| Summary of | EN12976-2 | SOLAR SYSTEM test results | Licence Number | SKM 9975 |
|---|---|---|---|---|
| Annex to Solar KEYMARK Certificate | | | Issued | 2017-08-10 |

| | | | | | |
|---|---|---|---|---|---|
| Company | CICERO HELLAS S.A. | | Country | Greece | |
| Brand (optional) | Calpak Mark4, Calpak giga XS, Solartherm | | Website | www.calpak.gr | |
| Street | 9, Sygrou Ave. | | E-mail | export@calpak.gr | |
| Postal Code | 11743 | Athens | Tel. / Fax | +30 | 210 9247250 / 9231616 |

| System classification | |
|---|---|
| Application(s) | Hot water |
| Solar loop, circulation principle | Thermosyphon |
| Direct solar loop / heat exchanger | Heat exchanger |
| Open, vented or closed solar loop | Closed |
| Drain back/down | Always filled (no drain) |
| Store location | Outdoor |
| Store orientation (of main axis) | Horizontal |
| Type of auxiliary heating (internal back-up heat) | Electric |
| If other auxiliary/internal back-up heating, please specifiy: | |
| Solar+supplementary OR Solar-only / Solar pre-heat | Solar only / Solar preheat |

| Collector(s) | | | | Heat store(s) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Company | CICERO HELLAS S.A. | | | Company | CICERO HELLAS S.A. | | | | | |
| *Keymark lic.no. if available* | *SKM 9954/1* | | | *Keymark lic.no. if available* | | | | | | |
| Collector name | Per module | | | Store name | Total nominal volume | Gross height | Gross width | Gross depth | Auxiliary heated volume | Electrical aux. heating power |
| | Gross Area (Ag) | Gross length | Gross width | | | | | | | |
| | $m^2$ | mm | mm | | litres | mm | mm | mm | litres | kW |
| M4-200 | 2.05 | 2070 | 990 | MARK 4-125 | 105 | 1230 | 500 | | - | 3.5 |
| M4-210 | 2.12 | 1710 | 1240 | MARK 4-160 | 133 | 1230 | 500 | | - | 3.5 |
| M4-260 | 2.63 | 2120 | 1240 | MARK 4-200 | 171 | 1520 | 500 | | - | 3.5 |
| M4-260H | 2.63 | 1240 | 2120 | MARK 4-300 | 234 | 1980 | 500 | | - | 3.5 |
| M4-300 | 3.00 | 2000 | 1500 | | | | | | | |
| M4-300H | 3.00 | 1500 | 2000 | | | | | | | |

| Solar loop controller | | Solar loop fluid | |
|---|---|---|---|
| *Keymark lic.no. if available* | - | Recommended/required | Required |
| Company | - | Company | - |
| Name | - | Name | Nox Fluid |
| Solar loop pump - power range | - W to - W | Freezing point | -30 °C |

**System family overview**

| Collector name | Number of collectors in each configuration for each store | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Store name | | | | | | | | | | | | | | | | | | | | | | | |
| | MARK 4-125 | | | | | | MARK 4-160 | | | | | | MARK 4-200 | | | | | | MARK 4-300 | | | | | |
| M4-200 | | | | | | | | | | | | | | | | | | | | | | | | |
| M4-210 | 1 | | | | | | 1 | | | | | | 1 | 2 | | | | | 2 | | | | | |
| M4-260 | | | | | | | 1 | | | | | | 1 | | | | | | 2 | | | | | |
| M4-260H | | | | | | | 1 | | | | | | 1 | | | | | | | | | | | |
| M4-300 | | | | | | | | | | | | | 1 | | | | | | | | | | | |
| M4-300H | | | | | | | | | | | | | | | | | | | 1 | | | | | |

| | |
|---|---|
| Testing Laboratory | NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB |
| Website | www.solar.demokritos.gr |
| Test report id. number | 6066 DE1, 6067 DE1, 6066F3 |
| Date of test report | 10/11/2014, 12/7/2016, 1/8/2017 |

| Comments of test lab | |
|---|---|
| Comments ... | N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr Vassilis Belessiotis Tel: +210 6503815 - Fax: +210 6544592 153 10 Ag. Paraskevi - Attiki - Greece |



Central Offices: 4, Kalavriton, 145 64 kifisia, Athens, Tel: +30 210 6233493-4 , Fax: +30 210 6233495, http://www.dqshellas.gr, e-mail: ioannisalexiou@dqshellas.gr

| Summary of | EN12976-2 | test results | Certification No. | SKM 9975 |
|---|---|---|---|---|
| Annex to Solar KEYMARK Certificate | | | Issued | 2017-08-10 |

| | | | |
|---|---|---|---|
| Company | CICERO HELLAS S.A. | Country | Greece |
| Brand (optional) | Calpak Mark4, Calpak giga XS, Solartherm | Website | www.calpak.gr |
| Street | 9, Sygrou Ave. | E-mail | export@calpak.gr |
| Postal Code | 11743 Athens | Tel. / Fax | +30 210 9247250 / 9231616 |

**System family overview**

| Collector name | For each storage and collector size, give number of collectors | | | |
|---|---|---|---|---|
| | MARK 4-125 | MARK 4-160 | MARK 4-200 | MARK 4-300 |
| M4-200 | | | | |
| M4-210 | 1 | 1 | 1 2 | 2 |
| M4-260 | | 1 | 1 | 2 |
| M4-260H | | 1 | 1 | |
| M4-300 | | | 1 | |
| M4-300H | | | | 1 |

| | | | |
|---|---|---|---|
| Name of system configuration | | | MARK 4-125/2.1 |
| Collector name | M4-210 | No. Collectors | 1 |
| | | Storage name | MARK 4-125 |

**Calculated annual results for "solar-only / preheat system"**

| Location | Qd,sh | Daily drawoff 80 l | | | | Daily drawoff 110 l | | | | Daily drawoff 140 l | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol |
| | MJ/y | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % |
| Stockholm SE | - | 4478 | 2290 | - | 51 | 6150 | 2740 | - | 45 | 7821 | 2968 | - | 38 |
| WürzburgDE | - | 4289 | 2308 | - | 54 | 5897 | 2826 | - | 48 | 7506 | 3113 | - | 41 |
| Davos CH | - | 4857 | 3406 | - | 70 | 6654 | 4005 | - | 60 | 8483 | 4320 | - | 51 |
| Athens GR | -' | 3343 | 2816 | - | 84 | 4573 | 3532 | - | 77 | 5834 | 4100 | - | 70 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

