

AENOR

Keymark Certificate Solar thermal energy



078/000283

AENOR certifies that the organization

SUNEX, S.A.

registered office UL. PIASKOWA, 7 47-400 RACIBÓRZ (Polonia)

supplies Solar collectors

in compliance with UNE-EN 12975-1:2006+A1:2011 (EN 12975-1:2006+A1:2010)

Trade Mark AMP AR 2.38, AMP AR 2.51
Technical information Specified in Annexes to the Certificate

Production site UL. PIASKOWA, 7 47-400 RACIBÓRZ (Polonia)

Certification scheme In order to grant this Certificate, AENOR has tested the product and has verified the quality system implemented for its manufacture. AENOR performs these tasks periodically while the Certificate has not been cancelled, in accordance with Specific Rules RP 078.01.

This certificate supersedes 078/000283, dated 2017-05-05

First issued on 2016-10-07
Modified on 2020-03-10
Validity date 2021-10-07

Rafael GARCÍA MEIRO
Chief Executive Officer

Original Electronic Certificate

AENOR INTERNACIONAL S.A.U.
Génova, 6. 28004 Madrid. España
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Product certification body accredited by ENAC, number 1/C-PR271



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|--|--|--------------------------|--|--|--|----------------------|------------------------------------|-----------------------|-------|----------------------|-------|------------------------------------|------------------------------------|------|
| Annex to Solar Keymark Certificate | | | | | Licence Number | | 078/000283 | | | | | | | |
| | | | | | Date issued | | 2020-03-10 | | | | | | | |
| | | | | | Issued by | | AENOR | | | | | | | |
| Licence holder | | SUNEX, S.A. | | | Country | | Poland | | | | | | | |
| Brand (optional) | | SX AL | | | Web | | www.sunex.pl | | | | | | | |
| Street, Number | | Ul. Piaskowa 7 | | | E-mail | | +48 32 414 92 12 | | | | | | | |
| Postcode, City | | 47-400 Racibórz, Śląskie | | | Tel | | +48 32 414 92 13 | | | | | | | |
| Collector Type | | | | | Flat plate collector | | | | | | | | | |
| Collector name | | | | | Power output per collector | | | | | | | | | |
| | | | | | G _b = 850 W/m ² , G _d = 150 W/m ² & u = 1.3 m/s θ _m - θ _a | | | | | | | | | |
| | | | | | 0 K | 10 K | 30 K | 50 K | 70 K | 130 K | | | | |
| | | | | | W | W | W | W | W | W | | | | |
| AMP AR 2.38 | | | | | 2,38 | 2.240 | 1.060 | 99 | 1.759 | 1.657 | 1.444 | 1.217 | 976 | 175 |
| AMP AR 2.51 | | | | | 2,51 | 2.240 | 1.120 | 99 | 1.854 | 1.747 | 1.522 | 1.282 | 1.029 | 185 |
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| Power output per m² gross area | | | | | 739 | 696 | 607 | 511 | 410 | 74 | | | | |
| Performance parameters test method | | | | | Steady state - outdoor | | | | | | | | | |
| Performance parameters (related to A_G) | | | | | η ₀ , b | a1 | a2 | a3 | a4 | a5 | a6 | a7 | a8 | Kd |
| Units | | | | | - | W/(m ² K) | W/(m ² K ²) | J/(m ³ K) | - | J/(m ² K) | s/m | W/(m ² K ⁴) | W/(m ² K ⁴) | - |
| Test results | | | | | 0,753 | 4,21 | 0,007 | 0,000 | 0,00 | 5.800 | 0,000 | 0,00 | 0,0E+00 | 0,88 |
| Incidence angle modifier test method | | | | | Steady state - outdoor | | | | | | | | | |
| Incidence angle modifier | | | | | Angle | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° |
| Transversal | | | | | K _{θT, coll} | 1,00 | 1,00 | 0,99 | 0,96 | 0,92 | 0,84 | 0,69 | 0,44 | 0,00 |
| Longitudinal | | | | | K _{θL, coll} | 1,00 | 1,00 | 0,99 | 0,96 | 0,92 | 0,84 | 0,69 | 0,44 | 0,00 |
| Heat transfer medium for testing | | | | | Water | | | | | | | | | |
| Flow rate for testing (per gross area, A_G) | | | | | dm/dt | 0,020 | | kg/(sm ²) | | | | | | |
| Maximum temperature difference during thermal performance test | | | | | (θ _m - θ _a) _{max} | 100 | | K | | | | | | |
| Standard stagnation temperature (G = 1000 W/m²; θ_a = 30 °C) | | | | | θ _{stg} | 210 | | °C | | | | | | |
| Maximum operating temperature | | | | | θ _{max, op} | 240 | | °C | | | | | | |
| Maximum operating pressure | | | | | p _{max, op} | 1000 | | kPa | | | | | | |
| Testing laboratory | | | | | INTA | | | www.inta.es | | | | | | |
| Test report(s) | | | | | CA/RPT/7611/003/INTA/16 Ed. 02 | | | Dated | | 04/10/2016 | | | | |
| | | | | | CA/RPT/4451/002/INTA/15 Ed. 01 | | | | | 21/07/2015 | | | | |
| Comments | | | | | Datashet version: 6.1, 2019-09-26 | | | | | | | | | |
| Based on the test report(s) from INTA and the former data sheet (issued 2017-05-05) the data sheet was updated to the version 6.1. The data sheet update was done at the TestLab Solar Thermal Systems, Fraunhofer ISE, Freiburg, Germany (collectortest.com). | | | | | | | | | | | | | | |
| AENOR INTERNACIONAL, S.A.U. - Génova, 6. - 28004 - Madrid, España - Tel. 91 432 60 00 - www.aenor.com Product certification body accredited by ENAC, number 1/C-PR271 | | | | | | | | | | | | | | |



