^2	12.64 ft^2
Dry Weight:	40	kg	88	lb	**Fluid Capacity:**	0.4	l	0.1 gal
Test Pressure:	1000	kPa	145	psig				

COLLECTOR MATERIALS

Frame:	Aluminum
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_2O
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]

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

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

$K_{\alpha\tau}$ =	1.0	+0.1174 (S)	-0.1400 (S)^2	**Model Tested:**	2006010A
$K_{\alpha\tau}$ =	1.0	-0.03 (S)	(Linear Fit)	**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)

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Oventrop Corporation**
29 Knipes Road
PO Box 789
East Granby, CT 06026

MODEL: Oventrop Solar OV 10-20 AS/AB
COLLECTOR TYPE: Tubular
CERTIFICATION #: 100-2006-028B

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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: April 13, 2007

COLLECTOR SPECIFICATIONS

Gross Area:	3.394	m^2	36.53	ft^2	**Net Aperture Area:**	3.008	m^2	32.38	ft^2
Dry Weight:	75	kg	165	lb	**Fluid Capacity:**	0.8	l	0.2	gal
Test Pressure:	1000	kPa	145	psig					

COLLECTOR MATERIALS

Frame:	Aluminum
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_2O

TECHNICAL INFORMATION

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

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

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

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

Model Tested: 2006010A
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)

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Oventrop Corporation**
29 Knipes Road
PO Box 789
East Granby, CT 06026

MODEL: Oventrop Solar OV 5-16 AS/AB
COLLECTOR TYPE: Tubular
CERTIFICATION #: 100-2006-027B

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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: April 13, 2007

COLLECTOR SPECIFICATIONS

Gross Area:	4.097	m^2	44.10	ft^2	**Net Aperture Area:**	3.634	m^2	39.12	ft^2
Dry Weight:	105	kg	232	lb	**Fluid Capacity:**	1.0	l	0.3	gal
Test Pressure:	1000	kPa	145	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

$K_{\alpha\tau}$ =	1.0	+0.9474 (S)	-1.0762 (S)^2	**Model Tested:**	2006026A
$K_{\alpha\tau}$ =	1.0	-0.18 (S)	(Linear Fit)	**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)

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Oventrop Corporation**
29 Knipes Road
PO Box 789
East Granby, CT 06026

MODEL: Oventrop Solar OV 5-8 AS/AB
COLLECTOR TYPE: Tubular
CERTIFICATION #: 100-2006-027A

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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: April 13, 2007

COLLECTOR SPECIFICATIONS

Gross Area:	2.028	m^2	21.83	ft^2	**Net Aperture Area:**	1.830	m^2	19.70	ft^2
Dry Weight:	49.2	kg	108	lb	**Fluid Capacity:**	0.5	l	0.1	gal
Test Pressure:	1000	kPa	145	psig					

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_2O
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]

						Y Intercept	Slope	
S I Units:	η =	0.4886	-1.5855	(P)/I	-0.0052 (P)²/I	0.4916	-1.9242	W/m²·°C
I P Units:	η =	0.4886	-0.2794	(P)/I	-0.0005 (P)²/I	0.4916	-0.339	Btu/hr·ft²·°F

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

$K_{\alpha\tau}$ = 1.0 +0.9474 (S) -1.0762 $(S)^2$

$K_{\alpha\tau}$ = 1.0 -0.18 (S) (Linear Fit)

Model Tested: 2006026A
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)

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	20.46	ft^2	**Net Aperture Area:**	1.745	m^2	18.78	ft^2
Dry Weight:	44	kg	97	lb	**Fluid Capacity:**	7.0	l	1.8	gal
Test Pressure:	552	kPa	80	psig					

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_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.697	-4.8300	(P)/I	-0.0186	(P)^2/I	0.708	-6.11	W/m^2·°C
I P Units:	η =	0.697	-0.8512	(P)/I	-0.0018	(P)^2/I	0.708	-1.077	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.1297 (S) +0.0214 (S)^2

$K_{\alpha\tau}$ = 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:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	23.35	ft^2	**Net Aperture Area:**	2.002	m^2	21.55	ft^2
Dry Weight:	48.5	kg	107	lb	**Fluid Capacity:**	6.9	l	1.8	gal
Test Pressure:	552	kPa	80	psig					

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_2O

TECHNICAL INFORMATION

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

						Y Intercept	Slope	
S I Units:	η = 0.697	-4.8300	(P)/I	-0.0186	(P)^2/I	0.708	-6.11	W/m^2·°C
I P Units:	η = 0.697	-0.8512	(P)/I	-0.0018	(P)^2/I	0.708	-1.077	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.1297 (S) +0.0214 (S)^2

$K_{\alpha\tau}$ = 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:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	31.41	ft^2	**Net Aperture Area:**	2.736	m^2	29.45	ft^2
Dry Weight:	68.5	kg	151	lb	**Fluid Capacity:**	8.8	l	2.3	gal
Test Pressure:	552	kPa	80	psig					

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_2O

TECHNICAL INFORMATION

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

						Y Intercept	Slope	
S I Units:	η = 0.697	-4.8300	(P)/I	-0.0186	(P)^2/I	0.708	-6.11	W/m^2·°C
I P Units:	η = 0.697	-0.8512	(P)/I	-0.0018	(P)^2/I	0.708	-1.077	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.1297 (S) +0.0214 (S)^2

$K_{\alpha\tau}$ = 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:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	20.46	ft^2	**Net Aperture Area:**	1.745	m^2	18.78	ft^2
Dry Weight:	40.6	kg	90	lb	**Fluid Capacity:**	7.0	l	1.8	gal
Test Pressure:	552	kPa	80	psig					

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_2O
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]

						Y Intercept	Slope	
S I Units:	η =	0.697	-4.8300	(P)/I	-0.0186 (P)^2/I	0.708	-6.11	W/m^2·°C
I P Units:	η =	0.697	-0.8512	(P)/I	-0.0018 (P)^2/I	0.708	-1.077	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.1297 (S) +0.0214 (S)^2
$K_{\alpha\tau}$ = 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:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	23.35	ft^2	**Net Aperture Area:**	2.002	m^2	21.55	ft^2
Dry Weight:	43.6	kg	96	lb	**Fluid Capacity:**	6.9	l	1.8	gal
Test Pressure:	552	kPa	80	psig					

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_2O

TECHNICAL INFORMATION

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

						Y Intercept	Slope	
S I Units:	η = 0.697	-4.8300	(P)/I	-0.0186	(P)^2/I	0.708	-6.11	W/m^2·°C
I P Units:	η = 0.697	-0.8512	(P)/I	-0.0018	(P)^2/I	0.708	-1.077	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.1297 (S) +0.0214 (S)^2
$K_{\alpha\tau}$ = 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:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	31.41	ft^2	**Net Aperture Area:**	2.736	m^2	29.45	ft^2
Dry Weight:	62.6	kg	138	lb	**Fluid Capacity:**	8.8	l	2.3	gal
Test Pressure:	552	kPa	80	psig					

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_2O

TECHNICAL INFORMATION

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

						Y Intercept	Slope	
S I Units:	η = 0.697	-4.8300	(P)/I	-0.0186	(P)^2/I	0.708	-6.11	W/m^2·°C
I P Units:	η = 0.697	-0.8512	(P)/I	-0.0018	(P)^2/I	0.708	-1.077	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.1297 (S) +0.0214 (S)^2

$K_{\alpha\tau}$ = 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:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	20.45	ft^2	**Net Aperture Area:**	1.748	m^2	18.82	ft^2
Dry Weight:	39.9	kg	88	lb	**Fluid Capacity:**	7.0	l	1.8	gal
Test Pressure:	552	kPa	80	psig					

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_2O
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]

						Y Intercept	Slope	
S I Units:	η =	0.697	-4.8300	(P)/I	-0.0186 (P)^2/I	0.708	-6.11	W/m^2·°C
I P Units:	η =	0.697	-0.8512	(P)/I	-0.0018 (P)^2/I	0.708	-1.077	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.1297 (S) +0.0214 (S)^2

$K_{\alpha\tau}$ = 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:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	23.35	ft^2	**Net Aperture Area:**	2.002	m^2	21.55	ft^2
Dry Weight:	44	kg	97	lb	**Fluid Capacity:**	6.9	l	1.8	gal
Test Pressure:	552	kPa	80	psig					

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_2O

TECHNICAL INFORMATION

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

						Y Intercept	Slope	
S I Units:	η = 0.697	-4.8300	(P)/I	-0.0186	(P)^2/I	0.708	-6.11	W/m^2·°C
I P Units:	η = 0.697	-0.8512	(P)/I	-0.0018	(P)^2/I	0.708	-1.077	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.1297 (S) +0.0214 (S)^2
$K_{\alpha\tau}$ = 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:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	31.41	ft^2	**Net Aperture Area:**	2.736	m^2	29.45	ft^2
Dry Weight:	55.8	kg	123	lb	**Fluid Capacity:**	8.9	l	2.4	gal
Test Pressure:	552	kPa	80	psig					

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_2O

TECHNICAL INFORMATION

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

						Y Intercept	Slope	
S I Units:	η = 0.697	-4.8300	(P)/I	-0.0186	(P)^2/I	0.708	-6.11	W/m^2·°C
I P Units:	η = 0.697	-0.8512	(P)/I	-0.0018	(P)^2/I	0.708	-1.077	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.1297 (S) +0.0214 (S)^2

$K_{\alpha\tau}$ = 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:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	39.20	ft^2	**Net Aperture Area:**	3.428	m^2	36.90	ft^2
Dry Weight:	77.1	kg	170	lb	**Fluid Capacity:**	10.8	l	2.9	gal
Test Pressure:	552	kPa	80	psig					

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_2O

TECHNICAL INFORMATION

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

						Y Intercept	Slope	
S I Units:	η = 0.697	-4.8300	(P)/I	-0.0186	(P)^2/I	0.708	-6.11	W/m^2·°C
I P Units:	η = 0.697	-0.8512	(P)/I	-0.0018	(P)^2/I	0.708	-1.077	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.1297 (S) +0.0214 (S)^2
$K_{\alpha\tau}$ = 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:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	36	27	19
B (5°C)	33	24	15
C (20°C)	28	19	10
D (50°C)	17	9	2
E (80°C)	8	2	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	34	26	18
B (9°F)	31	23	14
C (36°F)	26	18	10
D (90°F)	16	9	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	m²	23.69	ft²	**Net Aperture Area:**	2.054	m²	22.11 ft²
Dry Weight:	35.5	kg	78	lb	**Fluid Capacity:**	3.3	l	0.9 gal
Test Pressure:	1103	kPa	160	psig				

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		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.772	-4.3800	(P)/I	-0.0102	$(P)^2/I$	0.778	-4.964	W/m²·°C
I P Units:	η =	0.772	-0.7719	(P)/I	-0.0010	$(P)^2/I$	0.778	-0.875	Btu/hr·ft²·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0520	(S)	-0.1585	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.22	(S)	(Linear Fit)	

