



Associação para a Certificação

Emmvee Solar Systems Private Limited
Att. Mr. Srinath Thippegowda
Solar Tower # 55, 6 TH Main, 11 TH Cross
Lakshmaiah Block, Ganganagar
Bangalore – 560024
India

000290 19-02-20

PSK / AN

ASSUNTO • SUBJECT

Solar Keymark Certificates

Please find enclosed the Solar Keymark Certificates issued with the following references:

- PSK-001/2020, for Solar Thermal Collector ES2000A, issued for substitution of PSK-005/2017;
- PSK-002/2020, for Solar Thermal Collector ES2000B, issued for substitution of PSK-006/2017;
- PSK-003/2020, for Solar Thermal Systems T15&T20, issued for substitution of PSK-007/2017;
- PSK-004/2020, for Solar Thermal System T30, issued for substitution of PSK-008/2017.

Yours sincerely,

Ana Neves Sol

Ana Neves Sol
Process Engineer



Certificado



Certificate no. **PSK-001/2020**
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
Colector solar térmico

Type references:
Referências:

ES2000A

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

SOLARIZER

Technical characteristics:
Características técnicas:

Summary of EN 12975 Test Results: Registration No. PSK-001/2020
(in annex)
Resumo dos resultados dos ensaios realizados segundo a norma EN 12975:
Registo Nº PSK-001/2020 (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:

30.1842.0-3-1, 30.1842.0-4-1 and /e 30.1842.0 / CENER

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

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

2022-06-28

and supersedes certificate no:
e substitui o certificado nº:

PSK-005/2017

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-001/2020
Date issued	2020-02-12
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 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
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Collector name	Gross area (A _G) m ²	Gross length mm	Gross width mm	Gross height mm	Power output per collector G _b = 850 W/m ² , G _d = 150 W/m ² & u = 1.3 m/s θ _m - θ _a					
					0 K	10 K	30 K	50 K	70 K	86 K
					W	W	W	W	W	W
ES2000A	2.10	2,044	1,027	105	1,386	1,322	1,177	1,007	811	636
Power output per m ² gross area					660	630	561	479	386	303

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/(m²K)	W/(m²K²)	J/(m³K)	-	J/(m²K)	s/m	W/(m²K⁴)	W/(m²K⁴)	-
Test results	0.674	2.86	0.015	0.000	0.00	5.652	0.000	0.00	0.0E+00	0.86

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	0.91	0.84	0.71	0.45	0.00	0.00
Longitudinal	$K_{\theta L, coll}$	1.00	0.98	0.96	0.91	0.84	0.71	0.45	0.00	0.00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_g)	$\dot{m}/dt$	0.020	kg/(sm ²)
Maximum temperature difference during thermal performance test	$(\vartheta_m - \vartheta_a)_{\max}$	56	K
Standard stagnation temperature ($G = 1000 \text{ W/m}^2$; $\vartheta_a = 30 \text{ }^\circ\text{C}$)	ϑ_{stg}	216	$^\circ\text{C}$
Maximum operating temperature	$\vartheta_{\text{max op}}$	85	$^\circ\text{C}$
Maximum operating pressure	$p_{\text{max op}}$	800	kPa

Testing laboratory	Fundación CENER	http://www.cener.com	
Test report(s)	30.1842.0-3-1 30.1842.0-4-1 30.1842.0 Technical annex	Dated	12/06/2012 14/06/2012 22/06/2012

Comments of testing laboratory

Datasheet version: 6.1, 2019-09-26

This collector was tested according to EN 12975-2 in 2012.



