

### Issued to

**Megasun Manufacture Co., Ltd.**

387-388/5B-5B Block – Tan Bien Ward, Bien Hoa City, Dong Nai province, Vietnam

### Product name and description

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

Models: MGS-2000-BLT MGS-2500-BLT

### 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 ISO 9806:2017 Solar thermal collectors – 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 2026-04-06 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. RISE certification rules SPCR 402 for Keymark – Solar Thermal Products applies.

Martin Tillander

Annex to Solar Keymark Certificate					Licence Number		C900362							
					Date issued		2021-04-06							
					Issued by		RISE							
Licence holder		Megasun manufacture Co., Ltd			Country		Vietnam							
Brand (optional)		Megasun			Web		www.megasun.com.vn							
Street, Number		387-388/5B-5B Block, Tan Bien Ward			E-mail		info@megasun.com.vn							
Postcode, City		Bien Hoa City, Dong Nai Province			Tel		+84 2513 882488							
Collector Type					Flat plate collector									
Collector name					Power output per collector G <sub>b</sub> = 850 W/m <sup>2</sup> , G <sub>d</sub> = 150 W/m <sup>2</sup> & u = 1.3 m/s $\vartheta_m - \vartheta_a$									
					0 K	10 K	30 K	50 K	70 K	100 K				
					m <sup>2</sup>	mm	mm	mm	W	W	W	W	W	W
MGS-2000-BLT					2,00	2 000	1 000	80	1 399	1 335	1 191	1 022	829	494
MGS-2500-BLT					2,50	2 000	1 250	80	1 749	1 669	1 488	1 277	1 036	618
Power output per m <sup>2</sup> gross area									699	668	595	511	414	247
Performance parameters test method		Steady state - outdoor												
Performance parameters (related to A <sub>G</sub> )		$\eta_0, b$	a1	a2	a3	a4	a5	a6	a7	a8	Kd			
Units		-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )	J/(m <sup>3</sup> K)	-	J/(m <sup>2</sup> K)	s/m	W/(m <sup>2</sup> K <sup>4</sup> )	W/(m <sup>2</sup> K <sup>4</sup> )	-			
Test results		0,714	3,02	0,015	0,000	0,00	6 345	0,000	0,00	0,00	0,86			
Incidence angle modifier test method		Steady state - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		K <sub>θT, coll</sub>	1,00	1,00	0,99	0,97	0,93	0,85	0,71	0,46	0,00			
Longitudinal		K <sub>θL, coll</sub>	1,00	1,00	0,99	0,97	0,93	0,85	0,71	0,46	0,00			
Heat transfer medium for testing		Water												
Flow rate for testing (per gross area, A <sub>G</sub> )		dm/dt	0,020	kg/(sm <sup>2</sup> )										
Maximum temperature difference during thermal performance test		( $\vartheta_m - \vartheta_a$ ) <sub>max</sub>	70	K										
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; $\vartheta_a = 30^\circ\text{C}$ )		$\vartheta_{stg}$	210	°C										
Maximum operating temperature		$\vartheta_{max, op}$	120	°C										
Maximum operating pressure		p <sub>max, op</sub>	1000	kPa										
Testing laboratory		Intertek Testing Services Shenzhen Ltd. Guangzhou Branch				http://www.intertek.com								
Test report(s)		200925107GZU-001				Dated		2021-03-17						
Comments of testing laboratory		<p>Datasheet version: 6.1, 2019-09-26</p> <p>Above efficiency parameters come from test type MGS-2000-BLT;</p> <p>The performance parameter based aperture area (1.81 m<sup>2</sup>) are: <math>\eta_0, b' = 0.789</math>, <math>a1' = 3.34</math>, <math>a2' = 0.017</math>.</p>												
														
<p>RISE Research Institutes of Sweden AB   Certification</p> <p>Box 857, SE-501 15 Borås, Sweden, Phone: +46 10-516 50 00, certifying@ri.se   www.ri.se</p>														

<b>Annex to Solar Keymark Certificate</b> <b>Supplementary Information</b>							<b>Licence Number</b>			<b>C900362</b>			
							<b>Issued</b>			<b>2021-04-06</b>			
<b>Annual collector output in kWh/collector at mean fluid temperature <math>\vartheta_m</math></b>													
<b>Standard Locations</b>		<b>Athens</b>			<b>Davos</b>			<b>Stockholm</b>			<b>Würzburg</b>		
<b>Collector name</b>	<b><math>\vartheta_m</math></b>	<b>25°C</b>	<b>50°C</b>	<b>75°C</b>	<b>25°C</b>	<b>50°C</b>	<b>75°C</b>	<b>25°C</b>	<b>50°C</b>	<b>75°C</b>	<b>25°C</b>	<b>50°C</b>	<b>75°C</b>
MGS-2000-BLT		2 205	1 593	1 042	1 696	1 181	740	1 243	822	497	1 347	885	527
MGS-2500-BLT		2 756	1 992	1 303	2 120	1 476	925	1 554	1 028	621	1 684	1 107	658
Annual output per m <sup>2</sup> gross area		1 102	797	521	848	591	370	621	411	248	673	443	263
Annual efficiency, $\eta_a$		62%	45%	30%	52%	36%	23%	53%	35%	21%	54%	36%	21%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1630 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. 6.1 (September 2019). A detailed description of the calculations is available at <a href="http://www.estif.org/solarkeymarknew/">http://www.estif.org/solarkeymarknew/</a>													
<b>Additional Information</b>													
Collector heat transfer medium										Water			
The collector is deemed to be suitable for roof integration										Yes			
The collector was tested successfully under the following conditions:													
Climate class (A+, A, B or C)										B		--	
G (W/m <sup>2</sup> ) >		900		$\vartheta_a$ (°C) >		15		H <sub>x</sub> (MJ/m <sup>2</sup> ) >		540			
Maximum tested positive load										2400		Pa	
Maximum tested negative load										2400		Pa	
Hail resistance using steel ball (maximum drop height)										2		m	
<b>Additional collector attribute(s)</b>													
<input type="checkbox"/> Using external power source(s) for normal operation				<input type="checkbox"/> Active or passive measure(s) for self-protection									
<input type="checkbox"/> Co-generating thermal and electrical power				<input type="checkbox"/> Façade collector(s)									
<b>Energy Labelling Information</b>						<b>Additional Informative Technical Data</b>							
		Reference Area, A <sub>sol</sub> (m <sup>2</sup> )				Hydraulic Designation Code				Aperture Area, A <sub>a</sub> (m <sup>2</sup> )			
MGS-2000-BLT		2,00				8-VH-1234S-A:9,1890-C:20.6,1100-D				1,81			
MGS-2500-BLT		2,50				10-VH-1234S-A:9,1890-C:20.6,1310-				2,31			
<b>Data required for CDR (EU) No 811/2013 - Reference Area</b>						<b>Data required for CDR (EU) No 812/2013 - Reference Area A<sub>sol</sub></b>							
Collector efficiency ( $\eta_{col}$ )		55%				Zero-loss efficiency ( $\eta_0$ )		0,70		--			
Remark: Collector efficiency ( $\eta_{col}$ ) 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 $\eta_{col}$ is based on reference area (A <sub>sol</sub> ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.		First-order coefficient (a <sub>1</sub> )		3,02		Second-order coefficient (a <sub>2</sub> )		0,015		W/(m <sup>2</sup> K)			
		Incidence angle modifier IAM (50°)		0,93				--					
		Remark: The data given in this section are related to collector reference area (A <sub>sol</sub> ) 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.											
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