

Annex to Solar Keymark Certificate					Licence Number		011-7S3223 R							
					Date issued		2024-07-12							
					Issued by		DIN CERTCO							
Licence holder		Ritter Energie- und Umwelttechnik GmbH & Co. KG			Country	Germany								
Brand (optional)		RitterXL Solar			Web	ritter-energie.de								
Street, Number		Kuchenäcker 2			E-mail	info@ritter-energie.de								
Postcode, City		72135 Dettenhausen			Tel	+49 7157 5359 1200								
Collector Type					Evacuated tubular collector									
Collector name					Power output per collector									
					$G_b = 850 \text{ W/m}^2, G_d = 150 \text{ W/m}^2 \text{ \& } u = 1.3 \text{ m/s}$ $\vartheta_m - \vartheta_a$									
					0 K	10 K	30 K	50 K	70 K	169 K				
					W	W	W	W	W	W				
XXL 19/131					13.12	2'068	6'343	200	7'848	7'785	7'612	7'376	7'077	4'669
XXL 19/66					6.57	2'068	3'168	200	3'930	3'899	3'812	3'694	3'544	2'338
Power output per m² gross area					598	593	580	562	539	356				
Performance parameters test method		Steady state - outdoor												
Performance parameters (related to A_G)		$\eta_{0, b}$	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		0.600	0.42	0.006	0.000	0.00	9'947	0.000	0.00	0.0E+00	0.98			
Incidence angle modifier test method		Steady state - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		$K_{\theta T, coll}$	1.00	1.02	1.04	1.07	1.10	1.09	1.20	0.80	0.00			
Longitudinal		$K_{\theta L, coll}$	1.00	1.00	1.00	0.97	0.94	0.84	0.66	0.36	0.00			
Heat transfer medium for testing					Water									
Flow rate for testing (per gross area, A_G)					dm/dt	0.022	kg/(sm²)							
Maximum temperature difference during thermal performance test					$(\vartheta_m - \vartheta_a)_{max}$	139	K							
Standard stagnation temperature ($G = 1000 \text{ W/m}^2; \vartheta_a = 30 \text{ °C}$)					ϑ_{stg}	320	°C							
Maximum operating temperature					$\vartheta_{max, op}$	160	°C							
Maximum operating pressure					$p_{max, op}$	1000	kPa							
Testing laboratory		SPF Institute for Solar Technology					www.spf.ch							
Test report(s)		C1931 C1932					Dated	11.07.2024 11.07.2024						
Comments of testing laboratory					Draft Ver. 6.2 (22.09.2021)									
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S3223 R
	Issued	2024-07-12

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
XXL 19/131		13'948	13'114	11'964	12'389	11'377	10'147	8'914	8'083	7'115	9'538	8'679	7'643
XXL 19/66		6'984	6'567	5'991	6'204	5'697	5'081	4'464	4'048	3'563	4'776	4'346	3'827
Gross Thermal Yield per m ² gross area		1'063	1'000	912	944	867	773	679	616	542	727	662	583
Annual efficiency, η_a		60%	57%	52%	58%	53%	47%	58%	53%	47%	58%	53%	47%
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)	A		--
G (W/m ²) >	1000	ϑ_a (°C) >	20
		H_x (MJ/m ²) >	600
Maximum tested positive load	2500		Pa
Maximum tested negative load	2500		Pa
Hail resistance using ice balls (diameter)	35		mm

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)
XXL 19/131	13.12	9-V-12S-AC:X	11.80
XXL 19/66	6.57	9-V-12S-AC:X	5.90

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})	57%	Zero-loss efficiency (η_0)	0.60
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)	0.42
		Second-order coefficient (a_2)	0.006
		Incidence angle modifier IAM (50°)	1.03
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		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.	