CENER

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

Annex to Solar Keymark Certificate	Licence Number	PSK-001/2020
Supplementary Information	Issued	2020-02-12

Annual collector output in kWh/collector at mean fluid temperature ϑ_m													
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	25°C	50°C	75°C
ES2000A		2,087	1,483	948	1,594	1,090	663	1,167	762	452	1,269	819	476
Annual output per m ² gross area		994	706	451	759	519	316	556	363	215	604	390	227
Annual efficiency, η_a		56%	40%	26%	47%	32%	19%	48%	31%	18%	49%	31%	18%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m ²			1630 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. 6.1 (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 ²) >	850	g _a (°C) >	10	H _x (MJ/m ²) >	14
Maximum tested positive load				1000	Pa
Maximum tested negative load				1000	Pa
Hail resistance using steel ball (maximum drop height)				25	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)

[illegible]

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})	52%	Zero-loss efficiency (η_0)	0.66	—
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)	2.86	W/(m ² K)
		Second-order coefficient (a_2)	0.015	W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0.83	—
		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.		



Certificado



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):

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 ²	Gross length mm	Gross width mm	Gross height mm	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 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 ² gross area									669	634	556	469	373	294					
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					0.682	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					$K_{T, coll}$	1.00	0.98	0.96	0.92	0.85	0.73	0.48	0.00	0.00					
Longitudinal					$K_{L, coll}$	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 ²)											
Maximum temperature difference during thermal performance test					$(\vartheta_m - \vartheta_a)_{max}$	55		K											
Standard stagnation temperature ($G = 1000$ W/m ² ; $\vartheta_a = 30$ °C)					ϑ_{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.																			
 																			
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																			

Datasheet version: 6.1, 2019-09-26

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 ϑ_m													
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	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 ² gross area		1,009	690	428	753	500	296	554	349	202	604	375	212
Annual efficiency, η_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 ²			1630 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. 6.1 (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 ²) >		850		ϑ_a (°C) >		10		H _x (MJ/m ²) >		14		Pa	
Maximum tested positive load											1000		Pa
Maximum tested negative load											1000		Pa
Hail resistance using ice balls (diameter)											25		mm
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 _{sol} (m ²)		Hydraulic Designation Code				Aperture Area, A _a (m ²)			
ES2000B				2.09		8-V-12345-A:8,1912-C:18,1080-D				1.94			
Data required for CDR (EU) No 811/2013 - Reference Area A _{sol}							Data required for CDR (EU) No 812/2013 - Reference Area A _{ap}						
Collector efficiency (η_{col})				51%			Zero-loss efficiency (η_0)				0.67		
							First-order coefficient (a_1)				3.39		
							Second-order coefficient (a_2)				0.012		
							Incidence angle modifier IAM (50°)				0.85		
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.							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.						



Certificado



Certificate no. PSK-003/2020
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 system and components - Factory made system
Instalação solar térmica prefabricada e seus componentes

Type references:
Referências:

T15, T20

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

SOLARIZER

Technical characteristics:
Características técnicas:

Summary of EN 12976 Test Results: Registration No. PSK-003/2020
(in annex)
Resumo dos resultados dos ensaios realizados segundo a norma EN 12976:
Registo Nº PSK-003/2020 (em anexo)

This product is in conformity with:
Este produto está em conformidade com:

EN 12976-1:2006, EN 12976-2:2006

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:

30.1728.0 R and / e 30.1728.0-1 R / CENER

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

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

2022-06-28

and supersedes certificate no:
e substitui o certificado nº:

PSK-007/2017

Date of issue:
Data de emissão:

2020-02-12

Francisco Barroca
General Manager / Diretor Geral



This Certificate includes one Annex with 3 (three) pages
Este Certificado é constituído por um Anexo com 3 (três) páginas

