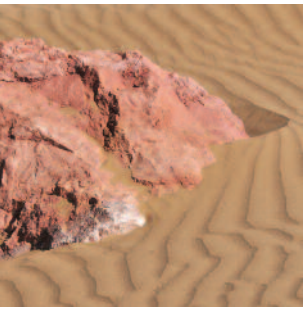
CALEFFI GE

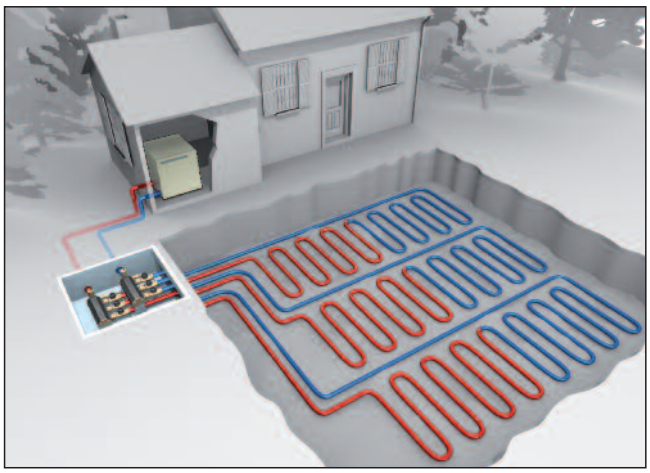




COMPONENTS FOR HEAT PUMP SYSTEMS

HEAT PUMP SYSTEMS WITH HORIZONTAL PROBES

Heat pump systems with horizontal probes use the heat that accumulates in the upper layers of the earth; this heat, down to 15 m deep, is basically supplied by the sun and rain. For this reason horizontal probes withstand fluctuations in surface temperature better and, to be installed, they need large areas clear of constructions, paving or vegetation that can prevent heat reaching the ground.

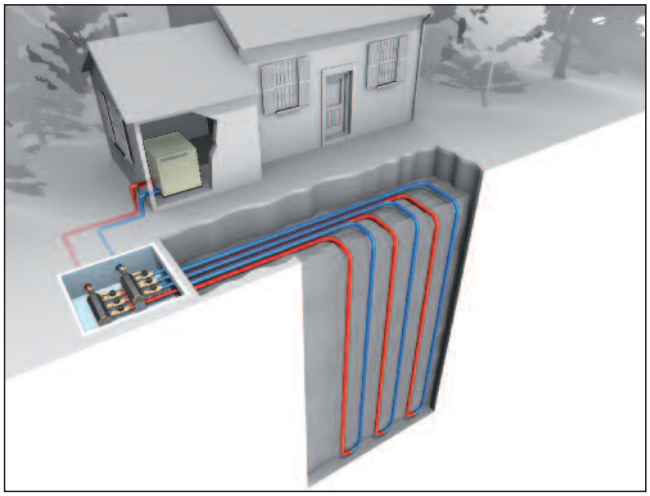


Pipes made of polyethylene (or reticulated polyethylene, depending on the type of ground) are inserted horizontally into the ground in an excavation from 1 to 3 m deep with a centre distance of 50–80 cm. After laying, the excavated ground is put back and compacted.

The sizing of these manifolds is performed according to the thermal efficiency of the ground, which is affected by its composition, compactness and the quantity of water it contains. It is necessary to pay attention to the sizing to prevent not only malfunctioning and low output of the heat pump, but also to prevent harmful consequences for the vegetation such as roots freezing.

HEAT PUMP SYSTEMS WITH VERTICAL PROBES

Systems with vertical geothermal probes are based on the fact that, beyond a depth of as little as 20 metres, the temperature of the subsoil is constant and no longer depends on daily or seasonal temperature changes: below 20 m, the temperature of the ground increases by approximately 3°C every 100 m in depth.



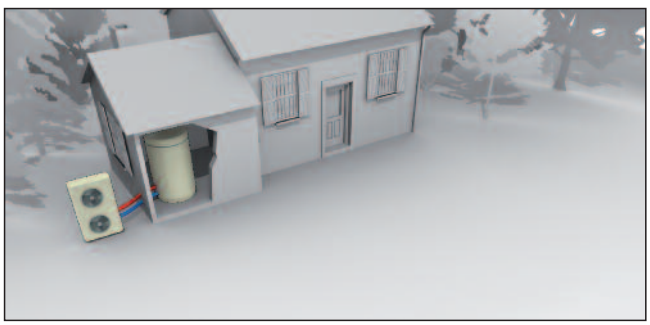
Vertical probes, varying in length from 20 to 150 m, are made with holes in which one or two U-circuits are sunk, made with high-resistance PE pipes (generally with diameters DN 25, DN 32 and DN 40) that are specific for geothermal applications. To aid their insertion in the holes, these circuits are ballasted with special disposable weights of 15 – 20 kg. After laying the circuits, the gap between the wall of the hole and the pipe is filled with a mixture comprising cement and bentonite (a clayey material).

AEROTHERMAL HEAT PUMP SYSTEMS

The outside air is a source of energy that does not need to be extracted and is extremely easy to find.

Systems that draw thermal energy from the air can be made with air-air and air-water heat pumps. The working principle is the same as for heat pumps that draw energy from the ground; in this case neither drilling nor digging are necessary.

These systems, on the contrary to the previous ones, are the best solution from the point of view of plant engineering and installation costs but they have a lower output. Since air is a source that greatly suffers the effect of the temperature, when the temperature drops the output factors of heat pumps decrease significantly. A lower efficiency can be accepted when considering the considerable economic savings in the construction of the system.

