


Annex to Solar Keymark Certificate					Licence Number		TSU 001-15							
					Date issued		2020-10-21							
					Issued by		TSU Piešťany, š.p.							
Licence holder		T.W.I. spol. s r.o.			Country		Czech republic							
Brand (optional)					Web		www.twi.cz							
Street, Number		Mnichov 146			E-mail		v.precan@twi.cz							
Postcode, City		793 26 Vrbno pod Pradědem			Tel		+420 737258601							
Collector Type					Flat plate collector									
Collector name					Power output per collector G _b = 850 W/m ² , G _d = 150 W/m ² & u = 1.3 m/s $\vartheta_m - \vartheta_a$									
					0 K	10 K	30 K	50 K	70 K	95 K				
					m ²	mm	mm	mm	W	W	W	W	W	W
SUN WING T4 Cu 1,9					1.90	1,774	1,092	82	1,483	1,412	1,255	1,077	878	598
SUN WING T4 Cu 2,2					2.20	2,015	1,092	82	1,717	1,635	1,454	1,247	1,016	693
SUN WING T4 Cu 2,5					2.50	2,294	1,092	82	1,951	1,858	1,652	1,417	1,155	787
SUN WING T4 Cu 2,66					2.66	2,433	1,092	82	2,076	1,977	1,757	1,508	1,229	838
Power output per m² gross area					780	743	661	567	462	315				
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		0.790	3.57	0.014	0.000	0.00	4,403	0.000	0.00	0.0E+00	0.92			
Incidence angle modifier test method		Steady state - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		K _{θT, coll}	1.00	0.99	0.99	0.97	0.95	0.91	0.83	0.57	0.00			
Longitudinal		K _{θL, coll}	1.00	0.99	0.99	0.97	0.95	0.91	0.83	0.57	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 during thermal performance test		($\vartheta_m - \vartheta_a$) _{max}	65	K										
Standard stagnation temperature (G = 1000 W/m²; $\vartheta_a = 30$ °C)		ϑ_{stg}	201	°C										
Maximum operating temperature		$\vartheta_{max, op}$	100	°C										
Maximum operating pressure		p _{max, op}	600	kPa										
Testing laboratory		Technický skúšobný ústav Piešťany, š.p					http://www.tsu.sk							
Test report(s)		150700003/1/PQ, 150700003/2/P					Dated		20-10-2015					
Comments of testing laboratory		Datasheet version: 6.1, 2019-09-26												
Tested according to EN ISO 9806:2013														
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	TSU 001-15
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Annual collector output 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
SUN WING T4 Cu 1,9		2,388	1,717	1,128	1,820	1,264	794	1,341	882	533	1,458	955	568
SUN WING T4 Cu 2,2		2,765	1,988	1,306	2,108	1,463	919	1,553	1,021	618	1,689	1,105	658
SUN WING T4 Cu 2,5		3,142	2,259	1,484	2,395	1,663	1,044	1,765	1,160	702	1,919	1,256	747
SUN WING T4 Cu 2,66		3,343	2,404	1,579	2,548	1,769	1,111	1,878	1,234	747	2,042	1,337	795
Annual output per m ² gross area		1,257	904	593	958	665	418	706	464	281	768	502	299
Annual efficiency, η_a		71%	51%	34%	59%	41%	26%	61%	40%	24%	62%	40%	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. 6.1 (September 2019). 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)	A		--
G (W/m ²) >	1000	ϑ_a (°C) >	20
		H_x (MJ/m ²) >	600
Maximum tested positive load	1800		Pa
Maximum tested negative load	1000		Pa
Hail resistance using steel ball (maximum drop height)	2		m

Additional collector attribute(s)			
<input type="checkbox"/> Using external power source(s) for normal operation	<input type="checkbox"/> Active or passive measure(s) for self-protection		
<input type="checkbox"/> Co-generating thermal and electrical power	<input checked="" type="checkbox"/> Façade collector(s)		

Energy Labelling Information		Additional Informative Technical Data	
	Reference Area, A_{sol} (m ²)	Hydraulic Designation Code	Aperture Area, A_a (m ²)
SUN WING T4 Cu 1,9	1.90	12-VH-12S-7,1655-16,1121	1.81
SUN WING T4 Cu 2,2	2.20	12-VH-12S-7,1892-16,1121	2.10
SUN WING T4 Cu 2,5	2.50	12-VH-12S-7,2174-16,1121	2.35
SUN WING T4 Cu 2,66	2.66	12-VH-12S-7,2311-16,1121	2.50

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})	62%	Zero-loss efficiency (η_0)	0.78
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)	3.57
		Second-order coefficient (a_2)	0.014
		Incidence angle modifier IAM (50°)	0.94
		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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