Model Tested:	408C-HP			
Test Fluid:	Water			
Test Flow Rate:	56	ml/s	0.89	gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	23.69	ft^2	**Net Aperture Area:**	2.054	m^2	22.11	ft^2
Dry Weight:	34	kg	75	lb	**Fluid Capacity:**	3.3	l	0.9	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.759	-6.8820	(P)/I	-0.1112	(P)^2/I	0.764	-7.51	W/m^2·°C
I P Units:	η =	0.759	-1.2128	(P)/I	-0.0109	(P)^2/I	0.764	-1.323	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.1230	(S)	-0.1030	(S)^2	
$K_{\alpha\tau}$ =	1.0	-99.00	(S)	(Linear Fit)		

Model Tested: 408P-HP
Test Fluid: Water
Test Flow Rate: 56 ml/s 0.89 gpm

REMARKS:

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/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	32.29	ft^2	**Net Aperture Area:**	2.806	m^2	30.20	ft^2
Dry Weight:	47.6	kg	105	lb	**Fluid Capacity:**	2.9	l	0.8	gal
Test Pressure:	1102	kPa	160	psig					

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_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.774	-4.2000	(P)/I	-0.0090	$(P)^2/I$	0.779	-4.77	$W/m^2 \cdot °C$
I P Units:	η =	0.774	-0.7402	(P)/I	-0.0009	$(P)^2/I$	0.779	-0.841	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.0520	(S)	-0.1585	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.22	(S)	(Linear Fit)	

Model Tested: 408C-HP
Test Fluid: Water
Test Flow Rate: 56 ml/s 0.89 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	51	39	27
B (5°C)	43	31	19
C (20°C)	32	21	9
D (50°C)	14	5	
E (80°C)	2		

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	48	37	26
B (9°F)	41	29	18
C (36°F)	30	20	9
D (90°F)	13	5	
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^2	32.28	ft^2	**Net Aperture Area:**	2.806	m^2	30.20	ft^2
Dry Weight:	46.3	kg	102	lb	**Fluid Capacity:**	4.7	l	1.2	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**
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]

							Y Intercept	Slope	
S I Units:	$\eta =$	0.763	-6.6200	(P)/I	-0.0100	$(P)^2/I$	0.768	-7.24	$W/m^2 \cdot °C$
I P Units:	$\eta =$	0.763	-1.1666	(P)/I	-0.0010	$(P)^2/I$	0.768	-1.276	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.1230	(S)	-0.1030	$(S)^2$	
$K_{\alpha\tau}$ =	1.0		(S)	(Linear Fit)		

Model Tested: 408P-HP
Test Fluid: Water
Test Flow Rate: 56 ml/s 0.89 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	62	47	32
B (5°C)	56	41	26
C (20°C)	47	32	17
D (50°C)	30	16	4
E (80°C)	15	4	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	59	45	30
B (9°F)	53	39	25
C (36°F)	45	30	16
D (90°F)	28	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	m²	39.91	ft²	**Net Aperture Area:**	3.488	m²	37.55 ft²
Dry Weight:	58.566	kg	129	lb	**Fluid Capacity:**	3.3	l	0.9 gal
Test Pressure:	1103	kPa	160	psig				

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		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.774	-4.2000	(P)/I	-0.0090	$(P)^2/I$	0.779	-4.77	W/m²·°C
I P Units:	η =	0.774	-0.7402	(P)/I	-0.0009	$(P)^2/I$	0.779	-0.841	Btu/hr·ft²·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0520	(S)	-0.1585	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.22	(S)	(Linear Fit)	

Model Tested: 408C-HP
Test Fluid: Water
Test Flow Rate: 56 ml/s 0.89 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	63	48	33
B (5°C)	53	38	24
C (20°C)	40	26	12
D (50°C)	17	6	
E (80°C)	2		

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	60	46	31
B (9°F)	50	36	23
C (36°F)	38	25	11
D (90°F)	16	6	
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	m²	39.91	ft²	**Net Aperture Area:**	3.488	m²	37.55 ft²
Dry Weight:	56.75	kg	125	lb	**Fluid Capacity:**	5.7	l	1.5 gal
Test Pressure:	1103	kPa	160	psig				

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.763	-6.6200	(P)/I	-0.0100	$(P)^2/I$	0.768	-7.24	W/m²·°C
I P Units:	η =	0.763	-1.1666	(P)/I	-0.0010	$(P)^2/I$	0.768	-1.276	Btu/hr·ft²·°F

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

$K_{\alpha\tau}$ =	1.0	-0.1230	(S)	-0.1030	$(S)^2$
$K_{\alpha\tau}$ =	1.0		(S)	(Linear Fit)	

Model Tested: 408P-HP
Test Fluid: Water
Test Flow Rate: 56 ml/s 0.89 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	76	57	39
B (5°C)	68	50	31
C (20°C)	57	39	21
D (50°C)	36	20	5
E (80°C)	18	5	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	72	54	37
B (9°F)	64	47	29
C (36°F)	54	37	20
D (90°F)	34	19	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^2	48.33	ft^2	**Net Aperture Area:**	4.212	m^2	45.34	ft^2
Dry Weight:	70.37	kg	155	lb	**Fluid Capacity:**	3.7	l	1.0	gal
Test Pressure:	1103	kPa	160	psig					

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		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.774	-4.2000	(P)/I	-0.0090	$(P)^2/I$	0.779	-4.77	$W/m^2 \cdot °C$
I P Units:	η =	0.774	-0.7402	(P)/I	-0.0009	$(P)^2/I$	0.779	-0.841	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.0520	(S)	-0.1585	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.22	(S)	(Linear Fit)	

Model Tested: 408C-HP
Test Fluid: Water
Test Flow Rate: 56 ml/s 0.89 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	76	58	40
B (5°C)	65	47	29
C (20°C)	49	31	14
D (50°C)	21	7	
E (80°C)	3		

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	72	55	38
B (9°F)	62	45	27
C (36°F)	46	29	13
D (90°F)	20	7	
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^2	48.33	ft^2	**Net Aperture Area:**	4.212	m^2	45.34	ft^2
Dry Weight:	68.1	kg	150	lb	**Fluid Capacity:**	6.7	l	1.8	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.763	-6.6200	(P)/I	-0.0100	$(P)^2/I$	0.768	-7.24	$W/m^2 \cdot °C$
I P Units:	η =	0.763	-1.1666	(P)/I	-0.0010	$(P)^2/I$	0.768	-1.276	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.1230	(S)	-0.1030	$(S)^2$
$K_{\alpha\tau}$ =	1.0		(S)	(Linear Fit)	

Model Tested: 408P-HP
Test Fluid: Water
Test Flow Rate: 56 ml/s 0.89 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	31	24	16
B (5°C)	29	21	14
C (20°C)	24	17	9
D (50°C)	14	8	2
E (80°C)	5		

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	30	22	15
B (9°F)	27	20	13
C (36°F)	23	16	9
D (90°F)	14	7	2
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^2	21.35	ft^2	**Net Aperture Area:**	1.867	m^2	20.10	ft^2
Dry Weight:	40.6	kg	90	lb	**Fluid Capacity:**	3.6	l	1.0	gal
Test Pressure:	179	kPa	26	psig					

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_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.731	-3.0411	(P)/I	-0.0325	$(P)^2/I$	0.759	-5.93	$W/m^2 \cdot °C$
I P Units:	η =	0.731	-0.5359	(P)/I	-0.0032	$(P)^2/I$	0.759	-1.045	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.1798	(S)	+0.0214	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.16	(S)	(Linear Fit)	

Model Tested: K
Test Fluid: Water
Test Flow Rate: 37 ml/s 0.59 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	32	25	17
B (5°C)	29	21	13
C (20°C)	23	15	8
D (50°C)	9	3	
E (80°C)			

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	31	23	16
B (9°F)	27	20	13
C (36°F)	22	14	7
D (90°F)	9	3	
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^2	21.35	ft^2	**Net Aperture Area:**	1.867	m^2	20.10	ft^2
Dry Weight:	40.6	kg	90	lb	**Fluid Capacity:**	3.6	l	1.0	gal
Test Pressure:	179	kPa	26	psig					

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_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.737	-4.4193	(P)/I	-0.0503	$(P)^2/I$	0.7724	-8.36	$W/m^2 \cdot °C$
I P Units:	η =	0.737	-0.7788	(P)/I	-0.0049	$(P)^2/I$	0.7724	-1.473	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.1395	(S)	+0.0127	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.13	(S)	(Linear Fit)	

Model Tested: J
Test Fluid: Water
Test Flow Rate: 37 ml/s 0.59 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	34	25	17
B (5°C)	30	22	14
C (20°C)	24	17	9
D (50°C)	15	8	2
E (80°C)	8	2	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	32	24	17
B (9°F)	28	21	13
C (36°F)	23	16	8
D (90°F)	14	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	m²	21.35	ft²	**Net Aperture Area:**	1.870 m²	20.13 ft²
Dry Weight:	31.5	kg	69	lb	**Fluid Capacity:**	2.3 l	0.6 gal
Test Pressure:	1103	kPa	160	psig			

COLLECTOR MATERIALS

Frame:	Aluminum
Cover (Outer):	Low Iron Tempered Glass
Cover (Inner):	None
Absorber Material:	Tube - Copper / Plate - Copper
Absorber Coating:	Titianium oxide
Insulation (Side):	Polyester wool
Insulation (Back):	Glasswool

PRESSURE DROP

Flow		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.753	-5.2917	(P)/I	+0.0064	$(P)^2/I$	0.75	-4.8668	W/m²·°C
I P Units:	η =	0.753	-0.9325	(P)/I	0.0000	$(P)^2/I$	0.75	-0.858	Btu/hr·ft²·°F

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

$K_{\alpha\tau}$ =	1.0	+0.1429	(S)	-0.2362	$(S)^2$
$K_{\alpha\tau}$ =	1.0	+0.10	(S)	(Linear Fit)	

Model Tested: Bt
Test Fluid: Water
Test Flow Rate: 37 ml/s 0.59 gpm

REMARKS:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Schuco USA L.P.**
240 Pane Road
Newington, CT 06111

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/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	29.05	ft^2	**Net Aperture Area:**	2.504	m^2	26.95	ft^2
Dry Weight:	55	kg	121	lb	**Fluid Capacity:**	2.0	l	0.5	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.708	-3.1129	(P)/I	-0.0193	$(P)^2/I$	0.718	-4.276	$W/m^2 \cdot °C$
I P Units:	η =	0.708	-0.5486	(P)/I	-0.0019	$(P)^2/I$	0.718	-0.754	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.0163	(S)	-0.1574	$(S)^2$	
$K_{\alpha\tau}$ =	1.0	-0.18	(S)	(Linear Fit)		

Model Tested: Premium V
Test Fluid: Water
Test Flow Rate: 50 ml/s 0.79 gpm

REMARKS:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Schuco USA L.P.**
240 Pane Road
Newington, CT 06111

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	24.88	ft^2	**Net Aperture Area:**	2.141	m^2	23.05	ft^2
Dry Weight:	41	kg	90	lb	**Fluid Capacity:**	1.5	l	0.4	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**
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]

						Y Intercept	**Slope**	
S I Units:	η =	0.706	-2.9209	(P)/I	-0.0179	(P)^2/I	0.715	-3.994	W/m^2·°C
I P Units:	η =	0.706	-0.5147	(P)/I	-0.0018	(P)^2/I	0.715	-0.704	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0574	(S)	-0.1117	(S)^2		
$K_{\alpha\tau}$ =	1.0	-0.17	(S)	(Linear Fit)			

Model Tested:	Slimline V		
Test Fluid:	Water		
Test Flow Rate:	43 ml/s	0.68	gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	77	60	42
B (5°C)	61	43	26
C (20°C)	44	27	11
D (50°C)	26	11	1
E (80°C)	25	11	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	73	57	40
B (9°F)	58	41	25
C (36°F)	42	26	10
D (90°F)	25	10	1
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	m²	47.40	ft²	**Net Aperture Area:**	4.098	m²	44.11	ft²
Dry Weight:	33.1	kg	73	lb	**Fluid Capacity:**	11.7	l	3.1	gal
Test Pressure:	207	kPa	30	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.736	-9.3230	(P)/I	-0.0701	$(P)^2/I$	0.739	-8.21	W/m²·°C
I P Units:	η =	0.736	-1.6430	(P)/I	-0.0069	$(P)^2/I$	0.739	-1.447	Btu/hr·ft²·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0529	(S)	-0.0437	$(S)^2$
$K_{\alpha\tau}$ =	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.

