TÜVRheinland®
DIN CERTCO
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| Annex to Solar Keymark Certificate | | Licence Number | 011-7S3219 P |
|---|---|---|---|
| | | Date issued | 2026-06-15 |
| | | Issued by | DINCERTCO |

| | | | |
|---|---|---|---|
| **Licence holder** | **Dualsun SAS** | **Country** | France |
| **Brand** (optional) | | **Web** | www.dualsun.com |
| **Street, Number** | 2 rue Marc Donadille - CS 800001 | **E-mail** | contact@dualsun.fr |
| **Postcode, City** | 13453 Marseille Cedex 13 | **Tel** | +33 413 415 371 |

| **Collector Type** | Isotropic WISCollector (flat swimming pool absorber) |
|---|---|

| **Collector name** | **Gross area ($A_G$)** | **Gross length** | **Gross width** | **Power output per collector** $G_b$ = 850 W/m², $G_d$ = 150 W/m² & u = 1.3 m/s $\vartheta_m - \vartheta_a$ | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | -10 K | 0 K | 10 K | 30 K | 50 K | 70 K | 50 K |
| | m² | mm | mm | W | W | W | W | W | W | W |
| **DSTF455-96G12RTB-03** | 1.99 | 1,762 | 1,134 | 1,390 | 897 | 404 | 0 | 0 | -- | 0 |
| **Power output per m² gross area** | | | | 699 | 451 | 203 | 0 | 0 | -- | 0 |

| **Performance parameters test method** | Quasi dynamic | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Performance parameters (related to $A_G$)** | η0, b | a1 | a2 | a3 | a4 | a5 | a6 | a7 | a8 | Kd |
| **Units** | - | W/(m²K) | W/(m²K²) | J/(m³K) | - | J/(m²K) | s/m | W/(m²K⁴) | W/(m²K⁴) | - |
| **Test results** | 0.376 | 36.94 | 0.000 | 7.162 | 0.00 | 28,874 | 0.045 | 0.00 | 0.0 | 0.98 |

| **Incidence angle modifier test method** | | Quasi dynamic - outdoor | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Incidence angle modifier for $G_b$** | Angle | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° |
| **Transversal** | $K_{\theta T,coll}$ | 1.00 | 1.00 | 1.00 | 1.00 | 0.99 | 0.96 | 0.88 | 0.65 | 0.00 |
| **Longitudinal** | $K_{\theta L,coll}$ | 1.00 | 1.00 | 1.00 | 1.00 | 0.99 | 0.96 | 0.88 | 0.65 | 0.00 |

| | | | |
|---|---|---|---|
| **Heat transfer medium for testing** | | Water | |
| **Flow rate for testing (per gross area, $A_G$)** | dm/dt | 0.045 | kg/(sm²) |
| **Maximum temperature difference during thermal performance test** | $(\vartheta_m-\vartheta_a)_{max}$ | 20 | K |
| **Standard stagnation temperature (G = 1000 W/m²; $\vartheta_a$ = 30 °C)** | $\vartheta_{stg}$ | 70 | °C |
| **Maximum operating temperature** | $\vartheta_{max\ op}$ | 80 | °C |
| **Maximum operating pressure** | $p_{max,op}$ | 600 | kPa |

| **Testing laboratory** | TÜV Rheinland Solar GmbH | www.tuv.com/solar | |
|---|---|---|---|
| **Test report(s)** | DE2334SN 001 (EN 9806)<br>DE23KLQE 004 (IEC 61215/ 61730)<br>300103547_Declaration_Dualsun_DSTF | **Dated** | 11.12.2023<br>27.05.2026<br>15.06.2026 |

**Comments of testing laboratory** Ver. 6.3 (12.01.2026)

Documented new performance parameters are taken from Declaration 300103547_Declaration_Dualsun_DSTF (202606-15). The intial type testing was performed with the old PV module version DSTF 425-108M10TB-03 with only 1.95 m² groß area and 420 Wpeak electrical power. The electrical issues for the current electrical power class 455 Wpeak and 1.99 m² gross area are covered by the certificate PV 60174698 0003 2026-05-28.

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| Supplementary Information | Issued | 2026-06-15 |

**Gross Thermal Yield 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 |
| DSTF455-96G12RTB-03 | | 1,302 | 5 | | 145 | | | 259 | | | 338 | 1 | |
| Gross Thermal Yield per m² gross area | | 654 | 2 | -- | 73 | | -- | 130 | | -- | 170 | 0 | -- |
| Annual efficiency, $\eta_a$ | | 37% | 0% | -- | 4% | | -- | 11% | | -- | 14% | 0% | -- |
| Fixed or tracking collector | | Fixed (slope = latitude - 15°; rounded to nearest 5°) | | | | | | | | | | | |
| Annual irradiation on collector plane | | 1765 kWh/m² | | | 1630 kWh/m² | | | 1166 kWh/m² | | | 1244 kWh/m² | | |
| 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 ϑm (mean of in- and outlet temperatures). The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool Scenocalc Ver. 6.3 (12.01.2026). 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/m²) > | 1000 | $\vartheta_a$ (°C) > | 20 | $H_x$ (MJ/m²) > | | 600 |
| Maximum tested positive load | | | | | 6600 | Pa |
| Maximum tested negative load | | | | | 3600 | Pa |
| Hail resistance using ice balls (diameter) | | | | | 25 | mm |

## 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

| | Reference Area, $A_{sol}$ (m²) |
|---|---|
| DSTF455-96G12RTB-03 | 1.99 |

**Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$**

| | |
|---|---|
| Collector efficiency ($\eta_{col}$) | -54% |

Remark: Collector efficiency (ηcol) 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/m², expressed in % and rounded to the nearest integer. Deviating from the regulation ηcol is based on reference area (Asol) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.

## Additional Informative Technical Data

| Hydraulic Designation Code | Aperture Area, $A_a$ (m²) |
|---|---|
| 304-V-1234S-A:2.7,1640-C:18.0,1132 | 1.99 |

**Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$**

| | | |
|---|---|---|
| Zero-loss efficiency ($\eta_0$) | 0.45 | -- |
| First-order coefficient ($a_1$) | 24.76 | W/(m²K) |
| Second-order coefficient ($a_2$) | 0.000 | W/(m²K²) |
| Incidence angle modifier IAM (50°) | 1.00 | -- |

*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.*