**Perf. indicators for the table above**

| | | |
|---|---|---|
| Qd,sh | MJ/y | **Not relevant for solar domestic hot water system** |
| Qd | MJ/y | **Annual heat demand for domestic hot water** |
| QL | MJ/y | **Annual heat energy delivered by the solar system** |
| Qpar | MJ/y | **Annual parasitic energy: (electricity for pumps/controllers)** |
| $f_{sol}=Q_L/Q_d$ | - | **Solar fraction** |

| Ref. conditions | | Stockholm SE | Würzburg DE | Davos CH | Athens GR |
|---|---|---|---|---|---|
| | G | 1,157 | 1,230 | 1,684 | 1,736 |
| | Ta,ave | 7.5 | 9.0 | 3.2 | 18.5 |
| | Tc,ave | 8.5 | 10.0 | 5.4 | 17.8 |
| | ± ΔTc | 6.4 | 3.0 | 0.8 | 7.4 |

| | | |
|---|---|---|
| G | kWh/m² | **Annual irradiation South, 45°** |
| Ta,ave | °C | **Annual average outdoor air temperature** |
| Tc,ave | °C | **Annual average mains cold water temp.** |
| ΔTc | K | **Seasonal variation of Tc** |
| Th | 45 °C | **Desired hot water temperature (mixing valve temperature).** |

| | | | | | |
|---|---|---|---|---|---|
| Max. operating press. - collector side | 200 | kPa | Max. operating press. - tank side | 1,000 | kPa |

| | |
|---|---|
| Testing Laboratory | NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB |
| Website | www.solar.demokritos.gr |
| Test report id. number | 6066 DE1, 6067 DE1, 6066F3 |
| Date of test report | 10/11/2014, 12/7/2016, 1/8/2017 |
| Test method | ISO 9459-5 (DST) |

**Comments of test lab**

The long term prediction was extrapolated according to the Annex D of "Solar Keymark – Specific Scheme Rules".

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SOLAR ENERGY LABORATORY
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153 10 Ag. Paraskevi - Attiki - Greece

*All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %*

*Version 3.6, 2014-06-18*

| Summary of | EN12976-2 | test results | Certification No. | SKM 9975 |
|---|---|---|---|---|
| Annex to Solar KEYMARK Certificate | | | Issued | 2017-08-10 |

| | | | | | |
|---|---|---|---|---|---|
| Company | CICERO HELLAS S.A. | | Country | Greece | |
| Brand (optional) | Calpak Mark4, Calpak giga XS, Solartherm | | Website | www.calpak.gr | |
| Street | 9, Sygrou Ave. | | E-mail | export@calpak.gr | |
| Postal Code | 11743 | Athens | Tel. / Fax | +30 | 210 9247250 / 9231616 |

**System family overview**

| Collector name | For each storage and collector size, give number of collectors | | | |
|---|---|---|---|---|
| | MARK 4-125 | MARK 4-160 | MARK 4-200 | MARK 4-300 |
| M4-200 | | | | |
| M4-210 | 1 | 1 | 1 2 | 2 |
| M4-260 | | 1 | 1 | 2 |
| M4-260H | | 1 | 1 | |
| M4-300 | | | 1 | |
| M4-300H | | | | 1 |

| Name of system configuration | | | | | MARK 4-160/2.1 | |
|---|---|---|---|---|---|---|
| Collector name | M4-210 | No. Collectors | 1 | Storage name | MARK 4-160 | |

**Calculated annual results for "solar-only / preheat system"**

| Location | Qd,sh | Daily drawoff 110 l | | | | Daily drawoff 140 l | | | | Daily drawoff 170 l | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol |
| | MJ/y | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % |
| Stockholm SE | - | 6150 | 2791 | - | 45 | 7821 | 3081 | - | 39 | 9492 | 3248 | - | 34 |
| WürzburgDE | - | 5897 | 2867 | - | 49 | 7506 | 3248 | - | 43 | 9114 | 3500 | - | 38 |
| Davos CH | - | 6654 | 4068 | - | 61 | 8483 | 4510 | - | 53 | 10281 | 4762 | - | 46 |
| Athens GR | -' | 4573 | 3595 | - | 79 | 5834 | 4194 | - | 72 | 7064 | 4699 | - | 67 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

**Perf. indicators for the table above**

| | | |
|---|---|---|
| Qd,sh | MJ/y | **Not relevant for solar domestic hot water system** |
| Qd | MJ/y | **Annual heat demand for domestic hot water** |
| QL | MJ/y | **Annual heat energy delivered by the solar system** |
| Qpar | MJ/y | **Annual parasitic energy: (electricity for pumps/controllers)** |
| $f_{sol}=Q_L/Q_d$ | - | **Solar fraction** |

| Ref. conditions | | Stockholm SE | Würzburg DE | Davos CH | Athens GR |
|---|---|---|---|---|---|
| | G | 1,157 | 1,230 | 1,684 | 1,736 |
| | Ta,ave | 7.5 | 9.0 | 3.2 | 18.5 |
| | Tc,ave | 8.5 | 10.0 | 5.4 | 17.8 |
| | ± ΔTc | 6.4 | 3.0 | 0.8 | 7.4 |

| | | |
|---|---|---|
| G | kWh/m² | **Annual irradiation South, 45°** |
| Ta,ave | °C | **Annual average outdoor air temperature** |
| Tc,ave | °C | **Annual average mains cold water temp.** |
| ΔTc | K | **Seasonal variation of Tc** |
| Th | 45 °C | **Desired hot water temperature (mixing valve temperature).** |

| Max. operating press. - collector side | 200 | kPa | Max. operating press. - tank side | 1,000 | kPa |
|---|---|---|---|---|---|

| | |
|---|---|
| Testing Laboratory | NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB |
| Website | www.solar.demokritos.gr |
| Test report id. number | 6066 DE1, 6067 DE1, 6066F3 |
| Date of test report | 10/11/2014, 12/7/2016, 1/8/2017 |
| Test method | ISO 9459-5 (DST) |

**Comments of test lab**

The long term prediction was extrapolated according to the Annex D of "Solar Keymark – Specific Scheme Rules".

