
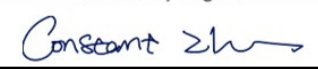


Annex to Solar Keymark Certificate					Licence Number		011-7S3197 R							
					Date issued		2023-08-07							
					Issued by		DIN CERTCO							
Licence holder		Linuo Ritter International Co., Ltd			Country		China							
Brand (optional)		Linuo Ritter			Web		http://www.linuo-ritter-international.com							
Street, Number		No. 30766 East Jingshi Road			E-mail		shangj@linuo-ritter-international.com							
Postcode, City		250103, Jinan, Shandong			Tel		+86 531-88729766							
Collector Type					Evacuated tubular collector									
Collector name					Power output per collector									
					Gb = 850 W/m ² , Gd = 150 W/m ² & u = 1.3 m/s $\vartheta_m - \vartheta_a$									
					0 K	10 K	30 K	50 K	70 K	84 K				
					m ²	mm	mm	mm	mm	mm				
					W	W	W	W	W	W				
CPC HP1512					2.28	1 640	1 392	103	1 270	1 238	1 144	1 013	843	701
CPC HP1515					2.85	1 640	1 737	103	1 587	1 547	1 430	1 266	1 053	876
CPC HP1518					3.41	1 640	2 082	103	1 899	1 851	1 711	1 514	1 260	1 048
CPC HP1521					3.98	1 640	2 427	103	2 217	2 160	1 997	1 768	1 471	1 223
Power output per m² gross area					557	543	502	444	370	307				
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		0.561	1.21	0.021	0.000	0.00	6 550	0.000	0.00	0.0E+00	0.95			
Incidence angle modifier test method		Quasi dynamic - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		K _{GT, coll}	1.00	1.01	1.01	1.03	1.09	1.14	0.97	0.55	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}	54	K							
Standard stagnation temperature (G = 1000 W/m²; $\vartheta_a = 30$ °C)					ϑ_{stg}	230	°C							
Maximum operating temperature					$\vartheta_{max, op}$	100	°C							
Maximum operating pressure					p _{max, op}	800	kPa							
Testing laboratory		TÜV Rheinland (Guangdong) Ltd.					http://www.tuv.com							
Test report(s)		CN23MQ90 001 CN23TY6N 001					Dated		2023-08-07 2023-08-07					
Comments of testing laboratory					Ver. 6.2 (13.01.2022)									
Above thermal performance parameters come from subtype CPC HP1521.					 Precisely Right. 									
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S3197 R
	Issued	2023-08-07

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
CPC HP1512		2 169	1 765	1 264	1 781	1 351	896	1 301	964	626	1 404	1 045	669
CPC HP1515		2 712	2 207	1 580	2 226	1 689	1 120	1 626	1 205	782	1 755	1 307	837
CPC HP1518		3 244	2 640	1 890	2 664	2 020	1 340	1 946	1 441	936	2 100	1 564	1 001
CPC HP1521		3 787	3 082	2 206	3 109	2 358	1 564	2 271	1 682	1 093	2 452	1 825	1 169
Gross Thermal Yield per m ² gross area		951	774	554	781	592	393	571	423	275	616	459	294
Annual efficiency, η_a		54%	44%	31%	48%	36%	24%	49%	36%	24%	50%	37%	24%
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)				B	--
G (W/m ²) >	900	ϑ_a (°C) >	15	H_x (MJ/m ²) >	540
Maximum tested positive load				2630	Pa
Maximum tested negative load				2000	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)
CPC HP1512	2.28	1-H-12S-C:19,1403-D	2.00
CPC HP1515	2.85	1-H-12S-C:19,1748-D	2.50
CPC HP1518	3.41	1-H-12S-C:19,2093-D	3.00
CPC HP1521	3.98	1-H-12S-C:19,2438-D	3.50

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)	0.56
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 goal is based on		First-order coefficient (a_1)	1.21
		Second-order coefficient (a_2)	0.021
		Incidence angle modifier IAM (50°)	0.99
		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	

nearest integer. Deviating from the regulation η_{cor} is based on reference area (Asol) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.

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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