



SOLAR RATING & CERTIFICATION CORPORATION

CERTIFIED SOLAR COLLECTOR

SUPPLIER:
Alternate Energy Technologies
 1345 Energy Cove Court
 Green Cove Springs, FL 32043 USA
 www.aetsolar.com
 In Accordance with:
SRCC Standard 100-2010-09

BRAND: MorningStar.
 MODEL: MSC-21
 COLLECTOR TYPE: Glazed Flat Plate
 CERTIFICATION #: 10001934
 Original Certification: December 11, 2014
 Expiration Date: August 28, 2026

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)	8.8	6.7	4.6	A (-9 °F)	30.1	22.8	15.5
B (5 °C)	8.0	5.9	3.8	B (9 °F)	27.4	20.1	12.8
C (20 °C)	6.6	4.6	2.5	C (36 °F)	22.7	15.6	8.5
D (50 °C)	3.7	1.9	0.3	D (90 °F)	12.8	6.5	1.1
E (80 °C)	1.1	0.0	0.0	E (144 °F)	3.8	0.1	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:	1.997 m ²	21.50 ft ²	Dry Weight:	39 kg	86 lb
Net Aperture Area:	1.764 m ²	18.99 ft ²	Fluid Capacity:	2.7 liter	0.7 gal
Absorber Area:	1.751 m ²	18.85 ft ²	Test Pressure:	1110 kPa	161 psi

TECHNICAL INFORMATION			Tested in accordance with: ISO 9806:1994		
ISO Efficiency Equation [NOTE: Based on gross area and (P)=Ti-Ta]					
SI UNITS:	$\eta = 0.711 - 3.60290(P/G) - 0.02720(P^2/G)$		Y Intercept:	0.726	Slope: -5.380 W/m ² .°C
IP UNITS:	$\eta = 0.711 - 0.63498(P/G) - 0.00266(P^2/G)$		Y Intercept:	0.726	Slope: -0.948 Btu/hr.ft ² .°F

Incident Angle Modifier								Test Fluid:	
θ	10	20	30	40	50	60	70	Water	
K_{ra}	1.00	0.99	0.98	0.97	0.94	0.89	0.80	Test Mass Flow Rate:	0.0845 kg/(s m ²) 62.28 lb/(hr ft ²)
								Impact Safety Rating: 11	

REMARKS:

Jean Higgins

Technical Director

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ADDITIONAL INFORMATION (click here to return to the rating page)			
Test Lab:	Exova Canada, Inc.	Test Date:	August 28, 2014
Test Report Number:	14-06-S0022A	Test Location:	indoors

SOLAR COLLECTOR CONSTRUCTION DETAILS					
Gross Length:	2.188 m	Gross Width:	0.913 m	Gross Depth:	81.000 mm

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

GLAZING	Outer Cover	Inner Cover
Material:	Glass sheet	None
Surface Characteristics:	Smooth	
Thickness:	3.2 mm	N/A
Transmissivity:	High (equal to or greater than 90%)	
Length:	2.121 m	
Width:	0.842 m	
Tube Glazing to Header Enclosure Seal:	EPDM gasket	

ABSORBER:		Absorber Coating:		Selective	
Header Material:	Copper	Header OD:	22.0 mm	Header Wall:	1.0 mm
Riser Tube Material:	Copper	Riser Tube OD:	10.0 mm	Riser Tube Wall Thickness:	0.5 mm
Fin Material:	Copper	Fin Thickness:	0.23 mm		



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Flow Pattern:	Parallel/Harp				
Number of Riser Tubes:	10	Tube Spacing:	86.0 mm	Number of times each riser crosses the absorber:	1
Length of Flow Path:	2.05 m	Riser to Fin/Plate Bond:	Other		

INSULATION:					
Location	Type	Thickness	Location	Type	Thickness
Back – Top Layer:	Fiber	4.0 mm	Sides – Inner Layer:	Foam	15.9 mm
Back – Bottom Layer:	Foam	25.4 mm	Sides – Outer Layer:	None	
Enclosure Fastening Methods:	Screws				

Power Output per Collector(W) [Ti-Ta, G = 1000 W/m²]					
0	10	30	50	70	
1451	1373	1186	955	681	

PRESSURE DROP					
Flow	ΔP		Flow	ΔP	
ml/s	Pa		gpm	in H ₂ O	
20	127		0.32	0.5	
50	552		0.79	2.2	
80	1260		1.27	5.1	



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