N.C.S.R "DEMOKRITOS"
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153 10 Ag. Paraskevi - Attiki - Greece

*All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %*

*Version 3.6, 2014-06-18*

| Summary of | EN12976-2 | test results | Certification No. | SKM 9975 |
|---|---|---|---|---|
| Annex to Solar KEYMARK Certificate | | | Issued | 2017-08-10 |

| | | | | | |
|---|---|---|---|---|---|
| Company | CICERO HELLAS S.A. | | Country | Greece | |
| Brand (optional) | Calpak Mark4, Calpak giga XS, Solartherm | | Website | www.calpak.gr | |
| Street | 9, Sygrou Ave. | | E-mail | export@calpak.gr | |
| Postal Code | 11743 | Athens | Tel. / Fax | +30 | 210 9247250 / 9231616 |

**System family overview**

| Collector name | For each storage and collector size, give number of collectors | | | |
|---|---|---|---|---|
| | MARK 4-125 | MARK 4-160 | MARK 4-200 | MARK 4-300 |
| M4-200 | | | | |
| M4-210 | 1 | 1 | 1 2 | 2 |
| M4-260 | | 1 | 1 | 2 |
| M4-260H | | 1 | 1 | |
| M4-300 | | | 1 | |
| M4-300H | | | | 1 |

| Name of system configuration | | | | | MARK 4-160/2.6 | |
|---|---|---|---|---|---|---|
| Collector name | M4-260 | No. Collectors | 1 | Storage name | MARK 4-160 | |

**Calculated annual results for "solar-only / preheat system"**

| Location | Qd,sh | Daily drawoff 110 l | | | | Daily drawoff 140 l | | | | Daily drawoff 170 l | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol |
| | MJ/y | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % |
| Stockholm SE | - | 6150 | 3078 | - | 50 | 7821 | 3469 | - | 44 | 9492 | 3721 | - | 39 |
| WürzburgDE | - | 5897 | 3119 | - | 53 | 7506 | 3627 | - | 48 | 9114 | 3942 | - | 43 |
| Davos CH | - | 6654 | 4541 | - | 68 | 8483 | 5140 | - | 61 | 10281 | 5487 | - | 53 |
| Athens GR | -' | 4573 | 3816 | - | 83 | 5834 | 4510 | - | 77 | 7064 | 5109 | - | 72 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

**Perf. indicators for the table above**

| | | |
|---|---|---|
| Qd,sh | MJ/y | **Not relevant for solar domestic hot water system** |
| Qd | MJ/y | **Annual heat demand for domestic hot water** |
| QL | MJ/y | **Annual heat energy delivered by the solar system** |
| Qpar | MJ/y | **Annual parasitic energy: (electricity for pumps/controllers)** |
| $f_{sol}=Q_L/Q_d$ | - | **Solar fraction** |

| Ref. conditions | | Stockholm SE | Würzburg DE | Davos CH | Athens GR | | | |
|---|---|---|---|---|---|---|---|---|
| | G | 1,157 | 1,230 | 1,684 | 1,736 | | | |
| | Ta,ave | 7.5 | 9.0 | 3.2 | 18.5 | | | |
| | Tc,ave | 8.5 | 10.0 | 5.4 | 17.8 | | | |
| | ± ΔTc | 6.4 | 3.0 | 0.8 | 7.4 | | | |

| | | |
|---|---|---|
| G | kWh/m² | **Annual irradiation South, 45°** |
| Ta,ave | °C | **Annual average outdoor air temperature** |
| Tc,ave | °C | **Annual average mains cold water temp.** |
| ΔTc | K | **Seasonal variation of Tc** |
| Th | 45 °C | **Desired hot water temperature (mixing valve temperature).** |

| Max. operating press. - collector side | 200 | kPa | Max. operating press. - tank side | 1,000 | kPa |
|---|---|---|---|---|---|

| | |
|---|---|
| Testing Laboratory | NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB |
| Website | www.solar.demokritos.gr |
| Test report id. number | 6066 DE1, 6067 DE1, 6066F3 |
| Date of test report | 10/11/2014, 12/7/2016, 1/8/2017 |
| Test method | ISO 9459-5 (DST) |

**Comments of test lab**

The long term prediction was extrapolated according to the Annex D of "Solar Keymark – Specific Scheme Rules".

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*All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %*

*Version 3.6, 2014-06-18*

| Summary of | EN12976-2 | test results | Certification No. | SKM 9975 |
|---|---|---|---|---|
| Annex to Solar KEYMARK Certificate | | | Issued | 2017-08-10 |

| | | | | | |
|---|---|---|---|---|---|
| Company | CICERO HELLAS S.A. | | Country | Greece | |
| Brand (optional) | Calpak Mark4, Calpak giga XS, Solartherm | | Website | www.calpak.gr | |
| Street | 9, Sygrou Ave. | | E-mail | export@calpak.gr | |
| Postal Code | 11743 | Athens | Tel. / Fax | +30 | 210 9247250 / 9231616 |

**System family overview**

| Collector name | For each storage and collector size, give number of collectors | | | |
|---|---|---|---|---|
| | MARK 4-125 | MARK 4-160 | MARK 4-200 | MARK 4-300 |
| M4-200 | | | | |
| M4-210 | 1 | 1 | 1 2 | 2 |
| M4-260 | | 1 | 1 | 2 |
| M4-260H | | 1 | 1 | |
| M4-300 | | | 1 | |
| M4-300H | | | | 1 |

| Name of system configuration | | | | | MARK 4-160/2.6H | |
|---|---|---|---|---|---|---|
| Collector name | M4-260H | No. Collectors | 1 | Storage name | MARK 4-160 | |

**Calculated annual results for "solar-only / preheat system"**

| Location | Qd,sh | Daily drawoff 110 l | | | | Daily drawoff 140 l | | | | Daily drawoff 170 l | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol |
| | MJ/y | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % |
| Stockholm SE | - | 6150 | 3081 | - | 50 | 7821 | 3469 | - | 44 | 9492 | 3721 | - | 39 |
| WürzburgDE | - | 5897 | 3122 | - | 53 | 7506 | 3627 | - | 48 | 9114 | 3942 | - | 43 |
| Davos CH | - | 6654 | 4573 | - | 69 | 8483 | 5140 | - | 61 | 10281 | 5487 | - | 53 |
| Athens GR | -' | 4573 | 3816 | - | 83 | 5834 | 4541 | - | 78 | 7064 | 5109 | - | 72 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

