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IGTE

Annex to Solar Keymark Certificate		Licence Number	011-7S2831 R
		Date issued	2023-01-25
		Issued by	DIN CERTCO

Licence holder	Ritter Energie- und Umwelttechnik GmbH & Co. KG	**Country**	Germany
Brand (optional)	Ritter XL Solar	**Web**	http://www.ritter-xl-solar.de
Street, Number	Kuchenäcker 2	**E-mail**	info@ritter-xl-solar.de
Postcode, City	72135 Dettenhausen	**Tel**	+49 7157 5359 1305

Collector Type	Evacuated tubular collector

Collector name	Gross area (A_G)	Gross length	Gross width	Gross height	Power output per collector Gb = 850 W/m2, Gd = 150 W/m2 & u = 1.3 m/s $\vartheta_m - \vartheta_a$					
					0 K	10 K	30 K	50 K	70 K	116 K
	m²	mm	mm	mm	W	W	W	W	W	W
XL 15/26	2,63	1.616	1.627	122	1.531	1.519	1.483	1.427	1.352	1.109
XL 15/39	3,93	1.616	2.432	122	2.287	2.270	2.215	2.132	2.021	1.657
XL 19/33	3,31	2.033	1.627	122	1.926	1.912	1.866	1.796	1.702	1.395
Power output per m² gross area					582	578	564	543	514	422

Performance parameters test method	Quasi dynamic									
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	0,581	0,339	0,009	0,000	0,000	8.620	0,000	0,00	0,00	1,011

Incidence angle modifier test method		Quasi dynamic - outdoor								
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$	1,01	1,02	1,03	1,03	0,99	1,08	1,31	0,66	0,00
Longitudinal	$K_{\theta L,coll}$	0,98	0,96	0,94	0,91	0,88	0,76	0,71	0,36	0,00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0,020	kg/(sm²)
Maximum temperature difference during thermal performance test	$(\vartheta_m-\vartheta_a)_{max}$	86	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	332	°C
Maximum operating temperature	$\vartheta_{max\ op}$	160	°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)	17COL1417 21COL1624QOEM01/1	**Dated**	20.06.2018 19.01.2023

Comments of testing laboratory Ver. 6.2 (13.01.2022)

Thermal performace parameters are taken from test report 17COL1417
This data sheet replaces the data sheet issued on 20.07.2018
Test report 21COL1624QOEM01/1 replaces 14COL1032Q/2

TZS Forschungs- und Testzentrum für Solaranlagen
Institut für Thermodynamik und Wärmetechnik
Universität Stuttgart
Pfaffenwaldring 6, 70550 Stuttgart (Vaihingen)

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Supplementary Information	Issued	2023-01-25

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
XL 15/26	2.669	2.498	2.228	2.362	2.134	1.839	1.709	1.527	1.299	1.833	1.647	1.403
XL 15/39	3.988	3.732	3.329	3.529	3.189	2.749	2.553	2.282	1.941	2.740	2.461	2.097
XL 19/33	3.359	3.143	2.804	2.972	2.686	2.315	2.150	1.922	1.635	2.308	2.073	1.766
Gross Thermal Yield per m² gross area	1.015	950	847	898	811	699	650	581	494	697	626	534
Annual efficiency, η_a	57%	54%	48%	55%	50%	43%	56%	50%	42%	56%	50%	43%
Fixed or tracking collector	Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane	1765 kWh/m²			1630 kWh/m²			1166 kWh/m²			1244 kWh/m²		
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 ϑm (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	
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/m²) >	1000	ϑ_a (°C) >	20	H_x (MJ/m²) >	600
Maximum tested positive load				3000	Pa
Maximum tested negative load				3000	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

	Reference Area, A_{sol} (m²)
XL 15/26	2,63
XL 15/39	3,93
XL 19/33	3,31

Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}

Collector efficiency (η_{col})	55%

Remark: Collector efficiency (ηcol) 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/m², expressed in % and rounded to the nearest integer. Deviating from the regulation ηcol is based on reference area (Asol) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.

Additional Informative Technical Data

Hydraulic Designation Code	Aperture Area, A_a (m²)
7-V-12S	2,33
7-V-12S	3,49
7-V-12S	3,00

Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}

Zero-loss efficiency (η_0)	0,58	--
First-order coefficient (a_1)	0,34	W/(m²K)
Second-order coefficient (a_2)	0,009	W/(m²K²)
Incidence angle modifier IAM (50°)	0,95	--

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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