

GREENLAND SOLAR COMMERCIAL SYSTEMS

Excellence in Solar Heating

Company Profile

Greenland Systems

has been servicing Australian Industries, Community and Health organisations since 1986. Through dedication and persistent hard work the Greenland Systems team have earned a reputation for working and designing most reliable professional grade thermal, pressure and process control systems in the industry.

In the solar thermal equipment arena Greenland Systems holds several Australian and international patents. Greenland Systems solar collectors feature full vacuum single skin glass tubes with an integrated solar absorber and heat transfer device. This makes Greenland Systems solar collectors one of the best performing solar products in the world.



Key features of Greenland Systems solar collector

The Absorber area of the Greenland Systems Solar Collectors is directly contained within a single skin Vacuum Tube made of AS/NZS 2712 Hail Resistant, 2.5mm ~ 2.8mm thick, Boron Glass

Why is the Absorber held in a vacuum ?

By holding the solar absorber permanently in vacuum, Greenland Systems is able to supply a highly efficient collector with long service life.

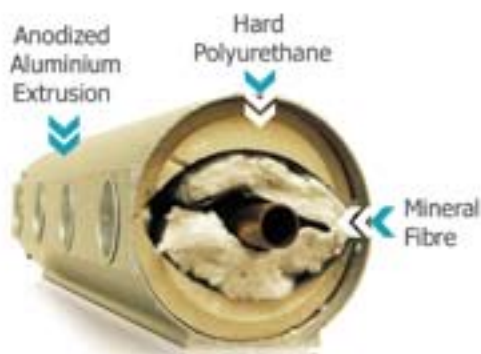
This is achieved by:

- Improved efficiency, since vacuum is a near perfect insulator preventing conductive and convective heat loss from the absorber to the environment
- Since all hot radiation-absorbing components are permanently isolated from the atmosphere and humidity, the absorber is not subject to erosion, electrolytic corrosion, oxidation and other forms of degradation. This collector design ensures the collector's peak performance during its entire service life



- C. Only a single layer of glass between the absorber and the incident radiation source improves the collector's efficiency further, providing yet another advantage over the conventional double skin (slip-on type) evacuated collectors offered by most competitors

With its unique design, Greenland Systems solar collector has a substantially longer service life than usually expect from a solar collector. It has been specifically designed to withstand extremely harsh operating conditions, including prolonged periods of thermal stagnation.



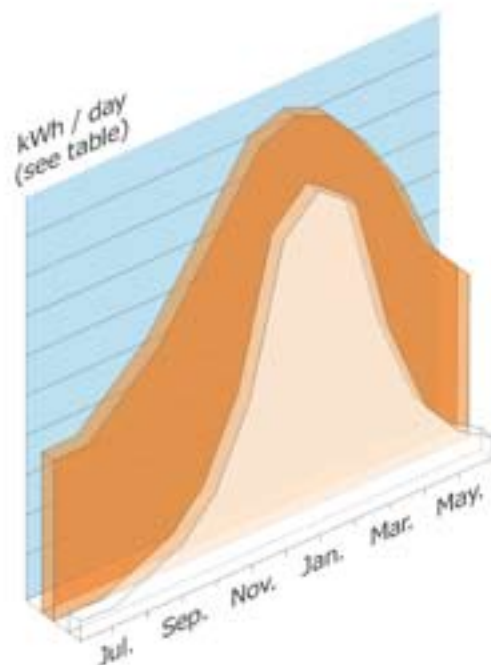
GREENLAND SYSTEMS HEADER BOX

Stagnation temperature is the maximum temperature achieved by a solar collector and is reached when the collector's total heat losses exactly balance the energy absorbed by the collector. In most conventional solar collectors used for water heating, stagnation temperature is about 160 to 180 degC. Stagnation temperature of Greenland Systems Heatpipe Type collectors is over 230 degrees Celsius, while that of the GLS DF type collector is almost 280 degC. High stagnation temperature is an indication of high performance of the collector at high fluid temperatures and at extremely low ambient temperatures.

Most collectors can not achieve such high stagnation temperature, let alone withstand it without a rapid and significant permanent loss of its working efficiency.

Greenland Systems Solar Collector can deliver "high quality heat". Greenland Systems Solar Collector can deliver heat consistently and efficiently over a wide range of operating temperatures and solar intensities. This makes our solar collectors perfectly suited for delivering "high quality heat" at heated fluid temperatures above 100°C. Greenland Systems collectors are suitable for applications in the areas of Solar thermal Electricity generation and Solar Air-Conditioning. Greenland Systems solar collector is the solar collector of choice for large scale commercial and industrial applications.

