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|--|--|---|---------------------------|--|---------------------------|---|--|------------------------------------|-----------------------|-------|-------|--|
| Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate | | | | | | Licence Number | | 011-7S2355 R | | | | |
| | | | | | | Issued | | 2014-05-07 | | | | |
| Company holding the | | WIKORA GmbH | | | | Country | | Germany | | | | |
| Brand (optional) | | - | | | | Website | | www.wikora.de | | | | |
| Street, street number | | Friedrichstr. 9 | | | | E-mail | | contact@wikora.de | | | | |
| Postal Code / City, province | | DE-89568 | | Hermaringen | | Tel/Fax | | 49 (07322) 96 05-0 /-30 | | | | |
| Collector Type (flat plate glazed/un-glazed; evacuate tubular) | | | | | | Evacuated tubular collector | | | | | | |
| Thermal / photo voltaic hybrid collector? (PVT collector) | | | | | | No | | | | | | |
| Integration in the roof possible ? (manufacturers declaration) | | | | | | No | | | | | | |
| | Collector name | Aperture area (Aa) m ² | Gross length mm | Gross width mm | Gross height mm | Gross area (AG) m ² | Power output per collector module | | | | | |
| | | | | | | | G = 1000 W/m ² | | | | | |
| | | | | | | | T _m -T _a | | | | | |
| | | | | | | | 0 K | 10 K | 30 K | 50 K | 70 K | |
| | | | | | | | W | W | W | W | W | |
| | WIKOSUN DF 65 - 10 | 1.071 | 2'050 | 750 | 130 | 1.538 | 848 | 825 | 778 | 731 | 684 | |
| | WIKOSUN DF 65 - 20 | 2.143 | 2'050 | 1'500 | 130 | 3.075 | 1'697 | 1'651 | 1'557 | 1'464 | 1'370 | |
| | WIKOSUN DF 65 - 30 | 3.214 | 2'050 | 2'250 | 130 | 4.613 | 2'545 | 2'476 | 2'336 | 2'195 | 2'054 | |
| Performance test method | | | | | | Glazed liquid heating collector - steady state - outdoor | | | | | | |
| Performance parameters related to aperture | | | | | | η_0 | a1 | a2 | | | | |
| Units | | | | | | - | W/(m ² K) | W/(m ² K ²) | | | | |
| Test results - Flow rate and fluid see note 1 | | | | | | 0.792 | 2.17 | 0.0002 | | | | |
| Bi-directional incidence angle | | Yes | | Kθ values are obligatory for 50°. | | | | | | | | |
| Incidence angle modifiers Kθ(θT) transversal direction | | Angle | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | |
| | | K θ (θ T) | 1.01 | 1.03 | 1.05 | 1.08 | 1.08 | 1.01 | 0.90 | 0.54 | 0.00 | |
| Incidence angle modifiers Kθ(θL) longitudinal direction | | Angle | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | |
| | | K θ (θ L) | 1.00 | 1.00 | 0.99 | 0.98 | 0.95 | 0.88 | 0.75 | 0.49 | 0.00 | |
| Stagnation temperature - Weather conditions see note 2 | | | | | | T _{stg} | 147 | | °C | | | |
| Effective thermal capacity | | | | | | C _{eff} = C/A _g | 9.6 | | kJ/(m ² K) | | | |
| Max. intende operation temperature - see note 3 | | | | | | T _{max,op} | -- | | °C | | | |
| Max. operation pressure - see note 3 | | | | | | p _{max,op} | 600 | | kPa | | | |
| Pressure drop table - for a collector family, the values shall be for the module with highest ΔP per m² aperture area | | | | | | | | | | | | |
| Flow rate | kg/(s m ²) | 0.011 | 0.022 | 0.033 | 0.044 | 0.055 | 0.066 | 0.077 | 0.088 | 0.099 | 0.109 | |
| Pressure drop, ΔP | Pa | 746 | 1522 | 2329 | 3166 | 4034 | 4932 | 5860 | 6819 | 7809 | 8829 | |
| Optional weather data | | Location | | | | Link | | | | | | |
| Testing Laboratory | | SPF, CH-8640 Rapperswil | | | | | | | | | | |
| Website | | www.solarenergy.ch | | | | | | | | | | |
| Test report id. number | | C1620LPEN, C1621LPEN, C1621QPEN | | | | Date of test reports | | 30.04.2014 | | | | |
| During the test G _{DIF} /G _{TOT} was always between | | 0.13 | and | 0.26 | | | | | | | | |
| Comments of testing laboratory: | | | | | | | | | | | | |
| Stagnation temperature: Temperature sensor introduced into manifold tube. Direct measurement of the absorber temperature is not possible. | | | | | | | | | | | | |
| Note 1 | Flow rate | 0.028 | kg/(s m ²) | Fluid | Water-Glycole | | | | | | | |
| Note 2 | Irradiance, G = 1000 W/m²; Ambient temperature , T_a=30 °C | | | | | | | | | | | |
| Note 3 | Given by manufacturer | | | | | | | | | | | |
|  Dr. Andreas Bohren Datasheet version: 4.06, 2014-01-15 | | | | | | | | | | | | |
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|---|----------------|--------------|
| Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate | Licence Number | 011-7S2355 R |
| | Issued | 2014-05-07 |

| Annual collector output kWh/module | | | | | | | | | | | | | |
|------------------------------------|--|-------|-------|-------|-------|-------|-----------|-------|-------|----------|-------|-------|--|
| Collector name | Location and collector temperature (T _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 | |
| WIKOSUN DF 65 - 10 | 1'462 | 1'237 | 1'042 | 1'216 | 1'023 | 861 | 877 | 712 | 580 | 947 | 768 | 623 | |
| WIKOSUN DF 65 - 20 | 2'926 | 2'475 | 2'084 | 2'434 | 2'047 | 1'723 | 1'756 | 1'425 | 1'160 | 1'894 | 1'537 | 1'246 | |
| WIKOSUN DF 65 - 30 | 4'388 | 3'712 | 3'126 | 3'650 | 3'071 | 2'584 | 2'633 | 2'138 | 1'740 | 2'841 | 2'306 | 1'869 | |
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| Collector mounting: Fixed or tracking | Fixed; slope = latitude - 15° (rounded to nearest 5°) |
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| Overview of locations | | | | |
|-----------------------|------------|-------------------------------------|-------------------|--|
| Location | Latitude ° | G _{tot} kWh/m ² | T _a °C | Collector orientation or tracking mode |
| Athens | 38 | 1'765 | 18.5 | South, 25° |
| Davos | 47 | 1'714 | 3.2 | South, 30° |
| Stockholm | 59 | 1'166 | 7.5 | South, 45° |
| Würzburg | 50 | 1'244 | 9.0 | South, 35° |
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|------------------|--|--------------------|
| G _{tot} | Annual total irradiation on collector plane | kWh/m ² |
| T _a | Mean annual ambient air temperature | °C |
| T _m | Constant collector operating temperature (mean of in- and outlet temperatures) | °C |

The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool ScenoCalc. The collector output is calculated hour by hour according to the efficiency parameters from the Keymark test using constant collector operating temperature (T_m). A detailed description of the calculations is available at <http://www.sp.se/en/index/services/solar/ScenoCalc/Sidor/default.aspx>.

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| | 4.06, 2014-01-15 |
| | ScenoCalc version: |
| | Ver. 4.06 (Jan, 2014) |