



# Installation, use, maintenance manual - DualSun solar heating system for individual swimming pools - Appendix filtration pump sizing

# 1. How to check that the power of the filtration pump is sufficient to couple a DualSun solar swimming pool heating system?

## 1. Essential point to check :

Is the filtration pump powerful enough to deliver the required head pressure to push water to the highest point of the solar system at the required pool filtration flow rate?

## 2. Calculation of the minimum filtration pump power :

The hydraulic power of a pump is expressed in head pressure.

To circulate a fluid in a circuit, the pump pressure must be greater than or equal to the sum of the pressure drops in the circuit. If the circuit is open to atmospheric pressure, the height of the water column to be pushed must be added. All values are expressed in meters of water column (mH<sub>2</sub>O):

$$P_{\text{pump}} [\text{mH}_2\text{O}] \geq H_{\text{installation}} + P_{\text{panels}} + P_{\text{filtered}} + P_{\text{linear}} + P_{\text{singular}} + P_{\text{heating\_bacup}}$$

- $H_{\text{installation}}$  = Height in meters between the highest point of the hydraulic circuit and the filtration pump
- $P_{\text{panels}}$  = see sensor pressure drop curves in chapter [Determination of panel pressure drops for the DualSun solar swimming pool heating system \[4\]](#)
- $P_{\text{filter}}$  = 10 mH<sub>2</sub>O\*
- \* Pressure drop from a clogged sand filter, with safety margin
- $P_{\text{linear}}$  = 0.02 x total length of the pipes in meters [mH<sub>2</sub>O]

If the exact length of the pipes is not known, the total length of the pipes can be approximated by:

$$L = 2.5 \times H_{\text{installation}} [\text{m}]$$

- $P_{\text{singular}}$  = 0.4 x  $P_{\text{linear}}$  [mH<sub>2</sub>O]
- $P_{\text{heating\_backup}}$ : If a heat pump or other additional heating system is used, add its pressure drops.

## 3. How to check that the power of the pump is sufficient?

Reading the performance curve on the technical data sheet of the filtration pump makes it possible to check the pressure value at the required filtration rate.

Reminder of the calculation of the swimming pool filtration rate:

The filtration rate is generally calculated on the basis of a total recycling of the pool volume in 3:30 to 4 hours.

Due to the additional pressure drops induced by the solar installation, the high flow rate value should be retained, hence:

$$Q_{\text{filtration}} [\text{m}^3/\text{h}] \geq V_{\text{pool}} / 3.5$$

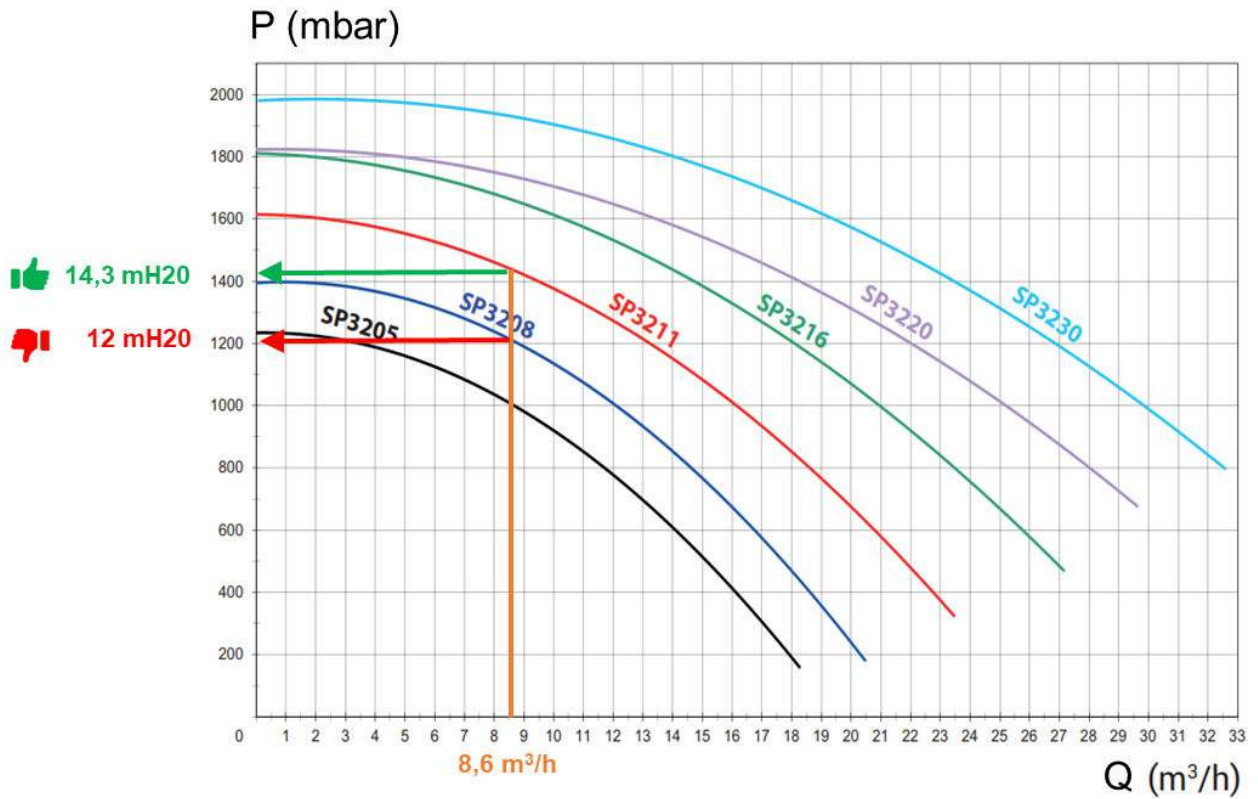
Example:  $H_{\text{installation}} = 2$  meters,  $V_{\text{pool}} = 30 \text{ m}^3$ , 8 DualSun SPRING panels

- As indicated in the chapter [Determination of panel pressure drops for the DualSun solar swimming pool heating system \[4\]](#), the maximum number of panels that can be hydraulically connected is 6
- With 8 SPRING it is therefore necessary to create 2 lines of 4 panels
- Pressure drop of 4 panels in line at 200 L / h / panel:  $P_{\text{panels}} = 0.513 \text{ mH}_2\text{O}$
- $Q_{\text{filtration}} = V_{\text{pool}} / 3.5 = 30 / 3.5 = 8.6 \text{ m}^3 / \text{h}$

$$P_{\text{pump}} = H_{\text{installation}} + P_{\text{panels}} + P_{\text{filter}} + P_{\text{linear}} + P_{\text{singular}} \text{ [mH2O]}$$

$$P_{\text{pump}} = 2 + 0.513 + 10 + 0.02 \times 2.5 \times 2 + 0.4 \times (0.02 \times 2.5 \times 2) = 12.65 \text{ mH2O}$$

Graphic verification :



**Hayward Tristar pump performance curve**

Reminder: 1 bar = 10 mH2O = 1000 mbar

- The pressure of the SP3208 pump is lower than the calculated value.
- The pressure of the SP3211 pump is higher than the calculated value.

## 2. Determination of panel pressure drops for the DualSun solar swimming pool heating system

DualSun SPRING panels are to be mounted in portrait by **line of 6 maximum panels** for a solar swimming pool heating installation.

If the sizing of the installation requires more than 6 panels, parallel lines should be installed.

For a good hydraulic balance between the lines of panels, we advise to create lines with the same number of panels.

It is necessary to over or under-dimension the installation to maintain homogeneous lines of panels, with the same number of panels.

If this is not technically feasible, it is also possible to install non-homogeneous lines, with a different number of panels, then it is necessary to install balancing valves to adjust the adequate flow for each line of panels .

