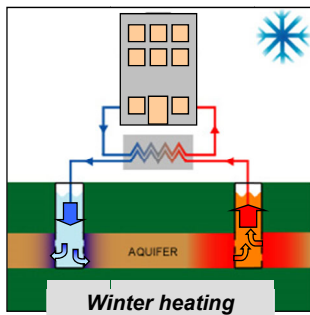


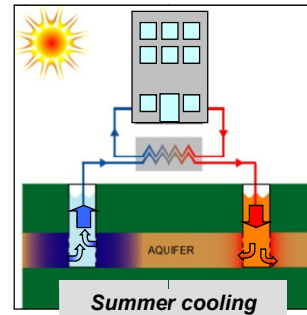
### ► ATES: Simple Concept and Environmental Safe Technology



A typical layout of a hydraulic system with two wells on either side of the area. One well is for the warm water and the other one for the cold water.

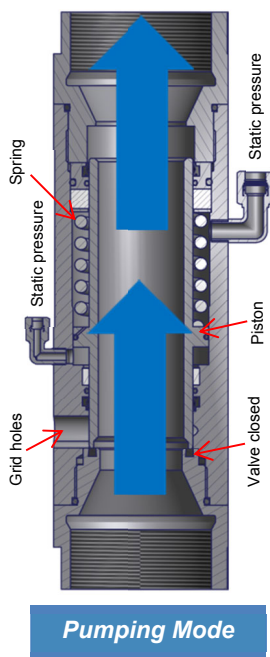
During the winter, warm water is used and passed to the cold well. Energy (heat) is extracted by the heat exchanger for heating purposes.

In the summer, the process is reversed and cold water is used and passed to the warm well. Energy (cold) is extracted by the heat exchanger for cooling purposes.

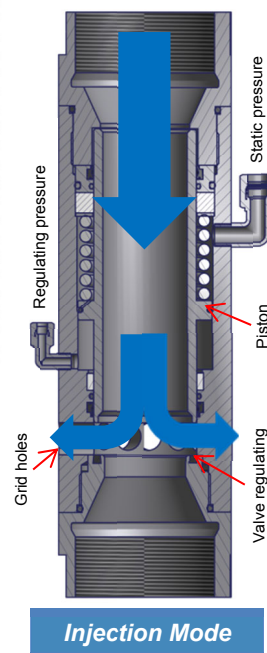
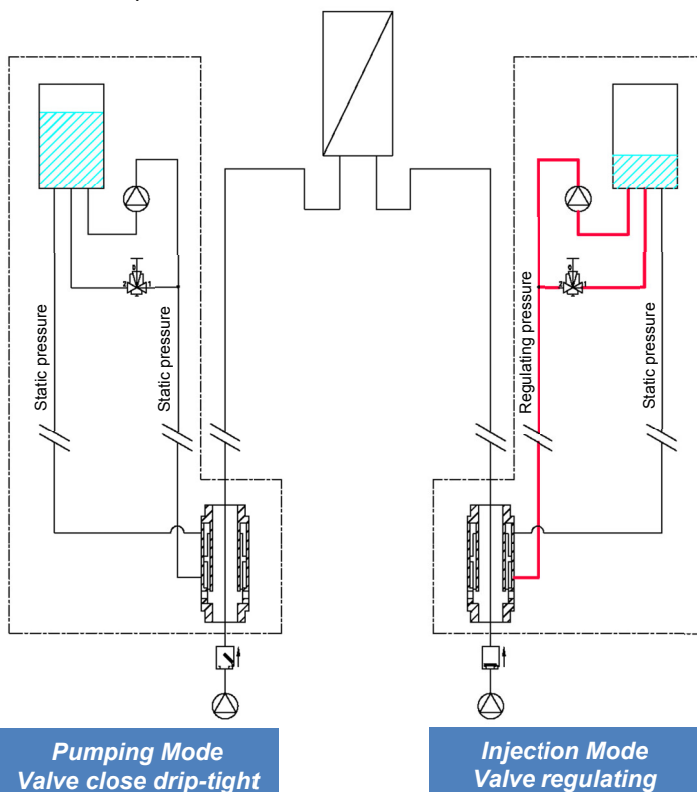


The system is **totally environmentally safe**: the water circulating from underground to the heat exchanger and back cannot be contaminated as it always remains in a closed hydraulic pressurized system. There is also no loss of underground water.

