


Annex to Solar Keymark Certificate					Licence Number		011-7S3043 F							
					Date issued		2024-08-14							
					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									
					$G_b = 850 \text{ W/m}^2$, $G_d = 150 \text{ W/m}^2$ & $u = 1.3 \text{ m/s}$ $\vartheta_m - \vartheta_a$									
					0 K	10 K	30 K	50 K	70 K	77 K				
					W	W	W	W	W	W				
FPC150C					1,50	1,000	1,500	80	1,093	1,039	921	788	640	588
FPC200C					2.00	1,000	2,000	80	1,458	1,386	1,228	1,050	854	784
FPC240C					2.40	1,200	2,000	80	1,749	1,663	1,473	1,260	1,025	941
FPC270C					2.68	1,340	2,000	80	1,953	1,857	1,645	1,408	1,144	1,051
FPC300C					3.00	1,500	2,000	80	2,186	2,079	1,841	1,576	1,281	1,176
Power output per m ² gross area					729	693	614	525	427	392				
Performance parameters test method		Steady state - outdoor												
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 ² K)	-	J/(m ² K)	s/m	W/(m ² K ⁴)	W/(m ² K ⁴)	-			
Test results		0.742	3.47	0.012	0.000	0.00	2612	0.000	0.00	0	0.88			
Incidence angle modifier test method		Steady state - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		$K_{GT, coll}$	1.00	1.00	0.99	0.97	0.92	0.84	0.70	0.45	0.00			
Longitudinal		$K_{GL, coll}$	1.00	1.00	0.99	0.97	0.92	0.84	0.70	0.45	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					$(\vartheta_m - \vartheta_a)_{max}$	46.67	K							
Standard stagnation temperature (G = 1000 W/m ² ; $\vartheta_a = 30 \text{ °C}$)					ϑ_{stg}	170	°C							
Maximum operating temperature					$\vartheta_{max, op}$	120	°C							
Maximum operating pressure					$p_{max, op}$	1200	kPa							
Testing laboratory		Intertek Testing Services Shenzhen Ltd. Guangzhou Branch				http://www.intertek.com								
Test report(s)		230628112GZU-001				Dated		2024/8/14						
Comments of testing laboratory					Draft Ver. 6.2 (22.09.2021)									
All test results come from model FPC150C					 Stamp & Sign.									
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Supplementary Information		Issued		2024-08-14										
Gross Thermal Yield in kWh/collector at mean fluid temperature ϑ_m														
Collector name	Standard Locations	Athens			Davos			Stockholm			Würzburg			
	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	
FPC150C		1,723	1,222	794	1,308	901	565	961	626	378	1,044	674	401	
FPC200C		2,298	1,630	1,059	1,744	1,201	754	1,281	834	504	1,392	899	534	
FPC240C		2,757	1,956	1,271	2,093	1,442	904	1,538	1,001	604	1,670	1,079	641	
FPC270C		3,079	2,184	1,419	2,337	1,610	1,010	1,717	1,118	675	1,865	1,205	716	
FPC300C		3,446	2,444	1,588	2,616	1,802	1,131	1,922	1,252	755	2,088	1,349	801	
Gross Thermal Yield per m ² gross area		1,149	815	529	872	601	377	641	417	252	696	450	267	
Annual efficiency, η_a		65%	46%	30%	53%	37%	23%	55%	36%	22%	56%	36%	21%	
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 Draft Ver. 6.2 (22.09.2021). 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)											B		--	
G (W/m ²) >		900		ϑ_a (°C) >		15		H _x (MJ/m ²) >		540				
Maximum tested positive load											5900		Pa	
Maximum tested negative load											3000		Pa	
Hail resistance using steel ball (maximum drop height)											2		m	
Additional collector attribute(s)														
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
Energy Labelling Information						Additional Informative Technical Data								
		Reference Area, A _{sol} (m ²)				Hydraulic Designation Code				Aperture Area, A _a (m ²)				
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				
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})		57%				Zero-loss efficiency (η_0)				0.73		--		
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)				3.47		W/(m ² K)		
						Second-order coefficient (a ₂)				0.012		W/(m ² K ²)		
						Incidence angle modifier IAM (50°)				0.93		--		
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.														
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