TÜVRheinland®
DIN CERTCO
Precisely Right.

IGTE



| Annex to Solar Keymark Certificate | | Licence Number | 011-7S2819 F |
|---|---|---|---|
| | | Date issued | 2020-11-10 |
| | | Issued by | DIN CERTCO |

| | | | |
|---|---|---|---|
| Licence holder | GREENoneTEC Solarindustrie GmbH | Country | Austria |
| Brand (optional) | | Web | www.greenonetec.com |
| Street, Number | Industriepark St. Veit, Energieplatz 1 | E-mail | info@greenonetec.com |
| Postcode, City | 9300 St. Veit a.d. Glan | Tel | +43 4212 28136-0 / 4212 28136-250 |

| 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 | 130 K |
| | m² | mm | mm | mm | W | W | W | W | W | W |
| GK HT 13,6 | 13.61 | 2 280 | 5 970 | 185 | 10 518 | 10 185 | 9 370 | 8 358 | 7 149 | 2 339 |
| Power output per m² gross area | | | | | 773 | 748 | 688 | 614 | 525 | 172 |

| Performance parameters test method | Steady state - outdoor | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 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 | 0.782 | 2.27 | 0.018 | 0.000 | 0.00 | 5 980 | 0.000 | 0.00 | 0.0 | 0.92 |

| 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 | 1.00 | 1.00 | 0.99 | 0.96 | 0.88 | 0.71 | 0.40 | 0.00 |
| Longitudinal | $K_{\theta L,coll}$ | 1.00 | 1.00 | 1.00 | 0.99 | 0.98 | 0.94 | 0.84 | 0.59 | 0.00 |

| | | | |
|---|---|---|---|
| Heat transfer medium for testing | | Water-Glycole | |
| Flow rate for testing (per gross area, $A_G$) | | dm/dt | 0.032 kg/(sm²) |
| Maximum temperature difference during thermal performance test | | $(\vartheta_m-\vartheta_a)_{max}$ | 100 K |
| Standard stagnation temperature (G = 1000 W/m²; $\vartheta_a$ = 30 °C) | | $\vartheta_{stg}$ | 220 °C |
| Maximum operating temperature | | $\vartheta_{max\ op}$ | 100 °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) | 20COLC1735ISO<br>20COLC1735ISOQ<br>C1735L, C1781L | Dated | 10.11.2020<br>10.11.2010<br>06.09.2018 |

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

The collector can be installed with a mechanical reinforcement kit for higher wind- and snow load resistance up to 2400 Pa (See test reports C1735L and C1781L)

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

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| Supplementary Information | Issued | 2020-11-10 |

**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 |
| GK HT 13,6 | 17 188 | 13 620 | 9 875 | 13 936 | 10 562 | 7 330 | 10 089 | 7 354 | 4 931 | 10 929 | 7 982 | 5 283 |
| Annual output per m² gross area | 1 263 | 1 001 | 726 | 1 024 | 776 | 539 | 741 | 540 | 362 | 803 | 587 | 388 |
| Annual efficiency, $\eta_a$ | 72% | 57% | 41% | 63% | 48% | 33% | 64% | 46% | 31% | 65% | 47% | 31% |
| 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 | | | | 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 | | | | 1000 / 2400 | Pa |
| Maximum tested negative load | | | | 1000 / 2400 | Pa |
| Hail resistance using ice balls (diameter) | | | | 35 | mm |

## 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) |
|---|---|
| GK HAT 13,6 | 13.61 |

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

| | |
|---|---|
| Collector efficiency ($\eta_{col}$) | 65% |

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 | Aperature Area, $A_a$ (m²) |
|---|---|
| 18-H-12V-A:9.3,5800-C:33,2280 | 12.56 |

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

| | | |
|---|---|---|
| Zero-loss efficiency ($\eta_0$) | 0.77 | -- |
| First-order coefficient ($a_1$) | 2.27 | W/(m²K) |
| Second-order coefficient ($a_2$) | 0.018 | W/(m²K²) |
| Incidence angle modifier IAM (50°) | 0.97 | -- |

*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.*