Annex to Solar Keymark Certificate

Licence Number	**OEM 9999/1/2**
Date issued	**2022-07-27**
Issued by	**DQS Hellas**

Licence holder	**SUNERG SOLAR SRL**	**Country**	Italy
Brand (optional)		**Web**	www.sunergsolar.com
Street, Number	51,Via Donini	**E-mail**	info@sunergsolar.co
Postcode, City	06012 Cinquemiglia Città di Castello	**Tel**	+39 075 854 0018

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	84 K
	m²	mm	mm	mm	W	W	W	W	W	W
SKY15	1,50	1.480	1.010	86	1.143	1.087	963	822	665	548
SKY15_O	1,50	1.010	1.480	86	1.143	1.087	963	822	665	548
SKY18	1,82	1.480	1.230	86	1.387	1.319	1.168	997	807	664
SKY18_O	1,82	1.230	1.480	86	1.387	1.319	1.168	997	807	664
SKY20	2,00	1.980	1.010	86	1.524	1.449	1.284	1.096	886	730
SKY20_O	2,00	1.010	1.980	86	1.524	1.449	1.284	1.096	886	730
SKY25	2,37	1.930	1.230	86	1.806	1.718	1.521	1.299	1.050	865
SKY25_O	2,37	1.230	1.930	86	1.806	1.718	1.521	1.299	1.050	865
SKY27	2,72	2.160	1.260	86	2.073	.2 (13.01	1.746	1.491	1.205	993
SKY27_O	2,72	1.260	2.160	86	2.073	1.971	1.746	1.491	1.205	993
Power output per m² gross area					762	725	642	548	443	365

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	0,771	3,59	0,014	0,000	0,00	10.827	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	0,90	0,78	0,52	0,00
Longitudinal	$K_{\theta L,coll}$	1,00	1,00	1,00	0,99	0,96	0,90	0,78	0,52	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	$(\vartheta_m-\vartheta_a)_{max}$	53,7	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	190,5	°C
Maximum operating temperature	ϑ_{max_op}	200	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	NCSR Demokritos / Solar & other Energy System	www.solar.demokritos.gr	
Test report(s)	4195DE2 4196DE2 4197DQ3	**Dated**	16/11/2016 16/11/2016 2/6/2017

Comments of testing laboratory	Ver. 6.2 (13.01.2022)

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Supplementary Information	Issued	2022-07-27

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
SKY15		1.848	1.320	859	1.405	970	605	1.034	675	405	1.125	731	431
SKY15_O		1.848	1.320	859	1.405	970	605	1.034	675	405	1.125	731	431
SKY18		2.243	1.601	1.042	1.705	1.177	734	1.254	819	491	1.365	886	523
SKY18_O		2.243	1.601	1.042	1.705	1.177	734	1.254	819	491	1.365	886	523
SKY20		2.464	1.759	1.145	1.874	1.293	806	1.379	900	540	1.500	974	575
SKY20_O		2.464	1.759	1.145	1.874	1.293	806	1.379	900	540	1.500	974	575
SKY25		2.920	2.085	1.357	2.221	1.532	955	1.634	1.066	639	1.778	1.154	682
SKY25_O		2.920	2.085	1.357	2.221	1.532	955	1.634	1.066	639	1.778	1.154	682
SKY27		3.352	2.393	1.558	2.549	1.759	1.097	1.875	1.223	734	2.040	1.325	782
SKY27_O		3.352	2.393	1.558	2.549	1.759	1.097	1.875	1.223	734	2.040	1.325	782
Gross Thermal Yield per m² gross area		1.232	880	573	937	647	403	689	450	270	750	487	288
Annual efficiency, η_a		70%	50%	32%	57%	40%	25%	59%	39%	23%	60%	39%	23%
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

	Reference Area, A_{sol} (m²)
SKY15	1,50
SKY15_O	1,50
SKY18	1,82
SKY18_O	1,82
SKY20	2,00
SKY20_O	2,00
SKY25	2,37
SKY25_O	2,37
SKY27	2,72
SKY27_O	2,72

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

Collector efficiency (η_{col})	60%

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	Aperture Area, A_a (m²)
SKY15	9-V-1234S-A:7.2,1380-C:20.6,1080-D	1,38
SKY15_O	14-V-1234S-A:7.2,908-C:20.6,1560-D	1,38
SKY18	11-V-1234S-A:7.2,1378-C:20.6,1300-D	1,72
SKY18_O	14-V-1234S-A:7.2,1128-C:20.6,1560-D	1,72
SKY20	9-V-1234S-A:7.2,1878-C:20.6,1080-D	1,86
SKY20_O	18-V-1234S-A:7.2,908-C:20.6,2060-D	1,86
SKY25	11-V-1234S-A:7.2,1828-C:20.6,1300-D	2,23
SKY25_O	18-V-1234S-A:7.2,1128-C:20.6,2010-D	2,23
SKY27	11-V-1234S-A:7.2,2060-C:20.6,1320-D	2,57
SKY27_O	18-V-1234S-A:7.2,1158-C:20.6,2240-D	2,57

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

Zero-loss efficiency (η_0)	0,76	--
First-order coefficient (a_1)	3,59	W/(m²K)
Second-order coefficient (a_2)	0,014	W/(m²K²)
Incidence angle modifier IAM (50°)	0,96	--

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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