


Annex to Solar Keymark Certificate					Licence Number		011-7S3166 R				
					Date issued		2023-03-21				
					Issued by		DIN CERTCO				
Licence holder		Jiangsu Sunrain Solar Energy Co.,Ltd			Country		China				
Brand (optional)		Sunrain			Web		http://www.sunrain.com				
Street, Number		Ninghai Industrial Zone			E-mail		certification@sunrain.com				
Postcode, City		222243/Lianyungang City, Jiangsu Province			Tel		+86 518-85959690				
Collector Type					Evacuated tubular collector						
Collector name	Gross area ( $A_G$ ) m <sup>2</sup>	Gross length mm	Gross width mm	Gross height mm	Power output per collector						
					$G_b = 850 \text{ W/m}^2, G_d = 150 \text{ W/m}^2 \text{ \& } u = 1.3 \text{ m/s}$ $\vartheta_m - \vartheta_a$						
					0 K	10 K	30 K	50 K	70 K	84 K	
					W	W	W	W	W	W	
TZ58/1800-20G	3.17	1,980	1,600	146	1,397	1,297	1,039	701	285	0	
TZ58/1800-25G	3.94	1,980	1,990	146	1,738	1,613	1,292	872	355	0	
TZ58/1800-30G	4.71	1,980	2,380	146	2,078	1,930	1,545	1,043	425	0	
Power output per m <sup>2</sup> gross area					441	409	328	221	90	0	
Performance parameters test method		Steady state - outdoor									
Performance parameters (related to $A_G$ )		$\eta_0, b$	$a_1$	$a_2$	$a_3$	$a_4$	$a_5$	$a_6$	$a_7$	$a_8$	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		0.429	2.843	0.031	0.000	0.000	83	0.000	0.000	0.000	1.193
Incidence angle modifier test method		Steady state - outdoor									
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal		$K_{\theta T, coll}$	1.07	1.14	1.21	1.35	1.50	1.91	1.27	0.64	0.00
Longitudinal		$K_{\theta L, coll}$	1.00	1.00	1.00	0.99	0.97	0.93	0.81	0.56	0.00
Heat transfer medium for testing		Water-Glycole									
Flow rate for testing (per gross area, $A_G$ )		dm/dt	0.006	kg/(sm <sup>2</sup> )							
Maximum temperature difference during thermal performance test		$(\vartheta_m - \vartheta_a)_{max}$	54	K							
Standard stagnation temperature ( $G = 1000 \text{ W/m}^2; \vartheta_a = 30 \text{ }^\circ\text{C}$ )		$\vartheta_{stg}$	260	°C							
Maximum operating temperature		$\vartheta_{max, op}$	230	°C							
Maximum operating pressure		$p_{max, op}$	1000	kPa							
Testing laboratory		Intertek Testing Services Shenzhen Ltd. Guangzhou Branch					http://www.intertek.com				
Test report(s)		Test Report 220428167GZU-001					Dated		2023/3/21		
Comments of testing laboratory		Ver. 6.2 (13.01.2022) 1. All of the data here are tested from model TZ58/1800-20G. 2. The test fluid flow rate was set at 72kg/h (0.006kg/(sm <sup>2</sup> )) for model model TZ58/1800-20G as specified by the manufacturer.									

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Supplementary Information		011-7S3166 R												
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<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
TZ58/1800-20G		2,775	1,766	818	1,972	1,096	375	1,511	828	302	1,657	900	340	
TZ58/1800-25G		3,452	2,196	1,017	2,453	1,363	466	1,879	1,030	376	2,061	1,119	423	
TZ58/1800-30G		4,128	2,626	1,216	2,933	1,630	558	2,248	1,232	450	2,465	1,338	506	
Gross Thermal Yield per m <sup>2</sup> gross area		876	557	258	622	346	118	477	261	95	523	284	107	
Annual efficiency, $\eta_a$		50%	32%	15%	38%	21%	7%	41%	22%	8%	42%	23%	9%	
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										Yes				
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										1500		Pa		
Maximum tested negative load										1500		Pa		
Hail resistance using steel ball (maximum drop height)										0.4		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> )			
TZ58/1800-20G						3.17		1-H-12S-C:28.5,1790-D			1.94			
TZ58/1800-25G						3.94		1-H-12S-C:28.5,2205-D			2.43			
TZ58/1800-30G						4.71		1-H-12S-C:28.5,2620-D			2.91			
<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 ( $\eta_{col}$ )						28%		Zero-loss efficiency ( $\eta_0$ )			0.44		--	
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> )			2.84		W/(m <sup>2</sup> K)			
						Second-order coefficient (a <sub>2</sub> )			0.031		W/(m <sup>2</sup> K <sup>2</sup> )			
						Incidence angle modifier IAM (50°)			1.32		--			
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.														
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