

Annex to Solar Keymark Certificate		Licence Number	SKM 10109.1
		Date issued	2020-12-21
		Issued by	DQS Hellas
Licence holder	VENMAN S.A.	Country	Greece
Brand (optional)		Web	http://www.venman.gr
Street, Number	7th Km Old National Road Thessaloniki –	E-mail	info@venman.gr
Postcode, City	57022, Thessaloniki	Tel	+30 2310 784684

Collector Type	Flat plate collector
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Collector name	Gross area (A_G) m ²	Gross length mm	Gross width mm	Gross height mm	Power output per collector G _b = 850 W/m ² , G _d = 150 W/m ² & u = 1.3 m/s $\vartheta_m - \vartheta_a$					
					0 K	10 K	30 K	50 K	70 K	84 K
					W	W	W	W	W	W
H81MP 2.0	1.90	1,970	965	80	1,472	1,388	1,198	979	731	538
H81MP 2.5	2.40	1,970	1,220	80	1,860	1,753	1,513	1,237	924	679
Power output per m ² gross area					775	730	630	515	385	283

Performance parameters test method	Steady state - outdoor									
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Performance parameters (related to A_G)	η_0, b	a1	a2	a3	a4	a5	a6	a7	a8	Kd
Units	-	W/(m ² K)	W/(m ² K ²)	J/(m ² K)	-	J/(m ² K)	s/m	W/(m ² K ⁴)	W/(m ² K ⁴)	-
Test results	0.786	4.24	0.019	0.000	0.00	0	0.000	0.00	0.0E+00	0.91

Incidence angle modifier test method	Steady state - outdoor									
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Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T, coll}$	1.00	1.00	0.99	0.98	0.94	0.87	0.74	0.48	0.00
Longitudinal	$K_{\theta L, coll}$	1.00	1.00	0.99	0.98	0.94	0.87	0.74	0.48	0.00

Heat transfer medium for testing	Water-Glycole									
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Flow rate for testing (per gross area, A_G)	dm/dt	0.021	kg/(sm ²)							
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Maximum temperature difference during thermal performance test	$(\vartheta_m - \vartheta_a)_{max}$	54.22	K							
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Standard stagnation temperature (G = 1000 W/m ² ; $\vartheta_a = 30^\circ\text{C}$)	ϑ_{stg}	187	°C							
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Maximum operating temperature	$\vartheta_{max, op}$	-	°C							
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Maximum operating pressure	$p_{max, op}$	-	kPa							
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Testing laboratory	NCSR Demokritos	http://www.solar.demokritos.gr								
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Test report(s)	4284 DQ2 4288 DE2 4294 DE2	Dated	17/12/2020 30/10/2020 30/10/2020
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Comments of testing laboratory	Datasheet version: 6.1, 2019-09-26									
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Example comment	Qualification tests are in extension of test report 4207 DQ2									
	<p>N.C.S.R. "DEMOKRITOS" SOLAR ENERGY LABORATORY Tel: +210 6503815 - Fax: +210 6544592 P.O. BOX 60037, 15310 Ag. Paraskevi, Greece</p> 									

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Supplementary Information				Issued				2020-11-10					
Annual collector output in kWh/collector at mean fluid temperature ϑ_m													
Standard Locations		Athens			Davos			Stockholm			Würzburg		
Collector name	ϑ_m	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
H81MP 2.0		2,339	1,565	911	1,722	1,098	596	1,277	770	407	1,393	831	433
H81MP 2.5		2,955	1,976	1,151	2,175	1,387	752	1,613	973	514	1,759	1,050	546
Annual output per m ² gross area		1,231	824	480	906	578	313	672	405	214	733	437	228
Annual efficiency, η_a		70%	47%	27%	56%	35%	19%	58%	35%	18%	59%	35%	18%
Fixed or tracking collector	Fixed (slope = latitude - 15°; rounded to nearest 5°)												
Annual irradiation on collector plane		1765 kWh/m ²			1630 kWh/m ²			1166 kWh/m ²			1244 kWh/m ²		
Mean annual ambient air temperature		18.5°C			3.2°C			7.5°C			9.0°C		
Collector orientation or tracking mode		South, 25°			South, 30°			South, 45°			South, 35°		
The collector is operated at constant temperature ϑ_m (mean of in- and outlet temperatures). The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool Scenocalc Ver. 6.1 (September 2019). A detailed description of the calculations is available at http://www.estif.org/solarkeymarknew/													
Additional Information													
Collector heat transfer medium	Water												
The collector is deemed to be suitable for roof integration	No												
The collector was tested successfully under the following conditions:													
Climate class (A+, A, B or C)											A	--	
G (W/m ²) >	1000	ϑ_a (°C) >			20	H_x (MJ/m ²) >			600				
Maximum tested positive load											3000	Pa	
Maximum tested negative load											3000	Pa	
Hail resistance using steel ball (maximum drop height)											2	m	
Additional collector attribute(s)													
<input type="checkbox"/> Using external power source(s) for normal operation						<input type="checkbox"/> Active or passive measure(s) for self-protection							
<input type="checkbox"/> Co-generating thermal and electrical power						<input type="checkbox"/> Façade collector(s)							
Energy Labelling Information						Additional Informative Technical Data							
	Reference Area, A_{sol} (m ²)		Hydraulic Designation Code				Aperture Area, A_a (m ²)						
H81MP 2.0	1.90		10-VH-1234S-A:7.2,1890-C:20,1030-				1.80						
H81MP 2.5	2.40		11-VH-1234S-A:7.2,1890-C:20,1280-				2.29						
Data required for CDR (EU) No 811/2013 - Reference Area						Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}							
Collector efficiency (η_{col})	57%					Zero-loss efficiency (η_0)	0.77	--					
Remark: Collector efficiency (η_{col}) is defined in CDR (EU) No 811/2013 as collector efficiency of the solar collector at a temperature difference between the solar collector and the surrounding air of 40 K and a global solar irradiance of 1000 W/m ² , expressed in % and rounded to the nearest integer. Deviating from the regulation η_{col} is based on reference area (A_{sol}) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.						First-order coefficient (a_1)	4.24	W/(m ² K)					
						Second-order coefficient (a_2)	0.019	W/(m ² K ²)					
						Incidence angle modifier IAM (50°)	0.95	--					
						Remark: The data given in this section are related to collector reference area (A_{sol}) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806. Consistent data sets for either aperture or gross area can be used in calculations like in the regulation 811 and 812 and simulation programs.							
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