



**Certificate no.**  
*Certificado nº* **PSK-001/2021**

**Name and address of certificate holder:**  
*Nome e morada do titular do certificado:*

**SOLE S. A.**  
Lefktron and Laikon Agonon,  
Acharnai – 13671, Athens  
Greece

**Product:**  
*Produto:*

**Thermal solar collector**  
*Coletor solar térmico*

**Type references:**  
*Referências:*

Climasol 200; Climasol 250; Climasol 270

**Trademark(s):**  
*Marca(s) comercial(is):*

EUROSTAR, AQUASOL, OLYMPUS, SUNLIT

**Technical characteristics:**  
*Características técnicas:*

Summary of EN ISO 9806 Test Results: Registration No. PSK-001/2021  
(in annex)  
*Resumo dos resultados dos ensaios realizados segundo a norma EN ISO 9806:  
Registo Nº PSK-001/2021 (em anexo)*

**This product is in conformity with:**  
*Este produto está em conformidade com:*

EN 12975-1:2006 + A1:2010, EN ISO 9806:2017

and with the Specific Keymark Scheme Rules for Solar Thermal Products  
*e com as Regras Particulares do CEN Keymark Scheme para Produtos Solares Térmicos.*

**Test report(s) no. / issued by:**  
*Relatório(s) de ensaios nº(s) / emitido(s) por:*

4290 DQ2, 4298 DE3 and / e 4299 DE3 / DEMOKRITOS

**Additional information (if any):**  
*Informação adicional (se existir):*

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**This certificate is valid until:**  
*Este certificado é válido até:*

2026-01-17

**and supersedes certificate no:**  
*e substitui o certificado nº:*

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**Date of issue:**  
*Data de emissão:*


2021-01-18



Francisco Barroca  
General Manager / *Diretor Geral*



This Certificate includes one Annex with 2 (two) pages  
*Este Certificado é constituído por um Anexo com 2 (duas) páginas*

