

Canadian Directory of Solar Water Heating Products

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Notice to Reader

Acceptance into the Directory indicates only that the described products have been evaluated based on stated guidelines. Although CanSIA believes that all reasonable efforts have been made to ensure the adequacy and appropriateness of the guidelines, CanSIA does not warrant or guarantee the completeness or appropriateness of these guidelines. Neither CanSIA nor the STPAC is to be held responsible for the performance or failure of any component or system as installed or for any consequential damages to persons or property as a result of the installation of any component or system listed in this Directory.

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1. Using the Directory

Introduction

The Canadian Directory of Solar Hot Water Products provides a listing of key technical, operational and performance specifications of solar hot water products based on CSA and international standards.

A directory of accepted products provides a valuable tool for increasing the use of solar technologies for water heating. The Canadian solar industry and the federal government worked in partnership to produce regularly updated Directories from 1978 to 1986 (editions 1-29). Edition 30, published in March 2007 is the first Canadian Directory since that time.

The Directory's aim is to make the selection process for solar water heating products simpler for:

- Government agencies that require a process to pre-qualify acceptable products for participation in support programs;
- Firms and agencies that plan to tender the selection of a solar water heating system;
- Homeowners and buyer groups who wish to pre-select qualified products for purchasing.

Currently in Canada there is limited ability for solar product manufacturers or suppliers to have their products certified due to the lack of current and appropriate Canadian standards and the lack of approved testing agencies that can certify to Canadian solar water heating standards.

This directory lists all products that are currently accepted by Canadian Solar Industries Association (CanSIA) on the basis of recommendations of the Solar Thermal Products Acceptance Committee (STPAC).

STPAC is an independent committee consisting of knowledgeable stakeholders from industry, governments and academia. Members of STPAC are approved by the board of CanSIA upon recommendation of NRCan and the CSA Renewable Energy Standards Standing Committee.

The general guidelines for acceptance into the Directory are as follows:

Solar Hot Water Collectors – those products that have gone through an independent review by NRCan and are qualified to receive support under the ecoEnergy Renewable Heat Program (previously the Renewable Energy Deployment Initiative). These products must have gone through independent testing to conform to *CAN/CSA F378-1987 – Solar Collectors* or an equivalent international standard.

Packaged Solar Domestic Hot Water Systems – those products that have been tested to *CAN/CSA-F379.1 Packaged Solar Domestic Hot Water Systems* or have been submitted to Natural Resources Canada (NRCan) for funding to be certified to CAN/CSA-F379.1 (R2004).

Acceptance into the Directory indicates only that the described products have been evaluated based on the above guidelines. Although CanSIA believes that all reasonable efforts have been made to ensure the adequacy and appropriateness of the guidelines, CanSIA does not warrant or guarantee the completeness or appropriateness of these guidelines. Neither CanSIA nor the STPAC are to be held responsible for the performance or failure of any component or system as installed or for any consequential damages to persons or property as a result of the installation of any component or system listed in the Directory.

This Directory is broken into four main sections:

- 1. Introduction and an explanation on how to use the Product Data Sheets
- 2. Solar Water Heating In Canada information on issues that affect the installation of solar water heating products
- 3. Directory of Solar Hot Water Collectors
- 4. Directory of Packaged Solar Domestic Hot Water (SDHW) Systems.

Process for Getting Products Listed in the Directory

The directory is published on a semi-annual basis and manufacturers and suppliers are encouraged to submit their products for consideration by the STPAC. Note that future directories will only be listing those products that are certified to CSA standards once various CSA certification processes are in place.

Interested suppliers should contact CanSIA to obtain information on how to submit products for inclusion in the Directory.

Listing in this directory is voluntary and does not imply an endorsement of products by CanSIA.

International Directories of Solar Thermal Products

Other countries have similar directories of solar thermal products that have been tested and certified to national standards.

<u>USA</u>

1. Solar Rating and Certification Corporation (SRCC)

The Solar Rating and Certification Corporation currently administer a certification, rating, and labeling program for solar collectors and a similar program for complete solar water and swimming pool heating systems.

www.solar-rating.org/

2. Florida Solar Energy Center

In accordance with Florida Law, the Florida Solar Energy Center is responsible for the testing of solar thermal products that are sold in the state of Florida. www.fsec.ucf.edu/en/industry/testing/index.htm

Europe

Solar Keymark

The Keymark is a voluntary third-party European certification mark, demonstrating to the consumer or user of a product that it is in conformity with the relevant European Standard(s). www.estif.org/solarkeymark/

How to Use the Product Data Sheets

The Directory provides detailed information on solar hot water collectors and packaged solar domestic hot water systems in the *Product Data Sheets*.

The Product Data Sheets and the associated listings provide the following types of information on the products:

- The manufacturer and Canadian suppliers
- The warranty and information on the experience of the manufacturer and Canadian supplier
- The type of product or system and its general application
- The technical specifications of the product (i.e. weight and dimensions)
- The operating characteristics of the product (i.e. flow rate and stagnation temperature)
- The energy performance (both absolute and relative to other comparable products)

Products certified to a solar "Standard" undergo an evaluation of generally three criteria:

- Safety
- Durability and reliability
- Energy performance

Canadian Standards for solar collectors and systems cover all three criteria. For safety and durability, acceptance is usually based on a straight pass-or-fail result. Products must meet a certain level of safety or durability (i.e. they pass the appropriate tests) or the product cannot be certified to the standard. On the other hand, testing of energy performance yields a set of values for the product for which there is no simple pass-or-fail result.

Further, while solar certification requires that the solar product be labeled to indicate that it is certified to the standard – giving assurance on safety and durability – there is no requirement to provide information on the energy performance of the product.

Thus one of the primary purposes of the Product Data Sheets is to provide information on the performance of the solar product in absolute terms and to provide a way to compare the relative performance of the product to other products.

However performance listings should not be used to estimate the actual performance that can be expected from a given product once it is installed. This is because solar products are tested under "standard" conditions simulated in the testing laboratory, which are different from variable "real world" conditions. The performance ratings are similar to the gas consumption ratings for cars or the EnerGuide ratings of appliances – they provide a benchmark for comparisons although the same performance may not be achieved in operating systems.

Site conditions that will affect the performance of a solar water heating system includes:

- Direction and tilt of the solar collectors;
- Shading on the solar collectors from topographic features and miscellaneous coverage (i.e. leaves, dirt and snow);
- Local weather conditions (amount of sunshine (dependent on location and time of year) and intensity due to moisture content in the air);
- Method of operation generally, using the heat from the solar collectors when it is collecting it will increase the solar product's performance as its heat transfer fluid will operate at a cooler temperature which increases the product's efficiency.

One of the primary reasons why a solar professional should install solar heating products is that the system performance is very dependent on proper installation. A proper installation can significantly increase the product's energy production. Information on certified solar installers can be found in Section 2 of the Directory.

Product performance is only one criterion in choosing a solar energy system. Quality of installation, availability of service and parts, warranty, aesthetics, and the expected life of the system are other criteria that are also important.

How to Use the Solar Hot Water Collectors Data Sheets

This section provides information on the specific listings in the Data Sheets. Product Data Sheets are only included in the directory if the supplier has completed and submitted a Directory application form. Listing of products in the Directory is voluntary.

General Information

The manufacturer and Canadian suppliers are listed in the Collector data sheets. Full contact details can be found in the listing of collector supplier contacts. To be listed as a Canadian suppler of a foreign manufacturer it is necessary for the firm to supply proof that they are an approved agent of the manufacturer.

The warranty line provides details on the length of the warranty as well as any limitations to the warranty. The date that the product was first listed in the Directory as well as the date that the product was tested or certified provides information on how long the product has been on the market.

Collector Specifications & Materials

This section of the Data Sheet provides information on the physical characteristics of the solar collector as well as information on acceptable heat transfer fluids and the heat transfer fluid's flow rates. This section provides useful information when designing the installation of a solar hot water system.

The collector diagram shows the major components of the solar collector.

Energy Performance

This section will only be completed if the product has gone through independent testing to an acceptable solar collector standard and has been approved by NRCan for inclusion in the ecoEnergy Renewable Heat Program. The supplier must supply to STPAC the test report to have the product's performance listed.

Incident Angle Modifier

The ability of a solar collector to capture solar radiation varies with the angle that the sun strikes the collector. This variation from what is expected is used to calculate the "Incident Angle Modifier". It is measured from 0° to 90° both vertically and horizontally across the face of the collector. The values are reported as a percentage of the expected collector performance. Reasons for these performance variations include: collector frame shading the absorber and increased reflection/refraction from the glazing and absorber at higher angles of incident radiation. Special "solar glass" as well as absorber plate "granulation" can increase the capture rate at high incident angles.

For flat-plate collectors the incident angle modifier always represents a decrease in collector performance. For evacuated tube collectors with tubular absorbers it often provides a small increase in performance.

Power (kW) Factor Rating

Power rating provides a comparison of the instantaneous outputs of the solar collector. It is also useful in providing a mechanism to calculate financial support for agencies interested in supporting the deployment of solar hot water systems as the power rating provides a rating similar to other energy sources such as wind generators and PV modules.

The Power Rating is the collector's efficiency (for the gross collector area) at a set temperature differential (between the fluid and the air) defined by the collector type multiplied by the solar radiation standard (1000 W/m^2)

Two power ratings are given – one for kW per m^2 and one for the entire collector power (using gross collector area).

Comparative Efficiency Curve

The efficiency curve includes reference curves for typical performance of three classes of collectors. Only the reference curve for the type of collector (evacuated tube, glazed flat plate, unglazed flat plate) in the Data Sheet is included.

The reference curve allows the reader to make an easier comparison of different models of solar collectors. However it must be understood that the reference curve should not be used to judge whether the collector has a better or worse performance than the average collector.



Collector Performance Rating

The collector performance rating provides a means of comparing energy output between collectors for different operating conditions. Four Δ Ts (the difference between ambient air temperature and the heat transfer fluid temperature) conditions are used.

- $5^{\circ}C$ swimming pools
- 20 °C domestic hot water (summer)
- 50 °C domestic hot water (winter)
- 80 °C process heat and refrigeration

For unglazed collectors, wind speed can affect the performance considerably so the collector performance was done using a set temperature (5° C) but with 3 wind speeds (0, 2.5, 5.0 m/sec).

The performance data will seem low compared to the expected daily output on a sunny day because the calculations use the CSA F39 standard day, which has a peak solar irradiance of only 768 W/m² and a total daily solar energy of only 12.5 MW/m². A "sunny" day is typically one with more than 17 MJ/m² and solar irradiance of 1,000 W/m² - locations in southern Canada can easily get days with over 25 MJ/m².

The collector performance rating is not an actual energy output for a specific site, as there are many sitespecific variables (including amount and hours of solar radiation). It is a rating system that allows for comparison between different collectors.

How to Use the Solar DHW System Data Sheets

This section provides information on the specific listings in the Data Sheets. Product Data Sheets are only included in the directory if the supplier has completed and submitted a Directory application form. Listing of products in the Directory is voluntary.

General Information

The manufacturer and Canadian suppliers are listed in the Solar Domestic Hot Water System Data Sheets. Full contact details can be found in the listing of collector supplier contacts. To be listed as a Canadian suppler of a foreign manufacturer it is necessary for the firm to supply proof that they are an approved agent of the manufacturer. The system type and collector type are listed to provide information on the basic system configuration.

The warranty line provides details on the length of the warranty as well as any limitations to the warranty. The date that the product was first listed in the Directory as well as the date that the product was tested or certified provides information on how long the product has been on the market.

System Component Specifications

This section of the Data Sheets provides details of individual components of the system including:

- Solar collectors collectors must be listed in the Directory of Solar Hot Water Collectors for the system to be listed here
- Piping including recommended material and pipe insulation as well as the maximum distance between the collectors and the storage tank.
- Storage Tank including the size and whether or not the tank is included with the system and information on the make and model of approved tanks.
- Pump including the type of pump and estimated energy consumption (parasitic load) if the pump consumes utility supplied electricity.

Performance Data

System Power Rating

This rating is the Power Rating of the individual collectors multiplied by the number of collectors in the system.

Performance Rating

There are three basic classifications of SDHW systems according to their use of auxiliary energy sources:

- Solar Preheat System. A Solar preheat system is a system designed to provide solar heated water directly to a dedicated hot water tank which in turn is fed into the auxiliary heated water tank.
- Solar Plus Supplemental System. A solar plus supplemental system is a system designed to provide domestic hot water into a single storage tank, which is heated, by both solar energy and an auxiliary energy source.
- Solar Only System. A solar only system is designed to provide solar-heated domestic water with an auxiliary energy source.

The performance rating is done under 3 different hot water loads where 150/225/300 litres of hot water are drawn off the system each day.

Product Cost Evaluation

One of the main criteria in the purchasing a solar water heating product is which provides the most energy for the least cost. There are a number of methodologies that can evaluate the cost of the product.

Solar Hot Water Collectors

The first method is to divide the system cost by the Standard Day Performance Rating (for the temperature conditions that the collector will be used for).

Cost Pating (Standard Day) (\$/kW/h) -	Cost of Solar Hot Water Collector		
$Cost Rating (Standard Ddy) (\phi/RWh) =$	Collector Performance Rating (at selected temperature)		

However this does not take into account the longevity of the collectors. While the warranty period does not necessarily equate to product life, it can be an effective method to evaluate the relative cost of different products.

Cost Rating (Warranty Period)(\$/kWh) =	Cost of Solar Hot Water Collector
	Collector Performance Rating (at selected temperature)
	X Warranty Period (years)

Finally, to provide a comparison of the life cycle costing of the collector it is possible to take the Cost Rating (Standard Day) and divide this by the estimated life expectancy of the collector. Typical life expectancy of solar hot water collectors is 20-25 years.

Cost Rating (Life Cycle Cost) (\$/kWh) =	Cost Rating (Standard Day)
	365 X Expected Life (20-25 years)

Solar Domestic Hot Water Systems

Similar calculations can be made for SDHW Systems except that the annual rating (kWh/year) for the hot water load is selected.

Cost Rating (Standard Day) (\$/kWh) =	Cost of SDHW System		
	System Performance Rating (at selected hot water load)		

	Cost of SDHW System
Cost Rating (Warranty Period)(\$/kWh) =	System Performance Rating (at selected hot water load)
	X Warranty Period (years)

Cost Rating (Life Cycle Cost) (\$/kWh) =	Cost Rating (Standard Day)		
	Expected Life (20-25 years)		

2. Solar Water Heating In Canada

This section of the Directory includes information on the various issues that relate to the installation of solar water heaters in Canada.

Detailed information on solar hot water collectors and residential water heating systems can be found on CanSIA's website and in two of CanSIA's publications:

- STT100 Solar Domestic Hot Water Installation Fundamentals
- STT200 Solar Domestic Hot Water Installation Design, Installation & Maintenance

Both can be ordered directly from CanSIA.

Solar Product Standards

CSA Standards for Solar Hot Water Heating

Currently there are three standards that are explicitly for solar water heating products:

- CAN/CSA-F378-87 Solar Collectors
- CAN/CSA-F379.1 (2005) Packaged Solar Domestic Hot Water Systems
- CAN/CSA-F383-87 Installation Code for Solar Domestic Hot Water Systems

To order copies of the CSA Standards for solar hot water products visit CSA's online store at <u>http://www.csa-intl.org/onlinestore/GetCatalogDrillDown.asp</u>. The solar standards can be found in the Energy Section under renewable energy.

CAN/CSA-F378-87 Solar Collectors

F-378 is only for solar collectors that produce heat. Solar "modules" that produce electricity directly are not covered under this standard. This standard was last updated in 1987 and there are no testing laboratories that are currently certified to test products to it.

A project to develop an updated edition of CSA F378 has been underway since September 2005. The intent of the new edition is to harmonize with international standards for solar collectors and to expand the scope to cover additional collector types. There is also discussion on withdrawing F378 and adopting an international standard such as ISO-9806 or EN-12975. A comparison of key features of F378 to international standards can be found in Appendix B.

CAN/CSA-F379.1 (2005) Packaged Solar Domestic Hot Water Systems

F379.1 is only for packaged systems designed for single-family dwellings. It has recently been updated in 2006 and the National Solar Test Facility (NSTF) operated by Bodycote Materials Testing Canada Inc. in Mississauga, Ontario is certified by the Canadian Standards Association - International (CSA-I) to certify systems to this standard.

Natural Resources Canada, working in conjunction with CanSIA, is offering a support program to assist in the certification of SDHW systems to CSA F379.1. Further details on this program can be obtained directly from NRCan.

This standard has been mis-referenced in the National Plumbing Code – see the next section for further details.

CAN/CSA-F383-87 Installation Code for Solar Domestic Hot Water Systems

F383 is only for the installation of packaged systems for single-family dwellings and is intrinsically linked to F379.1. The current standard was done in 1987 and is in the process of being updated. The new standard may be available in 2008-2009.

Canadian Standards for SDHW System Components

There are a number of standards that relate to components used in SDHW systems. A listing of these standards can be found in Appendix C.

Development of New Standards for Solar Water Heating Products

Various stakeholders have identified the need to develop two new Canadian Standards for specific solar water heating products. Normally the cost of developing standards is borne by the industry with governments providing assistance when it is deemed in the public interest.

<u>Proposed CSA-F383.2 Design & Installation Guide for Non-Packaged Solar Water Heating Systems.</u> This will meet the need of commercial and custom designed solar water heating systems. No timeline has been identified to develop this standard.

Standard for (Single Walled) Potable Water Heat Exchangers

Currently there is no standard for potable water heat exchangers and there is a recognized need for standalone standards/certification of Heat Exchangers to be used in potable water systems, in particular single-walled heat exchangers that use glycol or similar heat transfer fluids. These standards/certification could be used for non-packaged Solar Hot Water, Hydronic Systems, Ground Source heat pumps and the range of associated hybrid systems. Discussions of this proposed Standard are only at the preliminary stage.

Solar Water Heating in Canadian Building Codes

The use of Solar Domestic Hot Water Heating Systems is referenced in the 1995 National Plumbing Code (NPC), which is the current version in sections 2.10.13 and 6.1.8.

2.10.13 Solar Domestic Hot Water

(1) Equipment for solar heating of potable water shall conform to CAN/CSA-F379.1, Solar Domestic Hot Water Systems (Liquid-to-Liquid Heat Transfer)

6.1.15. Solar Domestic Hot Water Systems

Systems for solar heating of potable water shall be installed in conformance with CAN/CSA-F383, Installation Code for Solar Domestic Hot Water Systems

Currently the National Plumbing Code (and the related provincial building codes) misreferences the CSA F379 standard as it implies that all solar hot water systems must comply with a standard designed for packaged domestic systems. In 2005, a request to review this issue was made to the Canadian Code Centre of the Institute for Research in Construction. The Canadian Code Centre assists in the preparation of the National Building Code and the National Plumbing Code (NPC).

Their review identified the following:

1. The NPC does not require certification of solar systems that heat potable water (but notes that certification simplifies the inspector's job, by confirming code compliance).

2. The certification of installers is outside of the jurisdiction of the NPC (therefore, certification of installers must not be required by the NPC).

3. The intent of the NPC references to solar water heating systems was to ensure that "any potable water

heating solar system must conform to F379.1 and be installed in conformance with F383", however this puts custom and larger systems in an impossible situation since it requires that they meet F379.1 while they are excluded from the F379.1 scope. Since the intent of the NPC requirements is to ensure the integrity of the potable water system and avoid contamination, then in this situation such systems could be accepted under the NPC "equivalents" provisions.

Changes to the National Plumbing Code

In 2006, CanSIA submitted a request to change the National Plumbing Code to read as follow:

2.10.13. Solar Domestic Hot Water

1) Equipment for solar heating of potable water shall conform to CAN/CSA-F379.1 "Packaged Domestic Solar Hot Water Systems (Liquid to Liquid Heat Transfer)."

6.1.8 Solar Domestic Hot Water Systems

1) Packaged Domestic Solar Hot Water Systems used for heating of potable water shall be installed in conformance with CAN/CSA-F383, "Installation Code for Solar Domestic Hot Water Systems."

The request for change was turned down. The reason given was that CSA F379.1 was in the process of being revised.

Provincial Building Codes

The NPC is often adopted by the provinces or is used as the reference document for provincial codes. The wording in the Ontario Building Code on solar water heating is the same as the National Plumbing Code. In 2006, CanSIA and CSA made a submission to the Ontario Ministry of Municipal Affairs and Housing for changes in the referencing of the Ontario Building Code.

This request was approved. The Ontario Building Code now reads:

Division B, 7.2.10.13.Solar Domestic Hot Water

(1) Equipment forming part of a packaged system for solar heating of potable water shall conform to CAN/CSA-F379.1,

Division B, 7.6.1.15. Solar Domestic Hot Water Systems

(1) Except as provided in Sentence (2), a system for solar heating of potable water shall be installed in accordance with good engineering practice.

(2) Packaged systems for solar heating of potable water in residential occupancies shall be installed in conformance with CAN/CSA-F383.

The Inspection of Solar Water Heating Systems

CanSIA works closely with Plumbing Inspectors from many jurisdictions across Canada in resolving concerns on the installation of Solar Heating systems. Specific information for plumbing inspectors can be found below:

Permitting of Non-Packaged Solar Domestic Hot Water Systems

CSA F379 is only for packaged SDHW systems. These systems are residential hot water heating systems that come complete in one package with all components from a single supplier. However there are many applications where packaged systems are not applicable such as multi family units and combi (space and water) heating systems. Solar DHW systems can be custom designed for heating hot water and for specific customer requirements.

Custom residential SDHW systems (which include commercial SDHW systems) also do not fall under the jurisdiction of CSA F379, creating a gap in the regulatory means for installing them. However such systems are acceptable in the National Plumbing Code under the National Plumbing Code's "equivalency" provisions.

A solution to insure code and safety compliance for custom, non-packaged SDHW systems is to have an independent, licensed Professional Engineer approve the design of the SDHW system. This is the same process used to insure code and safety compliance for many other building systems such as swimming pools.

CanSIA has developed specific instructions to licensed Professional Engineers, regarding this issue. The intent is to ensure that licensed engineers are aware of the safety requirements for SDHW systems and to ensure that these requirements form part of the approved product/installation plan used by building departments. This document can be found in Appendix D.

Municipal Approval for the Installation of Solar Hot Water Systems

As the use of solar for heating water increases in Canada, various stakeholders have expressed issues related to the safety of the solar systems. Many of these issues relate to unfamiliarity with the technology and are usually overcome when the correct information is provided.

