



Certificate no. **PSK – 020/2016**  
Certificado nº

**Name and address of certificate holder:**  
*Nome e morada do titular do certificado:*

SOL Ltd.  
19 Ioanni Ralli Str.  
14452 Metamorfofi-Athens  
Greece

**Product:**  
*Produto:*

Thermal Solar Collector  
*Coletor Solar Térmico*

**Type references:**  
*Referências:*

ATLAS CA160, ATLAS CA200, ATLAS CA230

**Trademark(s):**  
*Marca(s) comercial(is):*

SONNE AKTION

**Technical characteristics:**  
*Características técnicas:*

Summary of EN 12975 Test Results: Registration No. PSK-020/2016  
(in annex)  
*Resumo dos resultados dos ensaios realizados segundo a norma EN 12975:  
Registo Nº PSK-020/2016 (em anexo)*

**This product is in conformity with:**  
*Este produto está em conformidade com:*

EN 12975-1:2006+A1:2010, EN ISO 9806:2013

and with the Specific Keymark Scheme Rules for Solar Thermal Products  
*e com as Regras Particulares do CEN Keymark Scheme para Produtos Solares Térmicos.*

**Test report(s) ref. / Issued by:**  
*Relatório(s) de ensaios nº(s) / Emitido(s) por:*

4185 DE1, 4186 DE1, 4187 DQ1 / NCSR DEMOKRITOS

**Additional information (if any):**  
*Informação adicional (se existir):*

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**This certificate is valid until:**  
*Este certificado é válido até:*

2021-11-29

**and supersedes certificate no:**  
*e substitui o certificado nº:*

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**Date of issue:**  
*Data de emissão:*

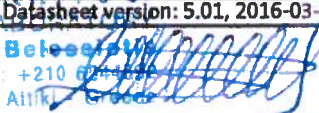
2016-11-30



Francisco Barroca  
General Manager / *Diretor Geral*

This Certificate includes one Annex with 2 (two) pages  
*Este Certificado é constituído por um Anexo com 2 (duas) páginas*



Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results						Licence Number		PSK-020/2016							
						Date issued		2016-11-30							
						Issued by		CERTIF							
Licence holder						Country		Greece							
Brand (optional)						Web		http://www.sonne.gr							
Street, Number						E-mail		info@sonne.gr							
Postcode, City						Tel		30 2102843376							
Collector Type						Flat plate collector, glazed									
Collector name	Gross area (A <sub>G</sub> ) m <sup>2</sup>	Gross length mm	Gross width mm	Gross height mm	Power output per collector G <sub>b</sub> = 850 W/m <sup>2</sup> ; G <sub>d</sub> = 150 W/m <sup>2</sup> θ <sub>m</sub> - θ <sub>a</sub>										
					0 K W	10 K W	30 K W	50 K W	70 K W	50 K W					
CA 160	1.60	1,570	1,020	75	1,228	1,147	984	821	657	821					
CA 200	1.90	1,970	965	75	1,457	1,361	1,168	974	780	974					
CA 230	2.30	1,970	1,165	75	1,759	1,643	1,410	1,176	941	1,176					
Power output per m <sup>2</sup> gross area					767	716	614	512	410	512					
Performance parameters test method						Steady state - outdoor									
Performance parameters (related to AG)						η <sub>0,hem</sub>	a <sub>1</sub>	a <sub>2</sub>							
Units						-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )							
Test results						0.767	5.064	0.000							
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 <sub>GT, coll</sub>					0.797				0.00
Longitudinal						K <sub>GL, coll</sub>					0.797				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>	50	K							
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; θ <sub>s</sub> = 30 °C)						θ <sub>str</sub>	146	°C							
Effective thermal capacity, incl. fluid (per gross area, A <sub>G</sub> )						C/m <sup>2</sup>	8.9	kJ/(Km <sup>2</sup> )							
Maximum operating temperature						θ <sub>max, op</sub>	100	°C							
Maximum operating pressure						P <sub>max, op</sub>	100	kPa							
Testing laboratory						NCSR DEMOKRITOS									
Test report(s)						4185 DE1 4186 DE1 4187 DQ1									
						Dated									
						21/9/2016 21/9/2016 20/9/2016									
Comments of testing laboratory						<p>N.C.S.H. DEMOKRITOS SOLAR ENERGY LABORATORY Head: Dr Vassilis Belenios Tel: +210 6503815 - Fax: +210 6503816 153 10 Ag. Paraskoil - Aitiki - Greece</p> <p>Database version: 5.01, 2016-03-01</p> 									
<p align="center"><b>CERTIF Associação para a Certificação</b> Rua José Afonso, 9E - 2810-237 Almada - Portugal Tel: +351 212 586 940 / Fax: +351 212 586 959 / mail@certif.pt / www.certif.pt</p>															

Annex to Solar Keymark Certificate Supplementary Information							Licence Number			PSK-020/2016			
							Issued			2016-11-30			
Annual collector output in kWh/collector at mean fluid temperature $\vartheta_m$ , based on ISO 9806:2013 test results													
Standard Locations		Athens			Davos			Stockholm			Würzburg		
Collector name	$\vartheta_m$	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
CA 160		1,709	1,067	640	1,222	777	461	902	534	308	977	565	318
CA 200		2,028	1,266	760	1,451	923	547	1,071	634	366	1,160	671	377
CA 230		2,449	1,529	917	1,752	1,114	661	1,293	765	442	1,400	810	455
Annual output per m <sup>2</sup> gross area		1,067	666	400	763	485	288	563	333	192	610	353	198
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 <a href="http://www.solarkeymark.org/scenocalc">www.solarkeymark.org/scenocalc</a>													
<b>Additional Information</b>													
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										2400		Pa	
Maximum tested negative load										2400		Pa	
Hail resistance using steel ball (maximum drop height)										2		m	
<b>Energy Labelling Information</b>													
	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$											
CA 160	1.60	Collector efficiency ( $\eta_{col}$ )		56		%							
CA 200	1.90	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.											
CA 230	2.30												
		Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$											
		Zero-loss efficiency ( $\eta_0$ )		0.767		-							
		First-order coefficient ( $a_1$ )		5.06		W/(m <sup>2</sup> K)							
		Second-order coefficient ( $a_2$ )		0.000		W/(m <sup>2</sup> K <sup>2</sup> )							
		Incidence angle modifier IAM (50°)		0.80		-							
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.													
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