TECHNICKÝ SKÚŠOBNÝ ÚSTAV PIEŠŤANY, š.p.

Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results		Licence Number	TSU 011-12
		Date issued	2017-12-06
		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/m²; Gd = 150 W/m² ϑm - ϑa					
					0 K	10 K	30 K	50 K	70 K	80 K
	m²	mm	mm	mm	W	W	W	W	W	W
TS 350	2,03	2 010	1 010	74	1 426	1 347	1 177	992	791	684
Power output per m² gross area					702	663	580	489	390	337

Performance parameters test method	Steady state - indoor								
Performance parameters (related to AG)	η0,hem	a1	a2						
Units	-	W/(m²K)	W/(m²K²)						
Test results	0,702	3,798	0,010						

Incidence angle modifier test method	Steady state - indoor								
Bi-directional incidence angle modifiers	No								
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$					0,95				0,00
Longitudinal	$K_{\theta L,coll}$					0,95				0,00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0,018	kg/(sm²)
Maximum temperature difference for thermal performance calculations	$(\vartheta_m-\vartheta_a)_{max}$	80	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	175,6	°C
Effective thermal capacity, incl. fluid (per gross area, A_G)	C/m²	5,8	kJ/(Km²)
Maximum operating temperature	ϑ_{max_op}	100	°C
Maximum operating pressure	$p_{max,op}$	600	kPa

Testing laboratory	ÖFPZ Arsenal Ges.m.b.H	www.arsenal.ac.at/ee	
Test report(s)	2.04.00695.1.0 - LT 2.04.00695.1.0 - QT	**Dated**	24.6.2009

Comments of testing laboratory — Datasheet version: 5.01, 2016-03-01

Performance parameters - complete re-evaluation of the test data of the previous test (according to EN 12975-2:2006) taking into account gross area. This data sheet is not complete as the testing of the collector was performed according to EN 12975-2:2006(which is replaced by EN ISO 9806:2013). The equivalent values according to EN 12975-2:2006 considering aperture area 1.78 m² are / correspond to eta0a=0.802; a1a=4.337; a2a=0.011.

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TECHNICKÝ SKÚŠOBNÝ ÚSTAV PIEŠŤANY, š.p.

Annex to Solar Keymark Certificate	Licence Number	TSU 011-12
Supplementary Information	Issued	2017-12-06

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 350	2 286	1 571	987	1 696	1 132	683	1 258	789	458	1 370	853	486
Annual output per m² gross area	1 126	774	486	836	558	336	620	389	225	675	420	240
Fixed or tracking collector	Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane	1765 kWh/m²			1714 kWh/m²			1166 kWh/m²			1244 kWh/m²		
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 ϑm (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)	C	--
Maximum tested positive load	1000	Pa
Maximum tested negative load	1000	Pa
	-	m

Energy Labelling Information

	Reference Area, A_{sol} (m^2)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}		
TS 350	2,03	Collector efficiency (η_{col})	54	%
		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.		
		Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}		
		Zero-loss efficiency (η_0)	0,702	--
		First-order coefficient (a_1)	3,80	W/(m²K)
		Second-order coefficient (a_2)	0,010	W/(m²K²)
		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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