**Perf. indicators for the table above**

| | | |
|---|---|---|
| Qd,sh | MJ/y | **Not relevant for solar domestic hot water system** |
| Qd | MJ/y | **Annual heat demand for domestic hot water** |
| QL | MJ/y | **Annual heat energy delivered by the solar system** |
| Qpar | MJ/y | **Annual parasitic energy: (electricity for pumps/controllers)** |
| $f_{sol}=Q_L/Q_d$ | - | **Solar fraction** |

| Ref. conditions | | Stockholm SE | Würzburg DE | Davos CH | Athens GR |
|---|---|---|---|---|---|
| | G | 1,157 | 1,230 | 1,684 | 1,736 |
| | Ta,ave | 7.5 | 9.0 | 3.2 | 18.5 |
| | Tc,ave | 8.5 | 10.0 | 5.4 | 17.8 |
| | ± ΔTc | 6.4 | 3.0 | 0.8 | 7.4 |

| | | |
|---|---|---|
| G | kWh/m² | **Annual irradiation South, 45°** |
| Ta,ave | °C | **Annual average outdoor air temperature** |
| Tc,ave | °C | **Annual average mains cold water temp.** |
| ΔTc | K | **Seasonal variation of Tc** |
| Th | 45 °C | **Desired hot water temperature (mixing valve temperature).** |

| Max. operating press. - collector side | 200 | kPa | Max. operating press. - tank side | 1,000 | kPa |
|---|---|---|---|---|---|

| | |
|---|---|
| Testing Laboratory | NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB |
| Website | www.solar.demokritos.gr |
| Test report id. number | 6066 DE1, 6067 DE1, 6066F3 |
| Date of test report | 10/11/2014, 12/7/2016, 1/8/2017 |
| Test method | ISO 9459-5 (DST) |

**Comments of test lab**

The long term prediction was extrapolated according to the Annex D of "Solar Keymark – Specific Scheme Rules".

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*All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %*

*Version 3.6, 2014-06-18*

| Summary of | EN12976-2 | test results | Certification No. | SKM 9975 |
|---|---|---|---|---|
| Annex to Solar KEYMARK Certificate | | | Issued | 2017-08-10 |

| | | | | | |
|---|---|---|---|---|---|
| Company | CICERO HELLAS S.A. | | Country | Greece | |
| Brand (optional) | Calpak Mark4, Calpak giga XS, Solartherm | | Website | www.calpak.gr | |
| Street | 9, Sygrou Ave. | | E-mail | export@calpak.gr | |
| Postal Code | 11743 | Athens | Tel. / Fax | +30 | 210 9247250 / 9231616 |

**System family overview**

| Collector name | For each storage and collector size, give number of collectors | | | |
|---|---|---|---|---|
| | MARK 4-125 | MARK 4-160 | MARK 4-200 | MARK 4-300 |
| M4-200 | | | | |
| M4-210 | 1 | 1 | 1 | 2 |
| M4-260 | | 1 | 1 | 2 |
| M4-260H | | 1 | 1 | |
| M4-300 | | | 1 | |
| M4-300H | | | | 1 |

| Name of system configuration | | | | | MARK 4-200/2.1 | |
|---|---|---|---|---|---|---|
| Collector name | M4-210 | No. Collectors | 1 | Storage name | MARK 4-200 | |

**Calculated annual results for "solar-only / preheat system"**

| Location | Qd,sh | Daily drawoff 170 l | | | | Daily drawoff 200 l | | | | Daily drawoff 250 l | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol |
| | MJ/y | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % |
| Stockholm SE | - | 9492 | 3343 | - | 35 | 11164 | 3469 | - | 31 | 13939 | 3658 | - | 26 |
| WürzburgDE | - | 9114 | 3564 | - | 39 | 10691 | 3753 | - | 35 | 13371 | 3879 | - | 29 |
| Davos CH | - | 10281 | 4825 | - | 47 | 12110 | 5046 | - | 42 | 15137 | 5203 | - | 34 |
| Athens GR | -' | 7064 | 4762 | - | 67 | 8326 | 5172 | - | 62 | 10407 | 5519 | - | 53 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

**Perf. indicators for the table above**

| | | |
|---|---|---|
| Qd,sh | MJ/y | **Not relevant for solar domestic hot water system** |
| Qd | MJ/y | **Annual heat demand for domestic hot water** |
| QL | MJ/y | **Annual heat energy delivered by the solar system** |
| Qpar | MJ/y | **Annual parasitic energy: (electricity for pumps/controllers)** |
| $f_{sol}=Q_L/Q_d$ | - | **Solar fraction** |

| Ref. conditions | | Stockholm SE | Würzburg DE | Davos CH | Athens GR |
|---|---|---|---|---|---|
| | G | 1,157 | 1,230 | 1,684 | 1,736 |
| | Ta,ave | 7.5 | 9.0 | 3.2 | 18.5 |
| | Tc,ave | 8.5 | 10.0 | 5.4 | 17.8 |
| | ± ΔTc | 6.4 | 3.0 | 0.8 | 7.4 |

| | | |
|---|---|---|
| G | kWh/m² | **Annual irradiation South, 45°** |
| Ta,ave | °C | **Annual average outdoor air temperature** |
| Tc,ave | °C | **Annual average mains cold water temp.** |
| ΔTc | K | **Seasonal variation of Tc** |
| Th | 45 °C | **Desired hot water temperature (mixing valve temperature).** |

| Max. operating press. - collector side | 200 | kPa | Max. operating press. - tank side | 1,000 | kPa |
|---|---|---|---|---|---|

| | |
|---|---|
| Testing Laboratory | NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB |
| Website | www.solar.demokritos.gr |
| Test report id. number | 6066 DE1, 6067 DE1, 6066F3 |
| Date of test report | 10/11/2014, 12/7/2016, 1/8/2017 |
| Test method | ISO 9459-5 (DST) |

**Comments of test lab**

The long term prediction was extrapolated according to the Annex D of "Solar Keymark – Specific Scheme Rules".

