



**Certificate no.**  
*Certificado n°* **PSK-001/2019**

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

**SOLE S. A.**  
Lefktron and Laikon Agonon,  
Acharnai – 13671, Athens  
Greece

**Product:**  
*Produto:*

**Thermal solar collector**  
*Coletor solar térmico*

**Type references:**  
*Referências:*

Climasol 1.75; Climasol 2.00; Climasol 2.50; Climasol 2.70

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

EUROSTAR, AQUASOL, OLYMPUS, SUNLIT

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

Summary of EN 12975 Test Results: Registration No. PSK-001/2019  
(in annex)  
*Resumo dos resultados dos ensaios realizados segundo a norma EN 12975:  
Registo N° PSK-001/2019 (em anexo)*

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

EN 12975-1:2006+A1:2010, EN 12975-2:2006

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) no. / issued by:**  
*Relatório(s) de ensaios n°(s) / emitido(s) por:*

N° 32/DER-LECS/2008 / INETI

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

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

2019-12-31

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

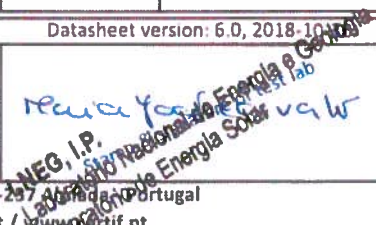
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**Date of issue:**  
*Data de emissão:*

2019-02-27

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						Licence Number		PSK-001/2019				
						Date issued		2019-02-27				
						Issued by		CERTIF				
Licence holder		SOLE, S.A.				Country		Greece				
Brand (optional)		EUROSTAR, AQUASOL, OLYMPUS, SUNLIT				Web		www.eurostar-solar.com				
Street, Number		Lefktron and Laikon, Agonon				E-mail		export@sole.gr				
Postcode, City		13671 Acharnai - Athens				Tel		+30 2102389500/2				
Collector Type						Flat plate collector						
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 = 1.3 m/s $\vartheta_m - \vartheta_a$						
						0 K	10 K	30 K	50 K	70 K	100 K	
						W	W	W	W	W	W	
Climasol 1.75		1.760	1,76	1 000	86	1,59	1.133	1.077	952	807	642	358
Climasol 2.00		1.970	1,91	970	86	1,73	1.229	1.169	1.033	876	697	389
Climasol 2.50		2.120	2,20	1.175	86	2,12	1.416	1.347	1.190	1.009	803	448
Climasol 2.70		2.470	2,69	1.250	86	2,47	1.731	1.647	1.455	1.233	982	547
Power output per m <sup>2</sup> gross area						644	612	541	459	365	204	
Performance parameters test method		Steady state - outdoor										
Performance parameters (related to A <sub>G</sub> )		$\eta_0, b$	a1	a2	a3	a4	a5	a6	a7	a8	Kd	
Units		-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )	J/(m <sup>2</sup> K)	-	J/(m <sup>2</sup> K)	s/m	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K)	-	
Test results		0,689	3,00	0,014							0,56	
Incidence angle modifier test method		Steady state - outdoor										
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°	
Transversal		K <sub>θT, coll</sub>	1,00	0,99	0,97	0,93	0,88	0,78	0,58	0,00	0,00	
Longitudinal		K <sub>θL, coll</sub>	1,00	0,99	0,97	0,93	0,88	0,78	0,58	0,00	0,00	
Heat transfer medium for testing						Water-Glycole						
Flow rate for testing (per gross area, A <sub>G</sub> )						dm/dt	0,020	kg/(sm <sup>2</sup> )				
Maximum temperature difference during thermal performance test						( $\vartheta_m - \vartheta_a$ ) <sub>max</sub>	70	K				
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; $\vartheta_a = 30^\circ\text{C}$ )						$\vartheta_{stg}$	154	°C				
Maximum operating temperature						$\vartheta_{max, op}$	150	°C				
Maximum operating pressure						P <sub>max, op</sub>	600	kPa				
Testing laboratory		LNEG				www.lneg.pt						
Test report(s)		n°32/DER-LECS/2008				Dated		14-11-2008				
Comments of testing laboratory						Datasheet version: 6.0, 2018-10-10						
Tests performed according to EN 12975-2:2006. Performnce parameters expressed in terms of Gross Area (A <sub>G</sub> ).												

Annex to Solar Keymark Certificate		Licence Number											
Supplementary Information		PSK-001/2019											
		Issued											
		2019-02-27											
<b>Annual collector output in kWh/collector at mean fluid temperature <math>\theta_m</math></b>													
	Standard Locations	Athens			Davos			Stockholm			Würzburg		
Collector name	$\theta_m$	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
Climasol 1.75		1.554	1.066	664	1.187	804	486	862	555	326	917	577	336
Climasol 2.00		1.686	1.157	721	1.288	873	527	936	602	354	995	627	364
Climasol 2.50		1.942	1.333	831	1.483	1.006	607	1.078	694	407	1.146	722	420
Climasol 2.70		2.375	1.629	1.016	1.814	1.230	742	1.318	848	498	1.402	883	513
Annual output per m <sup>2</sup> gross area		883	606	378	674	457	276	490	315	185	521	328	191
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 $\theta_m$ (mean of in- and outlet temperatures). The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool Scenocalc Ver. 6.0 (October 2018). 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			
The collector is deemed to be suitable for roof integration										No			
The collector was tested successfully under the following conditions:													
Climate class (A+, A, B or C)										C		--	
G (W/m <sup>2</sup> ) >		850		$\theta_a$ (°C) >		10		H <sub>x</sub> (MJ/m <sup>2</sup> ) >		1046			
Maximum tested positive load										3000		Pa	
Maximum tested negative load										3000		Pa	
Hail resistance using steel ball (maximum drop height)										---		m	
<b>Additional collector attribute(s)</b>													
<input type="checkbox"/> Using external power source(s) for normal operation				<input type="checkbox"/> Active or passive measure(s) for self-protection									
<input type="checkbox"/> Co-generating thermal and electrical power				<input type="checkbox"/> Wind and/or infrared sensitive collector(s) (WISC)									
<input type="checkbox"/> Façade collector(s)													
<b>Energy Labelling Information</b>													
	Reference Area, A <sub>ref</sub> (m <sup>2</sup> )	Hydraulic Designation Code											
Climasol 1.75	1,76	9-VH-12345-A:7,1760-C:21,1000											
Climasol 2.00	1,91	9-VH-12345-A:7,1970-C:21,970											
Climasol 2.50	2,20	11-VH-12345-A:7,1970-C:21,1175											
Climasol 2.70	2,69	12-VH-12345-A:7,2148-C:21,1250											
Data required for CDR (EU) No 811/2013 - Reference Area A <sub>ref</sub>													
Collector efficiency ( $\eta_{col}$ )		50%											
Data required for CDR (EU) No 812/2013 - Reference Area A <sub>ref</sub>													
Zero-loss efficiency ( $\eta_0$ )		0,64											
First-order coefficient ( $a_1$ )		3,00											
Second-order coefficient ( $a_2$ )		0,014											
Incidence angle modifier IAM (50°)		0,82											
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 <sub>ref</sub> ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.													
Remark: The data given in this section are related to collector reference area (A <sub>ref</sub> ) 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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