


<b>Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results</b>					<b>Licence Number</b>		<b>011-7S1965 F</b>								
					<b>Date issued</b>		<b>2017-04-24</b>								
					<b>Issued by</b>		<b>DIN CERTCO</b>								
<b>Licence holder</b>		GREENoneTEC Solarindustrie GmbH			<b>Country</b>		ÖSTERREICH								
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<b>Collector Type</b>					Flat plate collector, glazed										
<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	100 K W	
FK 8200 N4A Cu-Al-P					2.03	1 731	1 170	84	1 460	1 390	1 232	1 049	843	487	
FK 8230 N4A Cu-Al-P					2.34	2 000	1 170	83	1 687	1 606	1 423	1 213	974	563	
FK 8250 N4A Cu-Al-P					2.52	2 151	1 170	84	1 815	1 728	1 531	1 304	1 047	605	
FK 8200 L2A Cu-Al-P					2.02	1 730	1 170	83	1 459	1 389	1 231	1 049	842	487	
FK 8230 L2A Cu-Al-P					2.34	2 000	1 170	83	1 687	1 606	1 423	1 213	974	563	
FK 8250 L2A Cu-Al-P					2.52	2 150	1 170	83	1 814	1 727	1 531	1 304	1 047	605	
<b>Power output per m<sup>2</sup> gross area</b>									721	686	608	518	416	240	
<b>Performance parameters test method</b>					Steady state - indoor										
<b>Performance parameters (related to AG)</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>					0.721	3.306	0.015								
<b>Incidence angle modifier test method</b>					Quasi dynamic - outdoor										
<b>Bi-directional incidence angle modifiers</b>					No										
<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	0.99	0.98	0.95	0.90	0.81	0.66	0.41	0.00	
<b>Longitudinal</b>					K <sub>θL, coll</sub>	1.00	0.99	0.98	0.95	0.90	0.81	0.66	0.41	0.00	
<b>Heat transfer medium for testing</b>					Water										
<b>Flow rate for testing (per gross area, A<sub>G</sub>)</b>					dm/dt	0.019	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>	100	K								
<b>Standard stagnation temperature (G = 1000 W/m<sup>2</sup>; ϑ<sub>a</sub> = 30 °C)</b>					ϑ <sub>stg</sub>	184.4	°C								
<b>Effective thermal capacity, incl. fluid (per gross area, A<sub>G</sub>)</b>					C/m <sup>2</sup>	5.435	kJ/(Km <sup>2</sup> )								
<b>Maximum operating temperature</b>					ϑ <sub>max, op</sub>	n.a.	°C								
<b>Maximum operating pressure</b>					p <sub>max, op</sub>	1000	kPa								
<b>Testing laboratory</b>					TZS, ITW University Stuttgart			www.itw.uni-stuttgart.de							
<b>Test report(s)</b>					KTB Nr. 2006-39-en issued by Fraunhofer ISE			<b>Dated</b>		06.12.2011					
<b>Comments of testing laboratory</b>					Datashet version: 5.01, 2016-03-01										
This data sheet replaces the data sheet issued from Fraunhofer ISE on 08.12.2011 Documented performance parameters are taken from FK 8200 N4A Cu-Al-P					 <b>Forschungs- und Testzentrum für Solaranlagen</b> <small>Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaaffenwaldring 8, 70560 Stuttgart (Vaihingen)</small>										
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<b>Annex to Solar Keymark Certificate</b> <b>Supplementary Information</b>	<b>Licence Number</b>	<b>011-7S1965 F</b>
	<b>Issued</b>	<b>2017-04-24</b>

**Annual collector output in kWh/collector at mean fluid temperature  $\vartheta_m$ , based on ISO 9806:2013 test results**

Standard Locations Collector name	$\vartheta_m$	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
FK 8200 N4A Cu-Al-P		2 261	1 600	1 021	1 718	1 172	716	1 263	817	483	1 370	879	511
FK 8230 N4A Cu-Al-P		2 612	1 849	1 180	1 985	1 355	827	1 459	945	558	1 583	1 016	590
FK 8250 N4A Cu-Al-P		2 810	1 988	1 269	2 135	1 457	890	1 569	1 016	600	1 703	1 093	635
FK 8200 L2A Cu-Al-P		2 259	1 599	1 021	1 717	1 172	716	1 262	817	483	1 369	879	510
FK 8230 L2A Cu-Al-P		2 612	1 849	1 180	1 985	1 355	827	1 459	945	558	1 583	1 016	590
FK 8250 L2A Cu-Al-P		2 809	1 988	1 269	2 135	1 457	890	1 569	1 016	600	1 702	1 092	635
Annual output per m <sup>2</sup> gross area		1 116	790	504	848	579	354	624	404	238	677	434	252
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 [www.solarkeymark.org/scenocalc](http://www.solarkeymark.org/scenocalc)

**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)	C	--
Maximum tested positive load	1000	Pa
Maximum tested negative load	1000	Pa
Hail resistance using steel ball (maximum drop height)	n.a.	m

**Energy Labelling Information**

	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$	
FK 8200 N4A Cu-Al-P	2.03	Collector efficiency ( $\eta_{col}$ )	56 %
FK 8230 N4A Cu-Al-P	2.34	Remark: Collector efficiency ( $\eta_{col}$ ) 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 $\eta_{col}$ is based on reference area ( $A_{sol}$ ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2013.	
FK 8250 N4A Cu-Al-P	2.52		
FK 8200 L2A Cu-Al-P	2.02		
FK 8230 L2A Cu-Al-P	2.34		
FK 8250 L2A Cu-Al-P	2.52		
		Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$	
		Zero-loss efficiency ( $\eta_0$ )	0.721 --
		First-order coefficient ( $a_1$ )	3.31 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0.015 W/(m <sup>2</sup> K <sup>2</sup> )
		Incidence angle modifier IAM (50°)	0.90 --
Remark: The data given in this section are related to collector reference area ( $A_{sol}$ ) 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.			