



Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		011-7S2830 R								
					Date issued		2018-04-20								
					Issued by		DIN CERTCO								
Licence holder		Linuo Ritter International Co., Ltd.			Country		China								
Brand (optional)		Linuo Ritter			Web		http://www.linuo-paradigma.com								
Street, Number		No. 30766 East Jingshi Road			E-mail		info@linuo-ritter-international.com								
Postcode, City		250103 Jinan			Tel		+86 531 88729950								
Collector Type					Evacuated tubular collector										
Collector name					Power output per collector G _b = 850 W/m ² ; G _d = 150 W/m ² θ _m - θ _a										
					0 K	10 K	30 K	50 K	70 K	90 K					
					m ²	mm	mm	mm	mm	W	W	W	W	W	W
R1812-58-75					1.87	1 970	951	161	834	812	764	710	650	585	
R1816-58-75					2.46	1 970	1 251	161	1 097	1 069	1 006	935	856	769	
R1818-58-75					2.76	1 970	1 401	161	1 231	1 199	1 128	1 049	960	863	
R1820-58-75					3.06	1 970	1 551	161	1 365	1 329	1 251	1 162	1 064	957	
R1824-58-75					3.65	1 970	1 851	161	1 628	1 585	1 492	1 387	1 270	1 141	
R1830-58-75					4.53	1 970	2 301	161	2 020	1 968	1 852	1 721	1 576	1 416	
Power output per m ² gross area					446	434	409	380	348	313					
Performance parameters test method					Steady state - outdoor										
Performance parameters (related to AG)					η _{0,hem}	a1	a2								
Units					-	W/(m ² K)	W/(m ² K ²)								
Test results					0.446	1.122	0.004								
Incidence angle modifier test method					Quasi dynamic - outdoor										
Bi-directional incidence angle modifiers					Yes										
Incidence angle modifier					Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°	
Transversal					K _{θT,coil}	1.02	1.09	1.18	1.39	1.55	1.62	1.41	-	-	
Longitudinal					K _{θL,coil}	1.00	1.00	0.99	0.98	0.96	0.93	0.86	-	-	
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 for thermal performance calculations					(θ _m -θ _a) _{max}	90	K								
Standard stagnation temperature (G = 1000 W/m ² ; θ _a = 30 °C)					θ _{stg}	267.6	°C								
Effective thermal capacity, incl. fluid (per gross area, A _G)					C/m ²	14.5	kJ/(Km ²)								
Maximum operating temperature					θ _{max,op}	99	°C								
Maximum operating pressure					p _{max,op}	800	kPa								
Testing laboratory					TÜV Rheinland (Shanghai) Co., Ltd.										
Test report(s)					154150039c_Linuo_R1830-58-75_ISO_Report_chen 154150039c_Linuo_R1812-58-75_ISO_Report_chen										
					www.tuv.com										
					Dated										
					4/20/2018 4/20/2018										
Comments of testing laboratory					Datasheet version: 5.01, 2016-03-01										
No comment.															
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S2830 R
	Issued	2018-04-20

Annual collector output in kWh/collector at mean fluid temperature ϑ_m , based on ISO 9806:2013 test results

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
R1812-58-75		1 665	1 436	1 204	1 390	1 174	969	1 012	834	672	1 095	903	725
R1816-58-75		2 190	1 889	1 583	1 829	1 545	1 274	1 332	1 097	884	1 440	1 188	953
R1818-58-75		2 457	2 119	1 776	2 052	1 733	1 430	1 494	1 231	992	1 616	1 333	1 070
R1820-58-75		2 724	2 349	1 969	2 275	1 922	1 585	1 656	1 365	1 100	1 791	1 478	1 186
R1824-58-75		3 249	2 802	2 349	2 714	2 292	1 891	1 976	1 628	1 312	2 137	1 763	1 415
R1830-58-75		4 032	3 478	2 915	3 368	2 845	2 346	2 452	2 021	1 628	2 652	2 188	1 756
Annual output per m ² gross area		890	768	644	743	628	518	541	446	359	585	483	388
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m ²			1714 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. 5.01 (March 2016). A detailed description of the calculations is available at www.solarkeymark.org/scenocalc

Additional Information

Collector heat transfer medium	Water
Hybrid Thermal and Photo Voltaic collector	No
The collector is deemed to be suitable for roof integration	No
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:	
Climate class (A, B or C)	B --
Maximum tested positive load	2630 Pa
Maximum tested negative load	2000 Pa
Hail resistance using steel ball (maximum drop height)	0.6 m

Energy Labelling Information

	Reference Area, A_{sol} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}	
R1812-58-75	1.87	Collector efficiency (η_{col})	39 %
R1816-58-75	2.46	<i>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/m², 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 9806:2013.</i>	
R1818-58-75	2.76		
R1820-58-75	3.06		
R1824-58-75	3.65		
R1830-58-75	4.53		
		Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}	
		Zero-loss efficiency (η_0)	0.446 --
		First-order coefficient (a_1)	1.12 W/(m ² K)
		Second-order coefficient (a_2)	0.004 W/(m ² K ²)
		Incidence angle modifier IAM (50°)	1.36 --
<i>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.</i>			