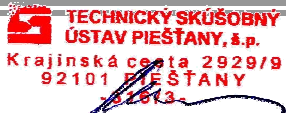


Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate		Licence number	TSU 004-12											
		Date of issue	27.11.2012											
Company holding the licence	THERMO/SOLAR Žiar s.r.o.		Country	Slovak republic										
Brand (optional)			Website	www.thermosolar.sk										
Street, number	Na vartičke 14		E-mail	info@thermosolar.sk										
Postal Code	965 01		Tel.	+421	(0)456016080									
City	Žiar nad Hronom		Fax	+421	(0)456716244									
Collector Type (flat plate / evacuate tubular / un-glazed)			Flat plate collector											
Integration in the roof possible ?			Yes											
Collector name	Aperture area (A _a) [m ²]	Gross length [mm]	Gross width [mm]	Gross height [mm]	Gross area (A _G) [m ²]	Power output per collector unit G = 1000 W/m ² T _m -T _a :								
						0 K [W]	10 K [W]	30 K [W]	50 K [W]	70 K [W]				
TS 330/M	1,78	1 009	2 009	75	2,03	1 435	1 366	1 213	1 040	848				
Collector efficiency parameters related to aperture area (A _a) Type of fluid and flow rate see note 1						η _{0a}	0,806	-						
						a _{1a}	3,73	W/(m ² K)						
						a _{2a}	0,014	W/(m ² K ²)						
Stagnation temperature - Weather conditions see note 2						t _{stg}	189	°C						
Effective thermal capacity						C _{eff} = C/A _a	6,73	kJ/(m ² K)						
Max. operation pressure - see note 3						p _{max}	600	kPa						
Incidence angle modifiers K _θ (θ)	G _{DIF} /G _{TOT}		θ _T / θ _L	50°	10°	20°	30°	40°	60°	70°				
	min	max									K _θ (θ _T)	0,95	1,00	0,99
G _{DIF} /G _{TOT} : min&max - while measuring			K _θ (θ _L)	0,95	1,00	0,99	0,99	0,97	0,91	0,83				
						Optional values								
Testing Laboratory						Technický skúšobný ústav Piešťany, š.p.								
Website						www.tsu.eu								
Test report id. number						110700002/1/PQ, 2.04.00479.1.0-7								
Date of test report						17.10.2011								
Perf. test method						EN 12975-2 6.1.4 (outdoor)								
Comments of testing laboratory :														
Note 1	Fluid	Water		Flow rate	0,018 kg/s per m ²		 TECHNICKÝ SKÚŠOBNÝ ÚSTAV PIEŠŤANY, š.p. Krajinská cesta 2929/9 92101 PIEŠŤANY +421 33 79 57 111							
Note 2	Irradiance, G _s =1000 W/m ² ; Ambient temperature , T _a =30 °C													
Note 3	Given by manufacturer													



Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence number	TSU 004-12
	Issued	27.11.2012

Annual collector output kWh															
Collector name	Location and collector temperature (T _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	2 313	1 660	1 090	1 892	1 305	810	1 299	852	515	1 411	922	548			

Collector mounting: Fixed or tracking	Fixed; slope = latitude - 15° (rounded to nearest 5°)
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Overview of locations				
Location	Latitude °	G _{tot} kWh/m ²	T _a °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 _{tot}	Annual total irradiation on collector plane	kWh/m ²
T _a	Mean annual ambient air temperature	°C
T _m	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_m). Detailed description with all equations used is available from the Solar Keymark web site (direct link: <http://www.estif.org/solarkeymark/annexb1.php>)

<p align="center">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</p>	Datasheet version:
	VERSION 3.6, 2012.01.20
	Calculation program version:
	3.07, October 2011 (SP)