




<b>Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results</b>					<b>Licence Number</b>		<b>SKM 9951/1</b>				
					<b>Date issued</b>		<b>2017-03-08</b>				
					<b>Issued by</b>		<b>DQS HELLAS</b>				
<b>Licence holder</b>	<b>Papaemmanouel S.A.</b>				<b>Country</b>	Greece					
<b>Brand (optional)</b>					<b>Web</b>	www.papaemmanouel.gr					
<b>Street, Number</b>	1st Km. Inofyta-St. Thomas				<b>E-mail</b>	exports@papaemmanouel.gr					
<b>Postcode, City</b>	32011 Inofyta-Viotia				<b>Tel</b>	+30 22620 31931 / 22620 32166					
<b>Collector Type</b>					Flat plate collector, glazed						
<b>Collector name</b>	<b>Gross area (A<sub>G</sub>)</b> m <sup>2</sup>	<b>Gross length</b> mm	<b>Gross width</b> mm	<b>Gross height</b> mm	<b>Power output per collector</b> G <sub>b</sub> = 850 W/m <sup>2</sup> ; G <sub>d</sub> = 150 W/m <sup>2</sup> ; u = 3 m/s ∅ <sub>m</sub> - ∅ <sub>a</sub>						
					0 K W	10 K W	30 K W	50 K W	70 K W	112 K W	
ASL0580.S86RS-2.72 m <sup>2</sup>	2.73	2 163	1 261	87	1 879	1 785	1 575	1 333	1 061	390	
ASL0580.S86RS-2.37 m <sup>2</sup>	2.37	1 930	1 230	86	1 632	1 550	1 367	1 157	921	339	
ASL0580.S86RS-2.00 m <sup>2</sup> H	2.00	1 010	1 980	86	1 377	1 308	1 154	977	777	286	
ASL0580.S86RS-2.00 m <sup>2</sup>	2.00	1 980	1 010	86	1 377	1 308	1 154	977	777	286	
ASL0580.S86RS-1.82 m <sup>2</sup>	1.82	1 480	1 230	86	1 253	1 190	1 050	889	707	260	
ASL0580.S86RS-1.50 m <sup>2</sup>	1.50	1 481	1 010	87	1 033	981	865	732	583	214	
<b>Power output per m<sup>2</sup> gross area</b>					688	654	577	488	389	143	
<b>Performance parameters test method</b>		Quasi dynamic									
<b>Performance parameters (related to A<sub>G</sub>)</b>		η <sub>0,b</sub>	c <sub>1</sub>	c <sub>2</sub>	c <sub>3</sub>	c <sub>4</sub>	c <sub>6</sub>	K <sub>d</sub>			
<b>Units</b>		-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )	J/(m <sup>3</sup> K)	-	s/m	-			
<b>Test results</b>		0.700	3.303	0.014	0.000	0.000	0.000	0.890			
<b>Incidence angle modifier test method</b>		Quasi dynamic - outdoor									
<b>Bi-directional incidence angle modifiers</b>		No									
<b>Incidence angle modifier</b>		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
<b>Transversal</b>		K <sub>θT, coll</sub>	1.00	0.98	0.95	0.90	0.82	0.68	0.39	0.00	0.00
<b>Longitudinal</b>		K <sub>θL, coll</sub>	1.00	0.98	0.95	0.90	0.82	0.68	0.39	0.00	0.00
<b>Heat transfer medium for testing</b>					Water						
<b>Flow rate for testing (per gross area, A<sub>G</sub>)</b>					dm/dt	0.020		kg/(sm <sup>2</sup> )			
<b>Maximum temperature difference for thermal performance calculations</b>					(∅ <sub>m</sub> -∅ <sub>a</sub> ) <sub>max</sub>	112		K			
<b>Standard stagnation temperature (G = 1000 W/m<sup>2</sup>; ∅<sub>a</sub> = 30 °C)</b>					∅ <sub>stg</sub>	188		°C			
<b>Effective thermal capacity, incl. fluid (per gross area, A<sub>G</sub>)</b>					C/m <sup>2</sup>	10.817		kJ/(Km <sup>2</sup> )			
<b>Maximum operating temperature</b>					∅ <sub>max, op</sub>	n.a.		°C			
<b>Maximum operating pressure</b>					p <sub>max, op</sub>	1000		kPa			
<b>Testing laboratory</b>		TZS, ITW University Stuttgart			www.itw.uni-stuttgart.de						
<b>Test report(s)</b>		10COL973 10COL973Q 10COL972			<b>Dated</b>		02.08.2011 02.08.2011 02.08.2011				
<b>Comments of testing laboratory</b>					Datasheet version: 5.01, 2016-03-01						
This data sheet replaces the data sheet issued on 10.10.2016 Documented performance parameters are taken from 10COL973. The licence number was corrected from 9951/1 to SKM 9951/1.					 <b>Forschungs- und Testzentrum für Solaranlagen</b> Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 8, 70550 Stuttgart (Vaihingen)						
DQS HELLAS: 4 Kalavriton Str., Kifisia 14564											
Tel : (+30) 210 62 33 493; (+30) 210 62 33 494; (+30) 210 62 33 495; Fax : (+30) 210 62 33 495; Email : info@dqshellas.gr											



