


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		TSU 004-12							
					Date issued		2017-10-24							
					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					Power output per collector Gb = 850 W/m ² ; Gd = 150 W/m ² θ _m - θ _a									
					0 K	10 K	30 K	50 K	70 K	80 K				
					m ²	mm	mm	mm	W	W	W	W	W	W
TS 330/M					2,03	2 009	1 009	75	1 435	1 366	1 215	1 047	861	761
TS 530/M					2,53	2 009	1 259	75	1 788	1 702	1 515	1 305	1 072	948
Power output per m² gross area					707	673	599	516	424	375				
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					0,707	3,270	0,011							
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, coll}					0,95			0,00	
Longitudinal					K _{θL, coll}					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}	189	°C							
Effective thermal capacity, incl. fluid (per gross area, A_G)					C/m ²	5,9	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)					170700007/1/PQ 170700007/2/P				Dated		20.10.2017			
Comments of testing laboratory					Datasheet version: 5.01, 2016-03-01									
					 TECHNICKÝ SKÚŠOBNÝ ÚSTAV PIEŠŤANY, š.p. Krajinská cesta 2929/9 92101 PIEŠŤANY -316/3-									
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	TSU 004-12
	Issued	2017-10-24

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 330/M		2 314	1 666	1 107	1 764	1 232	787	1 300	858	527	1 412	929	560
TS 530/M		2 883	2 077	1 379	2 198	1 535	980	1 620	1 070	657	1 760	1 158	698
Annual output per m ² gross area		1 140	821	545	869	607	387	640	423	260	696	458	276
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 330/M	2,03	Collector efficiency (η_{col})	56	%
TS 530/M	2,53	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)	0,707	--
		First-order coefficient (a_1)	3,27	W/(m ² K)
		Second-order coefficient (a_2)	0,011	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.		

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