


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		011-7S2464 R				
					Date issued		2018-08-10				
					Issued by		TÜV Rheinland Energy GmbH				
Licence holder	Consolar Solare Energiesysteme GmbH				Country	Germany					
Brand (optional)	Consolar				Web	www.consolar.com					
Street, Number	Kasseler Straße 1a				E-mail	---					
Postcode, City	60486 Frankfurt a. M.				Tel	+49 (0)69-7409328-0					
Collector Type					Evacuated tubular collector						
Collector name	Gross area (A_G) m ²	Gross length mm	Gross width mm	Gross height mm	Power output per collector G _b = 850 W/m ² ; G _d = 150 W/m ² θ _m - θ _a						
					0 K W	10 K W	30 K W	50 K W	70 K W	70 K W	
Consolar TUBO II T (*)	2.44	1 947	1 248	87	725	696	631	557	472	472	
Power output per m² gross area					297	285	259	228	194	194	
Performance parameters test method		Steady state - indoor									
Performance parameters (related to AG)		η _{0,hem}	a ₁	a ₂							
Units		-	W/(m ² K)	W/(m ² K ²)							
Test results		0.297	1.128	0.005							
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, coll}	1.00	1.03	1.15	1.31	1.56	2.10	2.10	1.05	0.00
Longitudinal		K _{θL, coll}	1.00	0.99	0.98	0.97	0.94	0.90	0.81	0.50	0.00
Heat transfer medium for testing					Water						
Flow rate for testing (per gross area, A_G)					dm/dt	0.018	kg/(sm ²)				
Maximum temperature difference for thermal performance calculations					(θ _m -θ _a) _{max}	70	K				
Standard stagnation temperature (G = 1000 W/m²; θ_a = 30 °C)					θ _{stg}	210	°C				
Effective thermal capacity, incl. fluid (per gross area, A_G)					C/m ²	7.34	kJ/(Km ²)				
Maximum operating temperature					θ _{max, op}	---	°C				
Maximum operating pressure					p _{max, op}	1000	kPa				
Testing laboratory		TÜV Rheinland Energy GmbH				http://www.tuv.com/solarthermie					
Test report(s)		21229230.004 21229230.003				Dated		07.07.2016 07.07.2016			
Comments of testing laboratory					Datasheet version: 5.01, 2016-03-01						
(*) Because of product size 2 samples were combined for testing incl. additional CPC-element. Dimension of single element (l/w/h) [mm]: 1947 / 624 / 87 Areas of single element (Aa/Ag) [m ²]: 0.46 / 1.22					 Genau. Richtig. TÜV Rheinland Energy GmbH Am Grauen Stein 51105 Köln						
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S2464 R
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Annual collector output in kWh/collector at mean fluid temperature ϑ_m, based on EN ISO 9806:2013 test results													
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
Consolar TUBO II T (*)		954	714	498	954	714	498	954	714	498	954	714	498
Annual output per m ² gross area		609	487	366	479	368	265	360	269	189	391	293	204
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-Glycole	
Hybrid Thermal and Photo Voltaic collector	No	
The collector is deemed to be suitable for roof integration	Yes	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	A	--
Maximum tested positive load	2688	Pa
Maximum tested negative load	3925	Pa
Hail resistance using ice balls (diameter)	--	mm

Energy Labelling Information				
	Reference Area, A_{sol} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}		
Consolar TUBO II T (*)	2.44	Collector efficiency (η_{col})	24	%
		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 9806:2013.		
		Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}		
		Zero-loss efficiency (η_0)	0.297	--
		First-order coefficient (a_1)	1.13	W/(m ² K)
		Second-order coefficient (a_2)	0.005	W/(m ² K ²)
		Incidence angle modifier IAM (50°)	1.27	--
		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.		