



# OPTIMA

# 86, 98, 498, 698

**LIQUID-COOLED FLAT PLATE SOLAR COLLECTORS**

**High Efficiency**

**Attractive Design**

**10 Year Full Warranty**



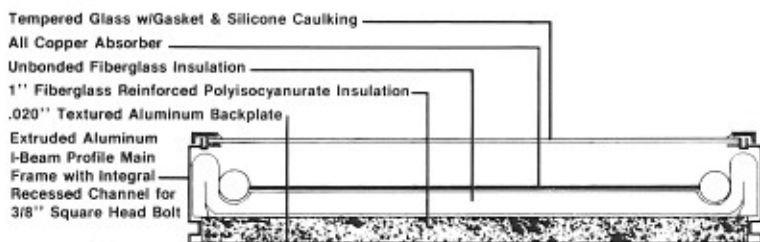
The Novan Optima collector series is noted for its aesthetic appearance as well as its perfect balance between cost and performance. Only 4 1/2" deep, the slim profile is compatible with all architectural styles. Each panel is coated with a metallic bronze silicone polyester paint finish which is baked on for durability.

The unique two-piece extruded aluminum frame offers maximum structural strength, minimum weight, and excellent integrity against unwanted air or moisture intrusion. The glazing cap strip is easily removed from the face of the collector, allowing access to the glazing without removing the collector from operation. This cap strip is available in two styles, including a special flashing option. Although this flashing strip should not be utilized for a "recess" mounting system, it does allow the installer to provide a smooth, unbroken appearance between adjacent collector panels.

Structural mounting is made simple and secure by the integral mounting track running around the entire perimeter of the collector. A 3/8" bolt or jam nut can be inserted into the track, and connections made to mounting kit components without penetrating the frame.

The solid copper absorber plate, coated with selective black chrome, has proven to be a very durable and efficient combination in countless applications, offering maximum heat conductivity and compatibility with all fluids. The soft texture tempered cover glass has a glare-free appearance and offers the best resistance to environmental conditions. It is also low-iron safety glass for performance and safety. These durable materials, combined with high temperature EPDM rubber seals and stainless steel hardware make the Optima the choice for long-term performance, appearance, and reliability.

The Optima collector series is covered by a full ten-year warranty against defects in material and workmanship as well as malfunction or failure to perform. This warranty covers parts, labor, and shipping, and may be transferred. A standard three year limited warranty covers corrosion of the absorber plate, unless it is installed in a complete Novan system which is charged with Brayco 888 heat transfer fluid. In this case, the collector is covered by a full six-year corrosion warranty. This warranty also covers parts, labor and shipping, and can be transferred. Please refer to the actual warranty, available on request, for complete details.



#### GENERAL DATA

Collector Weight: **86:** 85 lbs. **98:** 97 lbs. **498:** 140 lbs. **698:** 180 lbs.  
 Fluid Capacity: **86:** 3-1/4 qts. **98:** 3-3/8 qts. **498:** 4-3/4 qts. **698:** 6-3/4 qts.  
 Recommended Flow Rate: Oil or Silicone: 1 to 4 gpm  
 Water or Aqueous Glycol: .5 to 2 gpm  
 Max. Working Pressure: 150 psi

#### ABSORBER PLATE

Material: All copper alloy  
 Tube Size: 3/8"  
 Tube Spacing: 2" on center  
 Manifold: Internal 1" type M  
 Manifold Length: **86, 98:** 38.5" **498:** 49" **698:** 72-11/16"  
 Manifold Center-to-Center Dimensions: **86:** 80-3/8" **98, 498, 698:** 93-3/8"  
 Coating: Flat black paint — Absorptivity: .95 Emmissivity: .87 (C Series)  
 Optional Coating: Black chrome — Absorptivity: .95 Emmissivity: .075 (SC Series)

#### OVERALL DIMENSIONS

Length: 86 or 98 inches (add 1/2" for flange option)  
 Width **86 & 98:** 36" **498:** 46.5" (add 1/2" for flange option) **698:** 70-1/16"  
 Depth: 4-1/4 inches  
 Gross Area: **86:** 21.5 sq. ft. **98:** 24.5 sq. ft. **498:** 31.6 sq. ft. **698:** 47.6 sq. ft.  
 Net Area: **86:** 18.9 sq. ft. **98:** 21.7 sq. ft. **498:** 28.6 sq. ft. **698:** 43.43 sq. ft.

