
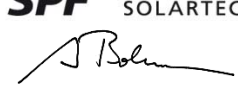


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		<b>011-7S2718 F</b>					
					Date issued		<b>2016-11-11</b>					
					Issued by							
Licence holder		<b>Fondital S.p.A.</b>			Country		Italy					
Brand (optional)		--			Web		www.fondital.it					
Street, Number		Via Cerreto 40			E-mail		info@fondital.it					
Postcode, City		IT-25079 Vobarno (Brescia)			Tel		+39 0365 87831					
Collector Type					Flat plate collector, glazed							
Collector name	Gross area (A <sub>G</sub> ) m <sup>2</sup>	Gross length mm	Gross width mm	Gross height mm	Power output per collector 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	10 K	30 K	50 K	70 K	130 K		
					W	W	W	W	W	W		
<b>FC20</b>	2.11	2'037	1'036	90	1'481	1'397	1'220	1'032	833	168		
<b>FC23</b>	2.31	2'037	1'136	90	1'624	1'532	1'338	1'132	913	184		
<b>FC25</b>	2.52	2'037	1'235	90	1'766	1'666	1'455	1'230	993	200		
Power output per m <sup>2</sup> gross area					702	662	578	489	395	80		
Performance parameters test method		Steady state - outdoor										
Performance parameters (related to A <sub>G</sub> )		η <sub>0,hem</sub>	a <sub>1</sub>	a <sub>2</sub>								
Units		-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )								
Test results		0.702	3.930	0.007								
Incidence angle modifier test method		Steady state - outdoor										
Bi-directional incidence angle modifiers		No										
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°	
Transversal		K <sub>θT, coll</sub>	1.00	1.00	0.99	0.97	0.91	0.78	0.63	0.36	0.00	
Longitudinal		K <sub>θL, coll</sub>	1.00	1.00	0.99	0.97	0.91	0.78	0.63	0.36	0.00	
Heat transfer medium for testing		Water-Glycole										
Flow rate for testing (per gross area, A <sub>G</sub> )		dm/dt	0.021	kg/(sm <sup>2</sup> )								
Maximum temperature difference for thermal performance calculations		(ϑ <sub>m</sub> -ϑ <sub>a</sub> ) <sub>max</sub>	130	K								
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; ϑ <sub>a</sub> = 30 °C)		ϑ <sub>stg</sub>	195	°C								
Effective thermal capacity, incl. fluid (per gross area, A <sub>G</sub> )		C/m <sup>2</sup>	5.26	kJ/(Km <sup>2</sup> )								
Maximum operating temperature		ϑ <sub>max, op</sub>	110	°C								
Maximum operating pressure		p <sub>max, op</sub>	1000	kPa								
Testing laboratory		SPF, CH-8640 Rapperswil			www.spf.ch							
Test report(s)		C1710LPEN C1711LPEN C1711QPEN			Dated		10.11.2016 10.11.2016 10.11.2016					
Comments of testing laboratory		Datashet version: 5.01, 2016-03-01										
--		 <b>INSTITUT FÜR SOLARTECHNIK</b> 										
DIN CERTCO • Alboinstraße 56 • 12103 Berlin, Germany Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de • www.dincertco.de												

<b>Annex to Solar Keymark Certificate Supplementary Information</b>	<b>Licence Number</b>	<b>011-7S2718 F</b>
	<b>Issued</b>	<b>2016-11-11</b>

<b>Annual collector output in kWh/collector at mean fluid temperature <math>\vartheta_m</math>, based on EN ISO 9806:2013 test results</b>													
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
FC20		2'282	1'546	973	1'690	1'129	697	1'244	779	462	1'354	836	487
FC23		2'503	1'695	1'068	1'854	1'238	765	1'365	855	507	1'485	917	534
FC25		2'721	1'843	1'161	2'016	1'346	831	1'484	929	551	1'614	997	580
Annual output per m <sup>2</sup> gross area		1'081	733	461	801	535	330	590	369	219	642	396	231
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>													

<b>Additional Information</b>		
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)	A	--
Maximum tested positive load	3000	Pa
Maximum tested negative load	3000	Pa
Hail resistance using ice balls (diameter)	45	mm

<b>Energy Labelling Information</b>				
	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$		
FC20	2.11	Collector efficiency ( $\eta_{col}$ )	53	%
FC23	2.31	<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>		
FC25	2.52			
		Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$		
		Zero-loss efficiency ( $\eta_0$ )	0.702	--
		First-order coefficient ( $a_1$ )	3.93	W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0.007	W/(m <sup>2</sup> K <sup>2</sup> )
		Incidence angle modifier IAM (50°)	0.91	--
		<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>		