



Certificate no. **PSK – 001/2018**
Certificado n°

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

Sunaitec Unipessoal Lda.
Urbanização Quinta da Gordalina
Lote 8, Loja D
Sismarias
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 EN ISO 9806 Test Results: Registration No. PSK-001/2018,
(in annex)
*Resumo dos resultados dos ensaios realizados segundo a norma EN ISO 9806:
Registo N° PSK-001/2018, (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 n°(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:
and supersedes certificate no:
e substitui o certificado n°:

2021-06-29

PSK-001/2017

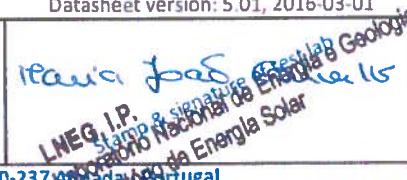
Date of issue:
Data de emissão:

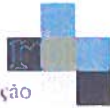
2018-03-15

Francisco Barroca
General Manager / *Diretor Geral*

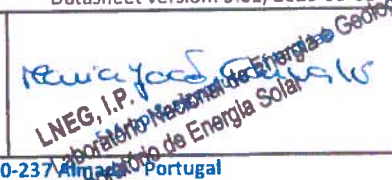
This Certificate includes one Annex with 4 (four) pages
Este Certificado é constituído por um Anexo com 4 (quatro) páginas



Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		PSK-001/2018							
					Date issued		15-03-2018							
					Issued by		CERTIF							
Licence holder		Sunaitec			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									
					Gb = 850 W/m ² ; Gd = 150 W/m ² ; u = 3 m/s θ _m - θ _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
Power output per m ² gross area					540	522	485	448	412	356				
Performance parameters test method					Quasi dynamic									
Performance parameters (related to AG)					η _{0,b}	c1	c2	c3	c4	c6	Kd			
Units					-	W/(m ² K)	W/(m ² K ²)	J/(m ³ K)	-	s/m	-			
Test results					0,609	1,840	0,000	0,000	0,000	0,000	0,250			
Incidence angle modifier test method					Quasi dynamic - outdoor									
Bi-directional incidence angle modifiers					Yes									
Incidence angle modifier					Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal					K _{GT, coll}	1,00	0,98	0,93	0,85	0,62	0,43	0,00	0,00	0,00
Longitudinal					K _{GL, coll}	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	
Heat transfer medium for testing					Water									
Flow rate for testing (per gross area, A _G)					dm/dt	0,020	kg/(sm ²)							
Maximum temperature difference for thermal performance calculations					(θ _m - θ _a) _{max}	100	K							
Standard stagnation temperature (G = 1000 W/m ² ; θ _a = 30 °C)					θ _{str}	254,5	°C							
Effective thermal capacity, incl. fluid (per gross area, A _G)					C/m ²	9	kJ/(Km ²)							
Maximum operating temperature					θ _{max, op}	100	°C							
Maximum operating pressure					p _{max, op}	1000	kPa							
Testing laboratory		LNEG			www.lneg.pt									
Test report(s)		n.5.V2/LES/2016 - Revisão 1			Dated		28-02-2018							
Comments of testing laboratory					Datashet version: 5.01, 2016-03-01									
Thermal performance test for collector with EW tracking axis / tilt of rotation axis = 0°.					 <p>LNEG I.P. Laboratório Nacional de Energia e Geologia Laboratório Nacional de Energia Solar</p>									
For calculation of annual energy, IAM transversal corresponds to EW direction and IAM longitudinal corresponds to NS direction and is set equal to 1.														
<p>CERTIF Associação para a Certificação Rua José Afonso, 9E - 2810-237 Lisboa, Portugal Tel: +351 212 586 940 / Fax: +351 212586959 / mail@certif.pt / www.certif.pt</p>														