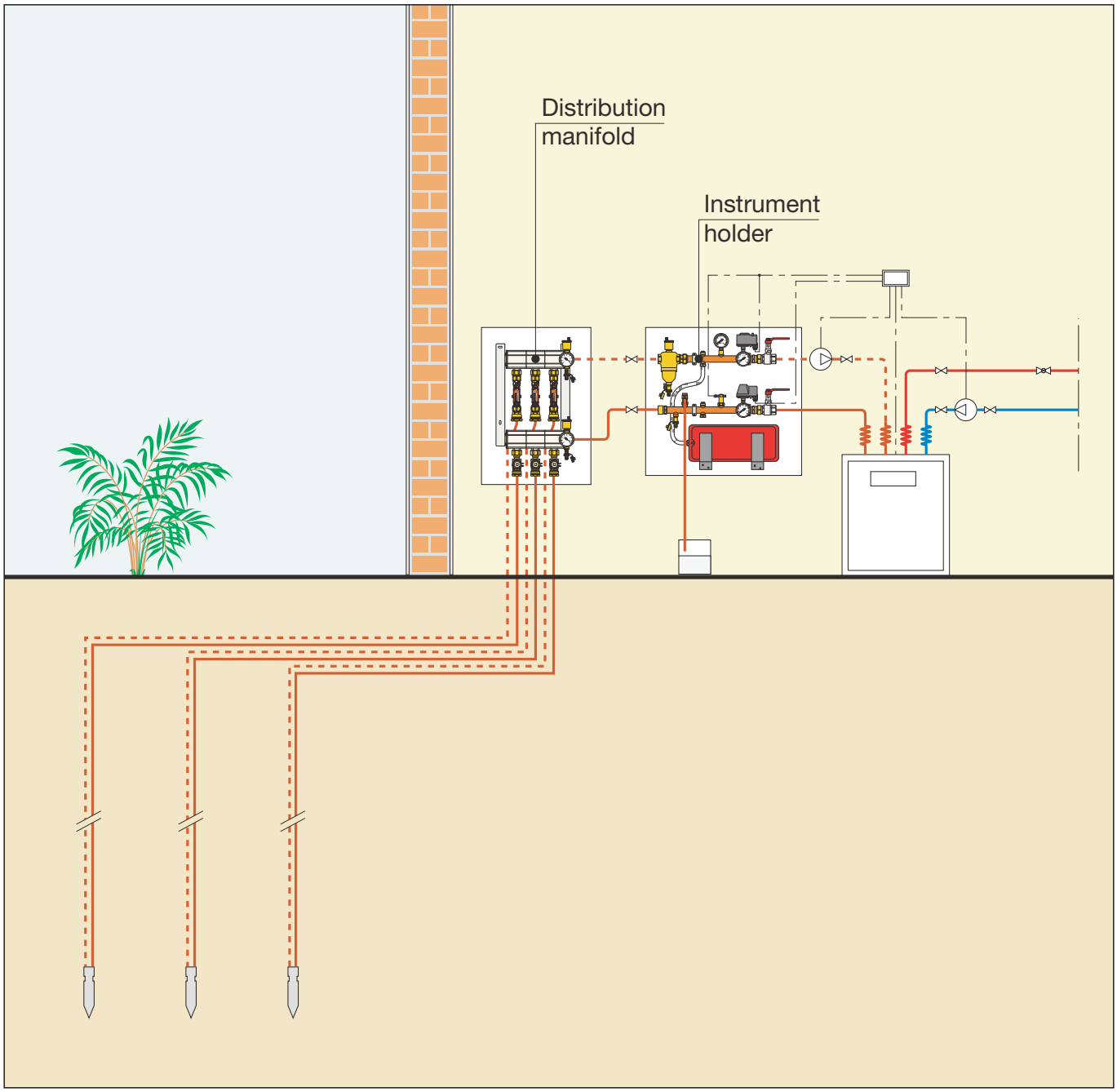


In a conventional installation, the heat pump is usually located outside the dwelling, to have better thermal exchange and to prevent problems associated with noise during operation caused by the considerable amounts of air to be treated. The design must take account of the possibility of the outside of the system freezing, between the heat pump and the system inside the dwelling.

The products in the CALEFFI GEO® series have been conceived specifically to be used in heat pump systems. In circuits with **geothermal heat pumps** the medium is generally a mixture of water and anti-freeze fluid since the temperatures can be extremely low.
The components are made with high-performance materials for this type of application.

COMPONENTS FOR GEOTHERMAL HEAT PUMP SYSTEMS

Here we give an application example of a geothermal heat pump system with vertical manifolds installed.

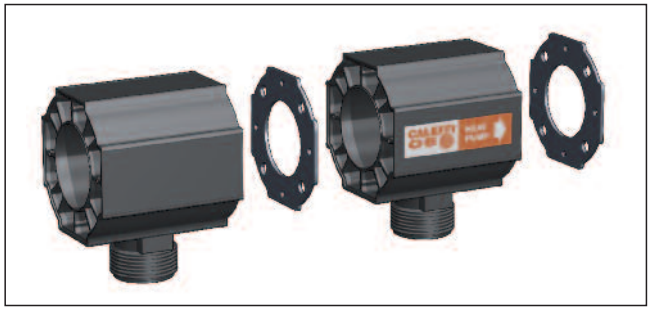


The distribution manifold and the instrument holder must be made so as to allow
1. the medium to flow in the probes in a balanced manner with little loss of head,
2. appropriate instruments (for control, safety and expansion) to assure correct operation of the heat pump.

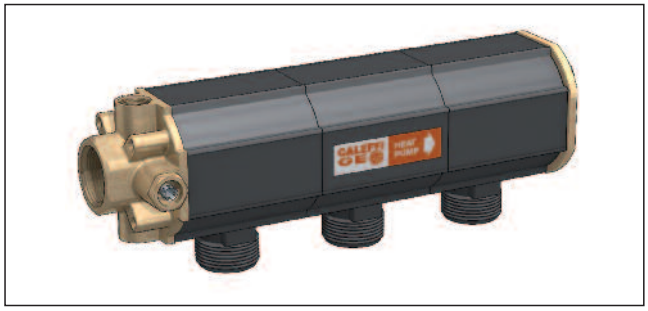
DISTRIBUTION MANIFOLD

The entirely modular distribution manifold has been designed to be easily fitted on a bench and afterwards hooked onto wall brackets.
This assembly feature moreover facilitates preparing the probes and connecting them to the manifold.
The manifold is modular to be able to be adapted to small residential systems in which geothermal probes generally vary from 2 up to 8.
The number of single modules to be used is defined by the number of probes.
The manifold is also available in a preassembled version to facilitate installation.

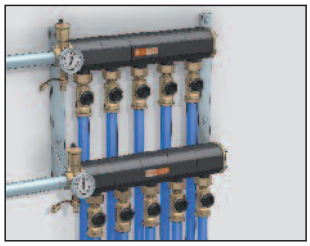
The modules have been designed with special techniques in order to limit condensation. An air gap isolates the medium from the outside.

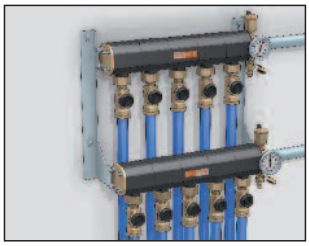


Two brass blind end plugs and 4 tie-rods permit compacting the modules with a seal in between that isolates the water duct and the single air chambers.

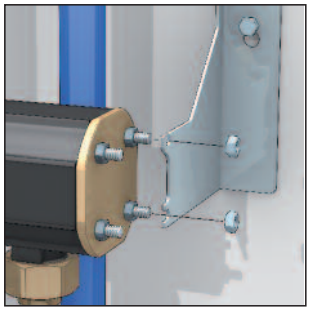


The manifold is reversible to adapt to the position of the probes with respect to the heat pump.





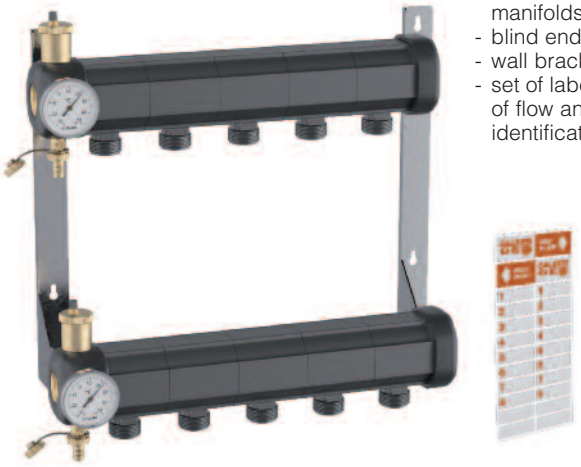
The bracket can be secured to a wall with no manifold so as to facilitate connecting the probes.



DISTRIBUTION MANIFOLD

110

Preassembled geothermal manifold.
Complete with:
- automatic air vents;
- temperature gauges Ø 80 mm;
- filler/drain cocks;
- flow and return manifolds;
- blind end plugs;
- wall brackets;
- set of labels for direction of flow and circuit identification.



Body made of polymer PA66G30.
Max. working pressure: 6 bar.
Pmax system test: 10 bar.
Working temperature range: -10–60°C.
Ambient temperature range: -20–60°C.
Medium: water, glycol solutions, saline solutions.
Maximum percentage of glycol: 40%.
Manifold DN 50.
Outlet connections with mechanical seal for shut-off valves 111 series, balancing valves 112 series and flow meters 113 series.

Code

1107B5	2 circuits
1107C5	3 circuits
1107D5	4 circuits
1107E5	5 circuits
1107F5	6 circuits
1107G5	7 circuits
1107H5	8 circuits

110

Modular manifold single module.

Body made of polymer PA66G30.
Max. working pressure: 6 bar.
Pmax system test: 10 bar.
Working temperature range: -10–60°C.
Ambient temperature range: -20–60°C.
Medium: water, glycol solutions, saline solutions
Maximum percentage of glycol: 40%.
Manifold DN 50.
Outlet connections with mechanical seal for shut-off valves 111 series, balancing valves 112 series and flow meters 113 series.

