



Annex to Solar Keymark Certificate					Licence Number		SKM 10110.1							
					Date issued		2020-12-21							
					Issued by		DQS Hellas							
Licence holder		SIRAKIAN ANDRONIKOS MON. I.K.E.			Country		Greece							
Brand (optional)		AL-SF PLUS 2.5			Web		www.sirakian.gr							
Street, Number		Industrial Area Sindos			E-mail		office@sirakian.gr							
Postcode, City		57022 Thessaloniki			Tel		+30 2310795677 / 2310795690							
Collector Type					Flat plate collector									
Collector name					Power output per collector									
					G _b = 850 W/m ² , G _d = 150 W/m ² & u = 1.3 m/s $\vartheta_m - \vartheta_a$									
					0 K	10 K	30 K	50 K	70 K	90 K				
					W	W	W	W	W	W				
AL-SF PLUS 2.5					2.44	1,978	1,232	85	1,928	1,825	1,609	1,377	1,130	874
					0	0	0	0	0	0	0	0	0	
Power output per m ² gross area					790	748	659	564	463	358				
Performance parameters test method		Steady state - outdoor												
Performance parameters (related to A _G)		η_0, b	a1	a2	a3	a4	a5	a6	a7	a8	Kd			
Units		-	W/(m ² K)	W/(m ² K ²)	J/(m ² K)	-	J/(m ² K)	s/m	W/(m ² K ⁴)	W/(m ² K ⁴)	-			
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/(sm ²)										
Maximum temperature difference during thermal performance test		$(\vartheta_m - \vartheta_a)_{max}$	59.5	K										
Standard stagnation temperature (G = 1000 W/m ² ; $\vartheta_a = 30^\circ C$)		ϑ_{stg}	155	°C										
Maximum operating temperature		$\vartheta_{max, op}$		°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												
		<p>N.C.S.R. "DEMOKRITOS" SOLAR ENERGY LABORATORY Tel: +210 6503815 - Fax: +210 6544582 P.O. BOX 60037, 15310 Ag. Paraskevi, Greece</p>												
Central Offices: Kalavriton 4, 145 64 kifisia, Athens, Tel: +301 6233493-4 , Fax: +301 6233495, http://www.dqshellas.gr, e-mail: ioannisalexou@dqshellas.gr														

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Supplementary Information		Issued		2020-12-21													
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				
AL-SF PLUS 2.5		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 m ² 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/m ²			1630 kWh/m ²			1166 kWh/m ²			1244 kWh/m ²							
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 ϑ_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. 6.1 (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/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)										1.8		m					
Additional collector attribute(s)																	
<input type="checkbox"/> Using external power source(s) for normal operation										<input type="checkbox"/> Active or passive measure(s) for self-protection							
<input type="checkbox"/> Co-generating thermal and electrical power										<input type="checkbox"/> Façade collector(s)							
Energy Labelling Information						Additional Informative Technical Data											
Reference Area, A _{sol} (m ²)						Hydraulic Designation Code				Aperture Area, A _a (m ²)							
AL-SF PLUS 2.5						2.44				13-VH-13S-A:7.2,1880-C:20.6,1250-				2.28			
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})						61%				Zero-loss efficiency (η_0)		0.79		--			
Remark: Collector efficiency (η_{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 ² , expressed in % and rounded to the nearest integer. Deviating from the regulation η_{col} is based on reference area (A _{sol}) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.						First-order coefficient (a ₁)		4.11		W/(m ² K)							
						Second-order coefficient (a ₂)		0.008		W/(m ² K ²)							
						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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