# Layout Document

| | |
|---|---|
| Project number: | **77152227** |
| Prepared: | |
| Description | **6 x WPL 23 E, 10 x SBB 1001 W SOL, 25 x SOL 27 Premium W** |

| | |
|---|---|
| Property | Stanley Development |
| Country | South Africa |

Installer:

Street

Post Code / Town

Phone

Fax / Mobilephone:

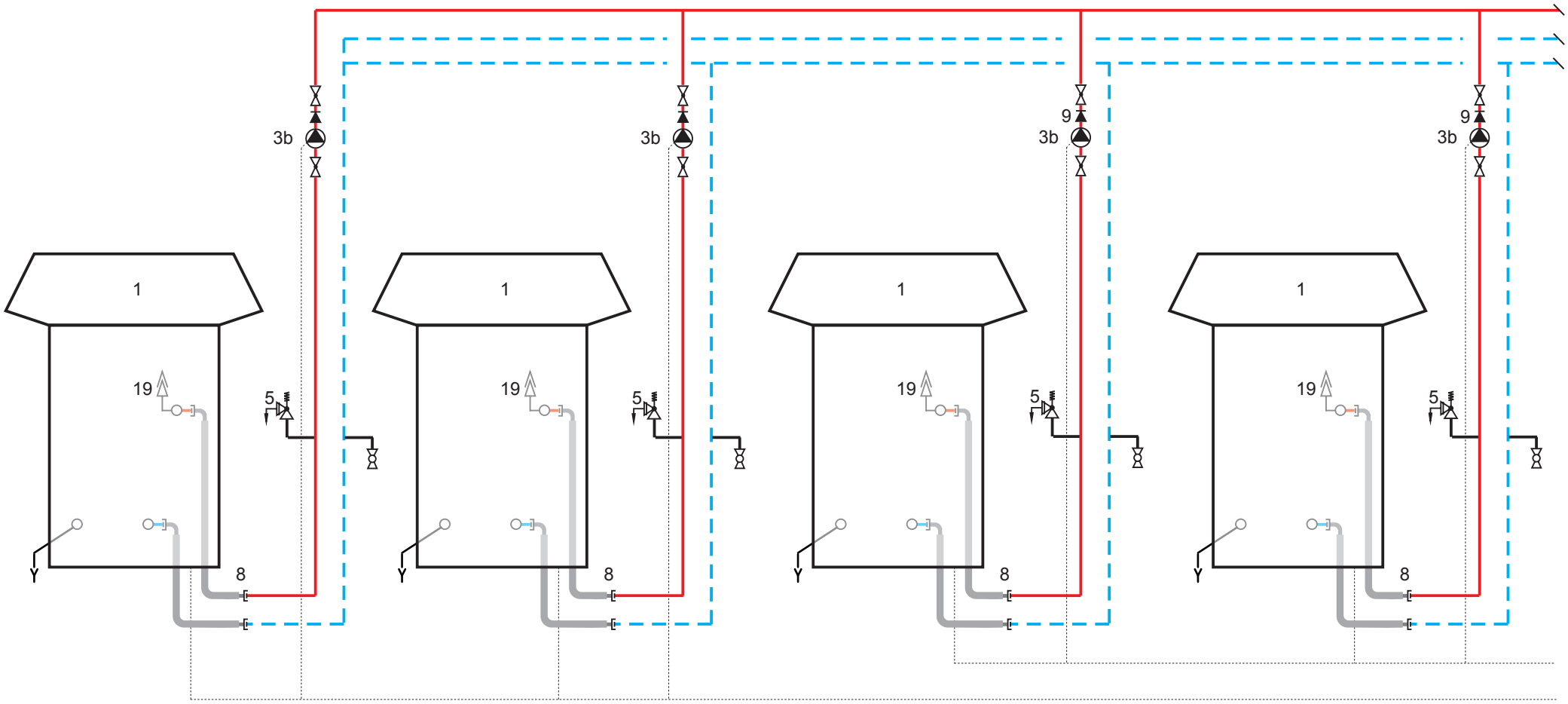
E-Mail:

Notes:

- This is a first proposal and not the final solution.
- The hydraulic system is planned as per information provided by Rivers corporate
- The solar collectors drawn in the hydraulic scheme are for representational purpose only. The material list consists of 25 collectors for flat roof and its system equipments.
- The circulation pump for solar collectors, 3.f, should be organized on-site. Recommendation : Grundfos UPS 40-120 F
- 6 heat pumps and 25 solar collectors provide DHW für 200 apartment units
- The DHW calculation is done for 2 people living in 200 units consuming an average of 40l water @ 45°C per day.
- External heat exchanger for DHW preparation should be arranged on-site Recommendation will follow
- The secondary side circulating pump should be arranged on-site
- Recommendation will follow

Solutions:

- Hydraulic scheme and simulation results are included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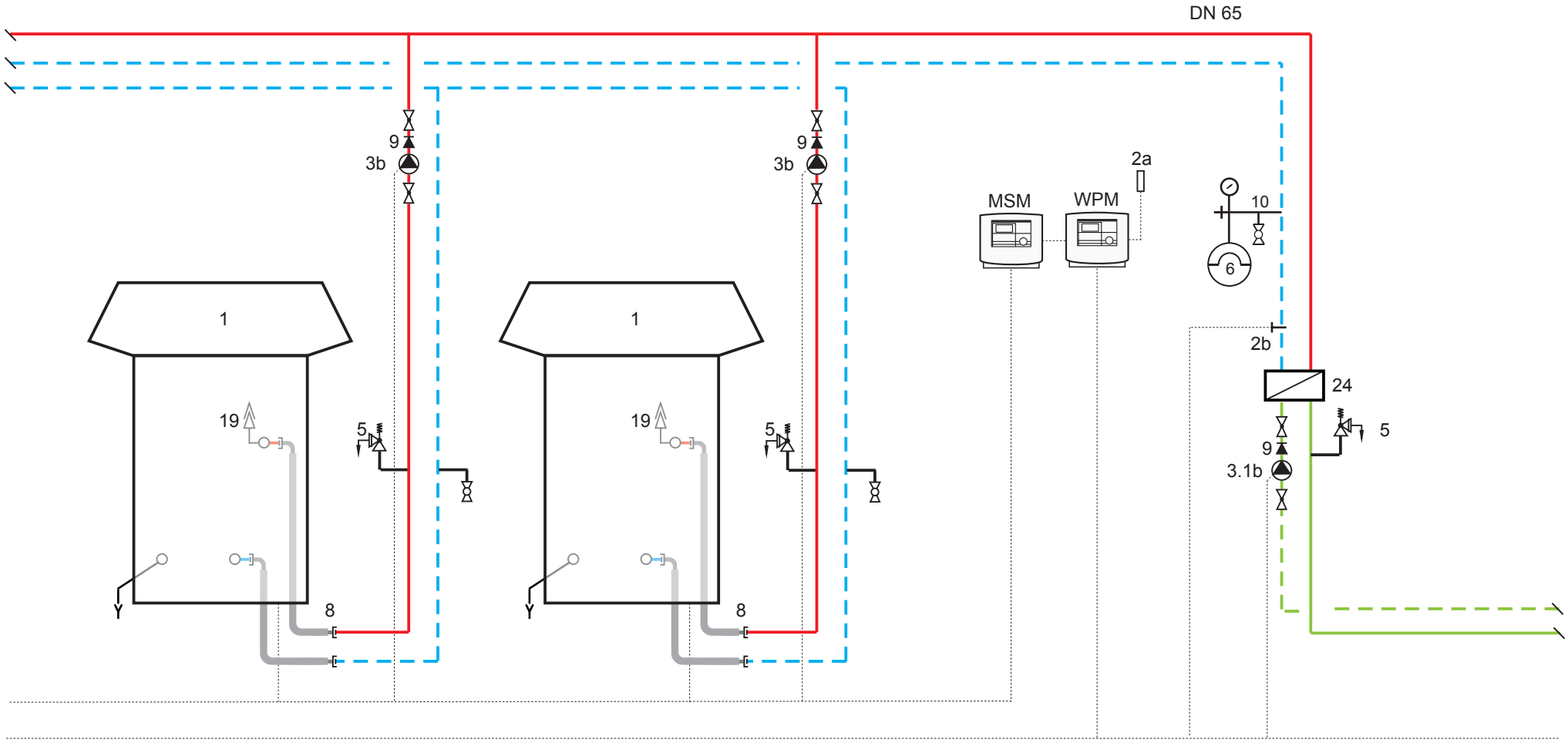
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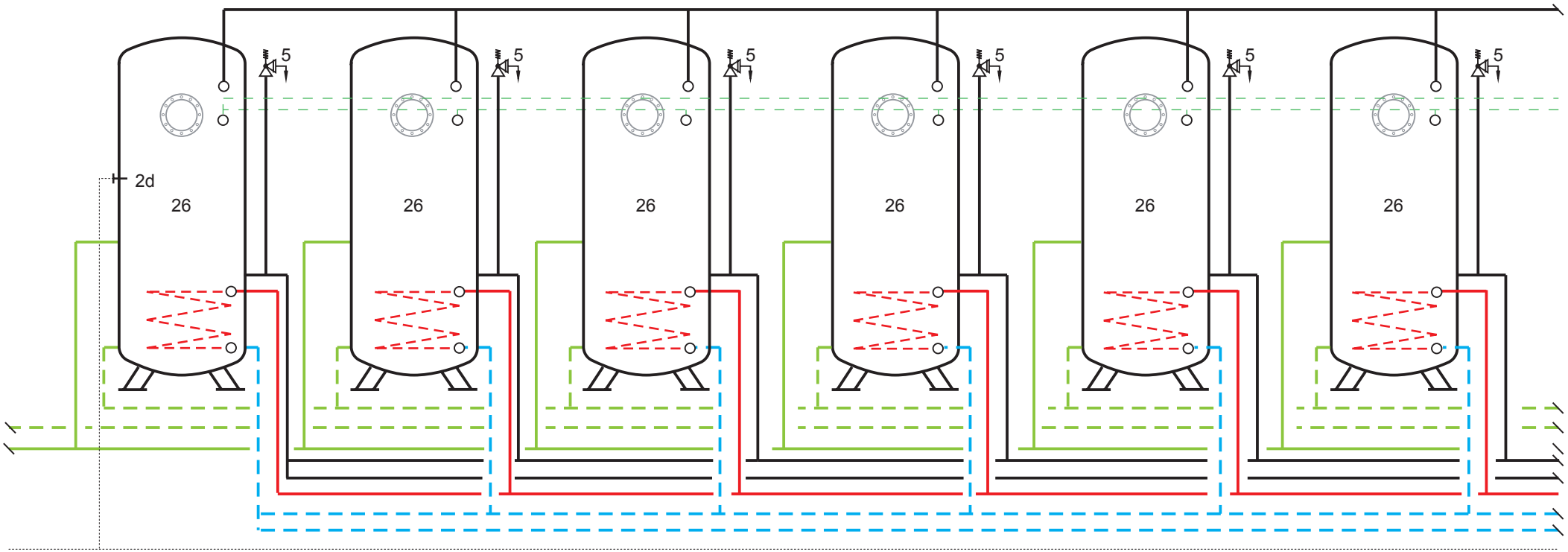