The City of Ottawa has taken a pro-active stance in providing direction to the building department on the requirements for permitting and inspecting solar water heating systems. The City of Ottawa's Guidelines for the approval for installation of solar domestic hot water systems can be found in Appendix E.

Solar Hot Water Installer Certification

CanSIA offers the **Canadian Solar Hot Water System Installer Certification Program**. The level 1 certificate is for the installation of solar domestic hot water systems for single-family residential applications. This certificate grants recognition to an individual who has met predetermined qualifications as set out by CanSIA and met the skill requirements to install SDHW systems according to <u>CSA F383-87</u> <u>Installation Code for Solar Domestic Hot Water Systems</u>. CanSIA offers regular training workshops across Canada for solar installers. CanSIA also administers the certification exam for the installer certification as well as accredits education institutes who offer courses on the installation of Solar DHW systems.

Information on the Canadian Solar Hot Water System Installer Certification program can be found at www.cansia.ca/certification.asp.

Information on CanSIA workshops (and registration) as well as accredited training programs in Canada can be found at <u>www.cansia.ca/education.asp</u>

The two course manuals for the installer certification program are:

- STT100: Solar Domestic Hot Water Installation Fundamentals;
- STT200: Solar Domestic Hot Water Installation Design, Installation & Maintenance

These manuals can be ordered directly from CanSIA through the solar store page of the website at <u>www.cansia.ca/solarstore.asp</u>

A listing of companies that employ certified Canadian Solar Hot Water Installers can be found on the Canadian Solar Industry Directory at <u>www.cansia.ca/directory/</u>

Product Performance Evaluation

This section provides an expanded explanation on how the performance characteristics of solar water heating products was developed in the Directory

Solar Hot Water Collectors

Power Factor Rating

In 2004, the International Energy Agency and various national trade associations (including CanSIA) adopted a methodology to report solar thermal deployment levels in kW (previously this was reported in gross installed area). This allows for a comparison to other sources of energy generation (such as wind and PV). A standard 0.7 kW per m^2 was accepted. This report can be found in Appendix F.

However individual solar collectors will have different power ratings dependent on the efficiency curve and the temperature difference between the surrounding air and the heat transfer fluid (often referred to as the "delta T" – or Δ T). In order to determine the power rating the following typical operation conditions are assumed:

	Radiation	ΔT	Wind speed
 Unglazed flat plate collectors 	1000 W/m ²	10°C	1.5 m/s
Glazed flat plate collectors	1000 W/m ²	20°C	-
Evacuated tube collectors	1000 W/m ²	20°C	-

Solar Collector Efficiency Curve

One of the most commonly used methods to compare solar collectors is through the comparison of the efficiency curves.

The performance of solar hot water collectors is affected by a number of variables including the amount of sunlight falling on them, weather conditions (clear or cloudy), wind speed (important for unglazed collectors – see below), etc. However one of the most important variables that affect the efficiency is the difference between the surrounding air temperature surrounding the collectors and the fluid temperature. This difference is often referred to as the "delta T" – or \triangle T.

Different types of collectors work better in different applications. For example an unglazed collector works very well where there is little $\triangle T$ (such as for swimming pools) while evacuated tube collectors perform better in high $\triangle T$ conditions (such as for water heating during the winter). The following chart provides comparative collector efficiencies of the different types of collectors



Collector Performance Ratings

Collector performance ratings are done for a "Standard" Day as referenced in CSA-F378. As wind speed can greatly affect the performance of unglazed collectors, the performance is done over 3 wind speeds that are found typically at close to ground levels.

For glazed collectors, the Performance Equation is of the form $q(h)_{a} = A \cdot G(K_{ra})_{alobal} - C(\Delta T_{ia}) - E(\Delta T_{ia})^{2}$

For unglazed collectors, the Performance Equation is of the form

 $q(h)_{ug} = (A - B \cdot V_{wind}) \cdot G(K_{\tau\alpha})_{global} - (C + D \cdot V_{wind})(\varDelta T_{ia})$

Where:

q(h) [W/m²] is the Energy Collected during Hour h, Q(h) [kWh/m²] is the Power Collected during Hour *h*, $G(K_{\tau\alpha})_{global}$ [W/m²] is the Incident Radiation, ΔT_{ia} [°C] is the Temperature Differential ($T_i - T_a$), T_i [°C] is Inlet Fluid Temperature, T_a [°C] is Ambient Temperature, V_{wind} [m/s] is the Wind Velocity

Packaged SDHW Systems

Performance Rating

Performance Ratings are defined in CAN/CSA F379.1. In Canada, solar DHW systems are tested and rated in accordance with *CAN/CSA-F379*. The rating of solar DHW systems is performed by a physical test of a complete system assembled in the National Solar Test Facility (NSTF) (located in the Bodycote Technology Centre in Mississauga, Ontario).

The solar collectors of the SDHW system are mounted in the NSTF solar simulator environmental chamber, facing a large area solar simulator. During the simulated daytime, the air temperature around the collectors is kept at 15° C.

The energy storage tank (if the system is so equipped) is kept in a 20° C room adjacent to the solar simulator, to represent conditions corresponding to an installation in a home. The tank room is equipped with a movable platform, which is used to support the storage tank either above (for thermosyphon system), below (for drain-back systems), or level with the collectors in the solar simulator chamber. A cold water supply controlled to a constant 15° C is attached to the inlet of the system, and the system is charged with heat transfer fluid and powered as required by the SDHW installation manual. In this way, the test conditions for the SDHW system are kept realistically close to what they would be in a normal application.

Once set up for testing, the SDHW system is subjected to environmental conditions that simulate a "standard" solar day for Canada. The collectors are irradiated by simulated sunlight at intensities that vary from approximately 337 W/m² at 8:00 AM, to 768 W/m² at noon, to 284 W/m² at 4:00 PM. The collectors are irradiated with the sunlight perpendicular to the collector aperture, so the intensity of the simulated sunlight is adjusted to account for the changing incidence angles that the sun would make on the collector array over the course of the day.

At predetermined times throughout the day, water is drawn from the SDHW system, to simulate a typical hot water use pattern for a residence. The total water volume drawn from the system in each 24-hour period can be either 150 or 225 or 300 litres, depending on the manufacturer's rating on the system.

(Typical systems consist of one or two solar collectors of about 3 square metres each, and are tested at the 300 litre per day load size.)

The energy delivery rating of the system is calculated from the measured water volume draws from the system and the difference between the water delivery temperature and the water supply main's temperature. The daily cycle of solar energy input and water draws is continued until each subsequent 24-hour energy delivery measurements are the same, within 5% of each other. The energy delivered by the system in the last 24-hour period of the test is the daily energy output rating that is reported for the system under test.

The SDHW system ratings process developed for *CAN/CSA-F379* was developed to provide test results that would be, on the one hand, representative of the annual average daily energy output of the system under test, and on the other hand, standardized to allow realistic comparisons to be made between different systems tested.

Since there is a single rating for each system, the rating is not meant to estimate actual performance in a particular part of Canada.

Indeed, the output of any given system will vary from year to year due to site-dependent factors such as amount of sunshine, volume of hot water used, and local ambient air temperature. Rather, the SDHW system energy ratings provided by *CAN/CSA-F379* are meant to used as benchmarks for mainly comparative purposes, much like mileage ratings on automobiles are used.

3. Directory of Solar Hot Water Collectors

Listing of Solar Hot Water Collectors

The following listings are for collectors that are qualified to be used under the Canadian government's ecoEnergy Renewable Heat Program.

Company	Product Name	Model Number	Country of Origin	Original Listing Date	Revision Date	Data Sheet in Directory
Evacuated Tube Collectors						
Focus Technology Co, Ltd.	Apricus		China	-	-	-
SCHOTT-Rohrglas GmbH	Schott	ETC16	Germany	-	-	-
SUNDA Solartechnik	SEIDO	1 16	Germany	-	-	-
Thermomax Ltd	Mazdon 20	TMA 600S	U. Kingdom	07-Mar	07-Mar	yes
Thermomax Ltd	Mazdon 30	TMA 600S	U. Kingdom	07-Mar	07-Mar	yes
Thermomax Ltd	Solamax 20	20	U. Kingdom	07-Mar	07-Mar	yes
Thermomax Ltd	Solamax 30	30	U. Kingdom	07-Mar	07-Mar	yes
Viessmann Werke GmbH & Co KG	Viessmann	H30	Germany	-	-	-
Viessmann Werke GmbH & Co KG	Vitosol	20	Germany	-	-	-
Wuxi HNT Co. Ltd.	SJ	1700-10	China	07-Mar	07-Mar	yes
Wuxi HNT Co. Ltd.	SJ	1700-20	China	07-Mar	07-Mar	yes
Wuxi HNT Co. Ltd.	SJ	1900-10	China	07-Mar	07-Mar	yes
Wuxi HNT Co. Ltd.	SJ	1900-20	China	07-Mar	07-Mar	yes
Glazed Flat Plate Collectors						
CMT Net Co	CMT	ALT-1	Canada	-	-	-
Enerworks Inc.	Commercial	NL-SG1-SH10	Canada	07-Mar	07-Mar	yes
Enerworks Inc.	Residential	NL-SG1- SD10	Canada	07-Mar	07-Mar	yes
Ezinc Metal Sanayi Ve Ticaret A.S.	Ezinc	Xba.ca	Turkey	-	-	-
H. Lenz AG	Multisol	M240	Switzerland	-	-	-
Heliotech Energies	Heliotech	H1-32T	Canada	-	-	-
KBB Kollectorbeau		KBB 320	Germany	-	-	-
Solahart Industries Pty Ltd.	Solahart	М	Australia	-	-	-
Solcan Ltd.	Solcan	2100	Canada	07-Mar	07-Mar	yes
Solcan Ltd.	Solcan	2100-T	Canada	07-Mar	07-Mar	yes
Solcan Ltd.	Solcan	2101-L	Canada	07-Mar	07-Mar	yes
Solcan Ltd.	Solcan	2101-V	Canada	07-Mar	07-Mar	yes
Thermo Dynamics Ltd.	Thermodynamics	G-32	Canada	07-Mar	07-Mar	yes
Thermo Dynamics Ltd.	Thermodynamics	S-32	Canada	-	-	-
Viessmann Werke GmbH & Co KG	Vitosol	S2.5	Germany	-	-	-
Viessmann Werke GmbH & Co KG	Vitosol	100-SV1	Germany	-	-	-
Viessmann Werke GmbH & Co KG	Vitosol	SH1	Germany	-	-	-

Unglazed Flat Plate Collectors						
Aquatherm Industries, Inc,	Aquatherm		USA	-	-	-
Dawn Solar Systems	Dawn Solar	2000	USA	-	-	-
Enersol	Enersol	S-1000	Canada	-	-	-
Fafco, Incorporated	Sunsaver		USA	-	-	-
Heliocol	Heliocol	30	Isreal	07-Mar	07-Mar	yes
Heliocol	Heliocol	40	Isreal	07-Mar	07-Mar	yes
Heliocol	Heliocol	50	Isreal	07-Mar	07-Mar	yes
Hot Sun Industries, Inc.	Powermat		USA	-	-	-
Les Energies Solex	Solex		Canada	-	-	-
Techno-Solis, Inc.	Techno-Solis		Canada	-	-	-

Company	Product Name	Model Number	Conditions of Acceptance
Glazed Solar Hot Water Collectors	i		
CMT Net Co	CMT	ALT-1	Acceptable for vertical mounting and installations where snow loads do not exceed 1000 Pa
KBB Kollectorbeau GmbH		KBB 320	Only for use in systems where the collector loop is not routinely drained
Viessmann Werke GmbH & Co KG	Vitosol	S2.5	The Viessmann Vitosol S2.5 collector mounting systems using the clips bolted directly to the Unistrut is accepted for both rack mounting and surface mounting. The Viessmann Vitosol S2.5 hardware for sloped roof mounting systems is not accepted.

Listing of Collector Supplier Contacts

Evacuated Tube Collectors	
Manufacturer	Canadian Supplier (See Note 1)
SCHOTT -Rohrglas GMbH	
Erich-Schott-Strass 14	
95666 Mitterteich	
Germany	
www.schott.com/solarthermal	
SUNDA Solartechnik	Canadian Solar Technologies
Donauworther Str. 27	8459-110A Street
D-89420 Hochstadt	Delta, BC
Germany	Canada, V4C 2K5
www.sunda.de	www.canadiansolartechnologies.ca
Thermomax Ltd.	Thermomax Industries Ltd.
7 Balloo Crescent - Balloo Industrial Estate	3181 Kingsley Street
Bangor, Co. Dowhn - BT19 7UP	Victoria, BC
Northern Ireland	Canada, V8P 4J5
solar@thermomax-group.com	www.solarthermal.com
Viessmann Werke GmbH & Co KG	Viessmann Manufacturing Company, Inc.
Viessmannstr. 1	750 McMurray Road
35107 Allendorf (Eder)	Waterloo, ON
Germany	Canada, N5V 2G5
www.viessmann.de	www.viessmann.com
Focus Technology Co, Ltd.	
13th Floor Union Mansion; 32 Zhong Yang Road	
Nanjing, Jiangsu	
China, 21008	
WUXI HNI Co. Ltd.	CAREarth
25 Zhujiang Road, New District	701 Eagleson Rd, P.O. Box 45006
Wuxi	Kanata, ON
China, 214000	Canada, K2M 2G0
	www.carearth.com
Glazed Flat Plat Collectors	Consider Supplier (See Note 1)
P O Box 0, 252 Hamilton Crossont	$P \cap Pox 0, 252$ Hamilton Crossont
P:O. Box 9, 252 Hammon Grescent	P.O. Dox 9, 252 Hamilton Crescent
Canada NOL 1G0	Canada NOL 160
	Walk operworks com
Ezinc Metal Sanavi Ve Ticarot A S	Taylor Munro Energy Systems Inc
Organize Sanavi Bolgesi	7157 Honeyman St #11
11 Cadde No: 12 38070	Delta BC
	Canada V4G 1E2
	www.tayiormunio.com

410-1255 rue University	410-1255 rue University
Montreal, QC	Montreal, QC
Canada, H3B 3B6	Canada, H3B 3B6
www.hltenergies.com	www.hltenergies.com
H. Lenz AG	Swiss Solar Tech Ltd.
Hirzenstrasse 2	5811 Giants Head Rd
9244 Niederuzwil	Summerland, BC
Switzerland	Canada, V0H 1Z7
www.lenz.ch	www.swisssolartech.com
Solahart Industries Pty Ltd.	Swiss Solar Tech Ltd.
35 Jonal Dr	5811 Giants Head Rd
Cavan 5094, South Australia	Summerland, BC
Australia	Canada, V0H 1Z7
www.solahart.com	www.swisssolartech.com
Solcan Ltd.	Solcan Ltd.
126 Wynchwood Park	126 Wynchwood Park
London, ON	London, ON
Canada, N6G 1R7	Canada, N6G 1R7
www.solcan.com	www.solcan.com
Thermo Dynamics Ltd.	Thermo Dynamics Ltd.
101 Frazee Avenue	101 Frazee Avenue
Dartmouth, NS	Dartmouth, NS
Canada, B3B 1Z4	Canada, B3B 1Z4
www.thermo-dynamics.com	www.thermo-dynamics.com
Viessmann Werke GmbH & Co KG	Viessmann Manufacturing Company, Inc.
Viessmannstr. 1	750 McMurray Road
35107 Allendorf (Eder)	Waterloo, ON
Germany	Canada, N5V 2G5
www.viessmann.de	www.viessmann.com
CMT Net Co	CMT Net Co
35 Canyon Ave	35 Canvon Ave
Toronto, ON	Toronto, ON
Canada, M3H 4Y2	Canada, M3H 4Y2
KBB Kollektorbeau GmbH	
Kopennicker Strasse 325	
D-12555 Berlin	
Germany	
www.kbb-solar.com	

Unglazed Flat Plate Collectors	
Manufacturer	Canadian Supplier (See Note 1)
SCHOTT -Rohrgals GMbH	
Erich-Schott-Strass 14	
95666 Mitterteich	
Germany	
www.schott.com/solarthermal	
Aquatherm Industries, Inc.	
1940 Rutgers University Blvd.	
Lakewood, NJ	
USA 08701	
www.warmwater.com	
Dawn Solar Systems	
183 Route 125, Bld. A-7	
Brentwood, NH	
USA 03833	
www.dawnsolar.com	
Enersol	Enersol
77 Campbellville Road	77 Campbellville Road
Campbellville, ON	Campbellville, ON
Canada, L0P 1B0	Canada, L0P 1B0
www.enersol.com	www.enersol.com
Fafco, Incorporated	Taylor Munro Energy Systems Inc.
435 Otterson Drive	7157 Honeyman St. #11
Chico, CA	Delta, BC
USA, 95928-8207	Canada, V4G 1E2
www.fafco.com	www.taylormunro.com
Heliocol	SunSolar Energy Technologies Inc
	3262 F.X Tessier
	Vaudreuil-Dorion QC
	Canada, J7V 5V5
www.heliocol.com	
Hot Sun Industries	
3923 Mt. Abraham Ave	
San Diego CA	
USA 92111	
www.powermat.com	
Techno-Solis, Inc.	Techno-Solis, Inc.
4225 Monte Saint-Hubert	4225 Monte Saint-Hubert
Saint-Hubert, QC	Saint-Hubert, QC
Canada, J3Y 1V2	Canada, J3Y 1V2
www.technosolis.com	www.technosolis.com
Les Energies Solex	Les Energies Solex
2598 Perrot Blvd.	2598 Perrot Blvd.
Candiac, QC	Candiac, QC
Canada, J7V 8P4	Canada, J7V 8P4
www.energies-solex.com	www.energies-solex.com

Note 1: Canadian Suppliers - only those that have submitted data sheets or who are members of CanSIA are listed here.

Manufacturer	Brand		Gross	Powe	r Rating	Stand	dard Day (kWh	Energy Ra /dav)	ating	Warranty	Tested to	Date of
Manufacturer	Name	Model Number	(m ²)	KW/m ⁻ (see #1)	collector	5°C	20°C	50°C	80°C	(years)	Standard	Testing
Evacuated Tube Co	ollectors				•							
Wuxi HNT	SJ	SJ 1700-10	1.8	0.72	0.72	2.3	2.2	1.8	1.2	5 year	EN 12975 -1,2	Nov-04
Wuxi HNT	SJ	SJ 1700-20	3.4	0.72	1.45	4.6	4.3	3.6	2.3	5 year	EN 12975 -1,2	Nov-04
Wuxi HNT	SJ	SJ 1900-10	1.9	0.72	0.87	2.7	2.6	2.1	1.4	5 year	EN 12975 -1,2	Nov-04
Wuxi HNT	SJ	SJ-1900-20	3.7	0.72	1.66	5.2	5.0	4.1	2.7	5 year	EN 12975 -1,2	Nov-04
Thermomax	Mazdon 20	TMA 600S	3.0	-	-	-	-	-	-	-	EN12975	-
Thermomax	Mazdon 30	TMA 600S	4.5	-	-	-	-	-	-	-	EN12975	-
Thermomax	DF-100	20	2.8	0.74	1.63	5.4	5.0	4.3	3.5	-	-	-
Thermomax	DF-100	30	4.2	0.74	2.37	7.9	7.3	6.2	5.2	-	-	-
Glazed Flat Plate C	ollectors			-		-	-					
EnerWorks Inc	Residential	COL-4X8-NL-SG1-SD10	2.9	0.56	1.6	5.0	0.5	0.0	0.0	5 year	CAN/CSA F378-87	May-06
EnerWorks Inc	Commercial	COL-4X8-NL-SG1-SH10	2.9	0.69	2.0	6.8	5.5	2.6	0.7	5 year	SRCC OG-100	Jul-06
Solcan	Solcan	2100	2.9	0.60	1.7	5.9	4.4	1.5	0.4	10 year	CAN/CSA F378-82	Jun-87
Solcan	Solcan	2101	2.9	-	-	-	-	-	-	10 year	EN 12975-2	Dec-06
Unglazed Flat Plate	Collectors											
Manufacturer	Brand	Model Number	Gross	Powe	r Rating	Stand	dard Day l (kWh	Energy Ra /day)	ating	Warranty	Tested to	Date of
manandotarer	Name		(m ²)	(see #1)	collector	0 m/s	2.5 m/s	5.0 m/s	-	(years)	Standard	Testing
Heliocol	Helicol	30	2.7	-	-	-	-	-	-	12 year	-	-
Heliocol	Helicol	40	3.8	-	-	-	-	-	-	12 year	-	-
Heliocol	Helicol	50	4.5	-	-	-	-	-	-	12 year	-	-

Summary of Key Characteristics of Solar Hot Water Collectors

Note 1: Some Evacuated Tube collectors report efficiency on an aperture or absorber area - CSA F378 reports efficiency on a gross area.

