



**Certificate no.**  
*Certificado n°* **PSK-008/2018**

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

**EMMVEE SOLAR SYSTEMS PRIVATE LIMITED**  
Solar Tower # 55, 6 TH Main, 11 TH Cross  
Lakshmaiah Block, Ganganagar  
Bangalore – 560024, INDIA

**Product:**  
*Produto:*

**Thermal solar collector**  
*Coletor solar térmico*

**Type references:**  
*Referências:*

ES2000AX

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

SOLARIZER

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

Summary of EN 12975 Test Results: Registration No. PSK-008/2018  
(in annex)  
*Resumo dos resultados dos ensaios realizados segundo a norma EN 12975:  
Registo N° PSK-008/2018 (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:**  
*Relatório(s) de ensaios n°(s) / emitido(s) por:*

30.2153.0-1-1, 30.2153.0-2-1 and/e 30.2153.1 / CENER

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

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

2023-10-30

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

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


2018-10-31



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*

Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		PSK-008/2018							
					Date issued		2018-10-31							
					Issued by		CERTIF							
Licence holder	EMMVEE Solar Systems Private Limited				Country	INDIA								
Brand (optional)	SOLARIZER				Web	http://www.emmvee.com								
Street, Number	Solar Tower # 55, 6 TH MAIN, 11 TH Cross				E-mail	srinath.t@emmvee.in								
Postcode, City	560024 BANGALORE				Tel	+91 80 4323 3442 / 80 2333 2060								
Collector Type					Flat plate collector, glazed									
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> θ <sub>m</sub> - θ <sub>a</sub>									
					0 K W	10 K W	30 K W	50 K W	70 K W	54 K W				
<b>ES2000AX</b>	2,11	2.046	1.033	115	1.367	1.297	1.148	987	815	954				
Power output per m <sup>2</sup> gross area					648	615	544	468	386	452				
Performance parameters test method					Steady state - indoor									
Performance parameters (related to A <sub>G</sub> )					η <sub>0,hem</sub>	a1	a2							
Units					-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )							
Test results					0,648	3,252	0,007							
Incidence angle modifier test method					Steady state - outdoor									
Bi-directional incidence angle modifiers					No									
Incidence angle modifier					Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal					K <sub>θT, coll</sub>					0,85			0,00	
Longitudinal					K <sub>θL, coll</sub>				0,85				0,00	
Heat transfer medium for testing					Water-Glycole									
Flow rate for testing (per gross area, A <sub>G</sub> )					dm/dt	0,020	kg/(sm <sup>2</sup> )							
Maximum temperature difference for thermal performance calculations					(θ <sub>m</sub> -θ <sub>a</sub> ) <sub>max</sub>	54	K							
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; θ <sub>a</sub> = 30 °C)					θ <sub>stg</sub>	209	°C							
Effective thermal capacity, Incl. fluid (per gross area, A <sub>G</sub> )					C/m <sup>2</sup>	6,068	kJ/(Km <sup>2</sup> )							
Maximum operating temperature					θ <sub>max, op</sub>	85	°C							
Maximum operating pressure					P <sub>max, op</sub>	800	kPa							
Testing laboratory	Fundación CENER-CIEMAT				http://www.cener.com									
Test report(s)	30.2153.0-1-1 30.2153.0-2-1 30.2153.0				Dated	07/08/2013 24/07/2013 30/08/2013								
Comments of testing laboratory					Datasheet version: 5.01, 2016-03-01									
														
<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-008/2018
	Issued	2018-10-31

Annual collector output in kWh/collector at mean fluid temperature  $\vartheta_m$ , based on ISO 9806:2013 test results

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
ES2000AX		2.011	1.392	902	1.515	1.037	660	1.108	717	440	1.201	764	460
Annual output per m <sup>2</sup> gross area		953	660	428	718	492	313	525	340	209	569	362	218
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1714 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. 5.01 (March 2016). A detailed description of the calculations is available at [www.solarkeymark.org/scenocalc](http://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	Yes	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	C	--
Maximum tested positive load	1000	Pa
Maximum tested negative load	1000	Pa
Hail resistance using ice balls (diameter)	25	mm

Energy Labelling information

	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$	
ES2000AX	2,11	Collector efficiency ( $\eta_{col}$ )	51 %
		<i>Remark: Collector efficiency (<math>\eta_{col}</math>) 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 <math>\eta_{col}</math> is based on reference area (<math>A_{sol}</math>) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2013.</i>	
		Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$	
		Zero-loss efficiency ( $\eta_0$ )	0,648 --
		First-order coefficient ( $a_1$ )	3,25 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0,007 W/(m <sup>2</sup> K <sup>2</sup> )
		Incidence angle modifier IAM (50°)	0,85 --
		<i>Remark: The data given in this section are related to collector reference area (<math>A_{sol}</math>) 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.</i>	