

Annex to Solar Keymark Certificate					Licence Number		011-7S2021 F				
					Date issued		2023-11-08				
					Issued by		DIN CERTCO				
Licence holder		Solimpeks Enerji San. Ve Tic. A.Ş.			Country		TÜRKIYE				
Brand (optional)					Web		https://solimpeks.com				
Street, Number		Fevzi Çakmak Mh. 10753. Sk. No: 3-3A			E-mail		kalite@solimpeks.com				
Postcode, City		Karatay/KONYA			Tel		+90 533 631 8446				
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 θ _m - θ _a					
						0 K W	10 K W	30 K W	50 K W	70 K W	115 K W
WUNDER ALS 2108 DRAIN		2.07	1,988	1,041	90	1,468	1,401	1,246	1,062	850	271
WUNDER ALS 2510 DRAIN		2.42	1,988	1,218	90	1,716	1,638	1,456	1,241	994	317
Power output per m² gross area						709	677	602	513	411	131
Performance parameters test method		Quasi dynamic									
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		0.713	3.08	0.017	0.000	0.00	11,843	0.000	0.00	0.0E+00	0.97
Incidence angle modifier test method		Quasi dynamic - outdoor									
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal		K _{θT, coll}	1.00	1.00	1.00	0.99	0.96	0.88	0.70	0.35	0.00
Longitudinal		K _{θL, coll}	1.00	1.00	1.00	0.99	0.96	0.88	0.70	0.35	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		(θ _m -θ _a) _{max}	85		K						
Standard stagnation temperature (G = 1000 W/m²; θ_a = 30 °C)		θ _{stg}	200		°C						
Maximum operating temperature		θ _{max op}	135		°C						
Maximum operating pressure		p _{max, op}	1000		kPa						
Testing laboratory		Institut für Gebäudeenergetik, Thermotechnik und Energiespeicherung (IGTE)					http://www.igte.uni-stuttgart.de				
Test report(s)		23COL1695 23COL1696 23COL1696Q					Dated		25.10.2023 25.10.2023 25.10.2023		
Comments of testing laboratory		Documented performance parameters are taken from 23COL1695 (WUNDER ALS 2108 DRAIN)					 Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 6, 70560 Stuttgart (Vaihingen)				
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Supplementary Information										Issued		2023-11-08			
Gross Thermal Yield 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		
WUNDER ALS 2108 DRAIN		2,404	1,743	1,132	1,847	1,280	786	1,354	893	530	1,477	971	568		
WUNDER ALS 2510 DRAIN		2,810	2,038	1,324	2,160	1,496	919	1,583	1,044	619	1,727	1,135	664		
Gross Thermal Yield per m ² gross area		1,161	842	547	892	618	380	654	431	256	714	469	274		
Annual efficiency, η_a		66%	48%	31%	55%	38%	23%	56%	37%	22%	57%	38%	22%		
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. 6.2 (13.01.2022). 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)										A		--			
G (W/m ²) >		1000		ϑ_a (°C) >		20		H _x (MJ/m ²) >		600					
Maximum tested positive load										3000		Pa			
Maximum tested negative load										2750		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															
	Reference Area, A _{sol} (m ²)														
WUNDER ALS 2108 DRAIN	2.07														
WUNDER ALS 2510 DRAIN	2.42														
Additional Informative Technical Data															
	Hydraulic Designation Code										Aperture Area, A _a (m ²)				
WUNDER ALS 2108 DRAIN	1-H-1234S-9.1,18350-16.6,1095-D										1.89				
WUNDER ALS 2510 DRAIN	1-H-1234S-9.1,21750-16.6,1272-D										2.24				
Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}															
Collector efficiency (η_{col})										56%					
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.															
Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}															
Zero-loss efficiency (η_0)										0.71		--			
First-order coefficient (a_1)										3.08		W/(m ² K)			
Second-order coefficient (a_2)										0.017		W/(m ² K ²)			
Incidence angle modifier IAM (50°)										0.98		--			
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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