



CERTIFICATE

Solar Keymark Certificate

No. SP SC0471-16

Holder/Issued to/Manufacturer

Company: Spectrum Solar
Address: Kupferstrasse 1, 49843 Uelsen, Germany

Product name and description

Vacuum tube solar thermal collectors for water heating.

For technical information see Appendix (2 pages).

Models:	Spectrum CPC 8, Spectrum CPC 9, Spectrum CPC 10, Spectrum CPC 12, Spectrum CPC 14, Spectrum CPC 15, Spectrum CPC 16, Spectrum CPC 18, Spectrum CPC 20, Spectrum CPC 21, Spectrum CPC 22, Spectrum CPC 24
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Certificate

The product is found to comply with the requirements in EN 12975-1:2006+A1:2010 Solar collectors Part 1: General requirements and the Specific CEN Keymark Scheme Rules for Solar Thermal Products, and are based on test results according to EN 12975-2:2006 Solar collectors Part 2: Test methods

Marking

Products conforming to this certificate shall be marked in accordance with the requirements in the Specific CEN Keymark Scheme Rules for Solar Thermal Products. The marking shall, together with the Keymark logo, show the identification code of the empowered certification body (SP Technical Research Institute of Sweden, No. 012), also see CEN-CENELEC Internal Regulations Part 4 Certification, Annex A.

Validity

This certificate is valid until 2019-01-20 provided that the conditions in the Solar Keymark Rules are fulfilled and the standard or rules are not modified significantly. The validity of the certificate can be checked in the database, see Solar Keymark website <http://www.solarkeymark.org>.

Miscellaneous

The manufacturer's factory production control procedures are under surveillance by the responsibility of SP. This is the first version of this certificate.

Borås, Sweden 2016-06-29

**SP Technical Research Institute of Sweden
Certification**


Lennart Aronsson
Certification Manager


Magnus Stureson
Certification Officer



SP Technical Research Institute of Sweden

Box 857, SE-501 15 Borås, Sweden
Phone: +46 10-516 50 00
E-mail/internet: info@sp.se/www.sp.se

Empowered Certification Body No. 012: SP Certification, Sweden
For more information of Solar Keymark visit: www.solarkeymar.org
This certificate may not be reproduced other than in full, except with the prior written approval by SP. SP Certification rules SPCR402 applies.



Annex to Solar Keymark Certificate

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Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate						Licence Number		SP SC0471-16								
						Issued		2016-06-29								
Company holding the		Spectrum Solar				Country		Germany								
Brand (optional)		Spectrum Solar				Website		www.spectrumssolar.de								
Street, street number		Kupferstrasse 1				E-mail		info@spectrumssolar.de								
Postal Code / City, province		49843		Uelsen		Tel/Fax		00 49		59429899888						
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										
						Power output per collector module										
						G = 1000 W/m ²										
						Tm-Ta										
						0 K	10 K	30 K	50 K	70 K						
Collector name						Aperture area (Aa) m ²	Gross length mm	Gross width mm	Gross height mm	Gross area (AG) m ²	W	W	W	W	W	
Spectrum CPC 8						1,41	1 917	910	133	1,74	942	920	872	819	760	
Spectrum CPC 9						1,59	1 917	1 020	133	1,96	1 062	1 038	984	923	857	
Spectrum CPC 10						1,78	1 917	1 130	133	2,17	1 189	1 162	1 101	1 034	959	
Spectrum CPC 12						2,16	1 917	1 350	133	2,59	1 443	1 409	1 336	1 254	1 164	
Spectrum CPC 14						2,53	1 917	1 570	133	3,01	1 690	1 651	1 565	1 469	1 363	
Spectrum CPC 15						2,72	1 917	1 680	133	3,22	1 817	1 775	1 683	1 580	1 465	
Spectrum CPC 16						2,91	1 917	1 790	133	3,43	1 944	1 899	1 800	1 690	1 568	
Spectrum CPC 18						3,28	1 917	2 010	133	3,85	2 191	2 140	2 029	1 905	1 767	
Spectrum CPC 20						3,66	1 917	2 230	133	4,28	2 445	2 388	2 264	2 125	1 972	
Spectrum CPC 21						3,84	1 917	2 340	133	4,49	2 565	2 506	2 376	2 230	2 069	
Spectrum CPC 22						4,03	1 917	2 450	133	4,70	2 692	2 630	2 493	2 340	2 171	
Spectrum CPC 24						4,41	1 917	2 670	133	5,12	2 946	2 878	2 728	2 561	2 376	
Performance test method						Glazed liquid heating collector - steady state - outdoor										
Performance parameters related to aperture						η ₀	a ₁	a ₂								
Units						-	W/(m ² K)	W/(m ² K ²)								
Test results - Flow rate and fluid see note 1						0,668	1,496	0,005								
Bi-directional incidence angle modifiers?						Yes	Kθ values are obligatory for 50°.									
Incidence angle modifiers Kθ(θT) transversal direction						Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°	
						Kθ(θT)	-	1,03	-	1,05	-	1,18	-	-	0,00	
Incidence angle modifiers Kθ(θL) longitudinal direction						Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°	
						Kθ(θL)	-	-	-	-	0,95	-	-	-	0,00	
Stagnation temperature - Weather conditions see note 2						Tstg		276		°C						
Effective thermal capacity						ceff = C/Ag		3,17		kJ/(m ² K)						
Max. intended operation temperature - see note 3						Tmax,op		120		°C						
Max. operation pressure - see note 3						pmax,op		1000		kPa						
Pressure drop table - for a collector family, the values shall be for the module with highest ΔP per m ² aperture area																
Flow rate		kg/(s m ²)	0	0,005	0,012	0,018	0,024	0,030								
Pressure drop, ΔP		Pa	0	20	110	270	483	721								
Optional weather data		Location					Link									
Testing Laboratory		Intertek Testing Services Shenzhen Ltd. Guangzhou Branch														
Website		www.intertek.com														
Test report id. number		131016040GZU-001						Date of test report		2014-01-07						
During the test GDIF/GTOT was always between		0,07	and	0,12												
Comments of testing laboratory:																
Negative pressure test of the collector according to EN12975-2:2006 5.9.2 was not performed.																
Note 1		Flow rate	0,020	kg/(s m ²)	Fluid	Water										
Note 2		Irradiance, G = 1000 W/m ² ; Ambient temperature, Ta=30 °C														
Note 3		Given by manufacturer														
Datasheet version: 4.06, 2014-01-15																
Certification Body: SP Technical Research Institute of Sweden Box 857, 501 15 Borås, Sweden www.sp.se info@sp.se tel +4610 516 5000																