Solar Hot Water Collector Data Sheets

Product Name: Collector Type:	SJ Evacuated	Tube		Prodi Appli	uct Model cations:	:	SJ Low 1	1700 to High To	10 emperat	ure out	put	
Canadian Supplier:	Carearth	Inc.		Manu	facturer:		HN7 China	Г а				
Warranty & Limitations:		5 years		Date	First Liste	ed in Directo	ory:		Mar-0	7		
COLLECTOR SPECIFICATIO	NS											
	height	width	depth									
Dimensions (mm):	1,755	1,000	165									
Gross Area (m ²):		1.8										
Net Aperture Area (m ²):		1.0										
Weight (dry) (kg):		35										
Fluid Capacity (litres):		37					Collec	tor Diag	ram			
Movimum Operating Tomp	α	235				·	Not	Sunnlia	d			
Maximum Operating Prens	sure (kPa):	600					NOL	Supplie	u			
Maximum operating river		min	max									
Acceptable Flow Rates (I/r	nin):	n.a.	n.a.									
Ideal Flow Rate (I/m):	,	3.0										
Heat Transfer Fluids:	n.a.											
COLLECTOR MATERIALS												
Frame Material:		Aluminum										
Coating:		none										
Mounting Connections:		Bolt and brack	et assembly	,								
Glazing Material (outer):		High Quality B	orosilicate C	alass								
Glazing Material (inner):		none										
Absorber Plate Material:		Aluminum										
Absorber Plate Coating:		Aluminum Niti	ride Blue col	or								
Tubing Material:		-										
Plate-Tubing Bonding Meti	nod:	- De almus al in 4										
Insulation (sides):		ROCKWOOI IN T	ne neader									
Header Pipe Size (OD) (m	m).	-										
Header Pipe Material:		conner										
Plumbing Connection Meth	nod:	soldered, flexi	ble coupling	or flex	ible hose							
	DTIEICATION	· I	Canadian Str	ndarda			Othor S	Standarda				
Name of Testing Authority			Canadian Sid	Inetit	ut für 7u	kunfte Enor			oetzont	rum Sa	arbruc	kon
Standard Tested to:	•			mour		KunntoEnerg	DIN F	N 12975	- 1.2			Ken
Date of Testing or Certifica	ation						18-No		•,=			
Certified to Standard (ves/	no):											
PERFORMANCE DATA Test Flow Rate (I/min):	,	Note: This sect 2.5 to 2.7	ion is only co	mpletea	if supplie	er has submi	itted ind	lependent	test resi	ults		
Efficiency Curve (M/m ² °C)		-				Coll	lector E	Efficiencv	Curve			
Y Intercept [F _p (ta)]:		0.74			1.00							
Slope of efficiency curve: [F-II.1	1.540										
		1.540			0.80 +							-
Incident Angle Modifier	•	-		S.	0.60					evacuated t	ube	
30° 45°	60°			ien	0.00							
1.07 1.12	0.68	1		ffic	0.40							_
Power Rating				Ш								
kW/m ² : 0.72		kW/Collector:	0.72		0.20 +							-
		50°C	80°C		0.00 +			+ +				
Kwii/day 30 Standard Day 33	200	1 8	19		0	10 20	30 4	40 50	60 70	U 80	90	100
	2.2	1.0	1.2					∆T [°C]			
MANUFACTURER'S COMME	NTS			L								

Product Name: Collector Type:		SJ Evacuated 1	Гube		Prod Appli	uct Model: cations:		SJ Low to	1700 High 1	20	rature c	output	
Canadian Supplier:		Carearth	Inc.		Manu	Ifacturer:		HNT China					
Warranty & Lim	itations:		5 years		Date	First Liste	d in Direc	ctory:		Ма	r-07		
COLLECTOR SPE	CIFICATION	S											
COLLECTOR SPE Dimensions (mr Gross Area (m ² Net Aperture Ar Weight (dry) (kg Weight (filled) (I Fluid Capacity (Maximum Oper Maximum Oper Acceptable Flow Ideal Flow Rate Heat Transfer F	CIFICATION m): rea (m ²): g): kg): (litres): ating Temper ating Pressur w Rates (l/min (l/m): fluids:	S height 1,755 rature (°C): re (kPa): n): n.a.	width 1,930 3.4 2.0 60 64 4 235 600 min n.a. 3.0	depth 165 max n.a.				Collecto Not S	or Diag Supplie	ram d			
Frame Material: Coating: Mounting Conne Glazing Materia Glazing Materia Absorber Plate Absorber Plate Tubing Material Plate-Tubing Bo Insulation (sides Header Pipe Siz Header Pipe Ma Plumbing Conne	ections: l (outer): l (inner): Material: Coating: : ponding Methors): s): c): ze (OD) (mm aterial: ection Methors):	od:): d:	Aluminum none Bolt and brac High Quality - Aluminum Aluminum Ni - - Rockwool in - 23 copper soldered, flet	cket assembly Borosilicate (tride Blue col the header the header	/ Glass lor g or fle	xible hos	e						
INDEPENDENT TE	STING/CER	TIFICATION		Canadian Stai	ndards			Other	Standar	ds			
Name of Testin Standard Teste Date of Testing Certified to Star	g Authority: d to: or Certification dard (yes/no	on:):			Insti	ut für Zul	kunftsEnd	ergieSyste DIN El 18-No	eme im N 12975 v-04	Testze - 1,2	entrum \$	Saarbru	cken
PERFORMANCE D Test Flow Rate Test Fluid:	DATA (l/min):		Note: This set 2.5 to 2.7 n.a.	ction is only co	omplete	ed if suppli	er has su	bmitted inc	lepende	nt test	results		
Efficiency Curve (W Y Intercept [F _R Slope of efficien	//m ^{2_o} C) (ta)]: ncy curve: [F _F	₃ UL]:	0.74 1.540			1.00							
Incident Angle Mod	ifier	60°	т		ncy	0.60					evad	cuated tube	
1.07	40 1.12	0.68	1		fficie	0.40	_						
Power Rating kW/m ² :	0.72		kW/Collector	1.45		0.20							
COLLECTOR PER	FORMANCE	RATING				0.00							
kWh/day	5°C	20°C	50°C	80°C		0	10 20	0 30	40 50	, 60	70	80 9	0 100
Standard Day	4.6	4.3	3.6	2.3					∆т [°C]			
MANUFACTURER'	S COMMEN	TS											

Product Name: Collector Type:	SJ Evacuated	Tube		Prod Appli	uct Mode	el:	S	5J 1 ow to	900 High T	10 empera	ture ou	tput		
Canadian Supplier:	Carearth	n Inc.		Manı	ufacturer	:	H ci	I NT hina						
Warranty & Limitations:		5 years		Date	First Lis	ted in Dire	ectory:			Mar-0	7			
COLLECTOR SPECIFICAT	IONS													
	height	width	depth											
Dimensions (mm):	1,905	1,000	165											
Gross Area (m ²):		1.9												
Net Aperture Area (m ²):		1.2												
Weight (dry) (kg):		38												
Weight (filled) (kg):		40					Coll	lecto	r Diag	ram				
Fluid Capacity (litres):	()-	2					Ν	lot S	Supplie	d				
Maximum Operating Ter	mperature (°C):	235												
Maximum Operating Fre	ssule (KFa).	min	may											
Acceptable Flow Bates	(l/min)·	n.a.	n a											
Ideal Flow Rate (I/m):	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	3.0	mai											
Heat Transfer Fluids:	n.a.													
COLLECTOR MATERIALS														
Frame Material:		Aluminum												
Coating:		none												
Mounting Connections:		Bolt and brack	et assembly											
Glazing Material (outer):		High Quality E	orosilicate G	lass										
Glazing Material (inner):		-												
Absorber Plate Material:		Aluminum												
Absorber Plate Coating:		Aluminum Nit	ride Blue colo	or										
I UDING Material:	athad.	-												
Insulation (sides):	ethoa.	- Bockwool in t	he header											
Insulation (back):		-	ne neader											
Header Pipe Size (OD)	(mm):	23												
Header Pipe Material:	().	copper												
Plumbing Connection M	ethod:	soldered, flexi	ble coupling	or flex	ible hos	e								
INDEPENDENT TESTING/	CERTIFICATION	N	Canadian Sta	ndards			0	ther S	Standard	ds				
Name of Testing Author	ity:			Insti	tut für Z	ukunftsEr	nergieS	Syster	ne im 1	Testzent	rum Sa	arbru	cken	
Standard Tested to:							D	IN EN	12975	- 1,2				
Date of Testing or Certif	ication:						18	3-Nov	-04					
Certified to Standard (ye	es/no):													
PERFORMANCE DATA		Note: This seci	tion is onlv cor	npleted	l if suppl	ier has sul	bmitted	inder	pendent	test res	ults			
Test Flow Rate (I/min):		2.5 to 2.7		,							-			
Test Fluid:		n.a.					0			•				
Efficiency Curve (W/m ² -°C)					1.00 -		Collec	tor E	fficiend	cy Curv	e			
Y Intercept [F _R (ta)]:		0.74												
Slope of efficiency curve	e: [F _R U _L]:	1.540			0.80 +									
Incident Anale Modifier				~	Γ						evacua	ted tube		
30° 45°	60°	7		enc	0.60 +									
1.07 1.12	0.68]		ficie	0 40								1	
Power Bating		_		Ш	0.40									
kW/m^2 : 0.72		kW/Collector	0.87		0.20 +									
0.72		Concertor.	0.07		-									
COLLECTOR PERFORMA	NCE RATING				0.00 +							- ↓		
kWh/day 5°C	20°C	50°C	80°C		0	10 2	20 30	0 4	0 50	60	70 8	i0 90	0 10	0
Standard Day 2.7	2.6	2.1	1.4						∆T [°	C]				
MANUFACTURER'S COMM	IENTS													

Product Name: Collector Type:	:	SJ Evacuated ⁻	Tube		Prod Appl	uct Moo ications	del: :		Ç	SJ ⁻ .ow to	190 High	0 20 Tempe	erature	outpu	t	
Canadian Supplier:		Carearth	Inc.		Man	ufacture	er:		F c	HNT hina						
Warranty & Lim	itations:		5 years		Date	First Li	sted in	n Dire	ctory:			Ма	r-07			
COLLECTOR SPE	CIFICATION	s														
COLLECTOR SPE Dimensions (mr Gross Area (m ² Net Aperture Ar Weight (dry) (kg Weight (filled) (l Fluid Capacity (Maximum Oper Maximum Oper Acceptable Flow	m): ea (m ²): y): y): kg): litres): ating Temper ating Pressur w Rates (l/min	S height 1,905 rature (°C): re (kPa): n):	width 1,930 3.7 2.3 66 70 4 235 600 min n.a.	depth 165 max n.a.	Collector Diagram Not Supplied											
Ideal Flow Rate Heat Transfer F	(l/m): iluids: I	n.a.	3.0													
COLLECTOR MAT Frame Material: Coating: Mounting Conne Glazing Materia Glazing Materia Absorber Plate Absorber Plate Tubing Material Plate-Tubing Bo Insulation (sides Insulation (back Header Pipe Ma Plumbing Conne	ERIALS ections: I (outer): I (inner): Material: Coating: : conding Metho s): i): ze (OD) (mm aterial: ection Metho	ıd:): d:	Aluminum none Bolt and brac High Quality n.a. Aluminum Aluminum Ni - - Rockwool in - 23 copper soldered, fley	ket assemb Borosilicate tride Blue co the header the header	ly Glass blor	exible f	nose									
INDEPENDENT TE	STING/CER	TIFICATION	I	Canadian Sta	andard Insti	s tut für 7	7ukur	nftsFn	C ergie	Other S	Standa	ards D Testze	ntrum	Saarl	nucke	'n
Standard Tester Date of Testing Certified to Star	d to: or Certification dard (yes/nc	on:)):			mətr		Lukui		D D	OIN EN 8-Nov	N 1297 v-04	5 - 1,2	um	oddin	Juck	
PERFORMANCE D Test Flow Rate Test Fluid:)ATA (I/min):	,) .	Note: This sec 2.5 to 2.7 n.a.	ction is only c	complet	ed if su	pplier	has s	ubmitt	ted inc	depend	dent tes	t results	3		
Efficiency Curve (W Y Intercept [F _R	//m ² -°C) (ta)]:		0.74			1.00 -		, 	Joned				live			
	icy curve. [F _f	₃ υ[].	1.540			0.80 -							eva	acuated to	ube	
30°	45°	60°	٦		ency	0.60 -										
1.07	1.12	0.68]		Effici	0.40 -								_		
kW/m ² :	0.72		kW/Collector:	1.66		0.20 -										_
COLLECTOR PER	FORMANCE	RATING	1 1			0.00 -										
kWh/day	5°C	20°C	50°C	80°C		() 1	0 2	0 3	30 4	40 5	50 60	70	80	90	100
Standard Day	5.2	5.0	4.1	2.7	1						ΔT	[°C]				
MANUFACTURER'	S COMMEN	TS			L											

Product Name: Mazd Collector Type: Evacuate	on 20 ^{d Tube}	Product Model: Applications:	TMA 600S
Canadian Supplier: Therm	omax industries Ltd	Manufacturer:	Thermomax ик
Warranty & Limitations:		Date First Listed in Direc	ctory: Mar-07
COLLECTOR SPECIFICATIONS			
height Dimensions (mm): 2,021 Gross Area (m ²): Net Aperture Area (m ²): Weight (dry) (kg): Fluid Capacity (litres): Maximum Operating Temperature (°C Maximum Operating Pressure (kPa): Acceptable Flow Rates (l/min): Ideal Flow Rate (l/m): Heat Transfer Fluids:	width depth 1,500 161 3.0 2.1 53 0.6): 157 min max 2.0 5.0 2.7 5.0		Collector Diagram Not Supplied
COLLECTOR MATERIALS Frame Material: Coating: Mounting Connections: Glazing Material (outer): Glazing Material (outer): Glazing Material (inner): Absorber Plate Material: Absorber Plate Coating: Tubing Material: Plate-Tubing Bonding Method: Insulation (sides): Insulation (sides): Header Pipe Size (OD) (mm): Header Pipe Material: Plumbing Connection Method:	Stainless Steel none Stainless Steel borasilicate glass Single layer glass tube copper sunselect Copper N/A 10-5 mbar vaccum 10-5 mbar vaccum 22 copper 22mm compression fitt	ings	
INDEPENDENT TESTING/CERTIFICATIOn Name of Testing Authority: Standard Tested to: Date of Testing or Certification: Cortified to Standard (voc(no)):	DN Canadian S	Standards Insti	Other Standards itut fur Solartechnik SPF EN12975
PERFORMANCE DATA Test Fluid: V Test Flow Rate (l/min): Efficiency Curve (W/m ² -°C) Y Intercept [F _R (ta)]: Slope of efficiency curve: [F _R U _L]: Incident Angle Modifier 30° 45° 0.96 0.93 Power Rating kW/m ² : COLLECTOR PERFORMANCE RATING kWh /day 5° C Standard Day	Note: This section is only vater - glycol (33.3%) 2.5 - - kW/Collector: 50°C 80°C	v completed if supplier has sul	ubmitted independent test results

Product Name: Collector Type:	Mazdor Evacuated T	n 30 ^{ube}		Product Model: Applications:	ТМА	600S
Canadian Supplier:	Thermom	nax indust	tries Ltd	Manufacturer:	Thermo UK	omax
Warranty & Limitations:				Date First Listed i	n Directory:	Mar-07
COLLECTOR SPECIFICATIO	ONS					
Dimensions (mm): Gross Area (m ²): Net Aperture Area (m ²): Weight (dry) (kg): Fluid Capacity (litres): Maximum Operating Tem Maximum Operating Press Acceptable Flow Rates (l/m Ideal Flow Rate (l/m): Heat Transfer Fluids:	<i>height</i> 2,021 perature (°C): sure (kPa): min):	width 2,210 4.5 3.2 89 90 0.8 99 min 3.0 4.0	depth 161 max 7.5		Collector I Not Sup	Diagram oplied
COLLECTOR MATERIALS Frame Material: Coating: Mounting Connections: Glazing Material (outer): Glazing Material (inner): Absorber Plate Material: Absorber Plate Coating: Tubing Material: Plate-Tubing Bonding Met Insulation (sides): Insulation (back): Header Pipe Size (OD) (m Header Pipe Material: Plumbing Connection Met	thod: nm): hod:	Stainless Ste none Stainless Ste borasilicate g Single layer g copper sunselect Copper N/A 10-5 mbar va 22 copper 22mm compi	eel glass glass tube ccum ccum ression fitting	JS		
INDEPENDENT TESTING/CE Name of Testing Authority Standard Tested to:	ERTIFICATION		Canadian Sta	ndards	Other Sta Institut fur Solart EN1297	ndards echnik SPF 5
Date of Testing or Certifica Certified to Standard (yes/	ation: /no):					
PERFORMANCE DATA Test Fluid:	wate	Note: This se er - glycol (33.	ction is only c . 3%)	ompleted if supplier	has submitted indepe	endent test results
I est Flow Rate (l/min): Efficiency Curve (W/m ² -°C) Y Intercept [F _R (ta)]: Slope of efficiency curve: Incident Angle Modifier 30° 45° 0.93 Power Rating kW/m ² : COLLECTOR PERFORMANC kWh/day 5°C Standard Day	[F _R U _L]: 60° CE RATING 20°C	3.8 kW/Collector: 50°C	80°C	Inde	ependent Test Re	esults Not Supplied
Efficiency equation data b	ased on absorb	er area				

Product Name: Collector Type:	DF 100 evacuated t) ube		Proc Appl	luct Mod ications:	el:		20 Med	ium Te	mpera	ture,	High 1	Гетре	rature
Canadian Supplier:	Thermor	nax indust	ries Ltd	Man	ufacture	:		The ик	ermo	max				
Warranty & Limitations:				Date	First Lis	sted in [Directo	ry:		N	lar-07	,		
COLLECTOR SPECIFICATIO	ONS													
Dimensions (mm): Gross Area (m ²):	height 1,996	width 1,418 2.8	depth 97											
Net Aperture Area (m ²): Weight (dry) (kg): Weight (filled) (kg): Fluid Capacity (litres):		2.2 55 57 3.8					C	Collec	tor Di	agran	n			
Maximum Operating Tem Maximum Operating Pres	perature (°C): sure (kPa):	286 800	may					Not	Supp	olied				
Acceptable Flow Rates (I/ Ideal Flow Rate (I/m):	min):	2.0	12.0											
Heat Transfer Fluids:	30-50% glyc	col/water												
COLLECTOR MATERIALS		aluminum												
Coating:		none												
Mounting Connections:		multiple conf	igurations											
Glazing Material (outer): Glazing Material (inner): Absorber Plate Material:		Single layer g	lass tube											
Absorber Plate Coating:		sunselect												
Tubing Material:		Copper												
Plate-Tubing Bonding Met	thod:	n/a 10-5 mbar va	ccum											
Insulation (back):		10-5 mbar va	ccum											
Header Pipe Size (OD) (m	וm):	22												
Header Pipe Material: Plumbing Connection Met	hod.	22mm compr	ession fitting	19										
			Canadian Sta	ndarde				Othe	r Stan	harde				
Name of Testing Authority	/:		Ganadian Sia	nuarus	,	DIN CE	ERO AI	boinst	rabe 56	6, D-12	103 B	erlin		
Standard Tested to:								Solar	keyma	ark				
Date of Testing or Certific	ation:													
PERFORMANCE DATA	/10).	Note: This sec	ction is only co	omplet	ed if sup	plier ha	s subr	nitted in	ndepen	ndent te	est res	ults		
Test Flow Rate (I/min):	F	propalyne glyco	bl				0							
Efficiency Curve (W/m ² -°C)					1.00 _T		Coll	ector	ETTICIE	ency C	urve			
Slope of efficiency curve:	[F _B U ₁]:	-			0.80									
Incident Anale Modifier				~	0.80							evacuate	ed tube	
<u>30°</u> 45°	60°]		ienc	0.60 +									
0.98 0.95	0.88			Effici	0.40				_					_
Power Rating kW/m ² : 0.74		kW/Collector	1.63		0.20 -									_
COLLECTOR PERFORMAN	CE RATING				0.00									
kWh/day 5°C	20°C	50°C	80°C		0	10	20	30	40	50 6	0 7	0 8	0 90	100
Standard Day 5.4	5.0	4.3	3.5						12	[°C]				

MANUFACTURER'S COMMENTS

Efficiency equation data based on absorber area

Product Name: Collector Type:		DF 100 evacuated tu) Jbe		Product Applicat	Model: ions:		30 Mediu	ım Temp	erature	e, High Te	emperature
Canadian Supplie	r:	Thermor	nax indust	ries Ltd	Manufa	cturer:		Ther UK	rmoma	ax		
Warranty & Lir	mitations:				Date Fir	st Listed i	n Directo	ry:		Mar-0	07	
COLLECTOR SP	ECIFICATION	S										
		height	width	depth								
Dimensions (n	nm):	1,996	2,127	97								
Gross Area (m	າ ²):		4.2									
Net Aperture A	Area (m ²):		3.2									
Weight (dry) (F	<g):< td=""><td></td><td>81</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></g):<>		81									
Fluid Canacity	(KY).		03 5.6					Collect	tor Diac	ram		
Maximum One	(intres). Arating Tempe	rature (^{0}C) .	286					Not	Supplie	d		
Maximum Ope	erating Pressu	re (kPa):	800						•••			
	3	- ()	min	max								
Acceptable Flo	ow Rates (I/mi	n):	2.0	12.0								
Heat Transfer	Eluids:	propalyne o	livcol									
	i laido.	proparjiro g	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,									
COLLECTOR MA	TERIALS											
Frame Materia	al:		aluminum									
Coating:			none									
Mounting Con	nections:		multiple conf	igurations								
Glazing Materi	ial (outer):		Single lavor a	lace tubo								
Absorber Plate	a (inner). Aterial		conner	iass lube								
Absorber Plate	e Coating:		sunselect									
Tubing Materia	al:		Copper									
Plate-Tubing E	Bonding Metho	od:	N/A									
Insulation (side	es):		10-5 mbar vad	cum								
Insulation (bac	ck):	、	10-5 mbar vad	cum								
Header Pipe S	Size (OD) (mm):	22 Coppor									
Plumbing Con	nection Metho	od:	22mm compr	ession fitting	us							
	ESTING/CEB	TIFICATION	1	Canadian St	andarde			Other	Standar	1c		
Name of Testi	ng Authority:		•	Canadian Ol	andarus	DIN C		boinstra	abe 56, D	,.)-12103	Berlin	
Standard Test	ed to:							Solar k	eymark			
Date of Testin	g or Certificati	on:										
Certified to Sta	andard (yes/no	o):										
PERFORMANCE	DATA		Note: This sec	tion is only c	ompleted i	f supplier i	has subn	nitted inc	depender	nt test re	esults	
Test Fluid:	o (l/min).		-									
Efficiency Curve (W/m ² -°C)				1	00	Col	lector E	Efficienc	y Curv	e	
Y Intercept [F	_R (ta)]:		-									
Slope of efficie	ency curve: [F	_R U _L]:	-		0	.80						
Incident Angle Mo	difier				5.0	60					evacuated	tube
30°	45°	60°]		ien	.60						
0.98	0.95	0.88	1		0	40						
Power Rating												
kW/m ² :	0.74		kW/Collector:	2.37	0	.20						
COLLECTOR PE	RFORMANCE	RATING			0	.00						
kWh/day	5°C	20°C	50°C	80°C		0 1	0 20	30 4	40 50	60	70 80	90 100
Standard Day	7.9	7.3	6.2	5.2					∆T [°	C]		
MANUFACTURE	R'S COMMEN	TS										