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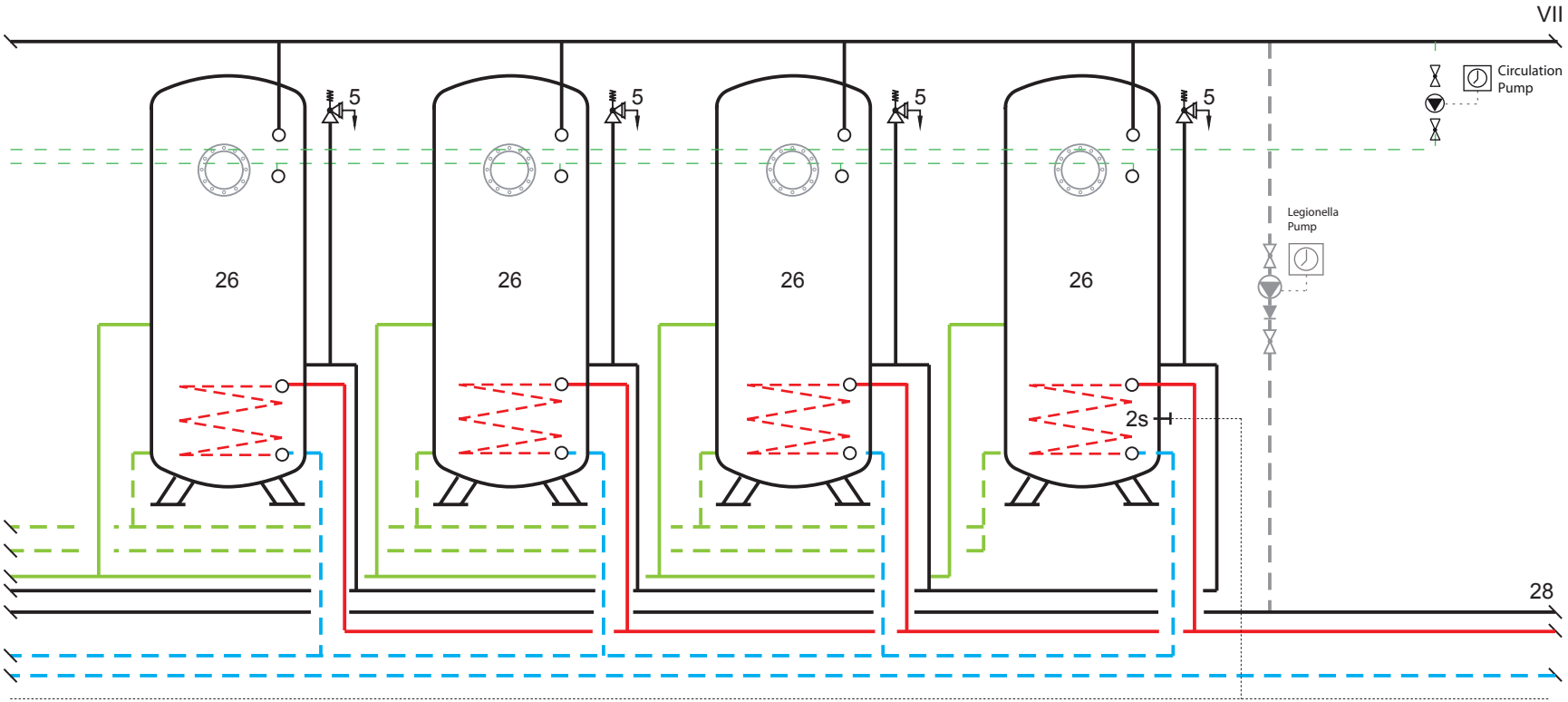
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Circulation Pump
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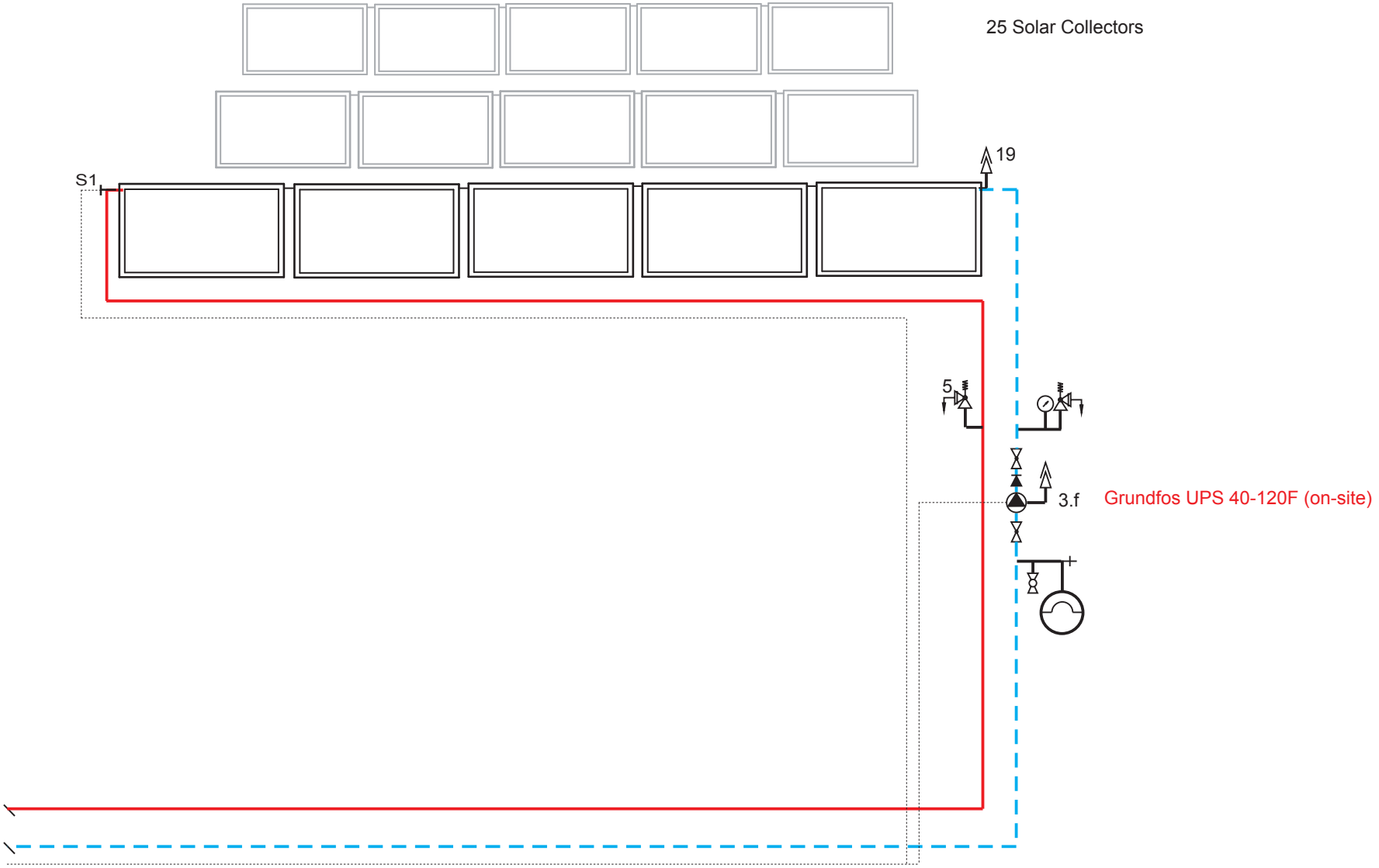
25 Solar Collectors
S1
19
5
3.f
Grundfos UPS 40-120F (on-site)