Summary of	EN12976-2	SOLAR SYSTEM test results	Licence Number	PSK-003/2020												
Annex to Solar KEYMARK Certificate			Issued	2020-02-12												
Company	EMMVEE SOLAR SYSTEMS PRIVATE LIMITED		Country	INDIA												
Brand (optional)	---		Website	www.emmvee.com												
Street	SOLAR TOWER # 55, 6 TH MAIN, 11 TH CROSS		E-mail	srinath.t@emmvee.in												
Postal Code	560024	GANGANAGAR, BANGALORE	Tel. / Fax	+91 8043233442												
System classification																
Application(s)			Hot water													
Solar loop, circulation principle			Thermosyphon													
Direct solar loop / heat exchanger			Heat exchanger													
Open, vented or closed solar loop			Closed													
Drain back/down			Always filled (no drain)													
Store location			Outdoor													
Store orientation (of main axis)			Horizontal													
Type of auxiliary heating (internal back-up heat)			None													
If other auxiliary/internal back-up heating, please specify:																
Solar+supplementary OR Solar-only / Solar pre-heat			Solar only / Solar preheat													
Collector(s)																
Company	EMMVEE SOLAR SYSTEMS PVT															
Keymark lic.no. if available	PSK-001/2020															
Collector name	Per module															
	Gross Area (Ag)	Gross length	Gross width													
	m ²	mm	mm													
ES2000A	2.09	2040	1025													
Heat store(s)																
Company	EMMVEE SOLAR SYSTEMS PVT LTD															
Keymark lic.no. if available																
Store name	Total nominal volume	Gross height	Gross width	Gross depth												
	litres	mm	mm	mm												
TS15	150	620	1000	0												
TS20	200	620	1250	0												
Solar loop controller																
Keymark lic.no. if available	---															
Company	---															
Name	---															
Solar loop pump - power range	W	to	W													
Solar loop fluid																
Recommended/required		Required														
Company	---															
Name	TYFOCOR															
Freezing point	-8	°C														
System family overview																
Collector name	Number of collectors in each configuration for each store															
	Store name															
	TS15				TS20											
ES2000A	1				1											
Testing Laboratory																
Fundación CENER-CIEMAT																
Website																
www.cener.com																
Test report id. number																
30.1728.0 R Technical Appendix of Solar System Family, 30.1728.0-1 R Test report																
Date of test report																
2012-06-15 and 2013-10-31																
Comments of test lab																
T15 and T20 is considered a Solar System Family. The thermal characterisation and the high-temperature test was performed on model T15.																
 CENER NATIONAL RENEWABLE ENERGY CENTER																



Summary of		EN12976-2		test results		Certification No.		PSK-003/2020						
Annex to Solar KEYMARK Certificate						Issued		2020-02-12						
Company		EMMVEE SOLAR SYSTEMS PRIVATE LIMITED				Country		INDIA						
Brand (optional)		--				Website		www.emmvee.com						
Street		SOLAR TOWER # 55, 6 TH MAIN, 11 TH CROSS				E-mail		srinath.t@emmvee.in						
Postal Code		560024		GANGANAGAR, BANGALORE		Tel. / Fax		+91 8043233442						
System family overview														
For each storage and collector size, give number of collectors														
Collector name		TS15		TS20										
ES2000A		1		1										
Name of system configuration						T15								
Collector name		ES2000A		No. Collectors		1		Storage name		TS15				
Calculated annual results for "solar-only / preheat system"														
Location	Qd,sh	Daily drawoff				Daily drawoff				Daily drawoff				
		110		140		170								
		Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	
	MJ/y	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	
Stockholm SE	--	6140	3003	--	48.9	7814	3473	--	44.4	9489	3775	--	39.8	
Würzburg DE	--	5888	3080	--	52.3	7494	3604	--	48.1	9099	3976	--	43.7	
Davos CH	--	6662	4417	--	66.3	8479	5039	--	59.4	10295	5417	--	52.6	
Athens GR	--	4575	3773	--	82.5	5823	4503	--	77.3	7071	5090	--	72.0	
Perf. indicators for the table above														
Qd,sh	MJ/y	Not relevant for solar domestic hot water system												
Qd	MJ/y	Annual heat demand for domestic hot water												
QL	MJ/y	Annual heat energy delivered by the solar system												
Qpar	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)												
f_{sol} = QL/Qd	-	Solar fraction												
Ref. conditions		G	Stockholm SE	Würzburg DE	Davos CH	Athens GR								
			1,157	1,230	1,684	1,736								
		Ta,ave	7.5	9.0	3.2	18.5								
		Tc,ave	8.5	10.0	5.4	17.8								
		± ΔTc	6.4	3.0	0.8	7.4								
G	kWh/m²	Annual irradiation South, 45°												
Ta,ave	°C	Annual average outdoor air temperature												
Tc,ave	°C	Annual average mains cold water temp.												
ΔTc	K	Seasonal variation of Tc												
Th	45 °C	Desired hot water temperature (mixing valve temperature).												
Max. operating press. - collector side				300 kPa		Max. operating press. - tank side				600 kPa				
Testing Laboratory				Fundación CENER-CIEMAT										
Website				www.cener.com										
Test report id. number				30.1728.0-1 R Test report										
Date of test report				2012-06-15										
Test method				ISO 9459-5 (DST)										
Comments of test lab														

