Annex to Solar Keymark Certificate

Licence Number	OEM 10110.1.1
Date issued	2021-06-20
Issued by	DQS Hellas

Licence holder	PLANETSOL - CHARALAMPIDOU MARIA	Country	Greece
Brand (optional)		Web	www.planetsol.gr
Street, Number	Chiou 3	E-mail	info@planetsol.gr
Postcode, City	12351 Ag. Barbara, Athens	Tel	+30 210 5694516

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	90 K
	m²	mm	mm	mm	W	W	W	W	W	W
Solar clock 250	2,44	1.978	1.232	85	1.928	1.825	1.609	1.377	1.130	874
Power output per m² gross area					790	748	659	564	463	358

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	0,798	4,11	0,008	0,000	0,00	0	0,000	0,00	0,0E+00	0,93

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	0,97	0,92	0,81	0,56	0,00
Longitudinal	$K_{\theta L,coll}$	1,00	1,00	1,00	0,99	0,97	0,92	0,81	0,56	0,00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0,021	kg/(sm²)
Maximum temperature difference during thermal performance test	$(\vartheta_m-\vartheta_a)_{max}$	59,5	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	155	°C
Maximum operating temperature	ϑ_{max_op}		°C
Maximum operating pressure	$p_{max,op}$		kPa

Testing laboratory	NCSR Demokritos	www.solar.demokritos.gr	
Test report(s)	4296 DQ1 4303 DE1	Dated	2/12/2020 2/12/2020

Comments of testing laboratory

Datasheet version: 6.1, 2019-09-26

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Supplementary Information	Issued	2021-06-20

Annual collector output 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
Solar clock 250		3.130	2.206	1.450	2.356	1.624	1.038	1.737	1.125	688	1.892	1.218	733
Annual output per m² gross area		1.283	904	594	965	665	426	712	461	282	776	499	301
Annual efficiency, η_a		73%	51%	34%	59%	41%	26%	61%	40%	24%	62%	40%	24%
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. 6.1 (September 2019). 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)				1,8	m

Additional collector attribute(s)

- ☐ Using external power source(s) for normal operation
- ☐ Active or passive measure(s) for self-protection
- ☐ Co-generating thermal and electrical power
- ☐ Façade collector(s)

Energy Labelling Information

	Reference Area, A_{sol} (m²)
Solar clock 250	2,44

Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}

Collector efficiency (η_{col})	61%

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.

Additional Informative Technical Data

Hydraulic Designation Code	Aperature Area, A_a (m²)
13-VH-13S-A:7.2,1880-C:20.6,1250-D	2,28

Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}

Zero-loss efficiency (η_0)	0,79	–
First-order coefficient (a_1)	4,11	W/(m²K)
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.

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