



Annex to Solar Keymark Certificate					Licence Number		OEM 9965/1/1				
					Date issued		2022-08-10				
					Issued by		DQS Hellas				
Licence holder		BSG CALDAIE A GAS S.P.A.			Country		Italy				
Brand (optional)					Web						
Street, Number		Via Pravolton 1/B			E-mail		supportotecnico@bsgcaldaie.it				
Postcode, City		33170 Pordenone			Tel		+390 434238341				
Collector Type					Flat plate collector						
Collector name					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 $\vartheta_m - \vartheta_a$						
					0 K	10 K	30 K	50 K	70 K	76 K	
					m <sup>2</sup>	mm	mm	mm	W	W	W
15 SOL TOP					1,52	1.510	1.010	110	1.054	992	860
20 SOL TOP					2,03	2.010	1.010	110	1.408	1.325	1.148
26 SOL TOP					2,53	2.010	1.270	110	1.755	1.651	1.431
Power output per m <sup>2</sup> gross area					694	653	566	473	373	342	
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		0,704	4,02	0,008	0,000	0,00	7.860	0,000	0,00	0,0E+00	0,90
Incidence angle modifier test method		Steady state - outdoor									
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal		K <sub>θT,coil</sub>	1,00	1,00	0,99	0,98	0,94	0,87	0,73	0,48	0,00
Longitudinal		K <sub>θL,coil</sub>	1,00	1,00	0,99	0,98	0,94	0,87	0,73	0,48	0,00
Heat transfer medium for testing					Water						
Flow rate for testing (per gross area, A <sub>G</sub> )					dm/dt	0,022	kg/(sm <sup>2</sup> )				
Maximum temperature difference during thermal performance test					( $\vartheta_m - \vartheta_a$ ) <sub>max</sub>	46	K				
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; $\vartheta_a$ = 30 °C)					$\vartheta_{stg}$	174	°C				
Maximum operating temperature					$\vartheta_{max,op}$	100	°C				
Maximum operating pressure					p <sub>max,op</sub>	1000	kPa				
Testing laboratory		NCSR Demokritos				www.solar.demokritos.gr					
Test report(s)		4188DE1 4189DE1 4023DQ2, 4046DQ2				Dated		27/7/2016 27/7/2016 5/9/2013			
Comments of testing laboratory					Ver. 6.2 (13.01.2022)						
<p>Central Offices: Kalavriton 4, 145 64 kifisia, Athens, Tel: +30 210 6233493-4 , Fax: +30 210 6233495, http://www.dqs.gr, e-mail: i.alexou@dqs.gr</p>											



Annex to Solar Keymark Certificate Supplementary Information	Licence Number	OEM 9965/1/1
	Issued	2022-08-10

Gross Thermal Yield in kWh/collector at mean fluid temperature $\vartheta_m$													
Collector name	$\vartheta_m$	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
15 SOL TOP		1.670	1.121	689	1.226	804	478	908	559	319	990	602	338
20 SOL TOP		2.230	1.497	920	1.638	1.074	638	1.213	746	426	1.322	804	452
26 SOL TOP		2.779	1.866	1.147	2.041	1.339	796	1.511	930	531	1.648	1.002	563
Gross Thermal Yield per m <sup>2</sup> gross area		1.099	737	453	807	529	314	597	368	210	651	396	222
Annual efficiency, $\eta_a$		62%	42%	26%	49%	32%	19%	51%	32%	18%	52%	32%	18%
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	1000		Pa
Maximum tested negative load	1000		Pa
Hail resistance using steel ball (maximum drop height)			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		Additional Informative Technical Data	
	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Hydraulic Designation Code	Aperture Area, $A_a$ (m <sup>2</sup> )
15 SOL TOP	1,52	10-V-1234S-A:7.2,1342-C:20.6,1060-D	1,34
20 SOL TOP	2,03	10-V-1234S-A:7.2,1842-C:20.6,1060-D	1,81
26 SOL TOP	2,53	13-V-1234S-A:7.2,1842-C:20.6,1320-D	2,32

Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$		Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$	
Collector efficiency ( $\eta_{col}$ )	52%	Zero-loss efficiency ( $\eta_0$ )	0,69
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 ( $A_{sol}$ ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.		First-order coefficient ( $a_1$ )	4,02
		Second-order coefficient ( $a_2$ )	0,008
		Incidence angle modifier IAM (50°)	0,94
		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.	