Code

110700

110

Assembly kit for modular manifolds.

Max. working pressure: 6 bar.
Pmax system test: 10 bar.
Working temperature range: -10–60°C.
Ambient temperature range: -20–60°C.
Medium: water, glycol solutions, saline solutions.
Maximum percentage of glycol: 40%.

Complete with:
- brass end fitting with automatic air vent, fillter/drain cock;
- brass blind end plug;
- pre-formed shell insulation;
- screws and bolts for tie-rods and brackets;
- set of labels for direction of flow and circuit identification;
- temperature gauge with pocket (-30–50°C);
- No. 2 seals gaskets.

Code

110750

110

Stainless steel tie-rods for assembling modular manifolds.
M8 threaded stainless steel bar.

Code

110012	for manifold with 2 circuits
110013	for manifold with 3 circuits
110014	for manifold with 4 circuits
110015	for manifold with 5 circuits
110016	for manifold with 6 circuits
110017	for manifold with 7 circuits
110018	for manifold with 8 circuits

110

Pair of stainless steel brackets to secure modular manifolds.
Rapid wall coupling system.
System for rapidly coupling the manifold on the brackets.
With screws and plugs.

Code

110001

SHUT-OFF AND BALANCING DEVICES

111

Ball shut-off valve fitted for integrated flow rate measuring sensor.
Brass body.
Polymer top plug.
Female connections with captive nut and fitting for polyethylene pipe.
Max. working pressure: 6 bar.
Pmax system test: 10 bar.
Working temperature range: -10–60°C.
Ambient temperature range: -20–60°C.
Medium: water, glycol solutions, saline solutions.
Maximum percentage of glycol: 40%.
Patent pending.

Code	Connection
111620	Ø 25
111630	Ø 32
111640	Ø 40

111

Pre-formed insulation for shut-off valves Ø 25 and Ø 32 mm.

Code
111001

130

Flow rate electronic measuring station for connecting sensor with Vortex effect.
Complete with:
- box;
- power supply unit;
- control lever:
- measuring sensor with Vortex effect;
- connecting cable.

Code
130010

111

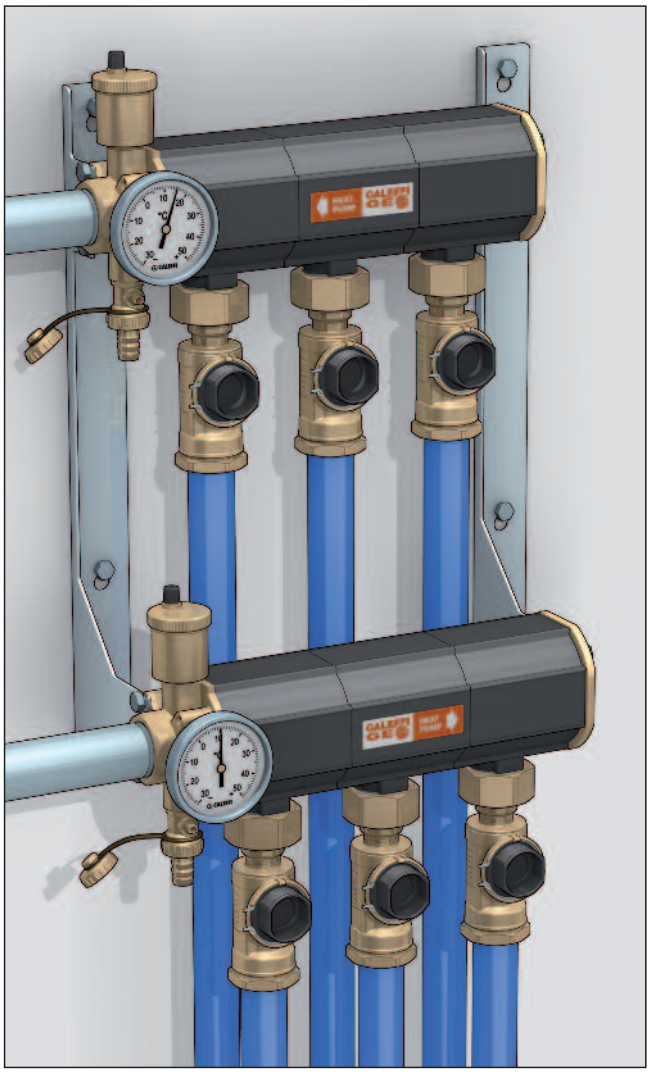
Integrated flow rate measuring sensor with Vortex effect.

Code
111010

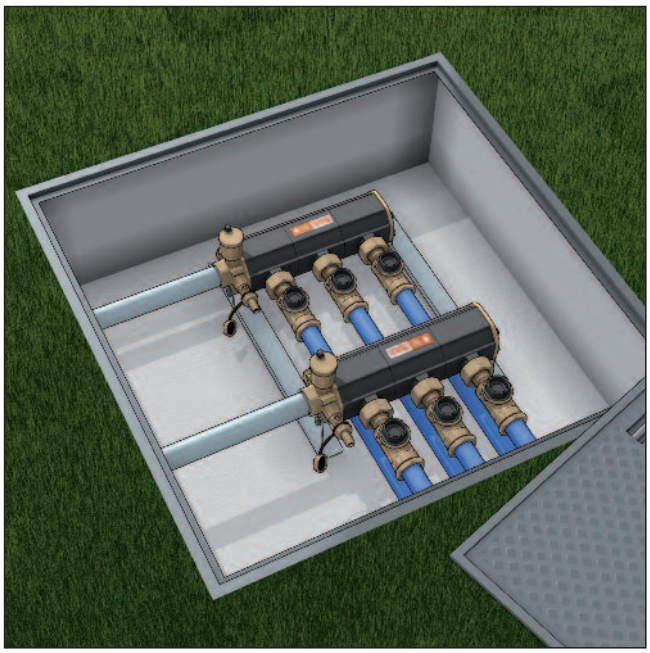
111

Control lever for shut-off valves.
Polymer body.

Code
111002

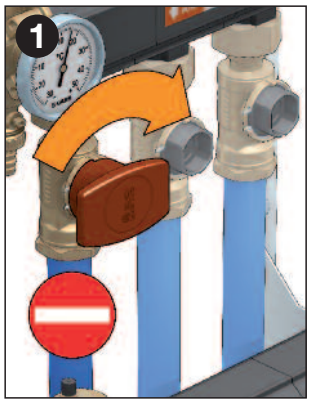


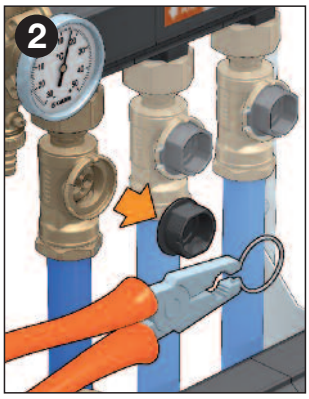
The manifold has been designed for both vertical use, anchored to a wall, and horizontal use, for example in a pit.



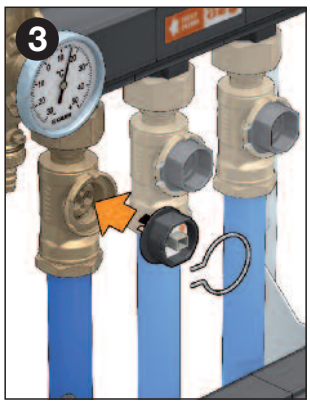
Circuit balancing

Flow rate balancing in the probes is essential to ensure correct thermal exchange. Before doing the balancing it is necessary to insert the flow rate measuring sensor into each shut-off valve of the flow manifold.
Each single valve is provided with a plug, anchored with an elastic ring that isolates the holes made in the ball.
To swap this plug with the sensor you need to:
1. Close the valve with the knob.
2. Remove the seal and extract the plug.

