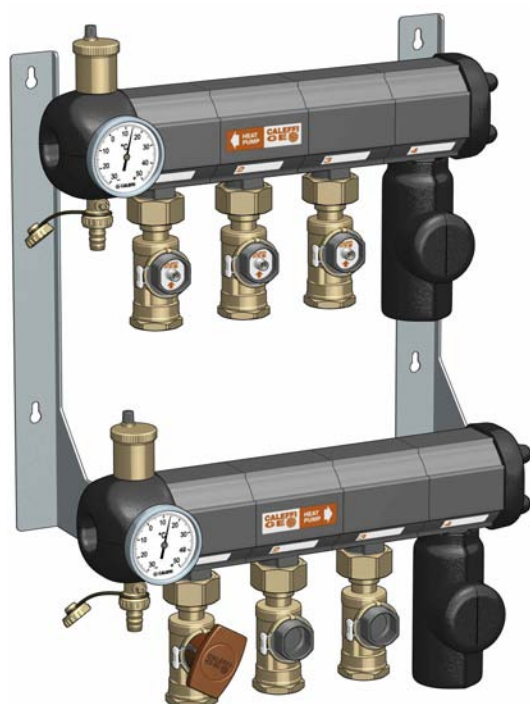


Distribution manifold for geothermal systems

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110 series

INSTALLATION AND COMMISSIONING MANUAL



Function

The CALEFFI GEO® 110 series manifolds are used for the control and distribution of medium in closed circuit geothermal plants.

In circuits with geothermal heat pump the thermal 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.

They are supplied pre-assembled, complete with end fittings and temperature gauges, or in ready-to-assemble modules.

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WARNINGS

These instructions must be read and understood before installing and maintaining the device.

CAUTION! FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN A SAFETY HAZARD!

CAUTION!

**YOUR SAFETY IS INVOLVED! FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN INJURY
THE PRODUCT SUPPLIED WITH THIS INSTRUCTION SHEET IS REFERRED TO BELOW AS 'DEVICE'**

The device must be installed, commissioned and maintained by qualified technical personnel in accordance with national regulations and/or relevant local requirements.

If the device is not installed, commissioned and maintained correctly in accordance with the instructions provided in this manual, then it may not work properly and may endanger the user.

Clean the pipes of any debris, rust, incrustations, limescale, welding slag and any other contaminants. The hydraulic circuit must be clean.

Make sure that all connecting pipework is watertight.

When connecting water pipes, make sure that threaded connections are not overstressed mechanically. Over time this may result in breakage, causing water damage and/or personal injury.

Water temperatures higher than 50°C may cause severe burns. When installing, commissioning and servicing the device, take the necessary precautions so that these temperatures will not be hazardous for people.

In the case of particularly hard or impure water, there must be suitable provision for filtering and treating the water before it enters the device, in accordance with current legislation. Otherwise the device may be damaged and will not work properly.

For optimal operation, any air in the medium must be removed. For reasons of safety, due to the high compression capacity of air, testing the entire system, and especially the valves, for watertightness using compressed air is not recommended.

Any use of the device other than its intended use is prohibited.

Any coupling of the device with other system components must be made while taking the operational characteristics of both units into consideration. An incorrect coupling could compromise the operation of the device and/or system.

The unit must be installed in an environment where any leakage would not cause personal injury or property damage.

Leave this manual as a reference guide for the user. Dispose of the product in compliance with current legislation

Product range

110 series Pre-assembled geothermal manifold	DN 50
111 series Ball shut-off valve fitted for integrated flow rate measuring sensor	Ø 25, Ø 32, Ø 40
112 series Balancing valve with flow meter	Ø 25, Ø 32, Ø 40
113 series Float flow meter	Ø 25, Ø 32
130 series Flow rate electronic measuring station for connecting sensor with Vortex effect	

Technical specifications

Manifold

Materials

Flow manifold

Body: polymer PA66G30

Return manifold

Body: polymer PA66G30

End fitting

Air vent

Obturator stem: brass EN 12164 CW614N

Spring: stainless steel

Seals: EPDM

Float: PP

Drain/fill cock

Body: brass EN 12165 CW617N

Performance

Medium: water, glycol solutions, salt solutions

Max. percentage of glycol: 50%

Max. working pressure: 6 bar

System test pressure: 10 bar

Working temperature range: -10–60°C

Ambient temperature range: -20–60°C

Main connections: 1 1/4"

Outlets: 42 p. 2.5 TR

Centre distance: 100 mm

Outlet connections with mechanical seal for 111 series shut-off valves, 112 series balancing valves and 113 series flow meters.