Efficiency equation data based on absorber area

Canadian Supplier: EnerWorks Inc. Manufacturer: EnerWorks Inc. Warranty & Limitations: sear material replacement, labour up to \$100 first year Date First Listed in Directory: Mar-07 COLLECTOR SPECIFICATIONS March 1 March 1 Sight depth Oracle Area (m ²): 2.441 1.171 Nick Apartures Area (m ²): 2.5 Weight (file) (hg): 50 Weight (file) (hg): 51 Had Capacity (files): 1 Maximum Operating Temperature ("Q):: 125 Maximum Operating Temperature ("Q):: 126 Maximum Operating Temperature ("Q):: 126 Maximum Operating Temperature ("Q):: 0.410 Maximum Operat	Product Name: Collector Type:	Reside Glazed Flat	ential Plate		Produ Applic	ct Model: cations:	C Me	OL-4X	B-TL-S	SG1-S erature	SD1	0
Warrenty & Limitations: System material replacement, labour up to 5100 first year Date First Listed in Directory: March COLLECTOR SPECIFICATION height March Addition Origona Shara (m ²): 2,9 Not Appet to Area (m ²): 30 Weight (Idiv) (kg): 51 Fluid Capacity (Idiv) (kg): 51 Maximum Coperating Temperature (*0): 12 Heat Transfer Fluids: Propriete Glycol Colleal Flow Rate (Imin): 0.5 Collear Flow Rate (Imin): 0.5 Collad Flow Rate (Imin): 0.5 Collear Flow Rate (Imin): 1.2 Heat Transfer Fluids: Mild Steel Coating: Galaviume Mounting Connections: Mounting contentions: Mounting Connections: Mounting contentions: Mounting Connections: Mounting: Contentions: Mounting Connections: Mounting: Contentions: Mounting Connections: Mounting: Contentions: Mounting Connections: Mounting: Contentions: Mounting: Coapper Plato Ubig Bonding Methond: Coopper Septentine Tube (rot heade	Canadian Supplier:	EnerWo	rks Inc.		Manu	facturer:	Ei Ca	nerWorks	s Inc.			
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Warranty & Limi Date First Listed	itations: 5 year mate d in Directory:	rial replacement, la Mar-07	abour up te	o \$10	0 first year	Residentia	al Collector-Partia	Transversal S	Section		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	COLLECTOR SPE	CIFICATIONS					cc	L-4X8-TL-SG1-SE	10			
Dimensions (inff): 2,441 1,171 80 Gross Area (inff): 2,9 Net Aparture Area (inff): 2,7 Weight (filled) (kg): 50 Height (filled) (kg): 50 Maximum Operating Temporature (°C): 125 Maximum Operating Pressure (kPa): 345 min max Acceptable Flow Rates (limin): 0.6 3.0 Idea Flow Rate (limin): 1.2 Heat Transfer Fluids: Propylene Glycol COLLECTOR MATERIALS Frame Material: Mild Steel Coating: Galvalume Mounting Connections: Mounting brackets attach to collector frame with screws Glazing Material (inner): none Absorber Plate Coating: Selective Tubing Material: Low iron, tempered glass Glazing Material (inner): none Absorber Plate Coating: Selective Tubing Material: Copper Plate-Tubing Material: Copper Plate-Tubing Authority: Loser spot widing Insulation (idea): How Presend wool with aluminum sheet outer protection Header Pipe Size (OD) (min): 10 Header Pipe Size (OD) (min): 10 Header Pipe Size (OD) (min): 12 Date Of Testing Authority: 1.2 Tots Flow Raterial: 0.65 Slope of efficiency curve: [F ₁ (L]: 0.65 Slope of efficiency curve: [F ₁ (L]: 0.55 Slope of efficienc		height	width c	depth	si	icone Achesive	Glazing Spacer	Tempered Glass	Absorber			
Gross Area (m ²): 2.3 Net Aporture Area (m ³): 2.7 Weight (Hey) (kg): 50 Head Transfer Area (m ³): 2.7 Weight (Hey) (kg): 51 Huid Capacity (Herse): 1 Maximum Operating Pressure (KPa): 345 min max Acceptable Flow Rates (Imin): 0.6 Udeal Flow Rate (Imin): 1.2 Heat Transfer Fluids: Mild Steel Costing: Glaviany Material (Lene): Mounting Connections: Mounting brockets attach to collector frame with screws Glaviany Material (Lene): Low into, tempered glass Glaviany Material (Lene): Low into, tempered glass Glaviany Material (Lene): Low is sective Tubing Material Aluminum, continuous sheet Absorber Plate Tubing Bonding Method: Laser spot welding Insulation (sidee): Mineral wool with aluminum sheet outer protection Header Pipe Size (OD) (mm): 10 Header Pipe Material: Copper Serpentine Tube (not header) Pubing Connection Method: Push-On Quick Connect INDEPENDENT TESTING/CERTIFICATION Conacian Standards <td>Dimensions (mr</td> <td>n): 2,441</td> <td>1,171</td> <td>80</td> <td></td> <td>ł</td> <td>/</td> <td> </td> <td>l</td> <td></td> <td></td> <td></td>	Dimensions (mr	n): 2,441	1,171	80		ł	/		l			
Net Appendix Area (mr):1Weight (Not):50Weight (Not):51Fluid Capacity (Itres):51Maximum Operating Temperature (°C):125Maximum Operating Temperature (°C):125Maximum Operating Temperature (°C):125Maximum Operating Temperature (°C):125Heat Transfer Fluids:Propylene GlycolCOLLECTOR MATERIALSFrame Material:Mild SteelCoaling:GalvalumeMounting Connections:Mounting brackets attach to collector frame with screwsGlazing Material (unor):Low iron, tempered glassGlazing Material (inor):noneAbsorber Plate Nating Bonding Method:Laser spot weldingInsulation (sides):Mile allowTubing Material:CopperTubing Material:Copper Serpentine Tube (not header)Plate-Tubing National (cuer):10Header Pipe Size (CO) (mm):10Header Pipe Naterial:Copper Serpentine Tube (not header)Plumbing Connection Method:Push-On Quick ConnectIto Testing Authonity:NT: This section is only completed if supplier has submitted independent test resultsStandard Testel to:0.55Song efficiency curve: (F _N U):0.45Standard Testel to:0.55Song efficiency curve: (F _N U):0.45Outer conve: (F _N U):0.45Standard Testel to:0.55Song efficiency curve: (F _N U):0.45Standard Testel to:0.55Song efficiency curve: (F _N U):	Gross Area (m ²)):	2.9				/	1	ł			
Weight (filled) (fig):51Fluid Capacity (files):1Maximum Operating Tenseure (IC):125Maximum Operating Tenseure (IC):125Maximum Operating Tenseure (IC):125Maximum Operating Tenseure (IC):345Mate (Imin):0.6Jeal Flow Rates (Imin):0.6Jeal Flow Rates (Imin):1.2Heat Transfer Fluids:Propylene GlycolCOLLECTOR MATERIALSFiram Material (cure):Low iron, tempered glassGlazing Material (cure):Low continuous sheetAbsorder Plate Coating:SelectiveAbsorder Plate Coating:SelectiveInsulation (slack):Mineral wool with aluminum sheet outer protectionHeader Pipe Size (OD) (mm):10Header Pipe Size (OD) (mm):10Header Pipe Size (OD) (mm):10Canaciand Tested to:Corper Serpentine Tube (not header)Purp Testing Certification:Collect ConnectName of Testing or Certification:0.14Material Standard (yes/no):Note: This section is only completed if supplier has submitted independent test resultsTest Fluid:0.56Supe of efficiency curve: [Filu]:0.65Sipe of efficiency curve: [Filu]:0.65Sipe of efficiency curve: [Filu]:0.65Sip	Weight (drv) (kg	ea (m):	50			1 /		{	ł			
Fluid Capacity (Ifters):1Maximum Operating Pressure (IPA):245Maximum Operating Pressure (IPA):345Acceptable Flow Rates (I/min):0.63.0Ideal Flow Rate (I/min):0.6Heat Transfer Fluids:Propylene GlycolCOLLECTOR MATERIALSFrame Material:Mild SteelCoating:GalvalumeMounting Connections:Mounting brackets attach to collector frame with screwsGlazing Material (uner):Low iron, tempered glassGlazing Material (uner):Low iron, tempered glassGlazing Material (uner):Low iron, tempered glassGlazing Material:CopperAbsorber Plate Material:CopperAbsorber Plate Coating:SelectiveTubing Material:Copper Serpentine Tube (not header)Plumbing Connection Method:Laser spot weldingInsulation (back):Mineral wool with aluminum sheet outer protectionHeader Pipe Material:Copper Serpentine Tube (not header)Plumbing Connection Method:Push-O Guick ConnectName of Testing Authority:Canadian StandardsStandard Tested to:CCANCSA F378-87Date of Testing or Certification:01-May-06PEFCONANCE DATANete: This section is only completed if supplier has submitted independent test resultsTest Fluid:50% Propylene GlycolEfficiency Curve (IVim ² : C)0.65Signed of filletion curve: (F _R U]:0.442Incident Angle Modifier1.63Outer Conserve: (F _R U):0.55<	Weight (filled) (k	(g):	51					+				
Maximum Operating Temperature (PG): 125 Maximum Operating Pressure (kPa): 345 min max Acceptable Flow Rate (l(min): 0.6 3.0 Ideal Flow Rate (l(min): 0.6 3.0 CollectOR MATERIALS Mild Steel Collector Grame With screws Glazing Material (cuter): Low tron, tempered glass Glazing Material (cuter): Glazing Material (cuter): none Absorber Plate Coating: Selective Tubing Material: Copper Copper Serpentine Tube (not header) Plate-Tubing Bonding Method: Laser spot velding Insulation (sides): Mineral wool with aluminum sheet outer protection Header Pipe Size (OD) (mm): 10 Header Pipe Material: Copper Serpentine Tube (not header) Plumbing Connection Method: Push-On Quick Connect INDEEPROENT TESTING/CERTIFICATION Canadian Standards Other Standards Other Standards Standard Tested to: Confeed to Standard (yes/no): Note: This section is only completed if supplier has submitted indepen	Fluid Capacity (litres):	1						+			
Maximum Operating Pressure (kPa): 345 min max Acceptable Flow Rates (lmin): 0.6 3.0 Idea Flow Rate (lmin): 1.2 Heat Transfer Fludds: Propylene Glycol COLLECTOR MATERIALS Mild Steel Coating: Galvalume Mounting Connections: Mounting brackets attach to collector frame with screws Glazing Material (curer): Low Iron, tempered glass Glazing Material (curer): none Absorber Plate Material: Copper Tubing Material: Copper Plate-Tubing Bonding Method: Laser spot welding Insulation (back): Mineral wool with aluminum sheet outer protection Header Pipe Size (OD) (mm): 10 CANCSA F378-85 Cother Standards Date of Testing Authority: Nate: This section is only completed if suppiler has submitted indepenent test results <	Maximum Opera	ating Temperature (°C):	125								-	_
min max Acceptable Flow Rate (I/min): 0.6 3.0 Ideal Flow Rate (I/min): 1.2 Heat Transfer Fluids: Propylene Glycol COLLECTOR MATERIALS Intermediation Frame Material: Mild Steel Coating: Galvalume Mounting Connections: Mounting brackets attach to collector frame with screws Glazing Material (outer): Low iron, tempered glass Glazing Material (outer): Note: iron to collector frame with screws Glazing Material (outer): Selective Absorber Plate Coating: Selective Selective Selective Plate-Tubing Bonding Method: Laser spot welding Insulation (sides): Iso-cryanutate foam Insulation (sides): Secore Plate Naterial: Plate-Tubing Material: Copper Plumbing Connection Method: Push-On Quick Connection Header Pipe Size (OD) (mm): 10 Header Pipe Material: Copper String Authority: Name of Testing Authority: Nate: This section is only completed if supplier has submitted independent test results Test	Maximum Opera	ating Pressure (kPa):	345									-
Acceptable How Hatles (t/min): 0.6 3.0 Licea Flow Rate (t/mi): 1.2 Heat Transfer Fluids: Propylene Glycol Trane Material: Mild Steel Costing: Galavalume Mounting Connections: Mounting brackets attach to collector frame with screws Glazing Material (uner): none Absorber Plate Material: Aluminum, continuous sheet Absorber Plate Coating: Selective Tubing Material: Copper Plate Tubing Bonding Method: Laser spot welding Insulation (sidee): Iso-cryanurate from Insulation (sidee): Boc-synurate from Insulation (sidee): Mineral wool with aluminum sheet outer protection Header Pipo Material: Copper Serpentine Tube (not header) Plumbing Connection Method: Push-On Quick Connect Nore: Tris Section 1: Other Standards Other Standard Tested (vim ¹): Canadian Standards Other Standard (ves/no): Note: This section is only completed if supplier has submitted independent test results Test Flow Rate (Umin): 1.2 Test Flow Rate (Umin): 1.4 Stope of			min	max			{					
Ideal Flow hale (ini). Heat Transfer Fluids:Propylene GlycolCollector MATERIALSCollector MATERIALSFrame Material: Mounting Connections: Glazing Material (uner): Low iron, tempered glass Glazing Material (uner): NoneGlazing Material (uner): Absorber Plate Material: Absorber Plate Coating: Selective Low iron, tempered glass Glazing Material (inner): NoneLow iron, tempered glass Aluminum, continuous sheet Absorber Plate Coating: Selective Loser spot welding Insulation (back): Header Pipe Size (OD) (mm): Header Pipe Size (OD) (mm): Name of Testing Authonty: Name of Testing Autho	Acceptable Flow	v Rates (I/min):	0.6	3.0								
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Heat Transfer F	(I/III). luids: Propylene (/	Ì	1					
COLLECTOR MATERIALS Frame Material: Mild Steel Coating: Galvalume Mounting Connections: Mounting brackets attach to collector frame with screws Galazing Material (outer): Low iron, tempered glass Glazing Material (outer): none Absorber Plate Material: A Juminum, continuous sheet Absorber Plate Coating: Selective Ubing Material Copper Plate-Tubing Bonding Method: Laser spot welding Insulation (back): Mineral wool with aluminum sheet outer protection Header Pipe Size (OD) (mm): 10 Header Pipe Material: Copper Serpentine Tube (not header) Plumbing Connection Method: Push-On Quick Connect Moter Standard Standards Other Standards Note: This section is only completed if supplier has submitted independent test results Standard Tested to: Collector Efficiency Curve Standard Standard (yes/no): No Note: This section is only completed if supplier has submitted independent test results			arycor		/ Frame	ا Side Insulatio	∫ n Back Insulation					
COLLECTOR MATERIALSFrame Material:Mild SteelCoating:GalvalumeMounting brackets attach to collector frame with screwsGlazing Material (outer):Low iron, tempered glassGlazing Material (inner):noneAbsorber Plate Material:Aluminum, continuous sheetAbsorber Plate Material:CopperPlate-Tubing Bonding Method:Laser spot weldingInsulation (sides):Iso-cyanurate foamInsulation (sides):Iso-cyanurate foamInsulation (sides):Iso-cyanurate foamInsulation (sides):Copper Serpentine Tube (not header)Plumbing Connection Method:Push-On Quick ConnectINDEPENDENT TESTING/CERTIFICATIONCanadian StandardsName of Testing Authonity:NSTF/Bodycote Materials TestingStandard Tested to:CANCSA F378-87Date of Testing or Certification:01-May-06Certified to Standard (yes/no):NoPERFORMANCE DATANote: This section is only completed if supplier has submitted independent test resultsTest Flow Rate (l/min):1.2Test Flow Rate (l/min):1.2Stop of efficiency curve: [F _R U ₁]:0.65Slope of efficiency ervere: [F _R U ₁]:0.65 <td></td>												
Initial mediation Initial offection Coating: Galvalume Mounting Connections: Mounting brackets attach to collector frame with screws Glazing Material (uner): Low iron, tempered glass Glazing Material (uner): none Absorber Plate Naterial: Aluminum, continuous sheet Absorber Plate Naterial: Copper Plate-Tubing Bonding Method: Laser spot welding Insulation (sides): Mineral wool with aluminum sheet outer protection Header Pipe Size (OD) (mm): 10 Header Pipe Size (OD) (mm): 10 Header Pipe Size (OD) (mm): 10 Header Pipe Material: Copper Serpentine Tube (not header) Puthing Connection Method: Push-On Quick Connect INDEPROENT TESTING/CERTIFICATION Canadian Standards Other Standards Name of Testing Authonity: NSTF/Bodycote Materials Testing Other Standard (yesino): Standard Tested to: CAN/CSA F378-87 Oate: This section is only completed if supplier has submitted independent test results Test Flow Rate ((min): 1.2 50% Propylene Glycol Inditin ruige Motifier 0.56	Erame Material	ERIALS	Mild Steel									
Mounting Connections: Mounting brackets attach to collector frame with screws Glazing Material (outer): Low iron, tempered glass Glazing Material (outer): none Absorber Plate Material: Aluminum, continuous sheet Absorber Plate Material: Aluminum, continuous sheet Absorber Plate Material: Copper Plate-Tubing Material: Copper Insulation (sides): Iso-cyanurate foam Insulation (sides): Nineral wood with aluminum sheet outer protection Header Pipe Size (OD) (mm): 10 Header Pipe Material: Copper Serpentine Tube (not header) Plumbing Connection Method: Push-On Quick Connect Note: The steed to: CANCSA F378-87 Date of Testing or Certification: 0.1-May-06 Certified to Standard (yes/no): No PerFORMANCE DATA Nete: This section is only completed if supplier has submitted independent test results 12	Coating:		Galvalume									
Glazing Material (outer): Low iron, tempered glass Glazing Material (inner): none Absorber Plate Material: Aluminum, continuous sheet Absorber Plate Material: Gapper Tubing Material: Selective Tubing Material: Copper Plate Tubing Bonding Method: Laser spot welding Insulation (sides): iso-cyanurate foam Insulation (sides): Mineral wool with aluminum sheet outer protection Header Pipe Size (OD) (mm): 10 Header Pipe Size (OD) (mm): 10 Header Pipe Material: Copper Serpentine Tube (not header) Plumbing Connection Method: Push-On Quick Connect Note: The Sting of Certification: CAN/CSA F378-87 Date of Testing or Certification: 0.1-May-06 Certified to Standard (yes/no): Note: This section is only completed if supplier has submitted independent test results Test Flow Rate (imin): 1.2 Test Flow Rate (imin): 1.2 Test Flow Rate (Mini): 0.56 Slope of efficiency curve: [F _n U_]: 0.56 Slope of efficiency curve: [F _n U_]: 0.56 <t< td=""><td>Mounting Conne</td><td>ections:</td><td>Mounting bracket</td><td>ts attach to</td><td>o coll</td><td>ector frame</td><td>with screws</td><td></td><td></td><td></td><td></td><td></td></t<>	Mounting Conne	ections:	Mounting bracket	ts attach to	o coll	ector frame	with screws					
Glazing Material (inner): none Absorber Plate Material: Aluminum, continuous sheet Absorber Plate Coating: Selective Tubing Material: Copper Plate-Tubing Bonding Method: Laser spot welding Insulation (sides): Iso-cyanurate foam Insulation (back): Mineral wool with aluminum sheet outer protection Header Pipe Size (OD) (mm): 10 Header Pipe Material: Copper Serpentine Tube (not header) Plumbing Connection Method: Push-On Quick Connect INDEPENDENT TESTING/CERTIFICATION Canadian Standards Other Standards Name of Testing Authority: NSTF/Bodycote Materials Testing Other Standards Standard Tested to: CAN/CSA F378-87 Other Standards Standard Tested to: CAN/CSA F378-87 Other This section is only completed if supplier has submitted independent test results Test Flow Rate (lmin): 1.2 Test Flow Rate (lmin): 1.2 Test Flow Rate (lmin): 0.65 Slope of efficiency Curve: [F _R U ₁]: 4.442 Incident Angle Modifier 0.06 0.00 0.00 0.00 0.00 0.00<	Glazing Materia	I (outer):	Low iron, temper	ed glass								
Absorber Plate Material: Aluminum, continuous sheet Absorber Plate Coating: Selective Tubing Material: Copper Plate-Tubing Bonding Method: Laser spot welding Insulation (back): Mineral wool with aluminum sheet outer protection Header Pipe Size (OD) (mm): 10 Header Pipe Material: Copper Serpentine Tube (not header) Plumbing Connection Method: Push-On Quick Connect INDEPENDENT TESTING/CERTIFICATION Canadian Standards Other Standards Name of Testing Authority: NSTF/Bodycote Materials Testing Standard Tested to: CAN/CSA F378-87 Date of Testing or Certification: 01-May-06 Certified to Standard (yes/no): No PERFORMANCE DATA Note: This section is only completed if supplier has submitted independent test results Test Flow 1.2 Test Flow 50% Propylene Glycol Efficiency Curve (W/m ²⁻ C) Y Y Intercept (F _n (L ₁): 0.65 Slope of efficiency curve: (F _n L ₁): 4.442 Incident Angle Modifier 0.56 W/m ² : 0.56 Standard Day 0.5 <td< td=""><td>Glazing Materia</td><td>l (inner):</td><td>none</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	Glazing Materia	l (inner):	none									
Absorber Plate Coating:SelectiveTubing Material:CopperPlate-Tubing Bonding Method:Laser spot weldingInsulation (sides):Iso-cyanurate foamInsulation (back):Mineral wool with aluminum sheet outer protectionHeader Pipe Size (OD) (mm):10Header Pipe Size (OD) (mm):10Header Pipe Material:Copper Serpentine Tube (not header)Publing Connection Method:Push-On Quick ConnectINDEPENDENT TESTING/CERTIFICATIONCanadian StandardsName of Testing Authority:NSTF/Bodycote Materials TestingStandard Tested to:CAN/CSA F378-87Date of Testing or Certification:01-May-06Certified to Standard (yes/no):NoPERFORMANCE DATA Test Fluid:Note: This section is only completed if supplier has submitted independent test results1.2 Test Fluid:1.2 Sofo Propylene GlycolEfficiency Curve (Wm ^{2,-S} C) Y Intercept [F _n (U]):0.65 4.442Note: This section is only completed if supplier has submitted independent test results1.2 Test Fluid:50% Propylene GlycolEfficiency Curve (Wm ^{2,-S} C) Y Intercept [F _n (U]):0.65 4.442Power Rating kW/m ² :0.56COLLECTOR PERFORMANCE RATING Curve:1.63COLLECTOR PERFORMANCE RATING MANCE DATA0.00Mubridy:5.00.0Authority:1.63Collector Efficiency Curve:0.00.100.00.200.00.300.50.400.00	Absorber Plate	Material:	Aluminum, contir	nuous she	et							
Tubing Material:Copper topperPlate-Tubing Bonding Method:Laser spot welding Iso-cyanurate foamInsulation (sides):Mineral wool with aluminum sheet outer protectionHeader Pipe Material:Copper Serpentine Tube (not header) Pumbing Connection Method:Plumbing Connection Method:Push-On Quick ConnectINDEPENDENT TESTING/CERTIFICATION Standard Tested to:Canadian Standards CAN/CSA F378-87 Date of Testing or Certification:Date of Testing or Certification:01-May-06 Certified to Standard (yes/no):PerFORMANCE DATA Test Fluid:Note: This section is only completed if supplier has submitted independent test results1.21.2Test Fluid:50% Propylene GlycolEfficiency Curve (IF _R U ₂):0.65 Slope of efficiency curve: [F _R U ₂]:Incident Angle Modifier W/m ² :0.56W/m ² :0.56KW/rolling5.0OLLECTOR PERFORMANCE RATING W/m ² :0.56Standard Day5.0OLLECTOR PERFORMANCE RATING MANCE RATINGMuthriday5.0Standard Day5.0OLLECTOR PERFORMANCE RATING MANCE DATMuthriday5.0Collector:1.63Collector PERFORMANCE RATING MANCE DATMuthriday5.0OLLECTOR PERFORMANCE RATING MANCE DATMuthriday5.0Standard Day5.0Standard Day5.0Muthriday5.0Muthriday5.0Muthriday5.0Muthriday5.0Muthriday	Absorber Plate	Coating:	Selective									
Insulation (sides): Laser spon weaking Insulation (sides): Iso-cyanurate foam Insulation (sides): Mineral wool with aluminum sheet outer protection Header Pipe Size (OD) (mm): 10 Header Pipe Size (OD) (mm): 10 Header Pipe Size (OD) (mm): 10 Plander Pipe Material: Copper Serpentine Tube (not header) Plumbing Connection Method: Push-On Quick Connect INDEPENDENT TESTING/CERTIFICATION Canadian Standards Name of Testing Authority: NSTF/Bodycote Materials Testing Standard Tested to: CAN/CSA F378-87 Date of Testing or Certification: 01-May-06 Certified to Standard (yes/no): No PERFORMANCE DATA Note: This section is only completed if supplier has submitted independent test results Test Fluid: 50% Propylene Glycol Efficiency Curve (W/m ^{2.o} C) Y Intercept [F _n (L)]: Y Intercept [F _n (L)]: 0.65 Slope of efficiency curve: [F _n U_1]: 4.442 Incident Angle Modifier	Plate-Tubing Material	nding Method:	Laser spot weldi	na								
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Insulation (sides		Iso-cvanurate foa	im								
Header Pipe Size (OD) (mm): Header Pipe Material: Plumbing Connection Method:10Kore Pipe Material: Plumbing Connection Method:Copper Serpentine Tube (not header) Push-On Quick ConnectINDEPENDENT TESTING/CERTIFICATION Name of Testing Authority: Standard Tested to: CAN/CSA F378-87 Date of Testing or Certification: Certified to Standard (yes/no):Other Standards Note: This section is only completed if supplier has submitted independent test results 1.2 50% Propylene GlycolPERFORMANCE DATA Test Fluid: Slope of efficiency Curve: $V Intercept [F_n(ta)]$: $\frac{30^\circ 45^\circ 60^\circ}{0.97}$ Note: This section is only completed if supplier has submitted independent test results 1.2 50% Propylene GlycolPower Rating kW/m2: 0.56 0.56 KW/Collector:1.63Collector PerFORMANCE RATING $May 5^\circ$ C 20° C 50° C 1.63 Boo 0.0 Mode: 0.00 0.0 0.0	Insulation (back):	Mineral wool with	n aluminun	n she	et outer prof	tection					
Header Pipe Material: Copper Serpentine Tube (not header) Plumbing Connection Method: Push-On Quick Connect INDEPENDENT TESTING/CERTIFICATION Canadian Standards Other Standards Name of Testing Authority: NSTF/Bodycote Materials Testing Standard Standards Standard Tested to: CAN/CSA F378-87 Date of Testing or Certification: 01-May-06 Certified to Standard (yes/no): No No PERFORMANCE DATA Note: This section is only completed if supplier has submitted independent test results Test Flow Rate (l/min): 1.2 Test Fluid: 50% Propylene Glycol Efficiency Curve (W/m ^{2,o} C) 0.65 Y Intercept [F _R (ta)]: 0.65 Slope of efficiency curve: [F _R U _L]: 4.442 Incident Angle Modifier 0.60 <u>30° 45° <u>0.97 0.91 V/m²: 0.56 KW/n²: 0.56 KW/n²: 0.56 Standard Day 5.0 OCLLECTOR PERFORMANCE RATING 1.63 Collector Efficiency Curve: 1.0 VM/n /day 5°C 20°C Standard</u></u>	Header Pipe Siz	, ze (OD) (mm):	10			•						
Plumbing Connection Method:Push-On Quick ConnectINDEPENDENT TESTING/CERTIFICATION Name of Testing Authority:Canadian StandardsOther StandardsName of Testing Authority:NSTF/Bodycote Materials Testing CAN/CSA F378-87Other StandardsDate of Testing or Certification:01-May-06Certified to Standard (yes/no):NoNoPERFORMANCE DATA Test Flow Rate (l/min):Test Flow Rate (l/min):1.2Test Flow Rate (l/min):1.2Test Flow Rate (l/min):1.2Test Flow Rate (l/min):1.2Test Flow Rate (l/min):1.4Test Flow Rate (l/min):1.2Test Flow Rate (l/min):1.2Test Flow Rate (l/min):1.2Test Flow Rate (l/min):1.2Test Flow Rate (l/min):1.2Slope of efficiency curve: [F _R U_]:0.65Slope of efficiency curve: [F _R U_]:0.65V Intercept [F _R (ta)]:0.65Slope of efficiency curve: [F _R U_]:1.63Power Rating 	Header Pipe Ma	terial:	Copper Serpentir	ne Tube (ne	ot hea	ader)						
INDEPENDENT TESTING/CERTIFICATION Name of Testing Authority: Standard Tested to: Date of Testing or Certification: Certified to Standard (yes/no):Canadian Standards CAN/CSA F378-87 O1-May-06Other Standards Date of Testing or Certification: O1-May-06PERFORMANCE DATA Test Fluid:Note: This section is only completed if supplier has submitted independent test results 1.2 Tost Fluid:Collector Efficiency CurvePERFORMANCE DATA Test Fluid:Note: This section is only completed if supplier has submitted independent test results 1.2 Tost Fluid:Collector Efficiency CurveIncident Angle Modifier $\frac{30^\circ 45^\circ 60^\circ}{0.97 0.91 0.80}$ 0.65 KW/Collector:0.65 0.40Power Rating kW/m ² :0.56kW/Collector:1.63COLLECTOR PERFORMANCE RATING Standard DaySto 0.5 0.0 0.080°C 0.00	Plumbing Conne	ection Method:	Push-On Quick C	connect								
Name of Testing Authority:NSTF/Bodycote Materials Testing CAN/CSA F378-87Date of Testing or Certification:01-May-06Certified to Standard (yes/no):NoPERFORMANCE DATA Test Fluid:Note: This section is only completed if supplier has submitted independent test results1.21.2Test Fluid:50% Propylene GlycolEfficiency Curve (W/m ^{2,o} C) Y Intercept [F _R (ta)]:0.65Slope of efficiency curve: [F _R U _L]:4.442Incident Angle Modifier $\frac{30^{\circ} 45^{\circ} 60^{\circ}}{0.97 0.91 0.80}$	INDEPENDENT TE	STING/CERTIFICATION	Car	nadian Star	ndards	;	Oti	her Standaro	s			
Standard Tested to:CAN/CSA F378-87Date of Testing or Certification:01-May-06Certified to Standard (yes/no):NoPERFORMANCE DATA Test Fluid:Note: This section is only completed if supplier has submitted independent test results1.250% Propylene GlycolEfficiency Curve (I/min):1.2Test Fluid:50% Propylene GlycolIncident Angle Modifier0.65No4.442Incident Angle Modifier0.65Nowr Rating kW/m ² :0.56kW/m ² :0.56kW/m ² :0.56collector PERFORMANCE RATINGCollector PERFORMANCE RATINGkW/n/day5°C20°C50°CStandard Day5.00.50.0	Name of Testing	g Authority:	NS	TF/Bodyco	te Ma	terials Testi	ng					
Date of Testing or Certification:01-May-06 NoCertified to Standard (yes/no):NoPERFORMANCE DATA Test Flow Rate (l/min):Note: This section is only completed if supplier has submitted independent test resultsTest Flow Rate (l/min):1.2Test Fluid:50% Propylene GlycolEfficiency Curve (W/m ^{2.o} °C) Y Intercept [F _R (ta]):0.65Slope of efficiency curve: [F _R U _L]:4.442Incident Angle Modifier0.65 $\underline{30^{\circ} 45^{\circ} 60^{\circ} \\ 0.97 0.91 0.80}$ Power Rating kW/m ² :0.56kWh/day5°C20°CStandard Day5.0 0.5 0.0 0.0	Standard Tester	d to:	CAI	N/CSA F37	8-87							
Certified to Standard (yes/no):NoPERFORMANCE DATA Test Flow Rate (l/min): Test Fluid:Note: This section is only completed if supplier has submitted independent test results 1.2Efficiency Curve (W/m ² -°C) Y Intercept [F _R (ta)]:0.65Slope of efficiency curve: [F _R U_]:4.442Incident Angle Modifier 0.97 0.91Ower Rating kW/m ² :0.56kW/m ² :0.56kW/m ² :0.56kW/collector:1.63Collector PERFORMANCE RATING 0.05 0.0istandard Day5.00.5Standard Day5.0Collector Berformance Rating kW/r/day5°C20°C50°C80°CStandard Day5.0Collector DayCollector Performance Rating kW/r/dayCollector DayCollector DayCollector DayCollector Performance Rating kW/r/dayCollector DayCollector DayCollector DayCollector DayCollector DayCollector DayCollector DayCollector DayCollector Day </td <td>Date of Testing</td> <td>or Certification:</td> <td>01-l</td> <td>May-06</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Date of Testing	or Certification:	01-l	May-06								
PERFORMANCE DATA Test Flow Rate (l/min):Note: This section is only completed if supplier has submitted independent test resultsTest Flow Rate (l/min):1.2Test Fluid:50% Propylene GlycolEfficiency Curve (W/m ² -°C) Y Intercept [F _R (ta)]:0.65Slope of efficiency curve: [F _R UL]:4.442Incident Angle Modifier0.60 30° 45° 0.97 0.91 0.80 0.97Power Rating kW/m ² :0.56kW/m ² :0.56kW/n/day 5° C 20° C 50° CStandard Day5.00.50.00.50.00.650.00.65 0.0 0.970.910.800.50.000.000.102020^{\circ}C 50° C800°C <t< td=""><td>Certified to Stan</td><td>idard (yes/no):</td><td>No</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Certified to Stan	idard (yes/no):	No									
Test Flow Rate (l/min): 1.2 Test Fluid: 50% Propylene Glycol Efficiency Curve (W/m ² -°C) V Intercept [F _R (ta)]: 0.65 Slope of efficiency curve: [F _R U_1]: 4.442 Incident Angle Modifier 0.97 0.91 0.97 0.91 0.80 Power Rating kW/m ² : 0.56 kW/collector: 1.63 COLLECTOR PERFORMANCE RATING 0.00 0.00 0	PERFORMANCE D	ATA	Note: This section	is only con	nplete	d if supplier l	has submittee	d independer	nt test resu	ults		
Test Fluid:50% Propylene GlycolEfficiency Curve (W/m²-°C) Y Intercept [F _R (ta]):0.65Slope of efficiency curve: [F _R U _L]:4.442Incident Angle Modifier 0.60° 30° 45° 0.97 0.91 0.80 Power Rating kW/m²: 0.56 kW/m²: 0.56 kW/collector: 1.63 COLLECTOR PERFORMANCE RATING $\frac{kWh/day}{5^{\circ}C}$ $20^{\circ}C$ $50^{\circ}C$ $50^{\circ}C$ Standard Day 5.0 0.55 0.0 0.00 0.00	Test Flow Rate	(l/min):	1.2	-	_							
Efficiency Curve (W/m ² -°C) Y Intercept [F _R (ta)]: 0.65 Slope of efficiency curve: [F _R U _L]: 4.442 Incident Angle Modifier 30° 45° 60° 0.97 0.91 0.80 Power Rating kW/m ² : 0.56 kW/Collector: 1.63 COLLECTOR PERFORMANCE RATING kWh/day 5°C 20°C 50°C 80°C Standard Day 5.0 0.5 0.0 0.0	Test Fluid:	<u>.</u>	50% Propylene G	lycol			Collect	or Efficienc	v Curve			
Y intercept $[F_R(ta)]$: 0.65 Slope of efficiency curve: $[F_RU_L]$: 4.442 Incident Angle Modifier 0.60° 30° 45° 60° 0.97 0.91 0.80 Power Rating kW/m ² : 0.56 kW/Collector: 1.63 COLLECTOR PERFORMANCE RATING 0.00 0.00 0.00 Standard Day 5.0 0.5 0.00 0.00	Efficiency Curve (W	//m ² -°C)				1.00			,			
Slope of efficiency curve: $[P_RO_L]$: 4.442 Incident Angle Modifier 30° 45° 60° 0.97 0.91 0.80 Power Rating kW/m ² : 0.56 kW/Collector: 1.63 COLLECTOR PERFORMANCE RATING 0.20°	Y Intercept [F _R (0.65									
Incident Angle Modifier 30° 45° 60° 0.97 0.91 0.80 Power Rating kW/m ² : 0.56 kW/Collector: 1.63 COLLECTOR PERFORMANCE RATING 0.20°	Slope of efficien	icy curve: [F _R UL]:	4.442			0.80						-
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Incident Angle Modi	fier	_		Š	0.60						
0.97 0.91 0.80 Power Rating kW/m ² : 0.56 kW/Collector: 1.63 COLLECTOR PERFORMANCE RATING 0.20 0.20 0.20 kWh/day 5° C 20° C 50° C 80° C Standard Day 5.0 0.5 0.0 0.0	30°	45° 60°	4		ien	0.00				fl.	at plate	
Power Rating kW/m^2 : 0.56 kW/Collector: 1.63 COLLECTOR PERFORMANCE RATING 0.20 0.20 0.20 0.00 kWh/day 5°C 20°C 50°C 80°C 0.00 0.10 0.20 0.20 0.00 <	0.97	0.91 0.80	Ţ		iffic	0.40					-	_
kW/m ² : 0.56 kW/Collector: 1.63 COLLECTOR PERFORMANCE RATING 0.20 0.00 0.00 kWh/day 5°C 20°C 50°C 80°C Standard Day 5.0 0.5 0.0 0.0	Power Rating				ш							
kWh/day 5°C 20°C 50°C 80°C Standard Day 5.0 0.5 0.0 0.0 10 20 30 40 50 60 70 80 90 100	kW/m ² :	0.56	kW/Collector:	1.63		0.20						
kWh/day 5°C 20°C 50°C 80°C Standard Day 5.0 0.5 0.0 0.0						0.00						
Standard Day 5.0 0.5 0.0 0.0 0.0 ΔT [°C]			50°C	80°C			0 20 20	40 50	60 70		00	
	Standard Dav	5.0 0.5	0.0	0.0		UI	0 20 30	UC U++	00 /(ור	, 00	90	100
	- and Buy								-1			

