

### Holder/Issued to/Manufacturer

## Sunshore Solar Energy CO., Ltd.

Industrial Park, Xiting Town, Tongzhou City, Jiangsu Province, China

### Product name and description

Vacuum tube solar thermal collectors for water heating.  
For technical information see Appendix (2 pages).

Models:      Z-RG/0.6-WF-0.93/10-58/1      Z-RG/0.6-WF-1.40/15-58/1      Z-RG/0.6-WF-1.68/18-58/1  
                 Z-RG/0.6-WF-1.87/20-58/1      Z-RG/0.6-WF-2.24/24-58/1      Z-RG/0.6-WF-2.43/26-58/1  
                 Z-RG/0.6-WF-2.80/30-58/1

### Performance specification

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 (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 2023-11-05 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 2013-11-04. RISE certification rules SPCR 402 for Keymark – Solar Thermal Products applies.

Johan Åkesson

Magnus Stuesson

Certificate No. SC1099-13 | issue 2 | 2018-11-05


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

2017-08-08



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<b>Annex to Solar Keymark Certificate - Summary of EN 12975 Test Results</b>						<b>Licence Number</b>		<b>SC1099-13</b>								
						<b>Date issued</b>		<b>2018-11-05</b>								
						<b>Issued by</b>		<b>RISE</b>								
<b>Licence holder</b>		SUNSHORE SOLAR ENERGY CO.,LTD.				<b>Country</b>		China								
<b>Brand (optional)</b>		SUNSHORE				<b>Web</b>		www.sunshore.cn								
<b>Street, Number</b>		Industrial Park, Xiting Town				<b>E-mail</b>		Global_market@sunshore.cn								
<b>Postcode, City</b>		226301		Tongzhou City		<b>Tel</b>		+49 4408-3088709								
<b>Collector Type</b>						Evacuated tubular collector										
<b>Collector name</b>						<b>Power output per collector</b> G <sub>b</sub> = 850 W/m <sup>2</sup> ; G <sub>d</sub> = 150 W/m <sup>2</sup> ϑ <sub>m</sub> - ϑ <sub>a</sub>										
						Gross area (A <sub>G</sub> )	Gross length	Gross width	Gross height	0 K	10 K	30 K	50 K	70 K	51 K	
						m <sup>2</sup>	mm	mm	mm	W	W	W	W	W	W	
Z-RG/0.6-WF-0.93/10-58/1						1,60	805	1990	165	651	635	584	505	399	500	
Z-RG/0.6-WF-1.40/15-58/1						2,34	1175	1990	165	952	929	854	739	584	731	
Z-RG/0.6-WF-1.68/18-58/1						2,79	1400	1990	165	1136	1108	1018	881	696	871	
Z-RG/0.6-WF-1.87/20-58/1						3,08	1550	1990	165	1254	1223	1123	972	769	962	
Z-RG/0.6-WF-2.24/24-58/1						3,68	1850	1990	165	1498	1461	1342	1161	919	1149	
Z-RG/0.6-WF-2.43/26-58/1						3,98	2000	1990	165	1620	1581	1452	1256	994	1243	
Z-RG/0.6-WF-2.80/30-58/1						4,58	2302	1990	165	1864	1819	1671	1445	1143	1430	
<b>Power output per m<sup>2</sup> gross area</b>						407	397	365	316	250	312					
<b>Performance parameters test method</b>						Steady state - outdoor										
<b>Performance parameters (related to AG)</b>						η <sub>0,hem</sub>	a <sub>1</sub>	a <sub>2</sub>								
<b>Units</b>						-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )								
<b>Test results</b>						0,407	0,778	0,021								
<b>Incidence angle modifier test method</b>						Steady state - outdoor										
<b>Bi-directional incidence angle modifiers</b>						Yes										
<b>Incidence angle modifier</b>						Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°	
<b>Transversal</b>						K <sub>θT, coll</sub>		1,02		1,19		1,43			0,00	
<b>Longitudinal</b>						K <sub>θL, coll</sub>				0,86				0,00		
<b>Heat transfer medium for testing</b>						Water										
<b>Flow rate for testing (per gross area, A<sub>G</sub>)</b>						dm/dt		0,012		kg/(sm <sup>2</sup> )						
<b>Maximum temperature difference for thermal performance calculations</b>						(ϑ <sub>m</sub> -ϑ <sub>a</sub> ) <sub>max</sub>		51,16		K						
<b>Standard stagnation temperature (G = 1000 W/m<sup>2</sup>; ϑ<sub>a</sub> = 30 °C)</b>						ϑ <sub>stg</sub>		210		°C						
<b>Effective thermal capacity, incl. fluid (per gross area, A<sub>G</sub>)</b>						C/m <sup>2</sup>		14,57		kJ/(Km <sup>2</sup> )						
<b>Maximum operating temperature</b>						ϑ <sub>max, op</sub>		80		°C						
<b>Maximum operating pressure</b>						p <sub>max, op</sub>		600		kPa						
<b>Testing laboratory</b>						Intertek Testing Services Shenzhen Ltd. Guangzhou Branch				<a href="http://www.intertek.com">http://www.intertek.com</a>						
<b>Test report(s)</b>						130605033GZU-001				<b>Dated</b>		15-10-2013				
<b>Comments of testing laboratory</b>						<p>The "negative pressure test of the collector" according to EN12975-2:2006,5.9.2 was not performed.</p> <p>Tests were performed based on EN 12975-2:2006.</p>						Datashet version: 5.01, 2016-03-01				
												 <i>William zheng</i>				
<b>RISE Research Institutes of Sweden AB   Certification</b> Box 857, SE-501 15 Borås, Sweden, Phone: +46 10-516 50 00, certifiering@ri.se   www.ri.se																

