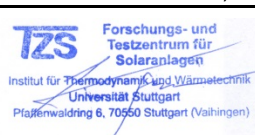


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results						Licence Number		011-7S1492 F								
						Date issued		2016-10-27								
						Issued by		DIN CERTCO								
Licence holder		DIMAS SA Solar Energy Systems				Country		Greece								
Brand (optional)		-				Web		www.dimas-solar.gr								
Street, Number		2nd km Argos - Nafplion				E-mail		info@dimas-solar.gr								
Postcode, City		21200, Argos				Tel		+30 275 10209110								
Collector Type						Flat plate collector, glazed										
Collector name						Power output per collector Gb = 850 W/m ² ; Gd = 150 W/m ² ; u = 3 m/s $\vartheta_m - \vartheta_a$										
						Gross area (A _G)	Gross length	Gross width	Gross height	0 K	10 K	30 K	50 K	70 K	114 K	
						m ²	mm	mm	mm	W	W	W	W	W	W	
ENERGY + ECO 15						1.51	1 503	1 007	85	1 011	938	774	584	369	0	
ENERGY + ECO 17						1.68	1 420	1 183	85	1 125	1 044	861	650	410	0	
ENERGY + ECO 19						1.96	1 503	1 305	85	1 312	1 218	1 004	758	478	0	
ENERGY + ECO 20						2.02	2 006	1 007	85	1 352	1 255	1 035	781	493	0	
ENERGY + ECO 23						2.24	1 893	1 183	85	1 500	1 392	1 148	866	547	0	
ENERGY + ECO 25						2.52	2 006	1 257	85	1 687	1 566	1 291	974	615	0	
Power output per m² gross area						670	621	512	387	244	0					
Performance parameters test method						Quasi dynamic										
Performance parameters (related to AG)						$\eta_{0,b}$	c1	c2	c3	c4	c6	Kd				
Units						-	W/(m ² K)	W/(m ² K ²)	J/(m ³ K)	-	s/m	-				
Test results						0.676	4.608	0.021	0.000	0.000	0.000	0.936				
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 _{θT, coll}	1.00	0.99	0.98	0.96	0.93	0.87	0.75	0.38	0.00	
Longitudinal						K _{θL, coll}	1.00	0.99	0.98	0.96	0.93	0.87	0.75	0.38	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						$(\vartheta_m - \vartheta_a)_{max}$		114		K						
Standard stagnation temperature (G = 1000 W/m²; $\vartheta_a = 30$ °C)						ϑ_{stg}		130		°C						
Effective thermal capacity, incl. fluid (per gross area, A_G)						C/m ²		12.195		kJ/(Km ²)						
Maximum operating temperature						$\vartheta_{max, op}$		n.a.		°C						
Maximum operating pressure						p _{max, op}		1600		kPa						
Testing laboratory						TZS, ITW University Stuttgart				www.itw.uni-stuttgart.de						
Test report(s)						10COL935/2 10COL936/2 10COL936Q/2				Dated		20.10.2016 20.10.2016 20.10.2016				
Comments of testing laboratory						Datashet version: 5.01, 2016-03-01										
<p>This data sheet replaces the data sheet issued on 01.08.2013</p> <p>The data sheet is issued on version 5.01</p> <p>documented performance parameters are taken from 10COL935/2 (ENERGY+ ECO 15)</p>						 <p>Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaaffenwaldring 8, 70560 Stuttgart (Vaihingen)</p>										
DIN CERTCO • Alboinstraße 56 • 12103 Berlin, Germany Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de • www.dincertco.de																

Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S1492 F
	Issued	2016-10-27

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

Standard Locations Collector name	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
ENERGY + ECO 15		1 588	951	459	1 102	614	256	832	440	184	914	474	198
ENERGY + ECO 17		1 767	1 058	510	1 226	683	285	925	489	205	1 017	528	220
ENERGY + ECO 19		2 062	1 235	595	1 431	796	332	1 080	571	239	1 186	616	257
ENERGY + ECO 20		2 125	1 273	614	1 474	821	342	1 113	588	246	1 223	634	265
ENERGY + ECO 23		2 356	1 411	680	1 635	910	379	1 234	652	273	1 356	704	293
ENERGY + ECO 25		2 651	1 588	766	1 839	1 024	427	1 388	734	307	1 525	792	330
Annual output per m ² gross area		1 052	630	304	730	406	169	551	291	122	605	314	131
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)	B	--
Maximum tested positive load	2500	Pa
Maximum tested negative load	2250	Pa
Hail resistance using steel ball (maximum drop height)	n.a.	m

Energy Labelling Information

	Reference Area, A_{sol} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}	
ENERGY + ECO 15	1.51	Collector efficiency (η_{col})	45 %
ENERGY + ECO 17	1.68	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/m ² , 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.	
ENERGY + ECO 19	1.96		
ENERGY + ECO 20	2.02		
ENERGY + ECO 23	2.24		
ENERGY + ECO 25	2.52		
		Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}	
		Zero-loss efficiency (η_0)	0.670 --
		First-order coefficient (a_1)	4.61 W/(m ² K)
		Second-order coefficient (a_2)	0.021 W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0.93 --
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.			