# DESCRIPTION



| | |
|---|---|
| Pos. 1 | Heat pump |
| Pos. 1-1 | Exhaust air module: LWM 250 |
| Pos. 1-2 | Cooling module: WPAC |
| Pos. 2 | Control unit: WPMW |
| Pos. 2-1 | Swimming pool module: MSMW |
| Pos. 2-2 | Remote control: FE 7 |
| Pos. 2-3 | Remote control cooling: FEK |
| Pos. 2 a | Temperature sensor: Outside temperature |
| Pos. 2 b | Temperature sensor: Return temperature |
| Pos. 2 c | Temperature sensor: Flow temperature, DHW "off" |
| Pos. 2 d | Temperature sensor: Flow temperature, DHW "on" |
| Pos. 2 e | Temperature sensor: Mixer control |
| Pos. 2 f | Temperature sensor: Heat source 2 |
| Pos. 2 g | Temperature sensor: Heat source |
| Pos. 2 h | Temperature sensor: Swimming pool water heating |
| Pos. 2 k | Temperature sensor: solar panel |
| Pos. 2 ko | Temperature sensor: solar panel East |
| Pos. 2 kw | Temperature sensor: solar panel West |
| Pos. 2 l | Temperature sensor 1:  return flow temperature increase |
| Pos. 2 m | Temperature sensor 2:  return flow temperature increase |
| Pos. 2 p | Temperature sensor: solar buffer cylinder |
| Pos. 2 r | Temperature sensor: additional solar buffer cylinder |
| Pos. 2 s | Temperature sensor: solar system hot water/ cooling |
| Pos. 3 | Circulation pump: Heat pump - heat source |
| Pos. 3 a | Circulation pump: Heat pump - heating side |
| Pos. 3 b | Circulation pump: DHW heating |
| Pos. 3 c | Circulation pump: Heating circuit 1 |
| Pos. 3 d | Circulation pump: Heating circuit 2 |
| Pos. 3 e | Circulation pump: Swimming pool |
| Pos. 3 f | Circulation pump: Solar DHE heating |
| Pos. 3 f.1 | Circulation pump: Solar heating system |
| Pos. 3 f.2 | Circulation pump: Solar Swimming pool |
| Pos. 3 fo | Circulation pump: Solar panel East |
| Pos. 3 fw | Circulation pump: Solar panel West |
| Pos. 3 g | Circulation pump: Solid fuel boiler |
| Pos. 3 x | Circulation pump: Cooling - heat source |
| Pos. 3 y | Circulation pump: Heat pump - heat source |
| Pos. 4 | Compact installation: WPKI |
| Pos. 5 | Safety valve |
| Pos. 6 | Expansion vessel |
| Pos. 7 | Buffer cylinder/ low loss header |
| Pos. 8 | Anti-vibration mount |
| Pos. 9 | Non-return valve |
| Pos. 10 | Fill & drain valve |
| Pos. 11 | Oil fired boiler / Gas fired boiler |
| Pos. 12 | Electric central heating |
| Pos. 13 | Mixing valve |
| Pos. 14 | Mixing valve actuator |
| Pos. 15 | Heating control unit |
| Pos. 16 | Remote set value selector |
| Pos. 17 | Temperature sensor: Outside temperature |
| Pos. 18 | Temperature sensor: Flow temperature |
| Pos. 19 | Air vent valve |
| Pos. 20 | Solid fuel boiler |
| Pos. 21 | Motorised valve / Solenoid valve |
| Pos. 22 | Diverter valve |
| Pos. 23 | Threaded immersion heater |
| Pos. 24 | Heat exchanger |
| Pos. 25 | Combi cylinder |
| Pos. 26 | DHW cylinder |
| Pos. 27 | Central control thermostat |
| Pos. 28 | Cold water - safety equipment assembly |
| Pos. 29 | Controller: Swimming pool water |
| Pos. 30 | Control thermostat |
| Pos. 31 | Overflow valve |
| Pos. 32 | cap valve |
| Pos. 33 | Line regulating valve |
| Pos. 34 | Temperature differential controller |
| Pos. 35 | Flow limiter |
| Pos. 36 | High limit thermostat - underfloor heating system |
| Pos. 37 | Zone valve |
| Pos. 38 | Inflow tube |
| Pos. 39 | Filter / strainer |
| Pos. 40 | Fancoil |
| Pos. 41 | Instantaneous water heater DHE |
| Pos. 42 | Solar panel |
| Pos. 43 | Elecrtical heating flang |
| | |
| Pos. I | Heat utilisation system |
| Pos. II | Heat source system |
| Pos. III | Solar panel |
| Pos. IV | Cooling system |
| Pos. V | Radiator heating system |
| Pos. VI | Underfloor heating system |
| Pos. VII | DHW |
| Pos. VIII | Swimming pool water |

# Material composition

| PROJECT | CUSTOMER |
| --- | --- |
| Stanley Development | |

PLG_152227

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Editor: B. Singh

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v4.09

## Heat pump

| Position | | ID | Quantity | Name |
|---|---|---|---|---|
| 1 |  | 227758 | 6 | Air\|Water heat pump WPL 23 E<br><br>Air \| water heat pump with enhanced vapour injection for heating and cooling. Can be used as an outdoor or indoor installation version with corresponding accessories. The metal casing is corrosion-protected and made from galvanised and powder-coated sheet steel with a stove enamel finish. The refrigerant circuit is hermetically sealed, tested for leaks at the factory and filled with safety refrigerant R407C. Twin flexible coupling for the compressor for reduced sound power level. Thanks to enhanced vapour injection the scroll compressor is cooled at low outside temperatures and a higher heating output is achieved. The wide fin spacing of the evaporator enables low air resistance for noise reduction and improved defrosting. The 4/2-way valve enables defrosting by reversing the circuit and the changeover of the refrigerant circuit from heating to cooling mode. Biflow-capable electronic expansion valve with a separate control unit and switching via the internal heat pump control unit (IWS) for optimised overheating protection and therefore a higher COP. Time optimised and energy |
| 2 |  | 074413 | 6 | Accessories WPL 13/18/23 external installation<br><br>The painted metal casings are a vital accessory for Air \| Water heat pumps. |
| 3 |  | 232977 | 12 | Pressure hose SD 32-1 G<br><br>Pressure hoses for flow and return lines (with 19 mm thermal insulation), operating pressure 0.25 MPa with threaded fittings. With straight ends. |
| 4 |  | 234922 | 1 | Heat pump manager WPMW 3 international<br><br>Heat pump manager WPM 3 available for wall mounting or for mounting inside a control panel. Comprising a controller for the connection of actuators and sensors and a separate programming unit with backlit LCD with graphic capability. Up to 6 heat pump stages can be controlled in conjunction with the MSM (accessories). Control of one direct heating circuit and one circuit with mixer with separate 7-day heating programs. The DHW heating is regulated via a freely adjustable individual 7-day program. Optional connection of a second heat source. Optional activation of a solar controller, heat meter or passive-active cooling function. The Internet Service Gateway (accessory) is required for connection to a home network / internet and SERVICEWELT. The Internet Service Gateway plus (accessory) is required for the SG |
| 5 |  | 074519 | 1 | Mixer module MSMW<br><br>The MSM mixer module is used as an extension to the WPM for systems with more than two heat pumps. An additional four single compressors or one 2-compressor heat pump(s) and an additional mixer circuit with heating and setback times can be controlled. For both versions, a contact sensor is part of the standard delivery. |
| 6 |  | 232943 | 6 | Circulation pump UP 25/7.5 E<br><br>Energy efficient heating circuit pump (EEI ? 0.23), electronic control, with thermal insulation. |
| 7 |  | 229295 | 10 | Warm water cylinder SBB 1001 SOL<br><br>Floorstanding, sealed unvented heat pump cylinder (pressure-tested), made from enamelled steel, for combination with the WTS 30 E or WTS 40 E charging station as an accessory for DHW heating. Cylinder for type SBB 751/1001 SOL with smooth tube internal coil to link up a solar thermal system. The thermal insulation WDH SBB as an accessory ensures the lowest heat losses. Protective anode as standard. Top and bottom flanged apertures are sealed with a blank flange and can be equipped optionally with a flanged immersion heater (type FCR 28). |
| 8 |  | 231924 | 10 | Thermal insulation WDH 1001 SBB<br><br>High grade EPTS rigid foam thermal insulation with insulation cover and floor disc for floorstanding DHW cylinders SBB 751/1001 and SBB 751/1001 SOL. Graphite inserts in the EPTS and fleece for lowest heat losses. Wedge-shaped cut-outs and fleece layer ensure an optimum match to the cylinder. Prepared adhesive joint in the wedge-shaped cut-outs enables adjustment to the shape prior to installation. External plastic jacket in white; cover in basalt grey. Thermal insulation secured with a quick-release hook strip. |
| 9 |  | 165342 | 2 | Immersion sensor TF 6 A<br><br>The TF 6 is an additional immersion sensor for the heat pump system. |

