


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results						Licence Number		011-7S1258 R				
						Date issued		2016-09-01				
						Issued by		TÜV Rheinland Energy GmbH				
Licence holder		PRAMEN GmbH				Country		Österreich				
Brand (optional)						Web		http://www.heat-pipe.info				
Street, Number		Madersbacher Weg 26				E-mail		Solar@PRAMEN.at				
Postcode, City		6300 Wörgl				Tel						
Collector Type						Evacuated tubular collector						
					Power output per collector G _b = 850 W/m ² ; G _d = 150 W/m ² ; u = 3 m/s θ _m - θ _a							
					0 K 10 K 30 K 50 K 70 K 80 K W W W W W W							
Collector name		Gross area (A _G)	Gross length	Gross width	Gross height							
		m ²	mm	mm	mm							
SP-58/1800-12 ST		2.02	1 990	1 015	182	872	846	790	726	657	619	
SP-58/1800-13 ST		2.18	1 990	2 455	182	941	913	852	784	709	669	
SP-58/1800-14 ST		2.34	1 990	2 455	182	1 010	980	915	841	761	718	
SP-58/1800-15 ST		2.50	1 990	2 455	182	1 079	1 047	977	899	813	767	
SP-58/1800-16 ST		2.66	1 990	2 455	182	1 149	1 114	1 040	956	865	816	
SP-58/1800-17 ST		2.82	1 990	2 455	182	1 218	1 181	1 102	1 014	917	865	
SP-58/1800-18 ST		2.98	1 990	2 455	182	1 287	1 248	1 165	1 072	969	914	
SP-58/1800-19 ST		3.13	1 990	2 455	182	1 351	1 311	1 223	1 125	1 018	960	
SP-58/1800-20 ST		3.29	1 990	2 455	182	1 421	1 378	1 286	1 183	1 070	1 009	
SP-58/1800-21 ST		3.45	1 990	2 455	182	1 490	1 445	1 348	1 241	1 122	1 058	
SP-58/1800-22 ST		3.61	1 990	2 455	182	1 559	1 512	1 411	1 298	1 174	1 107	
SP-58/1800-23 ST		3.77	1 990	2 455	182	1 628	1 579	1 474	1 356	1 226	1 156	
SP-58/1800-24 ST		3.93	1 990	2 455	182	1 697	1 646	1 536	1 413	1 278	1 205	
SP-58/1800-26 ST		4.25	1 990	2 455	182	1 835	1 780	1 661	1 528	1 382	1 303	
SP-58/1800-28 ST		4.57	1 990	2 455	182	1 973	1 915	1 786	1 643	1 486	1 401	
SP-58/1800-30 ST		4.89	1 990	2 455	182	2 111	2 049	1 911	1 758	1 590	1 500	
Power output per m ² gross area						432	419	391	360	325	307	
Performance parameters test method			Quasi dynamic									
Performance parameters (related to AG)			η _{0,b}	c ₁	c ₂	c ₃	c ₄	c ₆	K _d			
Units			-	W/(m ² K)	W/(m ² K ²)	J/(m ³ K)	-	s/m	-			
Test results			0.431	1.244	0.004	0.000	0.000	0.000	1.012			
Incidence angle modifier test method			Quasi dynamic - outdoor									
Bi-directional incidence angle modifiers			Yes									
Incidence angle modifier			Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal			K _{θT, coll}	1.03	1.02	1.08	1.16	1.25	1.22	1.16		0.00
Longitudinal			K _{θL, coll}	1.00	0.99	0.99	0.97	0.95	0.90	0.82		0.00
Heat transfer medium for testing						Water						
Flow rate for testing (per gross area, A _G)						dm/dt	0.015	kg/(sm ²)				
Maximum temperature difference for thermal performance calculations						(θ _m -θ _a) _{max}	80	K				
Standard stagnation temperature (G = 1000 W/m ² ; θ _a = 30 °C)						θ _{stg}	215	°C				
Effective thermal capacity, incl. fluid (per gross area, A _G)						C/m ²	57	kJ/(Km ²)				
Maximum operating temperature						θ _{max, op}	250	°C				
Maximum operating pressure						p _{max, op}	600	kPa				
Testing laboratory			TÜV Rheinland Energy GmbH			http://www.tuv.com/st						
Test report(s)			21209544_PRAMEN_30 21209544_PRAMEN_12			Dated		04.06.2010 04.06.2010				
Comments of testing laboratory						Datasheet version: 5.01, 2016-03-01						
The following collector sizes had been tested according to EN 12975-2:2006: SP-58/1800-12 ST & SP-58/1800-30 ST. The quasi-dynamic test evaluation was repeated with gross area as basis for this data sheet. Due to limited space, the sizes 25/27/29 could not be displayed. The results could be interpolated. The initial values based on aperture area had been eta0=0.582; a1=1.67 and a2=0.006.						 Genau. Richtig. lab TÜV Rheinland Energy GmbH Am Grauen Stein 51105 Köln S						
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												

Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S1258 R
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Annual collector output in kWh/collector at mean fluid temperature ϑ_m , based on EN ISO 9806:2013 test results

Standard Locations	ϑ_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
SP-58/1800-12 ST		1 573	1 308	1 050	1 291	1 050	828	942	742	566	1 016	801	608
SP-58/1800-13 ST		1 698	1 411	1 134	1 393	1 133	894	1 016	800	611	1 097	864	656
SP-58/1800-14 ST		1 822	1 515	1 217	1 495	1 216	960	1 091	859	656	1 177	928	704
SP-58/1800-15 ST		1 947	1 618	1 300	1 598	1 300	1 025	1 166	918	701	1 258	991	753
SP-58/1800-16 ST		2 071	1 722	1 383	1 700	1 383	1 091	1 240	976	746	1 338	1 054	801
SP-58/1800-17 ST		2 196	1 826	1 466	1 802	1 466	1 156	1 315	1 035	791	1 419	1 118	849
SP-58/1800-18 ST		2 320	1 929	1 550	1 905	1 549	1 222	1 389	1 094	835	1 499	1 181	897
SP-58/1800-19 ST		2 437	2 026	1 628	2 000	1 627	1 284	1 459	1 149	878	1 575	1 241	942
SP-58/1800-20 ST		2 562	2 130	1 711	2 103	1 710	1 349	1 534	1 208	922	1 655	1 304	990
SP-58/1800-21 ST		2 686	2 233	1 794	2 205	1 793	1 415	1 608	1 266	967	1 736	1 368	1 038
SP-58/1800-22 ST		2 811	2 337	1 877	2 307	1 877	1 480	1 683	1 325	1 012	1 816	1 431	1 087
SP-58/1800-23 ST		2 936	2 440	1 960	2 409	1 960	1 546	1 758	1 384	1 057	1 897	1 495	1 135
SP-58/1800-24 ST		3 060	2 544	2 044	2 512	2 043	1 612	1 832	1 443	1 102	1 977	1 558	1 183
SP-58/1800-26 ST		3 309	2 751	2 210	2 716	2 209	1 743	1 981	1 560	1 192	2 138	1 685	1 279
SP-58/1800-28 ST		3 559	2 958	2 376	2 921	2 376	1 874	2 131	1 678	1 281	2 299	1 812	1 376
SP-58/1800-30 ST		3 808	3 166	2 543	3 125	2 542	2 005	2 280	1 795	1 371	2 460	1 938	1 472
Annual output per m ² gross area		779	647	520	639	520	410	466	367	280	503	396	301
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m ²			1714 kWh/m ²			1166 kWh/m ²			1244 kWh/m ²		
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 ϑ_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

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)	--
Maximum tested positive load	Pa
Maximum tested negative load	Pa
Hail resistance using steel ball (maximum drop height)	m

Energy Labelling Information

	Reference Area, A_{sol} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}		
SP-58/1800-12 ST	2.02	Collector efficiency (η_{col})	38	%
SP-58/1800-13 ST	2.18	<i>Remark: Collector efficiency (η_{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/m², expressed in % and rounded to the nearest integer. Deviating from the regulation η_{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.</i>		
SP-58/1800-14 ST	2.34			
SP-58/1800-15 ST	2.50			
SP-58/1800-16 ST	2.66			
SP-58/1800-17 ST	2.82			
SP-58/1800-18 ST	2.98			
SP-58/1800-19 ST	3.13			
SP-58/1800-20 ST	3.29	Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}		
SP-58/1800-21 ST	3.45	Zero-loss efficiency (η_0)	0.432	--
SP-58/1800-22 ST	3.61	First-order coefficient (a_1)	1.24	W/(m ² K)
SP-58/1800-23 ST	3.77	Second-order coefficient (a_2)	0.004	W/(m ² K ²)
SP-58/1800-24 ST	3.93	Incidence angle modifier IAM (50°)	1.13	--
SP-58/1800-26 ST	4.25	<i>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.</i>		
SP-58/1800-28 ST	4.57			
SP-58/1800-30 ST	4.89			