



Annex to Solar Keymark Certificate		Licence Number	SKM 10132.5
		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
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Collector name	Gross area (A <sub>G</sub> ) m <sup>2</sup>	Gross length mm	Gross width mm	Gross height mm	Power output per collector G <sub>b</sub> = 850 W/m <sup>2</sup> , G <sub>d</sub> = 150 W/m <sup>2</sup> & u = 1.3 m/s ϑ <sub>m</sub> - ϑ <sub>a</sub>					
					0 K	10 K	30 K	50 K	70 K	102 K
					W	W	W	W	W	W
FMAX Gen2-150V	1.49	1,480	1,010	86	1,137	1,089	978	845	692	400
FMAX Gen2-150H	1.49	1,010	1,480	86	1,137	1,089	978	845	692	400
FMAX Gen2-182V	1.82	1,480	1,230	86	1,389	1,330	1,194	1,033	845	488
FMAX Gen2-182H	1.82	1,230	1,480	86	1,389	1,330	1,194	1,033	845	488
FMAX Gen2-187V	1.86	1,480	1,260	86	1,419	1,359	1,220	1,055	864	499
FMAX Gen2-187H	1.86	1,260	1,480	86	1,419	1,359	1,220	1,055	864	499
FMAX Gen2-200V	2.00	1,980	1,010	86	1,526	1,462	1,312	1,135	929	536
FMAX Gen2-200H	2.00	1,010	1,980	86	1,526	1,462	1,312	1,135	929	536
FMAX Gen2-237V	2.37	1,930	1,230	86	1,808	1,732	1,555	1,345	1,101	636
FMAX Gen2-237H	2.37	1,230	1,930	86	1,808	1,732	1,555	1,345	1,101	636
FMAX Gen2-250V	2.49	1,980	1,260	86	1,900	1,820	1,634	1,413	1,157	668
FMAX Gen2-250H	2.49	1,260	1,980	86	1,900	1,820	1,634	1,413	1,157	668
FMAX Gen2-272V	2.72	2,160	1,260	86	2,075	1,988	1,785	1,543	1,264	730
FMAX Gen2-272H	2.72	1,260	2,160	86	2,075	1,988	1,785	1,543	1,264	730
FMAX Gen2-300V	3.02	2,160	1,400	86	2,304	2,207	1,982	1,713	1,403	810
FMAX Gen2-300H	3.02	1,400	2,160	86	2,304	2,207	1,982	1,713	1,403	810
Power output per m <sup>2</sup> gross area					763	731	656	567	465	268

Performance parameters test method	Steady state - outdoor									
Performance parameters (related to A <sub>G</sub> )	η <sub>0</sub> , b	a1	a2	a3	a4	a5	a6	a7	a8	Kd
Units	-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )	J/(m <sup>3</sup> K)	-	J/(m <sup>2</sup> K)	s/m	W/(m <sup>2</sup> K <sup>4</sup> )	W/(m <sup>2</sup> K <sup>4</sup> )	-
Test results	0.772	3.04	0.018	0.000	0.00	11,461	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 <sub>GT, coll</sub>	1.00	1.00	1.00	0.99	0.96	0.91	0.78	0.53	0.00
Longitudinal	K <sub>GL, coll</sub>	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 <sub>G</sub> )	dm/dt	0.023	kg/(sm <sup>2</sup> )
Maximum temperature difference during thermal performance test	(ϑ <sub>m</sub> -ϑ <sub>a</sub> ) <sub>max</sub>	72.4	K
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; ϑ <sub>a</sub> = 30 °C)	ϑ <sub>stg</sub>	240	°C
Maximum operating temperature	ϑ <sub>max, op</sub>	250	°C
Maximum operating pressure	p <sub>max, op</sub>	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
	4450 DE1	20/11/24

Comments of testing laboratory Ver. 6.2 (13.01.2022)

Thermal efficiency data from Test Report 4450 DE1	<p><b>N.C.S.R. "DEMOKRITOS"</b>          SOLAR ENERGY LABORATORY          Tel: +210 6503815 - Fax: +210 6544592          P.O. BOX 60037, 15310 Ag. Paraskevi, Greece</p>
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<b>Annex to Solar Keymark Certificate</b> <b>Supplementary Information</b>	<b>Licence Number</b>	<b>SKM 10132.5</b>
	<b>Issued</b>	<b>2024-12-15</b>