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|---|----------------|------------|
| Annex to Solar Keymark Certificate Supplementary Information | Licence Number | 078/000283 |
| | Issued | 2020-03-10 |

Annual collector output in kWh/collector at mean fluid temperature ϑ_m

| Collector name | 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 |
| AMP AR 2.38 | | 2.749 | 1.857 | 1.162 | 2.027 | 1.346 | 822 | 1.498 | 933 | 547 | 1.631 | 1.002 | 577 |
| AMP AR 2.51 | | 2.898 | 1.958 | 1.225 | 2.137 | 1.419 | 866 | 1.579 | 983 | 576 | 1.719 | 1.056 | 609 |
| Annual output per m ² gross area | | 1.155 | 780 | 488 | 852 | 565 | 345 | 629 | 392 | 230 | 685 | 421 | 243 |
| Annual efficiency, η_a | | 65% | 44% | 28% | 52% | 35% | 21% | 54% | 34% | 20% | 55% | 34% | 20% |
| Fixed or tracking collector | Fixed (slope = latitude - 15°; rounded to nearest 5°) | | | | | | | | | | | | |
| Annual irradiation on collector plane | | 1765 kWh/m ² | | | 1630 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. 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 | No | | |
| The collector was tested successfully under the following conditions: | | | |
| Climate class (A+, A, B or C) | B | | -- |
| G (W/m ²) > | 900 | ϑ_a (°C) > | 15 |
| | | H_x (MJ/m ²) > | 540 |
| Maximum tested positive load | 2400 | | Pa |
| Maximum tested negative load | 2400 | | Pa |
| Hail resistance using steel ball (maximum drop height) | 1 | | 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 ²) | Hydraulic Designation Code | Aperture Area, A_a (m ²) |
| AMP AR 2.38 | 2,38 | 10-VH-1234S-A:7.5,2140-C:21,1120-D | 2,18 |
| AMP AR 2.51 | 2,51 | 10-VH-1234S-A:7.5,2140-C:21,1180-D | 2,31 |
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| 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 (η_{col}) | 56% |
| 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 9806:2017. | Zero-loss efficiency (η_0) |
| | First-order coefficient (a_1) |
| | Second-order coefficient (a_2) |
| | Incidence angle modifier IAM (50°) |
| | 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. |