



Licence Number	SKM10039
Date issued	2022-07-28
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	22620 31931

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	88 K
					W	W	W	W	W	W
FMAX TOP_2.72	2.73	2,161	1,263	102	2,148	2,073	1,884	1,640	1,343	1,028
FMAX TOP_2.72H	2.73	1,263	2,161	102	2,148	2,073	1,884	1,640	1,343	1,028
Power output per m ² gross area					787	759	690	601	492	377

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/(m²K)	W/(m²K²)	J/(m³K)	-	J/(m²K)	s/m	W/(m²K⁴)	W/(m²K⁴)	-
Test results	0.799	2.48	0.025	0.000	0.00	9.797	0.000	0.00	0.0E+00	0.90

Incidence angle modifier test method		Steady state - outdoor								
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	0.73	0.48	0.00
Longitudinal	$K_{\alpha L, coll}$	1.00	1.00	0.99	0.98	0.94	0.87	0.73	0.48	0.00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0.022	kg/(sm ²)
Maximum temperature difference during thermal performance test	$(\vartheta_m - \vartheta_a)_{\max}$	58	K
Standard stagnation temperature ($G = 1000 \text{ W/m}^2$; $\vartheta_a = 30 \text{ }^\circ\text{C}$)	ϑ_{stg}	187	$^\circ\text{C}$
Maximum operating temperature	$\vartheta_{\text{max_op}}$	210	$^\circ\text{C}$
Maximum operating pressure	$p_{\text{max_op}}$	1000	kPa

Testing laboratory	NCSR Demokritos / Solar & other Energy System		www.solar.demokritos.gr	
Test report(s)	4245DE4	Dated	20/02/24	
	4235DQ1		16/10/18	

Comments of testing laboratory		Ver. 6.2 (13.01.2022)
--------------------------------	--	-----------------------

N.C.S.R. "DEMOKRITOS"
SOLAR ENERGY LABORATORY
Tel: +210 6503815 - Fax: +210 6544592
P.O. BOX 60037, 15310 Ag. Paraskevi, Greece

Annex to Solar Keymark Certificate						Licence Number		SKM10039							
Supplementary Information						Issued		2022-07-28							
Gross Thermal Yield 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		
FMAX TOP_2.72		3,459	2,654	1,803	2,759	1,998	1,274	2,011	1,400	866	2,178	1,517	924		
FMAX TOP_2.72H		3,459	2,654	1,803	2,759	1,998	1,274	2,011	1,400	866	2,178	1,517	924		
Gross Thermal Yield per m ² gross area		1,267	972	660	1,011	732	467	737	513	317	798	556	338		
Annual efficiency, η_a		72%	55%	37%	62%	45%	29%	63%	44%	27%	64%	45%	27%		
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. 6.2 (13.01.2022). 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)										2		m			
Additional collector attribute(s)															
Using external power source(s) for normal operation										No		Active or passive measure(s) for self-protection		No	
Co-generating thermal and electrical power										No		Façade collector(s)		No	
Energy Labelling Information															
		Reference Area, A _{sol} (m ²)		Hydraulic Designation Code						Aperture Area, A _a (m ²)					
FMAX TOP_2.72		2.73		14-V-1234S-A:7.2,2060-C:20.6,1320-						2.57					
FMAX TOP_2.72H		2.73		25-V-1234S-A:7.2,1158-C:20.6,2240-						2.57					
Data required for CDR (EU) No 811/2013 - Reference Area															
Collector efficiency (η_{col})		65%													
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.															
Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}															
Zero-loss efficiency (η_0)		0.79													
First-order coefficient (a_1)		2.48													
Second-order coefficient (a_2)		0.025													
Incidence angle modifier IAM (50°)		0.94													
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.															
Central Offices: Kalavriton 2, 145 64 kifisia, Athens, Tel: +30 210 6233493-4 , Fax: +30 210 6233495, http://www.dqsglobal.com , e-mail: i.alexio@dqs.gr															