Annex to Solar Keymark Certificate

Licence Number	SKM 10209.1
Date issued	2024-11-28
Issued by	DQS Hellas

Licence holder	SOLE S.A.	**Country**	GREECE
Brand (optional)		**Web**	http://www.sole.gr
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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	89 K
	m^2	mm	mm	mm	W	W	W	W	W	W
SUPERSOL S200 (ECO S200)	1.88	1,960	960	82	1,455	1,389	1,237	1,059	854	635
SUPERSOL S230 (ECO S230)	2.28	1,960	1,165	82	1,765	1,685	1,500	1,284	1,035	770
SUPERSOL S260 (ECO S260)	2.64	2,135	1,238	82	2,043	1,950	1,737	1,486	1,199	891
Power output per m^2 gross area					774	739	658	563	454	338

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	-	$W/(m^2K)$	$W/(m^2K^2)$	$J/(m^3K)$	-	$J/(m^2K)$	s/m	$W/(m^2K^4)$	$W/(m^2K^4)$	-
Test results	0.782	3.34	0.018	0.000	0.00	10,630	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	0.55	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	1.00	1.00	0.99	0.97	0.92	0.81	0.55	0.00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0.020	$kg/(sm^2)$
Maximum temperature difference during thermal performance test	$(\vartheta_m-\vartheta_a)_{max}$	59	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	197	°C
Maximum operating temperature	ϑ_{max_op}	150	°C
Maximum operating pressure	$p_{max,op}$	1500	kPa

Testing laboratory	NCSR "DEMOKRITOS"	www.solar.demokritos.gr	
Test report(s)	4422 DE3 4423 DE1 4424 DQ1	**Dated**	28/11/24 10/10/24 10/10/24

Comments Ver. 6.2 (13.01.2022)

The data was obtained from the test reports 4422 DE3 and 4424 DQ1

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Supplementary Information	Issued	2024-11-20

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
SUPERSOL S200 (ECO S200)	2,372	1,727	1,132	1,826	1,272	791	1,342	888	532	1,459	963	568
SUPERSOL S230 (ECO S230)	2,877	2,094	1,373	2,214	1,543	959	1,627	1,077	646	1,769	1,168	689
SUPERSOL S260 (ECO S260)	3,331	2,425	1,589	2,564	1,786	1,110	1,884	1,247	748	2,049	1,352	798
Gross Thermal Yield per m² gross area	1,262	918	602	971	677	421	714	472	283	776	512	302
Annual efficiency, η_a	71%	52%	34%	60%	42%	26%	61%	41%	24%	62%	41%	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. 6.2 (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)
SUPERSOL S200 (ECO S200)	1.88
SUPERSOL S230 (ECO S230)	2.28
SUPERSOL S260 (ECO S260)	2.64

Additional Informative Technical Data

Hydraulic Designation Code	Aperture Area, A_a (m^2)
11-V-1234S-A:7.2-1892-C:16.6-1024	1.77
14-V-1234S-A:7.2-1892-C:16.6-1226	2.17
15-V-1234S-A:7.2-2067-C:16.6-1301	2.54

Data required for CDR (EU) No 811/2013 - Reference Area

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.

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

Zero-loss efficiency (η_0)	0.77	--
First-order coefficient (a_1)	3.34	W/(m²K)
Second-order coefficient (a_2)	0.018	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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