

**Holder/Issued to/Manufacturer****Tec-solar Energy Industry Co, Ltd.**

No. 33, Kunlun ROAD 213000, Changzhou, Jiangsu, China

**Product name and description**

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

Models: TS-24-58PA

**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 2023-05-31 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 2013-05-31. RISE certification rules SPCR 402 for Keymark – Solar Thermal Products applies.

Johan Åkesson

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Certificate No. SC0601-13 | issue 2 | 2018-06-07

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2017-08-08



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<b>Annex to Solar Keymark Certificate</b>	<b>Licence Number</b>	<b>SC0601-13</b>
<b>Supplementary Information</b>	<b>Issued</b>	<b>2018-06-07</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
TS-24-58PA		3689	3089	2452	3046	2468	1902	2223	1752	1315	2395	1891	1406
Annual output per m <sup>2</sup> gross area		883	739	587	729	590	455	532	419	315	573	452	336
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 [www.solarkeymark.org/scenocalc](http://www.solarkeymark.org/scenocalc)

Additional Information		
Collector heat transfer medium	Water	
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)	C	--
Maximum tested positive load	2230	Pa
Maximum tested negative load	--	Pa
Hail resistance using steel ball (maximum drop height)	0,4	m

Energy Labelling Information				
	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$		
TS-24-58PA	4,18	Collector efficiency ( $\eta_{col}$ )	43	%
		<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>		
		<b>Data required for CDR (EU) No 812/2013 - Reference Area <math>A_{sol}</math></b>		
		Zero-loss efficiency ( $\eta_0$ )	0,488	--
		First-order coefficient ( $a_1$ )	1,24	W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0,008	W/(m <sup>2</sup> K <sup>2</sup> )
		Incidence angle modifier IAM (50°)	1,10	--
		<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>		