


<b>Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results</b>					<b>Licence Number</b>		<b>011-7S085F</b>				
					<b>Date issued</b>		<b>2017-11-15</b>				
					<b>Issued by</b>		<b>DIN CERTCO</b>				
<b>Licence holder</b>		<b>Ernst Schweizer AG</b>			<b>Country</b>		<b>Switzerland</b>				
<b>Brand (optional)</b>					<b>Web</b>		<b>www.ernstschweizer.ch</b>				
<b>Street, Number</b>		<b>Bahnhofplatz 11</b>			<b>E-mail</b>		<b>info@ernstschweizer.ch</b>				
<b>Postcode, City</b>		<b>8908 Hedingen</b>			<b>Tel</b>		<b>+41 44 763 61 11</b>				
<b>Collector Type</b>					<b>Flat plate collector, glazed</b>						
					<b>Power output per collector</b> Gb = 850 W/m <sup>2</sup> ; Gd = 150 W/m <sup>2</sup> ; u = 3 m/s $\vartheta_m - \vartheta_a$						
					0 K	10 K	30 K	50 K	70 K	106 K	
<b>Collector name</b>		Gross area (A <sub>G</sub> ) m <sup>2</sup>	Gross length mm	Gross width mm	Gross height mm	W	W	W	W	W	W
<b>FK1-H2</b>		2.58	1,234	2,092	108	1,892	1,803	1,606	1,382	1,131	612
<b>FK1-V2</b>		2.58	2,092	1,234	108	1,892	1,803	1,606	1,382	1,131	612
<b>FK1-V2V</b>		2.58	2,092	1,234	108	1,892	1,803	1,606	1,382	1,131	612
<b>Power output per m<sup>2</sup> gross area</b>						733	699	623	536	439	237
<b>Performance parameters test method</b>		<b>Quasi dynamic</b>									
<b>Performance parameters (related to AG)</b>		$\eta_{0,b}$	c1	c2	c3	c4	c6	Kd			
<b>Units</b>		-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )	J/(m <sup>3</sup> K)	-	s/m	-			
<b>Test results</b>		0.735	3.302	0.013	0.000	0.000	0.000	0.985			
<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>	1.00	0.99	0.99	0.98	0.96	0.89	0.72	0.36	0.00
<b>Longitudinal</b>		K <sub>θL, coll</sub>	1.00	0.99	0.99	0.98	0.96	0.89	0.72	0.36	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		0.020		kg/(sm <sup>2</sup> )		
<b>Maximum temperature difference for thermal performance calculations</b>					$(\vartheta_m - \vartheta_a)_{max}$		106		K		
<b>Standard stagnation temperature (G = 1000 W/m<sup>2</sup>; <math>\vartheta_a = 30^\circ\text{C}</math>)</b>					$\vartheta_{stg}$		199		°C		
<b>Effective thermal capacity, incl. fluid (per gross area, A<sub>G</sub>)</b>					C/m <sup>2</sup>		9.77		kJ/(Km <sup>2</sup> )		
<b>Maximum operating temperature</b>					$\vartheta_{max, op}$		120		°C		
<b>Maximum operating pressure</b>					p <sub>max, op</sub>		600		kPa		
<b>Testing laboratory</b>		<b>TZS, ITW University Stuttgart</b>			<b>www.itw.uni-stuttgart.de</b>						
<b>Test report(s)</b>		16COL1358 16COL1359 16COL1360Q			<b>Dated</b>		04.07.2017 04.07.2017 04.07.2017				
<b>Comments of testing laboratory</b>					Datashet version: 5.01, 2016-03-01						
<p>This data sheet replaces the data sheet issued on 20.07.2017.          Documented performance parameters were taken from 16COL1358 (FK1-H2).          The web url and email addresse were changed.</p>					 <b>Forschungs- und Testzentrum für Solaranlagen</b> Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 6, 70560 Stuttgart (Vaihingen)						
<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>											

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**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
FK1-H2		3,101	2,251	1,495	2,374	1,662	1,056	1,743	1,158	708	1,904	1,261	760
FK1-V2		3,101	2,251	1,495	2,374	1,662	1,056	1,743	1,158	708	1,904	1,261	760
FK1-V2V		3,101	2,251	1,495	2,374	1,662	1,056	1,743	1,158	708	1,904	1,261	760
Annual output per m <sup>2</sup> gross area		1,202	872	579	920	644	409	676	449	275	738	489	294
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	Yes	
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	3000	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 $A_{sol}$	
FK1-H2	2.58	Collector efficiency ( $\eta_{col}$ )	58 %
FK1-V2	2.58	<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>	
FK1-V2V	2.58		
		Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$	
		Zero-loss efficiency ( $\eta_0$ )	0.733 --
		First-order coefficient ( $a_1$ )	3.30 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0.013 W/(m <sup>2</sup> K <sup>2</sup> )
		Incidence angle modifier IAM (50°)	0.96 --
<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>			