



## REQUIREMENT

### SOLAR WATER HEATER PARAMETERS REQUIRED FOR AS4234 PERFORMANCE RATING – THERMOSYPHON

Version 13 as updated in July 2010

The Office of the Renewable Energy Regulator (ORER) may request additional information to support your application to make a Solar Water Heater model eligible Renewable Energy Certificates. Please complete and supply this form for each model as requested by the ORER.

The system parameters required as inputs to the simulation deck are outlined below. Some systems may require other parameters to be specified. Add extra parameters if they are necessary for modelling features of your product.

(Attach drawing of typical installation showing relative position of tank and collector and fill in all spaces – use N/A if not applicable)

|  |  |
|--|--|
| Company  |  |
| Address  |  |
| Phone No   |  |
| Email address                                    |  |
| Company officer reporting system characteristics |  |
| Date   |  |
| Water heater model number                        |  |
| Water heater model number                        |  |
| Does the system comply with AS2712?<br>(Y/N)     |  |
| Date of compliance approval from QAS             |  |

#### TANK

| PARAMETER                           | VALUE | UNITS |
|-------------------------------------|-------|-------|
| Tank model                          |       |       |
| Tank inner diameter                 |       | mm    |
| Tank volume (physical not delivery) |       | L     |

## Pumped circulation solar water heater parameters

|  |  |                        |
|--|--|------------------------|
| Tank configuration   |  | Vertical or horizontal |
| Tank wall thickness  |  | mm                     |
| Thermal conductivity of tank wall material   |  | W/(m K)                |
| Volume above flow input from collector   |  | L                      |
| Volume above flow outlet to collector  |  | L                      |
| Volume above outlet to load supply   |  | L                      |
| Volume above cold water inlet  |  | L                      |
| Ratio of insulation thickness at top to bottom of horizontal tank                                |  | -                      |
| Ratio of insulation thickness at the top of the tank to the side of the tank for a vertical tank |  |                        |
| Glass lining thickness (if mantle heat exchanger used)   |  | mm                     |

### Tank heat loss (electric boosted tanks and solar preheat tanks)

|  |  |  |
|--|--|--|
| Tank standing heat loss (AS/NZS 4692.1) conditions with element in the bottom of the tank) |  | kWh/day<br>for $\Delta T = 55 \text{ K}$ |
| Test laboratory  |  |  |
| Date of test   |  |  |
| Test report number   |  |  |

### Tank heat loss (gas storage)

|   |  |      |
|---|--|------|
| Tank maintenance gas rate (AS 4552 conditions with gas booster in the bottom of the tank) |  | MJ/h |
| Temperature difference during maintenance rate testing                                    |  | K    |
| Test laboratory   |  |      |
| Date of test  |  |      |
| Test report number  |  |      |

## SUPPLEMENTARY BOOSTING

### Electric Boosting in tank

|  |  |   |
|--|--|---|
| Volume of water above the electric element No 1<br>For sickle elements the volume above the level with 50% of the active length of the |  | L |
|--|--|---|

## Pumped circulation solar water heater parameters

|  |  |  |
|--|--|--|
| element above and below.   |  |  |
| Volume of water above the thermostat No 1  |  | L  |
| Element heating capacity No 1  |  | kW   |
| Electric boost power connection for element No1  |  | Night rate off-peak (OP1), extended off-peak (OP2) or continuous (C) |
| Volume of water above element. No 2.<br>For sickle elements the volume above the level with 50% of the active length of the element above and below. |  | L  |
| Volume of water above thermostat No 2  |  | L  |
| Element heating capacity No 2  |  | kW   |
| Electric boost power connection for element No2  |  | Night rate off-peak (OP1), extended off-peak (OP2) or continuous (C) |