Technical specifications

Shut-off and balancing devices

Materials

Shut-off valve

Body: brass EN 12165 CW617N

Polymer cap: PA66G30

Seal ring: stainless steel

Balancing valve

Body: brass EN 12165 CW617N

Ball: brass EN 12164 CW614N

Ball control stem: brass EN 12164 CW614N

Ball seal seat: PTFE

Flow meter

Body: brass EN 12165 CW617N

Headwork: brass EN 12164 CW614N

Obturator stem: brass EN 12164 CW614N

Springs: stainless steel

Seals: EPDM

Flow meter float: PSU

Indicator cover: PSU

Float flow meter

Body: brass EN 12165 CW617N

Ball: brass EN 12164 CW614N

Ball control stem: brass EN 12164 CW614N

Ball seal seat: PTFE

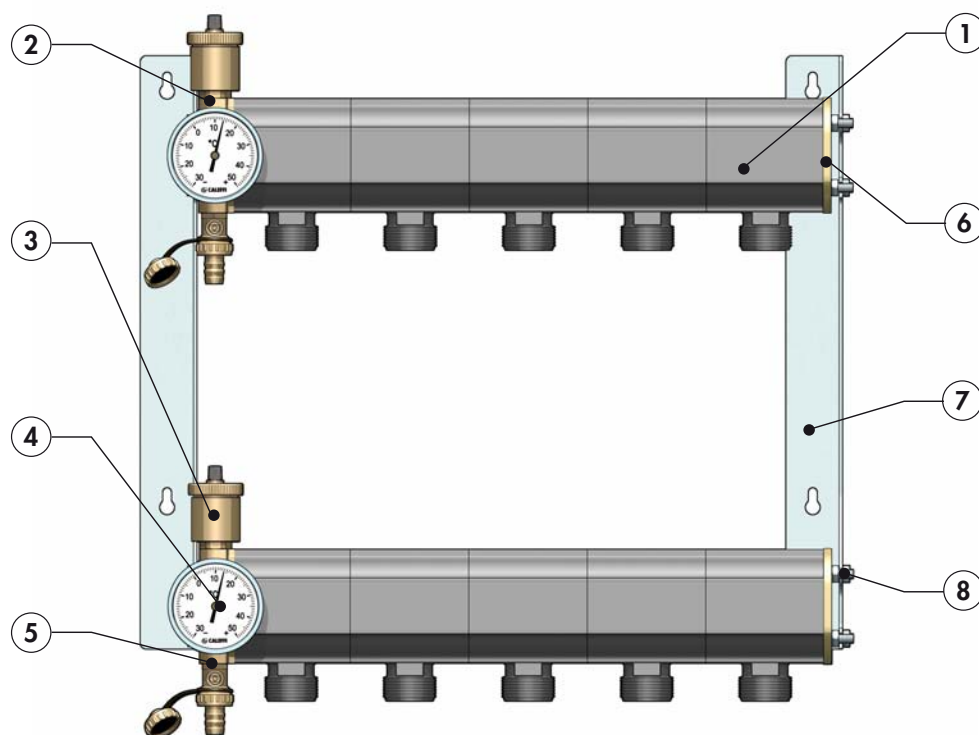
Float: brass EN 12165 CW614N

Seals: EPDM

Graduated scale support: PSU

Accuracy: 10%

Characteristic components



Pre-assembled unit complete with:

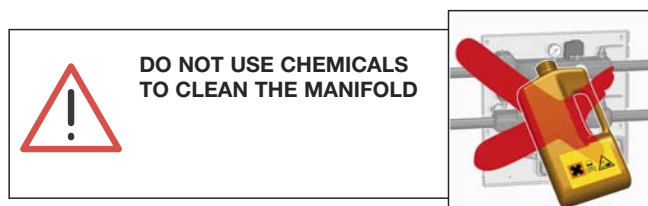
- 1) Polymer manifold complete with sealing gasket
- 2) Brass end fitting
- 3) Air vent
- 4) Temperature gauge with pocket
- 5) Fill/drain cock
- 6) Closure plate
- 7) Pair of stainless steel brackets
- 8) Stainless steel rods including screws and bolts for seal and clamping

Package content

The package contains:

- modules for flow and return manifold
- 8 stainless steel rods including screws and bolts for clamping seal
- end fitting and closure plates with corresponding insulation
- 2 automatic air vents
- 2 fill/drain cocks
- 2 temperature gauges with pockets
- pair of stainless steel brackets with corresponding wall anchors for wall fixing
- assembly instructions
- set of labels for direction of flow and circuit identification

Maintenance

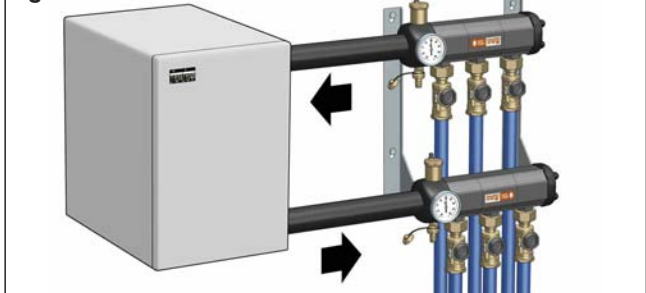


**DO NOT USE CHEMICALS
TO CLEAN THE MANIFOLD**

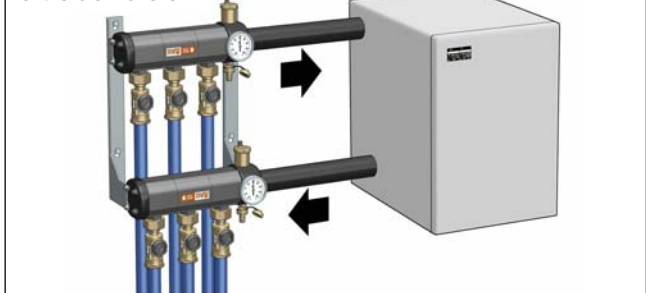
PRE-ASSEMBLED MANIFOLD

The pre-assembled manifold is supplied in the right-side version but can be fitted with the main connections on the left side depending on the heat pump position compared to the probes.

right-side version

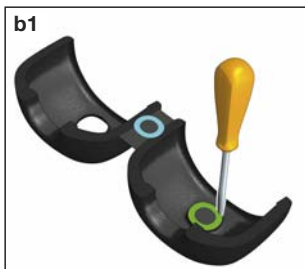
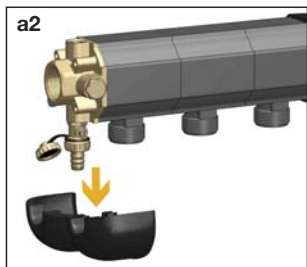
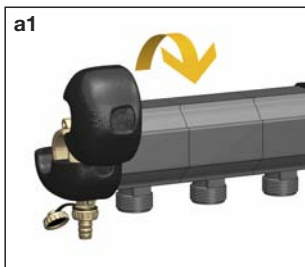


left-side version



Right-side version installation

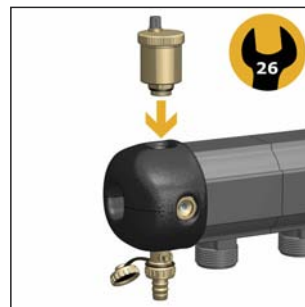
- 1) Install the temperature gauge and the air vent. The end fitting is supplied with only the fill/drain cock already mounted. Unfasten the insulation by means of the tear-off closure (a1) and make a hole through the embossed signs on the inner side (b1).