Annex to Solar Keymark Certificate Supplementary Information	Licence Number	SKM 9951/1
	Issued	2017-03-08

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
ASL0580.S86RS-2.72 m <sup>2</sup>		2 826	1 955	1 218	2 121	1 416	838	1 560	990	576	1 702	1 069	604
ASL0580.S86RS-2.37 m <sup>2</sup>		2 453	1 697	1 057	1 841	1 229	728	1 354	860	500	1 477	928	524
ASL0580.S86RS-2.00 m <sup>2</sup> H		2 070	1 432	892	1 554	1 037	614	1 143	726	422	1 247	783	442
ASL0580.S86RS-2.00 m <sup>2</sup>		2 070	1 432	892	1 554	1 037	614	1 143	726	422	1 247	783	442
ASL0580.S86RS-1.82 m <sup>2</sup>		1 884	1 303	812	1 414	944	559	1 040	660	384	1 135	713	403
ASL0580.S86RS-1.50 m <sup>2</sup>		1 552	1 074	669	1 165	778	461	857	544	316	935	587	332
Annual output per m <sup>2</sup> gross area		1 035	716	446	777	519	307	571	363	211	623	392	221
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)	B	--
Maximum tested positive load	2500	Pa
Maximum tested negative load	2500	Pa
Hail resistance using steel ball (maximum drop height)	n.a.	m

### Energy Labelling Information

	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$	
ASL0580.S86RS-2.72 m <sup>2</sup>	2.73	Collector efficiency ( $\eta_{col}$ )	53 %
ASL0580.S86RS-2.37 m <sup>2</sup>	2.37	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.	
ASL0580.S86RS-2.00 m <sup>2</sup> H	2.00		
ASL0580.S86RS-2.00 m <sup>2</sup>	2.00		
ASL0580.S86RS-1.82 m <sup>2</sup>	1.82		
ASL0580.S86RS-1.50 m <sup>2</sup>	1.50		
		Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$	
		Zero-loss efficiency ( $\eta_0$ )	0.688 --
		First-order coefficient ( $a_1$ )	3.30 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0.014 W/(m <sup>2</sup> K <sup>2</sup> )
		Incidence angle modifier IAM (50°)	0.82 --
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.			

DQS HELLAS: 4 Kalavriton Str., Kifisia 14564

Tel : (+30) 210 62 33 493; (+30) 210 62 33 494; (+30) 210 62 33 495; Fax : (+30) 210 62 33 495; Email : [info@dqshellas.gr](mailto:info@dqshellas.gr)