The Greenland Systems Solar Controller is robust and reliable, it has multifunction capabilities. The Controller has been designed to run from AC or DC power source. This makes our Solar Controller ideally suited for use in remote locations lacking electricity grid. Greenland Systems has designed an intelligent adaptive controller for large scale solar thermal applications.



- Greenland Systems Solar Collector
- Other Make of Solar Collector




Annual Comparative Energy Performance
This comparison is based on two solar collectors of same aperture installed on same location and operating under same conditions concurrently.

The Greenland Systems solar collector is a Single Glass type Full Vacuum Tube collector offering many advantages. Most competing Evacuated Tube solar collectors on the market today are of "double skin evacuated tube" type. This term describes a collector in which the insulating vacuum is confined between two layers of glass (hence the term "double skin"). In such collector design all heat transfer parts are actually situated in the atmosphere.

The high strength boron glass tube of Greenland Systems Solar Collector can withstand extreme weather conditions. This glass is fit for service in all regions of the earth from the south pole to the north pole and anywhere in between. Through heavy snows or hail storms, Greenland Systems Full Vacuum Glass Tube will retain its reliability and structural integrity.

Greenland Systems collector can work effectively even in cloudy or intermittent sunlight conditions. By clever design and low thermal inertia, any heat absorbed is quickly delivered to the water with minimum delay.

SOLAR COLLECTOR SPECIFICATIONS

Collector Model	GL 70 -20	GL 100 -16	GL 100 -16PT	GL 100 -16DF
General	Single Glass Wall Full Vacuum Tube Solar Collector			
Construction	HP ¹ DHI ²	HP ¹ DHI ²	HP ¹ DHI ²	DF ³
Dimensions (mm)	1800W×1935L×187H	1940W×2160L×187H	1940W×2160L×187H	1920W×2160L×151H
Tubes Per Collector	20	16	16	16
Tube Dimensions (Excl. Condenser)	Φ70×1765mm	Φ100×2015mm	Φ100×2015mm	Φ100×2015mm
Collector Fluid Capacity (Litres)	0.80	0.96	0.96	3.00
Dry Mass (Kg)	61	91	91	97
Fluid Pressure Drop at @120L/Hour (kPa)	0.28	0.20	0.20	0.84
at @480L/Hour (kPa)	2.75	2.24	2.24	5.40
Solar Aperture (m ²)	2.25	3.00	2.95	2.95
Effective Thermal Capacity acc. To EN 12975 (kJ/K)	10.59	13.5	14.8	38.5
Peak Output* note 4	6.1MJ/Hour 1.70kW	7.90MJ/Hour 2.20kW	7.60MJ/Hour 2.11kW	8.45MJ/Hour 2.35kW
Annual Energy Yield* note 5	11,010 MJ/year	14,260 MJ/year	16,080 MJ/year	15,700 MJ/year
Hail Test to AS/NZS 2712	PASS	PASS	PASS	PASS
Approvals	 AS/NZS 2712	 DIN CERTCO	 SOLAR KEYMARK	
Stagnation Temperature * note 4	234°C	235°C	221°C	276°C

1. HP - Heat Pipe Vacuum Tube Type
2. DHI - Dry Heat Interface
3. DF - Directly Flow Type

4. Measured at 1000W/m² of Normal Irradiance
5. Location Canberra, ACT, on historical solar data. Figures are based on heated fluid delta T of 50K



Dry Heat Interface (DHI) Advantages:

- Super-easy installation, dry tube insertion
- No blockages thru debris buildup
- Excellent heat transfer
- Allows tube rotation for maximum solar gain
- Minimum long-term maintenance
- All-metal construction, Extruded Al header box
- No seals, leakage-proof system

Stainless Steel Storage Tank:

Marine grade 316 stainless steel storage tank with stainless steel PU clad insulating panels for hot or chilled water storage for superior water quality, long life and aesthetic appearance.

Greenland Systems Vacuum Tube Types

GL type Solar Vacuum Tube with integrated Heat Pipe and flat absorber is very suitable for most heating applications, from very large commercial to domestic.

- Easy to install High Performance Solar Tube with full rotational adjustability.

GLPT (Passive Tracking) Solar Vacuum Tube with integrated Heat Pipe:

- Installations with all-day solar exposure can harvest 10-14% more heat annually with PT Tubes.
- PT Tube retains most advantages of GL vacuum tube with flat absorber.
- PT tube can install any time as a direct replacement for a GL flat-absorber Tube.

