


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results						Licence Number		011-7S1556 F							
						Date issued		2017-01-30							
						Issued by		TÜV Rheinland Energy GmbH							
Licence holder	Energetyka Solarna ensol SP. Z.o.o.					Country	Poland								
Brand (optional)	ensol					Web	www.ensol.pl								
Street, Number	ul. Piaskowa 11					E-mail	sekretariat@ensol.pl								
Postcode, City	47-400 Racibórz					Tel	+48 (0)32-414 9242/ -415 9665								
Collector Type						Flat plate collector, glazed									
Collector name	Gross area (A_G) m ²	Gross length mm	Gross width mm	Gross height mm	Power output per collector G _b = 850 W/m ² ; G _d = 150 W/m ² $\vartheta_m - \vartheta_a$										
					0 K W	10 K W	30 K W	50 K W	70 K W	90 K W					
ES2V/2,65S	2.64	2 356	1 120	85	2 009	1 931	1 730	1 470	1 151	773					
ES2V/2,65B	2.64	2 356	1 120	85	2 009	1 931	1 730	1 470	1 151	773					
Power output per m ² gross area					761	731	655	557	436	293					
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						0.761	2.683	0.028							
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						$K_{\theta T, \text{coll}}$	1.00	0.98	0.96	0.92	0.85	0.73	0.49	--	0.00
Longitudinal						$K_{\theta L, \text{coll}}$	1.00	0.98	0.96	0.92	0.85	0.73	0.49	--	0.00
Heat transfer medium for testing						Water-Glycole									
Flow rate for testing (per gross area, A_G)						dm/dt	0.021	kg/(sm ²)							
Maximum temperature difference for thermal performance calculations						$(\vartheta_m - \vartheta_a)_{\text{max}}$	90	K							
Standard stagnation temperature (G = 1000 W/m ² ; $\vartheta_a = 30^\circ\text{C}$)						ϑ_{stg}	184	°C							
Effective thermal capacity, incl. fluid (per gross area, A_G)						C/m ²	6.295	kJ/(Km ²)							
Maximum operating temperature						$\vartheta_{\text{max, op}}$	-	°C							
Maximum operating pressure						p _{max, op}	600	kPa							
Testing laboratory						TÜV Rheinland Energy GmbH									
Test report(s)						www.tuv.com/solarpower									
						Dated									
						19.04.2011 06.04.2011									
Comments of testing laboratory						Datasheet version: 5.01, 2016-03-01									
<p>*This data sheet is not complete as the testing of the collector was not performed according to ISO 9806:2013.</p> <p>The steady state test evaluation was recalculated with gross area. The former values related to 2.44 m² aperur area had been: $\eta_{0a}=0.824$; $a_{1a}=2.905$; $a_{2a}=0.03$.</p>						 <p>Genau. Richtig.</p> <p>TÜV Rheinland Energy GmbH Am Grauen Stein 51105 Köln</p>									
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S1556 F
	Issued	2017-01-30

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
ES2V/2,65S		2 991	2 175	1 359	2 332	1 594	926	1 704	1 121	641	1 840	1 201	673
ES2V/2,65B		2 991	2 175	1 359	2 332	1 594	926	1 704	1 121	641	1 840	1 201	673
Annual output per m ² gross area		1 133	824	515	883	604	351	646	425	243	697	455	255
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)	-*	--
Maximum tested positive load	-*	Pa
Maximum tested negative load	-*	Pa
Hail resistance using steel ball (maximum drop height)	-	m

Energy Labelling Information			
	Reference Area, A_{sol} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}	
ES2V/2,65S	2.64	Collector efficiency (η_{col})	61 %
ES2V/2,65B	2.64	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.	
		Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}	
		Zero-loss efficiency (η_0)	0.761 --
		First-order coefficient (a_1)	2.68 W/(m ² K)
		Second-order coefficient (a_2)	0.028 W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0.85 --
		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.	