



<b>Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate</b>					<b>Licence Number</b>		<b>OEM 9901/1/1</b>					
					<b>Issued</b>		<b>2014-09-19</b>					
<b>Company holding the</b>			<b>SINES INDUSTRIE</b>			<b>Country</b>		<b>TUNISIA</b>				
<b>Brand (optional)</b>			<b>DUROTHERM</b>			<b>Website</b>		<b>www.sines-industrie.com</b>				
<b>Street, street number</b>			<b>Z.I. JEBEL OUST</b>			<b>E-mail</b>		<b>amjed.sibai@sines.com.tn</b>				
<b>Postal Code / City, province</b>			<b>1111 JEBEL OUST, ZAGHOUAN</b>			<b>Tel/Fax</b>		<b>+216 72 640 485 / 72 640 385</b>				
<b>Collector Type</b> (flat plate glazed/un-glazed; evacuate tubular)					<b>Flat plate collector - glazed</b>							
<b>Thermal / photo voltaic hybrid collector?</b> (PVT collector)					<b>No</b>							
<b>Integration in the roof possible ?</b> (manufacturers declaration)					<b>Yes</b>							
Collector name	Aperture area (Aa)	Gross length	Gross width	Gross height	Gross area (Ag)	Power output per collector module						
	m <sup>2</sup>	mm	mm	mm	m <sup>2</sup>	G = 1000 W/m <sup>2</sup>						
						Tm-Ta						
						0 K	10 K	30 K	50 K	70 K		
T150S	1,41	1.592	992	95	1,57	993	939	820	687	539		
T200S	1,78	1.992	992	95	1,96	1.253	1.185	1.036	867	681		
T230S	2,17	1.877	1.265	95	2,37	1.528	1.445	1.263	1.058	830		
T250S	2,31	1.992	1.265	95	2,51	1.626	1.538	1.344	1.126	884		
<b>Performance test method</b>					<b>Glazed liquid heating collector - steady state - outdoor</b>							
<b>Performance parameters related to aperture area</b>					η0	a1	a2					
<b>Units</b>					-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )					
<b>Test results - Flow rate and fluid see note 1</b>					<b>0,704</b>	<b>3,683</b>	<b>0,013</b>					
<b>Bi-directional incidence angle modifiers?</b>					<b>Yes</b>	<i>Kθ values are obligatory for 50°.</i>						
<b>Incidence angle modifiers Kθ(θT) transversal direction</b>		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°	
		Kθ(θT)						<b>0,89</b>				<b>0,00</b>
<b>Incidence angle modifiers Kθ(θL) longitudinal direction</b>		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°	
		Kθ(θL)						<b>0,89</b>				<b>0,00</b>
<b>Stagnation temperature - Weather conditions see note 2</b>					T <sub>stg</sub>	<b>147 °C</b>						
<b>Effective thermal capacity</b>					C <sub>eff</sub> = C/A <sub>g</sub>	<b>20,3 kJ/(m<sup>2</sup>K)</b>						
<b>Max. intended operation temperature - see note 3</b>					T <sub>max,op</sub>	<b>°C</b>						
<b>Max. operation pressure - see note 3</b>					p <sub>max,op</sub>	<b>1000 kPa</b>						
<b>Pressure drop table - for a collector family, the values shall be for the module with highest ΔP per m<sup>2</sup> aperture area</b>												
<b>Flow rate</b>	kg/(s m <sup>2</sup> )	<b>0,006</b>	<b>0,009</b>	<b>0,012</b>	<b>0,015</b>	<b>0,018</b>	<b>0,021</b>	<b>0,025</b>	<b>0,031</b>	<b>0,036</b>	<b>0,038</b>	
<b>Pressure drop, ΔP</b>	Pa	<b>24</b>	<b>45</b>	<b>68</b>	<b>92</b>	<b>117</b>	<b>147</b>	<b>181</b>	<b>256</b>	<b>330</b>	<b>367</b>	
<b>Optional weather data</b>			Location		Link							
<b>Testing Laboratory</b>			<b>Demokritos</b>									
<b>Website</b>			<b>www.solar.demokritos.gr</b>									
<b>Test report id. number</b>			<b>4143 DE1, 4144 DE1, 4145 DQ1</b>				<b>Date of test report</b>		<b>2014/08/28</b>			
During the test G <sub>DIF</sub> /G <sub>TOT</sub> was always between			<b>0,05</b>	and	<b>1,15</b>							
<b>Comments of testing laboratory:</b>												
Example comment.												
<b>Note 1</b>	<b>Flow rate</b>	<b>0,020</b>	kg/(s m <sup>2</sup> )	<b>Fluid</b>	<b>Water</b>							
<b>Note 2</b>	<b>Irradiance, G = 1000 W/m<sup>2</sup>; Ambient temperature, T<sub>a</sub> = 30 °C</b>											
<b>Note 3</b>	<b>Given by manufacturer</b>											
Datasheet version: 4.06, 2014-01-15												
<b>Central Offices: Dragoumi 6, 145 61 kifisia, Athens, Tel: +301 6233493-4, Fax: +301 6233495, http://www.dqshellas.gr, e-mail: ioannisalexou@dqshellas.gr</b>												



Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence Number	OEM 9901/1/1
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Annual collector output kWh/module														
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		
T150S	1.414	938	558	1.044	676	384	769	470	263	835	502	273		
T200S	1.786	1.184	704	1.318	853	484	971	593	332	1.054	633	345		
T230S	2.177	1.444	859	1.607	1.040	591	1.184	723	404	1.285	772	420		
T250S	2.317	1.537	914	1.711	1.108	629	1.260	770	431	1.368	822	447		

Collector mounting: Fixed or tracking Fixed; slope = latitude - 15° (rounded to nearest 5°)

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

The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool ScenoCalc. The collector output is calculated hour by hour according to the efficiency parameters from the Keymark test using constant collector operating temperature (T<sub>m</sub>). A detailed description of the calculations is available at <http://www.sp.se/en/index/services/solar/ScenoCalc/Sidor/default.aspx>.

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	ScenoCalc version: Ver. 4.06 (Jan, 2014)