



Annex to Solar Keymark Certificate					Licence Number	SKM 10109.3					
					Date issued	2020-12-10					
					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						
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 ϑ _m - ϑ _a						
					0 K	10 K	30 K	50 K	70 K	90 K	
					W	W	W	W	W	W	
H98 2.0	1.97	1,988	993	103	1,536	1,459	1,301	1,135	960	779	
H98 2.5	2.46	1,989	1,238	103	1,917	1,822	1,624	1,417	1,199	973	
Power output per m ² gross area					779	741	660	576	488	396	
Performance parameters test method		Steady state - outdoor									
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		0.790	3.82	0.005	0.000	0.00	0	0.000	0.00	0.0E+00	0.91
Incidence angle modifier test method		Steady state - outdoor									
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal		K _{BT, coll}	1.00	1.00	0.99	0.98	0.95	0.88	0.75	0.50	0.00
Longitudinal		K _{BL, coll}	1.00	1.00	0.99	0.98	0.95	0.88	0.75	0.50	0.00
Heat transfer medium for testing					Water						
Flow rate for testing (per gross area, A _G)					dm/dt	0.021	kg/(sm ²)				
Maximum temperature difference during thermal performance test					(ϑ _m - ϑ _a) _{max}	59.9	K				
Standard stagnation temperature (G = 1000 W/m ² ; ϑ _a = 30 °C)					ϑ _{stg}	160.7	°C				
Maximum operating temperature					ϑ _{max, op}		°C				
Maximum operating pressure					p _{max, op}		kPa				
Testing laboratory		NCSR Demokritos			http://www.solar.demokritos.gr						
Test report(s)		4283 DQ1 4287 DE2 4293 DE1			Dated		25/11/2020 8/12/2020 25/11/2020				
Comments of testing laboratory					Datasheet version: 6.1, 2019-09-26						
					N.C.S.R. "DEMOKRITOS" SOLAR ENERGY LABORATORY Tel: +210 6503815 - Fax: +210 6544592 P.O. BOX 60037, 15310 Ag. Paraskevi, Greece						
DQS HELLAS Ltd, Central Offices: Kalavriton 4, 145 64 kifisia, Athens, Tel: +30 210 6233493-4 , Fax: +30 210 6233495, http://www.dqs.gr, e-mail: i.alexiou@dqs.gr											

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Supplementary Information							Issued			2020-12-10					
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		
H98 2.0		2,464	1,778	1,220	1,880	1,338	906	1,379	923	597	1,499	997	634		
H98 2.5		3,077	2,220	1,524	2,347	1,670	1,131	1,722	1,153	745	1,872	1,245	792		
Annual output per m ² gross area		1,251	903	619	954	679	460	700	469	303	761	506	322		
Annual efficiency, η_a		71%	51%	35%	59%	42%	28%	60%	40%	26%	61%	41%	26%		
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-Glycole						
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)											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)							
H98 2.0		1.97			12-VH-1234S-A:7.2,1870-C:20,1041-			1.83							
H98 2.5		2.46			16-VH-1234S-A:7.2,1870-C:20,1293-			2.30							
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})						62%			Zero-loss efficiency (η_0)			0.78			--
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)			3.82			W/(m ² K)			
						Second-order coefficient (a ₂)			0.005			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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