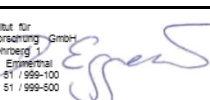


<b>Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate</b>						<b>Licence Number</b>		<b>011-7S1510 F</b>			
						<b>Issued</b>		<b>2015-04-24</b>			
<b>Company holding the</b>		<b>Wagner Solar GmbH</b>				<b>Country</b>		<b>Germany</b>			
<b>Brand (optional)</b>		<b>-</b>				<b>Website</b>		<b>www.wagner-solar.com</b>			
<b>Street, street number</b>		<b>Sonnenallee 2</b>				<b>E-mail</b>		<b>info@wagner-solar.com</b>			
<b>Postal Code / City, province</b>		<b>D-35274</b>		<b>Kirchhain</b>		<b>Tel/Fax</b>		<b>+49 6421 8007-0 / -22</b>			
<b>Collector Type (flat plate glazed/un-glazed; evacuate tubular)</b>						<b>Flat plate collector - glazed</b>					
<b>Thermal / photo voltaic hybrid collector? (PVT collector)</b>						<b>No</b>					
<b>Integration in the roof possible ? (manufacturers declaration)</b>						<b>No</b>					
<b>Collector name</b>	<b>Aperture area (Aa)</b>	<b>Gross length</b>	<b>Gross width</b>	<b>Gross height</b>	<b>Gross area (AG)</b>	<b>Power output per collector module</b>					
						<b>G = 1000 W/m<sup>2</sup></b>					
						<b>Tm-Ta</b>					
						<b>0 K</b>	<b>10 K</b>	<b>30 K</b>	<b>50 K</b>	<b>70 K</b>	
	<b>m<sup>2</sup></b>	<b>mm</b>	<b>mm</b>	<b>mm</b>	<b>m<sup>2</sup></b>	<b>W</b>	<b>W</b>	<b>W</b>	<b>W</b>	<b>W</b>	
<b>EURO L42 HTF</b>	<b>2.01</b>	<b>1933</b>	<b>1163</b>	<b>80</b>	<b>2.25</b>	<b>1 568</b>	<b>1 486</b>	<b>1 304</b>	<b>1 100</b>	<b>874</b>	
<b>Performance test method</b>						<b>Glazed liquid heating collector - steady state - indoor</b>					
<b>Performance parameters related to aperture area</b>		$\eta_0$	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>0.780</b>	<b>3.950</b>	<b>0.014</b>							
<b>Bi-directional incidence angle modifiers?</b>		<b>No</b> <i>K<math>\theta</math> values are obligatory for 50°.</i>									
<b>Incidence angle modifiers K<math>\theta</math>(<math>\theta</math>)</b>		<b>Angle</b>	<b>10°</b>	<b>20°</b>	<b>30°</b>	<b>40°</b>	<b>50°</b>	<b>60°</b>	<b>70°</b>	<b>80°</b>	<b>90°</b>
		<b>K<math>\theta</math>(<math>\theta</math>)</b>	<b>1.00</b>	<b>0.98</b>	<b>0.96</b>	<b>0.92</b>	<b>0.86</b>	<b>0.75</b>	<b>0.52</b>	<b>0.00</b>	<b>0.00</b>
<b>Incidence angle modifier not bi-directional - leave fields blank</b>											
<b>Stagnation temperature - Weather conditions see note 2</b>						<b>Tstg</b>	<b>191</b>	<b>°C</b>			
<b>Effective thermal capacity</b>						<b>ceff = C/Ag</b>	<b>4.5</b>	<b>kJ/(m<sup>2</sup>K)</b>			
<b>Max. intended operation temperature - see note 3</b>						<b>Tmax,op</b>	<b>-</b>	<b>°C</b>			
<b>Max. operation pressure - see note 3</b>						<b>pmax,op</b>	<b>1000</b>	<b>kPa</b>			
<b>Pressure drop table - for a collector family, the values shall be for the module with highest <math>\Delta P</math> per m<sup>2</sup> aperture area</b>											
<b>Flow rate</b>	<b>kg/(s m<sup>2</sup>)</b>	<b>-</b>									
<b>Pressure drop, <math>\Delta P</math></b>	<b>Pa</b>	<b>-</b>									
<b>Optional weather data</b>		<b>Location</b>			<b>Link</b>						
<b>Testing Laboratory</b>		<b>ISFH - Institut für Solarenergieforschung Hameln</b>									
<b>Website</b>		<b>www.isfh.de</b>									
<b>Test report id. number</b>		<b>142-10/KD; 143-10/KQ</b>				<b>Date of test report</b>		<b>2010-10-20; 2010-11-22</b>			
<b>During the test GDIF/GTOT was always between</b>		<b>0.1</b>	<b>and</b>	<b>0.3</b>							
<b>Comments of testing laboratory:</b>											
The collector efficiency parameters are related to G(DIF)/G(TOT)=0.15.											
The incidence angle modifier was determined outdoor according to a quasi-dynamic test procedure.											
<b>Note 1</b>	<b>Flow rate</b>	<b>0.039</b>	<b>kg/(s m<sup>2</sup>)</b>	<b>Fluid</b>	<b>Water</b>						
<b>Note 2</b>	<b>Irradiance, G = 1000 W/m<sup>2</sup>; Ambient temperature, Ta=30 °C</b>										
<b>Note 3</b>	<b>Given by manufacturer</b>										
						Institut für Solarenergieforschung GmbH Am Ohreberg 1 D-31860 Emmelhain Tel: 051 51 / 999-100 Fax: 051 51 / 999-600 					
						Datashet version: 4.06, 2014-01-15					
<b>DIN CERTCO • Alboinstraße 56 • 12103 Berlin, Germany</b> <b>Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de • www.dincertco.de</b>											

<b>Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate</b>	<b>Licence Number</b>	<b>011-7S1510 F</b>
	Issued	24.04.2015

<b>Annual collector output kWh/module</b>													
<b>Collector name</b>	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	
EURO L42 HTF	2 313	1 574	971	1 728	1 147	680	1 270	799	462	1 377	853	482	

<b>Collector mounting: Fixed or tracking</b>	<b>Fixed; slope = latitude - 15° (rounded to nearest 5°)</b>
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<b>Overview of locations</b>				
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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	4.06, 2014-01-15
	ScenoCalc version:
	Ver. 4.06 (Jan, 2014)