

Holder/Issued to/Manufacturer

Guangdong Fivestar Solar Energy Co., Ltd.

Liuchongwei Industrial Area, Wanjiang District, Dongguan City, Guangdong 523051, China

Product name and description

Solar thermal systems for water heating.
For technical information see Appendix (6 pages).

Models: FS-PSS-200 FS-PSS-300 FS-PSS-400 FS-PSS-500

Performance specification

The product is found to comply with the requirements in EN 12976-1:2006 Factory made systems, Part 1: General requirements and the Specific CEN Keymark Scheme Rules for Solar Thermal Products and are based on test results according to EN 12976-2:2006 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 (RISE Research Institutes of Sweden AB, No. 012), also see CEN-CENELEC Internal Regulations Part 4 Certification, Annex A.

Validity

This certificate is valid until 2023-04-25 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 RISE. This certificate was first issued 2013-04-25. RISE certification rules SPCR 402 for Keymark – Solar Thermal Products applies.

Johan Åkesson

Magnus Sturesson

Certificate No. SC0540-13 | issue 2 | 2018-07-03



RISE Research Institutes of Sweden AB | Certification
Box 857, SE-501 15 Borås, Sweden
Phone: +46 10-516 50 00
certifiering@ri.se | www.ri.se

2017-08-08



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Summary of annex to	EN12976-2	SOLAR SYSTEM test results	Licence Number	SC0540-13						
Annex to Solar KEYMARK Certificate			Issued	2018-07-03						
Company	Guangdong Fivestar Solar Energy Co.,Ltd		Country	China						
Brand (optional)	BrandName		Website	www.fivestarsolar.com						
Street	Liuchongwei Industrial Area, Wanjiang District,		E-mail	oversea@fivestarsolar.com						
Postal Code	523051	DongGuan , GuangDong	Tel. / Fax	+86	769-22774668/769 2277 6966					
System classification										
Application(s)	Hot water									
Solar loop, circulation principle	Pumped									
Direct solar loop / heat exchanger	Heat exchanger									
Open, vented or closed solar loop	Closed									
Drain back/down	Always filled (no drain)									
Store location	Indoor									
Store orientation (of main axis)	Vertical									
Type of auxiliary heating (internal back-up heat)	Electric									
If other auxiliary/internal back-up heating, please specify:	--									
Solar+supplementary OR Solar-only / Solar pre-heat	Solar only / Solar preheat									
Collector(s)			Heat store(s)							
Company	Guangdong Fivestar Solar		Company	Guangdong Fivestar Solar Energy						
Keymark lic.no. if available	SC1118-12		Keymark lic.no. if available	--						
Collector name	Per module			Store name	Total nominal volume litres	Gross height mm	Gross width mm	Gross depth mm	Auxiliary heated volume litres	Electrical aux. heating power kW
	Gross Area (AG) m ²	Gross length mm	Gross width mm							
FP3.0-E	2,00	2000	1000	200L	200	1517	521	521	--	1,5
				300L	300	1519	620	620	--	2,5
				400L	400	1576	710	710	--	2,5
				500L	500	1715	710	710	--	2,5
Solar loop controller			Solar loop fluid							
Keymark lic.no. if available	--		Recommended/required	No recommend./requirements						
Company	Changzhou Shuangri		Company	No recommend./requirements						
Name	SR868C8		Name	No recommend./requirements						
Solar loop pump - power range	--	W to --	Freezing point	-35 °C						
System family overview										
Collector name	Number of collectors in each configuration for each store									
	Store name									
	200L		300L		400L		500L			
FP3.0-E	2		2		3		4			
Testing Laboratory	Intertek Testing Services Shenzhen Ltd. Guangzhou Branch									
Website	www.intertek.com.cn									
Test report id. number	GZ12081617-1, GZ12081617-2									
Date of test report	2013-04-10, 2013-04-10									
Comments of test lab	No comments									
					 					

Summary of annex to	EN12976-2	test results	Certification No.	SC0540-13
Annex to Solar KEYMARK Certificate			Issued	2018-07-03

Company	Guangdong Fivestar Solar Energy Co.,Ltd		Country	China
Brand (optional)	BrandName		Website	www.fivestarsolar.com
Street	Liuchongwei Industrial Area,WanJiang District,		E-mail	oversea@fivestarsolar.com
Postal Code	523051	DongGuan , GuangDong	Tel. / Fax	+86 769-22774668/769 2277 6966


