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| Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate | | Licence number | TSU 005-12 |
| | | Date of issue | 28.11.2012 |
| Company holding the licence | THERMO/SOLAR Žiar s.r.o. | Country | Slovak republic |
| Brand (optional) | | Website | www.thermosolar.sk |
| Street, number | Na vartičke 14 | E-mail | info@thermosolar.sk |
| Postal Code | 965 01 | Tel. | +421 (0)456016080 |
| City | Žiar nad Hronom | Fax | +421 (0)456716244 |
| Collector Type (flat plate / evacuate tubular / un-glazed) | | Flat plate collector | |

Integration in the roof possible ? Yes

| Collector name | Aperture area (A _a) [m ²] | Gross length [mm] | Gross width [mm] | Gross height [mm] | Gross area (A _G) [m ²] | Power output per collector unit G = 1000 W/m ² T _m -T _a : | | | | |
|----------------|--|----------------------|---------------------|----------------------|---|--|-------|-------|-------|------|
| | | | | | | 0 K | 10 K | 30 K | 50 K | 70 K |
| | | | | | | [W] | [W] | [W] | [W] | [W] |
| TS 400 | 1,85 | 1 009 | 2 009 | 75 | 2,03 | 1 457 | 1 397 | 1 269 | 1 132 | 985 |
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| Collector efficiency parameters related to aperture area (A_a) Type of fluid and flow rate see note 1 | η _{0a} | 0,7899 | - |
| | a _{1a} | 3,2 | W/(m ² K) |
| | a _{2a} | 0,0065 | W/(m ² K ²) |

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| Stagnation temperature - Weather conditions see note 2 | t _{stg} | 224 | °C |
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|-----------------------------------|-------------------------------------|------|-----------------------|
| Effective thermal capacity | C _{eff} = C/A _a | 5,64 | kJ/(m ² K) |
|-----------------------------------|-------------------------------------|------|-----------------------|

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| Max. operation pressure - see note 3 | p _{max} | 600 | kPa |
|---|------------------|-----|-----|

| Incidence angle modifiers K _θ (θ) | G _{DIF} /G _{TOT} | | θ _T / θ _L | 50° | 10° | 20° | 30° | 40° | 60° | 70° |
|--|------------------------------------|------|---------------------------------|----------------------------------|------------------------|------|------|------|------|------|
| | min | max | | | | | | | | |
| | | 0,11 | 0,12 | K _θ (θ _L) | 0,95 | 1,00 | 0,99 | 0,99 | 0,97 | 0,91 |
| G _{DIF} /G _{TOT} : min&max - while measuring | | | | | <i>Optional values</i> | | | | | |

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| Testing Laboratory | Technický skúšobný ústav Piešťany, š.p. |
| Website | www.tsu.eu |
| Test report id. number | 120700003/1/P, 2.04.00479.1.0-6 |
| Date of test report | 30.10.2012 |
| Perf. test method | EN 12975-2 6.1.4 (outdoor) |

Comments of testing laboratory :

| | | | | | | |
|--------|--|-------|-----------|-------------------------------|--|--|
| Note 1 | Fluid | Water | Flow rate | 0,018 kg/s per m ² | Krajinská cesta 2929/9 92101 PIEŠŤANY 2013 | |
| Note 2 | Irradiance, G _s =1000 W/m ² ; Ambient temperature, T _a =30 °C | | | | | |
| Note 3 | Given by manufacturer | | | | | |



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|---|----------------|------------|
| Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate | Licence number | TSU 005-12 |
| | Issued | 28.11.2012 |

| Annual collector output kWh | | | | | | | | | | | | | | |
|-----------------------------|--|-------|-------|-------|-------|-------|-----------|------|------|----------|-------|------|--|--|
| 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 | | |
| TS 400 | 2 364 | 1 793 | 1 303 | 1 984 | 1 477 | 1 041 | 1 355 | 958 | 655 | 1 468 | 1 036 | 697 | | |
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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 |

Calculation of the annual collector performance is done by the official Solar Keymark spreadsheet tool. Hour by hour the collector output is calculated according to the efficiency parameters from the Keymark test using constant collector operating temperature (T_m). Detailed description with all equations used is available from the Solar Keymark web site (direct link: <http://www.estif.org/solarkeymark/annexb1.php>)

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|---|------------------------------|
| <p>Technický skúšobný ústav Piešťany, š.p. Address: Krajinská cesta 2929/9, 92101 Piešťany, Slovak Republic Phone: +421 33 79 57 111, Fax: +421 33 77 23 716, E-mail: sv@tsu.sk, web: www.tsu.eu</p> | Datasheet version: |
| | VERSION 3.6, 2012.01.20 |
| | Calculation program version: |
| | 3.07, October 2011 (SP) |