



Certificate no. **PSK-002/2020**  
Certificado nº

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:

**ES2000B**

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

**SOLARIZER**

Technical characteristics:  
Características técnicas:

Summary of EN 12975 Test Results: Registration No. PSK-002/2020  
(in annex)  
Resumo dos resultados dos ensaios realizados segundo a norma EN 12975:  
Registo Nº PSK-002/2020 (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 nº(s) / emitido(s) por:

**30.1842.0-1-1 and /e 30.1842.0-2-1 / CENER**

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

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

**2022-06-28**

and supersedes certificate no:  
e substitui o certificado nº:

**PSK-006/2017**


Date of issue:  
Data de emissão:

**2020-02-12**

**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-002/2020								
		Date issued	2020-02-12								
		Issued by	CERTIF								
Licence holder	EMMVEE Solar Systems Private Limites		Country	INDIA							
Brand (optional)	SOLARIZER		Web	http://www.emmvee.com							
Street, Number	Solar Tower # 55, 6 TH MAIN, 11 TH Cross Lashmaiah Block, Ganganagar		E-mail	srinath.t@emmbee.in							
Postcode, City	560024 BANGALORE		Tel	+91 80 4323 3442 / 2333 2060							
Collector Type			Flat plate collector								
Collector name	Gross area ( $A_G$ ) 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	85 K W	
ES2000B	2.09	2,040	1,025	110	1,398	1,324	1,163	981	779	615	
Power output per m <sup>2</sup> gross area					669	634	556	469	373	294	
Performance parameters test method		Steady state - indoor									
Performance parameters (related to $A_G$ )		$\eta_0, b$	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>2</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		0.682	3.39	0.012	0.000	0.00	4,761	0.000	0.00	0.0E+00	0.87
Incidence angle modifier test method		Steady state - outdoor									
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal		$K_{\theta T, coll}$	1.00	0.98	0.96	0.92	0.85	0.73	0.48	0.00	0.00
Longitudinal		$K_{\theta L, coll}$	1.00	0.98	0.96	0.92	0.85	0.73	0.48	0.00	0.00
Heat transfer medium for testing		Water									
Flow rate for testing (per gross area, $A_G$ )		$dm/dt$	0.020	kg/(sm <sup>2</sup> )							
Maximum temperature difference during thermal performance test		$(\vartheta_m - \vartheta_a)_{max}$	55	K							
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; $\vartheta_a = 30^\circ\text{C}$ )		$\vartheta_{stg}$	218	°C							
Maximum operating temperature		$\vartheta_{max, op}$	85	°C							
Maximum operating pressure		$P_{max, op}$	800	kPa							
Testing laboratory		Fundación CENER		http://www.cener.com							
Test report(s)		30.1842.0-1-1 30.1842.0-2-1		Dated		12/06/2012 14/06/2012					
Comments of testing laboratory		This collector was tested according to EN 12975-2 in 2012.									
<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-002/2020
	Issued	2020-02-12

Annual collector output 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
ES2000B		2,109	1,443	894	1,574	1,045	619	1,158	729	422	1,263	785	443
Annual output per m <sup>2</sup> gross area		1,009	690	428	753	500	296	554	349	202	604	375	212
Annual efficiency, $\eta_a$		57%	39%	24%	46%	31%	18%	48%	30%	17%	49%	30%	17%
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)				C	--
G (W/m <sup>2</sup> ) >	850	$\vartheta_a$ (°C) >	10	H <sub>a</sub> (MJ/m <sup>2</sup> ) >	14
Maximum tested positive load				1000	Pa
Maximum tested negative load				1000	Pa
Hail resistance using ice balls (diameter)				25	mm

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"/> 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> )
ES2000B	2.09	8-V-1234S-A:8,1912-C:18,1080-D	1.94

Data required for CDR (EU) No 811/2013 - Reference Area $A_{ref}$		Data required for CDR (EU) No 812/2013 - Reference Area $A_{ref}$	
Collector efficiency ( $\eta_{col}$ )	51%	Zero-loss efficiency ( $\eta_0$ )	0.67
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 ( $A_{ref}$ ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.		First-order coefficient ( $a_1$ )	3.39
		Second-order coefficient ( $a_2$ )	0.012
		Incidence angle modifier IAM (50°)	0.85
			--
		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.	