1 HYDRAULIC SYSTEM

1.1 DESIGN AND IMPLEMENTATION

The system must be designed and installed consistently with the features and functions of the individual unit or RT_ preassembled group.

- Especially pay attention to variable or constant flow rate operation of the units (see Paragraph 1.5 *p. 4*)

Sizing of the water piping and any circulation pump must assure the required nominal water flow for correct operation of the unit or RT_ preassembled group:

- For the pressure drop data of individual units, refer to Section B
- For the pressure drop data of RT_ preassembled groups, refer to Section C1.02
- For the data of circulating pumps, refer to Section C1.05

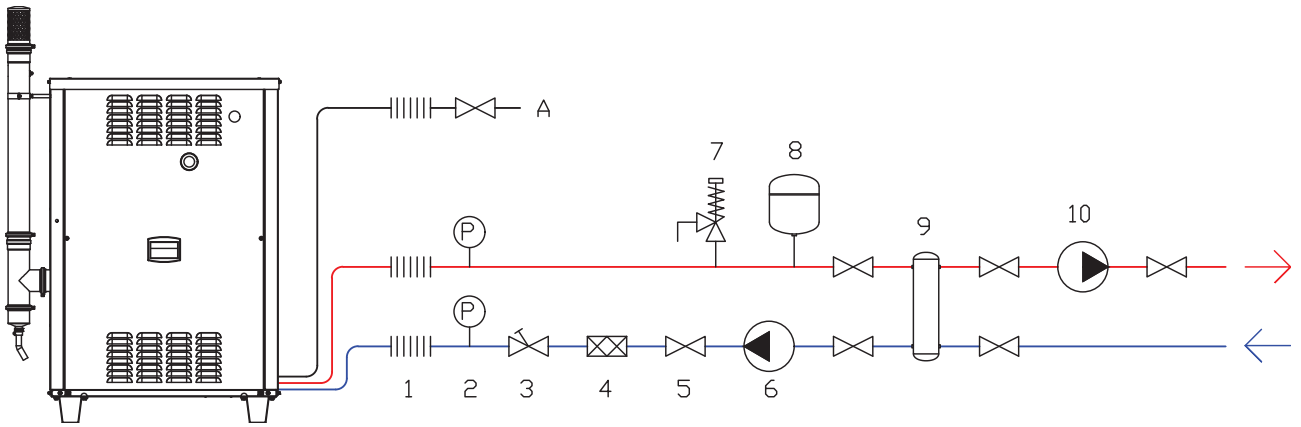
1.2 PRIMARY AND SECONDARY CIRCUIT

In many cases it is advisable to divide the hydraulic system into two parts, primary and secondary circuit(s), uncoupled by a hydraulic separator, or possibly by a tank that also acts as inertial volume/thermal inertia.
Installation of inertial volume/thermal inertia is recommended if the system has low water content.
For indications on sizing the inertial volume/thermal inertia refer to Paragraph 1.4 *p. 4*.
For further information on the buffer tank and hydraulic separator refer to Section C1.08.

1.3 WATER FLOW

The individual units are always supplied without circulating pumps, which must be appropriately selected on the basis of the unit features and its connected circuit (possibly from those listed as optional features in the catalogue).
Figure 1.1 *p. 1* shows an example of plumbing diagram for an individual aerothermal unit.

