


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		TSU 005-12				
					Date issued		2017-10-31				
					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) 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	80 K W	
TS 400	2,03	2 009	1 009	75	1 464	1 402	1 272	1 131	980	901	
Power output per m² gross area					721	691	627	557	483	444	
Performance parameters test method		Steady state - outdoor									
Performance parameters (related to A_G)		η _{0,hem}	a ₁	a ₂							
Units		-	W/(m ² K)	W/(m ² K ²)							
Test results		0,721	2,954	0,006							
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 _{θT,coil}					0,95				0,00
Longitudinal		K _{θL,coil}					0,95				0,00
Heat transfer medium for testing					Water						
Flow rate for testing (per gross area, A_G)					dm/dt	0,014	kg/(sm ²)				
Maximum temperature difference for thermal performance calculations					(θ _m -θ _a) _{max}	80	K				
Standard stagnation temperature (G = 1000 W/m²; θ_a = 30 °C)					θ _{stg}	224	°C				
Effective thermal capacity, incl. fluid (per gross area, A_G)					C/m ²	5,12	kJ/(Km ²)				
Maximum operating temperature					θ _{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)	170700008/1/PQ				Dated	27.10.2017					
Comments of testing laboratory					Datasheet version: 5.01, 2016-03-01						
											
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 005-12
	Issued	2017-10-31

Annual collector output in kWh/collector at mean fluid temperature ϑ_m , based on 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
TS 400		2 373	1 793	1 293	1 854	1 376	971	1 358	955	647	1 471	1 033	688
Annual output per m ² gross area		1 169	883	637	913	678	478	669	470	319	725	509	339
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	2300	Pa
Maximum tested negative load	2500	Pa
Hail resistance using steel ball (maximum drop height)	2	m

Energy Labelling Information			
	Reference Area, A_{sol} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}	
TS 400	2,03	Collector efficiency (η_{col})	59 %
		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)	0,721 --
		First-order coefficient (a_1)	2,95 W/(m ² K)
		Second-order coefficient (a_2)	0,006 W/(m ² K ²)
		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.	

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