



**Certificate no.**  
*Certificado nº* **PSK-007/2021**

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

OPENPLUS, Lda.  
Rua de Canelas Nº 10  
3860-529 Estarreja  
Portugal

**Product:**  
*Produto:*

Thermal Solar Collector  
*Coletor Solar Térmico*

**Type references:**  
*Referências:*

OP-V6, OP-V4 AL, OP-V4.3 AL and / e OP-V4.5 AL

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

OPENPLUS ENERGY SYSTEMS

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

Summary of EN 12975 Test Results: Registration No. PSK-007/2021  
(in annex)  
*Resumo dos resultados dos ensaios realizados segundo a norma EN 12975:  
Registo Nº PSK-007/2021 (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 nº(s) / Emitido(s) por:*

Nº 01/2021, Nº 02/2021 and / e Nº 03/2021 / CTCV

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

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

2026-12-29

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

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


2021-12-30

Francisco Barroca  
General Manager / *Diretor Geral*

**IPAC**  
*acreditação*

C0004  
ISO/IEC 17065  
Produtos

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-007/2021				
						Date issued		2021-12-30				
						Issued by		CERTIF				
Licence holder		OPENPLUS				Country	Portugal					
Brand (optional)		OPENPLUS				Web	https://www.openplus.pt					
Street, Number		Eco Parque - Rua Canelas, 10				E-mail	geral@openplus.pt					
Postcode, City		3860-529 Estarreja				Tel	351 234 811 450					
Collector Type						Flat plate collector						
Collector name	Gross area (A <sub>G</sub> ) m <sup>2</sup>	Gross length mm	Gross width mm	Gross height mm	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 W	10 K W	30 K W	50 K W	70 K W	78 K W		
OPV4 AL	2,13	2 058	1 037	68	1 471	1 373	1 176	978	780	700		
OPV4.3 AL	2,40	2 058	1 165	68	1 652	1 542	1 321	1 099	876	786		
OPV4.5 AL	2,65	2 058	1 290	68	1 830	1 708	1 463	1 217	970	871		
OPV6	2,01	1 930	1 040	68	1 383	1 291	1 106	920	734	658		
Power output per m <sup>2</sup> gross area					689	643	551	458	366	328		
Performance parameters test method		Steady state - indoor										
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		0,703	4,59	0,000	0,000	0,00	0	0,000	0,00	0,0E+00	0,87	
Incidence angle modifier test method		Steady state - indoor										
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°	
Transversal		K <sub>GT, coll</sub>	1,00	0,99	0,98	0,95	0,90	0,81	0,66	0,41	0,00	
Longitudinal		K <sub>GL, coll</sub>	1,00	0,99	0,98	0,95	0,90	0,81	0,66	0,41	0,00	
Heat transfer medium for testing						Water						
Flow rate for testing (per gross area, A <sub>G</sub> )						dm/dt	0,040	kg/(sm <sup>2</sup> )				
Maximum temperature difference during thermal performance test						$(\vartheta_m - \vartheta_a)_{max}$	48,07	K				
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; $\vartheta_a = 30^\circ\text{C}$ )						$\vartheta_{str}$	163,75	°C				
Maximum operating temperature						$\vartheta_{max, op}$	-	°C				
Maximum operating pressure						P <sub>max, op</sub>	600	kPa				
Testing laboratory		CTCV				http://www.testlab.domain						
Test report(s)		R01/2021 R02/2021 R03/2021				Dated		21/12/2021 21/12/2021 21/12/2021				
Comments of testing laboratory						Datasheet version: 6.1, 2019-09-26						
						 CENTRO TÉCNICO ORÇÃO DA CERÂMICA E DO VIDRO Rua Coronel Veiga Simão, 3025 - 307 COIMBRA						
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												

<b>Annex to Solar Keymark Certificate Supplementary Information</b>	<b>Licence Number</b>	<b>PSK-007/2021</b>
	<b>Issued</b>	<b>2021-12-30</b>

Annual collector output in kWh/collector at mean fluid temperature $\vartheta_m$													
Collector name	Standard Locations	Athens			Davos			Stockholm			Würzburg		
	$\vartheta_m$	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
OPV4 AL		2 258	1 449	875	1 616	1 035	620	1 201	715	410	1 310	766	431
OPV4.3 AL		2 537	1 627	984	1 815	1 163	697	1 349	803	461	1 472	860	484
OPV4.5 AL		2 809	1 802	1 089	2 010	1 288	771	1 494	890	510	1 630	953	536
OPV6		2 124	1 362	823	1 520	974	583	1 129	673	386	1 232	720	405
Annual output per m <sup>2</sup> gross area		1 058	679	410	757	485	291	563	335	192	614	359	202
Annual efficiency, $\eta_a$		60%	38%	23%	46%	30%	18%	48%	29%	16%	49%	29%	16%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1630 kWh/m <sup>2</sup>			1166 kWh/m <sup>2</sup>			1244 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		South, 25°			South, 30°			South, 45°			South, 35°		

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. 6.1 (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)	A
G (W/m <sup>2</sup> ) > 1000	$\vartheta_a$ (°C) > 20
Maximum tested positive load	2500 Pa
Maximum tested negative load	2500 Pa
Hail resistance using steel ball (maximum drop height)	1,6 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		Additional Informative Technical Data	
	Reference Area, $A_{ref}$ (m <sup>2</sup> )	Hydraulic Designation Code	Aperture Area, $A_a$ (m <sup>2</sup> )
OPV4 AL	2,13		2,02
OPV4.3 AL	2,40		2,32
OPV4.5 AL	2,65		2,53
OPV6	2,01		1,89

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 ( $\eta_{col}$ )	50%	Zero-loss efficiency ( $\eta_0$ )	0,69
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 ( $a_1$ )	4,59 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0,000 W/(m <sup>2</sup> K <sup>2</sup> )
		Incidence angle modifier IAM (50°)	0,90
		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.	