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Sensible Technologies, Inc.**
4723 Tidewater Avenue
Oakland, CA 94601

MODEL: Solar Thermal Systems STS 410BC
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2007-002B

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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: January 24, 2007

COLLECTOR SPECIFICATIONS

Gross Area:	3.796	m^2	40.86	ft^2	**Net Aperture Area:**	3.445	m^2	37.08	ft^2
Dry Weight:	62.6	kg	138	lb	**Fluid Capacity:**	4.5	l	1.2	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.702	-3.2828	(P)/I	-0.0099	(P)^2/I	0.714	-4.1279	W/m^2·°C
I P Units:	η =	0.702	-0.5785	(P)/I	-0.0010	(P)^2/I	0.714	-0.727	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.0707 (S) -0.1687 (S)^2

$K_{\alpha\tau}$ = 1.0 -0.25 (S) (Linear Fit)

Model Tested: 100-1981-098A
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Sensible Technologies, Inc.**
4723 Tidewater Avenue
Oakland, CA 94601

MODEL: Solar Thermal Systems STS 410BP
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2007-001B

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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: January 24, 2007

COLLECTOR SPECIFICATIONS

Gross Area:	3.796	m^2	40.86	ft^2	**Net Aperture Area:**	3.445	m^2	37.08	ft^2
Dry Weight:	62.6	kg	138	lb	**Fluid Capacity:**	4.5	l	1.2	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.666	-3.3563	(P)/I	-0.0138	(P)^2/I	0.682	-4.5392	W/m^2·°C
I P Units:	η =	0.666	-0.5915	(P)/I	-0.0014	(P)^2/I	0.682	-0.800	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	+0.0045	(S)	-0.2088	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.21	(S)	(Linear Fit)	

Model Tested: 100-1981-098E
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Sensible Technologies, Inc.**
4723 Tidewater Avenue
Oakland, CA 94601

MODEL: Solar Thermal Systems STS 48BC
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2007-002A

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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: January 24, 2007

COLLECTOR SPECIFICATIONS

Gross Area:	3.051	m^2	32.84	ft^2	**Net Aperture Area:**	2.750	m^2	29.60	ft^2
Dry Weight:	47.6	kg	105	lb	**Fluid Capacity:**	3.9	l	1.0	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.702	-3.2828	(P)/I	-0.0099	(P)^2/I	0.714	-4.1279	W/m^2·°C
I P Units:	η =	0.702	-0.5785	(P)/I	-0.0010	(P)^2/I	0.714	-0.727	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0707	(S)	-0.1687	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.25	(S)	(Linear Fit)	

Model Tested: 100-1981-098A
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Sensible Technologies, Inc.**
4723 Tidewater Avenue
Oakland, CA 94601

MODEL: Solar Thermal Systems STS 48BP
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2007-001A

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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: January 24, 2007

COLLECTOR SPECIFICATIONS

Gross Area:	3.051	m^2	32.84	ft^2	**Net Aperture Area:**	2.750	m^2	29.60	ft^2
Dry Weight:	47.6	kg	105	lb	**Fluid Capacity:**	3.9	l	1.0	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.666	-3.3563	(P)/I	-0.0138	(P)^2/I	0.682	-4.5392	W/m^2·°C
I P Units:	η =	0.666	-0.5915	(P)/I	-0.0014	(P)^2/I	0.682	-0.800	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	+0.0045	(S)	-0.2088	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.21	(S)	(Linear Fit)	

Model Tested: 100-1981-098E
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	21.35	ft^2	**Net Aperture Area:**	1.870	m^2	20.13	ft^2
Dry Weight:	31.5	kg	69	lb	**Fluid Capacity:**	2.3	l	0.6	gal
Test Pressure:	1103	kPa	160	psig					

COLLECTOR MATERIALS

Frame:	Aluminum
Cover (Outer):	Low Iron Tempered Glass
Cover (Inner):	None
Absorber Material:	Tube - Copper / Plate - Copper
Absorber Coating:	Titianium oxide
Insulation (Side):	Polyester wool
Insulation (Back):	Glasswool

PRESSURE DROP

Flow		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**
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]

						Y Intercept	**Slope**	
S I Units:	η =	0.753	-5.2917	(P)/I	+0.0064	(P)^2/I	0.75	-4.8668	W/m^2·°C
I P Units:	η =	0.753	-0.9325	(P)/I	0.0000	(P)^2/I	0.75	-0.858	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	+0.1429	(S)	-0.2362	(S)^2	**Model Tested:**	Bt	
$K_{\alpha\tau}$ =	1.0	+0.10	(S)	(Linear Fit)		**Test Fluid:**	Water	
						Test Flow Rate:	37 ml/s	0.59 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	21.35	ft^2	**Net Aperture Area:**	1.867	m^2	20.10	ft^2
Dry Weight:	40.6	kg	90	lb	**Fluid Capacity:**	3.6	l	1.0	gal
Test Pressure:	179	kPa	26	psig					

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_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.737	-4.4193	(P)/I	-0.0503	(P)^2/I	0.7724	-8.36	W/m^2·°C
I P Units:	η =	0.737	-0.7788	(P)/I	-0.0049	(P)^2/I	0.7724	-1.473	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.1395	(S)	+0.0127	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.13	(S)	(Linear Fit)		

Model Tested: J
Test Fluid: Water
Test Flow Rate: 37 ml/s 0.59 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	21.35	ft^2	**Net Aperture Area:**	1.867	m^2	20.10	ft^2
Dry Weight:	40.6	kg	90	lb	**Fluid Capacity:**	3.6	l	1.0	gal
Test Pressure:	179	kPa	26	psig					

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_2O**
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]

						Y Intercept	**Slope**	
S I Units:	η =	0.731	-3.0411	(P)/I	-0.0325	(P)^2/I	0.759	-5.93	W/m^2·°C
I P Units:	η =	0.731	-0.5359	(P)/I	-0.0032	(P)^2/I	0.759	-1.045	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.1798	(S)	+0.0214	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.16	(S)	(Linear Fit)		

Model Tested: K
Test Fluid: Water
Test Flow Rate: 37 ml/s 0.59 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	21.35	ft^2	**Net Aperture Area:**	1.867	m^2	20.10	ft^2
Dry Weight:	31.4	kg	69	lb	**Fluid Capacity:**	2.2	l	0.6	gal
Test Pressure:	1104	kPa	160	psig					

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_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.608	-5.4707	(P)/I	-0.0271	(P)^2/I	0.625	-7.47	W/m^2·°C
I P Units:	η =	0.608	-0.9641	(P)/I	-0.0027	(P)^2/I	0.625	-1.316	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.1718	(S)	-0.0580	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.23	(S)	(Linear Fit)		

Model Tested: L
Test Fluid: Water
Test Flow Rate: 37 ml/s 0.59 gpm

REMARKS:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Solahart Industries**
101 Bell Road
Montgomery, AL 36117

MODEL: Solahart M
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2000-005A

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·d
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^2	21.35	ft^2	**Net Aperture Area:**	1.867	m^2	20.10	ft^2
Dry Weight:	31.5	kg	69	lb	**Fluid Capacity:**	2.2	l	0.6	gal
Test Pressure:	1104	kPa	160	psig					

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

Flow		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.621	-4.1009	(P)/I	-0.0060	(P)^2/I	0.625	-4.53	W/m^2·°C
I P Units:	η =	0.621	-0.7227	(P)/I	-0.0006	(P)^2/I	0.625	-0.798	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.1194	(S)	-0.0121	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.13	(S)	(Linear Fit)	

Model Tested: M
Test Fluid: Water
Test Flow Rate: 37 ml/s 0.59 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	29	22	15
B (5°C)	26	19	12
C (20°C)	22	15	8
D (50°C)	13	7	2
E (80°C)	5	1	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	27	20	14
B (9°F)	25	18	11
C (36°F)	21	14	8
D (90°F)	12	7	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^2	20.79	ft^2	**Net Aperture Area:**	1.783	m^2	19.19	ft^2
Dry Weight:	33.6	kg	74	lb	**Fluid Capacity:**	3.0	l	0.8	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**
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]

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

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

$K_{\alpha\tau}$ =	1.0	-0.1939	(S)	-0.0055	$(S)^2$
$K_{\alpha\tau}$ =	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:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	35	26	18
B (5°C)	32	23	15
C (20°C)	27	18	10
D (50°C)	16	8	2
E (80°C)	6	1	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	33	25	17
B (9°F)	30	22	14
C (36°F)	25	17	9
D (90°F)	15	8	2
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^2	25.35	ft^2	**Net Aperture Area:**	2.197	m^2	23.65	ft^2
Dry Weight:	40.8	kg	90	lb	**Fluid Capacity:**	3.8	l	1.0	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

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

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

$K_{\alpha\tau}$ =	1.0	-0.1939	(S)	-0.0055	$(S)^2$
$K_{\alpha\tau}$ =	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:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	39	29	20
B (5°C)	35	26	16
C (20°C)	29	20	11
D (50°C)	18	9	2
E (80°C)	7	1	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	37	28	19
B (9°F)	33	24	15
C (36°F)	28	19	10
D (90°F)	17	9	2
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^2	27.98	ft^2	**Net Aperture Area:**	2.430	m^2	26.16	ft^2
Dry Weight:	44.9	kg	99	lb	**Fluid Capacity:**	4.2	l	1.1	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

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

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

$K_{\alpha\tau}$ =	1.0	-0.1939	(S)	-0.0055	$(S)^2$
$K_{\alpha\tau}$ =	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:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	44	33	23
B (5°C)	40	29	19
C (20°C)	33	23	13
D (50°C)	20	11	2
E (80°C)	8	1	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	42	31	21
B (9°F)	38	28	18
C (36°F)	32	22	12
D (90°F)	19	10	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: December 13, 2006

COLLECTOR SPECIFICATIONS

Gross Area:	2.965	m²	31.92	ft²	**Net Aperture Area:**	2.781	m²	29.94	ft²
Dry Weight:	51.2	kg	113	lb	**Fluid Capacity:**	4.9	l	1.3	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.691	-3.3960	(P)/I	-0.0197	$(P)^2/I$	0.706	-4.9099	W/m²·°C
I P Units:	η =	0.691	-0.5985	(P)/I	-0.0019	$(P)^2/I$	0.706	-0.865	Btu/hr·ft²·°F