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*All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %*

*Version 3.6, 2014-06-18*

| Summary of | EN12976-2 | test results | Certification No. | SKM 9975 |
|---|---|---|---|---|
| Annex to Solar KEYMARK Certificate | | | Issued | 2017-08-10 |

| | | | | | |
|---|---|---|---|---|---|
| Company | CICERO HELLAS S.A. | | Country | Greece | |
| Brand (optional) | Calpak Mark4, Calpak giga XS, Solartherm | | Website | www.calpak.gr | |
| Street | 9, Sygrou Ave. | | E-mail | export@calpak.gr | |
| Postal Code | 11743 | Athens | Tel. / Fax | +30 | 210 9247250 / 9231616 |

**System family overview**

| Collector name | For each storage and collector size, give number of collectors | | | |
|---|---|---|---|---|
| | MARK 4-125 | MARK 4-160 | MARK 4-200 | MARK 4-300 |
| M4-200 | | | | |
| M4-210 | 1 | 1 | 1 2 | 2 |
| M4-260 | | 1 | 1 | 2 |
| M4-260H | | 1 | 1 | |
| M4-300 | | | 1 | |
| M4-300H | | | | 1 |

| Name of system configuration | | | | | MARK 4-200/2.6 | |
|---|---|---|---|---|---|---|
| Collector name | M4-260 | No. Collectors | 1 | Storage name | MARK 4-200 | |

**Calculated annual results for "solar-only / preheat system"**

| Location | Qd,sh | Daily drawoff 170 l | | | | Daily drawoff 200 l | | | | Daily drawoff 250 l | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol |
| | MJ/y | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % |
| Stockholm SE | - | 9492 | 3847 | - | 41 | 11164 | 4037 | - | 36 | 13939 | 4257 | - | 31 |
| WürzburgDE | - | 9114 | 4068 | - | 45 | 10691 | 4352 | - | 41 | 13371 | 4541 | - | 34 |
| Davos CH | - | 10281 | 5676 | - | 55 | 12110 | 5960 | - | 49 | 15137 | 6150 | - | 41 |
| Athens GR | - | 7064 | 5203 | - | 74 | 8326 | 5740 | - | 69 | 10407 | 6276 | - | 60 |
| | | | | | | | | | | | | | |
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**Perf. indicators for the table above**

| | | |
|---|---|---|
| Qd,sh | MJ/y | **Not relevant for solar domestic hot water system** |
| Qd | MJ/y | **Annual heat demand for domestic hot water** |
| QL | MJ/y | **Annual heat energy delivered by the solar system** |
| Qpar | MJ/y | **Annual parasitic energy: (electricity for pumps/controllers)** |
| $f_{sol}=Q_L/Q_d$ | - | **Solar fraction** |

| Ref. conditions | | Stockholm SE | Würzburg DE | Davos CH | Athens GR |
|---|---|---|---|---|---|
| | G | 1,157 | 1,230 | 1,684 | 1,736 |
| | Ta,ave | 7.5 | 9.0 | 3.2 | 18.5 |
| | Tc,ave | 8.5 | 10.0 | 5.4 | 17.8 |
| | ± ΔTc | 6.4 | 3.0 | 0.8 | 7.4 |

| | | |
|---|---|---|
| G | kWh/m² | **Annual irradiation South, 45°** |
| Ta,ave | °C | **Annual average outdoor air temperature** |
| Tc,ave | °C | **Annual average mains cold water temp.** |
| ΔTc | K | **Seasonal variation of Tc** |
| Th | 45 °C | **Desired hot water temperature (mixing valve temperature).** |

| Max. operating press. - collector side | 200 | kPa | Max. operating press. - tank side | 1,000 | kPa |
|---|---|---|---|---|---|

| | |
|---|---|
| Testing Laboratory | NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB |
| Website | www.solar.demokritos.gr |
| Test report id. number | 6066 DE1, 6067 DE1, 6066F3 |
| Date of test report | 10/11/2014, 12/7/2016, 1/8/2017 |
| Test method | ISO 9459-5 (DST) |

**Comments of test lab**

The long term prediction was extrapolated according to the Annex D of "Solar Keymark – Specific Scheme Rules".

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*All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %*

*Version 3.6, 2014-06-18*

| Summary of | EN12976-2 | test results | Certification No. | SKM 9975 |
|---|---|---|---|---|
| Annex to Solar KEYMARK Certificate | | | Issued | 2017-08-10 |

| | | | | | |
|---|---|---|---|---|---|
| Company | CICERO HELLAS S.A. | | Country | Greece | |
| Brand (optional) | Calpak Mark4, Calpak giga XS, Solartherm | | Website | www.calpak.gr | |
| Street | 9, Sygrou Ave. | | E-mail | export@calpak.gr | |
| Postal Code | 11743 | Athens | Tel. / Fax | +30 | 210 9247250 / 9231616 |

**System family overview**

| Collector name | For each storage and collector size, give number of collectors | | | |
|---|---|---|---|---|
| | MARK 4-125 | MARK 4-160 | MARK 4-200 | MARK 4-300 |
| M4-200 | | | | |
| M4-210 | 1 | 1 | 1 2 | 2 |
| M4-260 | | 1 | 1 | 2 |
| M4-260H | | 1 | 1 | |
| M4-300 | | | 1 | |
| M4-300H | | | | 1 |

| Name of system configuration | | | | | MARK 4-200/2.6H | |
|---|---|---|---|---|---|---|
| Collector name | M4-260H | No. Collectors | 1 | Storage name | MARK 4-200 | |

**Calculated annual results for "solar-only / preheat system"**

| Location | Qd,sh | Daily drawoff 170 l | | | | Daily drawoff 200 l | | | | Daily drawoff 250 l | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol |
| | MJ/y | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % |
| Stockholm SE | - | 9492 | 3721 | - | 39 | 11164 | 3847 | - | 34 | 13939 | 4005 | - | 29 |
| WürzburgDE | - | 9114 | 3942 | - | 43 | 10691 | 4068 | - | 38 | 13371 | 4257 | - | 32 |
| Davos CH | - | 10281 | 5487 | - | 53 | 12110 | 5613 | - | 46 | 15137 | 5803 | - | 38 |
| Athens GR | -' | 7064 | 5203 | - | 74 | 8326 | 5708 | - | 69 | 10407 | 6276 | - | 60 |
| | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | |

**Perf. indicators for the table above**

| | | |
|---|---|---|
| Qd,sh | MJ/y | **Not relevant for solar domestic hot water system** |
| Qd | MJ/y | **Annual heat demand for domestic hot water** |
| QL | MJ/y | **Annual heat energy delivered by the solar system** |
| Qpar | MJ/y | **Annual parasitic energy: (electricity for pumps/controllers)** |
| $f_{sol}=Q_L/Q_d$ | - | **Solar fraction** |

| Ref. conditions | | Stockholm SE | Würzburg DE | Davos CH | Athens GR |
|---|---|---|---|---|---|
| | G | 1,157 | 1,230 | 1,684 | 1,736 |
| | Ta,ave | 7.5 | 9.0 | 3.2 | 18.5 |
| | Tc,ave | 8.5 | 10.0 | 5.4 | 17.8 |
| | ± ΔTc | 6.4 | 3.0 | 0.8 | 7.4 |

| | | |
|---|---|---|
| G | kWh/m² | **Annual irradiation South, 45°** |
| Ta,ave | °C | **Annual average outdoor air temperature** |
| Tc,ave | °C | **Annual average mains cold water temp.** |
| ΔTc | K | **Seasonal variation of Tc** |
| Th | 45 °C | **Desired hot water temperature (mixing valve temperature).** |

| Max. operating press. - collector side | 200 | kPa | Max. operating press. - tank side | 1,000 | kPa |
|---|---|---|---|---|---|

| | |
|---|---|
| Testing Laboratory | NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB |
| Website | www.solar.demokritos.gr |
| Test report id. number | 6066 DE1, 6067 DE1, 6066F3 |
| Date of test report | 10/11/2014, 12/7/2016, 1/8/2017 |
| Test method | ISO 9459-5 (DST) |

**Comments of test lab**

The long term prediction was extrapolated according to the Annex D of "Solar Keymark – Specific Scheme Rules".

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153 10 Ag. Paraskevi - Attiki - Greece

*All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %*

*Version 3.6, 2014-06-18*

| Summary of | EN12976-2 | test results | Certification No. | SKM 9975 |
|---|---|---|---|---|
| Annex to Solar KEYMARK Certificate | | | Issued | 2017-08-10 |

| | | | | | |
|---|---|---|---|---|---|
| Company | CICERO HELLAS S.A. | | Country | Greece | |
| Brand (optional) | Calpak Mark4, Calpak giga XS, Solartherm | | Website | www.calpak.gr | |
| Street | 9, Sygrou Ave. | | E-mail | export@calpak.gr | |
| Postal Code | 11743 | Athens | Tel. / Fax | +30 | 210 9247250 / 9231616 |

**System family overview**

| Collector name | For each storage and collector size, give number of collectors | | | |
|---|---|---|---|---|
| | MARK 4-125 | MARK 4-160 | MARK 4-200 | MARK 4-300 |
| M4-200 | | | | |
| M4-210 | 1 | 1 | 1 2 | 2 |
| M4-260 | | 1 | 1 | 2 |
| M4-260H | | 1 | 1 | |
| M4-300 | | | 1 | |
| M4-300H | | | | 1 |

| Name of system configuration | | | | | MARK 4-200/3 | | |
|---|---|---|---|---|---|---|---|
| Collector name | M4-300 | No. Collectors | 1 | Storage name | MARK 4-200 | | |

**Calculated annual results for "solar-only / preheat system"**

| Location | Qd,sh | Daily drawoff 170 l | | | | Daily drawoff 200 l | | | | Daily drawoff 250 l | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol |
| | MJ/y | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % |
| Stockholm SE | - | 9492 | 4163 | - | 44 | 11164 | 4384 | - | 39 | 13939 | 4699 | - | 34 |
| WürzburgDE | - | 9114 | 4384 | - | 48 | 10691 | 4730 | - | 44 | 13371 | 4983 | - | 37 |
| Davos CH | - | 10281 | 6213 | - | 60 | 12110 | 6559 | - | 54 | 15137 | 6812 | - | 45 |
| Athens GR | -' | 7064 | 5487 | - | 78 | 8326 | 6055 | - | 73 | 10407 | 6749 | - | 65 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

**Perf. indicators for the table above**

| | | |
|---|---|---|
| Qd,sh | MJ/y | **Not relevant for solar domestic hot water system** |
| Qd | MJ/y | **Annual heat demand for domestic hot water** |
| QL | MJ/y | **Annual heat energy delivered by the solar system** |
| Qpar | MJ/y | **Annual parasitic energy: (electricity for pumps/controllers)** |
| $f_{sol}=Q_L/Q_d$ | - | **Solar fraction** |

| Ref. conditions | | Stockholm SE | Würzburg DE | Davos CH | Athens GR | | | |
|---|---|---|---|---|---|---|---|---|
| | G | 1,157 | 1,230 | 1,684 | 1,736 | | | |
| | Ta,ave | 7.5 | 9.0 | 3.2 | 18.5 | | | |
| | Tc,ave | 8.5 | 10.0 | 5.4 | 17.8 | | | |
| | ± ΔTc | 6.4 | 3.0 | 0.8 | 7.4 | | | |

| | | |
|---|---|---|
| G | kWh/m² | **Annual irradiation South, 45°** |
| Ta,ave | °C | **Annual average outdoor air temperature** |
| Tc,ave | °C | **Annual average mains cold water temp.** |
| ΔTc | K | **Seasonal variation of Tc** |
| Th | 45 °C | **Desired hot water temperature (mixing valve temperature).** |

| Max. operating press. - collector side | 200 | kPa | Max. operating press. - tank side | 1,000 | kPa |
|---|---|---|---|---|---|

| | |
|---|---|
| Testing Laboratory | NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB |
| Website | www.solar.demokritos.gr |
| Test report id. number | 6066 DE1, 6067 DE1, 6066F3 |
| Date of test report | 10/11/2014, 12/7/2016, 1/8/2017 |
| Test method | ISO 9459-5 (DST) |

**Comments of test lab**

The long term prediction was extrapolated according to the Annex D of "Solar Keymark – Specific Scheme Rules".

