


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		TSU 010-12																	
					Date issued		2016-10-03																	
					Issued by		TSU Piešťany, š.p.																	
Licence holder		THERMO/SOLAR Žiar s.r.o.			Country		Slovak republic																	
Brand (optional)					Web		www.thermosolar.sk																	
Street, Number		Na vartičke 14			E-mail		info@thermosolar.sk																	
Postcode, City		965 01 Žiar nad Hronom			Tel		+421 (0)456016080																	
Collector Type					Flat plate collector, glazed																			
Collector name					Gross area (A_G)		Gross length		Gross width		Gross height		Power output per collector Gb = 850 W/m ² ; Gd = 150 W/m ² $\vartheta_m - \vartheta_a$											
					m ²		mm		mm		mm		0 K		10 K		30 K		50 K		70 K		90 K	
					W		W		W		W		W		W		W		W					
TS 300					2,03		2 009		1 009		75		1 445		1 379		1 234		1 074		899		708	
TS 250					2,03		2 009		1 009		75		1 445		1 379		1 234		1 074		899		708	
TS 500					2,53		2 009		1 259		75		1 801		1 719		1 538		1 339		1 120		883	
Power output per m² gross area					712		679		608		529		443		349									
Performance parameters test method					Steady state - outdoor																			
Performance parameters (related to AG)					$\eta_{0,hem}$		a1		a2															
Units					-		W/(m ² K)		W/(m ² K ²)															
Test results					0,712		3,180		0,010															
Incidence angle modifier test method					Steady state - outdoor																			
Bi-directional incidence angle modifiers					No																			
Incidence angle modifier					Angle		10°		20°		30°		40°		50°		60°		70°		80°		90°	
Transversal					$K_{AT, coll}$								0,95										0,00	
Longitudinal					$K_{AL, coll}$								0,95										0,00	
Heat transfer medium for testing					Water																			
Flow rate for testing (per gross area, A_G)					dm/dt		0,010		kg/(sm ²)															
Maximum temperature difference for thermal performance calculations					$(\vartheta_m - \vartheta_a)_{max}$		90		K															
Standard stagnation temperature ($G = 1000 \text{ W/m}^2$; $\vartheta_a = 30 \text{ }^\circ\text{C}$)					ϑ_{sta}		196		°C															
Effective thermal capacity, incl. fluid (per gross area, A_G)					C/m ²		6,32		kJ/(Km ²)															
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)					110700001/1/PQ 120700004/1/P 120700004/2/P							Dated		30.9.2011 3.12.2012 3.12.2012										
Comments of testing laboratory					Performance parameters - complete re-evaluation of the test data of the previous test (according to EN 12975-2:2006) taking into account gross area.							Datashet version: 5.01, 2016-03-01												
												 TECHNICKÝ SKÚŠOBNÝ ÚSTAV PIEŠŤANY, š.p. Krajinská cesta 2929/9 92101 PIEŠŤANY -316/3-												
Technický skúšobný ústav Piešťany, š.p.																								
Address: Krajinská cesta 2929/9, 92101 Piešťany, Slovak Republic																								
Phone: +421 33 79 57 111, Fax: +421 33 77 23 716, E-mail: sv@tsu.sk, web: www.tsu.eu																								

Annex to Solar Keymark Certificate Supplementary Information	Licence Number	TSU 010-12
	Issued	2016-10-03

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
TS 300		2 335	1 707	1 164	1 793	1 277	843	1 319	888	563	1 432	961	599
TS 250		2 335	1 707	1 164	1 793	1 277	843	1 319	888	563	1 432	961	599
TS 500		2 910	2 127	1 451	2 235	1 591	1 051	1 644	1 107	702	1 785	1 198	746
Annual output per m ² gross area		1 150	841	573	883	629	415	650	437	277	705	474	295
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	No	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	C	--
Maximum tested positive load	1000	Pa
Maximum tested negative load	1000	Pa
Hail resistance using steel ball (maximum drop height)		m

Energy Labelling Information				
	Reference Area, A_{sol} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}		
TS 300	2,03	Collector efficiency (η_{col})	57	%
TS 250	2,03	<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>		
TS 500	2,53			
		Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}		
		Zero-loss efficiency (η_0)	0,712	--
		First-order coefficient (a_1)	3,18	W/(m ² K)
		Second-order coefficient (a_2)	0,010	W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0,95	--
		<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>		

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