


Annex to Solar Keymark Certificate					Licence Number		011-7S3243 R							
					Date issued		2024-03-27							
					Issued by		DIN CERTCO							
Licence holder		SUNWOOD S.R.L.			Country		Italy							
Brand (optional)		SUNWOOD			Web		https://sunwoodsrl.it/							
Street, Number		Viale del lavoro 18			E-mail		stefano.bertolin@sunwoodsrl.it							
Postcode, City		37069 Villafranca di Verona (VR)			Tel		+39 457903582							
Collector Type					Evacuated tubular 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	93 K				
					W	W	W	W	W	W				
SW HP CPC 8					1.74	1917	910	133	939	917	870	817	758	682
SW HP CPC 9					1.96	1917	1020	133	1,053	1,028	975	915	849	765
SW HP CPC 10					2.17	1917	1130	133	1,166	1,139	1,080	1,014	941	847
SW HP CPC 12					2.59	1917	1350	133	1,394	1,361	1,291	1,212	1,124	1,013
SW HP CPC 14					3.01	1917	1570	133	1,621	1,583	1,501	1,409	1,308	1,178
SW HP CPC 15					3.22	1917	1680	133	1,734	1,694	1,606	1,508	1,399	1,260
SW HP CPC 16					3.43	1917	1790	133	1,848	1,805	1,711	1,606	1,491	1,342
SW HP CPC 18					3.85	1917	2010	133	2,075	2,027	1,922	1,804	1,674	1,508
SW HP CPC 20					4.28	1917	2230	133	2,302	2,242	2,132	2,001	1,857	1,673
SW HP CPC 21					4.49	1917	2340	133	2,416	2,360	2,237	2,100	1,949	1,755
SW HP CPC 22					4.70	1917	2450	133	2,529	2,471	2,342	2,199	2,041	1,838
SW HP CPC 24					5.12	1917	2670	133	2,756	2,692	2,552	2,396	2,224	2,002
Power output per m² gross area					538	526	499	468	434	391				
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 ³ K)	-	J/(m ² K)	s/m	W/(m ² K ⁴)	W/(m ² K ⁴)	-			
Test results		0.541	1.206	0.004	0.000	0.000	3,170	0.000	0.000	0.000	0.97			
Incidence angle modifier test method		Steady state - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		$K_{\theta T, coll}$	1.02	1.03	1.04	1.05	1.12	1.18	0.79	0.39	0.00			
Longitudinal		$K_{\theta L, coll}$	1.00	1.00	0.99	0.98	0.95	0.88	0.75	0.50	0.00			
Heat transfer medium for testing					Water									
Flow rate for testing (per gross area, A_G)					dm/dt		0.016	kg/(sm ²)						
Maximum temperature difference during thermal performance test					$(\vartheta_m - \vartheta_a)_{max}$		63.24	K						
Standard stagnation temperature (G = 1000 W/m²; $\vartheta_a = 30 \text{ }^\circ\text{C}$)					ϑ_{stg}		280	°C						
Maximum operating temperature					$\vartheta_{max, op}$		120	°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)		240320173GZU-001 (OBL) 131016040GZU-001 (OEM)					Dated		2024/3/21 2014/1/7					
Comments of testing laboratory					Draft Ver. 6.2 (22.09.2021)									
1. Above efficiency parameters come from test type SW HP CPC 8; 2. The "negative pressure test of the collector" according to EN 12975-2:2006,5.9.2 was not performed. 3. Tests were performed based on EN 12975-2:2006.					 Stamp & signature									
DIN CERTCO ● Alboinstraße 56 ● 12103 Berlin, Germany Tel: +49 30 7562-1131 ● Fax: +49 30 7562-1141 ● E-Mail: info@dincertco.de ● www.dincertco.de														

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Supplementary Information		Issued		2024-03-27									
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
SW HP CPC 8		1,633	1,406	1,180	1,376	1,163	963	990	813	654	1,068	878	704
SW HP CPC 9		1,831	1,576	1,323	1,542	1,303	1,079	1,110	912	733	1,198	984	789
SW HP CPC 10		2,028	1,746	1,466	1,708	1,444	1,196	1,230	1,010	812	1,327	1,091	874
SW HP CPC 12		2,423	2,087	1,751	2,041	1,726	1,429	1,470	1,207	971	1,585	1,303	1,045
SW HP CPC 14		2,818	2,427	2,037	2,374	2,007	1,662	1,709	1,404	1,129	1,844	1,516	1,215
SW HP CPC 15		3,016	2,597	2,180	2,541	2,148	1,778	1,829	1,502	1,208	1,973	1,622	1,300
SW HP CPC 16		3,213	2,766	2,322	2,706	2,288	1,894	1,949	1,600	1,287	2,102	1,728	1,385
SW HP CPC 18		3,608	3,107	2,607	3,039	2,569	2,127	2,188	1,797	1,445	2,360	1,940	1,555
SW HP CPC 20		4,003	3,447	2,893	3,372	2,850	2,360	2,428	1,994	1,603	2,619	2,153	1,726
SW HP CPC 21		4,201	3,617	3,036	3,538	2,991	2,477	2,548	2,092	1,682	2,748	2,259	1,811
SW HP CPC 22		4,398	3,787	3,178	3,705	3,132	2,593	2,668	2,191	1,762	2,877	2,365	1,896
SW HP CPC 24		4,792	4,126	3,463	4,037	3,412	2,826	2,907	2,387	1,919	3,135	2,577	2,066
Gross Thermal Yield per m ² gross area		936	806	677	789	667	552	568	466	375	613	504	404
Annual efficiency, η_a		53%	46%	38%	48%	41%	34%	49%	40%	32%	49%	40%	32%
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												
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) >	420								
Maximum tested positive load	2860 Pa												
Maximum tested negative load	- Pa												
Hail resistance using steel ball (maximum drop height)	0.8 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 (m²)							
SW HP CPC 8	1.74	1-H-12S-C:19,985-D				1.41							
SW HP CPC 9	1.96	1-H-12S-C:19,1095-D				1.62							
SW HP CPC 10	2.17	1-H-12S-C:19,1205-D				1.80							
SW HP CPC 12	2.59	1-H-12S-C:19,1425-D				2.16							
SW HP CPC 14	3.01	1-H-12S-C:19,1645-D				2.52							
SW HP CPC 15	3.22	1-H-12S-C:19,1755-D				2.70							
SW HP CPC 16	3.43	1-H-12S-C:19,1865-D				2.87							
SW HP CPC 18	3.85	1-H-12S-C:19,2085-D				3.23							
SW HP CPC 20	4.28	1-H-12S-C:19,2305-D				3.59							
SW HP CPC 21	4.49	1-H-12S-C:19,2415-D				3.77							
SW HP CPC 22	4.70	1-H-12S-C:19,2525-D				3.95							
SW HP CPC 24	5.12	1-H-12S-C:19,2745-D				4.41							
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})	48%			Zero-loss efficiency (η_0)	0.54			--					
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)	1.21			W/(m ² K)					
				Second-order coefficient (a_2)	0.004			W/(m ² K ²)					
				Incidence angle modifier IAM (50°)	1.02			--					
	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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