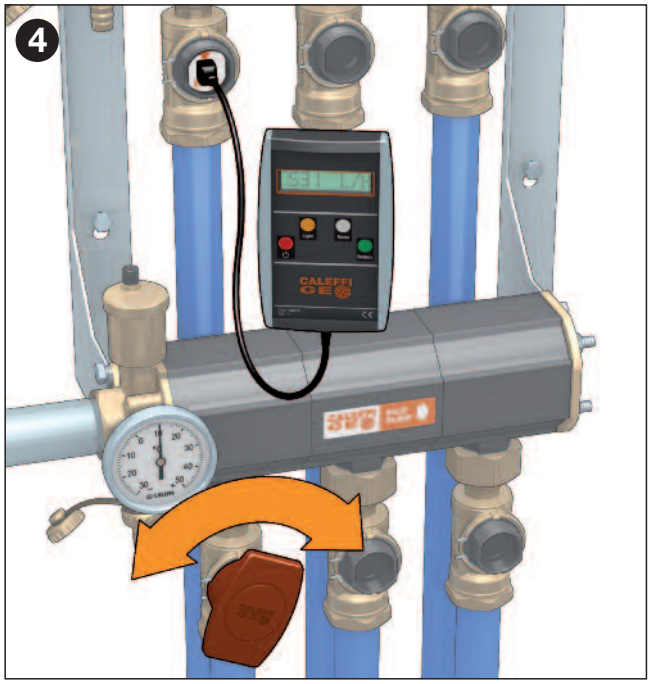




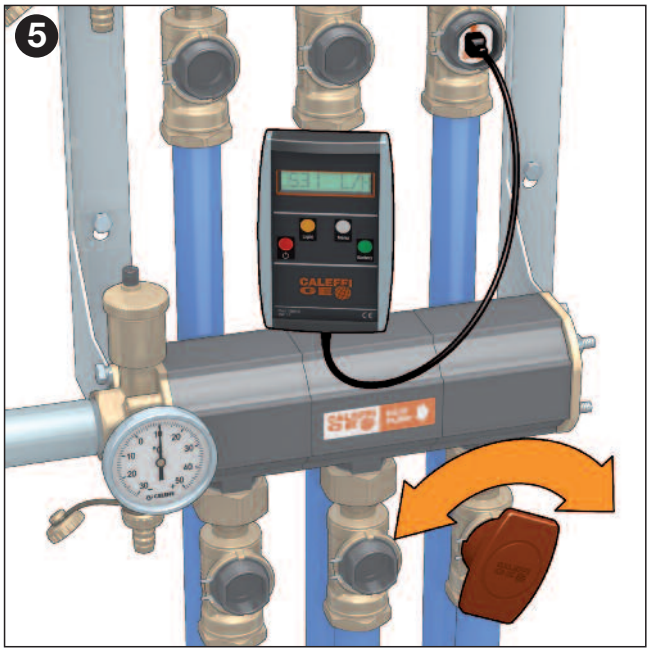
3. Insert the measuring sensor and retain it with the seal.



4. After carrying out these operations on all the outlets it is possible to connect the electronic measur to the sensor of the first branch and measure the corresponding flow rate.
The flow rate is adjusted with the special knob to adjust the shut-off valve on the return manifold in correspondence with the same circuit until the instrument indicates the design setting.



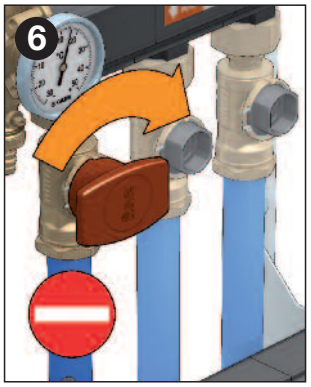
5. This operation must be repeated on the following branches to obtain the desired flow rate.

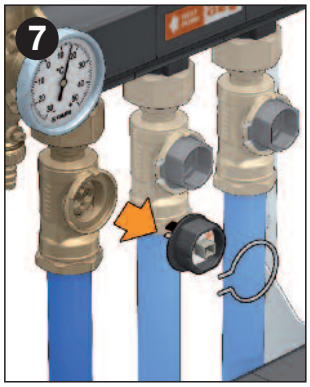


During the flow rate mesurement, the sensor creates no significant head losses and therefore causes no significant changes in the actual flow rate.

After balancing, disconnect the electronic measurer and put the shut-off valves back into their standard operating condition as follows:

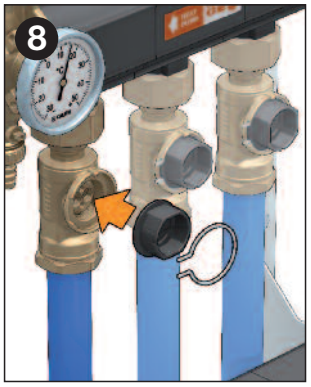
6. Close the valve with the knob.
7. Remove the seal and extract the sensor.

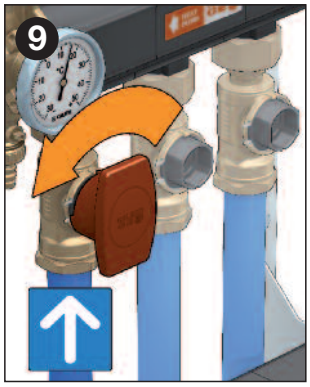




8. Fit the plug back in and secure it with the seal.
9. Reopen the valve with the knob.

Repeat the process for all the circuits.





112

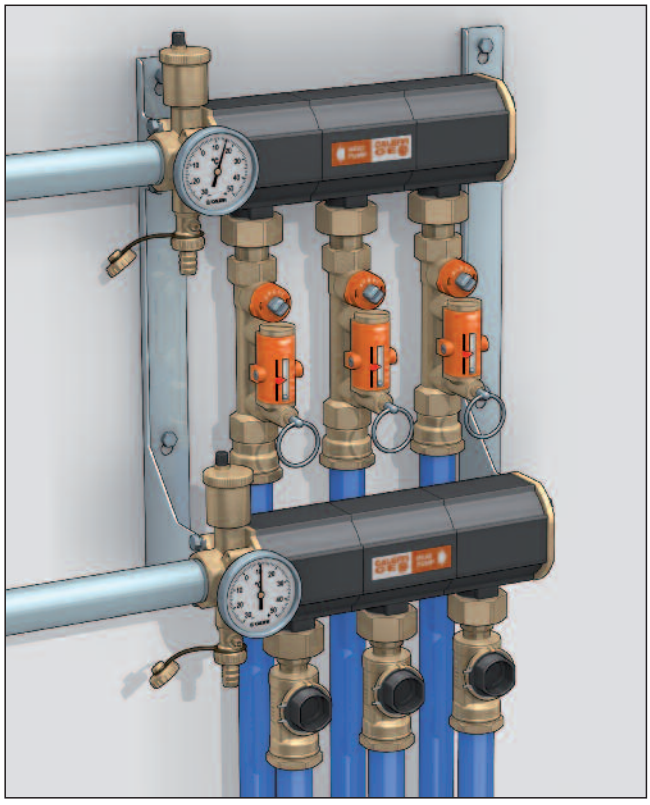
Balancing valve
with flow meter.
Direct reading of flow rate.
Brass valve body
and flow meter.
Ball valve for flow rate
adjustment.
Graduated scale flow
meter with magnetic
movement flow rate
indicator.

Brass body.
Female connections with captive nut and fitting for polyethylene pipe.
Max. working pressure: 10 bar.
Working temperature range: -10–110°C.
Ambient temperature range: -20–60°C.
Medium: water, glycol solutions, saline solutions
Maximum percentage of glycol: 40%.

Code	Connection	Scale (m³/h)
112621	Ø 25	0,3–1,2
112631	Ø 32	0,3–1,2
112641	Ø 40	0,3–1,2

Construction details

On 112 series valves, the flow rate reading is given directly by a flow meter, obtained with a by-pass on the body of the device, which can be automatically cut off during normal operation.



