



CERTIFIED SOLAR COLLECTOR

SUPPLIER:
Papaemmanouel S.A.
 1st Km. Inofyta-St. Thomas
 Industrial Zone of Inofyta
 Inofyta-Viotia, VIOTIA 32011 Greece
 www.papaemmanouel.gr

BRAND: SOLAR FLAME
MODEL: US-SOL_2,72m² HORIZONTAL
COLLECTOR TYPE: Glazed Flat Plate
CERTIFICATION #: 10001922
Original Certification: August 08, 2014
Expiration Date: May 13, 2026

In Accordance with:

The solar collector listed below has been evaluated by the Solar Rating & Certification Corporation™ (SRCC™), an ISO/IEC 17065 accredited and EPA recognized Certification Body, in accordance with SRCC OG-100, Operating Guidelines and Minimum Standards for Certifying Solar Collectors, and has been certified by the SRCC. This award of certification is subject to all terms and conditions of the Program Agreement and the documents incorporated therein by reference. This document must be reproduced in its entirety.

COLLECTOR THERMAL PERFORMANCE RATING							
Kilowatt-hours (thermal) Per Panel Per Day				Thousands of Btu Per Panel Per Day			
Climate ->	High Radiation (6.3 kWh/m ² .day)	Medium Radiation (4.7 kWh/m ² .day)	Low Radiation (3.1 kWh/m ² .day)	Climate ->	High Radiation (2000 Btu/ft ² .day)	Medium Radiation (1500 Btu/ft ² .day)	Low Radiation (1000 Btu/ft ² .day)
Category (Ti-Ta)				Category (Ti-Ta)			
A (-5 °C)	11.8	8.9	6.0	A (-9 °F)	40.2	30.3	20.4
B (5 °C)	11.0	8.0	5.1	B (9 °F)	37.4	27.4	17.5
C (20 °C)	9.4	6.6	3.7	C (36 °F)	32.1	22.4	12.7
D (50 °C)	5.9	3.3	1.0	D (90 °F)	20.2	11.4	3.3
E (80 °C)	2.4	0.5	0.0	E (144 °F)	8.3	1.7	0.0

A- Pool Heating (Warm Climate) **B-** Pool Heating (Cool Climate) **C-** Water Heating (Warm Climate)
D- Space & Water Heating (Cool Climate) **E-** Commercial Hot Water & Cooling

COLLECTOR SPECIFICATIONS					
Gross Area:	2.720 m ²	29.28 ft ²	Dry Weight:	53 kg	117 lb
Net Aperture Area:	2.576 m ²	27.73 ft ²	Fluid Capacity:	3.4 liter	0.9 gal
Absorber Area:	2.576 m ²	27.73 ft ²	Test Pressure:	1102 kPa	160 psi

TECHNICAL INFORMATION			Tested in accordance with: ISO 9806:1994		
ISO Efficiency Equation [NOTE: Based on gross area and (P)=Ti-Ta]					
SI UNITS:	$\eta = 0.745 - 2.78870(P/G) - 0.02850(P^2/G)$		Y Intercept:	0.751	Slope: -4.384 W/m ² .°C
IP UNITS:	$\eta = 0.745 - 0.49149(P/G) - 0.00279(P^2/G)$		Y Intercept:	0.751	Slope: -0.773 Btu/hr.ft ² .°F

Incident Angle Modifier								Test Fluid:	
θ	10	20	30	40	50	60	70	Water	
K_{ra}	1.00	0.98	0.96	0.92	0.86	0.75	0.52	Test Mass Flow Rate:	0.0200 kg/(s m ²) 14.75 lb/(hr ft ²)
Impact Safety Rating: 11									

REMARKS:

Jeri Higgins

Technical Director





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ADDITIONAL INFORMATION (click here to return to the rating page)			
Test Lab:	TÜV Rheinland PTL, LLC	Test Date:	May 13, 2014
Test Report Number:	RS1-PAP130807	Test Location:	outdoors

SOLAR COLLECTOR CONSTRUCTION DETAILS					
Gross Length:	2.159 m	Gross Width:	1.260 m	Gross Depth:	104.000 mm

COLLECTOR MATERIALS					
Outer Cover:	Glass sheet	Enclosure back:	Aluminum	Back Insulation:	Fiber, None
Inner Cover:	None	Enclosure side:	Aluminum	Side Insulation:	Fiber, None
Absorber Description:	Tubes connected to Single Sheet		Flow Pattern:	Parallel/Harp	
Riser Tube:	Copper		Fin:	Aluminum	
Absorber Coating:	Selective		Tube to fin connection	Solder	

GLAZING	Outer Cover	Inner Cover
Material:	Glass sheet	None
Surface Characteristics:	Textured	
Thickness:	3.3 mm	N/A
Transmissivity:	High (equal to or greater than 90%)	
Length:	2.117 m	
Width:	1.217 m	
Tube Glazing to Header Enclosure Seal:	EPDM gasket	

ABSORBER:		Absorber Coating:		Selective	
Header Material:	Copper	Header OD:	27.9 mm	Header Wall:	0.9 mm
Riser Tube Material:	Copper	Riser Tube OD:	10.0 mm	Riser Tube Wall Thickness:	1.0 mm
Fin Material:	Aluminum	Fin Thickness:	0.55 mm		





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Flow Pattern:	Parallel/Harp				
Number of Riser Tubes:	14	Tube Spacing:	68.0 mm	Number of times each riser crosses the absorber:	1
Length of Flow Path:	2.05 m	Riser to Fin/Plate Bond:	Solder		

INSULATION:					
Location	Type	Thickness	Location	Type	Thickness
Back – Top Layer:	Fiber	45.0 mm	Sides – Inner Layer:	Fiber	20.0 mm
Back – Bottom Layer:	None		Sides – Outer Layer:	None	
Enclosure Fastening Methods:	Rivets				

Power Output per Collector(W) [Ti-Ta, G = 1000 W/m ²]				
0	10	30	50	70
2027	1944	1730	1454	1117

PRESSURE DROP				
Flow	ΔP		Flow	ΔP
ml/s	Pa		gpm	in H ₂ O
20	80		0.32	0.3
50	209		0.79	0.8
80	347		1.27	1.4