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*All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %*

*Version 3.6, 2014-06-18*

| Summary of | EN12976-2 | test results | Certification No. | SKM 9975 |
|---|---|---|---|---|
| Annex to Solar KEYMARK Certificate | | | Issued | 2017-08-10 |

| | | | | | |
|---|---|---|---|---|---|
| Company | CICERO HELLAS S.A. | | Country | Greece | |
| Brand (optional) | Calpak Mark4, Calpak giga XS, Solartherm | | Website | www.calpak.gr | |
| Street | 9, Sygrou Ave. | | E-mail | export@calpak.gr | |
| Postal Code | 11743 | Athens | Tel. / Fax | +30 | 210 9247250 / 9231616 |

**System family overview**

| Collector name | For each storage and collector size, give number of collectors | | | |
|---|---|---|---|---|
| | MARK 4-125 | MARK 4-160 | MARK 4-200 | MARK 4-300 |
| M4-200 | | | | |
| M4-210 | 1 | 1 | 1 **2** | 2 |
| M4-260 | | 1 | 1 | 2 |
| M4-260H | | 1 | 1 | |
| M4-300 | | | 1 | |
| M4-300H | | | | 1 |

| Name of system configuration | | | | | MARK 4-200/4.2 | | |
|---|---|---|---|---|---|---|---|
| Collector name | M4-210 | No. Collectors | 2 | Storage name | MARK 4-200 | | |

**Calculated annual results for "solar-only / preheat system"**

| Location | Qd,sh | Daily drawoff 170 l | | | | Daily drawoff 200 l | | | | Daily drawoff 250 l | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol |
| | MJ/y | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % |
| Stockholm SE | - | 9492 | 4762 | - | 50 | 11164 | 5140 | - | 46 | 13939 | 5582 | - | 40 |
| WürzburgDE | - | 9114 | 4888 | - | 54 | 10691 | 5393 | - | 50 | 13371 | 5897 | - | 44 |
| Davos CH | - | 10281 | 7190 | - | 70 | 12110 | 7821 | - | 65 | 15137 | 8262 | - | 55 |
| Athens GR | -' | 7064 | 5960 | - | 84 | 8326 | 6686 | - | 80 | 10407 | 7569 | - | 73 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

**Perf. indicators for the table above**

| | | |
|---|---|---|
| Qd,sh | MJ/y | **Not relevant for solar domestic hot water system** |
| Qd | MJ/y | **Annual heat demand for domestic hot water** |
| QL | MJ/y | **Annual heat energy delivered by the solar system** |
| Qpar | MJ/y | **Annual parasitic energy: (electricity for pumps/controllers)** |
| $f_{sol}=Q_L/Q_d$ | - | **Solar fraction** |

| Ref. conditions | | Stockholm SE | Würzburg DE | Davos CH | Athens GR |
|---|---|---|---|---|---|
| | G | 1,157 | 1,230 | 1,684 | 1,736 |
| | Ta,ave | 7.5 | 9.0 | 3.2 | 18.5 |
| | Tc,ave | 8.5 | 10.0 | 5.4 | 17.8 |
| | ± ΔTc | 6.4 | 3.0 | 0.8 | 7.4 |

| | | |
|---|---|---|
| G | kWh/m² | **Annual irradiation South, 45°** |
| Ta,ave | °C | **Annual average outdoor air temperature** |
| Tc,ave | °C | **Annual average mains cold water temp.** |
| ΔTc | K | **Seasonal variation of Tc** |
| Th | 45 °C | **Desired hot water temperature (mixing valve temperature).** |

| Max. operating press. - collector side | 200 | kPa | Max. operating press. - tank side | 1,000 | kPa |
|---|---|---|---|---|---|

| | |
|---|---|
| Testing Laboratory | NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB |
| Website | www.solar.demokritos.gr |
| Test report id. number | 6066 DE1, 6067 DE1, 6066F3 |
| Date of test report | 10/11/2014, 12/7/2016, 1/8/2017 |
| Test method | ISO 9459-5 (DST) |

**Comments of test lab**

The long term prediction was extrapolated according to the Annex D of "Solar Keymark – Specific Scheme Rules".

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*All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %*

*Version 3.6, 2014-06-18*

| Summary of | EN12976-2 | test results | Certification No. | SKM 9975 |
|---|---|---|---|---|
| Annex to Solar KEYMARK Certificate | | | Issued | 2017-08-10 |

| | | | | | |
|---|---|---|---|---|---|
| Company | CICERO HELLAS S.A. | | Country | Greece | |
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| Street | 9, Sygrou Ave. | | E-mail | export@calpak.gr | |
| Postal Code | 11743 | Athens | Tel. / Fax | +30 | 210 9247250 / 9231616 |

**System family overview**

| Collector name | For each storage and collector size, give number of collectors | | | |
|---|---|---|---|---|
| | MARK 4-125 | MARK 4-160 | MARK 4-200 | MARK 4-300 |
| M4-200 | | | | |
| M4-210 | 1 | 1 | 1 2 | 2 |
| M4-260 | | 1 | 1 | 2 |
| M4-260H | | 1 | 1 | |
| M4-300 | | | 1 | |
| M4-300H | | | | 1 |

| Name of system configuration | | | | | MARK 4-300/3H | |
|---|---|---|---|---|---|---|
| Collector name | M4-300H | No. Collectors | 1 | Storage name | MARK 4-300 | |

**Calculated annual results for "solar-only / preheat system"**

| Location | Qd,sh | Daily drawoff 250 l | | | | Daily drawoff 300 l | | | | Daily drawoff 400 l | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol |
| | MJ/y | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % |
| Stockholm SE | - | 13939 | 4888 | - | 35 | 16746 | 5172 | - | 31 | 22327 | 5456 | - | 24 |
| WürzburgDE | - | 13371 | 5267 | - | 39 | 16052 | 5550 | - | 35 | 21413 | 5771 | - | 27 |
| Davos CH | - | 15137 | 7190 | - | 47 | 18165 | 7506 | - | 41 | 24220 | 7726 | - | 32 |
| Athens GR | -' | 10407 | 7001 | - | 67 | 12488 | 7663 | - | 61 | 16651 | 8136 | - | 49 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

**Perf. indicators for the table above**

| | | |
|---|---|---|
| Qd,sh | MJ/y | **Not relevant for solar domestic hot water system** |
| Qd | MJ/y | **Annual heat demand for domestic hot water** |
| QL | MJ/y | **Annual heat energy delivered by the solar system** |
| Qpar | MJ/y | **Annual parasitic energy: (electricity for pumps/controllers)** |
| $f_{sol}=Q_L/Q_d$ | - | **Solar fraction** |

| Ref. conditions | | Stockholm SE | Würzburg DE | Davos CH | Athens GR |
|---|---|---|---|---|---|
| | G | 1,157 | 1,230 | 1,684 | 1,736 |
| | Ta,ave | 7.5 | 9.0 | 3.2 | 18.5 |
| | Tc,ave | 8.5 | 10.0 | 5.4 | 17.8 |
| | ± ΔTc | 6.4 | 3.0 | 0.8 | 7.4 |

| | | |
|---|---|---|
| G | kWh/m² | **Annual irradiation South, 45°** |
| Ta,ave | °C | **Annual average outdoor air temperature** |
| Tc,ave | °C | **Annual average mains cold water temp.** |
| ΔTc | K | **Seasonal variation of Tc** |
| Th | 45 °C | **Desired hot water temperature (mixing valve temperature).** |

| Max. operating press. - collector side | 200 | kPa | Max. operating press. - tank side | 1,000 | kPa |
|---|---|---|---|---|---|

| | |
|---|---|
| Testing Laboratory | NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB |
| Website | www.solar.demokritos.gr |
| Test report id. number | 6066 DE1, 6067 DE1, 6066F3 |
| Date of test report | 10/11/2014, 12/7/2016, 1/8/2017 |
| Test method | ISO 9459-5 (DST) |