Annex to Solar Keymark Certificate Supplementary Information		Licence Number		PSK-001/2018									
		Issued		15-03-2018									
Annual collector output in kWh/collector at mean fluid temperature ϑ_m , based on ISO 9806:2013 test results													
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			
RTS plus		688	530	418	583	470	379	396	303	235	408	308	237
Annual output per m ² gross area		604	465	367	512	413	333	348	266	206	358	270	208
Fixed or tracking collector		EW-axis tracking											
Annual irradiation on collector plane		1955 kWh/m ²			1891 kWh/m ²			1268 kWh/m ²			1318 kWh/m ²		
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 ϑ_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. 5.01 (March 2016). A detailed description of the calculations is available at www.solarkeymark.org/scenocalc													
Additional Information													
Collector heat transfer medium										Water-Glycole			
Hybrid Thermal and Photo Voltaic collector										No			
The collector is deemed to be suitable for roof integration										No			
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:													
Climate class (A, B or C)										B		--	
Maximum tested positive load										1000		Pa	
Maximum tested negative load										1000		Pa	
Hail resistance using steel ball (maximum drop height)										0,4		m	
Energy Labelling Information													
		Reference Area, A_{sol} (m ²)		Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}									
RTS plus EW		1,14		Collector efficiency (η_{col})		47		%					
Remark: Collector efficiency (η_{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 ² , expressed in % and rounded to the nearest integer. Deviating from the regulation η_{col} is based on reference area (A_{sol}) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2013.													
				Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}									
				Zero-loss efficiency (η_0)		0,540		--					
				First-order coefficient (a_1)		1,84		W/(m ² K)					
				Second-order coefficient (a_2)		0,000		W/(m ² K ²)					
				Incidence angle modifier IAM (50°)		0,85		--					
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.													
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Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		PSK-001/2018							
					Date issued		15-03-2018							
					Issued by		CERTIF							
Licence holder		Sunaitec			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									
					Power output per collector Gb = 850 W/m ² ; Gd = 150 W/m ² ; u = 3 m/s $\vartheta_m - \vartheta_a$									
Collector name		Gross area (A_G)	Gross length	Gross width	Gross height	0 K	10 K	30 K	50 K	70 K	100 K			
		m ²	mm	mm	mm	W	W	W	W	W	W			
RTS plus		1,14	3 068	371	185	590	579	541	484	408	259			
Power output per m² gross area						518	508	475	425	359	227			
Performance parameters test method					Quasi dynamic									
Performance parameters (related to AG)					$\eta_{0,b}$	c1	c2	c3	c4	c6	Kd			
Units					-	W/(m ² K)	W/(m ² K ²)	J/(m ³ K)	-	s/m	-			
Test results					0,579	0,810	0,021	0,000	0,000	0,000	0,300			
Incidence angle modifier test method					Quasi dynamic - outdoor									
Bi-directional incidence angle modifiers					Yes									
Incidence angle modifier					Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal					K_{θT, coll}	1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,00	0,00
Longitudinal					K_{θL, coll}	1,00	0,98	0,93	0,85	0,62	0,43	0,00	0,00	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 for thermal performance calculations					($\vartheta_m - \vartheta_a$)_{max}	100		K						
Standard stagnation temperature (G = 1000 W/m²; $\vartheta_a = 30$ °C)					ϑ_{str}	254,5		°C						
Effective thermal capacity, incl. fluid (per gross area, A_G)					C/m²	9		kJ/(Km²)						
Maximum operating temperature					$\vartheta_{max, op}$	100		°C						
Maximum operating pressure					p_{max, op}	1000		kPa						
Testing laboratory					LNEG		www.lneg.pt							
Test report(s)					n.5.V2/LES/2016 - Revisão 1		Dated		28-02-2018					
Comments of testing laboratory					Datasheet version: 5.01, 2016-03-01									
Thermal performance test for collector with NS tracking axis / tilt of rotation axis = 30°. For calculation of annual energy, IAM transversal corresponds to EW direction and is set equal to 1. IAM longitudinal corresponds to NS direction.					 <p>LNEG, I.P. - Instituto Nacional de Energia e Geologia Laboratório Nacional de Energia Solar Laboratório de Energia Solar</p>									
<p>CERTIF Associação para a Certificação Rua José Afonso, 9E - 2810-237 Alameda da Universidade - Portugal Tel: +351 212 586 940 / Fax: +351 212586959 / mail@certif.pt / www.certif.pt</p>														



Annex to Solar Keymark Certificate Supplementary Information		Licence Number		PSK-001/2018									
		Issued		15-03-2018									
Annual collector output in kWh/collector at mean fluid temperature ϑ_m , based on ISO 9806:2013 test results													
Collector name	ϑ_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		768	626	451	652	507	347	472	361	243	483	365	245
Annual output per m ² gross area		674	550	396	573	446	304	415	317	214	424	321	215
Fixed or tracking collector		NS-axis tracking											
Annual irradiation on collector plane		2386 kWh/m ²			2009 kWh/m ²			1408 kWh/m ²			1444 kWh/m ²		
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 ϑ_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. 5.01 (March 2016). A detailed description of the calculations is available at www.solarkeymark.org/scenocalc													
Additional Information													
Collector heat transfer medium						Water-Glycole							
Hybrid Thermal and Photo Voltaic collector						No							
The collector is deemed to be suitable for roof integration						No							
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:													
Climate class (A, B or C)						B							
Maximum tested positive load						1000 Pa							
Maximum tested negative load						1000 Pa							
Hail resistance using steel ball (maximum drop height)						0,4 m							
Energy Labelling Information													
		Reference Area, A_{sol} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}										
RTS plus NS		1,14	Collector efficiency (η_{col})		45	%							
		Remark: Collector efficiency (η_{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 ² , expressed in % and rounded to the nearest integer. Deviating from the regulation η_{col} is based on reference area (A_{sol}) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2013.											
		Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}											
		Zero-loss efficiency (η_0)		0,518	--								
		First-order coefficient (a_1)		0,81	W/(m ² K)								
		Second-order coefficient (a_2)		0,021	W/(m ² K ²)								
		Incidence angle modifier IAM (50°)		0,85	--								
		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.											
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