Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate	Certificate No.	011-7S1942 R
	Date of issue	03.12.2012

Company	Jiangsu Sunrain Solar Energy Co., Ltd	**Country**		P.R.China
Brand (optional)		**Website**		www.sunrain.com
Street, number	15F,West Tower,Xinyin Mansion,1#YingZhou Rd	**E-mail**		certification@sunrain.com
Postal Code	222000	**Tel.**	0086	51885959886
City	Lianyungang City, Jiangsu	**Fax**	0086	51885959808

Collector Type (flat plate / evacuate tubular / un-glazed)	Evacuated tubular collector
Integration in the roof possible ?	No

Collector name	Aperture area (Aa)	Gross length	Gross width	Gross height	Gross area (AG)	Power output per collector unit G = 1000 W/m² Tm-Ta : 0 K	10 K	30 K	50 K	70 K
	[m²]	[mm]	[mm]	[mm]	[m²]	[W]	[W]	[W]	[W]	[W]
TZ58/1800-12G	1.08	2,033	1,147	200	2.33	824	804	763	717	669
TZ58/1800-14G*	1.26	2,035	1,301	210	2.65	961	938	890	837	780
TZ58/1800-15G*	1.35	2,035	1,298	210	2.64	1,030	1,006	953	897	836
TZ58/1800-16G*	1.44	2,035	1,467	210	2.99	1,099	1,073	1,017	956	891
TZ58/1800-18G*	1.62	2,035	1,633	210	3.32	1,236	1,207	1,144	1,076	1,003
TZ58/1800-20G	1.80	2,032	1,810	205	3.68	1,373	1,341	1,271	1,196	1,114
TZ58/1800-24G*	2.16	2,035	2,131	210	4.34	1,648	1,609	1,525	1,435	1,337
TZ58/1800-30G*	2.70	2,035	2,543	210	5.18	2,060	2,011	1,907	1,793	1,672

Collector efficiency parameters related to aperture area (Aa) Type of fluid and flow rate see note 1	η_{0a}	0.763	-
	a_{1a}	1.776	W/(m²K)
	a_{2a}	0.004	W/(m²K²)
Stagnation temperature - Weather conditions see note 2	t_{stg}	248	°C
Effective thermal capacity	$C_{eff} = C/A_a$	285	kJ/(m²K)
Max. operation pressure - see note 3	p_{max}	20	kPa

Incidence angle modifiers $K_\theta(\theta)$	G_{DIF}/G_{TOT} min	G_{DIF}/G_{TOT} max	θ_T / θ_L	50°	*10°*	*20°*	*30°*	*40°*	*60°*	*70°*
			$K_\theta(\theta_T)$	1.75	1.06	1.12	1.25	1.37	1.82	2.15
	-	-	$K_\theta(\theta_L)$	0.92	1.00	0.99	0.97	0.95	0.84	0.70

G_{DIF}/G_{TOT}: min&max - while measuring

Optional values

Testing Laboratory	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number	11COL1010, 11COL1011, 11COL1011Q
Date of test report	11.06.2012
Perf. test method	EN 12975-2 6.1.4 (outdoor)

Comments of testing laboratory :

* dimensions according to manufacturer

Note 1	**Fluid**	Water	**Flow rate**	0.025	kg/s per m²
Note 2	**Irradiance, Gs=1000 W/m²** **Ambient temperature , Ta=30 °C**				
Note 3	**Given by manufacturer**				

TZS Forschungs- und Testzentrum für Solaranlagen
Institut für Thermodynamik und Wärmetechnik
Universität Stuttgart
Pfaffenwaldring 6, 70550 Stuttgart (Vaihingen)

VERSION 3.6, 2012.01.13

Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Certificate No.	011-7S1942 R
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Annual collector output kWh

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			
TZ58/1800-12G	1,694	1,489	1,285	1,539	1,344	1,152	1,045	883	735	1,128	954	794			
TZ58/1800-14G*	1,976	1,737	1,499	1,796	1,568	1,344	1,219	1,030	858	1,316	1,113	926			
TZ58/1800-15G*	2,118	1,861	1,606	1,924	1,680	1,440	1,306	1,104	919	1,410	1,193	993			
TZ58/1800-16G*	2,259	1,985	1,713	2,052	1,792	1,536	1,393	1,177	980	1,504	1,272	1,059			
TZ58/1800-18G*	2,541	2,234	1,928	2,309	2,016	1,728	1,568	1,325	1,103	1,692	1,431	1,191			
TZ58/1800-20G	2,823	2,482	2,142	2,565	2,240	1,920	1,742	1,472	1,225	1,880	1,590	1,323			
TZ58/1800-24G*	3,388	2,978	2,570	3,078	2,688	2,304	2,090	1,766	1,470	2,256	1,908	1,588			
TZ58/1800-30G*	4,235	3,723	3,213	3,848	3,360	2,880	2,613	2,208	1,838	2,820	2,385	1,985			

Collector mounting: Fixed or tracking	Fixed; slope = latitude - 15° (rounded to nearest 5°)

Overview of locations

Location	Latitude °	Gtot kWh/m²	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/m²
Ta	Mean annual ambient air temperature	°C
Tm	Constant collector operating temperature (mean of in- and outlet temperatures)	°C

Calculation of the annual collector performance is done by the official Solar Keymark spreadsheet tool. Hour by hour the collector output is calculated according to the efficiency parameters from the Keymark test using constant collector operating temperature (Tm). Detailed description with all equations used is available from the Solar Keymark web site (direct link: http://www.estif.org/solarkeymark/annexb1.php)

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Calculation program version:
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