#### TRANSPARENT COVER

Material: Low iron patterned tempered glass  
 Number of Covers: One  
 Thickness: **86 & 98:** 1/8" **498:** 3/16" **698:** 1/8" (2 Sheets)  
 Solar Transmittance: 90.1%  
 Gasket: Seamless EPDM extrusion

#### MAIN FRAME

Material: 6063 T6 Extruded aluminum  
 Standard: Baked bronze enamel finish  
 Sidewall: 1" Polyisocyanurate foam with aluminum foil facing (R8)  
 Bottom: 1" unbonded fiberglass insulation and 1" fiberglass reinforced Polyisocyanurate foam with aluminum foil facing (R12)  
 Hardware: Black oxide plated stainless steel

**THE LEADER IN PRE-PACKAGED SOLAR SYSTEM TECHNOLOGY**

# OPTIMA Solar Collector

## TS — TECHNICAL SUPPORT

Data in this section was taken from performance test No. 45991, conducted at Wyle Laboratories in Huntsville, Alabama, or test No. B8111, conducted at the Solar Energy Analysis Laboratory in San Diego, California. Tests were conducted to verify thermal performance characteristics of the OPTIMA collector as well as its physical durability. Thermal performance tests were conducted in accordance with SRCC Standard RM-1, using ASHRAE Standard 93.77.

The graphs shown indicate performance for gross area of the collector. Flow rate for the test was .8 GPM (498SC, 698SC) or .64 GPM (86SC, 98SC) of water. Performance values calculated for net aperture area are:

$$FR\alpha = 0.850 \quad FRUL = 0.831 \quad (498SC, 698SC)$$

$$FR\alpha = 0.832 \quad FRUL = 0.948 \quad (86SC, 98SC)$$

The incident angle modifier, K, describes the decrease in efficiency of a collector at non-zero incident angles. K varies with incident angle according to the equation:

$$K = 1 - b_0 \left( \frac{1}{\cos \theta} - 1 \right)$$

The incident angle modifier constant,  $b_0$ , for this collector is 0.187 (86SC, 98SC) or 0.10 (498SC, 698SC).

The time constant is a measure of the time required for the collector to respond to changes in solar radiation level or inlet temperature. The

WATER FLOW RATE VS. PRESSURE DROP		
Flow (GPM)	Pressure Drop (PSI)	
	86	98, 498 & 698
0.25	.001	.001
0.50	.004	.004
0.75	.008	.009
1.00	.014	.016
1.50	.032	.036

## SUGGESTED ARCHITECTURAL SPECIFICATIONS

Solar collectors shall be OPTIMA series high performance liquid-cooled flat plate type as manufactured by Novan Energy Incorporated. Collectors shall have a solid copper absorber with a working pressure of up to 125 psi. The absorber shall be coated with a selective black chrome over nickel yielding an absorptance of .95 and an emittance of .075. The collector's front cover shall be textured, low-iron, tempered glass and shall have a solar energy transmittance of not less than

## AI — ASSEMBLY, INSTALLATION

The unique integral mounting channel is the key to simple and versatile installation of OPTIMA collectors. The channel, designed to accept the head of a 3/8" diameter bolt or jam nut, eliminates the need to drill or penetrate the collector box in any way. The channel allows attachment of mounting hardware at any point around the entire perimeter of the collector. Shown here are several illustrations of standard mounting kits and applications. The mounting channel offers unlimited flexibility in adapting to your specific needs.

Collector tube connections are 1" nominal type "M" copper. These copper headers are isolated from the aluminum sidewalls by rugged EPDM grommets designed to allow expansion and contraction. To ensure equal flow rates, a maximum of ten (86 and 98 series), eight (498 series), or five (698 series), collectors may be piped directly together in parallel without provisions for flow balancing.

All mounting angles, and vertical uprights are made of structural aluminum alloy. All bolts, nuts, and washers are stainless steel.

measured time constant for the OPTIMA collector is 1.7 minutes, (86SC, 98SC) or 1.28 minutes (498SC, 698SC).

## CERTIFICATIONS AND LISTINGS

Listed with the International Association of Plumbing and Mechanical Officials: IAPMO File No. S-2213.

Certified by the Solar Rating and Certification Corporation, (SRCC).

Meets the standards of Section 377.705, State of Florida Statutes, Florida Solar Energy Center Rating numbers: 80156S, 80157S, 80158S, 80159S.

Also approved by the States of Arizona, Michigan, and Wisconsin, the City and County of Denver, and the City of Cleveland.

## DURABILITY TEST RESULTS

### SOLAR COLLECTOR THERMAL SHOCK/WATER SPRAY TEST

Test conducted in accordance with SRCC 100-81. Results: "No evidence of damage or leakage." SOLAR COLLECTOR THERMAL SHOCK/COLD FILL TEST

Test conducted in accordance with SRCC 100-81. Results: "No sign of leakage or damage noted."

### STATIC OVERPRESSURE AND LEAKAGE TEST

Test conducted in accordance with SRCC 100-81. Leak test pressure: 120.0 PSI. Overpressure test pressure: 180.0 PSI. Results: "No leakage noted."