|  |  |      |
|--|--|------|
| <b>Gas boosting (in primary tank)</b>  |  |      |
| Determined gas capacity (gas input)  |  | MJ/h |
| Thermal efficiency (AS 4552)   |  | %    |
| Test laboratory  |  |      |
| Test report number   |  |      |
| Date of test   |  |      |
| Position of gas burner in the tank. Provide sketch if not in bottom of tank. |  |      |
| Thermostat set temperature   |  | °C   |
| Thermostat dead band   |  | K    |

|   |  |      |
|---|--|------|
| <b>Series gas tank</b>  |  |      |
| Tank maintenance gas rate (AS 4552 conditions with gas booster in the bottom of the tank) |  | MJ/h |
| Temperature difference during maintenance rate testing                                    |  | K    |
| Thermostat set temperature  |  | °C   |
| Thermostat dead band  |  | K    |
| Series tank volume (physical volume)  |  | L    |
| Volume of water above thermostat  |  | L    |

## Pumped circulation solar water heater parameters

|                    |  |
|--------------------|--|
| Test laboratory    |  |
| Test report number |  |
| Date of test       |  |

| <b>Instantaneous gas boosting</b>                  |  |      |
|--|--|------|
| Manufacturer                                       |  |      |
| Model number                                       |  |      |
| Determined gas capacity (maximum gas input)        |  | MJ/h |
| Efficiency AS 4552                                 |  | %    |
| Electric power consumption during standby          |  | W    |
| Electric power consumption during burner operation |  | W    |
| Start up heat capacity (AS 4552)                   |  | MJ   |
| Thermostat set temperature                         |  | °C   |
| Test laboratory                                    |  |      |
| Date of test                                       |  |      |
| Test report number                                 |  |      |

## Pumped circulation solar water heater parameters

### SUPPLEMENTARY ENERGY CONTROL (DETAIL ALL ELEMENTS OR BURNERS)

|   |  |   |
|---|--|---|
| Boosting control strategy (all auxiliary boost options)         |  | Detail supplementary heating times e.g., continuous, off-peak, other time control or other strategy (provide separate description of control logic if strategy is not simple time control). |
| Legionella control method – provide details of control strategy |  |   |

### PIPE BETWEEN SOLAR PREHEAT TANK AND GAS BOOSTER

|  |  |         |
|--|--|---------|
| Inner diameter (ID)                              |  | mm      |
| Pipe length (minimum 5 m)                        |  | m       |
| Thermal conductivity of pipe insulation material |  | W/(m K) |
| Pipe insulation thickness                        |  | mm      |

### SOLAR COLLECTOR

|  |  |  |
|--|--|--|
| Model No   |  |  |
| Type of collector  |  | Flat plate or evacuated tube or CPC or other |
| Collector efficiency parameters (AS/NZS 2535) specify 'a' or 'b' coefficients                          |  |  |
| $Efficiency = a_1 - a_2 \frac{(\bar{T} - T_a)}{G} - a_3 \frac{(\bar{T} - T_a)^2}{G}$                   |  |  |
| $a_1 =$  |  | -  |
| $a_2 =$  |  | W/(m <sup>2</sup> K)                         |
| $a_3 =$  |  | W/(m <sup>2</sup> K <sup>2</sup> )           |
| Collector efficiency parameters (AS 2535)  |  |  |
| $Efficiency = b_1 - b_2 \frac{(\bar{T} - T_a)}{G} - b_3 \frac{((\bar{T} + 273)^4 - (T_a + 273)^4)}{G}$ |  |  |
| $b_1 =$  |  | -  |
| $b_2 =$  |  | W/(m <sup>2</sup> K)                         |
| $b_3 =$  |  | W/(m <sup>2</sup> K <sup>4</sup> )           |
| Collector area used by test laboratory to define efficiency  |  | m <sup>2</sup>                               |