MANUFACTURER'S COMMENTS

This collector is fitted with a device that passively limits its maximum temperature to prevent overheating. The collector is suitable for closed loop glycol systems; it is not recommended for drain-back systems.

Product Name: Collector Type:		Comm Glazed Flat	ercial Plate		Prod Appli	uct Mod	lel:	C M		-4X8 and Lov	-NL-S	SG ⁻ eratur	1-Sł	110
Canadian Supplier:		EnerWo	rks Inc.		Manu	ıfacture	r:	E c	EnerV anada	Vorks	Inc.			
Warranty & Lim Date First Liste	nitations: d in Directory	5 year mate	rial replacemen Mar-07	t, labour up	to \$10	0 first y	/ear							
COLLECTOR SPE	CIFICATION	IS						Comn	nercial C (ollector-Par COL-4x8-NL-	SG1-SH10	udinal S	ection	
		height	width	depth										
Dimensions (m	m):	2,445	1,175	80	Silico	ne Adhesive	Glazing Spac	cer Side In /	sulation	Absorber /	Hat Cha 1	annel Te	empered G	ass
Gross Area (m ²	²):		2.9				{			/	Į			
Net Aperture Ar	rea (m²):		2.7				1		/	/	ł		\	
Weight (dry) (ko	g):		50					/			ł		1	
Weight (filled) (Kg): (litroo):		52			/	$\langle 1/$	/				ļ		\
Maximum Oper	(IIII es). Inting Tompo	$rature (^{0}C)$	230						/			1		1
Maximum Oper	ating Tempe	rature (C). re (kPa):	690					<u>_</u>	(0		+	0	
			min	max			HO-	Ì			(1			_
Acceptable Flow	w Rates (I/mi	in):	0.6	3.5			/┗━━━				•			
Ideal Flow Rate	e (l/m):		2.4			į	/	ł		/				
Heat Transfer F	luids:	Propylene (Gycol			_/				/				
						Frame	9	Serpentine	e Tube	Back Ins	ulation			
Frame Material	:		Mild Steel											
Coating:			Galvalume											
Mounting Conn	ections:		Mounting brac	kets attach	to col	ector fi	rame with	screw	s					
Glazing Materia	al (outer):		Low iron, temp	pered glass										
Glazing Materia	al (inner):		none											
Absorber Plate	Material:		Aluminum, coi	ntinuous sh	eet									
Absorber Plate	Coating:		Selective											
Plate-Tubing B	n. Andina Metha	od:	Laser spot wel	ldina										
Insulation (side	s):		Iso-cyanurate	foam										
Insulation (back	<):		Mineral wool v	vith aluminu	ım she	et oute	r protecti	ion						
Header Pipe Si	ze (OD) (mm	ı):	22											
Header Pipe Ma	aterial:		Copper											
Plumbing Conn	ection Metho	od:	Clamp, O-ring	and metal b	ellow									
INDEPENDENT TE	STING/CER	TIFICATION	N C	Canadian Sta	ndards	;		С	other St	tandards				
Name of Testin	g Authority:						NST	F/Bodyo	cote M	aterials	festing			
Standard Teste	d to:							SF	RCC O	G-100				
Date of Testing	or Certificati	ion:							05-Jul	-06				
Certified to Star	ndard (yes/nd	0):							NO					
PERFORMANCE	DATA		Note: This sect	ion is only co	omplete	ed if sup	plier has s	submitte	ed inde	pendent	test resu	ılts		
Test Flow Rate	(l/min):		3.4	<u>.</u>										
Test Fluid:	<i>u</i> - 2 00)		50% Propylene	GIYCOI				Collec	tor Eff	iciency	Curve			
Y Intercept [En	v/m⁻-°C) .(ta)]:		0.77			1.00								
Slope of efficier	ncy curve: [F	_R U _L]:	4.036			0.80 -								
Incident Angle Mod	lifier		_		5	0.60								
30°	45°	60°]		ien	0.00 -							flot plato	
1.01	0.99	0.84	1		ffic	0.40 -								
Power Rating					ш									
kW/m ² :	0.69		kW/Collector:	2.00		0.20 -						-+		_
COLLECTOR PER	FORMANCE	E RATING				0.00 -								
kWh/day	5°C	20°C	50°C	80°C	1	() 10	20 3	0 40	50	60 70) 80	90	100
Standard Day	6.8	5.5	2.6	0.7	1									
										1				

MANUFACTURER'S COMMENTS

This collector is manufactured using bonding technology for added strength, flex and a better seal. The collector is suitable for closed loop glycol systems; it is not recommended for drain-back systems.

Product Name: Collector Type:	Solcan glazed flat plate		Product Model: Applications:	2100 medium tempe	erature
Canadian Supplier:	Solcan Ltd		Manufacturer:	Solcan Ltd _{Canada}	l
Warranty & Limitations:	full warranty for 10) years	Date First Listed in Dire	ctory:	Mar-07
COLLECTOR SPECIFICATIO	NS				
Dimensions (mm): Gross Area (m ²): Net Aperture Area (m ²): Weight (dry) (kg): Weight (filled) (kg): Fluid Capacity (litres): Maximum Operating Temp Maximum Operating Press	height wi 2,450 1, 2 2 5 5 6 5 9 1	idth depth 175 76 2.9 2.7 50 52 2 65 800		Collector Diagr Not Supplied	am J
Acceptable Flow Rates (I/n Ideal Flow Rate (I/m): Heat Transfer Fluids:	nin): 0 1 water, propylene gl	nin max 0.9 2.5 1.0 Ilycol			
COLLECTOR MATERIALS Frame Material: Coating: Mounting Connections: Glazing Material (outer): Glazing Material (outer): Glazing Material (outer): Absorber Plate Material: Absorber Plate Coating: Tubing Material: Plate-Tubing Bonding Meth Insulation (sides): Insulation (back): Header Pipe Size (OD) (min Header Pipe Material: Plumbing Connection Meth INDEPENDENT TESTING/CE Name of Testing Authority: Standard Tested to: Date of Testing or Certifica Certified to Standard (vest)	alumin none rt ang low ird none alumin select coppe nod: high fi foil-fac f	num le aluminum bracket on tempered glass num fin tive er frequency welding uced isocyanurate foar uced isocyanurate foar er female unions Canadian Star NSTF CSA F378-M1 15-Jun-87 no	n n Idards 982	Other Standard	s
PERFORMANCE DATA Test Fluid: Test Flow Rate (I/min): Efficiency Curve (W/m ² -°C)	Note: 60/40 water propyle 0	This section is only cor ene glycol).9	npleted if supplier has su	ubmitted independen	nt test results y Curve
Y Intercept [F _R (ta)]: Slope of efficiency curve: [0. F _R U _L]: 4.0	.64 040	0.80		
Incident Angle Modifier 30° 45° 0.99 0.96 Power Rating kW/m ² : 0.60 COLLECTOR PERFORMANCE	60° 0.83 kW/Cc	ollector: 1.74	0.60 0.40 0.20 0.00		flat plate
<i>kWh/day</i> 5°C	20°C 50	0°C 80°C	0 10 2	0 30 40 50	60 70 80 90 100
Standard Day 5.9	4.4 1	1.5 0.4		∆T [°C	2]

MANUFACTURER'S COMMENTS

Manufacturer's recommended flow is 1.0 l/min.