- 2) Unscrew the cap from the front connection and screw down the pocket for the temperature gauge, tightening it to the end stop.

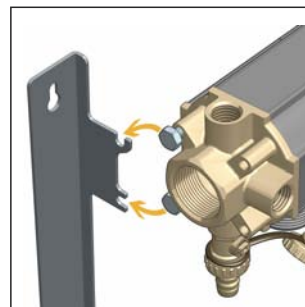
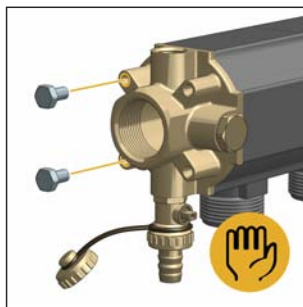


- 3) Close the insulation and fit the air vent in the upper connection.

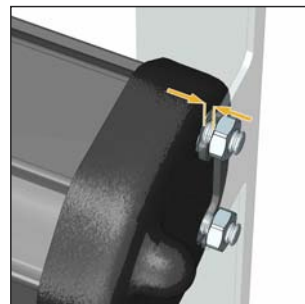
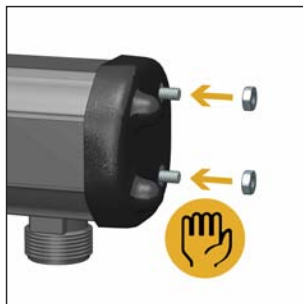


Mounting brackets - manifold

- 1) Hand thread the furnished screws several turns into the rear threads on the end fitting: do not tighten them to the end stop since they are the anchor point between the manifold and the brackets.



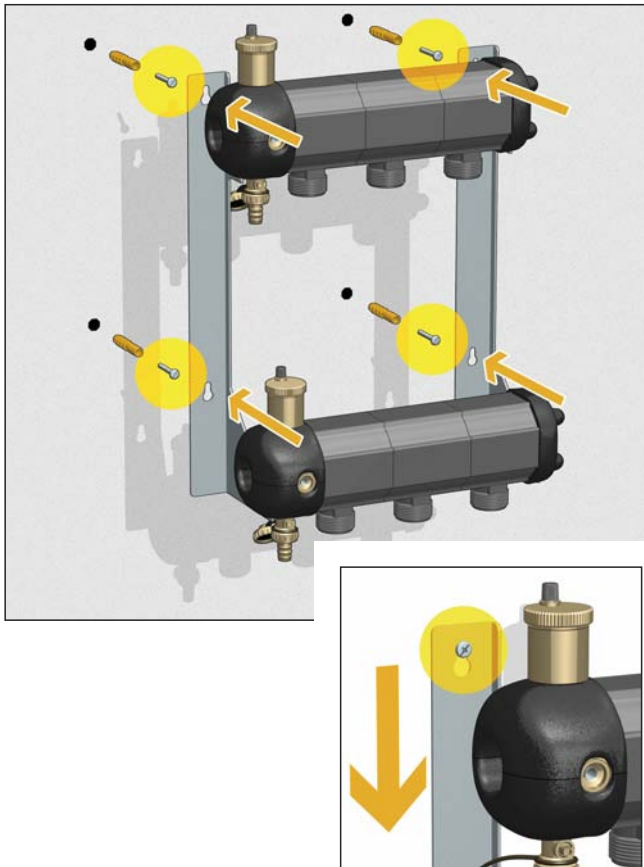
- 2) Thread the furnished nuts onto the steel bars extending from the end cap. Do not tighten them to the end stop since they are used as locks to connect the manifold to the brackets.