The use of a flow meter greatly simplifies the process of system balancing, since the flow rate can be measured and controlled at any time and there is no need for differential pressure gauges or reference charts.

112

Insulation for balancing
valves Ø 25 and
Ø 32 mm.

Code
112001

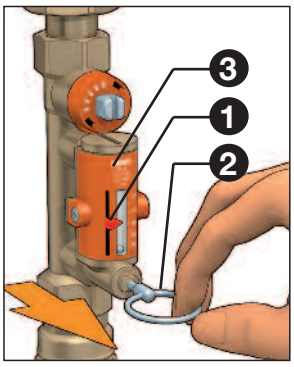
Flow rate adjustment

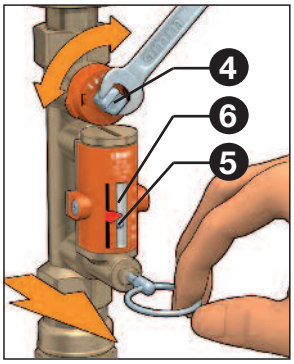
1. With the aid of the indicator (1), mark the reference flow rate at which the valve is to be set.

2. Use the ring (2) to open the obturator that shuts off the flow of medium in the flow meter (3) under normal operating conditions.

3. Keeping the obturator open, use a wrench on the valve's control stem (4) to adjust the flow rate.
It is indicated by a metal ball (5) that runsinside a transparent guide (6) next to which there is a graduated scale in m³/h.

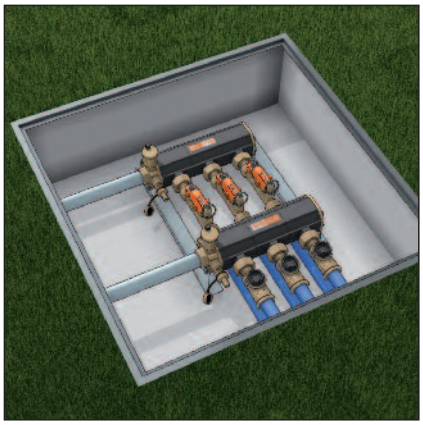
4. After completing the balancing, release the ring (2) of the flow meter obturator which, thanks to an internal spring, will automatically go back into the closed position.





5. On completing the adjustment, the indicator (1) can be used to keep the setting in memory, in case checks need to be made over time.

The versatility of the balancing valve in no way impairs installation with a horizontal manifold.



113

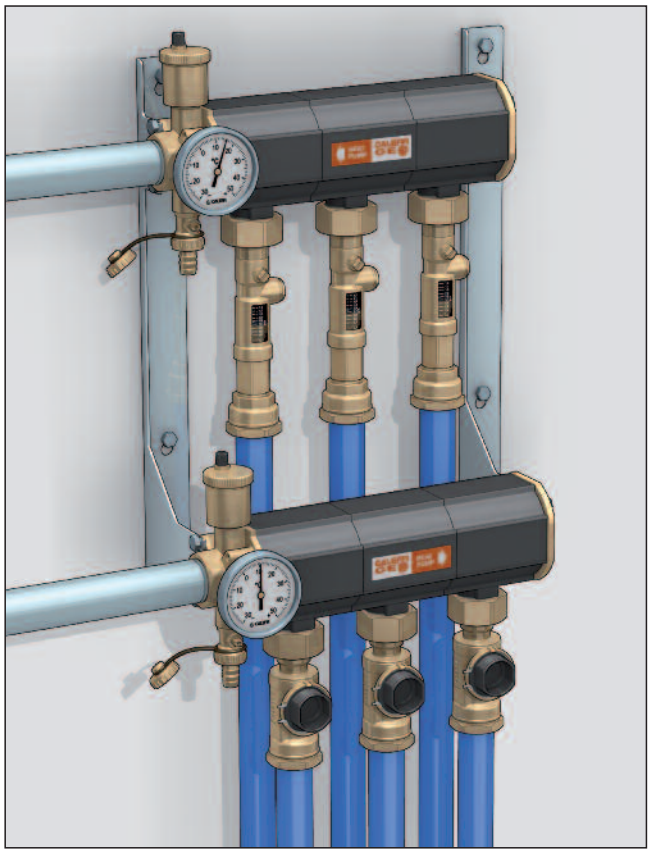
Float flow meter.

Brass body.
Female connections with captive nut and fitting for polyethylene pipe.
Max. working pressure: 10 bar.
Working temperature range: -10–110°C.
Ambient temperature range: -20–60°C.
Medium: water, glycol solutions, saline solutions.
Maximum percentage of glycol: 40%.

Code	Connection	Scale (m^3/h)
113621	Ø 25	0,3–1,2
113631	Ø 32	0,3–1,2

Flow meter

The flow meter is a floating gauge that measures fluid movement, and has a built-in adjustable flow limiter.
It works within a range of 0.3–1.2 m^3/h.
The flow meter must be fitted in a vertical position only.

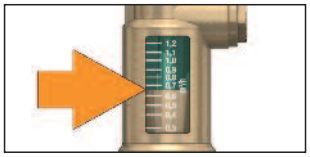


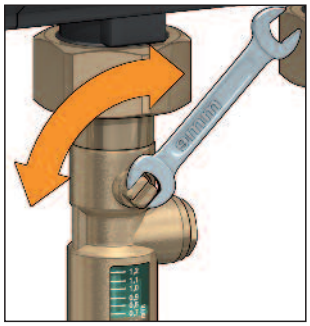
113

Insulation for float flow meter Ø 25 and Ø 32 mm.

Code
113001

The flow rate in each probe is indicated by the top edge of the float and can be modified by turning a 9 mm spanner on the ball valve.

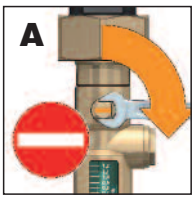




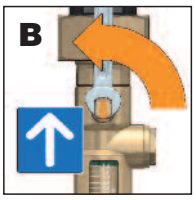
Full closing and opening of the valve

The valve can be fully opened or closed.
A slot on the obturator stem indicates the status of the valve.

Fully closed



Fully open



Correction for liquids with different densities

To have the actual flow rate when using glycol solutions at low temperature it is necessary to multiply the reading of the float flow meter by a corrective factor of:
- 0,9 for concentrations of 20-30%
- 0,8 for concentrations of 40-50%

Using the flow meter does not permit installation with a horizontal manifold.

INSTRUMENT HOLDER

115

Holder for instruments and accessories for heat pumps complete with steel anchoring base.

Connections: female.
Max. working pressure: 3,5 bar.
Working temperature range: -20–90°C (temperature gauges 50°C).
Ambient temperature range: -10–55°C.
Medium: water, glycol solutions, saline solutions.
Maximum percentage of glycol: 40%.
A saline solution can be used as the medium, changing the provided pressure gauge with the steel one.

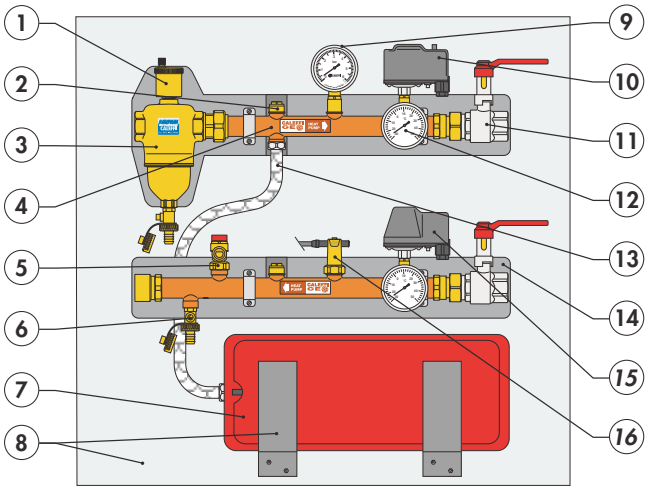
Code	
115700	1 1/4"

115

Box for coupling with instrument holder anchoring base 115 series.
Made of painted steel.
Composed of outer casing and door.