Product Name: Collector Type:	Solcan glazed flat p) plate		Product Model: Applications:	2101 medium t	emperature
Canadian Supplier:	Solcan L	.td		Manufacturer:	Solcan _{Canada}	Ltd
Warranty & Limitations:	full warrant	y for 10 years		Date First Listed	in Directory:	Mar-07
COLLECTOR SPECIFICATIO	ONS					
	height	width	depth			
Dimensions (mm):	2,450	1,175	76			
Gross Area (m ²):		2.9				
Net Aperture Area (m ²):		2.7				
Weight (filled) (kg):		52				
Fluid Capacity (litres):		0			Collector I	Diagram
Maximum Operating Tem	perature (°C):	165			Not Sup	oplied
Maximum Operating Pres	sure (kPa):	300				
		min	max			
Acceptable Flow Rates (I/	/min):	2.0	3.0			
Ideal Flow Rate (I/m):		2.2				
Heat Transfer Fluids:	water, prop	ylene glycol				
COLLECTOR MATERIALS						
Costing:		aiuminum				
Mounting Connections:		rt angle alum	inum bracket	r		
Glazing Material (outer):		low iron tem	pered glass	•		
Glazing Material (inner):		none	0			
Absorber Plate Material:		copper fin				
Absorber Plate Coating:		selective				
Tubing Material:	4la a al .	copper				
Plate-Tubing Bonding Me	thod:	foil-food iso	cy weiding	m		
Insulation (sides).		foil-faced iso	cvanurate foa	am		
Header Pipe Size (OD) (n	nm):	19	-,			
Header Pipe Material:	,	copper				
Plumbing Connection Met	thod:	male/female	unions			
INDEPENDENT TESTING/CI	ERTIFICATION		Canadian Star	ndards	Other Stand	dards
Name of Testing Authority	y:				Swedish N	NTRI
Standard Tested to:					EN12975	5-2
Date of Testing or Certific	ation:				01-Dec-0	06
Certified to Standard (yes	s/no):					
PERFORMANCE DATA		Note: This see	ction is only co	ompleted if supplier	r has submitted indepe	endent test results
Test Fluid:	60/40 water	propylene gly	col			
Test Flow Rate (I/min):		2.8				
Efficiency Curve (W/m ² - ^o C)						
Finitercept $[F_R(ta)]$.	(E]·	0.77				
Slope of efficiency curve.	[F _R UL].	3.400				
Incident Angle Modifier		-				
<u>30° 45°</u>	60°	_				
0.98 0.93		L		Inc	lependent Test Re	esults Not Supplied
Power Rating						
kW/m ² : 0.71		kW/Collector	1.92			
COLLECTOR PERFORMAN	CE RATING					
kWh/dav 5°C	20°C	50°C	80°C			
Standard Day						
· · ·						
MANUFACTURER'S COMM	ENTS					
			t			- he and a survey of the she she she will be a Detter in the

A system test was carried out in 2000 at the NSTF with two 2101 collectors to F379. The absorber with Batec absorber was tested by Batec in Sweden.

Product Name: Collector Type:	Helioco Stationary P	Oİ Pool Collecto	r	Product Mo Application	odel: s:	Helioco	ol 30 ^{rature}
Canadian Supplier:	Sunsola	r Energy ⁻	Technology	(SET)	Manufacturer	:	Heliocol Israel
Warranty & Limitations:	12 Year War	ranty		Date First I	Listed in Director	y:	Mar-07
COLLECTOR SPECIFICATIO	NS						
	height	width	depth				
Dimensions (mm):	2,311	1,1/2	40				
Gross Area (m ⁻): Not Aporturo Area (m ²):		2.7					
Weight (dry) (kg):		7					
Weight (filled) (kg):		14			0	Collector Die	
Fluid Capacity (litres):		7			U	Not Suppl	ligram
Maximum Operating Temp	erature (°C):					Not Suppl	lied
Maximum Operating Press	ure (kPa):	1103					
Accentable Flow Dates ///n		min	max				
Ideal Flow Bate (I/m):	nin).	11.4	22.1				
Heat Transfer Fluids:	WATER. PR	OPYLENE G	LYCOL				
COLLECTOR MATERIALS							
Mounting Connections:		GATOR CLA	AMPS AND/OR Z	BARS			
Absorber Plate Material:		POLYPROP	YLENE				
Header Pipe Size (OD) (m	m):						
Header Pipe Material:	ad.						
Plumbing Connection Metr	100.						
INDEPENDENT TESTING/CE Name of Testing Authority:			Canadian Stan	dards		Other Standa	ards
Date of Testing or Cortifies	tion:						
Certified to Standard (ves/	no):						
Toot Fluid:		Note: This s	ection is only con	npleted if su	oplier has submit	ted independe	ent test results
Test Flow Bate (I/min).							
Efficiency Curve (W/m ² -°C)							
Y Intercept [F _B (ta)]:							
Slope of efficiency curve: [F _R U _L]:						
Incident Angle Medifier							
	60°	T					
30 43	60	1					
Dower Dating		4			Independen	t Test Resi	ults Not Supplied
Power Rating		k/M/Collector	· ·		macpenaen	1 103111031	
		KW/COllector					
UNGLAZED COLLECTOR PE	RFORMANCE	E RATING	_				
Wind Speed 0.0 m/s	2.5 m/s	5.0 m/s					
kWh/day							
Performance Rating done for S	Standard Day	with a $ riangle I$ of	5°C				
MANUFACTURER'S COMME	NTS						

Product Name: Collector Type:	Heliocol Stationary Pool Collect	or	Product Mo Application	del: s:	Helioco	ol 40 _{rature}	
Canadian Supplier:	Sunsolar Energy	Technology	(SET)	Manufacturer:		Heliocol Israel	
Warranty & Limitations:	12 Year Warranty		Date First L	isted in Directory	:	Mar-07	
COLLECTOR SPECIFICATIO	NS						
Dimensions (mm): Gross Area (m ²): Net Aperture Area (m ²): Weight (dry) (kg): Weight (filled) (kg): Fluid Capacity (litres): Maximum Operating Temp Maximum Operating Press Acceptable Flow Rates (l/m Ideal Flow Rate (l/m): Heat Transfer Fluids:	height width 3,226 1,172 3.8 3.8 9 16 12 12 erature (°C): 207 min 15.1 19.2 WATER, PROPYLENE C	depth 40 <i>max</i> 30.3 GLYCOL		С	ollector Di Not Supp	agram Ilied	
COLLECTOR MATERIALS Mounting Connections: Absorber Plate Material: Header Pipe Size (OD) (mi Header Pipe Material: Plumbing Connection Meth INDEPENDENT TESTING/CE Name of Testing Authority: Standard Tested to: Date of Testing or Certifica Certified to Standard (yes/i	GATOR CL POLYPRO m): nod: RTIFICATION tion: no):	AMPS AND/OR Z PYLENE Canadian Star	ZBARS		Other Standa	ards	
PERFORMANCE DATA	Note: This	section is only cor	mpleted if su	oplier has submitt	ted independ	ent test results	
Test Flow Rate (I/min): Efficiency Curve (W/m ² -°C) Y Intercept [F _R (ta)]: Slope of efficiency curve: [Incident Angle Modifier 30° 45° Power Rating kW/m ² : UNGLAZED COLLECTOR PE Wind Speed 0.0 m/s kWh/day Performance Rating done for S	$F_{R}U_{L}$]: 60° kW/Collect RFORMANCE RATING 2.5 m/s 5.0 m/s Standard Day with a $\triangle T$ c	or:		Independent	t Test Resi	ults Not Supplied	3
MANUFACTURER'S COMME	NTS						

Product Name: Collector Type:	Helioco Stationary P) pol Collecto	or	Product Mo Application	odel: s: I	Heliocol 50 Low Temperature	
Canadian Supplier:	Sunsolar	Energy	Technology	(SET)	Manufacturer:	Heliocol Israel	
Warranty & Limitations:	12 Year War	anty		Date First L	isted in Directory:	: Mar-07	
COLLECTOR SPECIFICATIO	NS						
Dimensions (mm): Gross Area (m ²): Net Aperture Area (m ²): Weight (dry) (kg): Weight (filled) (kg): Fluid Capacity (litres): Maximum Operating Temp Maximum Operating Press	height width depth : (mm): 3,835 1,168 51 (m ²): 4.5 5 e Area (m ²): 4.5 5) (kg): 11 5 od) (kg): 18 Collector Diagra city (litres): 14 Not Supplied Operating Temperature (°C): 552 Not Supplied min max Flow Bates (l/min): 18.0 37.0						
Ideal Flow Rate (I/m): Heat Transfer Fluids:	WATER, PRO	18.6 DPYLENE G	GLYCOL				
COLLECTOR MATERIALS Mounting Connections: Absorber Plate Material: Header Pipe Size (OD) (m Header Pipe Material: Plumbing Connection Meth	m): nod:	GATOR CL POLYPROI	AMPS AND/OR 2 PYLENE	L			
INDEPENDENT TESTING/CE Name of Testing Authority Standard Tested to: Date of Testing or Certifica Certified to Standard (yes/	RTIFICATION		Canadian Stan	dards	(Other Standards	
PERFORMANCE DATA Test Fluid:		Note: This s	section is only cor	mpleted if su	ıpplier has submitt	ted independent test results	
Test Flow Rate (l/min): Efficiency Curve (W/m ² -°C) Y Intercept [$F_R(ta)$]: Slope of efficiency curve: [Incident Angle Modifier	F _R U _L]:						
Power Rating kW/m ² :	60	kW/Collecto	or:		Independent	Test Results Not Supplied	
UNGLAZED COLLECTOR PE		RATING					
Wind Speed 0.0 m/s kWh/day	2.5 m/s Standard Day v	5.0 m/s ⁄ith a ⊿ T o	f 5° C				
MANUFACTURER'S COMME	NTS						

4. Directory of Packaged Solar DHW Systems

Listing of Packaged Solar DHW Systems

The following listing is for packaged solar domestic hot water systems that have submitted applications to NRCan for support to become certified to CSA–F379.1-2004.

			CAN/C	SA F379.1	Original		Data
Company	Product Name	Model Number	Date of Testing	Date of Certification	Listing Date	Revision Date	Sheet in Directory
CaREarth	-	-		pending			
Copperhill Alternate Energy Inc.	-	-		pending			
EnerWorks Inc.	Solar DHW Appliance	EWRA1	Nov-06	Nov-06	Mar-07	Mar-07	yes
EnerWorks Inc.	Solar DHW Appliance	EWRA2	Nov-06	Nov-06	Mar-07	Mar-07	yes
EnerWorks Inc.	Solar DHW Appliance	EWRA3	Nov-06	Nov-06	Mar-07	Mar-07	yes
EnerWorks Inc.	Solar DHW Appliance	EWRA4	Nov-06	Nov-06	Mar-07	Mar-07	yes
Globe Solar Energy Inc.	-	-		pending			
Solcan Ltd.	Solar DHW Package	DD64-60	-	-	Mar-07	Mar-07	yes
Solcan Ltd.	Solar DHW Package	SC64-60	May-00	-	Mar-07	Mar-07	yes
Solcan Ltd.	Solar DHW Package	TS32-60	-	-	Mar-07	Mar-07	yes
Thermomax Industries Ltd.	Thermomax	DF100-20		pending	Mar-07	Mar-07	yes
Thermomax Industries Ltd.	Thermomax	DF100-30		pending	Mar-07	Mar-07	yes
Trimline Design Centre Inc.	-	-		pending	Mar-07	Mar-07	yes

Listing of Supplier Contacts

Products tested to F379.1

Solcan Ltd. 126 Wynchwood Park London, ON Canada, N6G 1R7 <u>www.solcan.com</u>

Products Certified to F379.1

EnerWorks Inc. P.O. Box 9, 252 Hamilton Crescent Dorchester, ON Canada, N0L 1G0 www.enerworks.com

Products Submitted for Certification
CaREarth
701 Eagleson Rd, P.O. Box 45006
Kanata, ON
Canada, K2M 2G0
www.carearth.com
Copperhill Alternate Energy Inc.
2524 Asphodel 10th Line
Norwood, ON
Canada, K0L 2V0
www.copperhill.ca
Globe Solar Energy Inc.
136 Finch Ave. East
Toronto, ON
Canada, M2N 4R7
www.globesolarenergy.com
Thermomax Industries Ltd.
3181 Kingsley Street
Victoria, BC
Canada, V8P 4J5
www.solarthermal.com
Trimline Design Centre Inc.
6772 99 Street NW
Edmonton, AB
Canada, T6E 5B8
www.trimlinedesigncentre.com

Note: Only suppliers who have submitted their product for listing or are members of CanSIA are listed.

Summar	y of Key	Characteristics	of Packaged	Solar DHW	Systems
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Manufacturor	Manufacturer Brand Name		System Type		Solar Collect	or		System Power	Tank	Storage	Perfo (rmance F kWh/yeai	Rating r)	Warranty
Manufacturer		Number	System Type	Collector Name	Collector Manufacturer	Collector Type	No.	Rating (kW)	(litres)	Method	150 litres	225 litres	300 litres	(years)
EnerWorks Inc.	Solar DHW Appliance	EWRA1	closed loop	COL-4X8-TL- SG1-SD10	EnerWorks	glazed flat plate	1	1.6	113 - 273	-	-	-	-	5
EnerWorks Inc.	Solar DHW Appliance	EWRA2	closed loop	COL-4X8-TL- SG1-SD10	EnerWorks	glazed flat plate	2	3.2	273 - 365	-	-	-	-	5
EnerWorks Inc.	Solar DHW Appliance	EWRA3	closed loop	COL-4X8-TL- SG1-SD10	EnerWorks	glazed flat plate	3	4.8	365 - 454	-	-	-	-	5
EnerWorks Inc.	Solar DHW Appliance	EWRA4	closed loop	COL-4X8-TL- SG1-SD10	EnerWorks	glazed flat plate	4	6.4	454 - 545	-	-	-	-	5
Solcan Ltd.	Solar DHW Package	DD64-60	drain back	2100	Solcan	glazed flat plate	2	3.4	225	-	-	-	-	10
Solcan Ltd.	Solar DHW Package	SC64-60	closed loop	2100	Solcan	glazed flat plate	1	1.7	225	-	-	-	-	10
Solcan Ltd.	Solar DHW Package	TS32-60	thermosiphon	2101	Solcan	glazed flat plate	2	-	225	-	-	-	-	10
Thermomax Industries Ltd.	Thermomax	DF100-20	direct flow	DF100-20	Thermomax	evacuated tube	1	1.6	230 - 456	-	-	-	-	10
Thermomax Industries Ltd.	Thermomax	DF100-30	direct flow	DF100 -30	Thermomax	evacuated tube	1	2.4	230 - 456	-	-	-	-	10
Trimline Design Centre Inc.	-	-	-	-	-	glazed flat plate	-	-	-	-	-	-	-	-

Packaged Solar DHW System Data Sheets

Product Name:	Solar D	HW App	pliance		Model:	EWRA1	
System Type:	Closed loop			Co	ollector Type:	Glazed flat plate	
Canadian Supplier:	EnerWork	s Inc		Ν	Manufacturer:	EnerWorks Inc. _{Canada}	
Warranty:	5 yr full; labo	ur reimbursa	ble up to \$10	0 in 1st year		Date First Listed in Directory:	Mar-07
SYSTEM COMPO	NENT SPECI	FICATIONS	5				
Collectors (see sepa	arate Collector E	<u> Data Sheet)</u>					
Product Name:		Residential C	Collector				
Model #:		COL-4X8-TL-	SG1-SD10				
Collector Type:		Glazed flat p	late				
Manufacturer:	I	EnerWorks					
Number of collect	ctors:	1					
Net Aperture Are	ea (m²):	-					
Piping							
Material:	Copper, refrig	geration grad	le, flexible			System Diagram	
Size (mm):	9	9.5/7.2				Not Supplied	
Max Pipe Run (m	n): :	30					
Recommended 1 130	Femperature To <i>minimum</i>	lerances (°C) 150	: maximum				
Insulation:	3/8" ID x 3/8" from UV radia	wall thicknes ation	ss; must be p	protected			
Solar Storage Tank							
Tank Required (y	yes/no):	yes					
Storage Capacity	y (litres):	-					
Tank Included (y	res/no):	no					
Approved Tanks	(Manufacturer	and Model Nu	ımber)				
	Any CSA app EWRA4=454 t	roved tank; F to 545 L	Recommende	ed size: EWR	A1=113 to 273	3L; EWRA2=273 to 365L; EWRA3=	365 to 454L;
Pump							
Type of Pump:	I	Miniature ge:	ar pump, Flui	d-O-Tech MG	209, 6W, fixe	ed flow	
Power Source:	:	Standard AC	115V/60Hz				
Flow rate (litres/r	min)	1.1	minimum	1.1	maximum		
Power Rating		25	watts	115	volts		
Estimated Energ	y Consumption	(kWh/year):		75			
Heat Exchanger							
Description	External braz	ed plate, 316	Stainless St	eel plates wit	h pure coppe	er brazing	
CSA CERTIFICAT	ΓΙΟΝ						
Certified to CAN	/CSA-F379.1-88	3 (R2004): So	lar Domestic	Hot Water Sys	stems		
Certification Test	t#	Bodycote #0	5-08-9129; CS	SA-Int Master	Contract #23	2023, Cert.#1721596	
Date of Certificat	lion	08-Nov-06					
PERFORMANCE Total System Po	DATA wer Rating (kW	'):	Note: This se	ction is only c	ompleted if su	pplier has submitted independent te	st results
Water Storage N	lethod:		Solar Preh	eat	Solar Plus	Solar Only	
Net Annual Solar	r Energy Contril	oution (kWh/y	ear)				
Daily Hot W	ater Load	150 litres/day	225 litres/day	300 litres/day			
kWh/y	/ear				I		
MANUFACTURER'S Micro-flow, clos	S COMMENTS sed loop glycol	I system with	n patented co	llector overh	eat protection	n device and automatic heat exch	anger cleaning valve

Product Name:	Solar D	HW App	oliance	Cr	Model:	EWRA2 Glazed flat plate	
Canadian Supplier:	EnerWor	ks Inc		N	Anufacturer:	EnerWorks Inc. Canada	
Warranty:	5 yr full; labo	our reimbursa	ble up to \$10)0 in 1st year		Date First Listed in Directory:	Mar-07
SYSTEM COMPO	NENT SPEC	(IFICATIONS	j	ſ			
Product Name: Model #: Collector Type: Manufacturer: Number of collec Net Aperture Are	otors: ea (m²):	Residential C COL-4X8-TL-3 Glazed flat pl EnerWorks 2 -	;ollector SG1-SD10 late				
<u>Piping</u>	. ,					Quetere Discuss	
Material: Size (mm): Max Pipe Run (m Recommended 1 130 Insulation:	Copper, refri n): Temperature T <i>minimum</i> 3/8" ID x 3/8' from UV rad	geration grad 9.5/7.2 30 olerances (°C): 150 " wall thicknes iation	e, flexible : maximum ss; must be p	protected		System Diagram Not Supplied	
Solar Storage Tank Tank Required (y Storage Capacity Tank Included (y Approved Tanks	yes/no): y (litres): res/no): (Manufacturer	yes no and Model Nu	ımber)		4 112 10 27	01 - EWDAQ 072 +0 2651 - EWDAQ-(205 4- 4541 -
	Any CSA app EWRA4=454	to 545 L	lecommenae	d size: Ewr	1=113 to 27	3L; EWHA2=273 to 365L; EWHA3=3	365 to 454L;
Pump							
Type of Pump: Power Source:		Miniature gea	ar pump, Flui 115V/60Hz	d-O-Tech MG	209, 6W, fixe	d flow	
Flow rate (litres/r Power Rating Estimated Energ	nin) Jy Consumptio [,]	1.1 25 n (kWh/year):	minimum watts	1.1 115 75	maximum volts		
Heat Exchanger Description	External bra	zed plate, 316	Stainless St	eel plates wit	h pure coppe	er brazing	
CSA CERTIFICAT Certified to CAN Certification Test Date of Certificat	F ION /CSA-F379.1-& t # tion	38 (R2004): Soi Bodycote #05 08-Nov-06	lar Domestic I 5-08-9129; CS	Hot Water Sys SA-Int Master	tems Contract #23	32023, Cert.#1721596	
PERFORMANCE Total System Po	DATA ower Rating (kV	V):	Note: This se	ction is only co	ompleted if su	pplier has submitted independent tes	at results
Water Storage N	lethod:	[Solar Preh	eat [Solar Plus	Solar Only	
Net Annual Sola	r Energy Contr	ibution (kWh/y	ear)				
Daily Hot W	ater Load	150 litres/day	225 litres/day	300 litres/day			
	Cai	LL	I	LI	l		
MANUFACTURER'S Micro-flow, clos	COMMENTS	ol system with	patented co	llector overhe	eat protection	n device and automatic heat excha	nger cleaning valve

Product Name: System Type:	Solar D	HW Ap	oliance	Co	Model: bllector Type:	EWRA3 Glazed flat plate	
Canadian Supplier:	EnerWor	ks Inc		Ν	Manufacturer:	EnerWorks Inc. Canada	
Warranty:	5 yr full; labo	our reimbursa	ble up to \$10	0 in 1st year		Date First Listed in Directory:	Mar-07
SYSTEM COMPC	NENT SPEC	IFICATIONS	i				
Product Name: Model #: Collector Type: Manufacturer: Number of collect Net Aperture Are	ctors: ea (m²):	Residential C COL-4X8-TL- Glazed flat p EnerWorks 3 -	Collector SG1-SD10 late				
Piping Material: Size (mm): Max Pipe Run (n Recommended 130 Insulation:	Copper, refri n): Temperature To minimum 3/8" ID x 3/8' from UV radi	geration grad 9.5/7.2 30 blerances (°C) 150 ' wall thicknes ation	le, flexible : maximum ss; must be p	protected		System Diagram Not Supplied	
Solar Storage Tank Tank Required (Storage Capacit Tank Included (y Approved Tanks	yes/no): y (litres): /es/no): (Manufacturer Any CSA app EWRA4=454	yes no and Model Nu proved tank; F to 545 L	imber) Recommende	ed size: EWR/	A1=113 to 273	3L; EWRA2=273 to 365L; EWRA3=	:365 to 454L;
Pump							
Type of Pump: Power Source: Flow rate (litres/r Power Rating Estimated Energ	min) yy Consumptior	Miniature gea Standard AC 1.1 25 n (kWh/year):	ar pump, Flui 115V/60Hz minimum watts	id-O-Tech MG 1.1 115 75	209, 6W, fixe maximum volts	ed flow	
Heat Exchanger Description	External braz	zed plate, 316	Stainless St	eel plates wit	h pure coppe	er brazing	
CSA CERTIFICAT Certified to CAN Certification Tes Date of Certificat	FION //CSA-F379.1-8 t # tion	8 (R2004): So Bodycote #0 08-Nov-06	lar Domestic 5-08-9129; CS	Hot Water Sys SA-Int Master	tems Contract #23	2023, Cert.#1721596	
PERFORMANCE Total System Po	DATA ower Rating (kV	V):	Note: This se	ection is only c	ompleted if su	pplier has submitted independent te	est results
Water Storage N	lethod:	1	Solar Preh	eat	Solar Plus	Solar Only	
Net Annual Sola	r Energy Contri	bution (kWh/y	ear)		r		
Daily Hot W	ater Load	150 litres/day	225 litres/day	300 litres/day			
kWh/y	/ear						
MANUFACTURER'S Micro-flow, clos	6 COMMENTS sed loop glyco	ol system with	patented co	llector overhe	eat protection	n device and automatic heat exch	anger cleaning valve

