



Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results						Licence Number		SKM 9999/2						
						Date issued		2019-05-30						
						Issued by		DQS Hellas						
Licence holder		PAPAEMMANOUEL S.A.				Country		Greece						
Brand (optional)						Web		www.papaemmanouel.gr						
Street, Number		1o Km Inofyta – St. Thomas, Inofyta Viotia				E-mail		exports@papaemmanouel.gr						
Postcode, City		32011, Viotia				Tel		+30 2262031931						
Collector Type						Flat plate collector, glazed								
					Power output per collector G _b = 850 W/m ² ; G _d = 150 W/m ² θ _m - θ _a									
					0 K 10 K 30 K 50 K 70 K 50 K W W W W W W									
Collector name		Gross area (A _G) m ²	Gross length mm	Gross width mm	Gross height mm									
FMAX_2.72		2.72	2,160	1,260	86	2,105	2,016	1,818	1,594	1,344	1,594			
FMAX_2.72H		2.72	1,260	2,160	86	2,105	2,016	1,818	1,594	1,344	1,594			
Power output per m ² gross area						774	741	668	586	494	586			
Performance parameters test method					Steady state - outdoor									
Performance parameters (related to AG)					η ₀ ,hem	a ₁	a ₂							
Units					-	W/(m ² K)	W/(m ² K ²)							
Test results					0.774	3.160	0.012							
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-Glycole								
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 / Solar & other Energy System Laboratory				www.solar.demokritos.gr					
Test report(s)					4196 DE2 4197 DQ3				Dated 16/11/2016 2/6/2017					
Comments of testing laboratory						Datasheet version: 5.01, 2016-03-01								
						<p>N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr Vassilis Belesiotis Tel: +30 6500915 - Fax: +30 6544580 153 10 Ag. Paraskevi - Attiki - Greece</p>								
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	SKM 9999/2
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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_2.72		3,442	2,574	1,792	2,677	1,941	1,301	1,967	1,354	873	2,133	1,468	930
FMAX_2.72H		3,442	2,574	1,792	2,677	1,941	1,301	1,967	1,354	873	2,133	1,468	930
Annual output per m ² gross area		1,266	946	659	984	714	478	723	498	321	784	540	342
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_2.72	2.72	Collector efficiency (η_{col})	63	%
FMAX_2.72H	2.72	<i>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/m², 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.</i>		
		Data required for CDR (EU) No 812/2013 - Reference Area A _{sol}		
		Zero-loss efficiency (η_0)	0.774	--
		First-order coefficient (a ₁)	3.16	W/(m ² K)
		Second-order coefficient (a ₂)	0.012	W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0.96	--
		<i>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.</i>		