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|---|------------------------|---------------------|
| <b>Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate</b> | <b>Certificate No.</b> | <b>011-7S1914 F</b> |
|   | Issued                 | 24-05-2013          |

| Annual collector output kWh |  |       |       |       |       |      |           |       |      |          |       |      |  |  |
|-----------------------------|--|-------|-------|-------|-------|------|-----------|-------|------|----------|-------|------|--|--|
| Collector name              | Location and collector temperature (T <sub>m</sub> ) |       |       |       |       |      |           |       |      |          |       |      |  |  |
|                             | 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 |  |  |
| FKF 200 V AlCu              | 2 235  | 1 510 | 909   | 1 775 | 1 145 | 647  | 1 223     | 755   | 419  | 1 331    | 810   | 442  |  |  |
| FKF 240 V AlCu              | 2 657  | 1 795 | 1 081 | 2 110 | 1 361 | 769  | 1 454     | 898   | 498  | 1 582    | 963   | 525  |  |  |
| FKF 270 V AlCu              | 3 058  | 2 065 | 1 243 | 2 428 | 1 566 | 885  | 1 673     | 1 033 | 573  | 1 820    | 1 108 | 604  |  |  |
| FKF 200 H AlCu              | 2 228  | 1 505 | 906   | 1 769 | 1 141 | 645  | 1 219     | 753   | 418  | 1 327    | 807   | 440  |  |  |
| FKF 240 H AlCu              | 2 657  | 1 795 | 1 081 | 2 110 | 1 361 | 769  | 1 454     | 898   | 498  | 1 582    | 963   | 525  |  |  |
| FKF 270 H AlCu              | 3 058  | 2 065 | 1 243 | 2 428 | 1 566 | 885  | 1 673     | 1 033 | 573  | 1 820    | 1 108 | 604  |  |  |
|                             |  |       |       |       |       |      |           |       |      |          |       |      |  |  |
|                             |  |       |       |       |       |      |           |       |      |          |       |      |  |  |
|                             |  |       |       |       |       |      |           |       |      |          |       |      |  |  |
|                             |  |       |       |       |       |      |           |       |      |          |       |      |  |  |
|                             |  |       |       |       |       |      |           |       |      |          |       |      |  |  |
|                             |  |       |       |       |       |      |           |       |      |          |       |      |  |  |
|                             |  |       |       |       |       |      |           |       |      |          |       |      |  |  |
|                             |  |       |       |       |       |      |           |       |      |          |       |      |  |  |
|                             |  |       |       |       |       |      |           |       |      |          |       |      |  |  |
|                             |  |       |       |       |       |      |           |       |      |          |       |      |  |  |

**Collector mounting:** Fixed or tracking      Fixed; slope = latitude - 15° (rounded to nearest 5°)

| Overview of locations |            |                         |       |  |
|-----------------------|------------|-------------------------|-------|--|
| Location              | Latitude ° | Gtot kWh/m <sup>2</sup> | Ta °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°                             |
|                       |            |                         |       |  |
|                       |            |                         |       |  |
|                       |            |                         |       |  |

|      |  |                    |
|------|--|--------------------|
| Gtot | Annual total irradiation on collector plane                                    | kWh/m <sup>2</sup> |
| Ta   | Mean annual ambient air temperature  | °C                 |
| Tm   | 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<sub>m</sub>). 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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