Product Name: Svstem Type:	Solar D	HW Ap	pliance	Co	Model: bllector Type:	EWRA4 Glazed flat plate	
Canadian Supplier:	EnerWorl	ks Inc		Ν	Manufacturer:	EnerWorks Inc. Canada	
Warranty:	5 yr full; labc	our reimbursa	ble up to \$10	0 in 1st year		Date First Listed in Directory:	Mar-07
SYSTEM COMPO	NENT SPEC	IFICATIONS	;				
Product Name: Model #: Collector Type: Manufacturer: Number of collect Net Aperture Are	otors: ea (m²):	Residential C COL-4X8-TL- Glazed flat p EnerWorks 4	Collector SG1-SD10 late				
Piping Material: Size (mm): Max Pipe Run (n	Copper, refri	geration grad 9.5/7.2 30	le, flexible			System Diagram Not Supplied	
Recommended [–] 130 Insulation:	Femperature To minimum 3/8" ID x 3/8" from UV radi	olerances (°C) 150 ' wall thicknes ation	: maximum ss; must be p	protected			
Solar Storage Tank Tank Required (y Storage Capacity Tank Included (y Approved Tanks	yes/no): y (litres): res/no): (Manufacturer Any CSA app FWRA4=454	yes no and Model Nu proved tank; F	ımber) Recommende	d size: EWR	A1=113 to 273	BL; EWRA2=273 to 365L; EWRA3=	-365 to 454L;
Pump	201144-454	10 343 L					
Type of Pump: Power Source: Flow rate (litres/r Power Rating Estimated Energ	min) gy Consumptior	Miniature ge Standard AC 1.1 25 n (kWh/year):	ar pump, Flui 115V/60Hz minimum watts	d-O-Tech MG 1.1 115 75	209, 6W, fixe maximum volts	ed flow	
Heat Exchanger Description	External bra:	zed plate, 316	Stainless St	eel plates wit	h pure coppe	er brazing	
CSA CERTIFICAT Certified to CAN Certification Tes Date of Certificat	Г ION //CSA-F379.1-8 t # tion	8 (R2004): So Bodycote #09 08-Nov-06	lar Domestic : 5-08-9129; CS	Hot Water Sys SA-Int Master	stems Contract #23	2023, Cert.#1721596	
PERFORMANCE Total System Po	DATA ower Rating (kV	V):	Note: This se	ction is only c	ompleted if su	pplier has submitted independent te	est results
Water Storage M	lethod:	ļ	Solar Preh	eat	Solar Plus	Solar Only	
Net Annual Sola	r Energy Contri	bution (kWh/y	ear)		r		
Daily Hot W	ater Load	150 litres/day	225 litres/day	300 litres/day			
kWh/y	/ear				l		
MANUFACTURER'S Micro-flow, clos	COMMENTS	ol system with	n patented co	llector overhe	eat protection	n device and automatic heat exch	anger cleaning valve

Product Name:	Solar D	HW pad	ckage		Model:	SC64-60	
System Type:	closed loop			Co	llector Type:	glazed flat plate	
Canadian Supplier:	Solcan L	td.		N	lanufacturer:	Solcan Ltd _{Canada}	
Warranty:	ten years ful	l warranty on	collectors			Date First Listed in Directory:	Mar-07
SYSTEM COMPO	NENT SPEC	FICATIONS	5				
Collectors (see sepa	arate Collector	<u>Data Sheet)</u>					
Product Name:		Solcan					
Model #:		2101					
Collector Type:		glazed flat p	ate				
Manufacturer:		Solcan					
Number of collect	ctors:	2					
Net Aperture Are	ea (m²):	5.45					
Piping							
Material:		copper				System Diagram	
Size (mm):		13				Not Supplied	
Max Pipe Run (m	n):	20					
Recommended	Temperature T	olerances (°C)	: mavimum				
Insulation:	fibreglass is	recommende	ed, 0.6 RSI, 40	mm			
Solar Storage Tank Tank Required (y Storage Capacity Tank Included (y Approved Tanks	yes/no): y (litres): res/no): (Manufacturer Advance Me	225 and Model Nu talpres JASS	umber) 60P stainless	steel tank wi	th stainless	steel internal HX	
Pump							
Type of Pump:		Grundfos UF	915-42 B5				
Power Source:		AC powerline	е				
Flow rate (litres/r	min)	1	minimum	2.5	maximum		
Power Rating		70	watts	120	volts		
Estimated Energ	y Consumption	n (kWh/year):		140			
<u>Heat Exchanger</u> Description	internal heat	exchanger					
CSA CERTIFICAT Certified to CAN Certification Test Date of Certificat	FION //CSA-F379.1-8 t # tion	38 (R2004): So 00-08-9042-S 18-May-00	olar Domestic H Solcan	Hot Water Sys	tems		
PERFORMANCE Total System Po	DATA wer Rating (kV	V):	Note: This se	ction is only co	ompleted if su	pplier has submitted independent tes	st results
Water Storage N	lethod:		Solar Prehe	eat [Solar Plus	Solar Only	
Net Annual Solar	r Energy Contr	ibution (kWh/y	rear)				
Daily Hot W	ater Load	150 litres/day	225 litres/day	300 litres/day			
kWh/y	/ear						
MANUFACTURER'S Package is avai	COMMENTS	er sizes of st	ainless steel t	anks or with	glass-lined t	ank with external stainless steel p	late HX.

Product Name:	Solar D	HW pac	kage		Model:	TS32-60	
Canadian Supplier:	· Solcan Ltd		· · · · ·	Manufacturer:	Solcan Ltd		
Warranty:	/arranty: ten years full warranty on collectors					Canada Date First Listed in Directory:	Mar-07
SYSTEM COMPO Collectors (see sepa Product Name: Model #: Collector Type:	NENT SPEC	CIFICATIONS Data Sheet) Solcan 2100 glazed flat pl	ate				
Number of collec	tors:	Solcan Ltd. 1 2.73					
Net Aperture Are	a (m):	2.73					
Material: Size (mm): Max Pipe Run (m Recommended T 0 Insulation:	n): Femperature T <i>minimum</i> Nomalock is	copper 13 n/a olerances (°C) 90 recommende	: maximum ed, 0.3 RSI, 4	10 mm		System Diagram Not Supplied	
Solar Storage Tank Tank Required (y Storage Capacity Tank Included (y Approved Tanks	ves/no): v (litres): es/no): (Manufacturen Advance Me	225 and Model Nu talpres stainle	mber) ess steel tan	k.			
Pump							
Type of Pump: Power Source: Flow rate (litres/r Power Rating Estimated Energ	nin) y Consumptio	n/a n/a n/a n/a n (kWh/year):	minimum watts	n/a n/a n/a	maximum volts		
Heat Exchanger Description	n/a						
CSA CERTIFICAT Certified to CAN/ Certification Test Date of Certificat	TION /CSA-F379.1-8 : # ion	38 (R2004): So 00-08-9042-S	lar Domestic olcan	Hot Water S	ystems		
PERFORMANCE Total System Por	DATA wer Rating (kV	V):	Note: This s	ection is only	completed if su	pplier has submitted independent tes	st results
Water Storage M	lethod:		Solar Pret	neat	Solar Plus	Solar Only	
Net Annual Solar	Energy Contr	ibution (kWh/y 150	ear) 225	300	Т		
Daily Hot W kWh/y	ater Load rear	litres/day	litres/day	litres/day	-		
							
MANUFACTURER'S	COMMENTS						

Product Name: System Type:	Solar D	HW pac	kage	Cc	Model: llector Type:	DD64-60 glazed flat plate	
Canadian Supplier:	Solcan L'	td		N	lanufacturer:	Solcan Ltd ^{Canada}	
Warranty:	ten years ful	I warranty on <i>i</i>	collectors			Date First Listed in Directory:	Mar-07
SYSTEM COMPO Collectors (see sepa Product Name: Model #: Collector Type: Manufacturer: Number of collec Net Aperture Are	NENT SPEC rate Collector	FICATIONS <u>Data Sheet</u>) Solcan 2101 glazed flat pla Solcan 2 5.45	ate				
Piping Material: Size (mm): Max Pipe Run (m Recommended 1 -40 Insulation:	ı): Γemperature T <i>minimum</i> fibreglass is	copper 13 20 folerances (°C): 165 recommende	: maximum d, 0.6 RSI, 40) mm		System Diagram Not Supplied	
Solar Storage Tank Tank Required (y Storage Capacity Tank Included (y Approved Tanks	/es/no): / (litres): /es/no): (Manufacturei Advance Me drainback ta	225 and Model Nu talpres JASS (ink.	mber) 6 0P stainless	s steel tank wi	ith stainless	steel internal HX for solar storage p	olus 40 litre
Pump							
Type of Pump: Power Source: Flow rate (litres/r Power Rating Estimated Energ	nin) 3y Consumptio	Grundfos UP2 AC powerline 1 120 n (kWh/year):	26-96BF minimum watts	2.5 120 240	maximum volts		
Heat Exchanger Description	available wit	th internal or e	xternal heat	exchanger			
CSA CERTIFICAT Certified to CAN/ Certification Test Date of Certificat	' ION <i>'CSA-F379.1-&</i> t # tion	38 (R2004): Sol	'ar Domestic F	Hot Water Sys	tems		
PERFORMANCE	DATA wer Rating (k)	N):	Note: This sea	ction is only cc	ompleted if su	upplier has submitted independent test	results
Water Storage M	lethod:	[Solar Prehe	eat [Solar Plus	Solar Only	
Net Annual Solar	r Energy Contr	ibution (kWh/yr	ear)	,			
Daily Hot W	ater Load	150 litres/day	225 litres/day	300 litres/day	ł		
KWn/y	ear	<u> </u>		<u>ــــــا</u>			
MANUFACTURER'S Package is avai	COMMENTS	er sizes of sta	inless steel (or glass-lined	l tanks.		

Product Name: System Type:	Thermomax coaxial copper direct flow		(Model: Collector Type:	DF 100-20 Evacuated Tube		
Canadian Supplier:	Thermomax industries Ltd			Manufacturer:	Thermomax ик		
Warranty:	10 years					Date First Listed in Directory:	Mar-07
SYSTEM COMPO	NENT SPEC	CIFICATIONS					
Product Name:		Thermomax					
Model #:		DF 100-20					
Collector Type:		evacuated tu	be				
Manufacturer:		Thermomax					
Number of collec	clors:	1					
Net Aperture Are	ea (m⁻):	2.153					
<u>Piping</u>		_				System Diagram	
Material:		Copper				Not Supplied	
Size (mm):		1/2"-3/4"+ ID	system depe	ndent			
Max Pipe Run (m	1): 	100					
Recommended I	emperature I <i>minimum</i>	olerances (°C): 110	maximum				
Insulation:	Insulation: High temperature boiler run insulation e.g. Armaflex		e.g.				
<u>Solar Storage Tank</u>							
Tank Required (y	/es/no):						
Storage Capacity Tank Included (y	Storage Capacity (litres): 230, 304, 456 Tank Included (yes/no):						
Approved Tanks	(Manufacture) SST 60, 80,	r and Model Nu 120, Rheem 80	mber) / 120, others.				
Pump							
Type of Pump:		Wilo Star 16L	J 15, Grundfo	ss, Taco, v	arious		
Power Source:		AC					
Flow rate (litres/r	nin)	1.6	minimum	5	8 maximum		
Power Rating		80	watts	11	5 volts		
Estimated Energ	y Consumptio	n (kWh/year):					
Heat Exchanger Description	various.						
CSA CERTIFICAT Certified to CAN/ Certification Test Date of Certificat	FION /CSA-F379.1-& t # ion	88 (R2004): Sol	lar Domestic I	Hot Water S	ystems		
PERFORMANCE Total System Por	DATA wer Rating (k\	V):	Note: This se	ction is only	completed if su	pplier has submitted independent te	est results
Water Storage M	lethod:	[Solar Prehe	eat	Solar Plus	Solar Only	
Net Annual Solar	r Energy Contr	ibution (kWh/ye	ear)				
Daily Hot W	ater Load	150 litres/day	225 litres/day	300 litres/day			
kWh/y	vear						
	000000000000						
MANUFACIURER'S	COMMENTS						

Product Name: System Type:	Thermomax coaxial copper direct flow			Model: Collector Type:	DF 100-30 Evacuated Tube		
Canadian Supplier:	Thermomax industries Ltd			Manufacturer:	Thermomax ик		
Warranty:	Warranty: 10 years				Date First Listed in Directory:	Mar-07	
SYSTEM COMPO	NENT SPEC	Data Sheet)					
Product Name:		Thermomax					
Model #:		DF 100-30					
Collector Type:		evacuated tube					
Manufacturer:		Thermomax					
Number of collec	tors:	1					
Net Aperture Are	ea (m²):	3.228					
<u>Piping</u>						System Diagram	
Material:		Copper				System Diagram	
Size (mm):		1/2"-3/4"+ ID	system depe	ndent		Not Supplied	
Max Pipe Run (m	ו):	100					
Recommended T	Femperature T	olerances (°C):	maximum				
Insulation: High temperature boiler run insulation e.g. Armaflex		e.g.					
Solar Storage Tank							
Tank Required (y	/es/no):						
Storage Capacity Tank Included (y	Storage Capacity (litres): 230, 304, 456 Tank Included (yes/no):						
Approved Tanks	(Manufacture) SST 60, 80,	⁻ and Model Nu 120, Rheem 80	mber) / 120, others.				
Pump							
Type of Pump:		Wilo Star 16L	I 15, Grundfo	ss, Taco, v	various		
Power Source:		AC					
Flow rate (litres/r	min)	1.6	minimum	Ę	58 maximum		
Power Rating		80	watts	11	5 volts		
Estimated Energ	y Consumptio	n (kWh/year):					
Heat Exchanger Description	various.						
CSA CERTIFICAT Certified to CAN/ Certification Test Date of Certificat	FION /CSA-F379.1-& t # ion	38 (R2004): Sol	lar Domestic F	Hot Water S	<i>Systems</i>		
PERFORMANCE Total System Por	DATA wer Rating (kN	V):	Note: This see	ction is only	completed if su	pplier has submitted independent te	est results
Water Storage M	lethod:	[Solar Prehe	eat	Solar Plus	Solar Only	
Net Annual Solar	r Energy Contr	ibution (kWh/ye	ear)		_		
Daily Hot W	ater Load	150 litres/day	225 litres/day	300 litres/day			
kWh/y	vear						
MANUFACTURER'S	5 COMMENTS	;					

Product Name:	-				Model:	-	
System Type:	Medium temp	perature (serv	vice hot wate	ər) Ca	ollector Type:	Glazed Flat Plate	
Canadian Supplier:	Trimline [Design Ce	entre Inc.	Ν	Vanufacturer:	Trimline Design Centre Inc. Canada	
Warranty:	-					Date First Listed in Directory:	Mar-07
SYSTEM COMPO	NENT SPECI	FICATIONS	5				
Product Name:	<u>1410 001100101 -</u>	-					
Model #:		-					
Collector Type:	(Glazed Flate	Plate				
Manufacturer:		-					
Number of collect	tors:	-					
Net Aperture Are	a (m ²):	-					
Distan	- ()						
<u>Piping</u> Motorial:						System Diagram	
	-	-				Not Supplied	
Size (mm).	-	-					
Max Pipe Run (m	1): - 	- ·					
Recommended I	emperature Io	lerances (°C)	: mavimum				
- Insulation:	-	•	Παλιπιαπ				
	-						
Solar Storage Tank							
Tank Required (y	/es/no):	-					
Storage Capacity	/ (litres):	-					
Tank Included (ye	es/no):	-					
Approved Tanks	(Manufacturer a	and Model Nu	imber)		L		
	-						
D							
Pump							
Type of Pump:	-	-					
Power Source:	• 、	-					
Flow rate (litres/m	nin) -	-	minimum	-	maximum		
Power Rating	- -	•	watts	-	volts		
Estimated Energy	y Consumption	(kWh/year):		-			
Heat Exchanger Description	-			-			
•							
CSA CERTIFICAT	ION						
Certified to CAN/	CSA-F379.1-88	3 (R2004): So	lar Domestic	Hot Water Sys	stems		
Certification Test	. #						
Date of Certificati	ion						
PERFORMANCE I Total System Pov	DATA wer Rating (kW	/):	Note: This se	ection is only c	completed if su	pplier has submitted independent test resu	ılts
Water Storage M	lethod:		🗌 Solar Preł	neat	Solar Plus	Solar Only	
Net Annual Solar	r Energy Contrik	bution (kWh/y	ear)		_	-	
Daily Hot Wa	ater Load	150 litres/day	225 litres/day	300 litres/day]		
kWh/y	vear	-	-	-	1		
,	I			<u></u>	1		
MANUFACTURER'S	COMMENTS						
	-						

Appendix A: Conversion Factors

Metric	Imperial
1 kg	2.20 lb
1 m	3.281 ft
1 cm	0.394 in
1 m ²	10.76 sq ft.
1 J	277.77 Watt-hours
1 L	0.0353 cubic ft
1 L	0.264 gal (US liquid)
1 L	0.22 gal (UK)
°C = (°F-32)X(5/9)	°F = °CX(9/5)+32
1 kg of water	1 liter

Appendix B: Comparison of Key Features of CSA F378 to International Standards

CSA-F378 (Liquid & Air Collectors)	SRCC 100 (Liquid & Air Collectors)	ISO 9806-1, -2, -3 (Liquid Collectors)	EN 12975-12 (Liquid Collectors)
		Three (3) collectors required for full test sequence.	
6.2.1 Liquid collector static pressure leakage:15 minute duration;1.5 times specified maximum operating pressure.	 4.2 Pressure test, liquid collector: 15 minute duration; 160 psig for street pressure collectors; different pressures for other types. 	 5.1 Internal pressure, liquid collector (metal absorber): 10 minute duration; 1.5 times specified maximum operating pressure. 5.2 Internal pressure, liquid collector (organic absorber): 1 hour duration; 1.5 times specified maximum operating pressure; Solar exposure & high ambient temp. Required. 	 5.2.1 Internal pressure (metal absorber): 15 minute duration; 1.5x specified maximum operating pressure. 5.2.2 Internal pressure (organic absorber): 1 hour duration; 1.5x specified maximum operating pressure; Solar exposure & high ambient temp. required.
6.2.2 Air collector static pressure leakage: 5 test pressures up to 750 kPa or to specified maximum operating pressure, for 5 minutes each	4.2 Pressure test, air collector: Apply pressure of 125 Pa for one hour, monitor air volume required to maintain it.	5.3 Internal pressure, air collector (metal absorber): 1.2 times specified maximum operating ΔP for 10 min. 5.4 Internal pressure, air collector (organic absorber): Test temperature as determined by high temperature resistance test (6.); 1.2 times specified maximum operating ΔP for 1 hour.	
5.5.2.4 Solar collector shall have a pressure drop of not greater than one-half of the mfrs. recommended working pressure at manufacturer's recommended flow rate.	4.2.4 Pressure Drop test (△P vs. flow): Measure at points from minimum to maximum design flow rates, including ASHRAE standard flow rate.	12. Pressure Drop test: Measure at points which span range likely to be used. If flow rate is not specified by the supplier, test at five equally spaced measurements over range of 0.005 - 0.03 kg/s/m ² of collector area. For unglazed collectors use 0.02 - 0.1 kg/s/m ² of collector area.	6.1.8 Pressure Drop test: Measure at points which span range likely to be used. If flow rate is not specified by the supplier, test at five equally spaced measurements over range of 0.005 - 0.03 kg/s/m ² of collector area. For unglazed collectors use 0.02 - 0.1 kg/s/m ² of collector area.
		 6. High Temperature Resistance Test: 3 classes: 950-1049 W/m² at 25 - 29.9 °C ambient; 1050-1200 W/m² at 30 - 40 °C ambient; or >1200 W/m² at >40 °C ambient. Monitor collector temperature. One-hour solar exposure (dry), or use a hot fluid loop. 	5.3 High Temperature Resistance Test: 1 hour of solar exposure >1000 W/m ² at 20 - 40 ℃ ambient air temperature. Monitor collector temperature.
6.2.3 Outdoor no-flow exposure test:	4.3 Exposure test:	7. Exposure Test:	5.4 Exposure test:
30 days Start wet One 30-minute rain penetration spray at start;	30 days Dry start	30 daysDry start10. Rain Penetration Test:Tilt collector at 45° (or manufacturer's specified tilt angle),spray for 4 hours. Collector is weighed before and afterspray, or visual inspection is made for water penetration.	30 days Dry start 5.7 Rain Penetration Test (glazed collectors only): Tilt collector at 30° (or manufacturer's specified tilt angle); spray for 4 hours. Collector is weighed before (3 times) & after spray, or visual inspection is made for water penetration.
	3 water sprays (5 minutes) after 20 exposure days;	Two water sprays, 15 minutes each (section 8.);	5.5 Two water sprays (15 minutes each);
1 cold fill, 5 minute duration;	1 cold fill (5 minutes) after 20 exposure days;	1 cold fill, 5 minutes (section 9.);	5.6 Two cold fills, 5 minutes;
17 MJ/m² per day; 1/2 hour period >950 + 5(30-Ta) W/m²	18 MJ/m ² per day; 4 hour period >950 W/m ² > 27 ^e C ambient.	14, 18 or 20 MJ/m ² per day (3 classes); 30 hours exposure at one of 3 climate classes specified.	14 MJ/m² per day; 30 hours exposure >850 W/m² at >10 °C ambient.

