

<b>Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results</b>					<b>Licence Number</b>		<b>011-7S2740 F</b>				
					<b>Date issued</b>		<b>2017-03-06</b>				
					<b>Issued by</b>		<b>ISFH CalTeC</b>				
<b>Licence holder</b>	<b>ÖkoFEN Forschungs- und Entwicklungs</b>				<b>Country</b>	<b>Austria</b>					
<b>Brand (optional)</b>					<b>Web</b>	<a href="http://www.pelletsheizung.at">http://www.pelletsheizung.at</a>					
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<b>Collector Type</b>					<b>Flat plate collector, glazed</b>						
<b>Collector name</b>	<b>Gross area (A<sub>G</sub>)</b> m <sup>2</sup>	<b>Gross length</b> mm	<b>Gross width</b> mm	<b>Gross height</b> mm	<b>Power output per collector</b> G <sub>b</sub> = 850 W/m <sup>2</sup> ; G <sub>d</sub> = 150 W/m <sup>2</sup> ϑ <sub>m</sub> - ϑ <sub>a</sub>						
					0 K W	10 K W	30 K W	50 K W	70 K W		
<b>Pellessol-Top</b>	2.32	2 037	1 137	80	1 772	1 689	1 503	1 291	1 053		
<b>Power output per m<sup>2</sup> gross area</b>					764	728	648	557	454		
<b>Performance parameters test method</b>		<b>Steady state - indoor</b>									
<b>Performance parameters (related to A<sub>G</sub>)</b>		η <sub>0,hem</sub>	a <sub>1</sub>	a <sub>2</sub>							
<b>Units</b>		-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )							
<b>Test results</b>		0.764	3.450	0.014							
<b>Incidence angle modifier test method</b>		<b>Quasi dynamic - outdoor</b>									
<b>Bi-directional incidence angle modifiers</b>		<b>No</b>									
<b>Incidence angle modifier</b>		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
<b>Transversal</b>		K <sub>θT, coll</sub>					0.95				0.00
<b>Longitudinal</b>		K <sub>θL, coll</sub>					0.95				0.00
<b>Heat transfer medium for testing</b>					<b>Water</b>						
<b>Flow rate for testing (per gross area, A<sub>G</sub>)</b>					dm/dt	0.036	kg/(sm <sup>2</sup> )				
<b>Maximum temperature difference for thermal performance calculations</b>					(ϑ <sub>m</sub> -ϑ <sub>a</sub> ) <sub>max</sub>	85	K				
<b>Standard stagnation temperature (G = 1000 W/m<sup>2</sup>; ϑ<sub>a</sub> = 30 °C)</b>					ϑ <sub>stg</sub>	209	°C				
<b>Effective thermal capacity, incl. fluid (per gross area, A<sub>G</sub>)</b>					C/m <sup>2</sup>	5.5	kJ/(Km <sup>2</sup> )				
<b>Maximum operating temperature</b>					ϑ <sub>max op</sub>	110	°C				
<b>Maximum operating pressure</b>					p <sub>max,op</sub>	100	kPa				
<b>Testing laboratory</b>		<b>ISFH CalTeC</b>			<a href="http://www.isfh.de">http://www.isfh.de</a>						
<b>Test report(s)</b>		<b>12-17/B</b>			<b>Dated</b>		<b>06.03.2017</b>				
<b>Comments of testing laboratory</b>					Datasheet version: 5.01, 2016-03-01						
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<b>Annex to Solar Keymark Certificate</b> <b>Supplementary Information</b>	<b>Licence Number</b>	<b>011-7S2740 F</b>
	<b>Issued</b>	<b>2017-03-06</b>

Annual collector output in kWh/collector at mean fluid temperature $\vartheta_m$ , based on ISO 9806:2013 test results													
Standard Locations		Athens			Davos			Stockholm			Würzburg		
Collector name	$\vartheta_m$	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
Pellesol-Top		2 860	2 063	1 360	2 184	1 521	958	1 610	1 061	644	1 749	1 149	685
Annual output per m <sup>2</sup> gross area		1 233	889	586	941	655	413	694	458	277	754	495	295
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1714 kWh/m <sup>2</sup>			1166 kWh/m <sup>2</sup>			1244 kWh/m <sup>2</sup>		
Mean annual ambient air temperature		18.5°C			3.2°C			7.5°C			9.0°C		
Collector orientation or tracking mode		South, 25°			South, 30°			South, 45°			South, 35°		
The collector is operated at constant temperature $\vartheta_m$ (mean of in- and outlet temperatures). The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool Scenocalc Ver. 5.01 (March 2016). A detailed description of the calculations is available at <a href="http://www.solarkeymark.org/scenocalc">www.solarkeymark.org/scenocalc</a>													

Additional Information		
Collector heat transfer medium	Water-Glycole	
Hybrid Thermal and Photo Voltaic collector	No	
The collector is deemed to be suitable for roof integration	No	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	B	--
Maximum tested positive load	3000	Pa
Maximum tested negative load	2000	Pa
Hail resistance using steel ball (maximum drop height)	2	m

Energy Labelling Information			
	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$	
Pellesol-Top	2.32	Collector efficiency ( $\eta_{col}$ )	60 %
		<i>Remark: Collector efficiency (<math>\eta_{col}</math>) is defined in CDR (EU) No 811/2013 as collector efficiency of the solar collector at a temperature difference between the solar collector and the surrounding air of 40 K and a global solar irradiance of 1000 W/m<sup>2</sup>, expressed in % and rounded to the nearest integer. Deviating from the regulation <math>\eta_{col}</math> is based on reference area (<math>A_{sol}</math>) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2013.</i>	
		<b>Data required for CDR (EU) No 812/2013 - Reference Area <math>A_{sol}</math></b>	
		Zero-loss efficiency ( $\eta_0$ )	0.764 --
		First-order coefficient ( $a_1$ )	3.45 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0.014 W/(m <sup>2</sup> K <sup>2</sup> )
		Incidence angle modifier IAM (50°)	0.95 --
		<i>Remark: The data given in this section are related to collector reference area (<math>A_{sol}</math>) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806. Consistent data sets for either aperture or gross area can be used in calculations like in the regulation 811 and 812 and simulation programs.</i>	