Parameters for systems extrapolation (Annex D)


Collector of measured system		Storage tank of measured system	
A_{ref} [m ²]	8,00	Volume [l]	500
η_0	0,758	A_{hx} [m ²]	--
a_1 [W/Km ²]	3,248	Piping	
a_2 [W/Km ²]	0,009		
IAM (50°)	0,820	$U_{loop,p}$	9,00

Parameters of system tested (ISO 9459-2)

Name of System Configuration Tested	I-O Diagram Parameters and Tank heat loss coefficient						
	a_1 [1/m ²]	a_2 [MJ/K]	a_3 [MJ]	U_s [W/K]			
	3,01	0,76	-1,90	4,210			
Draw-off profiles							
	H<16 MJ/m ²	H≥16 MJ/m ²	Mixing Draw-off		H<16 MJ/m ²	H≥16 MJ/m ²	Mixing Draw-off
V/V _{dep}	f (V/V _{dep})	f(V/V _{dep})	g(V/V _{dep})	V/V _{dep}	f (V/V _{dep})	f(V/V _{dep})	g(V/V _{dep})
0.1	12,30	12,25	12,19	1.6	0,15	0,15	0,21
0.2	12,25	12,10	12,23	1.7	0,15	0,14	0,18
0.3	12,25	12,07	12,20	1.8	0,11	0,13	0,17
0.4	12,25	11,97	12,12	1.9	0,10	0,12	0,17
0.5	12,11	12,00	12,10	2.0	0,08	0,12	0,13
0.6	11,83	12,05	12,08	2.1	0,07	0,11	0,14
0.7	11,46	11,93	11,75	2.2	0,04	0,10	0,13
0.8	8,68	9,30	7,30	2.3	0,02	0,10	0,10
0.9	3,10	2,79	2,77	2.4	0,02	0,09	0,11
1.0	1,17	0,86	1,21	2.5	0,02	0,08	0,10
1.1	0,63	0,39	0,69	2.6	0,02	0,07	0,07
1.2	0,38	0,25	0,54	2.7	0,02	0,07	0,09
1.3	0,28	0,21	0,40	2.8	0,01	0,07	0,09
1.4	0,25	0,18	0,28	2.9	0,01	0,06	0,06
1.5	0,18	0,16	0,24	3.0	0,02	0,06	0,07


Testing Laboratory	Intertek Testing Services Shenzhen Ltd. Guangzhou Branch
Website	www.intertek.com.cn
Test report id. number	GZ12081617-1, GZ12081617-2
Date of test report	2013-04-10, 2013-04-10
Test method	ISO 9459-2 (CSTG)


Comments of test lab	 <i>William zheng</i>
No comments	


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Company	Guangdong Fivestar Solar Energy Co.,Ltd		Country	China									
Brand (optional)	BrandName		Website	www.fivestarsolar.com									
Street	Liuchongwei Industrial Area,WanJiang District,		E-mail	oversea@fivestarsolar.com									
Postal Code	523051	DongGuan , GuangDong	Tel. / Fax	+86 769-22774668/769 2277 6966									
System family overview													
For each storage and collector size, give number of collectors													
Collector name	200L	300L	400L	500L									
FP3.0-E	2	2	3	4									
Name of system configuration													
Collector name			FP3.0-E	No. Collectors									
			2	Storage name									
			200L										
Calculated annual results for "solar-only / preheat system"													
Location	Qd,sh	Daily drawoff 140 l				Daily drawoff 170 l				Daily drawoff 200 l			
		Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol
	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	
Stockholm SE	NA	2166	1295	0	60	2627	1416	0	54	3094	1509	0	49
WürzburgDE	NA	2075	1388	0	67	2519	1474	0	59	2968	1566	0	53
Davos CH	NA	2352	2125	0	90	2849	2279	0	80	3356	2432	0	72
Athens GR	NA	1615	1431	0	89	1956	1629	0	83	2305	1825	0	79
Perf. indicators for the table above													
Qd,sh	MJ/y	Not relevant for solar domestic hot water system											
Qd	MJ/y	Annual heat demand for domestic hot water											
QL	MJ/y	Annual heat energy delivered by the solar system											
Qpar	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)											
f _{sol} =Q _L /Q _d	-	Solar fraction											
Ref. conditions	G	Stockholm SE	Würzburg DE	Davos CH	Athens GR								
		1 157	1 230	1 684	1 736								
	T _{a,ave}	7,5	9,0	3,2	18,5								
	T _{c,ave}	8,5	10,0	5,4	17,8								
	± ΔT _c	6,4	3,0	0,8	7,4								
G	kWh/m ²	Annual irradiation South, 45°											
T _{a,ave}	°C	Annual average outdoor air temperature											
T _{c,ave}	°C	Annual average mains cold water temp.											
ΔT _c	K	Seasonal variation of T _c											
Th	45 °C	Desired hot water temperature (mixing valve temperature).											
Max. operating press. - collector side		600	kPa	Max. operating press. - tank side		700	kPa						
Testing Laboratory		Intertek Testing Services Shenzhen Ltd. Guangzhou Branch											
Website		www.intertek.com.cn											
Test report id. number		GZ12081617-1, GZ12081617-2											
Date of test report		2013-04-10, 2013-04-10											
Test method		ISO 9459-2 (CSTG)											
Comments of test lab		No comments											
		 <i>William Zheng</i>											