Appendix C: Canadian Standards Applicable to Solar DHW System Components

SDHWS Component	Applicable Standard
Solar Collectors	CSA F378-87 (with the exception of Clause 4 and Clause
	6.1)
Air vents	None
Piping/adapters	None
Globe valves	None
Pumps	CSA C22.2 No. 108
Strainers	None
Air eliminators	None
Expansion tanks	None
Gate valves	None
Drain valves	CSA B125
Check valves	(soft seating required)
Pressure relief valves	CGA CAN1-4.4 or ANSI Z21.22
Differential thermostats	CSA C22.2 No.24
Storage tanks	CSA C309
Heat exchangers	F379.1 clause 7.4
Pressure and temperature relief valves	CGA CAN1-4.4 or ANSI Z21.22
Backflow preventer	CSA B64 Series
Mixing or tempering valve	None
Pressure gauge	None
Thermometer	None
Solenoid valves	CSA C22.2 No. 139
Water hammer arrestors	None
Plumbing fittings	CSA B125
Vacuum breakers	CSA B64 Series
Controls	CSA C22.2 No. 24

Appendix D: CanSIA Guidelines for the Inspection of Packaged SDHW Systems

Instructions to the Professional Engineer Providing Independent Assessment of Non-Packaged Solar Domestic Hot Water Heating (SDHW) Systems

Date:	November 3, 2005
Equipment:	Non-Packaged (custom) Solar Domestic Hot Water Heating Systems
References:	CSA F379.1-88 Solar Domestic Hot Water Systems (Liquid-to-Liquid Heat Transfer
	CSA F379.2- M89 Seasonal Use Solar Domestic Hot Water Systems
	CSA International Technical Information Letter (TIL) MSE-45 – Interim Certification Requirements for Packaged Solar Domestic Hot Water (SDHW) Systems
Purpose:	To provide the equivalent of product certification for Solar Domestic Hot Water Heating (SDHW) Systems that do not fall within the scope of CSA F379.1 and TIL No. MSE-45.

Background

Solar Domestic Hot Water Heating (SDHW) Systems may be pre-engineered to comply with the above reference documents and are known as "packaged systems". These standards offer the requirements for both factory-packaged and add-on packaged systems as proposed by a manufacturer for all subcomponents and materials of a given SDHW design.

Packaged systems are intended to provide a supply of heating energy to a domestic hot water storage tank, through the use of solar thermal collectors, liquid heat transfer media (with or without antifreeze protection), heat transfer exchanger between the heat transfer media and potable water, appropriate plumbing and electrical controls to affect this transfer.

A category of non-packaged or "custom systems" are available where captured heat energy may be directed to multiple sources of thermal energy absorbers such as hot tubs, swimming pools and saunas, in addition to providing domestic hot water. Although it may be possible to install a multiplicity of packaged systems, this is known to be an inefficient and expensive proposition.

Custom residential SDHW systems (which include commercial SDHW systems) do not fall under the jurisdiction of the above noted reference standards, creating a gap in the regulatory means for installing them. Municipal code enforcement personnel and industry do not have an effective means for bridging this gap.

This plan offers a solution to the problem of code and safety compliance for custom, non-packaged SDHW systems, by providing specific instructions to licensed Professional Engineers, regarding this issue. The intent of these requirements is to ensure that licensed engineers are aware of these requirements and to ensure that these requirements form part of the approved product plan from building departments.

Requirements

1. Licensed Professional Engineers will certify that the applicant custom-engineered Solar Domestic Hot Water (SDHW) System conforms with the intent of CSA International Technical Information Letter MSE-45 (or CSA F379.1-05 once it is published) and the intent of the requirements for SDHW systems in the National Plumbing Code of Canada.

2. The Licensed Engineer will apply sound engineering practices as intended by the above Reference Documents to ensure the public safety.

3. To affix to a copy of this document the Seal of a Licensed Professional Engineer, indicating that these requirements formed a part of the proposed SDHW design.

4. By affixing the above referenced Seal to this document, the Licensed Professional Engineer certifies that they have the technical competence to complete and certify the requirements contained herein.

Installer Requirements:

Installations may be completed by qualified installers certified by the Canadian Solar Industries Association (<u>www.cansia.ca</u>) or by persons who are not certified to industry standards. In the latter case, the professional engineer shall be called on to examine the final installation to ensure installation compliance with CAN/CSA-F383.

Appendix E: City of Ottawa Guidelines for the Approval for Installation of Packaged SDHW Systems

GUIDELINE: Solar Domestic Hot Water Heating Systems

Date: January 2007

Purpose: This guideline provides direction respecting the application and interpretation of building code requirements relating to solar domestic hot water heating systems.

Background

In the early 80's, the National Standards of Canada drafted four CSA standards providing the framework for the evaluation of active solar water heating systems. These standards included criteria for the durability and thermal performance of solar collectors, packaged solar water-heating systems (small pre-engineered factory designed systems intended for domestic use) and guidelines for the safe installation of the systems.

A packaged solar domestic hot water heating (SDHW) systems generally consists of a complete series of assembled components providing a supply of heating energy to a domestic hot water storage tank through the use of solar thermal collectors, heat transfer exchangers (utilizing liquid heat transfer media and potable water) and includes all appropriate plumbing and electrical controls to affect the transfer.

The Ontario Building Code (O. Reg. 403/97) refers to (SDHW) through reference in Part 7 of the Code specifying that SDHW systems must conform to the requirements of National Standards. This includes,

7.2.10.13 Solar Domestic Hot Water(1) Equipment for solar heating of potable water shall conform to CAN/CSA-F379.1,Solar Domestic Hot Water Systems (Liquid-to-Liquid Heat Transfer)

and

- 7.6.1.15. Solar Domestic Hot Water Systems
- (1) Systems for solar heating of potable water shall be installed in conformance with CAN/CSA-F383, Installation Code for Solar Domestic Hot Water Systems

It should be clearly noted that the prescriptive requirements of the Code by reference of the above standards provide an approval mechanism for "packaged systems" only.

From an industry perspective the regulatory requirements and referenced standards imposed a level of certification and testing that was not available. Manufacturers sited several shortcomings including the lack of an accredited testing body and testing program for the equipment, standards that are considered "out-dated" based on current technology and finally the absence of standards for systems that are not pre-packaged (such as non-standard or custom designed SDHW systems). Efforts have been made to resolve these barriers and to date progress has been made to address industry concerns.

CSA International has now commenced the creation of a certification program for SDHW systems through the development of current standards for solar equipment. To date, technical information letter (TIL) has been drafted as an interim certification standard and the National Solar Test Facility (operated by Bodycote Materials Testing Canada Inc.) is now accredited to facilitate system testing and certification. The TIL prescribes requirements for both factory packaged and *add-on packaged systems proposed by a manufacturer and for all subcomponents and materials. Custom systems however continue to be excluded from the certification framework creating a gap in the regulatory environment.

(*an add-on package refers to a unit intended to be used with or attached to an approved thermal storage device at the location of the final installation)

Ontario Regulation 349/06

In response to these and other concerns respecting energy-efficiency the Ministry of Municipal Affairs and Housing introduced a number of amendments to be included in the upcoming 2006 code cycle changes. A technical advisory committee comprising designers, builders, regulators, manufacturers, and energy suppliers and advocates reviewed the input from these consultations with recommendations drafted in the new Building Code.

As a result Ontario Regulation 349/06 was filed on June 28, 2006, providing in part some regulatory reform to SDHW. (amended wording in bolded font).

Division B, 7.2.10.13.Solar Domestic Hot Water

(1) Equipment **forming part of a packaged system** for solar heating of potable water shall conform to CAN/CSA-F379.1,

and

Division B, 7.6.1.15. Solar Domestic Hot Water Systems

- (1) Except as provided in Sentence (2), a system for solar heating of potable water shall be installed in accordance with good engineering practice.
- (2) **Packaged** systems for solar heating of potable water in residential occupancies shall be installed in conformance with CAN/CSA-F383.

The amendment attempts to clarify that the referenced standard for solar domestic hot water systems applies to packaged systems and furthermore allows for non-packaged systems to be designed in accordance with good engineering practice. However, the amendment fails to consider that the referenced standard applies to packaged systems only.

In an effort to provide clarity respecting the interpretation of this Code requirement while still exercising our due diligence as the principal authority for provisions of health and safety, the Branch is prepared to entertain the approval of (custom) non-packaged SDHW systems where third party professional involvement is undertaken.

Building Permit Requirements for Non Packaged SDHW Systems

1. A professional engineer licensed in the Province of Ontario shall certify that the proposed customengineered Solar Domestic Hot Water (SDHW) System conforms with the intent of CSA International Technical Information Letter (TIL) MSE-45 (as amended), the referenced standards applicable to SDHW components listed in Table 1 of the TIL and the intent of the requirements for SDHW systems in the Ontario Building Code. The building permit submission documents shall include a statement of compliance to the above reference documents.

2. Compliance of the installation to "good engineering practice" shall be confirmed by a professional engineer licensed in the Province of Ontario.

3. Installation of the system shall be undertaken by a qualified installer certified by the Canadian Solar Energy Industry Association (<u>www.cansia.ca</u>).

4. Packaged SDHW Systems in possession of a Certificate of Compliance with CSA International in accordance to Technical Information Letter (TIL) MSE-45 and CSA F379.1-88 Solar Domestic Hot Water Systems (Liquid-to-Liquid Heat Transfer) shall be exempt from clause 1 and 2 above.

Submission Requirements

Plans and specifications shall reflect the scope and installation of the system including;

- System components, documentation and specifications,
- Solar panel installation loading and attachment details,
- Plumbing schematic

References: CSA F379.1-88, Solar Domestic Hot Water Systems (Liquid to Liquid Heat Transfer)

CAN/CSA-F383, Installation Code for Solar Domestic Hot Water Systems

CSA International Technical Information Letter (TIL) MSE-45 – Interim Certification Requirements for Packaged Solar Domestic Hot Water (SDHW) Systems

Appendix F: Converting solar thermal collector area into installed capacity (m² to kW_{th})

A Report to the IEA SHC Executive Committee (September 2004)

Introduction

In the past, the installed base of solar thermal systems was measured in terms of collector area (square meters or square feet) rather than in terms of installed capacity to produce heat. As a consequence, solar thermal was not easily comparable with other (renewable) energy sources and thus was often left out of relevant statistics.

On 8th September 2004, representatives of the International Energy Agency's Solar Heating and Cooling Programme (IEA SHC) and several major solar thermal trade associations met in Gleisdorf, Austria (for a list of participating associations please see the end of this document). During this meeting, they discussed and agreed on an official recommendation for how to convert solar thermal collector area into installed capacity. Work is currently being done on defining also a suitable methodology to convert collector area into energy yield.

This recommendation was published jointly by IEA SHC and the involved associations who hope that this methodology will be used worldwide by all those who are concerned with solar thermal statistics.

The recommended conversion factor

For the purpose of solar thermal statistics, the installed capacity ($[kW_{th}] - Kilowatt$ thermal) shall be calculated by multiplying the aperture area of the solar collector area $[m^2]$ by the conversion factor 0.7 [kWth/m²].

This factor shall be used uniformly for unglazed collectors, flat plate collectors and evacuated tubular collectors.

Explanatory Note

The following notes explain the origins of the conversion factor of 0.7 kWth/m^2 .

3.1 Area

Three definitions of collector area exist:

- Absorber area = the area of absorber
- Aperture area = the area in which the solar radiation enters the collector
- Gross area = the area based on the outer dimensions of collector

All three areas are defined for glazed liquid heating collectors in the European standard EN12975-2 annex I. In EN12975-2 test reports all three areas are given. Efficiency coefficients in these reports are given based on both absorber area and aperture area. As there is a current trend towards using aperture area on certificates (e.g. DIN CERTCO Solar Keymark, SPF Factsheets) aperture area¹ shall be used.

¹ For unglazed collectors the three areas are the same

This implies:

- It is assumed that the existing statistics have counted aperture area.
- Aperture area should be counted in future statistics.
- Capacity conversion is done using the efficiency based on aperture area.

3.2 Collector classification

Proposed collector classification:

- 1. Unglazed flat plate collectors: All unglazed collectors (selective and non-selective, tubes, tube/fin, all-wetted, ...).
- 2. Glazed flat plate collectors: All glazed collectors of every type (single/double glazed, with/without convection suppression, selective and non-selective, tubes, tube/fin, all-wetted, air/gas...).
- 3. Evacuated tubular collectors: All types of evacuated tubular collectors (heat-pipe, direct, tube/fin, all-glass, ...).

3.3 Typical collector efficiency

The capacity conversion is based on the following simplified typical collector efficiencies (based on aperture area):

- 1. Unglazed flat plate collectors²: $\eta_0 = 0.90$, $a_1 = 20.0 \text{ W/(K*m^2)}$, $a_2 = 0.00 \text{ W/(K^{2*}m^2)}$
- 2. Glazed flat plate collectors³: $\eta_0 = 0.78$, $a_1 = 3.2 \text{ W/(K*m^2)}$, $a_2 = 0.015 \text{ W/(K^{2*m^2})}$
- 3. Evacuated tubular collectors⁴: $\eta_0 = 0,76, a_1 = 1,2 \text{ W}/(\text{K*m}^2), a_2 = 0,008 \text{ W}/(\text{K}^2 \text{*m}^2)$

3.4 Operation conditions

For the capacity conversion the following typical operation conditions are assumed⁵:

- 1. Unglazed flat plate collectors: $G = 1000 \text{ W/m}^2$, $T_a = 20 \text{ °C}$, $T_m = 30 \text{ °C}$, u = 1.5 m/s
- 2. Glazed flat plate collectors: $G = 1000 \text{ W/m^2}$, $T_a = 20 \text{ °C}$, $T_m = 50 \text{ °C}$
- 3. Evacuated tubular collectors: $G = 1000 \text{ W/m^2}$, $T_a = 20 \text{ °C}$, $T_m = 50 \text{ °C}$

3.5 "Installed" or "nominal" capacity: Capacity per m² of collector area

Definition 1:

"Nominal Capacity" of <u>unglazed</u> flat plate collectors is the instantaneous thermal output of the collector with the operation conditions:

- $G = 1000 \text{ W/m}^2$
- $T_a = 20 \ ^{\circ}C$
- $T_m = 30 \ ^{\circ}C$
- u = 1,5 m/s

Definition 2:

"Nominal Capacity" of <u>glazed</u> flat plate collectors and <u>evacuated tubular</u> collectors are the instantaneous thermal output of the collector with the operation conditions:

- $G = 1000 \text{ W/m}^2$
- $T_a = 20 \ ^{\circ}C$
- $T_m = 50 \ ^{\circ}C$

² Estimate

³ Average of last 10 EN tested flat plate collectors in SPF Collector Catalogue 2004

⁴ Average of last 10 EN tested ETC collectors in SPF Collector Catalogue 2004

⁵ These operation conditions are given in the power tables in the "conformity report" in the EN12975-2

Definition 3:

"Specific Nominal Capacity" of a collector is the nominal capacity of a collector divided by its aperture⁶ area.

Using the assumption above, the factor for converting – for each collector type – square meters of collector area to specific nominal capacity:

- 1. Unglazed flat plate collectors: $P/A = 0.7 \text{ kW}_{\text{th}}/\text{m}^2$
- 2. Glazed flat plate collectors: $P/A = 0.671 \text{ kW}_{\text{th}}/\text{m}^2$
- 3. Evacuated tubular collectors: $P/A = 0.717 \text{ kW}_{\text{th}}/\text{m}^2$

Taking into consideration the uncertainty on each value it is reasonable to use only one value: 0.7 kW_{th}/m^2 .

Participating organizations

The following organisations participated in the Gleisdorf meeting where the conversion factor of 0.7 kWth/m² was agreed upon:

- Austria Solar <u>www.austriasolar.at</u>
- Bundesverband Solarindustrie, Germany (BSi) <u>www.bsi-solar.de</u>
- Canadian Solar Industries Association (CanSIA) <u>www.cansia.ca</u>
- European Solar Thermal Industry Federation (ESTIF) <u>www.estif.org</u>
- Holland Solar <u>www.hollandsolar.nl</u>
- Solar Heating and Cooling Programme of the International Energy Agency (IEA SHC) www.iea-shc.org
- Solar Energy Association of Sweden (SEAS) <u>www.solenergiforeningen.se</u>
- Solar Energy Industries Association, USA (SEIA) <u>www.seia.org</u>

⁶ For unglazed collectors the aperture area equals the absorber area

Appendix G: Detailed Instructions For Completion of the Product Data Sheet

Detailed Instructions For Completion of the Solar Water Collector Data Sheet

The following notes provide detailed information on specific information data as well as guidance on descriptive words to use. The descriptive words listed below are for guidance and are not meant to be an exclusive listing.

Note 1: Warranty		
Include length of warranty (years) and limitations (full, prorated – 10% less each year, etc)		
Note 2: Collector Type		
Glazed Flat Plate, Unglazed Flat Plate, Concentrator, Evacuated Tube, Integrated Collector Storage		
Stationary, Tracking		
Note 3: Application		
Low temperature (swimming pools); Medium temperature (service hot water); High temperature (process		
heat, air conditioning)		
Note 4: Canadian Supplier		
If Canadian supplier is the same as the manufacturer insert "same" into cell		
Note 5: Independent Testing/Certification		
In order to have the collector's performance rating listed in the directory it is necessary to submit a copy of		
the test report with the application. The collectors must be tested by an independent testing laboratory that		
tests to one of the following standards: $(AAN)(CSA F270, 87 (B200A) L^{2} + 18 C + 11 C + 10 C + $		
- CAN/CSA-F3/8-8/ (K2004): Liquid & air collectors		
- EN 129/5-1.2 (Liquid collectors) – or listing to the KeyMark XXX		
- SKCC 00100 (Liquid & All Collectors) ISO 0806 1 2 2 (Liquid collectors)		
- 150 9800-125 (Elquid collectors)		
If the collectors have been tested to multiple standards then you have the option of listing all the standards		
that the product has been tested/certified to You must include full test reports to one standard and proof of		
certification for the other standards you want listed.		
Submission of other standards for acceptance will be reviewed by the Product Acceptance Committee.		
Note 6: Gross and Net Aperture Area		
Gross Area is the outside dimension of the collector (height x width)		
Gross Aperture Area includes the area that between absorber plates		
Absorber Area is the actual absorption area that collects solar radiating		
Note: for flat plate collectors the Gross Aperture Area will usually be the same as the Absorber Area, while		
for evacuated tube it will be less due to the air gaps between heat tubes		
Note 7: Heat Transfer Fluids		
Potable Heat Transfer Fluids (water); Non-Toxic Heat Transfer Fluids (Propylene Glycol); Toxic Heat		
Transfer Fluids (Ethanol)		
Note 8: Frame Material		
Aluminum, fibreglass, extruded, none		
Note 9: Frame Coating		
Anodized, painted, none		
Note 10: Mounting Connections		
Describe how the collectors is attached to the mounting frame or roof		
Note 11: Glazing Materials		
Glass, glass vacuum tube, clear rigid plastic, none, tempered, low iron		
Note 12: Absorber Material		
Copper, copper fin, aluminum fin		
Note 13: Absorber Coating		
Selective, moderately selective, non-selective, none		
Note 14: Absorber Tubing Material		
Copper, aluminum		



Detailed Instructions on The Solar Water Collector Cross Sectional Diagram

The diagram must be done by auto-cad and submitted electronically. Hand drawn diagrams will not be		
accepted.		
View	View must be a 3 - dimensional cut away showing all key elements. A full collector	
	diagram is not required as long as all key elements can be shown.	
Elements to Include	The drawing must show all collector elements that are installed to collect solar	
	energy. For example in the case of an Evacuated Tube systems the evacuated tubes	
	and the collection tank/header must be shown. The following is a partially listing of	
	possible elements: glazing, collector container, riser tubes, headers (including	
	penetration through the collector container), absorber plate, insulation, mounting	
	details (such as extrusion tracks)	
Absorber Plate	The drawing must clearly show the header and riser tube connection and the tubing	
Information	pattern on the absorber.	
Sizing of Diagram	The diagram must be clear when it is scaled to an approximate printing size of 10	
	cm x 10 cm – the font for diagram labels at this size must be approximately 8 pt	
Labeling of diagram	The key elements of the solar collector must be clearly labeled. The labeling	
elements	should be done in Arial font.	
File Type	The diagram must be submitted as a pdf, jpeg, or tiff file.	

Detailed Instructions For Completion of the Solar Packaged Hot Water System Data Sheet

The following notes provide detailed information on specific information data as well as guidance on descriptive words to use. The descriptive words listed below are for guidance and are not meant to be an exclusive listing.

Note 1: Warranty & Limitations		
Include length of warranty (years) and limitations (full, prorated – 10% less each year, etc)		
Note 2: Collector Type		
Glazed Flat Plate, Unglazed Flat Plate, Concentrator, Evacuated Tube, Integrated Collector Storage		
Stationary, Tracking		
Note 3: System Type		
Drain down, drain back, thermosyphon, closed loop		
Note 4: Piping material		
Recommended types of pipes to be used with the system, i.e. copper		
Note 5: Insulation Description		
Type of insulation recommended, RSI value, diameter of insulation		
Note 6: Solar Storage Tank		
List the storage tank that comes included with the system (manufacturer, model #). If the storage tank is not		
included but are from an approved list include all storage tanks that are approved (manufacturer, model #)		
Note 7: Type of Pump		
Items to include: manufacturer, model, rating (HP), fixed flow, variable flow		
Note 8: Power Source		
List power source for pump – i.e. AC powerline, PV module		
Note 9: Heat Exchanger		
Describe location and type of heat exchanger. I.e. internal heat exchanger is solar storage tank, external		
heat exchanger, tube in shell, wrap around, plate.		

Detailed Instructions on the Packaged SDHW System Schematic Diagram

The diagram must be done by auto-cad and submitted electronically.		
View	The diagram should be of a standard 1-line format that would be acceptable to use	
	for plumbing permit applications.	
Elements to include	The diagram must show all system components including: solar collectors, pump,	
	controls and sensors, plumbing, valves (all types), heat exchanger, water storage	
	tanks.	
Diagram symbols	Symbols used in the diagram must conform to the American Society of Heating,	
	Refrigerating and Air Conditioning Engineers (ASHRAE) Fundamentals Manual	
	or represent actual parts of the solar water heating system.	
Sizing of Diagram	The diagram must be clear when it is scaled to an approximate printing size of 10	
	cm x 10 cm – the font for diagram labels at this size must be approximately 8 pt	
Labelling of diagram	The key elements of the solar collector must be clearly labeled. The labeling	
elements	should be done in Arial font.	
File Type	The diagram must be submitted as a pdf, jpeg, or tiff file.	

Appendix H: Glossary of Terms

This section is under development