Gross Thermal Yield in kWh/collector at mean fluid temperature $\vartheta_m$													
Collector name	Standard Locations $\vartheta_m$	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 Gen2-150V		1,850	1,372	921	1,440	1,024	654	1,055	714	440	1,145	774	469
FMAX Gen2-150H		1,850	1,372	921	1,440	1,024	654	1,055	714	440	1,145	774	469
FMAX Gen2-182V		2,260	1,676	1,125	1,759	1,250	798	1,288	872	537	1,399	946	573
FMAX Gen2-182H		2,260	1,676	1,125	1,759	1,250	798	1,288	872	537	1,399	946	573
FMAX Gen2-187V		2,310	1,713	1,150	1,797	1,278	816	1,317	891	549	1,430	966	586
FMAX Gen2-187H		2,310	1,713	1,150	1,797	1,278	816	1,317	891	549	1,430	966	586
FMAX Gen2-200V		2,484	1,842	1,237	1,933	1,374	877	1,416	958	591	1,537	1,039	630
FMAX Gen2-200H		2,484	1,842	1,237	1,933	1,374	877	1,416	958	591	1,537	1,039	630
FMAX Gen2-237V		2,943	2,183	1,466	2,290	1,628	1,040	1,678	1,135	700	1,822	1,231	747
FMAX Gen2-237H		2,943	2,183	1,466	2,290	1,628	1,040	1,678	1,135	700	1,822	1,231	747
FMAX Gen2-250V		3,092	2,293	1,540	2,406	1,711	1,092	1,762	1,193	735	1,914	1,294	785
FMAX Gen2-250H		3,092	2,293	1,540	2,406	1,711	1,092	1,762	1,193	735	1,914	1,294	785
FMAX Gen2-272V		3,378	2,505	1,682	2,629	1,869	1,193	1,925	1,303	803	2,091	1,413	857
FMAX Gen2-272H		3,378	2,505	1,682	2,629	1,869	1,193	1,925	1,303	803	2,091	1,413	857
FMAX Gen2-300V		3,750	2,781	1,868	2,918	2,075	1,325	2,138	1,447	892	2,321	1,569	952
FMAX Gen2-300H		3,750	2,781	1,868	2,918	2,075	1,325	2,138	1,447	892	2,321	1,569	952
Gross Thermal Yield per m <sup>2</sup> gross area		1,242	921	618	966	687	439	708	479	295	769	520	315
Annual efficiency, $\eta_a$		70%	52%	35%	59%	42%	27%	61%	41%	25%	62%	42%	25%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1630 kWh/m <sup>2</sup>			1166 kWh/m <sup>2</sup>			1244 kWh/m <sup>2</sup>		
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  $\vartheta_m$  (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 <sup>2</sup> ) >	1000	$\vartheta_a$ (°C) >	20	$H_x$ (MJ/m <sup>2</sup> ) >	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	Facade collector(s)	No		

Energy Labelling Information		Additional Informative Technical Data	
	Reference Area, $A_{ref}$ (m <sup>2</sup> )	Hydraulic Designation Code	Aperture Area, $A_a$ (m <sup>2</sup> )
FMAX Gen2-150V	1.49	12-V-1234S-A:7.2,1380-C:20.6,1070-D	1.40
FMAX Gen2-150H	1.49	17-V-1234S-A:7.2,910-C:20.6,1540-D	1.40
FMAX Gen2-182V	1.82	14-V-1234S-A:7.2,1380-C:20.6,1290-D	1.71
FMAX Gen2-182H	1.82	17-V-1234S-A:7.2,1130-C:20.6,1540-D	1.71
FMAX Gen2-187V	1.86	14-V-1234S-A:7.2,1380-C:20.6,1320-D	1.76
FMAX Gen2-187H	1.86	17-V-1234S-A:7.2,1160-C:20.6,1540-D	1.76
FMAX Gen2-200V	2.00	12-V-1234S-A:7.2,1880-C:20.6,1070-D	1.88
FMAX Gen2-200H	2.00	23-V-1234S-A:7.2,910-C:20.6,2040-D	1.88
FMAX Gen2-237V	2.37	14-V-1234S-A:7.2,1830-C:20.6,1290-D	2.25
FMAX Gen2-237H	2.37	23-V-1234S-A:7.2,1130-C:20.6,1990-D	2.25
FMAX Gen2-250V	2.49	14-V-1234S-A:7.2,1880-C:20.6,1320-D	2.37
FMAX Gen2-250H	2.49	23-V-1234S-A:7.2,1160-C:20.6,2040-D	2.37
FMAX Gen2-272V	2.72	14-V-1234S-A:7.2,2060-C:20.6,1320-D	2.59
FMAX Gen2-272H	2.72	25-V-1234S-A:7.2,1160-C:20.6,2220-D	2.59
FMAX Gen2-300V	3.02	16-V-1234S-A:7.2,2060-C:20.6,1460-D	2.88
FMAX Gen2-300H	3.02	25-V-1234S-A:7.2,1300-C:20.6,2220-D	2.88

Data required for CDR (EU) No 811/2013 - Reference Area $A_{ref}$		Data required for CDR (EU) No 812/2013 - Reference Area $A_{ref}$	
Collector efficiency ( $\eta_{col}$ )	61%	Zero-loss efficiency ( $\eta_0$ )	0.76
Remark: Collector efficiency ( $\eta_{col}$ ) 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 <sup>2</sup> , expressed in % and rounded to the nearest integer. Deviating from the regulation $\eta_{col}$ is based on reference area ( $A_{ref}$ ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.		First-order coefficient ( $a_1$ )	3.04
		Second-order coefficient ( $a_2$ )	0.018
		Incidence angle modifier IAM (50°)	0.97
		W/(m <sup>2</sup> K)	--
		Remark: The data given in this section are related to collector reference area ( $A_{ref}$ ) 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.	