



**Certificate no.**  
*Certificado nº* **PSK-002/2022**

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

Sunaitec, Lda.  
Urbanização Quinta da Gordalina,  
Lote 8, Loja D  
Sismaria  
2415-440 Leiria

**Product:**  
*Produto:*

Thermal Solar Collector  
*Coletor Solar Térmico*

**Type references:**  
*Referências:*

RTS PLUS

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

SUNAITEC

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

Summary of Test Results: *Registration No. PSK-002/2022, (in annex)*  
*Resumo dos resultados dos ensaios realizados: Registo Nº PSK-002/2022, (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:*

05.V2/LES/2016 – Revisão 1/ LNEG

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

Thermal performance test performed for collector with EW tracking axis  
and with NS tracking axis / *Ensaio de rendimento realizado com o módulo em  
orientação EW e em orientação NS*

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

2026-06-29

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

PSK-005/2021

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

2022-03-10



Francisco Barroca  
General Manager / *Diretor Geral*

This Certificate includes one Annex with 4 (four) pages  
*Este Certificado é constituído por um Anexo com 4 (quatro) páginas*





Annex to Solar Keymark Certificate Supplementary Information	Licence Number	PSK-002/2022
	Issued	2022-03-10

Gross Thermal Yield in kWh/collector at mean fluid temperature $\vartheta_m$													
Collector name	$\vartheta_m$	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
RTS plus		1041	896	690	730	565	381	633	497	340	626	491	340
Gross Thermal Yield per m <sup>2</sup> gross area		914	786	605	641	495	334	555	436	299	549	431	299
Annual efficiency, $\eta_a$		38%	33%	25%	37%	29%	19%	39%	31%	21%	38%	30%	21%
Fixed or tracking collector		NS axis tracking											
Annual irradiation on collector plane		2386 kWh/m <sup>2</sup>			1715 kWh/m <sup>2</sup>			1408 kWh/m <sup>2</sup>			1444 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		Tracking			Tracking			Tracking			Tracking		
The collector is operated at constant temperature $\vartheta_m$ (mean of in- and outlet temperatures) The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool Scenocalc Ver 6.2 (13.01.2022) A detailed description of the calculations is available at <a href="http://www.estif.org/solarkeymarknew/">http://www.estif.org/solarkeymarknew/</a>													

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/m <sup>2</sup> ) >	900	$\vartheta_a$ (°C) >	15
		$H_x$ (MJ/m <sup>2</sup> ) >	540
Maximum tested positive load	1000		Pa
Maximum tested negative load	1000		Pa
Hail resistance using steel ball (maximum drop height)	0.4		m
Additional collector attribute(s)			
Using external power source(s) for normal operation	Yes	Active or passive measure(s) for self-protection	Yes
Co-generating thermal and electrical power	No	Façade collector(s)	Yes

Energy Labelling Information		Additional Informative Technical Data	
	Reference Area, $A_{col}$ (m <sup>2</sup> )	Hydraulic Designation Code	Aperture Area, $A_a$ (m <sup>2</sup> )
RTS plus	1.14	2-HV-23V-A:17,1200	1.14

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 ( $\eta_{col}$ )	45%	Zero-loss efficiency ( $\eta_0$ )	0.52
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 ( $a_1$ )	0.81
		Second-order coefficient ( $a_2$ )	0.021
		Incidence angle modifier IAM (50°)	0.77
		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.	

Annex to Solar Keymark Certificate					Licence Number		PSK-002/2022							
					Date issued		2022-03-10							
					Issued by		CERTIF							
Licence holder		Sunaitec; Lda			Country		Portugal							
Brand (optional)		Sunaitec			Web		www.sunaitec.pt							
Street, Number		Urbanização Quinta da Gordalina, lote 8, loja D			E-mail		info@sunaitec.pt							
Postcode, City		Sismarias, 2415-440 LEIRIA			Tel		+351 244818470							
Collector Type					Concentrating 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				
RTS plus					1.14	3 068	371	185	616	595	553	511	469	406
					0	0	0	0	0	0	0	0	0	
Power output per m <sup>2</sup> gross area					540	522	485	448	412	356				
Performance parameters test method		Quasi dynamic												
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		0.609	1.84	0.000	0.000	0.00	9	0.000	0.00	0.0E+00	0.25			
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	0.98	0.93	0.85	0.62	0.43	0.00	0.00	0.00			
Longitudinal		$K_{\theta L, coll}$	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	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		$(\vartheta_m - \vartheta_a)_{max}$	70	K										
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; $\vartheta_a = 30^\circ\text{C}$ )		$\vartheta_{stg}$	250	°C										
Maximum operating temperature		$\vartheta_{max, op}$	100	°C										
Maximum operating pressure		$P_{max, op}$	1000	kPa										
Testing laboratory		LNEG					http://www.lneg.pt							
Test report(s)		n.5.V2/LES/2016 - Revisão 1					Dated		28-02-18					
Comments of testing laboratory		Ver. 6.2 (13.01.2022)												
Thermal performance test for collector with <b>EW tracking axis / tilt of rotation axis = 0°</b> . For calculation of annual energy, IAM transversal corresponds to EW direction and IAM longitudinal corresponds to NS direction and is set equal to 1.		<b>LNEG, I.P.</b> <i>Jorge Facão</i> Laboratório Nacional de Energia e Geologia Laboratório de Energia Solar												
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														

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	Issued	2022-03-10

Gross Thermal Yield in kWh/collector at mean fluid temperature $\vartheta_m$													
Collector name	Standard Locations $\vartheta_m$	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
RTS plus		762	596	471	654	534	439	430	325	251	445	336	262
Gross Thermal Yield per m <sup>2</sup> gross area		669	523	413	574	468	385	377	285	220	390	295	230
Annual efficiency, $\eta_a$		34%	27%	21%	33%	27%	22%	30%	22%	17%	30%	22%	17%
Fixed or tracking collector		EW-axis tracking											
Annual irradiation on collector plane		1955 kWh/m <sup>2</sup>			1745 kWh/m <sup>2</sup>			1268 kWh/m <sup>2</sup>			1318 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		Tracking			Tracking			Tracking			Tracking		
The collector is operated at constant temperature $\vartheta_m$ (mean of in- and outlet temperatures). The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool Scenocalc Ver. 6.2 (13.01.2022). A detailed description of the calculations is available at <a href="http://www.estif.org/solarkeymarknew/">http://www.estif.org/solarkeymarknew/</a>													

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/m <sup>2</sup> ) >	900	$\vartheta_a$ (°C) >	15
		$H_x$ (MJ/m <sup>2</sup> ) >	540
Maximum tested positive load	1000		Pa
Maximum tested negative load	1000		Pa
Hail resistance using steel ball (maximum drop height)	0.4		m

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

Energy Labelling Information		Additional Informative Technical Data	
	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Hydraulic Designation Code	Aperture Area, $A_a$ (m <sup>2</sup> )
RTS plus	1.14	2-HV-23V-A:17,1200	1.14

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 ( $\eta_{col}$ )	47%	Zero-loss efficiency ( $\eta_0$ )	0.54
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 ( $a_1$ )	1.84
		Second-order coefficient ( $a_2$ )	0.000
		Incidence angle modifier IAM (50°)	0.76
			--
		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.	