



Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results						Licence Number		OEM 10061/1							
						Date issued		2019-01-28							
						Issued by		DQS Hellas							
Licence holder	SPIROPOULOS P. & SIA Co					Country	Greece								
Brand (optional)	Multiclima					Web	www.multiclima.gr								
Street, Number	Ag. Ioanni Pratsika 60					E-mail	info@multiclima.gr								
Postcode, City	26333 Patra					Tel	+30 2610 339558								
Collector Type						Flat plate collector, glazed									
Collector name	Gross area (A <sub>G</sub> ) m <sup>2</sup>	Gross length mm	Gross width mm	Gross height mm	Power output per collector G <sub>b</sub> = 850 W/m <sup>2</sup> ; G <sub>d</sub> = 150 W/m <sup>2</sup> θ <sub>m</sub> - θ <sub>a</sub>										
					0 K W	10 K W	30 K W	50 K W	70 K W	55 K W					
S15	1,50	1.485	1.010	85	1.014	965	850	711	548	672					
S18	1,75	1.730	1.010	85	1.183	1.126	992	830	639	785					
S20	2,00	1.980	1.010	85	1.352	1.287	1.134	948	730	897					
S23	2,30	1.980	1.160	85	1.555	1.480	1.304	1.090	840	1.031					
S25	2,46	1.990	1.235	85	1.663	1.583	1.394	1.166	898	1.103					
Power output per m <sup>2</sup> gross area					676	644	567	474	365	448					
Performance parameters test method						Steady state - outdoor									
Performance parameters (related to AG)						η <sub>0,hem</sub>	a <sub>1</sub>	a <sub>2</sub>							
Units						-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )							
Test results						0,676	3,040	0,020							
Incidence angle modifier test method						Steady state - outdoor									
Bi-directional incidence angle modifiers						No									
Incidence angle modifier						Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal						K <sub>θT, coll</sub>					0,87			0,00	
Longitudinal						K <sub>θL, coll</sub>					0,87			0,00	
Heat transfer medium for testing						Water									
Flow rate for testing (per gross area, A <sub>G</sub> )						dm/dt	0,021	kg/(sm <sup>2</sup> )							
Maximum temperature difference for thermal performance calculations						(θ <sub>m</sub> -θ <sub>a</sub> ) <sub>max</sub>	55	K							
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; θ <sub>a</sub> = 30 °C)						θ <sub>stg</sub>	172	°C							
Effective thermal capacity, incl. fluid (per gross area, A <sub>G</sub> )						C/m <sup>2</sup>	9,08	kJ/(Km <sup>2</sup> )							
Maximum operating temperature						θ <sub>max, op</sub>	180	°C							
Maximum operating pressure						p <sub>max, op</sub>	1000	kPa							
Testing laboratory	NCSR Demokritos / Solar & other Energy System Laboratory					www.solar.demokritos.gr									
Test report(s)	4240 DE1 4241 - 4242 DQ1 4243 DE1					Dated	31/10/2018 5/11/2018 30/10/2018								
Comments of testing laboratory						Datasheet version: 5.01, 2016-03-01									
Central Offices: Kalavriton 4, 145 64 kifisia, Athens, Tel: +301 6233493-4 , Fax: +301 6233495, http://www.dqshellas.gr, e-mail: ioannisalexidou@dqshellas.gr															



Annex to Solar Keymark Certificate Supplementary Information	Licence Number	OEM 10061/1
	Issued	2019-01-28

**Annual collector output in kWh/collector at mean fluid temperature  $\vartheta_m$ , based on ISO 9806:2013 test results**

Collector name	Standard Locations $\vartheta_m$	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
S15		1.518	1.052	635	1.150	759	429	843	533	295	915	570	310
S18		1.771	1.227	741	1.341	886	500	984	621	344	1.067	665	361
S20		2.024	1.403	847	1.533	1.013	572	1.124	710	393	1.219	760	413
S23		2.327	1.613	974	1.763	1.165	657	1.293	817	452	1.402	874	475
S25		2.489	1.725	1.042	1.885	1.246	703	1.383	874	484	1.500	934	508
Annual output per m <sup>2</sup> gross area		1.012	701	424	766	506	286	562	355	197	610	380	206
Fixed or tracking collector	Fixed (slope = latitude - 15°; rounded to nearest 5°)												
Annual irradiation on collector plane	1765 kWh/m <sup>2</sup>			1714 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. 5.01 (March 2016). A detailed description of the calculations is available at [www.solarkeymark.org/scenocalc](http://www.solarkeymark.org/scenocalc)

**Additional Information**

Collector heat transfer medium	Water-Glycole	
Hybrid Thermal and Photo Voltaic collector	No	
The collector is deemed to be suitable for roof integration	No	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	A	--
Maximum tested positive load	2400	Pa
Maximum tested negative load	2400	Pa
Hail resistance using steel ball (maximum drop height)	2	m

**Energy Labelling Information**

	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$	
S15	1,50	Collector efficiency ( $\eta_{col}$ )	52 %
S18	1,75	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 9806:2013.	
S20	2,00		
S23	2,30		
S25	2,46		
		Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$	
		Zero-loss efficiency ( $\eta_0$ )	0,676 --
		First-order coefficient ( $a_1$ )	3,04 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0,020 W/(m <sup>2</sup> K <sup>2</sup> )
		Incidence angle modifier IAM (50°)	0,87 --
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.			