## Solar

| Position | ID | Quantity | Name |
|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 10 |  | 230017 | 25 | Solar flat-plate collector SOL 27 premium W<br><br>The collector is available for vertical and horizontal installation and thus designed specifically for the relevant application. The laser-welded aluminium full area absorber with copper harp is provided with highly selective vacuum coating (Miro-Therm). The hydraulic connection between collectors is made by means of a plug-in connector system. An anti-reflection safety glass cover protects the absorber and guarantees a high level of transmission. The collector is insulated on the sides and back panel with low outgassing mineral wool (black backed). Its main characteristic is low thermal conductivity. The hydraulic connection between collectors is made by means of a plug-in connection system. Operating the collectors with a prepared water:glycol mixture (H-30 L) provides the essential frost protection. The collector casing is made from seawater-resistant aluminium. |
| 11 |  | 230920 | 25 | Mounting frame SOL R1 W<br><br>In combination with the fixing sets, the mounting frames SOL R1 and SOL R2 enable on-end installation of the collectors next to each other. The SOL R1 W is specifically designed for across installation of the collectors next to and above each other. |
| 12 |  | 230171 | 20 | Frame connection set SOL RV<br><br>The frame connection sets ensure secure connection of two mounting frames. The frame connection set SOL RV should be used for connection in the case of on-end installation and across installation next to each other. For across installation above each other, RV-W should be selected. |
| 13 |  | 230178 | 50 | Mounting kit flat roof SOL BF-W<br><br>The SOL BF-W mounting kit allows horizontal installation of collectors on flat roofs or on the wall. |
| 14 |  | 230185 | 20 | Push-fit connection SOL SV-A<br><br>The SOL SV-A plug-in connection provides the hydraulic connection of two rooftop collectors mounted one above the other. |
| 15 |  | 230913 | 5 | Push-fit connection SOL SV-F<br><br>The SOL SV-F push-fit connection is primarily intended for hydraulic connection of rooftop collectors in the case of flat roof installation and wall mounting. |
| 16 |  | 230141 | 1 | Solar control unit SOM 6 plus<br><br>The solar control unit SOM 6 plus is used with standard solar heating systems. The temperature differential control unit is designed for a single consumer. The standard setup is programmed into the controller. A simple and intuitive menu guide is provided in the form of pictorial graphics on the multi-function combination display. The display is backlit. Including 2 temperature sensor PT 1000, spare fuse, screws and rawl plugs, 4 strain reliefs and heat conducting paste. Order the collector sensors separately. |
| 17 |  | 165818 | 1 | Temperature sensor PT 1000<br><br>Accessories for solar control units, sensor diameter 6 mm, tolerance DIN class B, ICE 75 I, lead material silicone, lead lengths 1450 mm, operating temperature -50 to +180 °C. |
| 18 |  | 074100 | 25 | Heat transfer liquid H30-LS, 20 l<br><br>Ready to use heat transfer medium (on polypropylene glycol basis) for solar systems with corrosion and anti-boiling protection. Frost protection down to -30° (H-30 L) or -28° (H-30 LS).Never dilute with water. No health risks. |
| 19 |  | 231899 | 2 | Solar expansion vessel 80 l<br><br>Floorstanding 80 litre diaphragm expansion vessel for sealed unvented solar thermal systems. Suitable for H-30-L. |

## Legal note

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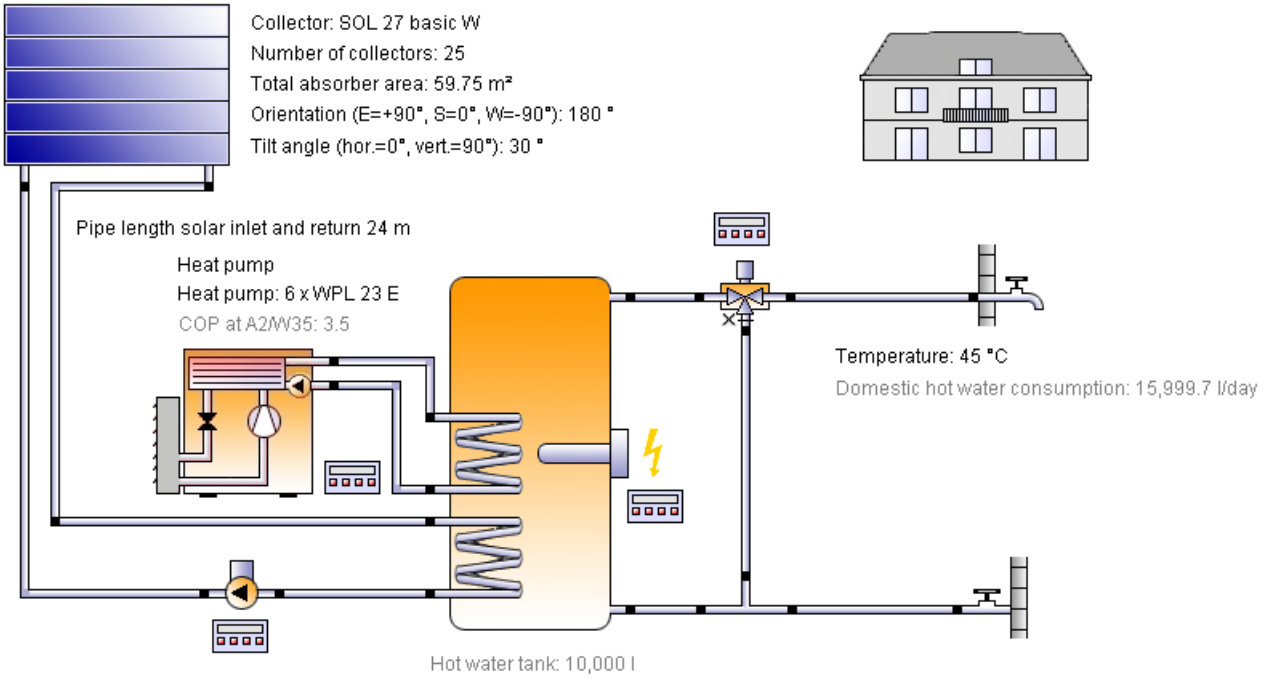