Code	Dimensions (h x w x d)
115080	900 x 850 x 165

Characteristic components



1) Automatic air vent
2) No. 2 1/2" pockets for temperature probes
3) Dirt separator with automatic air vent and drain cock
4) Copper instrument holder
5) Safety valve with adjustable outlet
6) Filler/drain cocks
7) Expansion tank capacity 7,5 litres
8) Anchoring plate (box bottom) complete with support brackets
9) Pressure gauge conforming to I.S.P.E.S.L.
10) I.S.P.E.S.L. approved minimum pressure gauge
11) No. 2 shut-off valves with extended lever to facilitate use when there is insulation
12) No. 2 temperature gauges Ø 80 mm
13) Hose for connecting expansion tank
14) Pre-formed shell insulation
15) Safety pressure switch 625 series (optional)
16) Flow switch 315 series (optional)

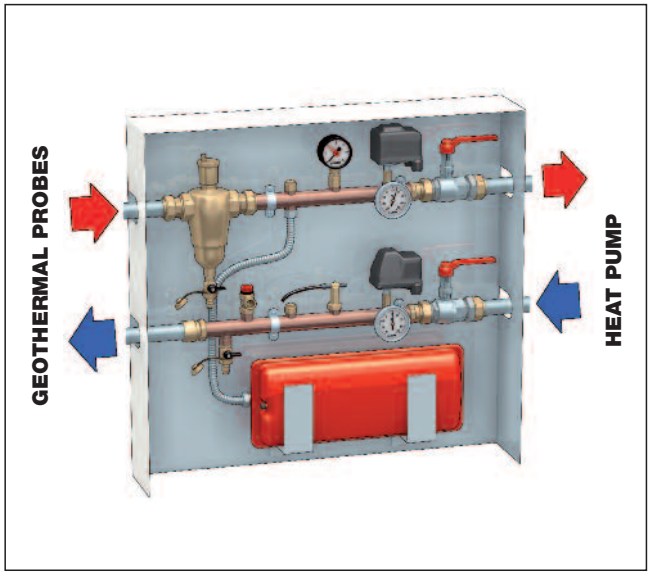
INSTRUMENT HOLDER

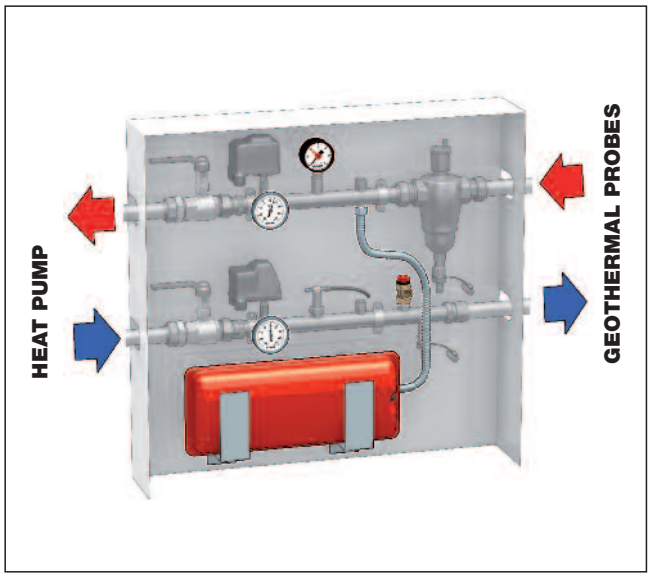
Construction details

Compact unit to check and ensure the safety and correct operation of the heat pump and geothermal probe system.
Insulation with two shells that completely encloses all the metal parts subject to condensation, including the ball valves, so as to be able to install the unit easily in the heating plant or dwelling.
Easy system filling and draining.
The manifold can be shut off for maintenance.
The manifold can be installed on a wall or in an exposed box.

Thanks to the combination of the dirt separator and the air vent it is possible to keep the medium circulating in the probes constantly clean and deaerated. This protects the heat exchanger from drops in output due to accumulated dirt and corrosion caused by the presence of air.

The manifold has been designed to be reversible to ensure right-hand or left-hand installation according to the position of the heat pump in relation to the probes.
It is sufficient to turn through 180° the installation of pressure gauge, temperature gauges, safety valve and expansion tank.





ACCESSORIES FOR INSTRUMENT HOLDER

315

Flow switch for heat pump instrument holder.
Magnetic control contacts.
Electric supply: 230 V - 0.02 A
Max. working pressure: 6 bar
Working temperature range: -20–100°C
3/4" female connection.
Protection class: IP 65.

Code	Flow rate (m^3/h)	Contact opening (m^3/h)	Contact closing (m^3/h)
315060	0,6	0,59	0,57
315070	0,7	0,70	0,64
315080	0,8	0,82	0,78

625

Safety pressure switch.
Up to 500 V three-pole - 16 A.
Max. working pressure: 15 bar.
Ambient temperature range: -10–55°C.
Medium temperature range: 0–110°C.
1/4" female connection.
Protection class: IP 44.

CE

Code	Temperature range
625005	1–5 bar
625010	3–12 bar

688

Temperature gauge.
1/2" back connection.
Galvanized steel body.
With brass pocket 40 mm long.
Accuracy class: UNI 2.

Code	°C	Ø (mm)
688005	-30–50	80

557

Pressure gauge.
3/8" radial connection.
Accuracy class: UNI 2,5.
Conforms to I.S.P.E.S.L. standards

Code	bar	Ø (mm)
557706	0–6	80

557

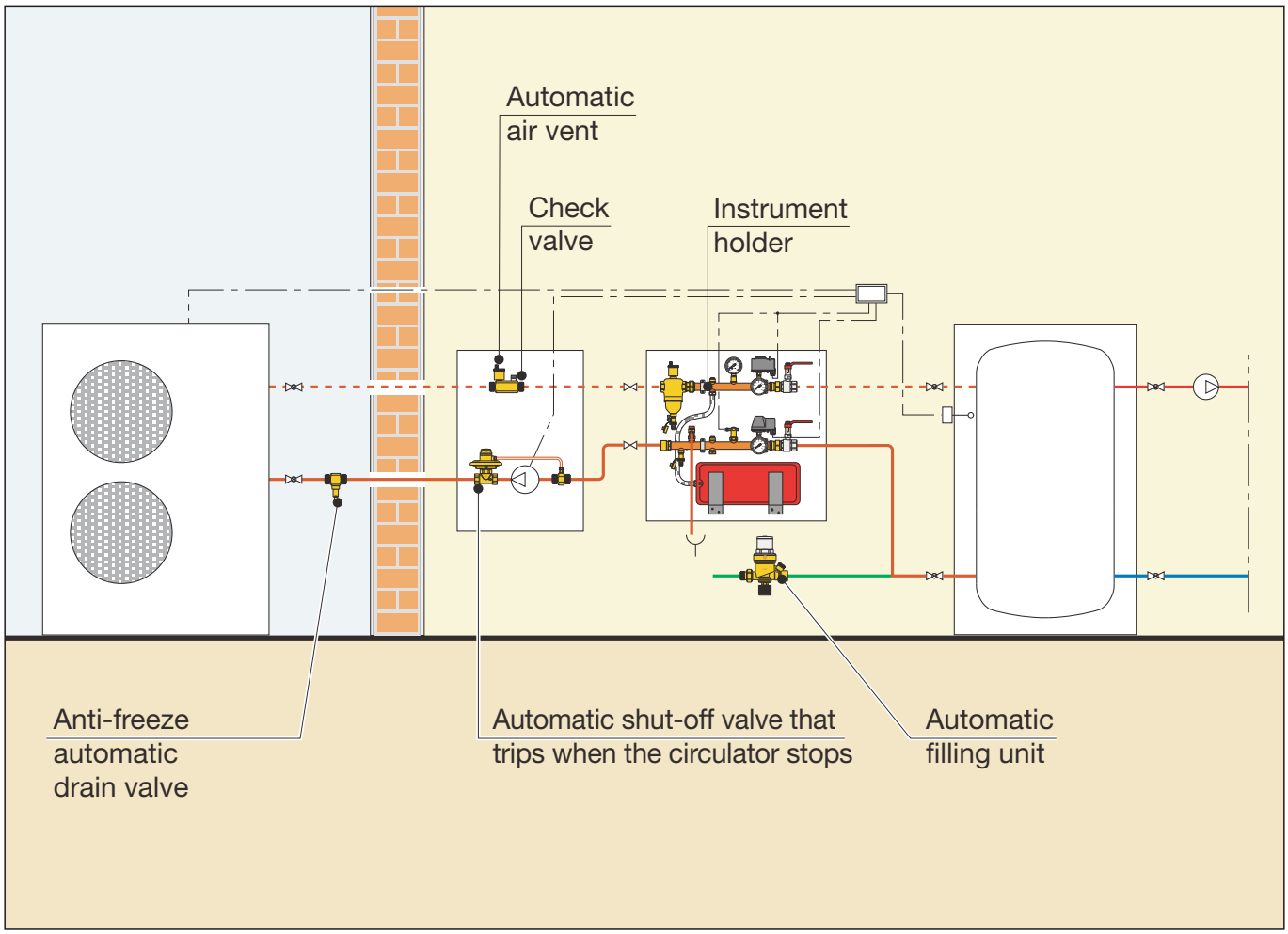
Pressure gauge.
3/8" radial connection.
Stainless steel body.
Accuracy class: UNI 1,6.