All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %

Version 4.5, 2017-10-24

Summary of annex to	EN12976-2	test results	Certification No.	SC0540-13										
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Brand (optional)	BrandName		Website	www.fivestarsolar.com										
Street	Liuchongwei Industrial Area,WanJiang District,		E-mail	oversea@fivestarsolar.com										
Postal Code	523051	DongGuan , GuangDong	Tel. / Fax	+86 769-22774668/769 2277 6966										
System family overview														
Collector name	For each storage and collector size, give number of collectors													
	200L			300L			400L			500L				
FP3.0-E	2			2			3			4				
Name of system configuration					FS-PSS-300									
Collector name	FP3.0-E		No. Collectors		2		Storage name		300L					
Calculated annual results for "solar-only / preheat system"														
Location	Qd,sh	Daily drawoff 200 l				Daily drawoff 250 l				Daily drawoff 300 l				
		Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	
	MJ/y	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	
Stockholm SE	NA	3094	1583	0	51	3865	1701	0	44	4638	1785	0	38	
WürzburgDE	NA	2968	1647	0	55	3709	1765	0	48	4451	1847	0	41	
Davos CH	NA	3356	2533	0	75	4194	2726	0	65	5038	2862	0	57	
Athens GR	NA	2305	1883	0	82	2884	2153	0	75	3459	2317	0	67	
Perf. indicators for the table above														
Qd,sh	MJ/y	Not relevant for solar domestic hot water system												
Qd	MJ/y	Annual heat demand for domestic hot water												
QL	MJ/y	Annual heat energy delivered by the solar system												
Qpar	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)												
f _{sol} =Q _l /Q _d	-	Solar fraction												
Ref. conditions	G	Stockholm SE	Würzburg DE	Davos CH	Athens GR									
	T _{a,ave}	7,5	9,0	3,2	18,5									
	T _{c,ave}	8,5	10,0	5,4	17,8									
	± ΔT _c	6,4	3,0	0,8	7,4									
	G	kWh/m ²	Annual irradiation South, 45°											
T _{a,ave}	°C	Annual average outdoor air temperature												
T _{c,ave}	°C	Annual average mains cold water temp.												
ΔT _c	K	Seasonal variation of T _c												
Th	45 °C	Desired hot water temperature (mixing valve temperature).												
Max. operating press. - collector side			600	kPa	Max. operating press. - tank side			700	kPa					
Testing Laboratory			Intertek Testing Services Shenzhen Ltd. Guangzhou Branch											
Website			www.intertek.com.cn											
Test report id. number			GZ12081617-1, GZ12081617-2											
Date of test report			2013-04-10, 2013-04-10											
Test method			ISO 9459-2 (CSTG)											
Comments of test lab			No comments											
			 <i>William zheng</i>											