|  |  |  |                      |                                    |  |       |                         |       |                                     |                                    |      |  |
|--|--|--|----------------------|------------------------------------|--|-------|-------------------------|-------|-------------------------------------|------------------------------------|------|--|
| Annex to Solar Keymark Certificate   |  |  |                      |                                    | Licence Number   |       | PSK-001/2021            |       |                                     |                                    |      |  |
|  |  |  |                      |                                    | Date issued  |       | 2021-01-18              |       |                                     |                                    |      |  |
|  |  |  |                      |                                    | Issued by  |       | CB                      |       |                                     |                                    |      |  |
| Licence holder   |  | SOLE S.A.  |                      |                                    | Country  |       | Greece                  |       |                                     |                                    |      |  |
| Brand (optional)   |  | CLIMASOL   |                      |                                    | Web  |       | www.sole.gr             |       |                                     |                                    |      |  |
| Street, Number   |  | Laikon Agonon & Lefktron   |                      |                                    | E-mail   |       |                         |       |                                     |                                    |      |  |
| Postcode, City   |  | 13671 Acharnes, Attica   |                      |                                    | Tel  |       | +30 210 2389500         |       |                                     |                                    |      |  |
| Collector Type   |  |  |                      |                                    | Flat plate collector   |       |                         |       |                                     |                                    |      |  |
| Collector name   |  |  |                      |                                    | Power output per collector   |       |                         |       |                                     |                                    |      |  |
|  |  |  |                      |                                    | Gb = 850 W/m <sup>2</sup> , Gd = 150 W/m <sup>2</sup> & u = 1.3 m/s<br>$\vartheta_m - \vartheta_a$ |       |                         |       |                                     |                                    |      |  |
|  |  |  |                      |                                    | 0 K  | 10 K  | 30 K                    | 50 K  | 70 K                                | 91 K                               |      |  |
|  |  |  |                      |                                    | W  | W     | W                       | W     | W                                   | W                                  |      |  |
| CLIMASOL 200   |  |  |                      |                                    | 1,432  | 1,361 | 1,186                   | 965   | 698                                 | 370                                |      |  |
| CLIMASOL 250   |  |  |                      |                                    | 1,731  | 1,646 | 1,434                   | 1,167 | 844                                 | 447                                |      |  |
| CLIMASOL 270   |  |  |                      |                                    | 2,009  | 1,910 | 1,664                   | 1,353 | 979                                 | 519                                |      |  |
|  |  |  |                      |                                    |  |       |                         |       |                                     |                                    |      |  |
|  |  |  |                      |                                    |  |       |                         |       |                                     |                                    |      |  |
|  |  |  |                      |                                    |  |       |                         |       |                                     |                                    |      |  |
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|  |  |  |                      |                                    |  |       |                         |       |                                     |                                    |      |  |
|  |  |  |                      |                                    |  |       |                         |       |                                     |                                    |      |  |
|  |  |  |                      |                                    |  |       |                         |       |                                     |                                    |      |  |
|  |  |  |                      |                                    |  |       |                         |       |                                     |                                    |      |  |
| Power output per m <sup>2</sup> gross area   |  |  |                      |                                    | 750  | 713   | 621                     | 505   | 365                                 | 193                                |      |  |
| 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   |  | 0.760  | 3.39                 | 0.030                              | 0.000  | 0.00  | 0                       | 0.000 | 0.00                                | 0.0E+00                            | 0.91 |  |
| Incidence angle modifier test method   |  | Steady state - outdoor   |                      |                                    |  |       |                         |       |                                     |                                    |      |  |
| Incidence angle modifier   |  | Angle  | 10°                  | 20°                                | 30°  | 40°   | 50°                     | 60°   | 70°                                 | 80°                                | 90°  |  |
| Transversal  |  | K <sub>GT, coll</sub>  | 1.00                 | 1.00                               | 0.99   | 0.98  | 0.95                    | 0.88  | 0.75                                | 0.49                               | 0.00 |  |
| Longitudinal   |  | K <sub>GL, coll</sub>  | 1.00                 | 1.00                               | 0.99   | 0.98  | 0.95                    | 0.88  | 0.75                                | 0.49                               | 0.00 |  |
| Heat transfer medium for testing   |  | Water  |                      |                                    |  |       |                         |       |                                     |                                    |      |  |
| Flow rate for testing (per gross area, A <sub>G</sub> )  |  | dm/dt  | 0.021                | kg/(sm <sup>2</sup> )              |  |       |                         |       |                                     |                                    |      |  |
| Maximum temperature difference during thermal performance test   |  | ( $\vartheta_m - \vartheta_a$ ) <sub>max</sub>   | 60.9                 | K                                  |  |       |                         |       |                                     |                                    |      |  |
| Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; $\vartheta_a = 30^\circ\text{C}$ )  |  | $\vartheta_{stg}$  | 182                  | °C                                 |  |       |                         |       |                                     |                                    |      |  |
| Maximum operating temperature  |  | $\vartheta_{max, op}$  |                      | °C                                 |  |       |                         |       |                                     |                                    |      |  |
| Maximum operating pressure   |  | p <sub>max, op</sub>   | 1500                 | kPa                                |  |       |                         |       |                                     |                                    |      |  |
| Testing laboratory   |  | NCSR Demokritos  |                      |                                    |  |       | www.solar.demokritos.gr |       |                                     |                                    |      |  |
| Test report(s)   |  | 4298 DE3<br>4299 DE3<br>4290 DQ2   |                      |                                    |  |       | Dated                   |       | 2/12/2020<br>2/12/2020<br>2/12/2020 |                                    |      |  |
| Comments of testing laboratory   |  | Datasheet version: 6.1, 2019-09-26   |                      |                                    |  |       |                         |       |                                     |                                    |      |  |
|  |  | <p>N.C.S.R. "DEMOKRITOS"<br/>SOLAR ENERGY LABORATORY<br/>Tel: +210 6503615 - Fax: +210 6544592<br/>P.O. BOX 60037, 15310 Ag. Paraskevi, Greece</p>  |                      |                                    |  |       |                         |       |                                     |                                    |      |  |
| <p>CERTIF Associação para a Certificação<br/>Rua José Afonso, 9E - 2810-237 Almada - Portugal<br/>Tel: +351 212 586 940 / Fax: +351 212 586 959 / mail@certif.pt / www.certif.pt</p> |  |  |                      |                                    |  |       |                         |       |                                     |                                    |      |  |

