

Certificate no. **PSK-006/2019**
Certificado n°



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

OPENPLUS, Lda.
Eco- Parque Empresarial, Rua de Canelas, n°10
3860-529 Estarreja
Portugal

Product:
Produto:

Thermal Solar Collector
Coletor Solar Térmico

Type references:
Referências:

OP-V1, OP-V1.3, OP-V1.5

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

OPENPLUS ENERGY SYSTEMS

Technical characteristics:
Características técnicas:

Summary of EN 12975 Test Results: Registration No. PSK-002/2018
(in annex)
*Resumo dos resultados dos ensaios realizados segundo a norma EN 12975:
Registo N° PSK-002/2018 (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) ref. / Issued by:
Relatório(s) de ensaios n°(s) / Emitido(s) por:

R01/2018, R02/2018, R03/2018 CTCV

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

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

2024-11-24

and supersedes certificate no:
e substitui o certificado n°:


Date of issue:
Data de emissão:

2019-11-25

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



Annex to Solar Keymark Certificate						Licence Number		PSK-006/2019								
						Date issued		2019-11-25								
						Issued by		CERTIF								
Licence holder			OPENPLUS, Lda.			Country		Portugal								
Brand (optional)			OPENPLUS ENERGY SYSTEMS			Web		www.openplus.pt								
Street, Number			Eco-Parque Empresarial, Rua de Canelas 10			E-mail		geral@openplus.pt								
Postcode, City			3860-529 Estarreja			Tel		+351 234811450								
Collector Type						Flat plate collector										
Collector name						Power output per collector										
						G _b = 850 W/m ² , G _d = 150 W/m ² & u = 1.3 m/s										
						$\vartheta_m - \vartheta_a$										
						0 K	10 K	30 K	50 K	70 K	81 K					
						W	W	W	W	W	W					
OPV1.5						98	2,68	2.066	1.298	2,52	1.977	1.851	1.596	1.336	1.072	931
OPV1						98	2,17	2.066	1.048	2,17	1.596	1.494	1.288	1.079	866	751
OPV1.3						98	2,52	1.938	1.298	2,36	1.858	1.739	1.499	1.255	1.007	874
Power output per m ² gross area						737	690	595	498	400	347					
Performance parameters test method						Steady state - indoor										
Performance parameters (related to A _G)						η_0, b	a1	a2	a3	a4	a5	a6	a7	a8	Kd	
Units						-	W/(m ² K)	W/(m ² K ²)	J/(m ³ K)	-	J/(m ² K)	s/m	W/(m ² K ⁴)	W/(m ² K ⁴)	-	
Test results						0,753	4,68	0,002	0,000	0,00	0	0,000	0,00	0,0E+00	0,86	
Incidence angle modifier test method						Quasi dynamic - outdoor										
Incidence angle modifier						Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°	
Transversal						K _{BT, coll}	0,99	0,98	0,97	0,95	0,90	0,83	0,69	0,44	0,00	
Longitudinal						K _{BL, coll}	0,99	0,98	0,97	0,95	0,90	0,83	0,69	0,44	0,00	
Heat transfer medium for testing						Water										
Flow rate for testing (per gross area, A _G)						dm/dt	0,053	kg/(sm ²)								
Maximum temperature difference during thermal performance test						($\vartheta_m - \vartheta_a$) _{max}	50,6	K								
Standard stagnation temperature (G = 1000 W/m ² ; $\vartheta_a = 30^\circ\text{C}$)						ϑ_{stp}	165,4	°C								
Maximum operating temperature						$\vartheta_{max, op}$	-	°C								
Maximum operating pressure						p _{max, op}	600	kPa								
Testing laboratory						CTCV			www.ctcv.pt							
Test report(s)						R01/2018 R02/2018 R03/2018			Dated 05-02-2019 07-06-2019 14-03-2019							
Comments of testing laboratory						Datasheet version: 6.0, 2018-10-30										
						 <p>CENTRO TECNOLÓGICO DA CERÂMICA E DO VIDRO Rua Carlos Veiga Gomes 3005 - 267 COIMBRA</p>										
<p align="center">CERTIF Associação para a Certificação Rua José Afonso, 9E - 2810-237 Almada - Portugal Tel: +351 212 586 940 / Fax: +351 212 586 959 / mail@certif.pt / www.certif.pt</p>																

Annex to Solar Keymark Certificate Supplementary Information	Licence Number	PSK-006/2019
	Issued	2019-11-25

Annual collector output in kWh/collector at mean fluid temperature ϑ_m													
Collector name	Standard Locations	Athens			Davos			Stockholm			Würzburg		
	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
OPV1.5		3.013	1.957	1.192	2.169	1.400	841	1.612	970	558	1.759	1.039	587
OPV1		2.432	1.580	962	1.751	1.130	679	1.302	783	451	1.420	839	474
OPV1.3		2.831	1.839	1.120	2.038	1.316	790	1.515	911	524	1.653	977	552
Annual output per m ² gross area		1.123	730	444	809	522	314	601	362	208	656	388	219
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m ²			1714 kWh/m ²			1166 kWh/m ²			1244 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		South, 25°			South, 30°			South, 45°			South, 35°		

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. 6.0 (October 2018). A detailed description of the calculations is available at www.solarkeymark.org/scenocalc

Additional Information			
Collector heat transfer medium	Water		
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)	A+		--
G (W/m ²) >	1000	ϑ_a (°C) >	20
		H_v (MJ/m ²) >	600
Maximum tested positive load	2500		Pa
Maximum tested negative load	2500		Pa
Hail resistance using steel ball (maximum drop height)	1,4		m

Additional collector attribute(s)	
<input type="checkbox"/> Using external power source(s) for normal operation	<input type="checkbox"/> Active or passive measure(s) for self-protection
<input type="checkbox"/> Co-generating thermal and electrical power	<input type="checkbox"/> Wind and/or infrared sensitive collector(s) (WISC)
<input type="checkbox"/> Façade collector(s)	

Energy Labelling Information		
	Reference Area, A_{sol} (m ²)	Hydraulic Designation Code
OPV1.5	2,68	{F}-{O}-{CL}-{A:Ø,L}-{C:Ø,L}-{D}
OPV1	2,17	{F}-{O}-{CL}-{A:Ø,L}-{C:Ø,L}-{D}
OPV1.3	2,52	

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 (η_{col})	55%	Zero-loss efficiency (η_0)	0,74
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 9806:2017.		First-order coefficient (a_1)	4,68
		Second-order coefficient (a_2)	0,002
		Incidence angle modifier IAM (50°)	0,89
			--
		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.	