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

$K_{\alpha\tau}$ =	1.0	-0.1939	(S)	-0.0055	$(S)^2$
$K_{\alpha\tau}$ =	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:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	55	41	28
B (5°C)	50	36	23
C (20°C)	42	29	16
D (50°C)	25	13	3
E (80°C)	10	1	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	52	39	27
B (9°F)	47	35	22
C (36°F)	40	27	15
D (90°F)	24	13	3
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^2	39.78	ft^2	**Net Aperture Area:**	3.481	m^2	37.47	ft^2
Dry Weight:	69.4	kg	153	lb	**Fluid Capacity:**	6.1	l	1.6	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

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

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

$K_{\alpha\tau}$ =	1.0	-0.1939	(S)	-0.0055	$(S)^2$
$K_{\alpha\tau}$ =	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:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	21.87	ft^2	**Net Aperture Area:**	1.875	m^2	20.18	ft^2
Dry Weight:	40.8	kg	90	lb	**Fluid Capacity:**	2.8	l	0.7	gal
Test Pressure:	552	kPa	80	psig					

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		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.698	-3.7428	(P)/I	-0.0125	(P)^2/I	0.704	-4.4855	W/m^2·°C
I P Units:	η =	0.698	-0.6596	(P)/I	-0.0012	(P)^2/I	0.704	-0.790	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0701	(S)	-0.0957	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.17	(S)	(Linear Fit)		

Model Tested: SE-21
Test Fluid: Water
Test Flow Rate: 38 ml/s 0.59 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	24.89	ft^2	**Net Aperture Area:**	2.163	m^2	23.28	ft^2
Dry Weight:	46.3	kg	102	lb	**Fluid Capacity:**	3.3	l	0.9	gal
Test Pressure:	552	kPa	80	psig					

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		Δ P	
ml/s	gpm	Pa	in H_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.698	-3.7428	(P)/I	-0.0125	(P)^2/I	0.704	-4.4855	W/m^2·°C
I P Units:	η =	0.698	-0.6596	(P)/I	-0.0012	(P)^2/I	0.704	-0.790	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0701	(S)	-0.0957	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.17	(S)	(Linear Fit)		

Model Tested: SE-21
Test Fluid: Water
Test Flow Rate: 38 ml/s 0.59 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	27.03	ft^2	**Net Aperture Area:**	2.366	m^2	25.47	ft^2
Dry Weight:	49.4	kg	109	lb	**Fluid Capacity:**	3.2	l	0.8	gal
Test Pressure:	552	kPa	80	psig					

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		Δ P	
ml/s	gpm	Pa	in H_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.698	-3.7428	(P)/I	-0.0125	(P)^2/I	0.704	-4.4855	W/m^2·°C
I P Units:	η =	0.698	-0.6596	(P)/I	-0.0012	(P)^2/I	0.704	-0.790	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0701	(S)	-0.0957	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.17	(S)	(Linear Fit)		

Model Tested: SE-21
Test Fluid: Water
Test Flow Rate: 38 ml/s 0.59 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	44	33	23
B (5°C)	40	29	18
C (20°C)	33	23	12
D (50°C)	21	11	3
E (80°C)	9	2	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	42	32	22
B (9°F)	38	28	17
C (36°F)	32	22	12
D (90°F)	20	11	3
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^2	30.87	ft^2	**Net Aperture Area:**	2.709	m^2	29.16	ft^2
Dry Weight:	56.2	kg	124	lb	**Fluid Capacity:**	3.8	l	1.0	gal
Test Pressure:	552	kPa	80	psig					

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		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.698	-3.7428	(P)/I	-0.0125	$(P)^2/I$	0.704	-4.4855	$W/m^2 \cdot °C$
I P Units:	η =	0.698	-0.6596	(P)/I	-0.0012	$(P)^2/I$	0.704	-0.790	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.0701	(S)	-0.0957	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.17	(S)	(Linear Fit)	

Model Tested: SE-21
Test Fluid: Water
Test Flow Rate: 38 ml/s 0.59 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	38.56	ft^2	**Net Aperture Area:**	3.396	m^2	36.56	ft^2
Dry Weight:	69.9	kg	154	lb	**Fluid Capacity:**	4.4	l	1.2	gal
Test Pressure:	552	kPa	80	psig					

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		Δ P	
ml/s	gpm	Pa	in H_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.698	-3.7428	(P)/I	-0.0125	(P)^2/I	0.704	-4.4855	W/m^2·°C
I P Units:	η =	0.698	-0.6596	(P)/I	-0.0012	(P)^2/I	0.704	-0.790	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0701	(S)	-0.0957	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.17	(S)	(Linear Fit)		

Model Tested: SE-21
Test Fluid: Water
Test Flow Rate: 38 ml/s 0.59 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	24.10	ft^2	**Net Aperture Area:**	2.091	m^2	22.51	ft^2
Dry Weight:	48.5	kg	107	lb	**Fluid Capacity:**	9.6	l	2.5	gal
Test Pressure:	827	kPa	120	psig					

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_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.591	-4.5502	(P)/I	-0.0189	(P)^2/I	0.6	-5.679	W/m^2·°C
I P Units:	η =	0.591	-0.8019	(P)/I	-0.0019	(P)^2/I	0.6	-1.001	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	+0.6317	(S)	-1.2396	(S)^2	
$K_{\alpha\tau}$ =	1.0	+999.00	(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)

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/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	24.52	ft^2	**Net Aperture Area:**	2.179	m^2	23.46	ft^2
Dry Weight:	35.3	kg	78	lb	**Fluid Capacity:**	1.9	l	0.5	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.779	-4.2847	(P)/I	-0.0048	$(P)^2/I$	0.782	-4.5996	$W/m^2 \cdot °C$
I P Units:	η =	0.779	-0.7551	(P)/I	-0.0005	$(P)^2/I$	0.782	-0.811	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.2947	(S)	-0.0119	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.31	(S)	(Linear Fit)	

Model Tested:	SLCO-30			
Test Fluid:	Water			
Test Flow Rate:	45	ml/s	0.71	gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	31.78	ft^2	**Net Aperture Area:**	2.836	m^2	30.53	ft^2
Dry Weight:	48	kg	106	lb	**Fluid Capacity:**	2.4	l	0.6	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.782	-4.2829	(P)/I	-0.0048	(P)^2/I	0.785	-4.598	W/m^2·°C
I P Units:	η =	0.782	-0.7548	(P)/I	-0.0005	(P)^2/I	0.785	-0.810	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.2947	(S)	-0.0119	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.31	(S)	(Linear Fit)	

Model Tested: SLCO-30
Test Fluid: Water
Test Flow Rate: 45 ml/s 0.71 gpm

REMARKS:

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/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	38.87	ft^2	**Net Aperture Area:**	3.478	m^2	37.44	ft^2
Dry Weight:	60	kg	132	lb	**Fluid Capacity:**	2.6	l	0.7	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.784	-4.2805	(P)/I	-0.0048	$(P)^2/I$	0.787	-4.5961	$W/m^2 \cdot °C$
I P Units:	η =	0.784	-0.7543	(P)/I	-0.0005	$(P)^2/I$	0.787	-0.810	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.2947	(S)	-0.0119	$(S)^2$	
$K_{\alpha\tau}$ =	1.0	-0.31	(S)	(Linear Fit)		

Model Tested: SLCO-30
Test Fluid: Water
Test Flow Rate: 45 ml/s 0.71 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	30.30	ft^2	**Net Aperture Area:**	2.608	m^2	28.07	ft^2
Dry Weight:	49.9	kg	110	lb	**Fluid Capacity:**	2.7	l	0.7	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.704	-1.7983	(P)/I	-0.0470	(P)^2/I	0.735	-5.365	W/m^2·°C
I P Units:	η =	0.704	-0.3169	(P)/I	-0.0046	(P)^2/I	0.735	-0.945	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.2011 (S) +0.0069 (S)^2
$K_{\alpha\tau}$ = 1.0 -0.19 (S) (Linear Fit)

Model Tested: SLCR-30
Test Fluid: Water
Test Flow Rate: 52 ml/s 0.82 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	31.98	ft^2	**Net Aperture Area:**	2.758	m^2	29.69	ft^2
Dry Weight:	49	kg	108	lb	**Fluid Capacity:**	3.0	l	0.8	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.704	-1.7983	(P)/I	-0.0470	(P)^2/I	0.735	-5.365	W/m^2·°C
I P Units:	η =	0.704	-0.3169	(P)/I	-0.0046	(P)^2/I	0.735	-0.945	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.2011	(S)	+0.0069	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.19	(S)	(Linear Fit)		

Model Tested: SLCR-30
Test Fluid: Water
Test Flow Rate: 52 ml/s 0.82 gpm

REMARKS:

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/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	40.05	ft^2	**Net Aperture Area:**	3.469	m^2	37.34	ft^2
Dry Weight:	68.9	kg	152	lb	**Fluid Capacity:**	3.8	l	1.0	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.704	-1.7983	(P)/I	-0.0470	$(P)^2/I$	0.735	-5.365	$W/m^2 \cdot °C$
I P Units:	η =	0.704	-0.3169	(P)/I	-0.0046	$(P)^2/I$	0.735	-0.945	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.2011	(S)	+0.0069	$(S)^2$	
$K_{\alpha\tau}$ =	1.0	-0.19	(S)	(Linear Fit)		

Model Tested: SLCR-30
Test Fluid: Water
Test Flow Rate: 52 ml/s 0.82 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	41	31	21
B (5°C)	37	27	17
C (20°C)	32	22	12
D (50°C)	21	12	4
E (80°C)	10	3	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	39	29	20
B (9°F)	35	26	16
C (36°F)	30	21	12
D (90°F)	20	11	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^2	29.43	ft^2	**Net Aperture Area:**	2.595	m^2	27.93	ft^2
Dry Weight:	48.9	kg	108	lb	**Fluid Capacity:**	1.6	l	0.4	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.649	-3.1374	(P)/I	-0.0148	$(P)^2/I$	0.66	-4.287	$W/m^2 \cdot °C$
I P Units:	η =	0.649	-0.5529	(P)/I	-0.0014	$(P)^2/I$	0.66	-0.755	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.2824	(S)	-0.0111	$(S)^2$
$K_{\alpha\tau}$ =	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:

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/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	10.04	ft^2	**Net Aperture Area:**	0.847	m^2	9.12	ft^2
Dry Weight:	8.6	kg	19	lb	**Fluid Capacity:**	0.6	l	0.2	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

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

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

$K_{\alpha\tau}$ =	1.0	-0.1944	(S)	-0.0186	$(S)^2$
$K_{\alpha\tau}$ =	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:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **SunBank Solar**
PO Box 779
Anderson, CA 96007

MODEL: SunBank SB20
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2006-016A

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	20.08	ft^2	**Net Aperture Area:**	1.720	m^2	18.51	ft^2
Dry Weight:	17.2	kg	38	lb	**Fluid Capacity:**	1.8	l	0.5	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**
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]