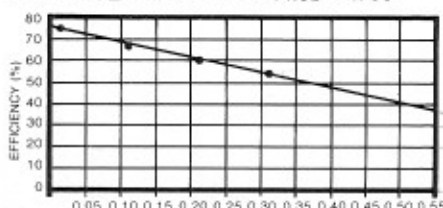
These are the results of tests done on the 498 SC collector. The same durability tests, with the same results, were undertaken for different collector sizes. Contact your local Novan representative for this information.

### NO FLOW 30 DAY EXPOSURE TEST

Test conducted in accordance with SRCC 100-81. During this test the collector was exposed in a cumulative total of 30 days having a solar radiation total plane of 1500 BTU/ft<sup>2</sup> or greater.

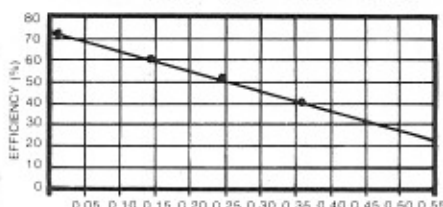
.90. Insulation shall be a combination of high density, low binder, unfaced fiberglass and rigid board type fiberglass-reinforced polyisocyanurate providing a minimum R-12 behind the absorber and R-8 at the collector sides. The components of the collector shall be unitized by a weather-tight extruded aluminum frame. The frame shall have a baked-on silicone polyester paint finish. The frame shall be constructed in two parts, providing access to the glazing without interruption of service. The frame shall have an integral mounting channel so that hardware may be attached without drilling or

## 498SC, 698SC PERFORMANCE PLOT SELECTIVE $FR\alpha = .769$ $FRUL = .750$



Performance plot based on gross collector area

## 86SC, 98SC PERFORMANCE PLOT SELECTIVE $FR\alpha = .725$ $FRUL = .830$



Performance plot based on gross collector area

$$\frac{T_m - T_a}{I} \quad F \text{ (ft}^2 \text{ hr/Btu)}$$

$T_m$  — Fluid temperature at the collector inlet (°F)

$T_a$  — Ambient air temperature (°F)

$I$  — Incident solar radiation (Btu/ft<sup>2</sup>/HR)

There was no visible change in the condition of the collector.

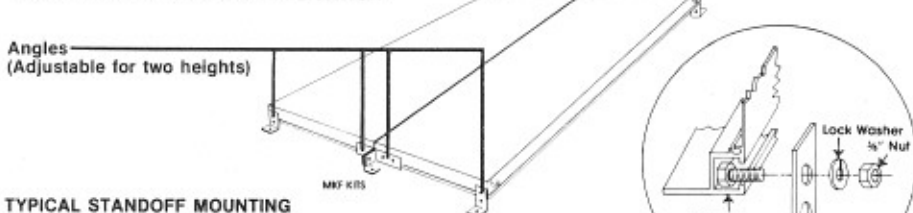
Post exposure test results:

$$\text{First order efficiency equation} = 498SC, 698SC: 0.769 - 0.750 \left( \frac{T_m - T_a}{I} \right)$$

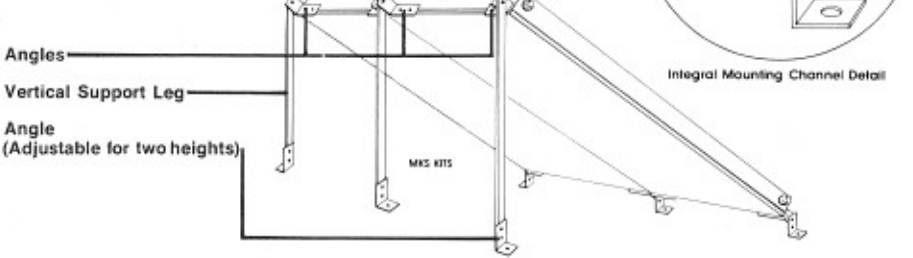
$$86SC, 98SC: 0.726 - 0.832 \left( \frac{T_m - T_a}{I} \right)$$

penetrating the collector in any way. The collector shall be furnished with 1" nominal copper internal manifolds. The collector shall have four 1" type "M" copper connections. The performance characteristics as tested in accordance with ASHRAE 93-77 of the collector shall not be less than  $FR\alpha =$  and not greater than  $FRUL =$  and shall not degrade significantly after 30 days of stagnation with a minimum solar flux of 1500 BTU/ft<sup>2</sup> · day. All hardware used in the collector shall be black oxide coated stainless steel.

## TYPICAL FLUSH MOUNTING APPLICATION



## TYPICAL STANDOFF MOUNTING APPLICATION



NOVAN Energy, Inc.  
1630 N. 63rd Street • Boulder, CO 80301 • (303) 447-9193  
A PUBLICLY OWNED COMPANY — NOVN (NASDAQ)