TÜVRheinland®
DIN CERTCO
Precisely Right.

IGTE



| Annex to Solar Keymark Certificate | | Licence Number | CERTNO-01C |
|---|---|---|---|
| | | Date issued | 2020-05-05 |
| | | Issued by | DIN CERTCO |

| | | | |
|---|---|---|---|
| **Licence holder** | **Reinhard Solartechnik GmbH** | **Country** | Germany |
| **Brand** (optional) | | **Web** | http://www.reinhard-solartechnik.de |
| **Street, Number** | Brückenstraße 2 | **E-mail** | solar@reinhard-solartechnik.de |
| **Postcode, City** | D-28857 Syke-Barrien | **Tel** | +49 (0)4242 80106 |

| | |
|---|---|
| **Collector Type** | Flat plate collector |

| Collector name | Gross area ($A_G$) | Gross length | Gross width | Gross height | Power output per collector Gb = 850 W/m2, Gd = 150 W/m2 & u = 1.3 m/s $\vartheta_m - \vartheta_a$ | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 0 K | 10 K | 30 K | 50 K | 70 K | 125 K |
| | m² | mm | mm | mm | W | W | W | W | W | W |
| **RST Sol 5** | 2.25 | 1 928 | 1 168 | 100 | 1 723 | 1 633 | 1 442 | 1 234 | 1 010 | 310 |
| **Power output per m² gross area** | | | | | 766 | 726 | 641 | 548 | 449 | 138 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **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** | 0.774 | 3.898 | 0.009 | 0.000 | 0.00 | 10 290 | 0.000 | 0.00 | 0.0 | 0.929 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Incidence angle modifier test method** | Quasi dynamic - outdoor | | | | | | | | |
| **Incidence angle modifier** | Angle | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° |
| **Transversal** | $K_{\theta T,coll}$ | 1.00 | 0.99 | 0.98 | 0.97 | 0.94 | 0.85 | 0.67 | 0.34 | 0.00 |
| **Longitudinal** | $K_{\theta L,coll}$ | 1.00 | 0.99 | 0.98 | 0.97 | 0.94 | 0.85 | 0.67 | 0.34 | 0.00 |

| | | | |
|---|---|---|---|
| **Heat transfer medium for testing** | Water | | |
| **Flow rate for testing (per gross area, $A_G$)** | dm/dt | 0.020 | kg/(sm²) |
| **Maximum temperature difference during thermal performance test** | $(\vartheta_m-\vartheta_a)_{max}$ | 95 | K |
| **Standard stagnation temperature (G = 1000 W/m²; $\vartheta_a$ = 30 °C)** | $\vartheta_{stg}$ | 220 | °C |
| **Maximum operating temperature** | $\vartheta_{max\ op}$ | 220 | °C |
| **Maximum operating pressure** | $p_{max,op}$ | 1000 | kPa |

| | | | |
|---|---|---|---|
| **Testing laboratory** | Institut für Gebäudeenergetik, Thermotechnik und Energiespeicherung (IGTE) | http://www.igte.uni-stuttgart.de | |
| **Test report(s)** | 19COL1511<br>19COL1511Q | **Dated** | 05.05.2020<br>05.05.2020 |

**Comments of testing laboratory** Datasheet version: 6.1, 2019-09-26

TZS Forschungs- und Testzentrum für Solaranlagen
Institut für Thermodynamik und Wärmetechnik
Universität Stuttgart
Pfaffenwaldring 6, 70550 Stuttgart (Vaihingen)

| Annex to Solar Keymark Certificate | Licence Number | CERTNO-01C |
|---|---|---|
| Supplementary Information | Issued | 2020-05-05 |

**Annual collector output 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 |
| RST Sol 5 | | 2 743 | 1 927 | 1 255 | 2 064 | 1 416 | 896 | 1 519 | 983 | 597 | 1 657 | 1 063 | 635 |
| Annual output per m² gross area | | 1 219 | 856 | 558 | 917 | 629 | 398 | 675 | 437 | 265 | 736 | 472 | 282 |
| Annual efficiency, $\eta_a$ | | 69% | 49% | 32% | 56% | 39% | 24% | 58% | 37% | 23% | 59% | 38% | 23% |
| 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. 6.1 (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 | | | | Yes | |
| | | | | | |
| 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 | | | | 3000 | Pa |
| Maximum tested negative load | | | | 3000 | Pa |
| Hail resistance using steel ball (maximum drop height) | | | | 2 | 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

| | Reference Area, $A_{sol}$ (m²) |
|---|---|
| RST Sol 5 | 2.25 |

## Additional Informative Technical Data

| Hydraulic Designation Code | Aperature Area, $A_a$ (m²) |
|---|---|
| 14-V-1234S-7.3,1838-22.4,1216-D | 2.14 |

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

| | |
|---|---|
| Collector efficiency ($\eta_{col}$) | 60% |

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.

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

| | | |
|---|---|---|
| Zero-loss efficiency ($\eta_0$) | 0.77 | -- |
| First-order coefficient ($a_1$) | 3.90 | W/(m²K) |
| Second-order coefficient ($a_2$) | 0.009 | W/(m²K²) |
| 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.*

**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**