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

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

$K_{\alpha\tau}$ =	1.0	-0.1944	(S)	-0.0186	$(S)^2$
$K_{\alpha\tau}$ =	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:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	19.71	ft^2	**Net Aperture Area:**	1.607	m^2	17.30	ft^2
Dry Weight:	34	kg	75	lb	**Fluid Capacity:**	2.4	l	0.6	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.702	-3.2828	(P)/I	-0.0099	(P)^2/I	0.714	-4.1279	W/m^2·°C
I P Units:	η =	0.702	-0.5785	(P)/I	-0.0010	(P)^2/I	0.714	-0.727	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0707	(S)	-0.1687	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.25	(S)	(Linear Fit)		

Model Tested: EC-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.50 gpm

REMARKS:

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 #: 100-1981-098O

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	21.22	ft^2	**Net Aperture Area:**	1.734	m^2	18.67	ft^2
Dry Weight:	32	kg	71	lb	**Fluid Capacity:**	2.7	l	0.7	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.702	-3.2828	(P)/I	-0.0099	(P)^2/I	0.714	-4.1279	W/m^2·°C
I P Units:	η =	0.702	-0.5785	(P)/I	-0.0010	(P)^2/I	0.714	-0.727	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0707	(S)	-0.1687	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.25	(S)	(Linear Fit)		

Model Tested: EC-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.50 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	24.65	ft^2	**Net Aperture Area:**	2.015	m^2	21.69	ft^2
Dry Weight:	36.7	kg	81	lb	**Fluid Capacity:**	2.9	l	0.8	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

Efficiency Equation [NOTE: Based on gross area and (P) = Ti-Ta] — Y Intercept — Slope

S I Units: η = 0.702 -3.2828 (P)/I -0.0099 (P)^2/I 0.7135 -4.1279 W/m^2·°C

I P Units: η = 0.702 -0.5785 (P)/I -0.0010 (P)^2/I 0.7135 -0.727 Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.0707 (S) -0.1687 (S)^2

$K_{\alpha\tau}$ = 1.0 -0.25 (S) (Linear Fit)

Model Tested: EC-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	32.84	ft^2	**Net Aperture Area:**	2.750	m^2	29.60	ft^2
Dry Weight:	47.6	kg	105	lb	**Fluid Capacity:**	3.9	l	1.0	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.702	-3.2828	(P)/I	-0.0099	(P)^2/I	0.714	-4.1279	W/m^2·°C
I P Units:	η =	0.702	-0.5785	(P)/I	-0.0010	(P)^2/I	0.714	-0.727	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.0707 (S) -0.1687 (S)^2

$K_{\alpha\tau}$ = 1.0 -0.25 (S) (Linear Fit)

Model Tested: EC-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	40.86	ft^2	**Net Aperture Area:**	3.445	m^2	37.08	ft^2
Dry Weight:	62.6	kg	138	lb	**Fluid Capacity:**	4.5	l	1.2	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.702	-3.2828	(P)/I	-0.0099	(P)^2/I	0.714	-4.1279	W/m^2·°C
I P Units:	η =	0.702	-0.5785	(P)/I	-0.0010	(P)^2/I	0.714	-0.727	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0707	(S)	-0.1687	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.25	(S)	(Linear Fit)		

Model Tested: EC-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	19.71	ft^2	**Net Aperture Area:**	1.607	m^2	17.30	ft^2
Dry Weight:	29.5	kg	65	lb	**Fluid Capacity:**	2.4	l	0.6	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.666	-3.3563	(P)/I	-0.0138	(P)^2/I	0.682	-4.5392	W/m^2·°C
I P Units:	η =	0.666	-0.5915	(P)/I	-0.0014	(P)^2/I	0.682	-0.800	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	+0.0045	(S)	-0.2088	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.21	(S)	(Linear Fit)	

Model Tested: EP-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.50 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	21.22	ft^2	**Net Aperture Area:**	1.734	m^2	18.67	ft^2
Dry Weight:	32	kg	71	lb	**Fluid Capacity:**	2.7	l	0.7	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.666	-3.3563	(P)/I	-0.0138	(P)^2/I	0.682	-4.5392	W/m^2·°C
I P Units:	η =	0.666	-0.5915	(P)/I	-0.0014	(P)^2/I	0.682	-0.800	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	+0.0045	(S)	-0.2088	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.21	(S)	(Linear Fit)	

Model Tested: EP-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.50 gpm

REMARKS:

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/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	24.65	ft^2	**Net Aperture Area:**	2.015	m^2	21.69	ft^2
Dry Weight:	36.3	kg	80	lb	**Fluid Capacity:**	2.9	l	0.8	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.666	-3.3563	(P)/I	-0.0138	$(P)^2/I$	0.682	-4.5392	$W/m^2 \cdot °C$
I P Units:	η =	0.666	-0.5915	(P)/I	-0.0014	$(P)^2/I$	0.682	-0.800	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	+0.0045	(S)	-0.2088	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.21	(S)	(Linear Fit)	

Model Tested: EP-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	32.84	ft^2	**Net Aperture Area:**	2.750	m^2	29.60	ft^2
Dry Weight:	47.6	kg	105	lb	**Fluid Capacity:**	3.9	l	1.0	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.666	-3.3563	(P)/I	-0.0138	(P)^2/I	0.682	-4.5392	W/m^2·°C
I P Units:	η =	0.666	-0.5915	(P)/I	-0.0014	(P)^2/I	0.682	-0.800	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	+0.0045	(S)	-0.2088	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.21	(S)	(Linear Fit)	

Model Tested: EP-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

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/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	40.86	ft^2	**Net Aperture Area:**	3.445	m^2	37.08	ft^2
Dry Weight:	62.6	kg	138	lb	**Fluid Capacity:**	4.5	l	1.2	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.666	-3.3563	(P)/I	-0.0138	$(P)^2/I$	0.682	-4.5392	$W/m^2 \cdot °C$
I P Units:	η =	0.666	-0.5915	(P)/I	-0.0014	$(P)^2/I$	0.682	-0.800	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	+0.0045	(S)	-0.2088	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.21	(S)	(Linear Fit)	

Model Tested: EP-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	35	26	18
B (5°C)	32	23	15
C (20°C)	27	19	10
D (50°C)	18	11	3
E (80°C)	10	4	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	33	25	17
B (9°F)	30	22	14
C (36°F)	26	18	10
D (90°F)	17	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: May 1, 1992

COLLECTOR SPECIFICATIONS

Gross Area:	2.301	m^2	24.77	ft^2	**Net Aperture Area:**	2.015	m^2	21.69	ft^2
Dry Weight:	36.7	kg	81	lb	**Fluid Capacity:**	2.9	l	0.8	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.702	-3.2828	(P)/I	-0.0099	$(P)^2/I$	0.714	-4.1279	$W/m^2 \cdot °C$
I P Units:	η =	0.702	-0.5785	(P)/I	-0.0010	$(P)^2/I$	0.714	-0.727	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.0707	(S)	-0.1687	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.25	(S)	(Linear Fit)	

Model Tested: EC-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	46	35	24
B (5°C)	42	31	20
C (20°C)	36	25	14
D (50°C)	24	14	4
E (80°C)	14	5	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	44	33	22
B (9°F)	40	29	19
C (36°F)	34	24	13
D (90°F)	23	13	4
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^2	32.96	ft^2	**Net Aperture Area:**	2.750	m^2	29.60	ft^2
Dry Weight:	47.6	kg	105	lb	**Fluid Capacity:**	3.9	l	1.0	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.702	-3.2828	(P)/I	-0.0099	$(P)^2/I$	0.714	-4.1279	$W/m^2 \cdot °C$
I P Units:	η =	0.702	-0.5785	(P)/I	-0.0010	$(P)^2/I$	0.714	-0.727	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.0707	(S)	-0.1687	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.25	(S)	(Linear Fit)	

Model Tested: EC-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	41.00	ft^2	**Net Aperture Area:**	3.445	m^2	37.08	ft^2
Dry Weight:	62.6	kg	138	lb	**Fluid Capacity:**	4.5	l	1.2	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.702	-3.2828	(P)/I	-0.0099	(P)^2/I	0.714	-4.1279	W/m^2·°C
I P Units:	η =	0.702	-0.5785	(P)/I	-0.0010	(P)^2/I	0.714	-0.727	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0707	(S)	-0.1687	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.25	(S)	(Linear Fit)	

Model Tested: EC-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	34	25	17
B (5°C)	31	22	14
C (20°C)	26	18	10
D (50°C)	16	9	2
E (80°C)	7	2	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	32	24	16
B (9°F)	29	21	13
C (36°F)	24	17	9
D (90°F)	15	9	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^2	24.77	ft^2	**Net Aperture Area:**	2.015	m^2	21.69	ft^2
Dry Weight:	36.3	kg	80	lb	**Fluid Capacity:**	2.9	l	0.8	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.666	-3.3563	(P)/I	-0.0138	$(P)^2/I$	0.682	-4.5392	$W/m^2 \cdot °C$
I P Units:	η =	0.666	-0.5915	(P)/I	-0.0014	$(P)^2/I$	0.682	-0.800	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	+0.0045	(S)	-0.2088	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.21	(S)	(Linear Fit)	

Model Tested: EP-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	45	34	23
B (5°C)	41	30	19
C (20°C)	34	24	13
D (50°C)	22	12	3
E (80°C)	10	2	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	43	32	22
B (9°F)	39	28	18
C (36°F)	33	22	12
D (90°F)	21	11	3
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	m²	32.96	ft²	**Net Aperture Area:**	2.750	m²	29.60 ft²
Dry Weight:	42.6	kg	94	lb	**Fluid Capacity:**	3.9	l	1.0 gal
Test Pressure:	1103	kPa	160	psig				

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.666	-3.3563	(P)/I	-0.0138	$(P)^2/I$	0.682	-4.5392	W/m²·°C
I P Units:	η =	0.666	-0.5915	(P)/I	-0.0014	$(P)^2/I$	0.682	-0.800	Btu/hr·ft²·°F

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

$K_{\alpha\tau}$ =	1.0	+0.0045	(S)	-0.2088	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.21	(S)	(Linear Fit)	

Model Tested: EP-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	56	42	29
B (5°C)	51	37	24
C (20°C)	43	29	16
D (50°C)	27	15	4
E (80°C)	12	3	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	53	40	27
B (9°F)	48	35	22
C (36°F)	41	28	15
D (90°F)	26	14	4
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	m²	41.00	ft²	**Net Aperture Area:**	3.445 m²	37.08 ft²
Dry Weight:	62.6	kg	138	lb	**Fluid Capacity:**	4.5 l	1.2 gal
Test Pressure:	1103	kPa	160	psig			

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.666	-3.3563	(P)/I	-0.0138	$(P)^2/I$	0.682	-4.5392	W/m²·°C
I P Units:	η =	0.666	-0.5915	(P)/I	-0.0014	$(P)^2/I$	0.682	-0.800	Btu/hr·ft²·°F

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

$K_{\alpha\tau}$ =	1.0	+0.0045	(S)	-0.2088	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.21	(S)	(Linear Fit)	

Model Tested: EP-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	35	26	18
B (5°C)	32	23	15
C (20°C)	27	19	10
D (50°C)	18	11	3
E (80°C)	10	4	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	33	25	17
B (9°F)	30	22	14
C (36°F)	26	18	10
D (90°F)	17	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: August 1, 1995

