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|--|--|----------------------------|--|--|--|----------------------|------------------------------------|----------------------|---|----------------------|-------|--|------------------------------------|------|--|
| Annex to Solar Keymark Certificate | | | | | Licence Number | | 011-7S3291 P | | | | | | | | |
| | | | | | Date issued | | 2025-03-14 | | | | | | | | |
| | | | | | Issued by | | DIN CERTCO | | | | | | | | |
| Licence holder | | YACK S.A.S | | | Country | | France | | | | | | | | |
| Brand (optional) | | | | | Web | | www.yack.fr | | | | | | | | |
| Street, Number | | ZAC des Pradeaux | | | E-mail | | contact@yack.fr | | | | | | | | |
| Postcode, City | | FR 83270 Saint-Cyr-sur-Mer | | | Tel | | +33 4 98 03 21 00 | | | | | | | | |
| Collector Type | | | | | Flat plate collector | | | | | | | | | | |
| Collector name | | | | | Gross area (A_G) | Gross length | Gross width | Gross height | Power output per collector | | | | | | |
| | | | | | | | | | $G_b = 850 \text{ W/m}^2, G_d = 150 \text{ W/m}^2 \text{ \& } u = 1.3 \text{ m/s}$ $\vartheta_m - \vartheta_a$ | | | | | | |
| | | | | | m ² | mm | mm | mm | 0 K | 10 K | 30 K | 50 K | 70 K | 80 K | |
| | | | | | | | | | W | W | W | W | W | W | |
| ORA E.T. YETORAP001 | | | | | 1.96 | 1'970 | 995 | 83 | 1'373 | 1'256 | 1'021 | 787 | 553 | 435 | |
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| Power output per m² gross area | | | | | 700 | 641 | 521 | 401 | 282 | 222 | | | | | |
| 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 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 | | | | | 0.709 | 5.98 | 0.000 | 0.000 | 0.00 | 26'125 | 0.000 | 0.00 | 0.0E+00 | 0.92 | |
| 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 | 0.98 | 0.95 | 0.90 | 0.79 | 0.54 | 0.00 | |
| Longitudinal | | | | | $K_{\theta L, coll}$ | 1.00 | 1.00 | 0.99 | 0.98 | 0.95 | 0.90 | 0.79 | 0.54 | 0.00 | |
| Heat transfer medium for testing | | | | | Water-Glycole | | | | | | | | | | |
| Flow rate for testing (per gross area, A_G) | | | | | dm/dt | | 0.033 | | kg/(sm ²) | | | | | | |
| Maximum temperature difference during thermal performance test | | | | | $(\vartheta_m - \vartheta_a)_{max}$ | | 50 | | K | | | | | | |
| Standard stagnation temperature ($G = 1000 \text{ W/m}^2; \vartheta_a = 30 \text{ °C}$) | | | | | ϑ_{stg} | | 130 | | °C | | | | | | |
| Maximum operating temperature | | | | | $\vartheta_{max, op}$ | | 85 | | °C | | | | | | |
| Maximum operating pressure | | | | | $p_{max, op}$ | | 1000 | | kPa | | | | | | |
| Testing laboratory | | | | | SPF Institute for Solar Technology | | | | | www.spf.ch | | | | | |
| Test report(s) | | | | | R06/2019, R07/2019 TRPVM-2021-40207-1 C1965, C1969 | | | | | Dated | | 02.05.2019, 12.07.2019 24.04.2022 01.02.2025, 14.03.2025 | | | |
| Comments of testing laboratory | | | | | Draft Ver. 6.2 (22.09.2021) | | | | | | | | | | |
| | | | | |  INSTITUT FÜR SOLARTECHNIK  | | | | | | | | | | |
| DIN CERTCO • Alboinstraße 56 • 12103 Berlin, Germany Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de • www.dincertco.de | | | | | | | | | | | | | | | |

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|---|-----------------------|---------------------|
| Annex to Solar Keymark Certificate Supplementary Information | Licence Number | 011-7S3291 P |
| | Issued | 2025-03-14 |

| Gross Thermal Yield in kWh/collector at mean fluid temperature ϑ_m | | | | | | | | | | | | | |
|--|---------------------------------|---|-------------|-------------|-------------------------|-------------|-------------|-------------------------|-------------|-------------|-------------------------|-------------|-------------|
| Standard Locations | | Athens | | | Davos | | | Stockholm | | | Würzburg | | |
| Collector name | ϑ_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 |
| ORA E.T. YETORAP001 | | 2'160 | 1'238 | 630 | 1'451 | 817 | 395 | 1'099 | 572 | 267 | 1'208 | 614 | 285 |
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| Gross Thermal Yield per m ² gross area | | 1'102 | 631 | 322 | 740 | 417 | 202 | 561 | 292 | 136 | 616 | 313 | 145 |
| Annual efficiency, η_a | | 62% | 36% | 18% | 45% | 26% | 12% | 48% | 25% | 12% | 50% | 25% | 12% |
| 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 Draft Ver. 6.2 (22.09.2021). 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) | A | | -- | | |
| G (W/m ²) > | 1000 | ϑ_a (°C) > | 20 | H_x (MJ/m ²) > | 600 |
| Maximum tested positive load | 1000 | | Pa | | |
| Maximum tested negative load | 1000 | | Pa | | |
| Hail resistance using steel ball (maximum drop height) | 1.6 | | m | | |

| Additional collector attribute(s) | | | |
|---|-----|--|----|
| Using external power source(s) for normal operation | No | Active or passive measure(s) for self-protection | No |
| Co-generating thermal and electrical power | Yes | Façade collector(s) | No |

| Energy Labelling Information | | Additional Informative Technical Data | |
|-------------------------------------|---|--|--|
| | Reference Area, A_{sol} (m ²) | Hydraulic Designation Code | Aperture Area, A_a (m ²) |
| ORA E.T. YETORAP001 | 1.96 | 10-VH-1234S-A:7.2,1859-C:20.4,994 | 1.88 |
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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}) | 46% | Zero-loss efficiency (η_0) | 0.70 | |
| 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. | | First-order coefficient (a_1) | 5.98 | |
| | | Second-order coefficient (a_2) | 0.000 | |
| | | Incidence angle modifier IAM (50°) | 0.95 | -- |
| | | 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. | | |