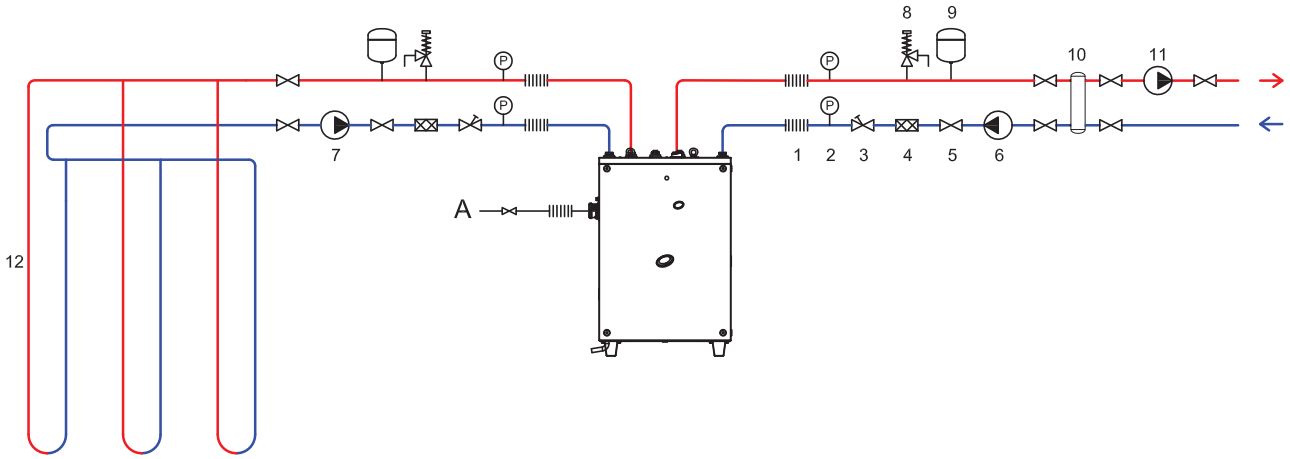
Figure 1.1 *Hydraulic plan*



The flow regulator valve must only be used when the primary circuit circulation pump is constant flow type
A Gas connection
1 Anti-vibration connection
2 Pressure gauge
3 Flow regulator valve
4 Water filter
5 Shut-off valves
6 Water pump (primary circuit)
7 Safety valve (3 bar)
8 Expansion tank
9 Hydraulic separator / inertial tank with 4 fittings
10 Water pump (secondary circuit)

Figure 1.2 *p. 2* shows an example of plumbing diagram for an individual GAHP GS HT unit.

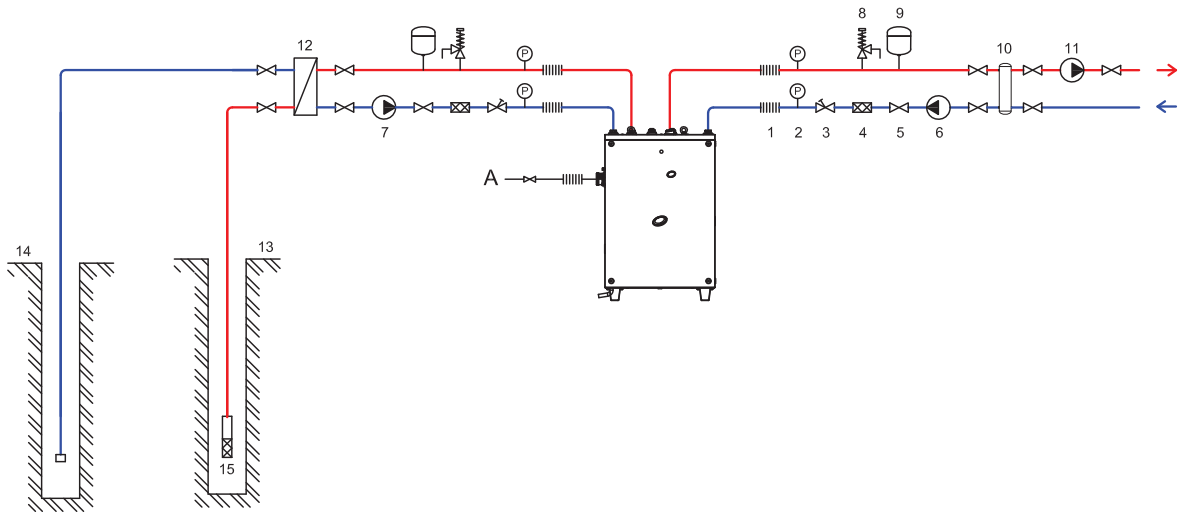
Figure 1.2 *GAHP GS Water diagram*



The flow regulator valve must only be used when the primary circuit circulation pump is constant flow type
A Gas connection
1 Anti-vibration connection
2 Pressure gauge
3 Flow regulator valve
4 Water filter
5 Shut-off valves
6 Hot side circulation pump (primary circuit)
7 Cold side circulation pump (primary circuit)
8 Safety valve (3 bar)
9 Expansion tank
10 Hydraulic separator/4-pipe buffer tank
11 Hot side circulation pump (secondary circuit)
12 Geothermal field probes

Figure 1.3 *p. 2* shows an example of plumbing diagram for an individual GAHP WS unit.

