





<b>Annex to Solar Keymark Certificate</b>						<b>Licence Number</b>		<b>011-7S969 F</b>				
<b>Summary of EN 12975-2 Test Results</b>						<b>Issued</b>		<b>2015-12-10</b>				
<b>Collector test standard</b>			<b>EN 12975-2</b>									
<b>Licence holder</b>		Thermostrom Energietechnik GmbH				<b>Country</b>		Austria				
<b>Brand (optional)</b>		--				<b>Web</b>		www.thermostrom.at				
<b>Street, Number</b>		Ennsner Strasse 91-93				<b>E-mail</b>		office@thermostrom.at				
<b>Postcode, City</b>		AT-4407 Steyr-Dietachdorf				<b>Tel</b>		+43 (0)72 523 82-71				
<b>Collector Type</b>						Flat plate collector, glazed						
						<b>Power output per collector</b> G = 1000 W/m <sup>2</sup>						
						$\vartheta_m - \vartheta_a$						
<b>Collector name</b>		<b>Gross area (A<sub>G</sub>)</b>	<b>Gross length</b>	<b>Gross width</b>	<b>Gross height</b>	<b>0 K</b>	<b>10 K</b>	<b>30 K</b>	<b>50 K</b>	<b>70 K</b>	<b>130 K</b>	
		m <sup>2</sup>	mm	mm	mm	W	W	W	W	W	W	
Strebel FKA 240		2.514	2'095	1'200	111	1'746	1'663	1'485	1'289	1'076	334	
<b>Power output per m<sup>2</sup> aperture area. For aperture area, see page 2</b>						778	741	662	575	480	149	
<b>Performance parameters test method</b>						Steady state - outdoor						
<b>Performance parameters (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</b>		0.778	3.590	0.010								
<b>Incidence angle modifier test method</b>						Steady state - outdoor						
<b>Bi-directional incidence angle modifiers</b>		Yes										
<b>Incidence angle modifier</b>		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°	
<b>Transversal</b>		K <sub>θT, coll</sub>	1.00	1.00	0.99	0.97	0.93	0.85	0.71	0.46	0.00	
<b>Longitudinal</b>		K <sub>θL, coll</sub>	1.00	1.00	0.99	0.97	0.93	0.85	0.71	0.46	0.00	
<b>Fluid for testing</b>						Water-Glycole						
<b>Flow rate for testing (per Aa)</b>						dm/dt	0.011	kg/(sm <sup>2</sup> )				
<b>Maximum temperature difference for thermal performance calculations</b>						( $\vartheta_m - \vartheta_a$ ) <sub>max</sub>	130	K				
<b>Standard stagnation temperature (G = 1000 W/m<sup>2</sup>; <math>\vartheta_a = 30</math> °C)</b>						$\vartheta_{stg}$	206	°C				
<b>Effective thermal capacity (per Aa)</b>						C/m <sup>2</sup>	3.1	kJ/(Km <sup>2</sup> )				
<b>Maximum operating temperature</b>						$\vartheta_{max, op}$	--	°C				
<b>Maximum operating pressure</b>						p <sub>max, op</sub>	600	kPa				
<b>Testing laboratory</b>		SPF, CH-8640 Rapperswil				www.solarenergy.ch						
<b>Test report(s)</b>		C1099LPEN C1099QPEN				<b>Dated</b>		13.10.2009 13.10.2009				
<b>Comments of testing laboratory</b>						--						
						 INSTITUT FÜR SOLARTECHNIK 						



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	Issued	2015-12-10

**Annual collector output in kWh/collector at mean fluid temperature  $\vartheta_m$ , based on EN 12975-2 Test Results**

Collector name	Standard Locations $\vartheta_m$	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
Strebel FKA 240		2'765	1'998	1'349	2'117	1'497	986	1'551	1'036	654	1'685	1'117	695
Annual output per m <sup>2</sup> aperture area		1'232	891	601	944	667	440	691	462	291	751	498	310
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 (July 2015). A detailed description of the calculations is available at [www.solarkeymark.org/scenocalc](http://www.solarkeymark.org/scenocalc)

**Additional Information**

Collector heat transfer medium	Liquid
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 12975-2 under the following conditions:	
No valid climate reference class	A --
Positive Mechanical Load	1000 Pa
Negative Mechanical Load	1000 Pa
Hail resistance using steel ball (maximum drop height)	-- m

**Energy Labelling Information**

	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$	
Strebel FKA 240	2.24	Collector efficiency ( $\eta_{col}$ )	62 %
		<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.</i>	
		<b>Data required for CDR (EU) No 812/2013 - Reference Area <math>A_{sol}</math></b>	
		Zero-loss efficiency ( $\eta_0$ )	0.778 --
		First-order coefficient ( $a_1$ )	3.59 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0.010 W/(m <sup>2</sup> K <sup>2</sup> )
		Incidence angle modifier IAM (50°)	0.94 --
		<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>	