Label

## Location of the system

South Africa
Johannesburg
Longitude: 28.03°
Latitude: -26.17°
Elevation: 1,676 m

## System overview (annual values)

| | |
|---|---|
| Total fuel and/or electricity consumption of the system [Etot] | 36,448.3 kWh |
| Total energy consumption [Qse] | 184,519.7 kWh |
| Seasonal performance factor (SPF-SHP) | 5.1 |
| Comfort demand | Energy demand covered |

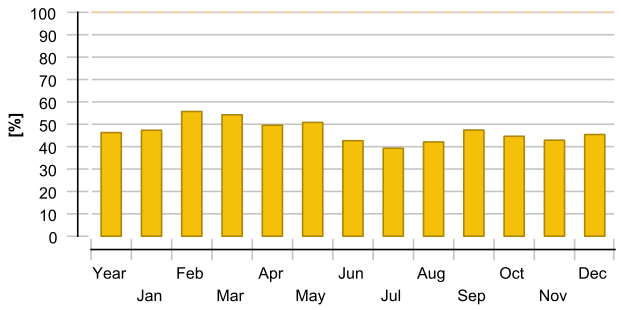
## Overview solar thermal energy (annual values)

| | |
|---|---|
| Collector area | 63.3 m² |
| Solar fraction total | 46.3% |
| Total annual field yield | 86,734.9 kWh |
| Collector field yield relating to gross area | 1,371.3 kWh/m²/Year |
| Collector field yield relating to aperture area | 1,451.6 kWh/m²/Year |
| Max. energy savings | 31,278.9 kWh |
| Max. reduction in CO2 emissions | 16,778 kg |

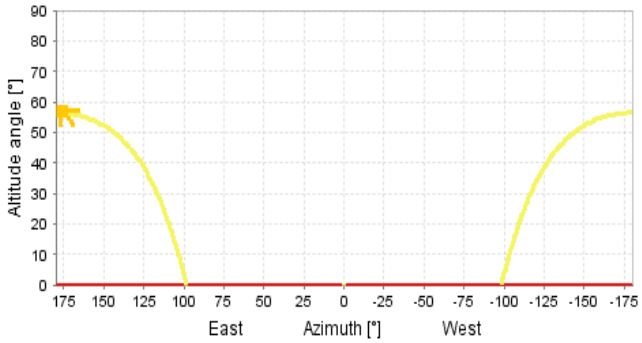
## Overview heat pump (annual values)

| | |
|---|---|
| Seasonal performance factor for air-to-water heat pump | 2.8 |
| Total electricity consumption when heating [Eaux] | 36,300 kWh |
| Total energy savings | 64,358.2 kWh |
| Total reduction in CO2 emissions | 34,521.7 kg |

### Solar fraction: fraction of solar energy to system [SFn]




### Horizon line




## Meteorological data-Overview

| | |
|---|---|
| Average outdoor temperature | 15.7 °C |
| Global irradiation, annual sum | 2,084.9 kWh/m² |
| Diffuse irradiation, annual sum | 612.6 kWh/m² |

## Component overview (annual values)

| **Collector** | **SOL 27 basic W** | |
|---|---|---|
| Data Source | | ISFH |
| Number of collectors | | 25 |
| Number of arrays | | 1 |
| Total gross area | m² | 63.25 |
| Total aperture area | m² | 59.75 |
| Total absorber area | m² | 59.75 |
| Tilt angle (hor.=0°, vert.=90°) | ° | 30 |
| Orientation (E=+90°, S=0°, W=-90°) | ° | 180 |
| Collector field yield [Qsol] | kWh | 86,734.9 |
| Irradiation onto collector area [Esol] | kWh | 136,420.8 |
| Collector efficiency [Qsol / Esol] | % | 63.6 |
| Direct irradiation after IAM | kWh | 93,023.6 |
| Diffuse irradiation after IAM | kWh | 34,575.5 |
| **Heat pump** | **6 x WPL 23 E** | |
| Heating power at A2/W35 | kW | 88.8 |
| Electrical power at A2/W35 | kW | 25.2 |
| COP at A2/W35 | | 3.5 |
| DeltaT at A7/W35 | K | 5 |
| Performance factor | | 2.77 |
| Energy from/to the system [Qaux] | kWh | 100,658.2 |
| Fuel and electricity consumption [Eaux] | kWh | 36,300 |
| Energy savings solar thermal | kWh | 31,278.9 |
| CO2 savings solar thermal | kg | 16,778 |
| Energy savings heat pump | kWh | 64,358.2 |
| CO2 savings heat pump | kg | 34,521.7 |
| **Hot water demand** | **Multi family dwelling** | |
| Volume withdrawal/daily consumption | l/d | 16,000.1 |
| Temperature setting | °C | 45 |
| Energy demand [Qdem] | kWh | 198,839.5 |

