



Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		OEM 9965/1/4																	
					Date issued		2018-03-10																	
					Issued by		DQS Hellas																	
Licence holder		BLACK KING GROUP SRLS			Country		Italy																	
Brand (optional)					Web																			
Street, Number		38, Via Leopardi			E-mail																			
Postcode, City		92020 Grotte (AG), Sicily			Tel		+39 393 87 91 874																	
Collector Type					Flat plate collector, glazed																			
Collector name					Gross area (A_G)		Gross length		Gross width		Gross height		Power output per collector Gb = 850 W/m ² ; Gd = 150 W/m ² $\vartheta_m - \vartheta_a$											
					m ²		mm		mm		mm		0 K		10 K		30 K		50 K		70 K		90 K	
SOLAR – 1500					1,52		1.510		1.010		110		1.053		991		859		716		563		716	
SOLAR – 2000					2,03		2.010		1.010		110		1.406		1.323		1.147		957		753		957	
SOLAR – 2600					2,53		2.010		1.270		110		1.752		1.649		1.429		1.192		938		1.192	
Power output per m² gross area					693		652		565		471		371		471									
Performance parameters test method					Steady state - outdoor																			
Performance parameters (related to AG)					η_0, hem		a1		a2															
Units					-		W/(m ² K)		W/(m ² K ²)															
Test results					0,693		3,999		0,009															
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					$K_{GT, coll}$		1,00		0,99		0,98		0,97		0,94		0,90		0,81				0,00	
Longitudinal					$K_{GL, coll}$		1,00		0,99		0,98		0,97		0,94		0,90		0,81				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 for thermal performance calculations					$(\vartheta_m - \vartheta_a)_{max}$		50		K															
Standard stagnation temperature ($G = 1000 \text{ W/m}^2$; $\vartheta_a = 30^\circ \text{C}$)					ϑ_{stg}		174		°C															
Effective thermal capacity, incl. fluid (per gross area, A_G)					C/m^2		7,86		kJ/(Km ²)															
Maximum operating temperature					$\vartheta_{max, op}$		100		°C															
Maximum operating pressure					$p_{max, op}$		1000		kPa															
Testing laboratory					NCSR Demokritos							www.solar.demokritos.gr												
Test report(s)					4188DE1 4189DE1 4023DQ2, 4046DQ2							Dated		27/7/2016 27/7/2016 05/9/2013										
Comments of testing laboratory					Datasheet version: 5.01, 2016-03-01																			
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	OEM 9965/1/4
	Issued	2018-03-10

Annual collector output in kWh/collector at mean fluid temperature ϑ_m , based on ISO 9806:2013 test results

Collector name	Standard Locations ϑ_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
SOLAR – 1500		1.667	1.118	683	1.222	798	469	907	557	315	989	600	334
SOLAR – 2000		2.226	1.493	913	1.632	1.066	626	1.211	744	420	1.321	801	446
SOLAR – 2600		2.775	1.860	1.137	2.034	1.328	781	1.509	927	524	1.646	998	556
Annual output per m ² gross area		1.097	735	450	804	525	309	597	366	207	651	395	220
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m ²			1714 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. 5.01 (March 2016). A detailed description of the calculations is available at 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	1000 Pa
Maximum tested negative load	1000 Pa
Hail resistance using steel ball (maximum drop height)	- m

Energy Labelling Information

	Reference Area, A_{col} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}	
APOLLON AL 1500	1,52	Collector efficiency (η_{col})	52 %
APOLLON AL 2000	2,03	<i>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/m², 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 9806:2013.</i>	
APOLLON AL 2600	2,53		
		Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}	
		Zero-loss efficiency (η_0)	0,693 --
		First-order coefficient (a_1)	4,00 W/(m ² K)
		Second-order coefficient (a_2)	0,009 W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0,94 --
		<i>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.</i>	