### ► HPV: Principles of Operation



**Pumping Mode:** During pumping mode the piston is fully closed and the grid holes are drip tight closed. Both spring force and relieved hydraulic pressure push the piston downwards and automatically maintaining the grid holes drip tight closed regardless of any change in flow and/or inlet pressure.



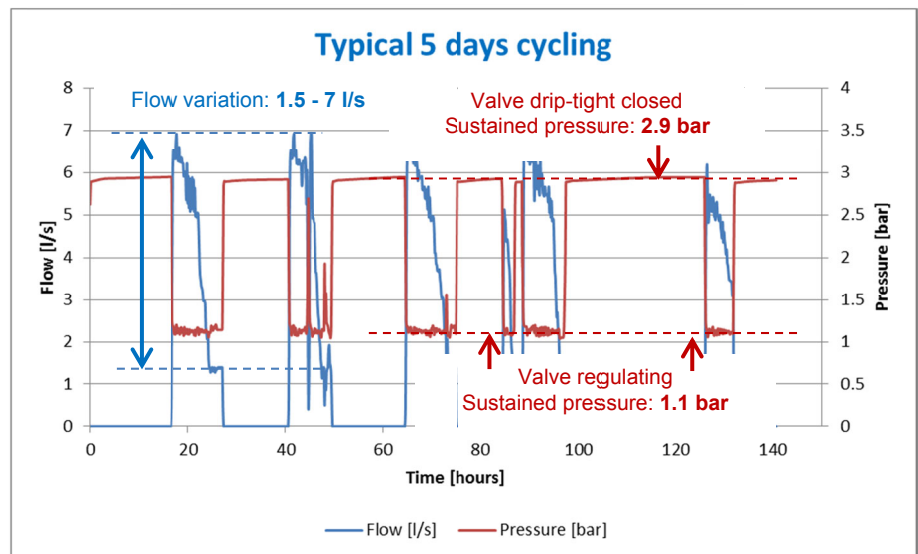
**Injection Mode:** During injection mode the piston is regulating and the water is injected in the well through the grid holes. The piston adjusts the grid holes opening accurately maintaining a preset inlet pressure regardless of changing flow rate. Both spring force and regulated hydraulic pressure are accurately and automatically maintaining a preset inlet pressure. The typical range of sustained pressures is between 0.5 bar and 5 bar.

### ▶ HPV: Typical Installation

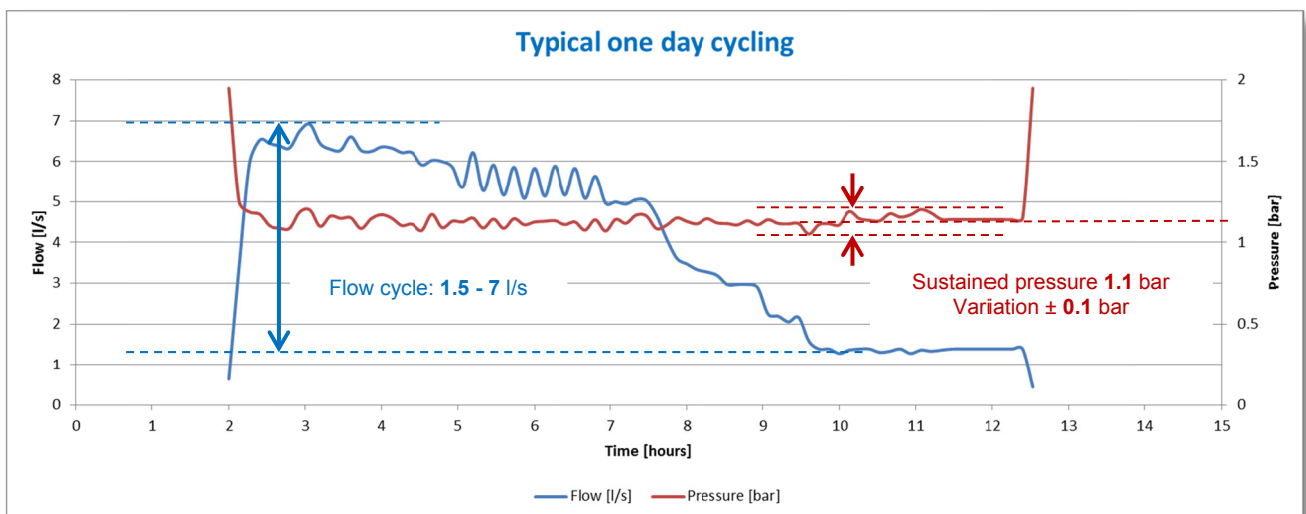
Over a six month period at one of our demo sites in the Netherlands, two HPV valves performed precise regulation. Throughout the testing period, the HPV valves have proven their performance as exceptional bi-directional valves for ATEs pressure sustained systems.

The first graph illustrates a typical five days cycling. The flow (blue) is, when in heat exchanging mode, varying between a peak of 7 l/s to a low flow of 1.5 l/s or 0 l/s when the installation is not working.

The pressure (red) is preset at a drip-tight 2.9 bar pressure when the installation is not working and maintained at a precise 1.1 bar pressure when the installation is flowing.



The second graph illustrates in more detail a typical one day cycle. The sustained pressure at well top is maintained at a preset pressure value of 1.1 bar. When the valve is regulating, the pressure variation is within an amazing accuracy of  $\pm 0.1$  bar!





# Hydraulic Pipe Valve (HPV)

## Aquifer Thermal Energy Storage Applications

### ▶ HPV: Dimensions and hydraulic performance

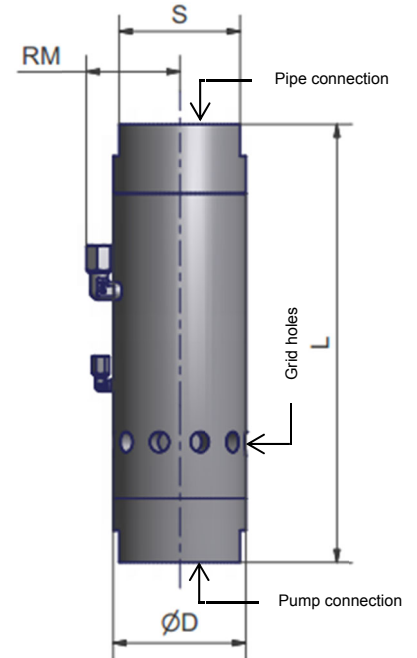
#### Main Valve

HPV Size *[Rp]	L [mm]	D [mm]	S [mm]	RM [mm]	Weight [kg]	Cv** [l/s] Pumping	Cv*** [l/s] Injecting
1 1/2"	☎ CLA-VAL						
2"	296	88	68	73	8.6	25	12
3"	345	105	96	80	12.0	30	19
4"	358	150	130	95	23.6	109	58
5"	☎ CLA-VAL						
6"	☎ CLA-VAL						

⚠ Contact CLA-VAL for a valve depth installation more than 50 meters and a wellhead pressure more than 2 bar.

#### General Arrangement Dimension

Control Panel	Height [mm]	Width [mm]	Depth [mm]	Bolts Fixation Diameter [mm]
Hydraulic	380	380	130	5.0 (4x)
Electric	310	250	180	5.0 (4x)



\*: Threads of the pump and pipe connections according to ISO 7-1 and EN 10266-1 standards.

\*\* The pumping mode Cv is the quantity of water at 15°C flowing through the valve with a differential pressure of 1 bar between the pump connection and the pipe connection.

\*\*\* The injecting mode Cv is the quantity of water at 15°C flowing through the valve with a differential pressure of 1 bar between the pipe connection and the grid holes.

### ▶ HPV: Six Reasons to buy

#### Electronic Command

*Improved and reliable electronic control system.*

#### Low Head loss

*During pumping mode, the valve is an open full port pipe with reduced head loss.*

#### Manufacturer Commitment

*World-wide sales and maintenance support.  
Competitive pricing.*



#### Hydraulic Control

*Fully tested and documented product.*

*Large flow capacity range.  
Certifications.*

#### Quality Materials / Simple Product

*Stainless steel main body and parts.*

*Only two key parts.*

#### Friction / Clogging

*Mobile parts made from high quality material, reduced friction loss and clogging.*