Annex to Solar Keymark Certificate		Licence Number	SKM 10132.7
		Date issued	2024-12-15
		Issued by	DQS Hellas

Licence holder	PAPAEMMANOUEL S.A.	Country	Greece
Brand (optional)	SOLAR FLAME	Web	www.papaemmanouel.gr
Street, Number	Thesi Loumaria	E-mail	exports@papaemmanouel.gr
Postcode, City	32009 Oinofyta Viotias	Tel	+30 22620 31931

Collector Type	Flat plate collector

Collector name	Gross area (A_G)	Gross length	Gross width	Gross height	Power output per collector Gb = 850 W/m2, Gd = 150 W/m2 & u = 1.3 m/s $\vartheta_m - \vartheta_a$					
					0 K	10 K	30 K	50 K	70 K	104 K
	m²	mm	mm	mm	W	W	W	W	W	W
FMAX Gen2-300V	3.02	2,160	1,400	86	2,329	2,233	2,025	1,798	1,552	1,093
FMAX Gen2-300H	3.02	1,400	2,160	86	2,329	2,233	2,025	1,798	1,552	1,093
Power output per m² gross area					771	739	671	595	514	362

Performance parameters test method	Steady state - outdoor									
Performance parameters (related to A_G)	η0, 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	0.780	3.12	0.008	0.000	0.00	13,001	0.000	0.00	0.0E+00	0.92

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	1.00	0.99	0.96	0.91	0.78	0.53	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	1.00	1.00	0.99	0.96	0.91	0.78	0.53	0.00

Heat transfer medium for testing		Water		
Flow rate for testing (per gross area, A_G)		dm/dt	0.022	kg/(sm²)
Maximum temperature difference during thermal performance test		$(\vartheta_m - \vartheta_a)_{max}$	73.7	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)		ϑ_{stg}	240	°C
Maximum operating temperature		$\vartheta_{max\ op}$	250	°C
Maximum operating pressure		$p_{max,op}$	1000	kPa

Testing laboratory	NCSR Demokritos / Solar & other Energy System	www.solar.demokritos.gr	
Test report(s)	4439 DE1	Dated	20/11/24
	4439 DQ1		12/12/24

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	SKM 10132.7
Supplementary Information	Issued	2024-12-15

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 Gen2-300V		3,792	2,875	2,067	2,977	2,210	1,555	2,172	1,529	1,033	2,357	1,656	1,101
FMAX Gen2-300H		3,792	2,875	2,067	2,977	2,210	1,555	2,172	1,529	1,033	2,357	1,656	1,101
Gross Thermal Yield per m² gross area		1,256	952	685	986	732	515	719	506	342	780	549	365
Annual efficiency, η_a		71%	54%	39%	60%	45%	32%	62%	43%	29%	63%	44%	29%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m²			1630 kWh/m²			1166 kWh/m²			1244 kWh/m²		
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 ϑm (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/m²) >	1000	ϑ_a (°C) >	20	H_x (MJ/m²) >	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		Additional Informative Technical Data	
	Reference Area, A_{sol} (m²)	Hydraulic Designation Code	Aperture Area, A_a (m²)
FMAX Gen2-300V	3.02	16-V-1234S-A:7.2,2060-C:20.6,1460-	2.88
FMAX Gen2-300H	3.02	25-V-1234S-A:7.2,1300-C:20.6,2220-	2.88

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})	63%	Zero-loss efficiency (η_0)	0.77	--
		First-order coefficient (a_1)	3.12	W/(m²K)
Remark: Collector efficiency (ηcol) 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 ηcol is based on reference area (Asol) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.		Second-order coefficient (a_2)	0.008	W/(m²K²)
		Incidence angle modifier IAM (50°)	0.97	--
		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.		