COLLECTOR SPECIFICATIONS

Gross Area:	2.290	m^2	24.65	ft^2	**Net Aperture Area:**	2.015	m^2	21.69	ft^2
Dry Weight:	36.7	kg	81	lb	**Fluid Capacity:**	2.9	l	0.8	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.702	-3.2828	(P)/I	-0.0099	$(P)^2/I$	0.714	-4.1279	$W/m^2 \cdot °C$
I P Units:	η =	0.702	-0.5785	(P)/I	-0.0010	$(P)^2/I$	0.714	-0.727	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.0707	(S)	-0.1687	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.25	(S)	(Linear Fit)	

Model Tested: EC-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	46	35	24
B (5°C)	42	31	20
C (20°C)	36	25	14
D (50°C)	24	14	4
E (80°C)	14	5	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	44	33	22
B (9°F)	40	29	19
C (36°F)	34	24	13
D (90°F)	23	13	4
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	m²	32.84	ft²	**Net Aperture Area:**	2.750 m²	29.60 ft²
Dry Weight:	47.6	kg	105	lb	**Fluid Capacity:**	3.9 l	1.0 gal
Test Pressure:	1103	kPa	160	psig			

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.702	-3.2828	(P)/I	-0.0099	$(P)^2/I$	0.714	-4.1279	W/m²·°C
I P Units:	η =	0.702	-0.5785	(P)/I	-0.0010	$(P)^2/I$	0.714	-0.727	Btu/hr·ft²·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0707	(S)	-0.1687	$(S)^2$	
$K_{\alpha\tau}$ =	1.0	-0.25	(S)	(Linear Fit)		

Model Tested: EC-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	40.86	ft^2	**Net Aperture Area:**	3.445	m^2	37.08	ft^2
Dry Weight:	62.6	kg	138	lb	**Fluid Capacity:**	4.5	l	1.2	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.702	-3.2828	(P)/I	-0.0099	(P)^2/I	0.714	-4.1279	W/m^2·°C
I P Units:	η =	0.702	-0.5785	(P)/I	-0.0010	(P)^2/I	0.714	-0.727	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0707	(S)	-0.1687	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.25	(S)	(Linear Fit)		

Model Tested: EC-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	34	25	17
B (5°C)	30	22	14
C (20°C)	26	18	10
D (50°C)	16	9	2
E (80°C)	7	2	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	32	24	16
B (9°F)	29	21	13
C (36°F)	24	17	9
D (90°F)	15	9	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^2	24.65	ft^2	**Net Aperture Area:**	2.015	m^2	21.69	ft^2
Dry Weight:	36.3	kg	80	lb	**Fluid Capacity:**	2.9	l	0.8	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.666	-3.3563	(P)/I	-0.0138	$(P)^2/I$	0.682	-4.5392	$W/m^2 \cdot °C$
I P Units:	η =	0.666	-0.5915	(P)/I	-0.0014	$(P)^2/I$	0.682	-0.800	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	+0.0045	(S)	-0.2088	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.21	(S)	(Linear Fit)	

Model Tested: EP-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

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/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	32.84	ft^2	**Net Aperture Area:**	2.750	m^2	29.60	ft^2
Dry Weight:	47.6	kg	105	lb	**Fluid Capacity:**	3.9	l	1.0	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.666	-3.3563	(P)/I	-0.0138	$(P)^2/I$	0.682	-4.5392	$W/m^2 \cdot °C$
I P Units:	η =	0.666	-0.5915	(P)/I	-0.0014	$(P)^2/I$	0.682	-0.800	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	+0.0045	(S)	-0.2088	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.21	(S)	(Linear Fit)	

Model Tested: EP-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

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/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	40.86	ft^2	**Net Aperture Area:**	3.445	m^2	37.08	ft^2
Dry Weight:	62.6	kg	138	lb	**Fluid Capacity:**	4.5	l	1.2	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.666	-3.3563	(P)/I	-0.0138	$(P)^2/I$	0.682	-4.5392	$W/m^2 \cdot °C$
I P Units:	η =	0.666	-0.5915	(P)/I	-0.0014	$(P)^2/I$	0.682	-0.800	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	+0.0045	(S)	-0.2088	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.21	(S)	(Linear Fit)	

Model Tested: EP-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.51 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	20.02	ft^2	**Net Aperture Area:**	1.699	m^2	18.29	ft^2
Dry Weight:	37.2	kg	82	lb	**Fluid Capacity:**	2.7	l	0.7	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.702	-3.2828	(P)/I	-0.0099	(P)^2/I	0.714	-4.1279	W/m^2·°C
I P Units:	η =	0.702	-0.5785	(P)/I	-0.0010	(P)^2/I	0.714	-0.727	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0707	(S)	-0.1687	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.25	(S)	(Linear Fit)		

Model Tested: EC-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.50 gpm

REMARKS:

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/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	23.24	ft^2	**Net Aperture Area:**	1.992	m^2	21.44	ft^2
Dry Weight:	42.6	kg	94	lb	**Fluid Capacity:**	3.0	l	0.8	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.702	-3.2828	(P)/I	-0.0099	$(P)^2/I$	0.714	-4.1279	$W/m^2 \cdot °C$
I P Units:	η =	0.702	-0.5785	(P)/I	-0.0010	$(P)^2/I$	0.714	-0.727	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.0707	(S)	-0.1687	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.25	(S)	(Linear Fit)	

Model Tested: EC-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.50 gpm

REMARKS:

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	44	33	22
B (5°C)	40	29	19
C (20°C)	34	24	13
D (50°C)	23	13	4
E (80°C)	13	5	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	42	31	21
B (9°F)	38	28	18
C (36°F)	33	23	13
D (90°F)	22	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 28, 1999

COLLECTOR SPECIFICATIONS

Gross Area:	2.907	m²	31.29	ft²	**Net Aperture Area:**	2.724	m²	29.32 ft²
Dry Weight:	54.4	kg	120	lb	**Fluid Capacity:**	3.8	l	1.0 gal
Test Pressure:	1103	kPa	160	psig				

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.702	-3.2828	(P)/I	-0.0099	$(P)^2/I$	0.714	-4.1279	W/m²·°C
I P Units:	η =	0.702	-0.5785	(P)/I	-0.0010	$(P)^2/I$	0.714	-0.727	Btu/hr·ft²·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0707	(S)	-0.1687	$(S)^2$	
$K_{\alpha\tau}$ =	1.0	-0.25	(S)	(Linear Fit)		

Model Tested: EC-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.50 gpm

REMARKS:

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/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·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^2	39.06	ft^2	**Net Aperture Area:**	3.415	m^2	36.76	ft^2
Dry Weight:	72.7	kg	160	lb	**Fluid Capacity:**	4.5	l	1.2	gal
Test Pressure:	1104	kPa	160	psig					

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.702	-3.2828	(P)/I	-0.0099	$(P)^2/I$	0.714	-4.1279	$W/m^2 \cdot °C$
I P Units:	η =	0.702	-0.5785	(P)/I	-0.0010	$(P)^2/I$	0.714	-0.727	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.0707	(S)	-0.1687	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.25	(S)	(Linear Fit)	

Model Tested: EC-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.50 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	20.02	ft^2	**Net Aperture Area:**	1.699	m^2	18.29	ft^2
Dry Weight:	37.2	kg	82	lb	**Fluid Capacity:**	2.7	l	0.7	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.666	-3.3563	(P)/I	-0.0138	(P)^2/I	0.682	-4.5392	W/m^2·°C
I P Units:	η =	0.666	-0.5915	(P)/I	-0.0014	(P)^2/I	0.682	-0.800	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	+0.0045	(S)	-0.2088	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.21	(S)	(Linear Fit)		

Model Tested: EP-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.50 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	23.24	ft^2	**Net Aperture Area:**	1.992	m^2	21.44	ft^2
Dry Weight:	42.6	kg	94	lb	**Fluid Capacity:**	3.0	l	0.8	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.666	-3.3563	(P)/I	-0.0138	(P)^2/I	0.682	-4.5392	W/m^2·°C
I P Units:	η =	0.666	-0.5915	(P)/I	-0.0014	(P)^2/I	0.682	-0.800	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	+0.0045	(S)	-0.2088	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.21	(S)	(Linear Fit)	

Model Tested: EP-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.50 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	31.29	ft^2	**Net Aperture Area:**	2.724	m^2	29.32	ft^2
Dry Weight:	54.4	kg	120	lb	**Fluid Capacity:**	3.8	l	1.0	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.666	-3.3563	(P)/I	-0.0138	(P)^2/I	0.682	-4.5392	W/m^2·°C
I P Units:	η =	0.666	-0.5915	(P)/I	-0.0014	(P)^2/I	0.682	-0.800	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	+0.0045	(S)	-0.2088	(S)^2
$K_{\alpha\tau}$ =	1.0	-0.21	(S)	(Linear Fit)	

Model Tested: EP-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.50 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	39.06	ft^2	**Net Aperture Area:**	3.415	m^2	36.76	ft^2
Dry Weight:	72.7	kg	160	lb	**Fluid Capacity:**	4.5	l	1.2	gal
Test Pressure:	1104	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.666	-3.3563	(P)/I	-0.0138	(P)^2/I	0.682	-4.5392	W/m^2·°C
I P Units:	η =	0.666	-0.5915	(P)/I	-0.0014	(P)^2/I	0.682	-0.800	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 +0.0045 (S) -0.2088 (S)^2

$K_{\alpha\tau}$ = 1.0 -0.21 (S) (Linear Fit)

Model Tested: EP-20
Test Fluid: Water
Test Flow Rate: 32 ml/s 0.50 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	34.20	ft^2	**Net Aperture Area:**	2.759	m^2	29.70	ft^2
Dry Weight:	54.026	kg	119	lb	**Fluid Capacity:**	0.0	l	0.0	gal
Test Pressure:	0	kPa	0	psig					

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		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.508	-4.8400	(P)/I	0.0000	(P)^2/I	0.508	-4.84	W/m^2·°C
I P Units:	η =	0.508	-0.8529	(P)/I	0.0000	(P)^2/I	0.508	-0.853	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0720	(S)	0.0000	(S)^2	
$K_{\alpha\tau}$ =	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

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	19.91	ft^2	**Net Aperture Area:**	1.653	m^2	17.79	ft^2
Dry Weight:	35	kg	77	lb	**Fluid Capacity:**	2.3	l	0.6	gal
Test Pressure:	1103	kPa	160	psig					

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_2O
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]

						Y Intercept	Slope	
S I Units:	η =	0.612	-4.3317	(P)/I	-0.0206 (P)^2/I	0.626	-6.0142	W/m^2·°C
I P Units:	η =	0.612	-0.7634	(P)/I	-0.0020 (P)^2/I	0.626	-1.060	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.0507 (S) -0.1253 (S)^2

$K_{\alpha\tau}$ = 1.0 -0.18 (S) (Linear Fit)

Model Tested: S19.78
Test Fluid: Water
Test Flow Rate: 33 ml/s 0.52 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	26.68	ft^2	**Net Aperture Area:**	2.272	m^2	24.46	ft^2
Dry Weight:	47.2	kg	104	lb	**Fluid Capacity:**	3.1	l	0.8	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