**Comments of test lab**

The long term prediction was extrapolated according to the Annex D of "Solar Keymark – Specific Scheme Rules".

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*All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5 % to ± 15 %*

*Version 3.6, 2014-06-18*

| Summary of | EN12976-2 | test results | Certification No. | SKM 9975 |
|---|---|---|---|---|
| Annex to Solar KEYMARK Certificate | | | Issued | 2017-08-10 |

| | | | | | |
|---|---|---|---|---|---|
| Company | CICERO HELLAS S.A. | | Country | Greece | |
| Brand (optional) | Calpak Mark4, Calpak giga XS, Solartherm | | Website | www.calpak.gr | |
| Street | 9, Sygrou Ave. | | E-mail | export@calpak.gr | |
| Postal Code | 11743 | Athens | Tel. / Fax | +30 | 210 9247250 / 9231616 |

**System family overview**

| Collector name | For each storage and collector size, give number of collectors | | | |
|---|---|---|---|---|
| | MARK 4-125 | MARK 4-160 | MARK 4-200 | MARK 4-300 |
| M4-200 | | | | |
| M4-210 | 1 | 1 | 1 2 | 2 |
| M4-260 | | 1 | 1 | 2 |
| M4-260H | | 1 | 1 | |
| M4-300 | | | 1 | |
| M4-300H | | | | 1 |

| Name of system configuration | | | | | | | | MARK 4-300/4.2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Collector name | M4-210 | | No. Collectors | 2 | | Storage name | MARK 4-300 | | | | |

**Calculated annual results for "solar-only / preheat system"**

| Location | Qd,sh | Daily drawoff 250 l | | | | Daily drawoff 250 l | | | | Daily drawoff 400 l | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol |
| | MJ/y | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % |
| Stockholm SE | - | 13939 | 6023 | - | 43 | 16746 | 6370 | - | 38 | 22327 | 6717 | - | 30 |
| WürzburgDE | - | 13371 | 6370 | - | 48 | 16052 | 6780 | - | 42 | 21413 | 7096 | - | 33 |
| Davos CH | - | 15137 | 8956 | - | 59 | 18165 | 9335 | - | 51 | 24220 | 9618 | - | 40 |
| Athens GR | -' | 10407 | 7947 | - | 76 | 12488 | 8799 | - | 70 | 16651 | 9808 | - | 59 |
| | | | | | | | | | | | | | |
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**Perf. indicators for the table above**

| | | |
|---|---|---|
| Qd,sh | MJ/y | **Not relevant for solar domestic hot water system** |
| Qd | MJ/y | **Annual heat demand for domestic hot water** |
| QL | MJ/y | **Annual heat energy delivered by the solar system** |
| Qpar | MJ/y | **Annual parasitic energy: (electricity for pumps/controllers)** |
| $f_{sol}=Q_L/Q_d$ | - | **Solar fraction** |

| Ref. conditions | | Stockholm SE | Würzburg DE | Davos CH | Athens GR |
|---|---|---|---|---|---|
| | G | 1,157 | 1,230 | 1,684 | 1,736 |
| | Ta,ave | 7.5 | 9.0 | 3.2 | 18.5 |
| | Tc,ave | 8.5 | 10.0 | 5.4 | 17.8 |
| | ± ΔTc | 6.4 | 3.0 | 0.8 | 7.4 |

| | | |
|---|---|---|
| G | kWh/m² | **Annual irradiation South, 45°** |
| Ta,ave | °C | **Annual average outdoor air temperature** |
| Tc,ave | °C | **Annual average mains cold water temp.** |
| ΔTc | K | **Seasonal variation of Tc** |
| Th | 45 °C | **Desired hot water temperature (mixing valve temperature).** |

| Max. operating press. - collector side | 200 | kPa | Max. operating press. - tank side | 1,000 | kPa |
|---|---|---|---|---|---|

| | |
|---|---|
| Testing Laboratory | NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB |
| Website | www.solar.demokritos.gr |
| Test report id. number | 6066 DE1, 6067 DE1, 6066F3 |
| Date of test report | 10/11/2014, 12/7/2016, 1/8/2017 |
| Test method | ISO 9459-5 (DST) |

**Comments of test lab**

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*Version 3.6, 2014-06-18*

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| M4-260H | | 1 | 1 | |
| M4-300 | | | 1 | |
| M4-300H | | | | 1 |

| Name of system configuration | | | | | MARK 4-300/5.2 | |
|---|---|---|---|---|---|---|
| Collector name | M4-260 | No. Collectors | 2 | Storage name | MARK 4-300 | |

**Calculated annual results for "solar-only / preheat system"**

| Location | Qd,sh | Daily drawoff 250 l | | | | Daily drawoff 300 l | | | | Daily drawoff 400 l | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol | Qd,hw | QL | Qpar | fsol |
| | MJ/y | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % | MJ/y | MJ/y | MJ/y | % |
| Stockholm SE | - | 13939 | 6559 | - | 47 | 16746 | 7127 | - | 43 | 22327 | 7726 | - | 35 |
| WürzburgDE | - | 13371 | 6875 | - | 51 | 16052 | 7506 | - | 47 | 21413 | 8136 | - | 38 |
| Davos CH | - | 15137 | 9965 | - | 66 | 18165 | 10659 | - | 59 | 24220 | 11227 | - | 46 |
| Athens GR | - | 10407 | 8420 | - | 81 | 12488 | 9492 | - | 76 | 16651 | 10880 | - | 65 |
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| Website | www.solar.demokritos.gr |
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| Test method | ISO 9459-5 (DST) |

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