

# KEYMARK CERTIFICATE

## SK0805550

TUV CYPRUS LTD Certifies that the organization

### JOHNSUN HEATERS LTD

**Address:** Voukourestiou 20, 2033 Strovolos, Nicosia (CY)

**Supplies:** Solar thermal collectors

**In compliance with:** EN 12975-1:2006+A1:2010 & EN ISO 9806:2013

**Certified Product:** Solar Collector Family

**Trade Mark:** SAF 1.5 ALUCASE, SAF 1.5 (H) ALUCASE, SAF 1.7 ALUCASE,  
SAF 1.7 (H) ALUCASE, SAF 2.0 ALUCASE, SAF 2.0 (H) ALUCASE  
SAF 2.45 ALUCASE, SAF 2.45 (H) ALUCASE

**Test Results:** Annex to certificate

**Certification scheme:** The initial Certificate with number SK0805550 of Solar Keymark Certification Body CEN033 was issued on 15/04/2021.  
In order to grant this certificate, TUV CYPRUS has visited the manufacturing site and verified the implementation of the quality management system. TUV CYPRUS performs these tasks periodically while the certificate has not been cancelled, in accordance with the Product Certification Regulations and the Rules for Authorization to use Conformity Mark for Solar Collectors.




SOLAR KEYMARK  
CERTIFICATION BODY  
GEN 033

Accredited by



Certificate No. 885

  
TUV CYPRUS (TUV NORD) LTD  
Certification Body



Nicosia, 15/04/2021  
Initial Certification : 15/04/2021  
Valid until : 14/04/2026





|   |  |                           |                      |                                    |  |       |   |       |                                    |                                    |       |       |     |     |
|---|--|---------------------------|----------------------|------------------------------------|--|-------|---|-------|------------------------------------|------------------------------------|-------|-------|-----|-----|
| Annex to Solar Keymark Certificate                  |  |                           |                      |                                    | Licence Number   |       | SK0805550   |       |                                    |                                    |       |       |     |     |
|   |  |                           |                      |                                    | Date issued  |       | 2021-04-15  |       |                                    |                                    |       |       |     |     |
|   |  |                           |                      |                                    | Issued by  |       | TUV CYPRUS LTD  |       |                                    |                                    |       |       |     |     |
| Licence holder                                      |  | JOHNSUN HEATERS LTD       |                      |                                    | Country  |       | CYPRUS  |       |                                    |                                    |       |       |     |     |
| Brand (optional)                                    |  |                           |                      |                                    | Web  |       | <a href="http://www.johnsun-solar.com.cy/">http://www.johnsun-solar.com.cy/</a> |       |                                    |                                    |       |       |     |     |
| Street, Number                                      |  | Voukourestiou, 20         |                      |                                    | E-mail   |       | info@johnsun-solar.com.cy   |       |                                    |                                    |       |       |     |     |
| Postcode, City                                      |  | 2033, Strovolos (Nicosia) |                      |                                    | Tel  |       | +357  |       | 22317170                           |                                    |       |       |     |     |
| 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                               | 88 K                               |       |       |     |     |
|   |  |                           |                      |                                    | W  | W     | W   | W     | W                                  | W                                  |       |       |     |     |
| SAF 1.5 ALUCASE                                     |  |                           |                      |                                    | 1,48   | 1.490 | 991   | 86    | 1.007                              | 944                                | 814   | 678   | 536 | 403 |
| SAF 1.7 ALUCASE                                     |  |                           |                      |                                    | 1,50   | 1.725 | 870   | 86    | 1.021                              | 957                                | 825   | 687   | 543 | 408 |
| SAF 2.0 ALUCASE                                     |  |                           |                      |                                    | 1,97   | 1.990 | 990   | 86    | 1.340                              | 1.257                              | 1.083 | 902   | 713 | 536 |
| SAF 2.45 ALUCASE                                    |  |                           |                      |                                    | 2,44   | 1.989 | 1.225   | 86    | 1.660                              | 1.556                              | 1.342 | 1.117 | 883 | 664 |
| SAF 1.5(H) ALUCASE                                  |  |                           |                      |                                    | 1,48   | 991   | 1.490   | 86    | 1.007                              | 944                                | 814   | 678   | 536 | 403 |
| SAF 1.7(H) ALUCASE                                  |  |                           |                      |                                    | 1,50   | 870   | 1.725   | 86    | 1.021                              | 957                                | 825   | 687   | 543 | 408 |
| SAF 2.0(H) ALUCASE                                  |  |                           |                      |                                    | 1,97   | 990   | 1.990   | 86    | 1.340                              | 1.257                              | 1.083 | 902   | 713 | 536 |
| SAF 2.45(H) ALUCASE                                 |  |                           |                      |                                    | 2,44   | 1.225 | 1.989   | 86    | 1.660                              | 1.556                              | 1.342 | 1.117 | 883 | 664 |
| Power output per m <sup>2</sup> gross area          |  |                           |                      |                                    | 680  | 638   | 550   | 458   | 362                                | 272                                |       |       |     |     |
| Performance parameters test method                  |  | Steady state - outdoor    |                      |                                    |  |       |   |       |                                    |                                    |       |       |     |     |
| Performance parameters (related to A <sub>G</sub> ) |  | η <sub>0</sub> , 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  |  | 0,696                     | 4,20                 | 0,005                              | 0,000  | 0,00  | 8   | 0,000 | 0,00                               | 0,0E+00                            | 0,85  |       |     |     |
| 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                 | 0,99                               | 0,97   | 0,94  | 0,88  | 0,78  | 0,63                               | 0,39                               | 0,00  |       |     |     |
| Longitudinal  |  | K <sub>θL, coll</sub>     | 1,00                 | 0,99                               | 0,97   | 0,94  | 0,88  | 0,78  | 0,63                               | 0,39                               | 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   | $(\vartheta_m - \vartheta_a)_{max}$  | 58  | K                     |
| Standard stagnation temperature ( $G = 1000 \text{ W/m}^2$ ; $\vartheta_a = 30 \text{ }^\circ\text{C}$ ) | $\vartheta_{stg}$  | 153   | $^\circ\text{C}$      |
| Maximum operating temperature  | $\vartheta_{max,op}$   | 100   | $^\circ\text{C}$      |
| Maximum operating pressure   | $p_{max,op}$   | 1000  | kPa                   |
| Testing laboratory   |  | Aelab   |                       |
| Test report(s)   | Σ.16.09.15.01/Rev.01 , Σ.16.09.15.03/Rev.01<br>Σ.30.05.16.02 , Σ.16.09.15.03_IT<br>Σ.16.09.15.01_PD , Σ.16.09.15.03_PD | <a href="http://www.aelab.gov.cy">www.aelab.gov.cy</a>  |                       |
|  |  | Dated   | 13/04/2021            |
|  |  |   | 17/10/2019            |
| Comments of testing laboratory   |  | Datasheet version: 6.1, 2019-09-26  |                       |
| <u>Not entered</u>   |  |   |                       |
| TÜV CYPRUS, Papaflessa 2, 2235 Latsia, Nicosia, Cyprus P.O.Box: 20732, 1663 Nicosia, Cyprus              |  |   |                       |



|   |                |            |
|---|----------------|------------|
| Annex to Solar Keymark Certificate<br>Supplementary Information | Licence Number | SK0805550  |
|   | Issued         | 2021-04-15 |

| Annual collector output in kWh/collector at mean fluid temperature $\vartheta_m$   |   |                         |       |      |                         |       |      |                         |      |      |                         |      |      |
|--|---|-------------------------|-------|------|-------------------------|-------|------|-------------------------|------|------|-------------------------|------|------|
| Collector name   | Standard Locations                                    | Athens                  |       |      | Davos                   |       |      | Stockholm               |      |      | Würzburg                |      |      |
|  | $\vartheta_m$   | 25°C                    | 50°C  | 75°C | 25°C                    | 50°C  | 75°C | 25°C                    | 50°C | 75°C | 25°C                    | 50°C | 75°C |
| SAF 1.5 ALUCASE  |   | 1.528                   | 995   | 599  | 1.105                   | 711   | 418  | 820                     | 493  | 280  | 893                     | 528  | 293  |
| SAF 1.7 ALUCASE  |   | 1.549                   | 1.008 | 607  | 1.120                   | 720   | 424  | 831                     | 500  | 284  | 905                     | 535  | 297  |
| SAF 2.0 ALUCASE  |   | 2.034                   | 1.324 | 797  | 1.471                   | 946   | 556  | 1.092                   | 657  | 373  | 1.189                   | 703  | 390  |
| SAF 2.45 ALUCASE   |   | 2.519                   | 1.640 | 987  | 1.821                   | 1.172 | 689  | 1.352                   | 813  | 462  | 1.473                   | 870  | 484  |
| SAF 1.5(H) ALUCASE   |   | 1.528                   | 995   | 599  | 1.105                   | 711   | 418  | 820                     | 493  | 280  | 893                     | 528  | 293  |
| SAF 1.7(H) ALUCASE   |   | 1.549                   | 1.008 | 607  | 1.120                   | 720   | 424  | 831                     | 500  | 284  | 905                     | 535  | 297  |
| SAF 2.0(H) ALUCASE   |   | 2.034                   | 1.324 | 797  | 1.471                   | 946   | 556  | 1.092                   | 657  | 373  | 1.189                   | 703  | 390  |
| SAF 2.45(H) ALUCASE  |   | 2.519                   | 1.640 | 987  | 1.821                   | 1.172 | 689  | 1.352                   | 813  | 462  | 1.473                   | 870  | 484  |
| Annual output per m <sup>2</sup> gross area  |   | 1.032                   | 672   | 404  | 747                     | 480   | 282  | 554                     | 333  | 189  | 604                     | 357  | 198  |
| Annual efficiency, $\eta_a$  |   | 58%                     | 38%   | 23%  | 46%                     | 29%   | 17%  | 48%                     | 29%  | 16%  | 49%                     | 29%  | 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 <a href="http://www.estif.org/solarkeymarknew/">http://www.estif.org/solarkeymarknew/</a> |   |                         |       |      |                         |       |      |                         |      |      |                         |      |      |

| Additional Information  |      |                      |    |                                       |      |       |
|---|------|----------------------|----|---------------------------------------|------|-------|
| Collector heat transfer medium  |      |                      |    |                                       |      | Water |
| 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   |
| Maximum tested positive load  |      |                      |    |                                       | 2386 | Pa    |
| Maximum tested negative load  |      |                      |    |                                       | 2386 | Pa    |
| Hail resistance using steel ball (maximum drop height)                |      |                      |    |                                       | 1,6  | m     |



| Additional collector attribute(s)  |   |   |   |
|--|---|---|---|
| Using external power source(s) for normal operation  |   | Active or passive measure(s) for self-protection  |   |
| Co-generating thermal and electrical power   |   | 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> )        |
| SAF 1.5 ALUCASE  | 1,48  | {8}-{V}-{1234S}-{A:14.1,1365}-{C:20.2,1050}-{}-   | "[1,32]"                                      |
| SAF 1.7 ALUCASE  | 1,50  | {7}-{V}-{1234S}-{A:14.1,1605}-{C:20.2,950}-{}-D   | "[1,34]"                                      |
| SAF 2.0 ALUCASE  | 1,97  | {8}-{V}-{1234S}-{A:14.1,1876}-{C:20.2,1050}-{}-   | "[1,78]"                                      |
| SAF 2.45 ALUCASE   | 2,44  | {10}-{V}-{1234S}-{A:14.1,1876}-{C:20.2,1050}-{}-  | "[2,24]"                                      |
| SAF 1.5(H) ALUCASE   | 1,48  | {12}-{H}-{1234S}-{A:14.1,876}-{C:20.2,1580}-{}-   | "[1.32]"                                      |
| SAF 1.7(H) ALUCASE   | 1,50  | {14}-{H}-{1234S}-{A:14.1,751}-{C:20.2,1800}-{}-   | "[1.34]"                                      |
| SAF 2.0(H) ALUCASE   | 1,97  | {16}-{H}-{1234S}-{A:14.1,876}-{C:20.2,2080}-{}-   | "[1.78]"                                      |
| SAF 2.45(H) ALUCASE  | 2,44  | {16}-{H}-{1234S}-{A:14.1,1111}-{C:20.2,2080}-{}-  | "[2.24]"                                      |
| <b>Data required for CDR (EU) No 811/2013 - Reference Area <math>A_{sol}</math></b>  |   | <b>Data required for CDR (EU) No 812/2013 - Reference Area <math>A_{sol}</math></b>   |   |
| Collector efficiency ( $\eta_{col}$ )  | 50%   | Zero-loss efficiency ( $\eta_0$ )   | 0,68      --                                  |
| <p>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 9806:2017.</p> |   | First-order coefficient ( $a_1$ )   | 4,20      W/(m <sup>2</sup> K)                |
|  |   | Second-order coefficient ( $a_2$ )  | 0,005      W/(m <sup>2</sup> K <sup>2</sup> ) |
|  |   | Incidence angle modifier IAM (50°)  | 0,88      --                                  |
|  |   | <p>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.</p> |   |
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