




Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results						Licence Number		SKM 9999/1							
						Date issued		2017-06-30							
						Issued by		DQS Hellas							
Licence holder						PAPAEMMANOUEL S.A.									
Brand (optional)						Country						Greece			
Street, Number						Web						www.papaemmanouel.gr			
Postcode, City						E-mail						exports@papaemmanouel.gr			
						Tel						+30 2262031931			
Collector Type						Flat plate collector, glazed									
Collector name	Gross area (A _G)	Gross length	Gross width	Gross height	Power output per collector										
					G _b = 850 W/m ² ; G _d = 150 W/m ²										
					θ _m - θ _a										
	m ²	mm	mm	mm	0 K	10 K	30 K	50 K	70 K	50 K					
					W	W	W	W	W	W					
FMAX_1.50	1.50	1,480	1,010	86	1,142	1,085	961	819	661	819					
FMAX_1.50H	1.50	1,010	1,480	86	1,142	1,085	961	819	661	819					
FMAX_1.82	1.82	1,480	1,230	86	1,385	1,317	1,166	994	802	994					
FMAX_1.82H	1.82	1,230	1,480	86	1,385	1,317	1,166	994	802	994					
FMAX_2.00	2.00	1,980	1,010	86	1,522	1,447	1,281	1,092	881	1,092					
FMAX_2.00H	2.00	1,010	1,980	86	1,522	1,447	1,281	1,092	881	1,092					
FMAX_2.37	2.37	1,930	1,230	86	1,804	1,715	1,518	1,294	1,044	1,294					
FMAX_2.37H	2.37	1,230	1,930	86	1,804	1,715	1,518	1,294	1,044	1,294					
FMAX_2.72	2.72	2,160	1,260	86	2,070	1,968	1,742	1,485	1,198	1,485					
FMAX_2.72H	2.72	1,260	2,160	86	2,070	1,968	1,742	1,485	1,198	1,485					
Power output per m ² gross area					761	724	640	546	440	546					
Performance parameters test method						Steady state - outdoor									
Performance parameters (related to AG)						η ₀ ,hem	a1	a2							
Units						-	W/(m ² K)	W/(m ² K ²)							
Test results						0.761	3.600	0.014							
Incidence angle modifier test method						Steady state - outdoor									
Bi-directional incidence angle modifiers						No									
Incidence angle modifier						Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal						K _{θT, coll}					0.96			0.00	
Longitudinal						K _{θL, coll}					0.96			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 for thermal performance calculations						(θ _m -θ _a) _{max}	50	K							
Standard stagnation temperature (G = 1000 W/m ² ; θ _a = 30 °C)						θ _{stg}	190.5	°C							
Effective thermal capacity, incl. fluid (per gross area, A _G)						C/m ²	10.85	kJ/(Km ²)							
Maximum operating temperature						θ _{max, op}	200	°C							
Maximum operating pressure						p _{max, op}	1000	kPa							
Testing laboratory						NCSR Demokritos									
Test report(s)						www.solar.demokritos.gr									
						Dated		16/11/2016							
								16/11/2016							
								2/6/2017							
Comments of testing laboratory						Datasheet version: 5.01, 2016-03-01									
This data sheet was issued based on data appeared in the first SKM certificate.						<p>N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr Vassilis Belessiotis Tel: +210 6503915 - Fax: +210 6544592 153 10 Ag. Paraskevi - Attiki - Greece</p> 									
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	SKM 9999/1
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Annual collector output in kWh/collector at mean fluid temperature ϑ_m , based on ISO 9806:2013 test results													
Collector name	Standard Locations ϑ_m	Athens			Davos			Stockholm			Würzburg		
		25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
FMAX_1.50		1,856	1,324	859	1,406	966	597	1,040	675	402	1,131	732	428
FMAX_1.50H		1,856	1,324	859	1,406	966	597	1,040	675	402	1,131	732	428
FMAX_1.82		2,252	1,606	1,042	1,706	1,172	724	1,262	819	487	1,372	888	519
FMAX_1.82H		2,252	1,606	1,042	1,706	1,172	724	1,262	819	487	1,372	888	519
FMAX_2.00		2,475	1,765	1,145	1,875	1,288	795	1,387	900	535	1,508	976	571
FMAX_2.00H		2,475	1,765	1,145	1,875	1,288	795	1,387	900	535	1,508	976	571
FMAX_2.37		2,932	2,092	1,357	2,222	1,527	943	1,643	1,067	635	1,787	1,157	676
FMAX_2.37H		2,932	2,092	1,357	2,222	1,527	943	1,643	1,067	635	1,787	1,157	676
FMAX_2.72		3,366	2,400	1,557	2,550	1,752	1,082	1,886	1,224	728	2,051	1,328	776
FMAX_2.72H		3,366	2,400	1,557	2,550	1,752	1,082	1,886	1,224	728	2,051	1,328	776
Annual output per m ² gross area		1,237	883	572	938	644	398	693	450	268	754	488	285
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m ²			1714 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. 5.01 (March 2016). A detailed description of the calculations is available at www.solarkeymark.org/scenocalc													

Additional Information

Collector heat transfer medium	Water-Glycole	
Hybrid Thermal and Photo Voltaic collector	No	
The collector is deemed to be suitable for roof integration	No	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	A	--
Maximum tested positive load	3000	Pa
Maximum tested negative load	3000	Pa
Hail resistance using steel ball (maximum drop height)	2	m

Energy Labelling Information

	Reference Area, A_{sol} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}		
FMAX_1.50	1.50	Collector efficiency (η_{col})	59	%
FMAX_1.50H	1.50	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 9806:2013.		
FMAX_1.82	1.82			
FMAX_1.82H	1.82			
FMAX_2.00	2.00			
FMAX_2.00H	2.00			
FMAX_2.37	2.37			
FMAX_2.37H	2.37			
FMAX_2.72	2.72			
FMAX_2.72H	2.72			
		Zero-loss efficiency (η_0)	0.761	--
		First-order coefficient (a_1)	3.60	W/(m ² K)
		Second-order coefficient (a_2)	0.014	W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0.96	--
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.				