All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %

Version 4.5, 2017-10-24

CERTIF Associação para a Certificação

Rua José Afonso, 9E - 2810-237 Almada - Portugal

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Summary of	EN12976-2	test results	Certification No.	PSK-003/2020									
Annex to Solar KEYMARK Certificate			Issued	2020-02-12									
Company	EMMVEE SOLAR SYSTEMS PRIVATE LIMITED		Country	INDIA									
Brand (optional)	---		Website	www.emmvee.com									
Street	SOLAR TOWER # 55, 6 TH MAIN, 11 TH CROSS		E-mail	srinath.t@emmvee.in									
Postal Code	560024	GANGANAGAR, BANGALORE	Tel. / Fax	+91 8043233442									
System family overview													
For each storage and collector size, give number of collectors													
Collector name	TS15 TS20												
ES2000A	1	1											
Name of system configuration													
Collector name	ES2000A	No. Collectors	1	Storage name TS20									
Calculated annual results for "solar-only / preheat system"													
Location	Qd,sh MJ/y	Daily drawoff 170 l				Daily drawoff 200 l				Daily drawoff 250 l			
		Qd,hw MJ/y	QL MJ/y	Qpar MJ/y	fsol %	Qd,hw MJ/y	QL MJ/y	Qpar MJ/y	fsol %	Qd,hw MJ/y	QL MJ/y	Qpar MJ/y	fsol %
Stockholm SE	--	9489	3909	--	41.2	11163	4186	--	37.5	13954	4396	--	31.5
WürzburgDE	--	9099	4109	--	45.2	10705	4446	--	41.5	13381	4704	--	35.2
Davos CH	--	10295	5606	--	54.5	12112	5957	--	49.2	15140	6214	--	41.0
Athens GR	--	7071	5204	--	73.6	8319	5765	--	69.3	10398	6423	--	61.8
Perf. indicators for the table above													
Qd,sh	MJ/y	Not relevant for solar domestic hot water system											
Qd	MJ/y	Annual heat demand for domestic hot water											
QL	MJ/y	Annual heat energy delivered by the solar system											
Qpar	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)											
f _{sol} =Q _l /Q _d	-	Solar fraction											
Ref. conditions	G	Stockholm SE	Würzburg DE	Davos CH	Athens GR								
	T _{a,ave}	7.5	9.0	3.2	18.5								
	T _{c,ave}	8.5	10.0	5.4	17.8								
	± ΔT _c	6.4	3.0	0.8	7.4								
G	kWh/m ²	Annual irradiation South, 45°											
T _{a,ave}	°C	Annual average outdoor air temperature											
T _{c,ave}	°C	Annual average mains cold water temp.											
ΔT _c	K	Seasonal variation of T _c											
Th	45 °C	Desired hot water temperature (mixing valve temperature).											
Max. operating press. - collector side		300	kPa	Max. operating press. - tank side		600	kPa						
Testing Laboratory		Fundación CENER-CIEMAT											
Website		www.cener.com											
Test report id. number		30.1728.0 R Technical Appendix of Solar System Family											
Date of test report		2012-06-15											
Test method		ISO 9459-5 (DST)											
Comments of test lab													
The thermal performance and the long-term prediction were extrapolated according to Annex D of Solar keymark Specific Scheme Rule for model T15.													