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Postal Code	523051	DongGuan , GuangDong	Tel. / Fax	+86 769-22774668/769 2277 6966									
System family overview													
For each storage and collector size, give number of collectors													
Collector name	200L	300L	400L	500L									
FP3.0-E	2	2	3	4									
Name of system configuration													
Collector name			FS-PSS-400										
FP3.0-E		No. Collectors	3	Storage name									
				400L									
Calculated annual results for "solar-only / preheat system"													
Location	Qd,sh	Daily drawoff 250 l				Daily drawoff 300 l				Daily drawoff 400 l			
		Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol
	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	
Stockholm SE	NA	3865	2072	0	54	4638	2207	0	48	6193	2387	0	39
WürzburgDE	NA	3709	2161	0	58	4451	2295	0	52	5935	2472	0	42
Davos CH	NA	4194	3302	0	79	5038	3523	0	70	6713	3813	0	57
Athens GR	NA	2884	2421	0	84	3459	2729	0	79	4614	3105	0	67
Perf. indicators for the table above													
Qd,sh	MJ/y	Not relevant for solar domestic hot water system											
Qd	MJ/y	Annual heat demand for domestic hot water											
QL	MJ/y	Annual heat energy delivered by the solar system											
Qpar	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)											
f _{sol} =Q _L /Q _d	-	Solar fraction											
Ref. conditions	G	Stockholm SE	Würzburg DE	Davos CH	Athens GR								
	T _{a,ave}	1 157	1 230	1 684	1 736								
	T _{c,ave}	7,5	9,0	3,2	18,5								
	± ΔT _c	8,5	10,0	5,4	17,8								
		6,4	3,0	0,8	7,4								
G	kWh/m ²	Annual irradiation South, 45°											
T _{a,ave}	°C	Annual average outdoor air temperature											
T _{c,ave}	°C	Annual average mains cold water temp.											
ΔT _c	K	Seasonal variation of T _c											
Th	45 °C	Desired hot water temperature (mixing valve temperature).											
Max. operating press. - collector side		600	kPa	Max. operating press. - tank side		700	kPa						
Testing Laboratory		Intertek Testing Services Shenzhen Ltd. Guangzhou Branch											
Website		www.intertek.com.cn											
Test report id. number		GZ12081617-1, GZ12081617-2											
Date of test report		2013-04-10, 2013-04-10											
Test method		ISO 9459-2 (CSTG)											
Comments of test lab		No comments											
		 <i>William zheng</i>											

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Postal Code	523051	DongGuan , GuangDong	Tel. / Fax	+86 769-22774668/769 2277 6966									
System family overview													
For each storage and collector size, give number of collectors													
Collector name	200L	300L	400L	500L									
FP3.0-E	2	2	3	4									
Name of system configuration													
Collector name			FS-PSS-500										
FP3.0-E		No. Collectors	4	Storage name									
500L													
Calculated annual results for "solar-only / preheat system"													
Location	Qd,sh	Daily drawoff 300 l				Daily drawoff 400 l				Daily drawoff 600 l			
		Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol
	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	
Stockholm SE	NA	4638	2144	0	46	6193	2781	0	45	9280	3237	0	35
WürzburgDE	NA	4451	2138	0	48	5935	2873	0	48	8903	3466	0	39
Davos CH	NA	5038	3411	0	68	6713	4364	0	65	10069	4799	0	48
Athens GR	NA	3459	2562	0	74	4614	3452	0	75	6898	4438	0	64
Perf. indicators for the table above													
Qd,sh	MJ/y	Not relevant for solar domestic hot water system											
Qd	MJ/y	Annual heat demand for domestic hot water											
QL	MJ/y	Annual heat energy delivered by the solar system											
Qpar	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)											
$f_{sol}=Q_L/Q_d$	-	Solar fraction											
Ref. conditions		Stockholm SE	Würzburg DE	Davos CH	Athens GR								
	G	1 157	1 230	1 684	1 736								
	Ta,ave	7,5	9,0	3,2	18,5								
	Tc,ave	8,5	10,0	5,4	17,8								
	$\pm \Delta Tc$	6,4	3,0	0,8	7,4								
G	kWh/m ²	Annual irradiation South, 45°											
Ta,ave	°C	Annual average outdoor air temperature											
Tc,ave	°C	Annual average mains cold water temp.											
ΔTc	K	Seasonal variation of Tc											
Th	45 °C	Desired hot water temperature (mixing valve temperature).											
Max. operating press. - collector side		600	kPa	Max. operating press. - tank side		700	kPa						
Testing Laboratory		Intertek Testing Services Shenzhen Ltd. Guangzhou Branch											
Website		www.intertek.com.cn											
Test report id. number		GZ12081617-1, GZ12081617-2											
Date of test report		2013-04-10, 2013-04-10											
Test method		ISO 9459-2 (CSTG)											
Comments of test lab		No comments											
		 <i>William zheng</i>											