						Y Intercept	Slope	
S I Units:	η =	0.612	-4.3317 (P)/I	-0.0206 (P)^2/I		0.626	-6.0142	W/m^2·°C
I P Units:	η =	0.612	-0.7634 (P)/I	-0.0020 (P)^2/I		0.626	-1.060	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.0507 (S) -0.1253 (S)^2

$K_{\alpha\tau}$ = 1.0 -0.18 (S) (Linear Fit)

Model Tested: S19.78
Test Fluid: Water
Test Flow Rate: 33 ml/s 0.52 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	19.92	ft^2	**Net Aperture Area:**	1.786	m^2	19.22	ft^2
Dry Weight:	37.7	kg	83	lb	**Fluid Capacity:**	2.3	l	0.6	gal
Test Pressure:	1103	kPa	160	psig					

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_2O
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]

						Y Intercept	Slope	
S I Units:	η =	0.633	-3.2437	(P)/I	-0.0153 (P)^2/I	0.647	-4.6653	W/m^2·°C
I P Units:	η =	0.633	-0.5716	(P)/I	-0.0015 (P)^2/I	0.647	-0.822	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.0313 (S) -0.1424 (S)^2

$K_{\alpha\tau}$ = 1.0 -0.18 (S) (Linear Fit)

Model Tested: T19.78
Test Fluid: Water
Test Flow Rate: 33 ml/s 0.52 gpm

REMARKS:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Synergy Solar**
6114 Bullard
Suite A
Austin, TX 78757

MODEL: Synergy T26.68
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2004-006B

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·d
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^2	26.68	ft^2	**Net Aperture Area:**	2.272	m^2	24.46	ft^2
Dry Weight:	37.7	kg	83	lb	**Fluid Capacity:**	2.3	l	0.6	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

						Y Intercept	Slope	
S I Units:	η =	0.633	-3.2437 (P)/I	-0.0153	(P)^2/I	0.647	-4.6653	W/m^2·°C
I P Units:	η =	0.633	-0.5716 (P)/I	-0.0015	(P)^2/I	0.647	-0.822	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0313 (S)	-0.1424	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.18 (S)	(Linear Fit)		

Model Tested: T19.78
Test Fluid: Water
Test Flow Rate: 33 ml/s 0.52 gpm

REMARKS:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Synergy Solar**
6114 Bullard
Suite A
Austin, TX 78757

MODEL: Synergy TC-19.78
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2005-007B

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·d
A (-5°C)	27	20	14	A (-9°F)	26	19	13
B (5°C)	24	18	11	B (9°F)	23	17	11
C (20°C)	20	14	7	C (36°F)	19	13	7
D (50°C)	12	7	2	D (90°F)	12	6	1
E (80°C)	6	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: March 8, 2007

COLLECTOR SPECIFICATIONS

Gross Area:	1.838	m^2	19.78	ft^2	**Net Aperture Area:**	1.657	m^2	17.84	ft^2
Dry Weight:	35.6	kg	78	lb	**Fluid Capacity:**	1.7	l	0.4	gal
Test Pressure:	1103	kPa	160	psig					

COLLECTOR MATERIALS

Frame: Aluminum
Cover (Outer): Low Iron Tempered Glass
Cover (Inner): None
Absorber Material: Tube - Copper / Plate - Copper Fin
Absorber Coating: Sputtered aluminium nitride
Insulation (Side): Paper-faced fiberglass
Insulation (Back): Foil-faced fiberglass

PRESSURE DROP

Flow		Δ P	
ml/s	gpm	Pa	in H_2O

TECHNICAL INFORMATION

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

						Y Intercept	Slope	
S I Units:	η =	0.677	-3.7302 (P)/I	-0.0103 (P)^2/I		0.686	-4.59	W/m^2·°C
I P Units:	η =	0.677	-0.6574 (P)/I	-0.0010 (P)^2/I		0.686	-0.809	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.0558 (S) -0.1313 (S)^2
$K_{\alpha\tau}$ = 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:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	26.70	ft^2	**Net Aperture Area:**	2.271	m^2	24.45	ft^2
Dry Weight:	49	kg	108	lb	**Fluid Capacity:**	2.3	l	0.6	gal
Test Pressure:	1103	kPa	160	psig					

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_2O
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]

						Y Intercept	Slope	
S I Units:	η =	0.688	-3.6994	(P)/I	-0.0105 (P)^2/I	0.697	-4.573	W/m^2·°C
I P Units:	η =	0.688	-0.6519	(P)/I	-0.0010 (P)^2/I	0.697	-0.806	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.0558 (S) -0.1313 (S)^2

$K_{\alpha\tau}$ = 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:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Thermo Dynamics, Ltd.**
101 Frazee Avenue
Dartmouth, Nova Scotia B3B 1Z4

MODEL: Thermo Dynamics G Series G32-P
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2006-005A

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-5°C)	42	32	21	A (-9°F)	40	30	20
B (5°C)	37	27	17	B (9°F)	35	26	16
C (20°C)	30	20	10	C (36°F)	29	19	10
D (50°C)	17	8	1	D (90°F)	16	8	1
E (80°C)	6			E (144°F)	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 12, 2007

COLLECTOR SPECIFICATIONS

Gross Area:	2.982	m^2	32.10	ft^2	**Net Aperture Area:**	2.783	m^2	29.96 ft^2
Dry Weight:	43.5	kg	96	lb	**Fluid Capacity:**	2.3	l	0.6 gal
Test Pressure:	1103	kPa	160	psig				

COLLECTOR MATERIALS

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

PRESSURE DROP

Flow		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**
20	0.32	73	0.29
50	0.79	228	0.91
80	1.27	437	1.75

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.689	-3.8475	(P)/I	-0.0174	$(P)^2/I$	0.7	-4.934	$W/m^2 \cdot °C$
I P Units:	η =	0.689	-0.6780	(P)/I	-0.0017	$(P)^2/I$	0.7	-0.870	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.4920	(S)	-0.1291	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.36	(S)	(Linear Fit)	

Model Tested: G32-P
Test Fluid: Water
Test Flow Rate: 60 ml/s 0.94 gpm

REMARKS:

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	32.94	ft^2	**Net Aperture Area:**	2.254	m^2	24.26	ft^2
Dry Weight:	61.2	kg	135	lb	**Fluid Capacity:**	0.5	l	0.1	gal
Test Pressure:	1034	kPa	150	psig					

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_2O
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]

						Y Intercept	Slope	
S I Units:	η =	0.525	-0.8860	(P)/I	-0.0074 (P)^2/I	0.53	-1.421	W/m^2·°C
I P Units:	η =	0.525	-0.1561	(P)/I	-0.0007 (P)^2/I	0.53	-0.250	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.1441 (S) -0.0948 (S)^2

$K_{\alpha\tau}$ = 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)

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	49.31	ft^2	**Net Aperture Area:**	3.381	m^2	36.39	ft^2
Dry Weight:	89.4	kg	197	lb	**Fluid Capacity:**	0.7	l	0.2	gal
Test Pressure:	1034	kPa	150	psig					

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_2O
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]

						Y Intercept	Slope	
S I Units:	η =	0.525	-0.8858	(P)/I	-0.0074 (P)^2/I	0.53	-1.421	W/m^2·°C
I P Units:	η =	0.525	-0.1561	(P)/I	-0.0007 (P)^2/I	0.53	-0.250	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.1441 (S)	-0.0948 (S)^2	**Model Tested:**	30
$K_{\alpha\tau}$ =	1.0	-0.24 (S)	(Linear Fit)	**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)

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	82.25	ft^2	**Net Aperture Area:**	5.635	m^2	60.66	ft^2
Dry Weight:	150.6	kg	332	lb	**Fluid Capacity:**	1.2	l	0.3	gal
Test Pressure:	1034	kPa	150	psig					

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_2O
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]

						Y Intercept	Slope	
S I Units:	η =	0.525	-0.8858	(P)/I	-0.0074 (P)^2/I	0.53	-1.421	W/m^2·°C
I P Units:	η =	0.525	-0.1561	(P)/I	-0.0007 (P)^2/I	0.53	-0.250	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ = 1.0 -0.1441 (S) -0.0948 (S)^2

$K_{\alpha\tau}$ = 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.

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	115.19	ft^2	**Net Aperture Area:**	7.889	m^2	84.92	ft^2
Dry Weight:	211.8	kg	467	lb	**Fluid Capacity:**	1.7	l	0.4	gal
Test Pressure:	1034	kPa	150	psig					

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_2O
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]

						Y Intercept	Slope	
S I Units:	η =	0.525	-0.8858	(P)/I	-0.0074 (P)^2/I	0.53	-1.421	W/m^2·°C
I P Units:	η =	0.525	-0.1561	(P)/I	-0.0007 (P)^2/I	0.53	-0.250	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.1441	(S)	-0.0948	(S)^2
$K_{\alpha\tau}$ =	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.

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	131.56	ft^2	**Net Aperture Area:**	9.016	m^2	97.05	ft^2
Dry Weight:	240	kg	529	lb	**Fluid Capacity:**	1.9	l	0.5	gal
Test Pressure:	1034	kPa	150	psig					

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_2O
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]

						Y Intercept	Slope	
S I Units:	η =	0.525	-0.8858	(P)/I	-0.0074 (P)^2/I	0.53	-1.421	W/m^2·°C
I P Units:	η =	0.525	-0.1561	(P)/I	-0.0007 (P)^2/I	0.53	-0.250	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.1441	(S)	-0.0948	(S)^2
$K_{\alpha\tau}$ =	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.

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	30.67	ft^2	**Net Aperture Area:**	2.496	m^2	26.87	ft^2
Dry Weight:	57.1	kg	126	lb	**Fluid Capacity:**	1.4	l	0.4	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.573	-2.8501	(P)/I	-0.0028	(P)^2/I	0.574	-3.0491	W/m^2·°C
I P Units:	η =	0.573	-0.5023	(P)/I	-0.0003	(P)^2/I	0.574	-0.537	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	+0.0469	(S)	-0.1044	(S)^2	
$K_{\alpha\tau}$ =	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)

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

CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d
A (-5°C)	47	36	25
B (5°C)	42	31	20
C (20°C)	36	25	14
D (50°C)	25	14	4
E (80°C)	14	5	

Thousands of Btu Per Panel Per Day

CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-9°F)	45	34	24
B (9°F)	40	30	19
C (36°F)	34	23	13
D (90°F)	23	13	4
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	m²	46.07	ft²	**Net Aperture Area:**	3.749	m²	40.36 ft²
Dry Weight:	85.6	kg	189	lb	**Fluid Capacity:**	2.1	l	0.6 gal
Test Pressure:	1103	kPa	160	psig				

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_2O**

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.573	-2.8501	(P)/I	-0.0028	$(P)^2/I$	0.574	-3.0491	W/m²·°C
I P Units:	η =	0.573	-0.5023	(P)/I	-0.0003	$(P)^2/I$	0.574	-0.537	Btu/hr·ft²·°F

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

$K_{\alpha\tau}$ =	1.0	+0.0469	(S)	-0.1044	$(S)^2$	
$K_{\alpha\tau}$ =	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)

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	76.74	ft^2	**Net Aperture Area:**	6.245	m^2	67.22	ft^2
Dry Weight:	142.7	kg	315	lb	**Fluid Capacity:**	3.5	l	0.9	gal
Test Pressure:	1103	kPa	160	psig					

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_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.573	-2.8501	(P)/I	-0.0028	(P)^2/I	0.574	-3.0491	W/m^2·°C
I P Units:	η =	0.573	-0.5023	(P)/I	-0.0003	(P)^2/I	0.574	-0.537	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	+0.0469	(S)	-0.1044	(S)^2	
$K_{\alpha\tau}$ =	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.

