



Certificate no. **PSK – 020/2015**  
Certificado nº

**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:*

WASCO 175; WASCO 200; WASCO 250; WASCO 270

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

WASCO

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

Summary of EN 12975 Test Results: *Registration No. PSK-020/2015,*  
(in annex)  
*Resumo dos resultados dos ensaios realizados segundo a norma EN 12975:*  
*Registo Nº PSK-020/2015, (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:**  
*Relatórios de ensaios nº(s) / emitidos por:*

Nº 11.V3/LES/2010 / INETI-LECS

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

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

2018-09-27

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

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

2015-09-28



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*



Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate						Licence Number		PSK-020/2015							
						Issued		2015-09-28							
Company holding the			Sole, S.A.			Country		Greece							
Brand (optional)			Wasco			Website		www.eurostar-solar.com							
Street, street number			Lefktron & Laikon Agonon			E-mail		export@sole.com							
Postal Code / City, province			13671 Acharnai – Athens			Tel/Fax		30 2102389500 / 2							
Collector Type (flat plate glazed/un-glazed; evacuate tubular)						Flat plate collector - glazed									
Thermal / photo voltaic hybrid collector? (PVT collector)						No									
Integration in the roof possible? (manufacturers declaration)						No									
						Power output per collector module									
						G = 1000 W/m <sup>2</sup>									
						T <sub>m</sub> -T <sub>a</sub>									
						0 K	10 K	30 K	50 K	70 K					
						W	W	W	W	W	W				
Collector name	Aperture area (A <sub>a</sub> )	Gross length	Gross width	Gross height	Gross area (A <sub>G</sub> )										
	m <sup>2</sup>	mm	mm	mm	m <sup>2</sup>										
Wasco 175	1.587	1760	1000	85	1.760	1171	1111	976	818	639					
Wasco 200	1.727	1970	970	86	1.911	1275	1209	1062	890	695					
Wasco 250	2.118	1970	1175	86	2.315	1563	1483	1302	1092	853					
Wasco 270	2.460	2145	1248	86	2.680	1815	1723	1512	1268	991					
Performance test method						Glazed liquid heating collector - steady state - outdoor									
Performance parameters related to aperture						η <sub>0</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 - Flow rate and fluid see note 1						0.738	3.600	0.017							
Bi-directional incidence angle						No <i>Kθ values are obligatory for 50°.</i>									
Incidence angle modifiers K <sub>θ</sub> (θ)						Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
						K <sub>θ</sub> (θ)	0.96	0.93	0.89	0.86	0.82	0.62	0.41	0.20	0.00
Incidence angle modifier not bi-directional - leave fields blank															
Stagnation temperature - Weather conditions see note 2						T <sub>stg</sub>	160	°C							
Effective thermal capacity						c <sub>eff</sub> = C/A <sub>G</sub>	11.1	kJ/(m <sup>2</sup> K)							
Max. intended operation temperature - see note 3						T <sub>max,op</sub>	150	°C							
Max. operation pressure - see note 3						p <sub>max,op</sub>	600	kPa							
Pressure drop table - for a collector family, the values shall be for the module with highest ΔP per m <sup>2</sup> aperture area															
Flow rate	kg/(s m <sup>2</sup> )	---	---	---	---	---	---	---	---	---	---				
Pressure drop, ΔP	Pa	---	---	---	---	---	---	---	---	---	---				
Optional weather data						Location		Link							
Testing Laboratory						LNEG									
Website						www.lneg.pt									
Test report id. number						n.11.V3/LES/2010			Date of test report			2013-12-04			
During the test GDIF/GTOT was always between						0.09	and	0.14							
Comments of testing laboratory:															
Wasco 175 was thermal performance tested.															
Wasco 270 was thermal performance tested and reliability and durability tested.															
Note 1	Flow rate	0.020	kg/(s m <sup>2</sup> )	Fluid	Water										
Note 2	Irradiance, G = 1000 W/m <sup>2</sup> ; Ambient temperature, T <sub>a</sub> =30 °C														
Note 3	Given by manufacturer														
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															



Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence Number	PSK-020/2015
	Issued	2015-09-28

Annual collector output kWh/module												
Collector name	Location and collector temperature (Tm)											
	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
Wasco 175	1 569	1 033	599	1 157	737	402	855	518	282	925	550	291
Wasco 200	1 708	1 124	652	1 259	802	438	931	563	306	1 007	598	317
Wasco 250	2 094	1 379	800	1 544	984	537	1 142	691	376	1 235	733	388
Wasco 270	2 432	1 602	929	1 793	1 143	624	1 326	802	437	1 434	852	451

Collector mounting: Fixed or tracking Fixed; slope = latitude - 15° (rounded to nearest 5°)

Overview of locations				
Location	Latitude °	Gtot kWh/m <sup>2</sup>	Ta °C	Collector orientation or tracking mode
Athens	38	1 765	18.5	South, 25°
Davos	47	1 714	3.2	South, 30°
Stockholm	59	1 166	7.5	South, 45°
Würzburg	50	1 244	9.0	South, 35°

Gtot	Annual total irradiation on collector plane	kWh/m <sup>2</sup>
Ta	Mean annual ambient air temperature	°C
Tm	Constant collector operating temperature (mean of in- and outlet temperatures)	°C

The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool ScenoCalc. The collector output is calculated hour by hour according to the efficiency parameters from the Keymark test using constant collector operating temperature (Tm). A detailed description of the calculations is available at <http://www.sp.se/en/index/services/solar/ScenoCalc/Sidor/default.aspx>.