Code	bar	Ø (mm)
557596	0–6	63

The series of CALEFFI GEO® products have been made specifically for use in circuits of heat pump systems. A system with an **aerothermal heat pump**, in case of malfunctioning and outside conditions with temperature below 3°C, risks ice forming in the pipes.
The components are made with high-performance materials for this type of application.

COMPONENTS FOR AEROTHERMAL HEAT PUMP SYSTEMS

Exposed aerothermal heat pumps are connected to heating and air-conditioning systems with the following kind of diagrams:



In the event of the pump malfunctioning or an electric supply failure, the external pipes are exposed to the danger of frost. To avoid this danger it is possible to use anti-freeze solutions, heating cable protection or hydraulic systems.

Anti-freeze solutions significantly increase head losses of the medium. In addition, they require constant checks and servicing to prevent both the loss of the anti-freeze action and excessive acidity with a greater risk of corrosion.

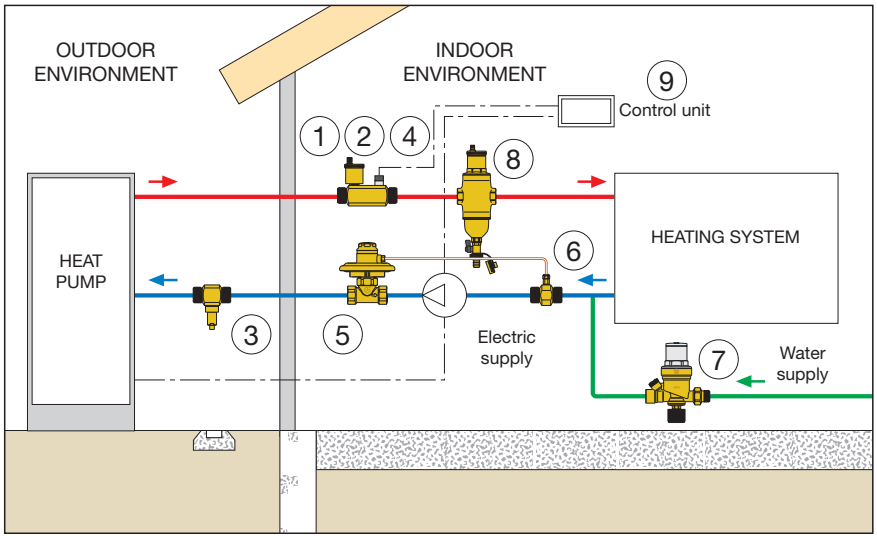
Heating cable protection, in this specific case, is not recommended since with no electric power there can be no anti-freeze function.

On the contrary, hydraulic anti-freeze systems do not increase the head losses of the medium, they do not require constant checking and servicing and they are not made ineffective by an electric power failure.

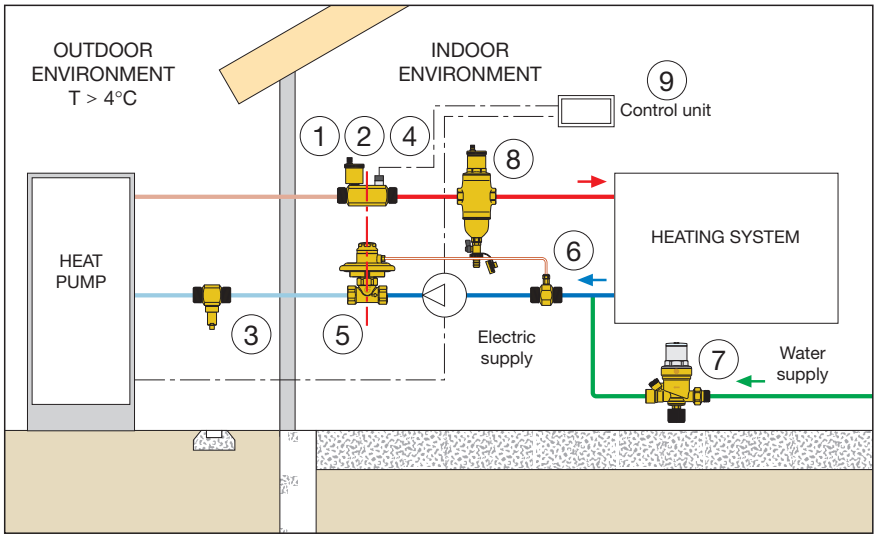
ANTI-FREEZE PROTECTION

Operating principle
The anti-freeze protection unit comes into effect in the event of failure of the electric supply of the heating system and heat pump, for an extended period, when the outside temperature is below 0°C.
Here we show the functional diagram of the protection unit composed of:

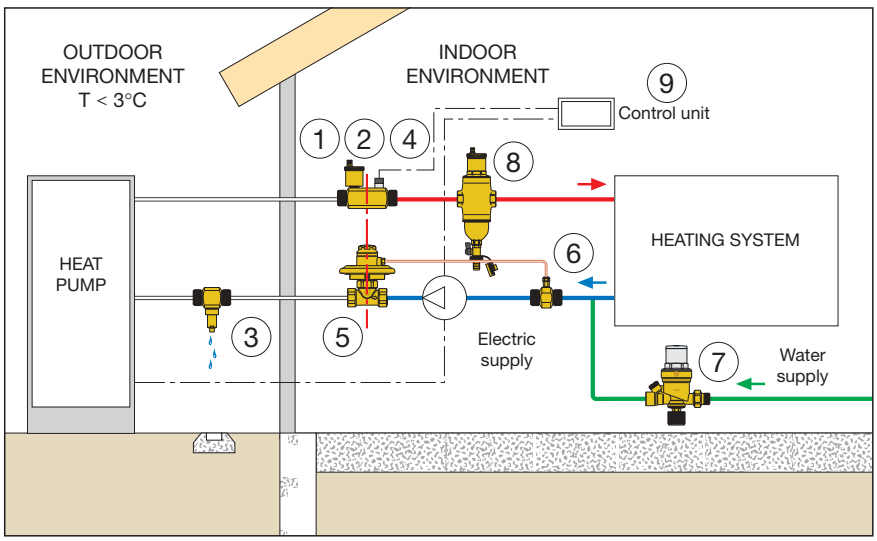
1. Air vent with dual function:
   besides the conventional use of venting air, it is also used to draw air into the system when the protection unit triggers.
2. Check valve with the function of isolating the system branch on the outside.
3. Anti-freeze valve sensitive to the system water temperature.
4. "Minimum temperature" safety thermostat.
5. Differential valve with the function of isolating the system branch on the outside.
6. Fitting acting as a pressure test point.
7. Filling unit to maintain the static pressure of the system and recharge the circuit after the protection unit has triggered.
8. Deaerator-dirt separator that continuously eliminates the air and debris contained in the circuit.
9. Control unit.



