


<b>Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate</b>			<b>Licence number</b>	<b>TSU 010-12</b>						
			Date of issue	6.12.2012						
<b>Company holding the licence</b>	THERMO/SOLAR Žiar s.r.o.		<b>Country</b>	Slovak republic						
<b>Brand (optional)</b>			<b>Website</b>	www.thermosolar.sk						
<b>Street, number</b>	Na vartičke 14		<b>E-mail</b>	info@thermosolar.sk						
<b>Postal Code</b>	965 01		<b>Tel.</b>	+421	(0)456016080					
<b>City</b>	Žiar nad Hronom		<b>Fax</b>	+421	(0)456716244					
<b>Collector Type</b> (flat plate / evacuate tubular / un-glazed)			Flat plate collector							
<b>Integration in the roof possible ?</b>			Yes							
Collector name	Aperture area (A <sub>a</sub> ) [m <sup>2</sup> ]	Gross length [mm]	Gross width [mm]	Gross height [mm]	Gross area (A <sub>G</sub> ) [m <sup>2</sup> ]	Power output per collector unit G = 1000 W/m <sup>2</sup> T <sub>m</sub> -T <sub>a</sub> :				
						0 K	10 K	30 K	50 K	70 K
						[W]	[W]	[W]	[W]	[W]
TS 300	1,78	2 009	1 009	75	2,03	1 444	1 378	1 233	1 073	896
TS 250	1,78	2 009	1 009	75	2,03	1 441	1 375	1 228	1 066	888
TS 500	2,26	2 009	1 259	74	2,53	1 828	1 745	1 563	1 361	1 139
<b>Collector efficiency parameters related to aperture area (A<sub>a</sub>)</b>				$\eta_{0a}$	0,809	-				
Type of fluid and flow rate see note 1				a <sub>1a</sub>	3,59	W/(m <sup>2</sup> K)				
				a <sub>2a</sub>	0,011	W/(m <sup>2</sup> K <sup>2</sup> )				
<b>Stagnation temperature - Weather conditions see note 2</b>				t <sub>stg</sub>	196	°C				
<b>Effective thermal capacity</b>				C <sub>eff</sub> = C/A <sub>a</sub>	6,02	kJ/(m <sup>2</sup> K)				
<b>Max. operation pressure - see note 3</b>				p <sub>max</sub>	600	kPa				
Incidence angle modifiers K <sub>θ</sub> (θ)	G <sub>DIF</sub> /G <sub>TOT</sub>		θ <sub>T</sub> / θ <sub>L</sub>	50°	10°	20°	30°	40°	60°	70°
	min	max	K <sub>θ</sub> (θ <sub>T</sub> )	0,95	1,00	0,99	0,99	0,97	0,91	0,83
	0,12		0,12	K <sub>θ</sub> (θ <sub>L</sub> )	0,95	1,00	0,99	0,99	0,97	0,91
G <sub>DIF</sub> /G <sub>TOT</sub> : min&max - while measuring						Optional values				
<b>Testing Laboratory</b>			Technický skúšobný ústav Piešťany, š.p.							
<b>Website</b>			www.tsu.eu							
<b>Test report id. number</b>			110700001/1/PQ, 120700004/1/P, 120700004/2/P							
<b>Date of test report</b>			3.12.2012							
<b>Perf. test method</b>			EN 12975-2 6.1.4 (outdoor)							
<b>Comments of testing laboratory :</b>										
Note 1	<b>Fluid</b>	Water	<b>Flow rate</b>	0,014	kg/s per m <sup>2</sup>					
Note 2	<b>Irradiance, G<sub>s</sub>=1000 W/m<sup>2</sup>; Ambient temperature , T<sub>a</sub>=30 °C</b>									
Note 3	<b>Given by manufacturer</b>									
 <b>TECHNICKÝ SKÚŠOBNÝ ÚSTAV PIEŠŤANY, š.p.</b> Krajinská cesta 2929/9 92101 PIEŠŤANY 37613										



Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence number	TSU 010-12
	Issued	6.12.2012

Annual collector output kWh														
Collector name	Location and collector temperature (T <sub>m</sub> )													
	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	2 334	1 705	1 161	1 924	1 362	886	1 318	886	561	1 431	960	596		
TS 250	2 328	1 694	1 148	1 915	1 350	874	1 313	879	553	1 425	951	588		
TS 500	2 954	2 162	1 476	2 438	1 730	1 128	1 670	1 126	714	1 813	1 219	759		

Collector mounting: Fixed or tracking	Fixed; slope = latitude - 15° (rounded to nearest 5°)
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Overview of locations				
Location	Latitude °	G <sub>tot</sub> kWh/m <sup>2</sup>	T <sub>a</sub> °C	Collector orientation or tracking mode
Athens	38	1 765	18,5	South, 25°
Davos	47	1 714	3,2	South, 30°
Stockholm	59	1 166	7,5	South, 45°
Würzburg	50	1 244	9,0	South, 35°

G <sub>tot</sub>	Annual total irradiation on collector plane	kWh/m <sup>2</sup>
T <sub>a</sub>	Mean annual ambient air temperature	°C
T <sub>m</sub>	Constant collector operating temperature (mean of in- and outlet temperatures)	°C

Calculation of the annual collector performance is done by the official Solar Keymark spreadsheet tool. Hour by hour the collector output is calculated according to the efficiency parameters from the Keymark test using constant collector operating temperature (T<sub>m</sub>). Detailed description with all equations used is available from the Solar Keymark web site (direct link: <http://www.estif.org/solarkeymark/annexb1.php>)

<p><b>Technický skúšobný ústav Piešťany, š.p.</b>          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</p>	Datasheet version:
	VERSION 3.6, 2012.01.20
	Calculation program version:
	3.07, October 2011 (SP)