


Annex to Solar Keymark Certificate					Licence Number		011-7S3109R				
					Date issued		2022-02-21				
					Issued by		DIN CERTCO				
Licence holder		Orionsolar Energietechnik GmbH			Country		Austria				
Brand (optional)		Plasma Spectral			Web		www.orionsolar.at				
Street, Number		Flemingstraße 17, A-4614 Marchtrenk			E-mail		info@orionsolar.at				
Postcode, City		Marchtrenk 4614			Tel		+43 724351008				
Collector Type					Evacuated tubular collector						
Collector name					Power output per collector						
					G_b = 850 W/m², G_d = 150 W/m² & u = 1.3 m/s						
					ϑ_m - ϑ_a						
					0 K	10 K	30 K	50 K	70 K	93 K	
					W	W	W	W	W	W	
Plasma Spectral CPC8					939	917	870	817	758	682	
Plasma Spectral CPC15					1,734	1,694	1,606	1,508	1,399	1,260	
Plasma Spectral CPC20					2,299	2,246	2,130	1,999	1,855	1,671	
Plasma Spectral CPC24					2,756	2,692	2,552	2,396	2,224	2,003	
Power output per m² gross area					539	526	499	468	434	391	
Performance parameters test method		Steady state - outdoor									
Performance parameters (related to A_G)		η₀, b	a1	a2	a3	a4	a5	a6	a7	a8	Kd
Units		-	W/(m²K)	W/(m²K²)	J/(m³K)	-	J/(m²K)	s/m	W/(m²K⁴)	W/(m²K⁴)	-
Test results		0.542	1.206	0.004	0.000	0.000	3,170	0.000	0.000	0.000	0.957
Incidence angle modifier test method		Steady state - outdoor									
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal		K_{θT, coll}	1.01	1.02	1.03	1.04	1.09	1.14	0.76	0.38	0.00
Longitudinal		K_{θL, 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-Glycol									
Flow rate for testing (per gross area, A_G)		dm/dt		0.020		kg/(sm²)					
Maximum temperature difference during thermal performance test		(ϑ_m - ϑ_a)_{max}		63.24		K					
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)		ϑ_{stg}		275.6		°C					
Maximum operating temperature		ϑ_{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)		141218042GZU-001					Dated		2015/1/6		
Comments of testing laboratory		Draft Ver. 6.2 (22.09.2021)									
1. Performance above are come from model Plasma Spectral CPC8;		 Stamp & signature									
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Supplementary Information				Issued				2022-02-21						
Gross Thermal Yield in kWh/collector at mean fluid temperature ϑ_m														
Collector name	Standard Locations ϑ_m	Athens			Davos			Stockholm			Würzburg			
		25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	
Plasma Spectral CPC8		1,616	1,389	1,164	1,361	1,148	950	979	802	644	1,056	866	693	
Plasma Spectral CPC15		2,983	2,564	2,149	2,512	2,120	1,753	1,807	1,481	1,189	1,950	1,600	1,279	
Plasma Spectral CPC20		3,955	3,401	2,849	3,331	2,812	2,325	2,397	1,964	1,577	2,585	2,121	1,696	
Plasma Spectral CPC24		4,741	4,076	3,415	3,993	3,370	2,787	2,873	2,355	1,890	3,099	2,542	2,033	
Gross Thermal Yield per m ² gross area		926	796	667	780	659	544	561	460	369	605	497	397	
Annual efficiency, η_a		52%	45%	38%	48%	40%	33%	48%	39%	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-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)										C		--		
G (W/m ²) >		850		ϑ_a (°C) >		15		H_x (MJ/m ²) >		720				
Maximum tested positive load										2860		Pa		
Maximum tested negative load										-		Pa		
Hail resistance using steel ball (maximum drop height)										0.6		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)				
Plasma Spectral CPC8	1.74					1-H-12S-C:19,985-D				1.41				
Plasma Spectral CPC15	3.22					1-H-12S-C:19,1755-D				2.72				
Plasma Spectral CPC20	4.27					1-H-12S-C:19,2305-D				3.66				
Plasma Spectral CPC24	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°)				1.01		--		
						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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