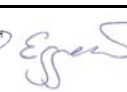


Precisely Right.

Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate							Licence Number		<b>011-7S2416 F</b>							
							Issued		2014-09-25							
Company holding the			Sonnig GbR				Country		Germany							
Brand (optional)			-				Website		www.sonnig.de							
Street, street number			Gewerbedorf Rohrstetten 1				E-mail		sonnig@sonnig.de							
Postal Code / City, province			D-94551	Hunding/ Lalling			Tel/Fax		+49 01805 7666-44 / -22							
Collector Type (flat plate glazed/un-glazed; evacuate tubular)							Flat plate collector - glazed									
Thermal / photo voltaic hybrid collector? (PVT collector)							No									
Integration in the roof possible ? (manufacturers declaration)							No									
Collector name	Aperture area (Aa) m <sup>2</sup>	Gross length mm	Gross width mm	Gross height mm	Gross area (Ag) m <sup>2</sup>	Power output per collector module										
						G = 1000 W/m <sup>2</sup>										
						Tm-Ta										
						0 K	10 K	30 K	50 K	70 K						
						W	W	W	W	W						
Solix S	2.39	2 170	1 170	96	2.53	1 875	1 781	1 572	1 337	1 074						
Performance test method							Glazed liquid heating collector - steady state - indoor									
Performance parameters related to aperture							η0	a1	a2							
Units							-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )							
Test results - Flow rate and fluid see note 1							0.783	3.780	0.014							
Bi-directional incidence angle							No	Kθ values are obligatory for 50°.								
Incidence angle modifiers Kθ(θ)							Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
							Kθ(θ)	1.00	0.99	0.98	0.96	0.93	0.88	0.77	0.43	0.00
Incidence angle modifier not bi-directional - leave fields blank																
Stagnation temperature - Weather conditions see note 2							T <sub>stg</sub>	207 °C								
Effective thermal capacity							C <sub>eff</sub> = C/A <sub>g</sub>	5.6 kJ/(m <sup>2</sup> K)								
Max. intended operation temperature - see note 3							T <sub>max,op</sub>	- °C								
Max. operation pressure - see note 3							P <sub>max,op</sub>	600 kPa								
Pressure drop table - for a collector family, the values shall be for the module with highest ΔP per m <sup>2</sup> aperture area																
Flow rate		kg/(s m <sup>2</sup> )	-													
Pressure drop, ΔP		Pa	-													
Optional weather data			Location	-			Link	-								
Testing Laboratory			Institut für Solarenergieforschung Hameln													
Website			www.isfh.de													
Test report id. number			60-14/KB				Date of test report		2014.09.25							
During the test G <sub>DIF</sub> /G <sub>TOT</sub> was always between							0.1	and	0.3							
Comments of testing laboratory: The collector efficiency parameter and incidence angle modifiers are related to G(DIF)/G(TOT)=0.15. The incidence angle modifier was determined outdoor according to a quasi-dynamic test procedure.																
Note 1		Flow rate	0.020 kg/(s m <sup>2</sup> )	Fluid	Water											
Note 2		Irradiance, G = 1000 W/m <sup>2</sup> ; Ambient temperature, T <sub>a</sub> =30 °C														
Note 3		Given by manufacturer														
							Institut für Solarenergieforschung GmbH Am Ohrberg 1 D-31860 Emmenpar Tel.: 0 51 51 / 999-100 Fax: 0 51 51 / 999-500 									
							Datasheet version: 4.06, 2014-01-15									
<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>																

Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence Number	011-7S2416 F
	Issued	25.09.2014

Annual collector output kWh/module																
Collector name	Location and collector temperature (T <sub>m</sub> )															
	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	25°C	50°C	75°C	
Solix S	2 963	2 086	1 333	2 237	1 522	931	1 649	1 062	626	1 793	1 146	665				

Collector mounting: Fixed or tracking	Fixed; slope = latitude - 15° (rounded to nearest 5°)
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Overview of locations				
Location	Latitude °	G <sub>tot</sub> kWh/m <sup>2</sup>	T <sub>a</sub> °C	Collector orientation or tracking mode
Athens	38	1 765	18.5	South, 25°
Davos	47	1 714	3.2	South, 30°
Stockholm	59	1 166	7.5	South, 45°
Würzburg	50	1 244	9.0	South, 35°
-				South, -15°

G <sub>tot</sub>	Annual total irradiation on collector plane	kWh/m <sup>2</sup>
T <sub>a</sub>	Mean annual ambient air temperature	°C
T <sub>m</sub>	Constant collector operating temperature (mean of in- and outlet temperatures)	°C

The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool ScenoCalc. The collector output is calculated hour by hour according to the efficiency parameters from the Keymark test using constant collector operating temperature (T<sub>m</sub>). A detailed description of the calculations is available at <http://www.sp.se/en/index/services/solar/ScenoCalc/Sidor/default.aspx>.

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	ScenoCalc version: Ver. 4.06 (Jan, 2014)