| Annex to Solar Keymark Certificate   |               | Licence Number  |       |   |                         |   |      |   |       |                                    |                         |       |      |
|--|---------------|---|-------|---|-------------------------|---|------|---|-------|------------------------------------|-------------------------|-------|------|
| Supplementary Information  |               | PSK-001/2021  |       |   |                         |   |      |   |       |                                    |                         |       |      |
|  |               | Issued  |       |   |                         |   |      |   |       |                                    |                         |       |      |
|  |               | 2021-01-18  |       |   |                         |   |      |   |       |                                    |                         |       |      |
| Annual collector output in kWh/collector at mean fluid temperature $\vartheta_m$   |               |   |       |   |                         |   |      |   |       |                                    |                         |       |      |
| Standard Locations   |               | Athens  |       |   | Davos                   |   |      | Stockholm                                       |       |                                    | Würzburg                |       |      |
| Collector name   | $\vartheta_m$ | 25°C  | 50°C  | 75°C  | 25°C                    | 50°C  | 75°C | 25°C  | 50°C  | 75°C                               | 25°C                    | 50°C  | 75°C |
| CLIMASOL 200   |               | 2,291   | 1,583 | 911   | 1,725                   | 1,107   | 572  | 1,276   | 783   | 400                                | 1,389                   | 847   | 426  |
| CLIMASOL 250   |               | 2,771   | 1,914 | 1,101   | 2,087                   | 1,339   | 692  | 1,543   | 947   | 483                                | 1,680                   | 1,025 | 516  |
| CLIMASOL 270   |               | 3,215   | 2,221 | 1,278   | 2,421                   | 1,553   | 803  | 1,790   | 1,099 | 561                                | 1,949                   | 1,189 | 598  |
| Annual output per m <sup>2</sup> gross area  |               | 1,200   | 829   | 477   | 903                     | 579   | 299  | 668   | 410   | 209                                | 727                     | 444   | 223  |
| Annual efficiency, $\eta_a$  |               | 68%   | 47%   | 27%   | 55%                     | 36%   | 18%  | 57%   | 35%   | 18%                                | 58%                     | 36%   | 18%  |
| 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-Glycole           |       |      |
| The collector is deemed to be suitable for roof integration  |               |   |       |   |                         |   |      |   |       |                                    | No                      |       |      |
| The collector was tested successfully under the following conditions:  |               |   |       |   |                         |   |      |   |       |                                    |                         |       |      |
| Climate class (A+, A, B or C)  |               |   |       |   |                         |   |      |   |       |                                    | A                       |       | --   |
| G (W/m <sup>2</sup> ) >  |               | 1000  |       | $\vartheta_a$ (°C) >  |                         | 20  |      | H <sub>x</sub> (MJ/m <sup>2</sup> ) >           |       | 600                                |                         | 600   |      |
| Maximum tested positive load   |               |   |       |   |                         |   |      |   |       |                                    | 3000                    |       | Pa   |
| Maximum tested negative load   |               |   |       |   |                         |   |      |   |       |                                    | 3000                    |       | 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> ) |       |                                    |                         |       |      |
| CLIMASOL 200   |               | 1.91  |       | 9-VH-12345-A:7.2,1860-C:16.4,1010-  |                         |   |      | 1.71  |       |                                    |                         |       |      |
| CLIMASOL 250   |               | 2.31  |       | 11-VH-12345-A:7.2,1970-   |                         |   |      | 2.31  |       |                                    |                         |       |      |
| CLIMASOL 270   |               | 2.68  |       | 13-VH-12345-A:7.2,2037-   |                         |   |      | 2.45  |       |                                    |                         |       |      |
| Data required for CDR (EU) No 811/2013 - Reference Area  |               |   |       |   |                         | Data required for CDR (EU) No 812/2013 - Reference Area A <sub>sol</sub>  |      |   |       |                                    |                         |       |      |
| Collector efficiency ( $\eta_{col}$ )  |               | 57%   |       |   |                         | Zero-loss efficiency ( $\eta_0$ )   |      | 0.75  |       | --                                 |                         |       |      |
| 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> )   |      | 3.39  |       | W/(m <sup>2</sup> K)               |                         |       |      |
|  |               |   |       |   |                         | Second-order coefficient (a <sub>2</sub> )  |      | 0.030   |       | W/(m <sup>2</sup> K <sup>2</sup> ) |                         |       |      |
|  |               |   |       |   |                         | Incidence angle modifier IAM (50°)  |      | 0.95  |       | --                                 |                         |       |      |
|  |               |   |       |   |                         | 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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| Tel: +351 212 586 940 / Fax: +351 212 586 959 / mail@certif.pt / www.certif.pt   |               |   |       |   |                         |   |      |   |       |                                    |                         |       |      |