<b>Annex to Solar Keymark Certificate</b>	<b>Licence Number</b>	<b>SC1099-13</b>
<b>Supplementary Information</b>	<b>Issued</b>	<b>2018-11-05</b>

Annual collector output in kWh/collector at mean fluid temperature $\vartheta_m$ based on ISO 9806:2013 test results													
Collector name	Standard Locations $\vartheta_m$	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
Z-RG/0.6-WF-0.93/10-58/1		1 137	920	630	931	688	424	686	500	308	739	541	327
Z-RG/0.6-WF-1.40/15-58/1		1 663	1 346	921	1 361	1 006	620	1 004	731	450	1 081	791	478
Z-RG/0.6-WF-1.68/18-58/1		1 983	1 605	1 098	1 623	1 199	739	1 197	872	536	1 289	943	570
Z-RG/0.6-WF-1.87/20-58/1		2 189	1 771	1 212	1 791	1 324	816	1 321	962	592	1 423	1 041	630
Z-RG/0.6-WF-2.24/24-58/1		2 615	2 116	1 448	2 140	1 581	975	1 579	1 150	707	1 700	1 244	752
Z-RG/0.6-WF-2.43/26-58/1		2 828	2 289	1 566	2 315	1 710	1 054	1 707	1 243	765	1 838	1 345	814
Z-RG/0.6-WF-2.80/30-58/1		3 255	2 634	1 803	2 664	1 968	1 213	1 965	1 431	880	2 115	1 548	936
Annual output per m <sup>2</sup> gross area		711	575	394	582	430	265	429	312	192	462	338	204
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1714 kWh/m <sup>2</sup>			1166 kWh/m <sup>2</sup>			1244 kWh/m <sup>2</sup>		
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 $\vartheta_m$ (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 <a href="http://www.solarkeymark.org/scenocalc">www.solarkeymark.org/scenocalc</a>													

Additional Information		
Collector heat transfer medium	Water	
Hybrid Thermal and Photo Voltaic collector	No	
The collector is deemed to be suitable for roof integration	Yes	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	C	--
Maximum tested positive load	4700	Pa
Maximum tested negative load	--	Pa
Hail resistance using steel ball (maximum drop height)	0,8	m

Energy Labelling Information			
	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$	
Z-RG/0.6-WF-0.93/10-58/1	1,60	Collector efficiency ( $\eta_{col}$ )	34 %
Z-RG/0.6-WF-1.40/15-58/1	2,34	<i>Remark: Collector efficiency (<math>\eta_{col}</math>) 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/m<sup>2</sup>, expressed in % and rounded to the nearest integer. Deviating from the regulation <math>\eta_{col}</math> is based on reference area (<math>A_{sol}</math>) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2013.</i>	
Z-RG/0.6-WF-1.68/18-58/1	2,79		
Z-RG/0.6-WF-1.87/20-58/1	3,08		
Z-RG/0.6-WF-2.24/24-58/1	3,68		
Z-RG/0.6-WF-2.43/26-58/1	3,98		
Z-RG/0.6-WF-2.80/30-58/1	4,58		
		Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$	
		Zero-loss efficiency ( $\eta_0$ )	0,407 --
		First-order coefficient ( $a_1$ )	0,78 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0,021 W/(m <sup>2</sup> K <sup>2</sup> )
		Incidence angle modifier IAM (50°)	0,00 --
		<i>Remark: The data given in this section are related to collector reference area (<math>A_{sol}</math>) 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>	