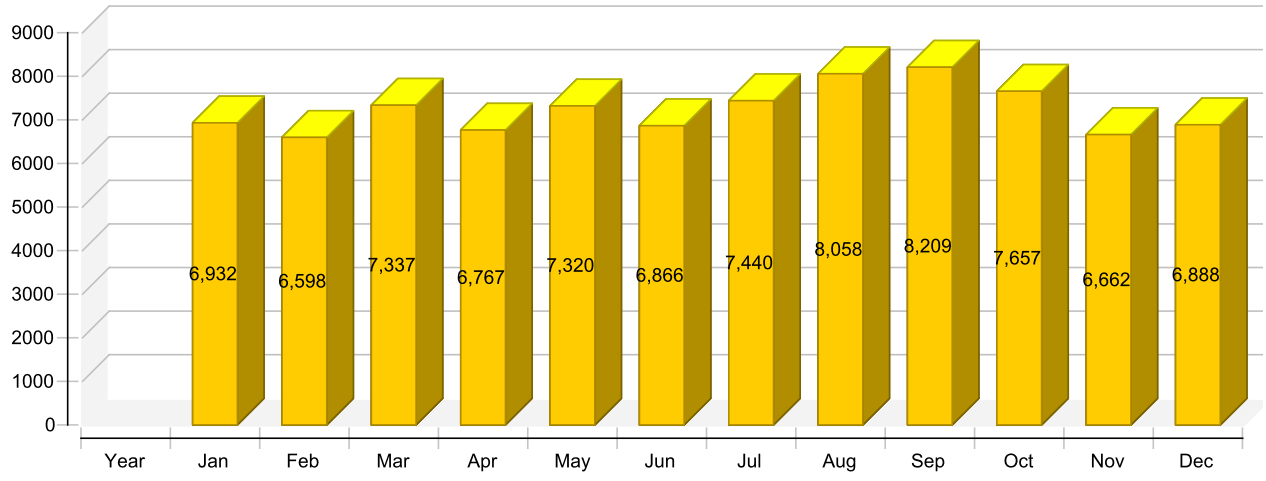
| **Pump Solar loop pump** | **Eco, large** | |
|---|---|---|
| Circuit pressure drop | bar | 2.608 |
| Flow rate | l/h | 2,390 |
| Fuel and electricity consumption [Epar] | kWh | 148.2 |

| Storage tank Hot water tank | 10 x SBB 1001 W SOL | |
|---|---|---|
| Volume | l | 10,000 |
| Height | m | 2.15 |
| Material | | Enameled steel |
| Insulation | | Rigid PU foam |
| Thickness of insulation | mm | 110 |
| Heat loss [Qhl] | kWh | 1,088.4 |
| Connection losses | kWh | 221.3 |

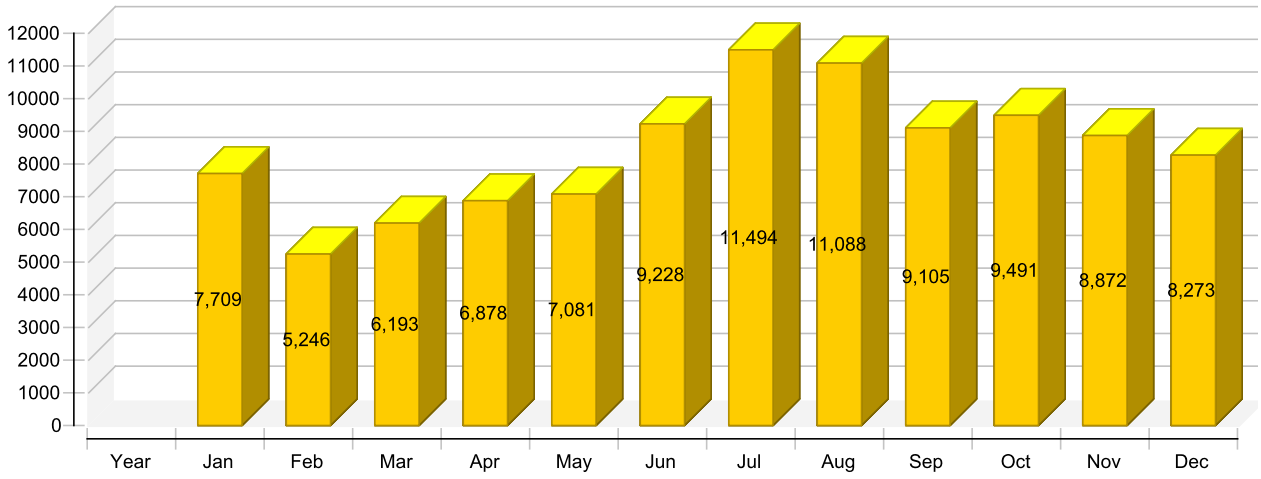
## Loop

| Solar loop | | |
|---|---|---|
| Fluid mixture | | Propylene mixture |
| Fluid concentration | % | 40 |
| Fluid domains volume | l | 81.4 |
| Pressure on top of the circuit | bar | 4 |

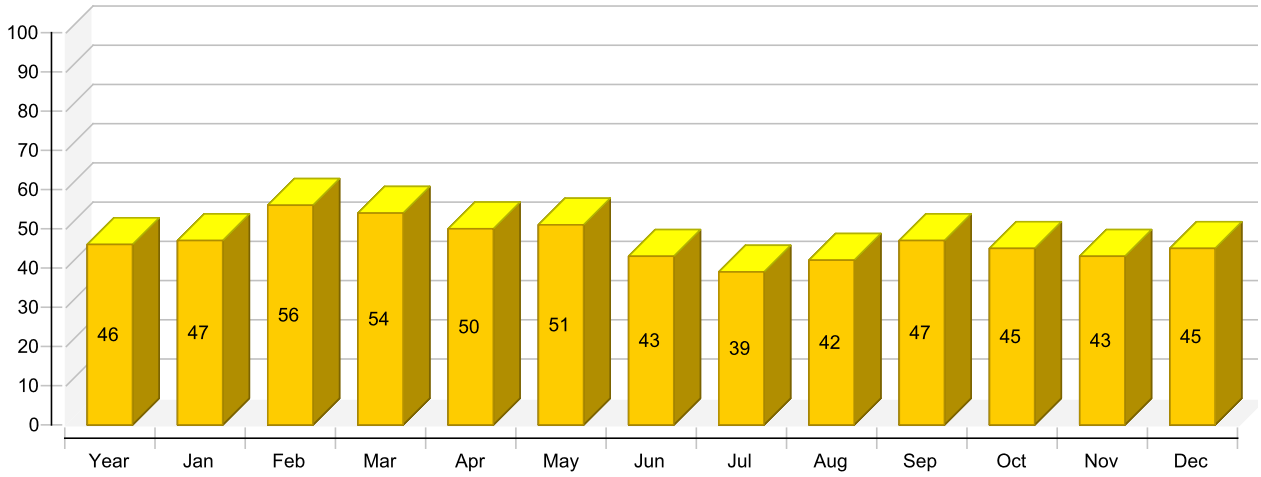
## Solar thermal energy to the system [Qsol] kWh



