



**Certificate no.**  
*Certificado nº* **PSK-006/2021**

**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:*

ECO S150; ECO S200; ECO S230; ECO S260

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

ECO

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

Summary of EN 12975 Test Results: *Registration No. PSK-006/2021, (in annex)*  
*Resumo dos resultados dos ensaios realizados segundo a norma EN 12975: Registo Nº PSK-006/2021, (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) no. / issued by:**  
*Relatórios de ensaios nº(s) / emitidos por:*

Nº 6.V1/LES/2018 and/e Nº 9.V1/LES/2018 / LNEG  
Nº 4154 DE4 / DEMOKRITOS

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

—

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

2025-11-22

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

PSK-008/2020


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

2021-07-19

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-006/2021				
					Date issued		2021-07-19				
					Issued by		CERTIF				
Licence holder		Sole, S.A.			Country		Greece				
Brand (optional)		ECO			Web		www.eurostar-solar.com				
Street, Number		Lefktron & Laikon Agonon			E-mail		export@sole.com				
Postcode, City		13671, Acharnai – Athens			Tel		+30 2102389500				
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	130 K	
					W	W	W	W	W	W	
ECO S260					1 921	1 807	1 558	1 284	985	0	
ECO S230					1 660	1 561	1 346	1 109	851	0	
ECO S200					1 369	1 287	1 110	915	702	0	
ECO S150					1 075	1 010	871	718	551	0	
Power output per m <sup>2</sup> gross area					728	685	590	487	373	0	
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>3</sup> K)	-	J/(m <sup>2</sup> K)	s/m	W/(m <sup>2</sup> K <sup>4</sup> )	W/(m <sup>2</sup> K <sup>4</sup> )	-
Test results		0.746	4.23	0.012			0				0.84
Incidence angle modifier test method		Steady state - outdoor									
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal		K <sub>gT, coll</sub>	1.00	0.98	0.95	0.90	0.82	0.68	0.38	0.00	0.00
Longitudinal		K <sub>gL, coll</sub>	1.00	0.98	0.95	0.90	0.82	0.68	0.38	0.00	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 during thermal performance test					( $\vartheta_m - \vartheta_a$ ) <sub>max</sub>	100		K			
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; $\vartheta_a = 30$ °C)					$\vartheta_{stg}$	164		°C			
Maximum operating temperature					$\vartheta_{max, op}$	150		°C			
Maximum operating pressure					p <sub>max, op</sub>	1000		kPa			
Testing laboratory		LNEG			http://www.lneg.pt						
Test report(s)		n.6.V1/LES/2018 (Thermal performance test - ECO n.9.V1/LES/2018 (Thermal performance test - ECO 4154 DE4 (Reliability and durability tests - ECO S260)			Dated		29-06-18 07-09-18 22-09-15				
Comments of testing laboratory					Datasheet version: 6.1, 2019-09-26						
Reliability and durability tested by NCSR "Demokritos" (www.solar.demokritos.gr).					 <b>LNEG, I.P.</b> Laboratório Nacional de Energia e Geologia Laboratório de Energia Solar						
Performance parameters related to aperture area obtained applying the correction factor: Gross Area/Aperture Area.											
$\eta_{0, b} = 0,792$ ; a1 = 4,492; a2 = 0,013 Aperture area based on manufacturer information.											
CERTIF Associação para a Certificação   Rua José Afonso, 9E - 2810-237 Almada - Portugal Tel: +351 212 586 940 / Fax: +351 212586959 / mail@certif.pt / www.certif.pt											

Annex to Solar Keymark Certificate Supplementary Information	Licence Number	PSK-006/2021
	Issued	2021-07-19

Annual collector output in kWh/collector at mean fluid temperature $\theta_m$													
Collector name	Standard Locations $\theta_m$	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
ECO S260		2 819	1 824	1 062	2 045	1 293	714	1 513	903	492	1 651	967	513
ECO S230		2 435	1 576	918	1 767	1 117	617	1 308	780	425	1 426	836	443
ECO S200		2 008	1 299	757	1 457	921	509	1 078	643	350	1 176	689	365
ECO S150		1 576	1 020	594	1 144	723	399	846	505	275	923	541	287
Annual output per m <sup>2</sup> gross area		1 068	691	403	775	490	271	573	342	186	626	367	194
Annual efficiency, $\eta_a$		61%	39%	23%	48%	30%	17%	49%	29%	16%	50%	29%	16%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1630 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. 6.1 (September 2019). A detailed description of the calculations is available at <http://www.estif.org/solarkeymarknew/>

Additional Information		
Collector heat transfer medium	Water-Glycole	
The collector is deemed to be suitable for roof integration	Yes	
The collector was tested successfully under the following conditions:		
Climate class (A+, A, B or C)	A	
G (W/m <sup>2</sup> ) >	1000	$\theta_a$ (°C) >
		20
		$H_x$ (MJ/m <sup>2</sup> ) >
		600
Maximum tested positive load	3000	Pa
Maximum tested negative load	3000	Pa
Hail resistance using steel ball (maximum drop height)	2	m

Additional collector attribute(s)	
<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"/> Façade collector(s)

Energy Labelling Information	Additional Informative Technical Data	
	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Hydraulic Designation Code
ECO S260	2.64	10-VH-1234S-A:16.4,2037-C:7.2,1240.5
ECO S230	2.28	9-VH-1234S-A:16.4,1860-C:7.2,1157.5
ECO S200	1.88	7-VH-1234S-A:16.4,1860-C:7.2,955
ECO S150	1.48	7-VH-1234S-A:16.4,1440-C:7.2,955
		Aperture Area, $A_p$ (m <sup>2</sup> )
		"[Aa]"
		"[Aa]"
		"[Aa]"

Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$	Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$	
Collector efficiency ( $\eta_{col}$ )	54%	Zero-loss efficiency ( $\eta_0$ )
		0.73
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 9806:2017.		First-order coefficient ( $a_1$ )
		4.23
		Second-order coefficient ( $a_2$ )
		0.012
		Incidence angle modifier IAM (50°)
		0.81
		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.