


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		011-7S1493 F							
					Date issued		2018-07-02							
					Issued by		DIN CERTCO							
Licence holder		DIMAS SA Solar Energy Systems			Country		Greece							
Brand (optional)		-			Web		www.dimas-solar.gr							
Street, Number		2nd km Argos - Nafplion			E-mail		info@dimas-solar.gr							
Postcode, City		21200, Argos			Tel		+30 27510 20920							
Collector Type					Flat plate collector, glazed									
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 = 3 m/s θ <sub>m</sub> - θ <sub>a</sub>									
					0 K	10 K	30 K	50 K	70 K	116 K				
					m <sup>2</sup>	mm	mm	mm	W	W	W	W	W	W
SOL+EVO 20					2.02	2 006	1 007	103	1 460	1 391	1 242	1 077	896	418
SOL+EVO 23					2.24	1 893	1 183	103	1 618	1 543	1 377	1 194	993	463
SOL+ EVO25					2.52	2 006	1 257	103	1 821	1 735	1 550	1 344	1 118	521
SOL+EVO 29					2.92	2 006	1 457	103	2 110	2 011	1 796	1 557	1 295	604
TERRA+EVO 20					2.02	2 006	1 007	103	1 460	1 391	1 242	1 077	896	418
TERRA+EVO 23					2.24	1 893	1 183	103	1 618	1 543	1 377	1 194	993	463
TERRA+ EVO25					2.52	2 006	1 257	103	1 821	1 735	1 550	1 344	1 118	521
TERRA+EVO 29					2.92	2 006	1 457	103	2 110	2 011	1 796	1 557	1 295	604
Power output per m <sup>2</sup> gross area									723	689	615	533	444	207
Performance parameters test method					Quasi dynamic									
Performance parameters (related to A <sub>G</sub> )					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>			
Units					-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )	J/(m <sup>3</sup> K)	-	s/m	-			
Test results					0.727	3.286	0.010	0.000	0.000	0.000	0.959			
Incidence angle modifier test method					Quasi dynamic - outdoor									
Bi-directional incidence angle modifiers					No									
Incidence angle modifier					Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal					K <sub>GT, coll</sub>	1.00	0.99	0.98	0.97	0.94	0.89	0.79	0.47	0.00
Longitudinal					K <sub>GL, coll</sub>	1.00	0.99	0.98	0.97	0.94	0.89	0.79	0.47	0.00
Heat transfer medium for testing					Water									
Flow rate for testing (per gross area, A <sub>G</sub> )					dm/dt	0.020	kg/(sm <sup>2</sup> )							
Maximum temperature difference for thermal performance calculations					(θ <sub>m</sub> -θ <sub>a</sub> ) <sub>max</sub>	116	K							
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; θ <sub>a</sub> = 30 °C)					θ <sub>stg</sub>	185	°C							
Effective thermal capacity, incl. fluid (per gross area, A <sub>G</sub> )					C/m <sup>2</sup>	10.165	kJ/(Km <sup>2</sup> )							
Maximum operating temperature					θ <sub>max, op</sub>	n.a.	°C							
Maximum operating pressure					p <sub>max, op</sub>	1600	kPa							
Testing laboratory					TZS, ITW University Stuttgart			www.itw.uni-stuttgart.de						
Test report(s)					10COL931/3			Dated		27.06.2018				
					10COL932/3					27.06.2018				
					10COL932Q/4					27.06.2018				
Comments of testing laboratory					Datashet version: 5.01, 2016-03-01									
<p>This data sheet replaces the data sheet issued on 28.10.2016</p> <p>Documented performance parameters are taken from 10COL931/3 (SOL+EVO 20)</p> <p>The collector types were changed from SOL+ to SOL+EVO. TERRA series was added.</p> <p>Maximum tested poistiv load was corrected from 2500 Pa to 3000 Pa</p> <p>Minimum tested negative load was corrected from 2250 Pa to 2000 Pa</p>					 <p>Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 8, 70550 Stuttgart (Vaihingen)</p>									
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<b>Annex to Solar Keymark Certificate</b> <b>Supplementary Information</b>	<b>Licence Number</b>	<b>011-7S1493 F</b>
	<b>Issued</b>	<b>2018-07-02</b>

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

Standard Locations 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
SOL+EVO 20		2 368	1 722	1 162	1 811	1 279	833	1 332	891	558	1 452	967	596
SOL+EVO 23		2 626	1 909	1 289	2 008	1 418	924	1 478	988	618	1 611	1 073	661
SOL+ EVO25		2 954	2 148	1 450	2 259	1 595	1 039	1 662	1 111	696	1 812	1 207	743
SOL+EVO 29		3 423	2 489	1 680	2 618	1 848	1 204	1 926	1 287	806	2 099	1 398	861
TERRA+EVO 20		2 368	1 722	1 162	1 811	1 279	833	1 332	891	558	1 452	967	596
TERRA+EVO 23		2 626	1 909	1 289	2 008	1 418	924	1 478	988	618	1 611	1 073	661
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Annual output per m <sup>2</sup> gross area		1 172	852	575	897	633	412	660	441	276	719	479	295
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	3000	Pa
Maximum tested negative load	2000	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 $A_{sol}$	
SOL+EVO 20	2.02	Collector efficiency ( $\eta_{col}$ )	58 %
SOL+EVO 23	2.24	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.	
SOL+ EVO25	2.52		
SOL+EVO 29	2.92		
TERRA+EVO 20	2.02		
TERRA+EVO 23	2.24		
TERRA+ EVO25	2.52		
TERRA+EVO 29	2.92		
		Zero-loss efficiency ( $\eta_0$ )	0.723 --
		First-order coefficient ( $a_1$ )	3.29 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0.010 W/(m <sup>2</sup> K <sup>2</sup> )
		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.			