Certificado

Certificate no.
Certificado nº **PSK-001/2022**

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

SOLDIRECTO – Sistemas Solares, Lda.
Herdade Cuncos do Meio
7050-677 Silveiras
Portugal

Product:
Produto:

Thermal Solar Collector
Colecor Solar Térmico

Type references:
Referências:

VH 2.1 Selectivo, VH 2.5 Selectivo

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

SOLDIRECTO

Technical characteristics:
Características técnicas:

Summary of Test Results: Registration No. PSK-001/2022 (in annex)
Resumo dos resultados dos ensaios realizados: Registo Nº PSK-001/2022, (em anexo)

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

EN 12975-1:2006+A1:2010, EN ISO 9806:2017

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 02/V.2/LES/2021

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

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

2027-02-24

and supersedes certificate no:
e substitui o certificado nº:

PSK-005/2019

Date of issue:
Data de emissão:

2022-02-25

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

Certif – Associação para a Certificação
Rua José Afonso, 9 E – 2810-237 Almada – Portugal – Tel.: 351. 21 258 69 40 – E-mail: mail@certif.pt

Annex to Solar Keymark Certificate

Licence Number	PSK-001/2022
Date issued	2022-02-25
Issued by	CERTIF

Licence holder	Soldirecto - Sistemas Solares, Lda	Country	Portugal
Brand (optional)	Soldirecto	Web	http://www.soldirecto.pt
Street, Number	Herdade Cuncos do Meio	E-mail	geral@soldirecto.pt
Postcode, City	7050-677 Silveiras	Tel	+351 266 891 281

Collector Type	Flat plate collector

Collector name	Gross area (A_G)	Gross length	Gross width	Gross height	Power output per collector Gb = 850 W/m2, Gd = 150 W/m2 & u = 1.3 m/s $\vartheta_m - \vartheta_a$					
					0 K	10 K	30 K	50 K	70 K	100 K
	m²	mm	mm	mm	W	W	W	W	W	W
VH 2.1	2.09	2 031	1 030	87	1 498	1 386	1 158	926	689	323
VH 2.5	2.52	2 031	1 239	87	1 801	1 667	1 393	1 114	828	389
Power output per m² gross area					716	662	554	443	329	155

Performance parameters test method	Quasi dynamic									
Performance parameters (related to A_G)	η0, b	a1	a2	a3	a4	a5	a6	a7	a8	Kd
Units	-	W/(m²K)	W/(m²K²)	J/(m³K)	-	J/(m²K)	s/m	W/(m²K⁴)	W/(m²K⁴)	-
Test results	0.722	5.31	0.003			8 094				0.94

Incidence angle modifier test method		Quasi dynamic - outdoor								
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$	1.00	0.99	0.97	0.95	0.90	0.83	0.67	0.18	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	0.99	0.97	0.95	0.90	0.83	0.67	0.18	0.00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0.020	kg/(sm²)
Maximum temperature difference during thermal performance test	$(\vartheta_m-\vartheta_a)_{max}$	70	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	155.3	°C
Maximum operating temperature	ϑ_{max_op}	--- (*)	°C
Maximum operating pressure	$p_{max,op}$	-	kPa

Testing laboratory	LNEG	http://www.lneg.pt	
Test report(s)	02/V.2/LES/2021	Dated	14-01-22

Comments of testing laboratory

Ver. 6.2 (13.01.2022)

(*) Information on maximum operation temperature not available.

LNEG, I.P.
Laboratório Nacional de Energia e Geologia
Laboratório de Energia Solar

Annex to Solar Keymark Certificate	Licence Number	PSK-001/2022
Supplementary Information	Issued	2022-02-25

Gross Thermal Yield in kWh/collector at mean fluid temperature ϑ_m

Standard Locations	Athens			Davos			Stockholm			Würzburg		
Collector name / ϑ_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
VH 2.1	2 330	1 414	778	1 616	963	506	1 212	674	344	1 334	726	363
VH 2.5	2 801	1 701	936	1 943	1 158	608	1 458	811	413	1 604	873	437
Gross Thermal Yield per m² gross area	1 113	676	372	772	460	242	579	322	164	637	347	174
Annual efficiency, η_a	63%	38%	21%	47%	28%	15%	50%	28%	14%	51%	28%	14%
Fixed or tracking collector	Fixed (slope = latitude - 15°, rounded to nearest 5°)											
Annual irradiation on collector plane	1765 kWh/m²			1630 kWh/m²			1166 kWh/m²			1244 kWh/m²		
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 ϑm (mean of in- and outlet temperatures). The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool Scenocalc Ver. 6.2 (13.01.2022). 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				No	
The collector was tested successfully under the following conditions:					
Climate class (A+, A, B or C)				B	--
G (W/m²) >	900	ϑ_a (°C) >	15	H_x (MJ/m²) >	540
Maximum tested positive load				1000	Pa
Maximum tested negative load				1000	Pa
Hail resistance using steel ball (maximum drop height)				2	m

Additional collector attribute(s)

Using external power source(s) for normal operation	No	Active or passive measure(s) for self-protection	No
Co-generating thermal and electrical power	No	Façade collector(s)	No

Energy Labelling Information

	Reference Area, A_{sol} (m²)
VH 2.1	2.09
VH 2.5	2.52

Additional Informative Technical Data

Hydraulic Designation Code	Aperture Area, A_a (m²)
11-VH-1234S	1.92
11-VH-1234S	2.33

Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}

Collector efficiency (η_{col})	50%

Remark: Collector efficiency (ηcol) 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/m², expressed in % and rounded to the nearest integer. Deviating from the regulation ηcol is based on reference area (Asol) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.

Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}

Zero-loss efficiency (η_0)	0.72	--
First-order coefficient (a_1)	5.31	W/(m²K)
Second-order coefficient (a_2)	0.003	W/(m²K²)
Incidence angle modifier IAM (50°)	0.91	--

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.