Certificado

Certificate no.
Certificado nº **PSK-005/2019**

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 *Coletor Solar Térmico*
Type references: *Referências:*	VH 2.1 Selectivo
Trademark(s): *Marca(s) comercial(is):*	SOLDIRECTO
Technical characteristics: *Características técnicas:*	Summary of EN 12975 Test Results: *Registration No. PSK–005/2019,* (in annex) *Resumo dos resultados dos ensaios realizados segundo a norma EN 12975: Registo Nº PSK-005/2019, (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: *Relatórios de ensaios nº(s) / emitidos por:*	25.V1/DER-LECS/2009 and/*e* 6.V1/LES/2012 / LNEG
Additional information (if any): *Informação adicional (se existir):*	-----
This certificate is valid until: *Este certificado é válido até:*	2022-12-31
and supersedes certificate no: *e substitui o certificado nº:*	---
Date of issue: *Data de emissão:*	2019-10-31

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

IPAC acreditação
C0004
ISO/IEC 17065
Produtos

Certif – Associação para a Certificação
Rua José Afonso, 9 E – 2810-237 Almada – Portugal – Tel.: 351. 21 258 69 40 – Fax: 351. 21 258 69 59

Annex to Solar Keymark Certificate

Licence Number	PSK-005/2019
Date issued	31/10/2019
Issued by	CERTIF

Licence holder	SOLDIRECTO SISTEMAS SOLARES, LDA	Country	Portugal
Brand (optional)	SOLDIRECTO SISTEMAS SOLARES, LDA	Web	www.soldirecto.pt
Street, Number	Herdade Cuncos do Maio	E-mail	soldirecto@gmail.pt
Postcode, City	7050-677 Silveiras	Tel	+351 265 891 295

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 Selectivo	2.09	2 032	1 030	87	1 535	1 445	1 257	1 059	849	515
Power output per m² gross area					734	691	602	507	406	247

Performance parameters test method	Steady state - outdoor									
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	0.747	4.23	0.006	0.000	0.00	8 650	0.000	0.00	0.0E+00	0.89

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	0.98	0.97	0.93	0.87	0.76	0.40	0.00
Longitudinal	$K_{\theta l,coll}$	1.00	0.99	0.98	0.97	0.93	0.87	0.76	0.40	0.00

Heat transfer medium for testing	Water-Glycole		
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}	168.7	°C
Maximum operating temperature	$\vartheta_{max\ op}$	--- (*)	°C
Maximum operating pressure	$p_{max,op}$	700	kPa

Testing laboratory	LNEG	www.lneg.pt	
Test report(s)	6.V1/LES/2012 25.V1/DER-LECS/2009	Dated	23/04/2012 27/10/2009

Comments of testing laboratory	Datasheet version: 6.1, 2019-09-26
Tests performed according to EN 12975-2:2006. Performnace parameters expressed in terms of Gross Area (AG). (*) Information on maximum operation temperature not available.	Signature of test lab Stamp of test lab LNEG, I.P. Laboratório Nacional de Energia e Geologia Laboratório de Energia Solar

Annex to Solar Keymark Certificate	Licence Number	PSK-005/2019
Supplementary Information	Issued	31/10/2019

Annual collector output 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 Selectivo		2 409	1 623	1 014	1 771	1 172	713	1 311	814	475	1 430	876	502
Annual output per m² gross area		1 153	777	485	848	561	341	627	389	227	684	419	240
Annual efficiency, η_a		65%	44%	27%	52%	34%	21%	54%	33%	19%	55%	34%	19%
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. 6.1 (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	No	
The collector was tested successfully under the following conditions:		
Climate class (A+, A, B or C)	C	--
G (W/m²) > 850	ϑ_a (°C) > 10	H_g (MJ/m²) > 448
Maximum tested positive load	1100	Pa
Maximum tested negative load	1100	Pa
Hail resistance using steel ball (maximum drop height)	0	m

Additional collector attribute(s)

- ☐ Using external power source(s) for normal operation
- ☐ Active or passive measure(s) for self-protection
- ☐ Co-generating thermal and electrical power
- ☐ Façade collector(s)

Energy Labelling Information

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

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

Collector efficiency (η_{col})	55%

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.

Additional Informative Technical Data

Hydraulic Designation Code	Aperature Area, A_a (m²)
9-VH-1234S-A:7.32,1976-C:20.62,975	"[Aa]"

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

Zero-loss efficiency (η_0)	0.73	--
First-order coefficient (a_1)	4.23	W/(m²K)
Second-order coefficient (a_2)	0.006	W/(m²K²)
Incidence angle modifier IAM (50°)	0.93	--

Remark: The data given in this section are related to collector reference area (A_{ref}) 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.