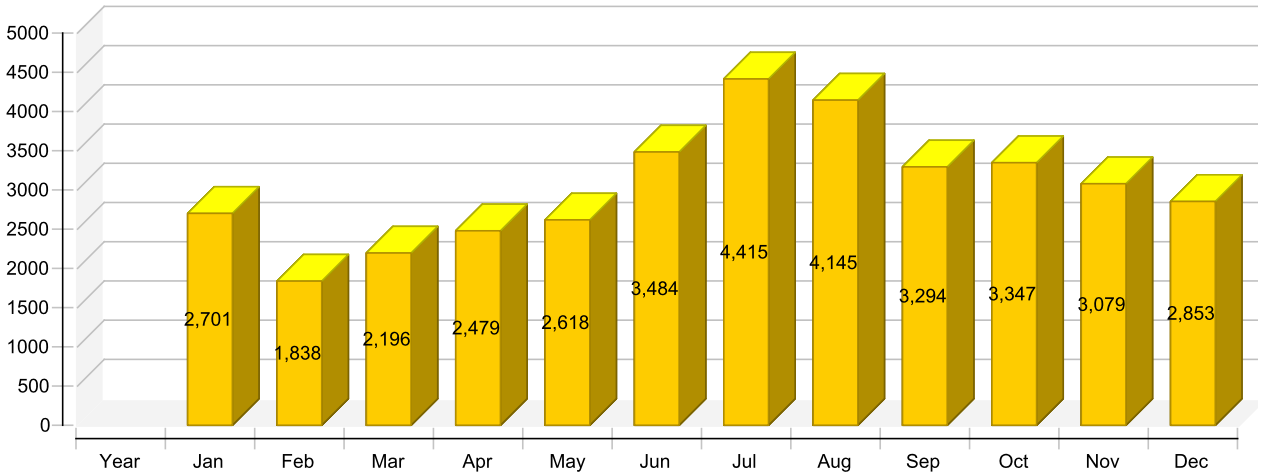
## Heat generator energy to the system (solar thermal energy not included) [Qaux] kWh




## Solar fraction: fraction of solar energy to system [SFn] %



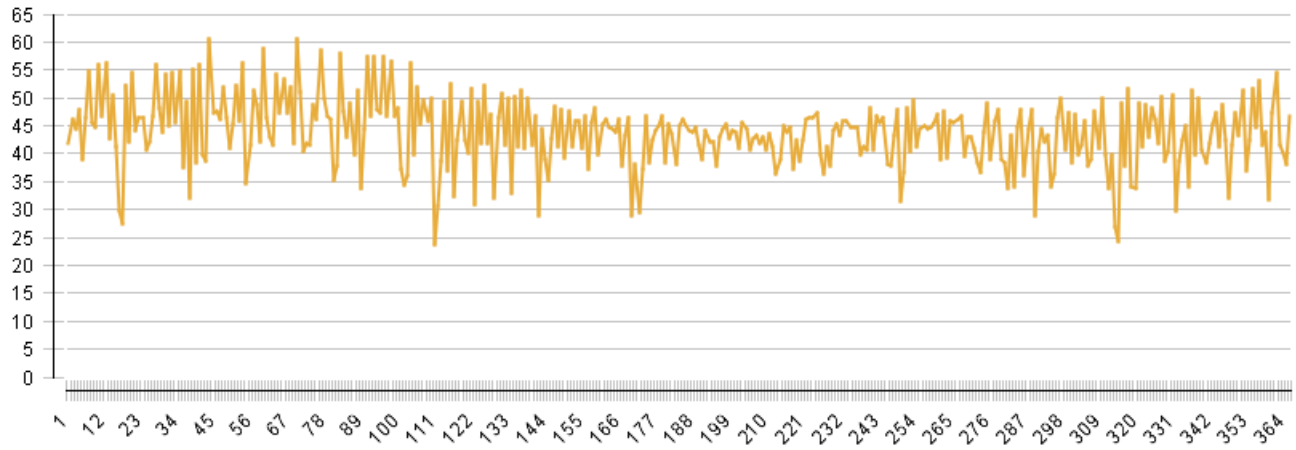

## Total fuel and/or electricity consumption of the system [Etot] kWh



| | Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Solar thermal energy to the system [Qsol]** | | | | | | | | | | | | | |
| kWh | 86735 | 6932 | 6598 | 7337 | 6767 | 7320 | 6866 | 7440 | 8058 | 8209 | 7657 | 6662 | 6888 |
| **Heat generator energy to the system (solar thermal energy not included) [Qaux]** | | | | | | | | | | | | | |
| kWh | 100658 | 7709 | 5246 | 6193 | 6878 | 7081 | 9228 | 11494 | 11088 | 9105 | 9491 | 8872 | 8273 |
| **Heat generator fuel and electricity consumption [Eaux]** | | | | | | | | | | | | | |
| kWh | 36300 | 2689 | 1826 | 2183 | 2468 | 2606 | 3472 | 4403 | 4131 | 3280 | 3334 | 3067 | 2841 |
| **Solar fraction: fraction of solar energy to system [SFn]** | | | | | | | | | | | | | |
| % | 46.3 | 47.3 | 55.7 | 54.2 | 49.6 | 50.8 | 42.7 | 39.3 | 42.1 | 47.4 | 44.7 | 42.9 | 45.4 |
| **Total fuel and/or electricity consumption of the system [Etot]** | | | | | | | | | | | | | |
| kWh | 36448 | 2701 | 1838 | 2196 | 2479 | 2618 | 3484 | 4415 | 4145 | 3294 | 3347 | 3079 | 2853 |
| **Irradiation onto collector area [Esol]** | | | | | | | | | | | | | |
| kWh | 136421 | 11176 | 10558 | 11662 | 10709 | 11574 | 11046 | 11864 | 12345 | 12365 | 11648 | 10439 | 11036 |
| **Electricity consumption of pumps [Epar]** | | | | | | | | | | | | | |
| kWh | 148.2 | 12.2 | 11.4 | 12.7 | 11.5 | 12.5 | 11.7 | 12.7 | 13.3 | 13.2 | 12.9 | 11.8 | 12.4 |
| **Total energy consumption [Quse]** | | | | | | | | | | | | | |
| kWh | 184520 | 14266 | 11828 | 13280 | 13207 | 14174 | 15866 | 18686 | 18899 | 17090 | 16919 | 15297 | 15008 |
| **Heat loss to indoor room (including heat generator losses) [Qint]** | | | | | | | | | | | | | |
| kWh | 2790 | 253 | 223 | 248 | 227 | 228 | 228 | 253 | 242 | 212 | 220 | 217 | 240 |
| **Heat loss to surroundings (without collector losses) [Qext]** | | | | | | | | | | | | | |
| kWh | 230 | 19 | 17 | 19 | 19 | 21 | 20 | 21 | 20 | 19 | 19 | 18 | 19 |

## Collector

### Daily maximum temperature [ °C]



## Energy flow diagram (annual balance)