Annex to Solar Keymark Certificate

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Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence Number	SP SC0471-16
	Issued	2016-06-29

Annual collector output kWh/module												
Collector name	Location and collector temperature (T _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
Spectrum CPC 8	1 602	1 376	1 151	1 349	1 137	939	972	796	638	1 046	857	685
Spectrum CPC 9	1 807	1 551	1 297	1 521	1 283	1 059	1 096	897	720	1 179	967	772
Spectrum CPC 10	2 023	1 737	1 452	1 703	1 436	1 186	1 226	1 004	806	1 320	1 082	864
Spectrum CPC 12	2 455	2 107	1 763	2 066	1 742	1 439	1 488	1 219	978	1 602	1 313	1 049
Spectrum CPC 14	2 875	2 468	2 064	2 420	2 041	1 685	1 743	1 428	1 146	1 877	1 538	1 228
Spectrum CPC 15	3 091	2 654	2 220	2 602	2 194	1 812	1 874	1 535	1 232	2 017	1 654	1 321
Spectrum CPC 16	3 307	2 839	2 375	2 784	2 347	1 939	2 005	1 642	1 318	2 158	1 769	1 413
Spectrum CPC 18	3 728	3 200	2 676	3 138	2 646	2 185	2 260	1 851	1 485	2 433	1 994	1 592
Spectrum CPC 20	4 159	3 571	2 987	3 501	2 952	2 438	2 522	2 065	1 657	2 715	2 225	1 777
Spectrum CPC 21	4 364	3 746	3 133	3 673	3 098	2 558	2 646	2 167	1 739	2 848	2 335	1 864
Spectrum CPC 22	4 580	3 932	3 288	3 855	3 251	2 685	2 777	2 274	1 825	2 989	2 450	1 957
Spectrum CPC 24	5 012	4 302	3 599	4 219	3 557	2 938	3 039	2 489	1 997	3 271	2 681	2 141

Collector mounting: Fixed or tracking	Fixed; slope = latitude - 15° (rounded to nearest 5°)
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Overview of locations				
Location	Latitude °	G _{tot} kWh/m ²	T _a °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°

G _{tot}	Annual total irradiation on collector plane	kWh/m ²
T _a	Mean annual ambient air temperature	°C
T _m	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_m). A detailed description of the calculations is available at <http://www.sp.se/en/index/services/solar/ScenoCalc/Sidor/default.aspx>.

Certification Body: SP Technical Research Institute of Sweden Box 857, 501 15 Borås, Sweden www.sp.se info@sp.se tel +4610 516 5000	Datasheet version: 4.06, 2014-01-15
	ScenoCalc version: Ver. 4.06 (Jan, 2014)