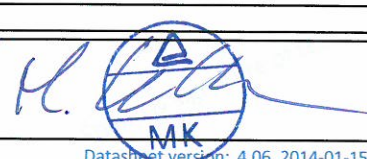


Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate						Licence Number		011-7S2405 R				
						Issued		17-Mar-2015				
Company holding the		Jiangsu Sunpower Solar Technology Co., Ltd.				Country		P.R. China				
Brand (optional)		Sunpower				Website		www.sunpower-solar.com				
Street, street number		2969# Longcheng Rd, Xinbei District				E-mail		keyway@sunpower-solar.com				
Postal Code / City, province		213133 Changzhou, Jiangsu Province				Tel/Fax		86 (0)519 8508 3226 / 3220				
Collector Type (flat plate glazed/un-glazed; evacuate tubular)						Evacuated tubular collector						
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		
SPB-58/1800-12	2.23	2 000	1 360	185	2.72	1 106	1 079	1 021	957	884		
SPB-58/1800-15	2.79	2 000	1 690	185	3.38	1 382	1 349	1 277	1 196	1 106		
SPB-58/1800-18	3.34	2 000	2 020	185	4.04	1 658	1 619	1 532	1 435	1 327		
SPB-58/1800-20	3.71	2 000	2 240	185	4.48	1 843	1 799	1 702	1 594	1 474		
SPB-58/1800-22	4.09	2 000	2 460	185	4.92	2 027	1 979	1 873	1 754	1 621		
SPB-58/1800-24	4.46	2 000	2 680	185	5.36	2 211	2 159	2 043	1 913	1 769		
SPB-58/1800-25	4.64	2 000	2 790	185	5.58	2 303	2 249	2 128	1 993	1 843		
Performance test method						Glazed liquid heating collector - steady state - outdoor						
Performance parameters related to aperture						$\eta_0$	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						0.496	1.137	0.004				
Bi-directional incidence angle		Yes <i>K<math>\theta</math> values are obligatory for 50°.</i>										
Incidence angle modifiers K $\theta$ ( $\theta$ T) transversal direction		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°	
		K $\theta$ ( $\theta$ T)	1.02	1.04	1.07	1.08	1.13	1.34	1.37	1.33	0.00	
Incidence angle modifiers K $\theta$ ( $\theta$ L) longitudinal direction		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°	
		K $\theta$ ( $\theta$ L)	1.00	0.99	0.98	0.95	0.92	0.85	0.71	0.29	0.00	
Stagnation temperature - Weather conditions see note 2						Tstg	259.5 °C					
Effective thermal capacity						ceff = C/Ag	10.18 kJ/(m <sup>2</sup> K)					
Max. intended operation temperature - see note 3						Tmax,op	100 °C					
Max. operation pressure - see note 3						pmax,op	600 kPa					
Pressure drop table - for a collector family, the values shall be for the module with highest $\Delta P$ per m <sup>2</sup> aperture area												
Flow rate	kg/(s m <sup>2</sup> )	-	-	-	-	-	-	-	-	-	-	
Pressure drop, $\Delta P$	Pa	-	-	-	-	-	-	-	-	-	-	
Optional weather data		Location				Link						
Testing Laboratory		TUV Rheinland (Shanghai) Co., Ltd.										
Website		www.tuv.com										
Test report id. number		154021470_EN_SPB-58/1800-12_Report_Zhao				Date of test report		6-Aug-2014				
		154021470_EN_SPB-58/1800-25_Report_Zhao										
During the test GDIF/GTOT was always between		10.00%		and		18.00%						
Comments of testing laboratory:												
Test results based on report 154021470_EN_SPB-58/1800-25												
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, Ta=30 °C											
Note 3	Given by manufacturer											
						 Datasheet version: 4.06, 2014-01-15						
<b>DIN CERTCO • Alboinstraße 56 • 12103 Berlin</b> Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de • www.dincertco.de												

Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence Number	011-7S2405 R
	Issued	17-Mar-2015

Annual collector output kWh/module												
Collector name	Location and collector temperature (Tm)											
	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
SPB-58/1800-12	2 006	1 730	1 449	1 672	1 410	1 161	1 226	1 009	806	1 318	1 084	867
SPB-58/1800-15	2 508	2 162	1 812	2 090	1 763	1 451	1 533	1 261	1 008	1 648	1 355	1 083
SPB-58/1800-18	3 009	2 595	2 174	2 508	2 115	1 741	1 840	1 513	1 210	1 977	1 626	1 300
SPB-58/1800-20	3 343	2 883	2 415	2 787	2 350	1 934	2 044	1 681	1 344	2 197	1 807	1 445
SPB-58/1800-22	3 678	3 171	2 657	3 066	2 585	2 128	2 249	1 849	1 478	2 417	1 988	1 589
SPB-58/1800-24	4 012	3 459	2 899	3 344	2 820	2 321	2 453	2 017	1 613	2 636	2 168	1 733
SPB-58/1800-25	4 179	3 604	3 019	3 484	2 938	2 418	2 555	2 101	1 680	2 746	2 259	1 806

Collector mounting: Fixed or tracking	Fixed; slope = latitude - 15° (rounded to nearest 5°)
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Overview of locations				
Location	Latitude °	Gtot kWh/m <sup>2</sup>	Ta °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°

Gtot	Annual total irradiation on collector plane	kWh/m <sup>2</sup>
Ta	Mean annual ambient air temperature	°C
Tm	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 (Tm). A detailed description of the calculations is available at <http://www.sp.se/en/index/services/solar/ScenoCalc/Sidor/default.aspx>.