## Pumped circulation solar water heater parameters

|   |  |                           |
|---|--|---------------------------|
| Test laboratory                                       |  |                           |
| Date of test  |  |                           |
| Test report number                                    |  |                           |
| Number of collectors used in water heater             |  |                           |
| Number of risers or evacuated tubes in each collector |  |                           |
| Riser inner diameter                                  |  | mm                        |
| Riser length  |  | m                         |
| Spacing between risers                                |  | m                         |
| Header inner diameter                                 |  | mm                        |
| Header length (one header only)                       |  | m                         |
| Absorber material                                     |  | e.g., copper or aluminium |
| Absorber thickness                                    |  | mm                        |
| Absorber coating                                      |  | e.g. selective surface    |

### Incidence angle modifier

|                      |                     |                       |   |
|----------------------|---------------------|-----------------------|---|
| Flat Plate           | b =                 |                       | - |
| Evacuated tube array |                     |                       |   |
| Incidence angle      | Transverse modifier | Longitudinal modifier |   |
| 0                    | 1.0                 | 1.0                   |   |
| 10                   |                     |                       |   |
| 20                   |                     |                       |   |
| 30                   |                     |                       |   |
| 40                   |                     |                       |   |
| 50                   |                     |                       |   |
| 60                   |                     |                       |   |
| 70                   |                     |                       |   |
| 80                   |                     |                       |   |
| 90                   | 0                   | 0                     |   |

## Pumped circulation solar water heater parameters

### COLLECTOR LOOP HEAT EXCHANGER (if used)

| <b>In-tank coil heat exchanger</b>             |  |                |
|--|--|----------------|
| Inner diameter of coil tubing                  |  | mm             |
| Length of coil inside the tank                 |  | m              |
| Wall thickness of tubing                       |  | mm             |
| Wall material of tubing                        |  |                |
| Thermal conductivity of tubing                 |  | W/(m K)        |
| External surface area of heat exchanger        |  | m <sup>2</sup> |
| Volume of water above top of heat exchanger    |  | L              |
| Volume of water above bottom of heat exchanger |  | L              |

### Mantle collector loop heat exchanger (provide diagram of mantle and tank)

|  |  |    |
|--|--|----|
| Volume of water in tank above top of mantle    |  | L  |
| Volume of water in tank above bottom of mantle |  | L  |
| Mantle gap                                     |  | mm |
| Circumferential width of mantle                |  | mm |

### SOLAR COLLECTOR LOOP PLUMBING

|  |  |   |
|--|--|---|
| Direct connection to tank or via heat exchanger<br>If collector loop heat exchanger then provide details of heat exchanger location and construction |  | Direct or heat exchanger<br>Provide dimensioned drawing |
| Vertical separation between the centreline of the collector upper header and the centreline of the collector lower header                            |  | m   |
| Vertical separation between the tank cold outlet to the collector and the centreline of the collector inlet header                                   |  | m   |
| Collector supply (inlet) pipe inner diameter   |  | mm  |
| Inlet pipe length  |  | m   |
| Inlet pipe insulation thickness  |  | mm  |
| Thermal conductivity of inlet pipe insulation material   |  | W/(m K)   |

## Pumped circulation solar water heater parameters

|   |  |         |
|---|--|---------|
| Collector outlet pipe inner diameter                    |  | mm      |
| Outlet pipe length                                      |  | m       |
| Thermal conductivity of outlet pipe insulation material |  | W/(m K) |
| Outlet pipe insulation thickness                        |  | mm      |

### **LOAD SIDE HEAT EXCHANGER (if used)**

|  |  |         |
|--|--|---------|
| Inner diameter of heat exchanger tubing                        |  | mm      |
| Plain tube or finned tube in heat exchanger                    |  |         |
| Fin pitch for finned tube                                      |  | mm      |
| Fin thickness for finned tube                                  |  | mm      |
| Fin radial length for finned tube                              |  | mm      |
| Length of each heat exchanger flow path in the tank            |  | m       |
| Number of parallel heat exchanger paths                        |  |         |
| Wall thickness of heat exchanger tubing                        |  | mm      |
| Thermal conductivity of wall material of heat exchanger tubing |  | W/(m K) |
| Volume of water above top of heat exchanger                    |  | L       |
| Volume of water above bottom of heat exchanger                 |  | L       |