


Annex to Solar Keymark Certificate					Licence Number		011-7S3043 F				
					Date issued		2024-07-19				
					Issued by		DIN CERTCO				
Licence holder		Jiangsu Sunrain Solar Energy Co., Ltd.			Country		China				
Brand (optional)		Sunrain			Web		http://en.sunrain.com [en.sunrain.com]				
Street, Number		Ninghai Industrial Zone, 222243			E-mail		certification@sunrain.com				
Postcode, City		Lianyungang City, Jiangsu Province			Tel		+86 518-85959563				
Collector Type					Flat plate collector						
Collector name					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	10 K	30 K	50 K	70 K	77 K	
					W	W	W	W	W	W	
FPC150C					1,119	1,086	1,001	894	764	716	
FPC200C					1,492	1,447	1,335	1,192	1,019	954	
FPC240C					1,791	1,737	1,602	1,430	1,223	1,145	
FPC270C					2,000	1,940	1,789	1,597	1,365	1,279	
FPC300C					2,239	2,171	2,002	1,788	1,528	1,432	
Power output per m <sup>2</sup> gross area					746	724	667	596	509	477	
Performance parameters test method		Steady state - outdoor									
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		0.758	2.06	0.019	0.000	0.00	5,813	0.000	0.00	0.00	0.90
Incidence angle modifier test method		Steady state - outdoor									
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal		K <sub>θT, coll</sub>	1.00	1.00	0.99	0.97	0.92	0.84	0.70	0.45	0.00
Longitudinal		K <sub>θL, coll</sub>	1.00	1.00	0.99	0.97	0.92	0.84	0.70	0.45	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 during thermal performance test					( $\vartheta_m - \vartheta_a$ ) <sub>max</sub>	46.67	K				
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; $\vartheta_a = 30$ °C)					$\vartheta_{stg}$	170	°C				
Maximum operating temperature					$\vartheta_{max, op}$	120	°C				
Maximum operating pressure					p <sub>max, op</sub>	1200	kPa				
Testing laboratory		Intertek Testing Services Shenzhen Ltd. Guangzhou Branch				http://www.intertek.com					
Test report(s)		230628112GZU-001				Dated		2024/7/19			
Comments of testing laboratory					Ver. 6.2 (13.01.2022)						
All test results come from model FPC300C					 Stamp & signature						
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Supplementary Information		011-7S3039 F											
		Issued											
		2024-07-19											
<b>Gross Thermal Yield in kWh/collector at mean fluid temperature <math>\vartheta_m</math></b>													
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
FPC150C		1,802	1,432	1,036	1,464	1,110	766	1,061	775	518	1,147	840	553
FPC200C		2,403	1,909	1,381	1,951	1,479	1,021	1,415	1,034	690	1,530	1,120	738
FPC240C		2,883	2,291	1,657	2,342	1,775	1,225	1,698	1,240	828	1,835	1,344	885
FPC270C		3,219	2,558	1,851	2,615	1,982	1,368	1,896	1,385	925	2,050	1,500	989
FPC300C		3,604	2,864	2,072	2,927	2,219	1,531	2,122	1,551	1,036	2,294	1,680	1,107
Gross Thermal Yield per m <sup>2</sup> gross area		1,201	955	691	976	740	510	707	517	345	765	560	369
Annual efficiency, $\eta_a$		68%	54%	39%	60%	45%	31%	61%	44%	30%	61%	45%	30%
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. 6.2 (13.01.2022). A detailed description of the calculations is available at <a href="http://www.estif.org/solarkeymarknew/">http://www.estif.org/solarkeymarknew/</a>													
<b>Additional Information</b>													
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)										B		--	
G (W/m <sup>2</sup> ) >		900		$\vartheta_a$ (°C) >		15		H <sub>x</sub> (MJ/m <sup>2</sup> ) >		540			
Maximum tested positive load										5900		Pa	
Maximum tested negative load										3000		Pa	
Hail resistance using steel ball (maximum drop height)										2		m	
<b>Additional collector attribute(s)</b>													
Using external power source(s) for normal operation					No		Active or passive measure(s) for self-protection					No	
Co-generating thermal and electrical power					No		Façade collector(s)					No	
<b>Energy Labelling Information</b>						<b>Additional Informative Technical Data</b>							
		Reference Area, A <sub>sol</sub> (m <sup>2</sup> )		Hydraulic Designation Code			Aperture Area, A <sub>a</sub> (m <sup>2</sup> )						
FPC150C		1.50		8-VH-1234S-A:9,1885-C22,1060-D			1.38						
FPC200C		2.00		8-VH-1234S-A:9,1885-C22,1060-D			1.85						
FPC240C		2.40		8-VH-1234S-A:9,1885-C22,1310-D			2.24						
FPC270C		2.68		8-VH-1234S-A:9,1885-C22,1400-D			2.52						
FPC300C		3.00		8-VH-1234S-A:9,1885-C22,1560-D			2.84						
<b>Data required for CDR (EU) No 811/2013 - Reference Area A<sub>sol</sub></b>						<b>Data required for CDR (EU) No 812/2013 - Reference Area A<sub>sol</sub></b>							
Collector efficiency ( $\eta_{col}$ )		63%				Zero-loss efficiency ( $\eta_0$ )		0.75		--			
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 <sub>sol</sub> ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.				First-order coefficient (a <sub>1</sub> )		2.06		W/(m <sup>2</sup> K)					
				Second-order coefficient (a <sub>2</sub> )		0.019		W/(m <sup>2</sup> K <sup>2</sup> )					
				Incidence angle modifier IAM (50°)		0.93		--					
<i>Remark: The data given in this section are related to collector reference area (A<sub>sol</sub>) 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>													
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