



<b>Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate</b>	<b>Certificate No.</b>	<b>011-7S2325 F</b>
	Date of issue	17-03-2014

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<b>Collector Type</b> (flat plate / evacuated tubular / un-glazed)	Flat plate collector
<b>Integration in the roof possible ?</b>	No

Collector name	Aperture area (Aa) [m <sup>2</sup> ]	Gross length [mm]	Gross width [mm]	Gross height [mm]	Gross area (Ag) [m <sup>2</sup> ]	Power output per collector unit G = 1000 W/m <sup>2</sup> Tm-Ta :				
						0 K	10 K	30 K	50 K	70 K
						[W]	[W]	[W]	[W]	[W]
HR 2.1 T	2.065	2 145	1 045	77.5	2.242	1 522	1 446	1 277	1 087	876

<b>Collector efficiency parameters related to aperture area (Aa)</b> Type of fluid and flow rate see note 1	η <sub>0a</sub>	0.737	-
	a <sub>1a</sub>	3.560	W/(m <sup>2</sup> K)
	a <sub>2a</sub>	0.013	W/(m <sup>2</sup> K <sup>2</sup> )

<b>Stagnation temperature</b> - Weather conditions see note 2	t <sub>stg</sub>	204.9 °C
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<b>Effective thermal capacity</b>	C <sub>eff</sub> = C/A <sub>a</sub>	6.19 kJ/(m <sup>2</sup> K)
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<b>Max. operation pressure</b> - see note 3	p <sub>max</sub>	600 kPa
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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> )	0.87	1.00	0.98	0.96	0.93	0.76	0.53
	G <sub>DIF</sub> /G <sub>TOT</sub> : min&max - while measuring		K <sub>θ</sub> (θ <sub>L</sub> )	#BEZUG!	#####	#####	#####	#####	#####	#####
				<b>Optional values</b>						

<b>Testing Laboratory</b>	TÜV Energie und Umwelt GmbH
<b>Website</b>	<a href="http://www.eco-tuv.de">www.eco-tuv.de</a>
<b>Test report id. number</b>	21222195_HSD_EN_P_IT; 21222195_HSD_EN_R_IT
<b>Date of test report</b>	07-11-2013
<b>Perf. test method</b>	EN 12975-2 6.1.5 (indoor)

**Comments of testing laboratory :**

Note 1	<b>Fluid</b>	Water	<b>Flow rate</b>	0.020 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>Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate</b>	<b>Certificate No.</b>	<b>011-7S2325 F</b>
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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		
HR 2.1 T	2 268	1 573	995	1 824	1 223	739	1 254	805	476	1 360	860	499		
#BEZUG!														

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

Overview of locations				
Location	Latitude °	Gtot kWh/m <sup>2</sup>	Ta °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°

Gtot	Annual total irradiation on collector plane	kWh/m <sup>2</sup>
Ta	Mean annual ambient air temperature	°C
Tm	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>)

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	VERSION 3.5, 2012.01.13
	Calculation program version: 3.07, October 2011 (SP)