If there is no electric current but the outside conditions are not such as to cause freezing (T > 4°C), the system will separate the internal part of the system from the external part at the differential valve (5) and check valve (2).
The water contained in the external part of the system is not discharged.
When the electric supply returns, the circulator will restart and the system recommence normal operation.

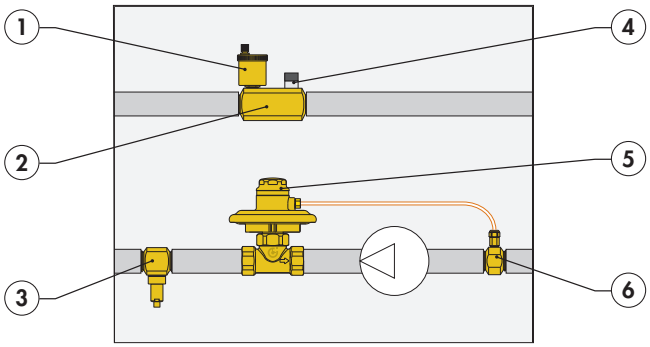


If there is no electric current and the water temperature is < 3°C the unit will separate the external part of the system from the internal one and the anti-freeze valve (3) will come into operation and drain the system.
When the electric supply returns, the circulator will restart and the filling unit will recharge the system to the nominal pressure setting.



ANTI-FREEZE PROTECTION

Characteristic components



1) Automatic air vent valve.
2) Check valve fitted for air vent and minimum thermostat, 1" male connections.
3) Anti-freeze valve, 1" male connections.
4) Sensor for connection to control unit.
5) Differential valve complete with capillary pipe for connecting to the pressure test point, 1" female connections.
6) Fitting with pressure point, 1" male connections.

109

Anti-freeze kit.

Max. working pressure: 3 bar
Working temperature range: 0–65°C
Ambient temperature range: -20–60°C
Patent pending.

Code	Connection
109600	1"

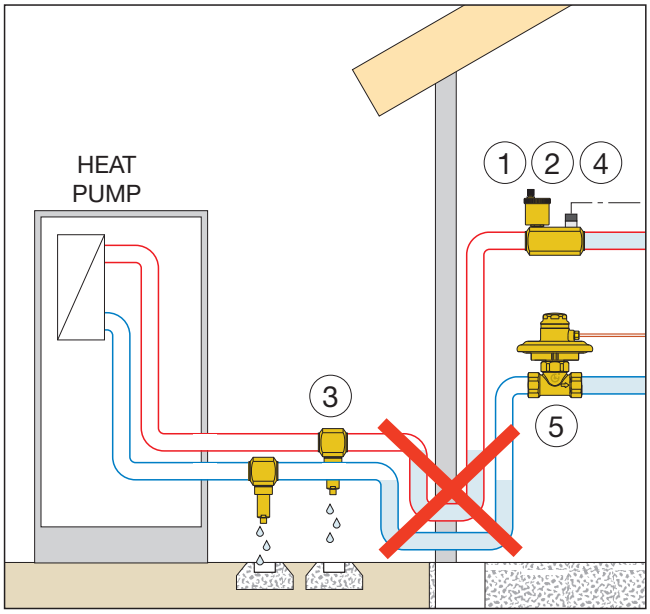
108

Anti-freeze valve.

Brass body.
Max. working pressure: 3 bar.
Working temperature range: 0–65°C.
Ambient temperature range: -20–60°C.
Opening temperature: 3°C.
Closing temperature: 4°C.
Patent pending.

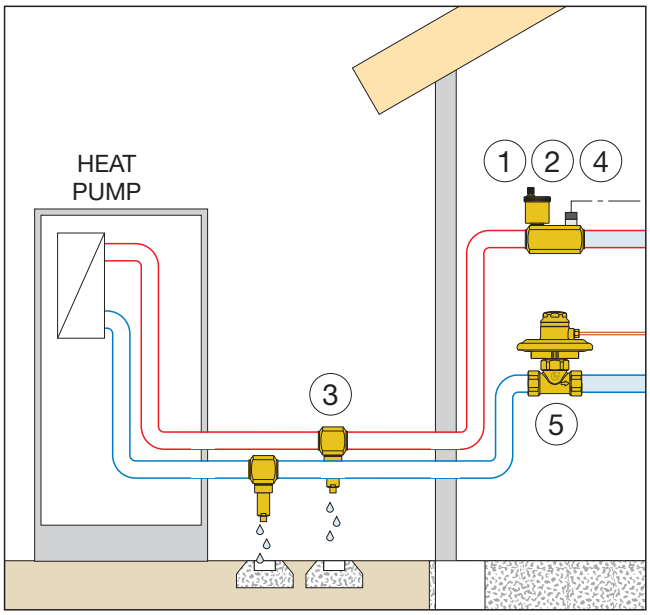
Code	Connection
108600	1"

If the heat pump has both circuit connections at the bottom of the machine, installing just one anti-freeze valve will not ensure complete drainage of the external part of the system since the connections with the exchanger are at the top of the machine.
With this configuration it is necessary to install two anti-freeze valves at the bottom of each branch so as to ensure correct operation of the protection unit.
The pipe connecting the anti-freeze valve and the air vent must have no structures such as to create a siphon effect and prevent draining part of the piping.



For optimal operation of the protection unit it is advisable to use a thermal flywheel upstream from the circulator to aid filling the external part of the system that may have been drained by the protection unit coming into operation.

The anti-freeze valves must be positioned in the coldest part of the system or anyhow well away from any sources of heat that could impair operation and at least 15 cm off the ground to avoid ice forming on the ground from preventing the water from coming out of the valve.
The pressure point must be positioned immediately upstream from the circulator while the differential valve is installed immediately downstream.



ACCESSORIES

115

Holder for instruments and accessories for heat pumps complete with steel anchoring base.

Connections: female.
Max. working pressure: 3.5 bar.
Working temperature range: -20–90°C (temperature gauges 50°C).
Ambient temperature range: -10–55°C.
Medium: water, glycol solutions, saline solutions.
Maximum percentage of glycol: 40%.
A saline solution can be used as the medium, changing the provided pressure gauge with the steel one.

Code	
115700	1 1/4"

115

Box for coupling with instrument holder anchoring base series 115.
Made of painted steel.
Composed of outer casing and door.

Code	Dimensions (h x w x d)
115080	900 x 850 x 165

546 DISCALDIRT®

broch. 01123

Deaerator-dirt separator.
Brass body.
Female connections.
Drain cock with hose connection.
Max. working pressure: 10 bar.
Max. drain pressure: 10 bar.
Working temperature range: 0–110°C.
Particle separation rating: up to 5 µm.
Patented.

Code	
546005	3/4"
546006	1"

553

broch. 01061

Pre-adjustable automatic filling unit, antiscale,
inspectionable with pressure setting indicator. Complete with manual cock, strainer and check valve.
Adjustment range: 0.2–4 bar.
Max. inlet pressure: 16 bar.
Max. working temperature: 65°C.

Code	
553540	1/2" with press. gauge conn.
553640	1/2" with press. gauge

0317510GB

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