Figure 1.3 *GAHP WS Water diagram*



The flow regulator valve must only be used when the primary circuit circulation pump is constant flow type
A Gas connection
1 Anti-vibration connection
2 Pressure gauge
3 Flow regulator valve
4 Water filter
5 Shut-off valves
6 Hot side circulation pump (primary circuit)
7 Cold side circulation pump (primary circuit)
8 Safety valve (3 bar)
9 Expansion tank
10 Hydraulic separator/4-pipe buffer tank
11 Hot side circulation pump (secondary circuit)
12 Heat exchanger
13 Pumping sump
14 Drain sump
15 Submersible pump

The primary circulating pumps for single units must be controlled by the unit electronic board (see Section B for the specific unit involved).

The RT_ preassembled group may be:
- already fitted with circulating pumps for each individual appliance/module (preferrable configuration in a number of applications)
- without circulating pumps, in which case it is required to install at least one common circulation pump, on the primary circuit (option to be assessed carefully)

Figures 1.4 *p. 3* and 1.5 *p. 3* show examples of plumbing diagrams of preassembled groups with independent circulating pumps.
Figures 1.6 *p. 4* and 1.7 *p. 4* show examples of plumbing diagrams of preassembled groups without circulating pumps (with common circulating pump, not supplied with the preassembled group).

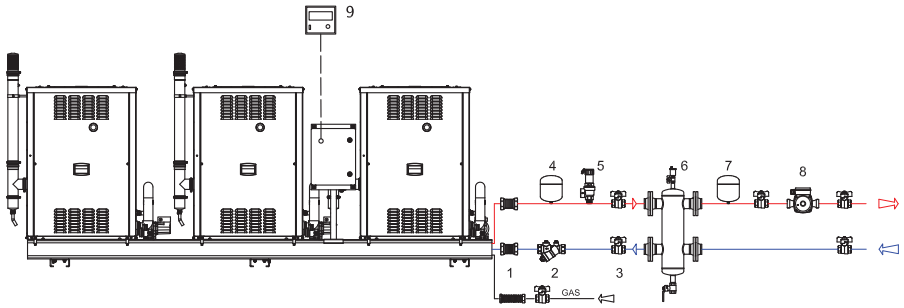
The common circulating pump does not allow the water

flow to bypass generators that are temporarily turned off from normal cascade control.

Under partial load conditions, it is not therefore possible to ensure the general setpoint is reached and maintained.
With high delivery setpoint, GAHP units may exceed their operative limits to offset the mixing that is brought about with inactive units.
The solution with common circulating pump is therefore recommended only if the thermal or cooling load applied is constant in any operating condition.

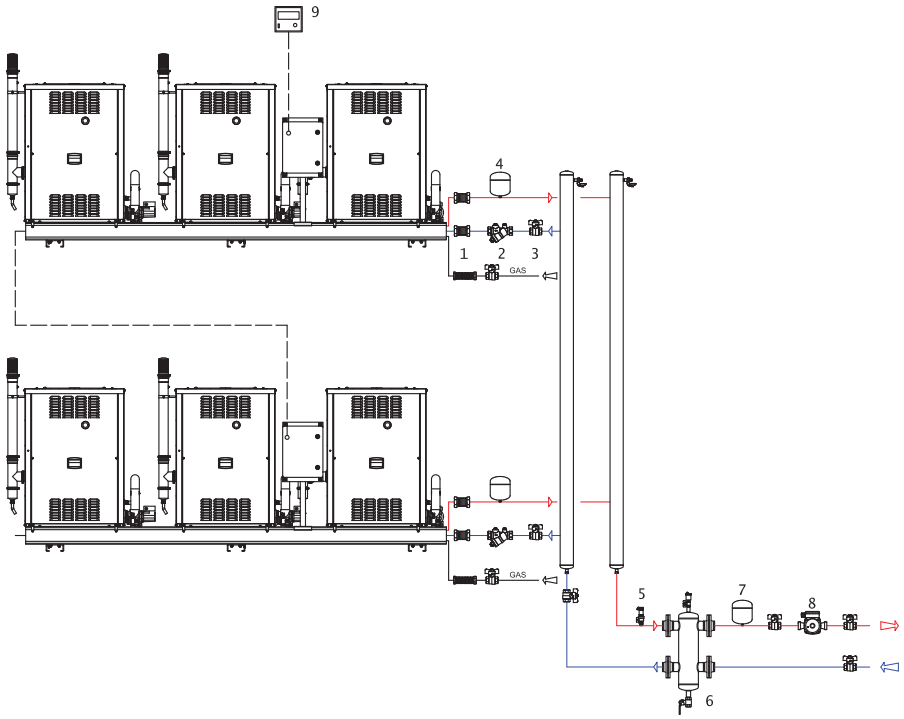
The common primary circulating pump must be controlled by the request on the preassembled group electrical panel (see Section C1.02).

Figure 1.4 *Example of hydraulic system diagram for connection of n. 1 RTCR version with circulating pumps*



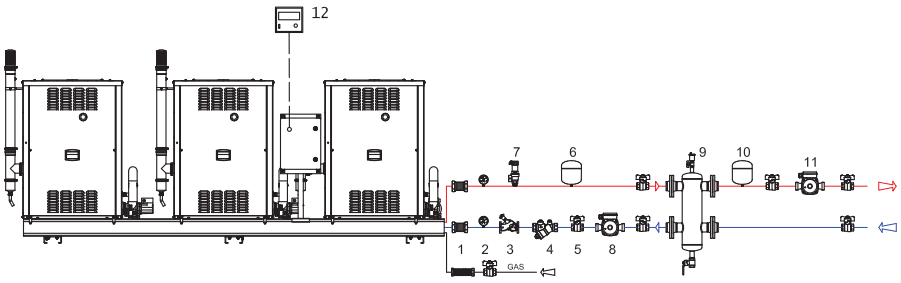
1 anti-vibration connections
2 water filter (mesh min. 0.7 mm and max 1 mm)
3 shut-off valve
4 expansion tank of the primary circuit
5 3 bar safety valve
6 hydraulic separator (with air vent valve and drain cock)
7 expansion tank of the secondary circuit
8 circulating pump of the secondary circuit
9 DDC control panel

Figure 1.5 *Example of hydraulic system diagram for connection of n. 2 RTCR, version with circulating pumps*



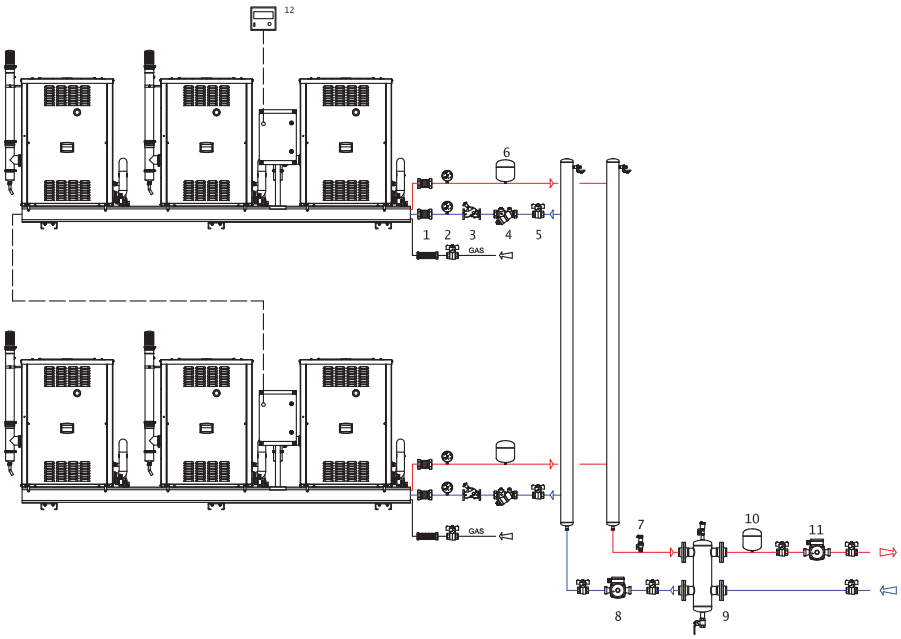
1 anti-vibration connections
2 water filter (mesh min. 0.7 mm and max 1 mm)
3 shut-off valve
4 expansion tank of the primary circuit
5 3 bar safety valve
6 hydraulic separator (with air vent valve and drain cock)
7 expansion tank of the secondary circuit
8 circulating pump of the secondary circuit
9 DDC control panel

Figure 1.6 *Example of hydraulic system diagram for connection of n. 1 RTCR version without circulating pumps*



1 anti-vibration connections
2 pressure gauge
3 flow regulator valve
4 water filter (mesh min. 0.7 mm and max 1 mm)
5 shut-off valve
6 expansion tank of the primary circuit
7 3 bar safety valve
8 primary circuit circulating pump
9 hydraulic separator (with air vent valve and drain cock)
10 expansion tank of the secondary circuit
11 circulating pump of the secondary circuit
12 DDC control panel

Figure 1.7 *Example of hydraulic system diagram for connection of n. 2 RTCR version without circulating pumps*



1 anti-vibration connections
2 pressure gauge
3 flow regulator valve
4 water filter (mesh min. 0.7 mm and max 1 mm)
5 shut-off valve
6 expansion tank of the primary circuit
7 3 bar safety valve
8 primary circuit circulating pump
9 hydraulic separator (with air vent valve and drain cock)
10 expansion tank of the secondary circuit
11 circulating pump of the secondary circuit
12 DDC control panel

1.4 PRIMARY CIRCUIT WATER CONTENT

It is required to assure a minimum water volume in the primary circuit equal to at least 70 litres for each intended GAHP module, GA ACF or AY00-120, both on the conditioning and renewable source circuit (only for systems with GAHP GS/WS), in order to absorb the energy (heating or cooling) delivered by the unit in the switch-off stage.
In order to provide thermal inertia to the system, especially in low load conditions, and consequently optimise performance, it is possible to provide a greater water volume, according to the details in Section C1.08.

1.5 CONSTANT OT VARIABLE WATER FLOW

Units GAHP A and GAHP GS/WS are able to operate with constant or variable water flow (only on the hot side) regardless of operative mode, ON/OFF or modulating.
All other single units may only work with constant water flow.
The RT_ preassembled groups fitted with independent circulating pumps work at variable flow, as only the circulating pumps of the actually active modules are on.
The RT_ preassembled groups without independent circulating pumps, however, work at constant flow.

2 HYDRAULIC CONNECTIONS

2.1 PLUMBING FITTINGS

The water connections are detailed in the technical data tables of the individual units (see Section B) or of the RT_ preassembled group (see Section C1.02).
The connections of the preassembled group may be moved to the left side by moving the blind plugs supplied.

2.2 HYDRAULIC PIPES, MATERIALS AND FEATURES

Use pipes for heating/cooling installations, protected from weathering, insulated for thermal losses, with vapour barrier to prevent condensation.

Pipe cleaning

Before connecting the units, accurately wash the water and gas piping and any other system component, removing any residue.

2.3 MINIMUM COMPONENTS OF PRIMARY PLUMBING CIRCUIT

Always provide, near the water connections of the unit or preassembled group:
— on water piping, both output and input (m/r)
- 2 antivibration joints on water fittings;
- 2 pressure gauges;
- 2 isolation ball valves;

— on the input water piping (r)
- 1 separator filter;
- 1 flow regulation valve, if the circulation pump is with constant flow;
- 1 water circulation pump, with thrust towards the appliance (only for single units and preassembled groups without circulating pumps);

— on the output water piping (m)
- 1 safety valve (3 bar);
- 1 expansion tank (for the single unit or preassembled group).

Both components must be installed before any isolation valves, so they cannot be bypassed

— on the inlet gas piping (r)
- 1 Anti-vibration connection;
- 1 Isolation ball valves

For GAHP WS units with open circuit it is always mandatory to use a heat exchanger on the renewable source side

See Paragraph 1.3 *p. 1* for example water diagrams.

3 SPECIFICATIONS OF DIVERTER VALVES

Table 3.1 *p. 5* shows the minimum and maximum flow rate to be assured to Robur units in all operating conditions, hence also during the switching stage of any diverter valves installed on the system.
These flow rates are valid both for DHW separation valves and for hot/cold switching valves.
The valve (hence its kvs indicating pressure drops) must consequently be selected in connection with the required flow rates, so that the indicated flow rate range is complied with even in the switching stage.

Table 3.1 *Diverter valves water flow*

			GAHP GS/WS		GAHP A	AY00-120	GA ACF		GAHP-AR
			GAHP WS	GAHP GS HT				ACF 60-00 LB	
Heating mode									
Heating water flow	minimum	l/h	1400		1400	1500			2500
	maximum	l/h	4000		4000	3200			3500
Operation in conditioning mode									
Water flow rate	minimum	l/h					2500	2300	2500
	maximum	l/h					3500	2900	3500
Renewable source operating conditions									
Renewable source water flow rate	minimum	l/h	2300						
	maximum	l/h	4700						
Renewable source water flow rate (with 25% glycol)	minimum	l/h		2000					
	maximum	l/h		4000					

4 DEFROSTING WATER DRAINAGE

Defrosting

In winter, frost may form on the finned coil of aerothermal heat pumps and the appliance performs defrosting cycles.

4.1 COLLECTION BASIN AND DRAINAGE SYSTEM

Provide for a collection basin or containment rim and a discharge system of the defrosting water, to avoid overflowing, icing and damage.