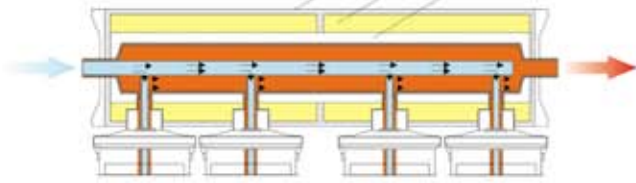
GL DF (Direct Flow) Solar Vacuum Tube:

- Designed for excellent architectural adaptability, this Vacuum Tube can operate either horizontally, vertically, or tilted at any angle.
- Unmatched high fluid temperature operating performance is well beyond reach of most non-concentrated solar thermal system.
- Intended for installations requiring efficient heat supply at temperatures higher than normally expected from non-concentrated solar thermal systems.
- Applications include Commercial Heating, Solar Air-Conditioning, Medical Sterilizing, Food and Dairy, etc.
- Optimum orientation of solar absorber inside the tube is achieved by simply rotating the tube around its longitudinal axis.

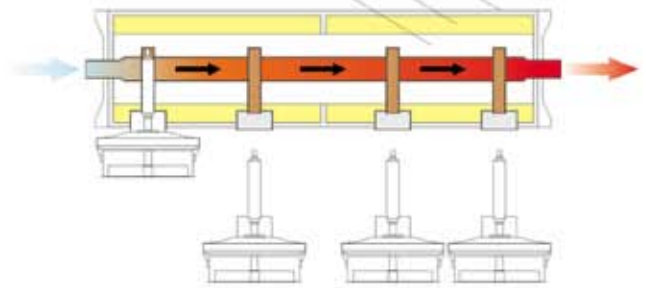


Tube Cross - Sections

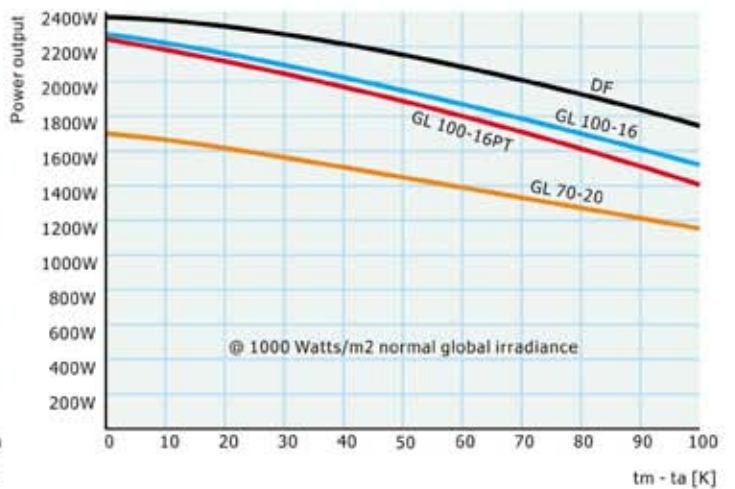
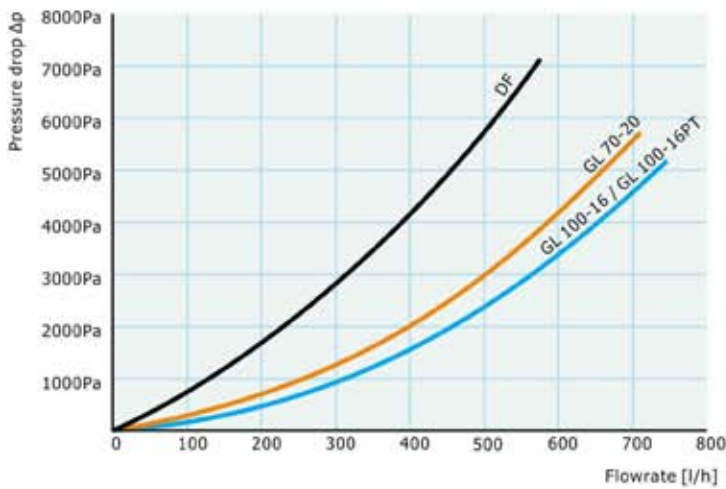
Anodized Extruded Al. Header Box
 Hard Polyurethane Insulation
 High Temperature Primary Insulation



GL-DF Tube Installation



GL/GL-PT Heat Pipe Tube Installation



Pt 1000 System Sensor
 in SS Body (260°C rated)



Braided Teflon Cable



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