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	107.41	ft^2	**Net Aperture Area:**	8.741	m^2	94.09	ft^2
Dry Weight:	199.8	kg	441	lb	**Fluid Capacity:**	4.9	l	1.3	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.573	-2.8501	(P)/I	-0.0028	(P)^2/I	0.574	-3.0491	W/m^2·°C
I P Units:	η =	0.573	-0.5023	(P)/I	-0.0003	(P)^2/I	0.574	-0.537	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	+0.0469	(S)	-0.1044	(S)^2	
$K_{\alpha\tau}$ =	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.

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	122.80	ft^2	**Net Aperture Area:**	9.994	m^2	107.58	ft^2
Dry Weight:	228.3	kg	503	lb	**Fluid Capacity:**	5.6	l	1.5	gal
Test Pressure:	1103	kPa	160	psig					

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_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.573	-2.8501	(P)/I	-0.0028	(P)^2/I	0.574	-3.0491	W/m^2·°C
I P Units:	η =	0.573	-0.5023	(P)/I	-0.0003	(P)^2/I	0.574	-0.537	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	+0.0469	(S)	-0.1044	(S)^2	
$K_{\alpha\tau}$ =	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.

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	27.16	ft^2	**Net Aperture Area:**	2.334	m^2	25.12	ft^2
Dry Weight:	44.2	kg	97	lb	**Fluid Capacity:**	1.9	l	0.5	gal
Test Pressure:	897	kPa	130	psig					

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_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.7162	-3.0562	(P)/I	-0.0067	(P)^2/I	0.7203	-3.4981	W/m^2·°C
I P Units:	η =	0.7162	-0.5386	(P)/I	-0.0007	(P)^2/I	0.7203	-0.616	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.0707	(S)	-0.1232	(S)^2
$K_{\alpha\tau}$ =	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

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	30.98	ft^2	**Net Aperture Area:**	2.504	m^2	26.95	ft^2
Dry Weight:	57.6	kg	127	lb	**Fluid Capacity:**	1.3	l	0.3	gal
Test Pressure:	130	kPa	19	psig					

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_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.5079	-0.9156	(P)/I	-0.0030	(P)^2/I	0.5093	-1.0948	W/m^2·°C
I P Units:	η =	0.5079	-0.1614	(P)/I	-0.0003	(P)^2/I	0.5093	-0.193	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	+0.5192	(S)	-0.7428	(S)^2	
$K_{\alpha\tau}$ =	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)

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^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·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^2	46.15	ft^2	**Net Aperture Area:**	3.760	m^2	40.47	ft^2
Dry Weight:	68	kg	150	lb	**Fluid Capacity:**	1.8	l	0.5	gal
Test Pressure:	130	kPa	19	psig					

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_2O

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
S I Units:	η =	0.5079	-0.9156	(P)/I	-0.0030	(P)^2/I	0.5093	-1.0948	W/m^2·°C
I P Units:	η =	0.5079	-0.1614	(P)/I	-0.0003	(P)^2/I	0.5093	-0.193	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	+0.5192	(S)	-0.7428	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.26	(S)	(Linear Fit)		

Model Tested: Vitosol 300, SP3, 2m2
Test Fluid: Prolylene Glycol & 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)

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Your Solar Home, Inc.**
299 Applewood Crescent, Unit 4
Vaughan, ON L4K 4E7

MODEL: SolarSheat 1000G
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2006-008C

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m²·d	MILDLY CLOUDY 17 MJ/m²·d	CLOUDY DAY 11 MJ/m²·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft²·d	MILDLY CLOUDY 1500 Btu/ft²·d	CLOUDY DAY 1000 Btu/ft²·d
A (-5°C)	13	10	7	A (-9°F)	12	10	7
B (5°C)	10	7	4	B (9°F)	10	7	4
C (20°C)	6	4	1	C (36°F)	6	3	1
D (50°C)	1			D (90°F)	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: June 4, 2007

COLLECTOR SPECIFICATIONS

Gross Area:	1.204	m^2	12.96	ft^2	**Net Aperture Area:**	1.037	m^2	11.16	ft^2
Dry Weight:	19.5	kg	43	lb	**Fluid Capacity:**		l	0.0	gal
Test Pressure:	0	kPa	0	psig					

COLLECTOR MATERIALS

Frame:	Aluminum Extrusion
Cover (Outer):	Tempered Glass
Cover (Inner):	None
Absorber Material:	Tube - / Plate - Aluminum
Absorber Coating:	Powder coating
Insulation (Side):	Polyisocyanurate
Insulation (Back):	Polyisocyanurate

PRESSURE DROP

Flow		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.489	-6.8242	(P)/I	-0.0043	$(P)^2/I$	0.49	-6.9913	$W/m^2 \cdot °C$
I P Units:	η =	0.489	-1.2026	(P)/I	-0.0004	$(P)^2/I$	0.49	-1.232	$Btu/hr \cdot ft^2 \cdot °F$

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

$K_{\alpha\tau}$ =	1.0	-0.1084	(S)	-0.1851	$(S)^2$
$K_{\alpha\tau}$ =	1.0	-0.09	(S)	(Linear Fit)	

Model Tested: 1500GS
Test Fluid: Air
Test Flow Rate: 40 l/s 85.0 scfm

REMARKS:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Your Solar Home, Inc.**
299 Applewood Crescent, Unit 4
Vaughan, ON L4K 4E7

MODEL: SolarSheat 1000GS
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2006-008D

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·d
A (-5°C)	17	13	9	A (-9°F)	16	13	9
B (5°C)	13	9	6	B (9°F)	13	9	5
C (20°C)	8	5	2	C (36°F)	8	5	1
D (50°C)	1			D (90°F)	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: June 4, 2007

COLLECTOR SPECIFICATIONS

Gross Area:	1.578	m^2	16.99	ft^2	**Net Aperture Area:**	1.392	m^2	14.98	ft^2
Dry Weight:	26.3	kg	58	lb	**Fluid Capacity:**		l	0.0	gal
Test Pressure:	0	kPa	0	psig					

COLLECTOR MATERIALS

Frame:	Aluminum Extrusion
Cover (Outer):	Tempered Glass
Cover (Inner):	None
Absorber Material:	Tube - / Plate - Aluminum
Absorber Coating:	Powder coating
Insulation (Side):	Polyisocyanurate
Insulation (Back):	Polyisocyanurate

PRESSURE DROP

Flow		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.489	-6.8242	(P)/I	-0.0043	(P)^2/I	0.49	-6.9913	W/m^2·°C
I P Units:	η =	0.489	-1.2026	(P)/I	-0.0004	(P)^2/I	0.49	-1.232	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.1084	(S)	-0.1851	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.09	(S)	(Linear Fit)		

Model Tested: 1500GS
Test Fluid: Air
Test Flow Rate: 40 l/s 85.0 scfm

REMARKS:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Your Solar Home, Inc.**
299 Applewood Crescent, Unit 4
Vaughan, ON L4K 4E7

MODEL: SolarSheat 1500G
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2006-008B

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·d
A (-5°C)	22	17	12	A (-9°F)	21	16	12
B (5°C)	17	12	7	B (9°F)	16	12	7
C (20°C)	11	6	2	C (36°F)	10	6	2
D (50°C)	2			D (90°F)	2		
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 4, 2007

COLLECTOR SPECIFICATIONS

Gross Area:	2.051	m^2	22.08	ft^2	**Net Aperture Area:**	1.896	m^2	20.41	ft^2
Dry Weight:	41.2	kg	91	lb	**Fluid Capacity:**		l	0.0	gal
Test Pressure:	0	kPa	0	psig					

COLLECTOR MATERIALS

Frame:	Aluminum Extrusion
Cover (Outer):	Tempered Glass
Cover (Inner):	None
Absorber Material:	Tube - / Plate - Aluminum
Absorber Coating:	Powder coating
Insulation (Side):	Polyisocyanurate
Insulation (Back):	Polyisocyanurate

PRESSURE DROP

Flow		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**
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]

							Y Intercept	Slope	
S I Units:	η =	0.489	-6.8242	(P)/I	-0.0043	(P)^2/I	0.49	-6.9913	W/m^2·°C
I P Units:	η =	0.489	-1.2026	(P)/I	-0.0004	(P)^2/I	0.49	-1.232	Btu/hr·ft^2·°F

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

$K_{\alpha\tau}$ =	1.0	-0.1084	(S)	-0.1851	(S)^2	
$K_{\alpha\tau}$ =	1.0	-0.09	(S)	(Linear Fit)		

Model Tested: 1500GS
Test Fluid: Air
Test Flow Rate: 40 l/s 85.0 scfm

REMARKS:

SOLAR COLLECTOR CERTIFICATION AND RATING

SRCC OG-100

CERTIFIED SOLAR COLLECTOR

SUPPLIER: **Your Solar Home, Inc.**
299 Applewood Crescent, Unit 4
Vaughan, ON L4K 4E7

MODEL: SolarSheat 1500GS
COLLECTOR TYPE: Glazed Flat-Plate
CERTIFICATION #: 100-2006-008A

COLLECTOR THERMAL PERFORMANCE RATING

Megajoules Per Panel Per Day				Thousands of Btu Per Panel Per Day			
CATEGORY (Ti-Ta)	CLEAR DAY 23 MJ/m^2·d	MILDLY CLOUDY 17 MJ/m^2·d	CLOUDY DAY 11 MJ/m^2·d	CATEGORY (Ti-Ta)	CLEAR DAY 2000 Btu/ft^2·d	MILDLY CLOUDY 1500 Btu/ft^2·d	CLOUDY DAY 1000 Btu/ft^2·d
A (-5°C)	29	23	16	A (-9°F)	28	22	15
B (5°C)	23	16	10	B (9°F)	22	15	9
C (20°C)	14	8	3	C (36°F)	14	8	2
D (50°C)	2			D (90°F)	2		
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 4, 2007

COLLECTOR SPECIFICATIONS

Gross Area:	2.428	m^2	26.14	ft^2	**Net Aperture Area:**	2.211	m^2	23.80	ft^2
Dry Weight:	37	kg	82	lb	**Fluid Capacity:**		l	0.0	gal
Test Pressure:	0	kPa	0	psig					

COLLECTOR MATERIALS

Frame:	Aluminum Extrusion
Cover (Outer):	Tempered Glass
Cover (Inner):	None
Absorber Material:	Tube - / Plate - Aluminum
Absorber Coating:	Powder coating
Insulation (Side):	Polyisocyanurate
Insulation (Back):	Polyisocyanurate

PRESSURE DROP

Flow		Δ P	
ml/s	**gpm**	**Pa**	**in H_2O**
25000	396.51	69	0.28
50000	793.02	280	1.12
100000	1586.04	1125	4.51

TECHNICAL INFORMATION

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

							Y Intercept	Slope	
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Model Tested: 1500GS
Test Fluid: Air
Test Flow Rate: 40 l/s 85.0 scfm

REMARKS: