


| Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results | | | | | Licence Number | | 011-7S1941 F | | | | | | | |
|--|--|-------|-------------------------------------|--|--|----------------------|------------------------------------|----------------------|-----------------------|--------------------------|-------|--|-------|------|
| | | | | | Date issued | | 2019-01-21 | | | | | | | |
| | | | | | Issued by | | DIN CERTCO | | | | | | | |
| Licence holder | | | Solimpeks Solar Energy Corp. | | Country | | Turkey | | | | | | | |
| Brand (optional) | | | | | Web | | www.solimpeks.com | | | | | | | |
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| Postcode, City | | 42050 | Karatay Konya | | Tel | | +90 4 440 602 | | | | | | | |
| Collector Type | | | | | Flat plate collector, glazed | | | | | | | | | |
| Collector name | | | | | Power output per collector Gb = 850 W/m ² ; Gd = 150 W/m ² ; u = 3 m/s ̑m - ̑a | | | | | | | | | |
| | | | | | 0 K | 10 K | 30 K | 50 K | 70 K | 116 K | | | | |
| | | | | | m ² | mm | mm | mm | W | W | W | W | W | W |
| Wunder ALS 1809 | | | | | 1.80 | 1 929 | 933 | 91 | 1 301 | 1 238 | 1 099 | 944 | 774 | 322 |
| Wunder ALS 2110 | | | | | 2.07 | 1 988 | 1 041 | 90 | 1 497 | 1 424 | 1 264 | 1 086 | 890 | 370 |
| Wunder ALS 2412 | | | | | 2.40 | 1 980 | 1 210 | 90 | 1 735 | 1 651 | 1 465 | 1 259 | 1 032 | 429 |
| Wunder ALS 2512 | | | | | 2.43 | 1 990 | 1 222 | 91 | 1 757 | 1 671 | 1 484 | 1 275 | 1 045 | 434 |
| Wunder ALS 2710 | | | | | 2.70 | 2 220 | 1 218 | 90 | 1 952 | 1 857 | 1 649 | 1 417 | 1 161 | 483 |
| Wunder ALS 3010 | | | | | 2.97 | 2 436 | 1 218 | 90 | 2 147 | 2 043 | 1 814 | 1 558 | 1 277 | 531 |
| Power output per m ² gross area | | | | | | | | | 723 | 688 | 611 | 525 | 430 | 179 |
| Performance parameters test method | | | | | Quasi dynamic | | | | | | | | | |
| Performance parameters (related to AG) | | | | | ̑0,b | c1 | c2 | c3 | c4 | c6 | Kd | | | |
| Units | | | | | - | W/(m ² K) | W/(m ² K ²) | J/(m ³ K) | - | s/m | - | | | |
| Test results | | | | | 0.730 | 3.416 | 0.011 | 0.000 | 0.000 | 0.000 | 0.936 | | | |
| Incidence angle modifier test method | | | | | Quasi dynamic - outdoor | | | | | | | | | |
| Bi-directional incidence angle modifiers | | | | | No | | | | | | | | | |
| Incidence angle modifier | | | | | Angle | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° |
| Transversal | | | | | K _{̑T, coll} | 1.00 | 0.99 | 0.98 | 0.97 | 0.94 | 0.90 | 0.80 | 0.51 | 0.00 |
| Longitudinal | | | | | K _{̑L, coll} | 1.00 | 0.99 | 0.98 | 0.97 | 0.94 | 0.90 | 0.80 | 0.51 | 0.00 |
| Heat transfer medium for testing | | | | | Water | | | | | | | | | |
| Flow rate for testing (per gross area, A _G) | | | | | dm/dt | | 0.018 | | kg/(sm ²) | | | | | |
| Maximum temperature difference for thermal performance calculations | | | | | (̑ _m -̑ _a) _{max} | | 116 | | K | | | | | |
| Standard stagnation temperature (G = 1000 W/m ² ; ̑ _a = 30 °C) | | | | | ̑ _{stg} | | 203 | | °C | | | | | |
| Effective thermal capacity, incl. fluid (per gross area, A _G) | | | | | C/m ² | | 8.658 | | kJ/(Km ²) | | | | | |
| Maximum operating temperature | | | | | ̑ _{max, op} | | n.a. | | °C | | | | | |
| Maximum operating pressure | | | | | p _{max, op} | | 1000 | | kPa | | | | | |
| Testing laboratory | | | | | TZS, ITW University Stuttgart | | | | | www.itw.uni-stuttgart.de | | | | |
| Test report(s) | | | | | 12COL1079/2 12COL1079Q/3 12COL1078/1 | | | | | Dated | | 10.03.2016 21.01.2019 06.11.2013 | | |
| Comments of testing laboratory | | | | | Datashet version: 5.01, 2016-03-01 | | | | | | | | | |
| This data sheet replaces the data sheet issued on 19.04.2017. Collector types Wunder ALS 2710 and Wunder ALS 3010 have been added. | | | | |  Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 8, 70560 Stuttgart (Vaihingen) | | | | | | | | | |
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| Annex to Solar Keymark Certificate Supplementary Information | Licence Number | 011-7S1941 F |
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Annual collector output in kWh/collector at mean fluid temperature ϑ_m , based on ISO 9806:2013 test results

| Standard Locations | ϑ_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 |
| Wunder ALS 1809 | | 2 096 | 1 501 | 989 | 1 591 | 1 104 | 699 | 1 173 | 770 | 469 | 1 278 | 834 | 500 |
| Wunder ALS 2110 | | 2 410 | 1 726 | 1 137 | 1 830 | 1 270 | 804 | 1 349 | 885 | 539 | 1 469 | 959 | 575 |
| Wunder ALS 2412 | | 2 795 | 2 001 | 1 318 | 2 122 | 1 472 | 933 | 1 564 | 1 026 | 625 | 1 704 | 1 112 | 667 |
| Wunder ALS 2512 | | 2 829 | 2 026 | 1 335 | 2 148 | 1 490 | 944 | 1 584 | 1 039 | 633 | 1 725 | 1 126 | 675 |
| Wunder ALS 2710 | | 3 144 | 2 251 | 1 483 | 2 387 | 1 656 | 1 049 | 1 760 | 1 155 | 704 | 1 917 | 1 251 | 750 |
| Wunder ALS 3010 | | 3 458 | 2 476 | 1 631 | 2 626 | 1 821 | 1 154 | 1 936 | 1 270 | 774 | 2 108 | 1 377 | 825 |
| Annual output per m ² gross area | | 1 164 | 834 | 549 | 884 | 613 | 389 | 652 | 428 | 261 | 710 | 463 | 278 |
| Fixed or tracking collector | | Fixed (slope = latitude - 15°; rounded to nearest 5°) | | | | | | | | | | | |
| Annual irradiation on collector plane | | 1765 kWh/m ² | | | 1714 kWh/m ² | | | 1166 kWh/m ² | | | 1244 kWh/m ² | | |
| 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 ϑ_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

Additional Information

| | | |
|---|---------------|----|
| Collector heat transfer medium | Water-Glycole | |
| Hybrid Thermal and Photo Voltaic collector | No | |
| The collector is deemed to be suitable for roof integration | Yes | |
| 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 | 3000 | Pa |
| Maximum tested negative load | 2250 | Pa |
| Hail resistance using steel ball (maximum drop height) | n.a | m |

Energy Labelling Information

| | Reference Area, A_{sol} (m ²) | Data required for CDR (EU) No 811/2013 - Reference Area A_{sol} | |
|---|---|--|--|
| Wunder ALS 1809 | 1.80 | Collector efficiency (η_{col}) | 57 % |
| Wunder ALS 2110 | 2.07 | Remark: Collector efficiency (η_{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 ² , expressed in % and rounded to the nearest integer. Deviating from the regulation η_{col} is based on reference area (A_{sol}) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2013. | |
| Wunder ALS 2412 | 2.40 | | |
| Wunder ALS 2512 | 2.43 | | |
| Wunder ALS 2710 | 2.70 | | |
| Wunder ALS 3010 | 2.97 | | |
| | | | |
| | | Data required for CDR (EU) No 812/2013 - Reference Area A_{sol} | |
| | | Zero-loss efficiency (η_0) | 0.723 -- |
| | | First-order coefficient (a_1) | 3.42 W/(m ² K) |
| | | Second-order coefficient (a_2) | 0.011 W/(m ² K ²) |
| | | Incidence angle modifier IAM (50°) | 0.94 -- |
| 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. | | | |