

### Issued to

**Jiangsu GMO Hi-tech Co., Ltd.**

No. 2, Weier Road, Jingjiang Economic Zone, Jiangsu Province, China

### Product name and description

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

Models: GMO 2000A

### 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 9806:2013 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 2025-11-17 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 2018-12-13. RISE certification rules SPCR 402 for Keymark – Solar Thermal Products applies.

Martin Tillander

Annex to Solar Keymark Certificate					Licence Number		SC0841-18																	
					Date issued		2021-01-15																	
					Issued by		RISE																	
Licence holder		Jiangsu GMO Hi-tech Co., Ltd.			Country		China																	
Brand (optional)		GMO			Web		www.gmoworld.com																	
Street, Number		No.2 Weier Road, Jingjiang Economic Zone			E-mail		xlh@gmoworld.com																	
Postcode, City		Jiangsu Province			Tel		+86 0523-80378999																	
Collector Type					Flat plate collector																			
Collector name					Gross area ( $A_G$ )		Gross length		Gross width		Gross height		Power output per collector $G_b = 850 \text{ W/m}^2$ , $G_d = 150 \text{ W/m}^2$ & $u = 1.3 \text{ m/s}$ $\vartheta_m - \vartheta_a$											
					m <sup>2</sup>		mm		mm		mm		0 K		10 K		30 K		50 K		70 K		79 K	
GMO 2000A					2,00		2 000		1 000		76		1 466		1 387		1 195		956		671		520	
Power output per m <sup>2</sup> gross area					733		694		597		478		335		260									
Performance parameters test method					Steady state - outdoor																			
Performance parameters (related to $A_G$ )					$\eta_0, b$		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					0,745		3,649		0,029		0,000		0,00		2 710		0,00		0,00		0,00		0,89	
Incidence angle modifier test method					Steady state - outdoor																			
Incidence angle modifier					Angle		10°		20°		30°		40°		50°		60°		70°		80°		90°	
Transversal					$K_{\theta T, coll}$		1,00		1,00		0,99		0,97		0,93		0,85		0,71		0,46		0,00	
Longitudinal					$K_{\theta L, coll}$		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, $A_G$ )					dm/dt		0,020		kg/(sm <sup>2</sup> )															
Maximum temperature difference during thermal performance test					$(\vartheta_m - \vartheta_a)_{max}$		49,45		K															
Standard stagnation temperature ( $G = 1000 \text{ W/m}^2$ ; $\vartheta_a = 30 \text{ °C}$ )					$\vartheta_{stg}$		190		°C															
Maximum operating temperature					$\vartheta_{max, op}$		120		°C															
Maximum operating pressure					$p_{max, op}$		800		kPa															
Testing laboratory					Intertek Testing Services Shenzhen Ltd. Guangzhou Branch							http://www.intertek.com												
Test report(s)					180927072GZU-001							Dated		2018-11-07, revised 2021-01-14										
Comments of testing laboratory					Datasheet version: 6.1, 2019-09-26																			
<p><i>This data sheet replace the previous version issued on 2018-12-13;</i>  <i>The performance parameter based aperture area (1.85 m2) are: <math>\eta_0, b'=0.805</math>,  <math>a1'=3.945</math>, <math>a2'=0.031</math>.</i></p>																								
<p>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</p>																								

<b>Annex to Solar Keymark Certificate</b>	<b>Licence Number</b>	<b>SC0841-18</b>
<b>Supplementary Information</b>	<b>Issued</b>	<b>2021-01-15</b>

Annual collector output in kWh/collector at mean fluid temperature $\vartheta_m$													
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
GMO 2000A		2 311	1 546	852	1 711	1 063	522	1 270	754	368	1 383	813	392
Annual output per m <sup>2</sup> gross area		1 156	773	426	856	532	261	635	377	184	692	406	196
Annual efficiency, $\eta_a$		65%	44%	24%	52%	33%	16%	54%	32%	16%	56%	33%	16%
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 <http://www.estif.org/solarkeymarknew/>

Additional Information			
Collector heat transfer medium	Water-Glycole		
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
		$H_x$ (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

Additional collector attribute(s)			
<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)		

Energy Labelling Information		Additional Informative Technical Data	
	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Hydraulic Designation Code	Aperture Area, $A_a$ (m <sup>2</sup> )
GMO 2000A	2,00	9-VH-1234S-A:8,1900-C:22,1060-D	1,85

Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$		Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$	
Collector efficiency ( $\eta_{col}$ )	54%	Zero-loss efficiency ( $\eta_0$ )	0,73
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 ( $A_{sol}$ ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.		First-order coefficient ( $a_1$ )	3,65
		Second-order coefficient ( $a_2$ )	0,029
		Incidence angle modifier IAM (50°)	0,93
			--
		Remark: The data given in this section are related to collector reference area ( $A_{sol}$ ) 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.	