All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %

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Certificado

Certificate no.
Certificado nº

PSK-004/2020



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 system and components - Factory made
system
Instalação solar térmica prefabricada e seus componentes

Type references:
Referências:

T30

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

SOLARIZER

Technical characteristics:
Características técnicas:

Summary of EN 12976 Test Results: Registration No. PSK-004/2020
(in annex)
Resumo dos resultados dos ensaios realizados segundo a norma EN 12976:
Registo Nº PSK-004/2020 (em anexo)

This product is in conformity with:
Este produto está em conformidade com:

EN 12976-1:2006, EN 12976-2:2006

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:

30.1728.1-1 R / CENER

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

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

2022-06-28

and supersedes certificate no:
e substitui o certificado nº:

PSK-008/2017

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





Summary of		EN12976-2		test results		Certification No.		PSK-004/2020					
Annex to Solar KEYMARK Certificate						Issued		2020-02-12					
Company		EMMVEE SOLAR SYSTEMS PRIVATE LIMITED				Country		INDIA					
Brand (optional)		--				Website		www.emmvee.com					
Street		SOLAR TOWER # 55, 6 TH MAIN, 11 TH CROSS				E-mail		srinath.t@emmvee.in					
Postal Code		560024		GANGANAGAR, BANGALORE		Tel. / Fax		+91 8043233442					
System family overview													
For each storage and collector size, give number of collectors													
Collector name		TS30											
ES2000A		1											
ES2000B		1											
Name of system configuration						T30							
Collector name		ES2000A		No. Collectors		1		Storage name					
Collector name		ES2000B		No. Collectors		1		TS30					
Calculated annual results for "solar-only / preheat system"													
Location	Qd,sh	Daily drawoff 250 l				Daily drawoff 300 l				Daily drawoff 400 l			
	Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	
	MJ/y	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%
Stockholm SE	--	13954	6700	--	48.0	16745	7316	--	43.7	22327	7683	--	34.4
Würzburg DE	--	13381	6938	--	51.8	16058	7659	--	47.7	21410	8210	--	38.3
Davos CH	--	15140	9836	--	65.0	18168	10592	--	58.3	24225	10961	--	45.2
Athens GR	--	10398	8423	--	81.0	12478	9482	--	76.0	16637	10895	--	65.5
Perf. indicators for the table above													
Qd,sh	MJ/y	Not relevant for solar domestic hot water system											
Qd	MJ/y	Annual heat demand for domestic hot water											
QL	MJ/y	Annual heat energy delivered by the solar system											
Qpar	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)											
f_{sol} = QL / Qd	-	Solar fraction											
Ref. conditions		G	Stockholm SE	Würzburg DE	Davos CH	Athens GR							
		Ta,ave	7.5	9.0	3.2	18.5							
		Tc,ave	8.5	10.0	5.4	17.8							
		± ΔTc	6.4	3.0	0.8	7.4							
G	kWh/m²	Annual irradiation South, 45°											
Ta,ave	°C	Annual average outdoor air temperature											
Tc,ave	°C	Annual average mains cold water temp.											
ΔTc	K	Seasonal variation of Tc											
Th	45 °C	Desired hot water temperature (mixing valve temperature).											
Max. operating press. - collector side		300		kPa		Max. operating press. - tank side		600		kPa			
Testing Laboratory		Fundación CENER-CIEMAT											
Website		www.cener.com											
Test report id. number		30.1728.1-1 R Test report											
Date of test report		2012-06-15											
Test method		ISO 9459-5 (DST)											
Comments of test lab													

All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %



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