See chapter [Équilibrage hydraulique de champs de panneaux pour système de chauffage solaire piscine Dual-Sun](#) of the [Notice d'installation, utilisation, maintenance DualSun SPRING](#)

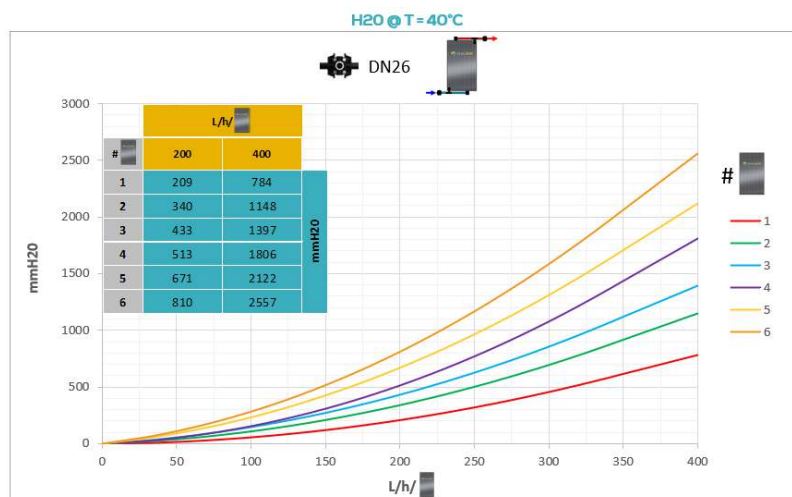
**Solar circulation flow** in DualSun panels:

$$Q_{\text{panel}} = 0,2 \text{ [m}^3\text{/ h / panel]} = 200 \text{ [L / h / panel]}$$

Total solar installation flow:

$$Q_{\text{total}} = Q_{\text{panel}} \times \text{Number\_SPRING\_panels [m}^3\text{/ h]}$$

**In the case of an installation of several rows of panels, the pressure drops of the solar installation correspond to the pressure drops of the largest row of panels .**



Memo conversion of units:

$$1 \text{ bar} = 10 \text{ mH}_2\text{O} = 1000 \text{ mbar}$$

$$1 \text{ m}^3\text{/ h} = 1000 \text{ L / h} = 16.7 \text{ L / min}$$

### 3. Filtration Pump Sizing Worksheet for DualSun Solar Swimming Pool Heating System

Physical data of the installation to be entered	
S <sub>p</sub> : Pool area [m <sup>2</sup> ]	To inform
P <sub>p</sub> : Pool depth [m]	To inform
V <sub>p</sub> : Pool volume (m <sup>3</sup> )	S <sub>p</sub> x P <sub>p</sub>
H: Solar installation height [m]	To inform <sup>(1)</sup>
<i>(1): Distance between filtration pump and top of the solar installation</i>	

Solar system configurator	
As an indication - Sizing to be carried out on <a href="#">MyDualSun</a>	
Ratio <sub>p</sub> : Ratio number of panels	0.5 <sup>(2)</sup> or 0.75 <sup>(3)</sup>
N <sub>p</sub> : Number of panels to install	S <sub>p</sub> x Ratio <sub>p</sub> / 1,66
N <sub>L</sub> : Number of row of panels	Choose the right number of lines (maximum 6 panels / line)
<i>(2): area with good sunshine if annual solar irradiation received by horizontal surface &gt; 1300 kWh / m<sup>2</sup> / year</i>	
<i>(3): area with limited sunshine if annual solar irradiation received by horizontal surface &lt; 1300 kWh / m<sup>2</sup> / year</i>	

Calculation of the pool filtration flow rate	
Q: filtration flow rate [m <sup>3</sup> / h]	V <sub>p</sub> / 3.5

Determination of pressure drops	
P1: P <sub>Panels @ 200 L / h / panel</sub> [mH2O]	See chart of panel pressure drops <sup>(4)</sup> : <a href="#">Determination of panel pressure drops for the DualSun solar swimming pool heating system [4]</a>
P2: P <sub>sand_filter</sub> [mH2O]	10
P3: P <sub>linear</sub> [mH2O]	0.02 x 2.5 x H
P4: P <sub>singular</sub> [mH2O]	0.4 x P3
P5: P <sub>heating_backup</sub> [mH2O]	if there is a heating back-up (heat pump, etc.)
<i>(4): If lines of panels are parallel, keep only the largest line</i>	

Calculation of pressure losses	
P <sub>solar</sub> [mH2O]	H + P1 + P2 + P3 + P4 + P5

**Check if P<sub>pump</sub> ≥ P<sub>solar</sub> at the swimming pool filtration flow rate (Q)**