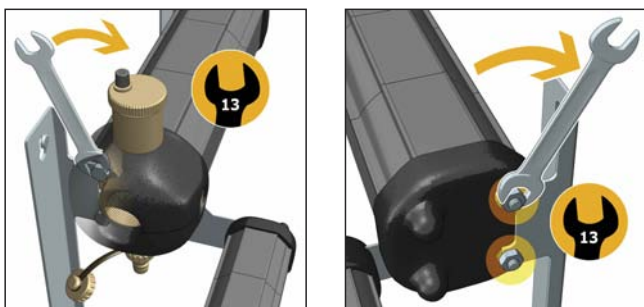
- 3) Connect the manifolds to the brackets using the quick coupling, before mounting the brackets on the wall. If necessary the manifolds can be connected without the insulation inserted on the end fitting, so that the screws for connecting the manifold to the brackets remain visible.



- 4) Position the manifold and mark the wall anchor holes on the wall. Install the wall anchors and attach the brackets to the wall using the mounting slots. If more convenient, the brackets can be installed on the wall first, then connect the manifold to the brackets.



- 5) After having attached the manifold to the brackets, fully tighten the nuts on the end cap and closure plate. If necessary this operation can be carried out without the insulation inserted on the end fitting.



- 6) Determine the manifolds flow direction and attach the labels supplied with the manifold. This will help with the installation of the circuits and the respective regulating valves. The recommended flow direction is shown in the following figure:



Shut-off valves installation

- 1) Uncouple the return manifold (the one with medium flowing from the heat pump to the geothermal probes) and connect the shut-off valve. Position the seal and thread the nut fully onto the manifold outlet.



- 2) Uncouple the flow manifold (the one with medium flowing from the geothermal probes to the heat pump) and connect the regulating valves. The manifold is fitted for use with three different circuit balancing systems.

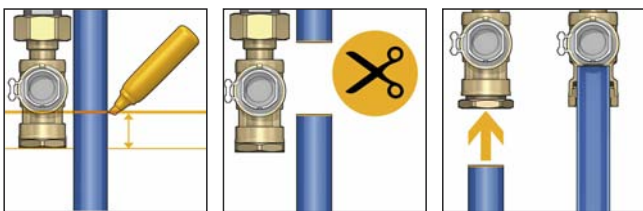


- 3) In all three situations, simply position the seal and fully tighten the nut on the manifold outlet.



Branch circuits connection

- 1) With the manifold mounted on the brackets, prepare the pipe for the outlets and cut it to size for connecting to the fitting. Both the shut-off and balancing valves are equipped with DECA fitting for attaching to the geothermal pipe.

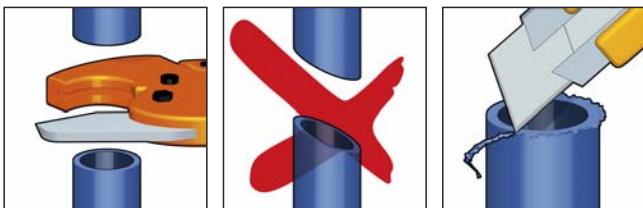


- 2) To make it easier to insert the pipe into the DECA fitting, uncouple the shut-off/balancing valve from the manifold, couple the pipe to the fitting and then reconnect the valve to the manifold, ensuring that the sealing gasket is correctly positioned.



Helpful suggestions for installation

Pipe preparation.



Cut pipe square

Do not cut at an angle

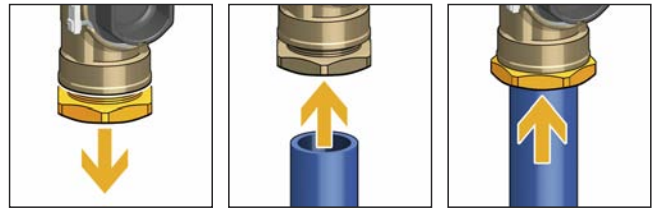
Remove burrs from the outer surface

Pipe connection

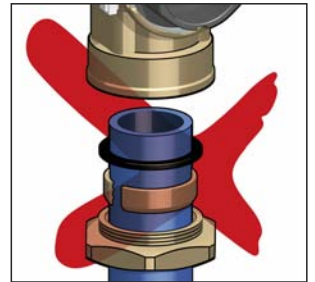
Loosen the locking nut of the DECA fitting without taking it

Insert the pipe to the end stop

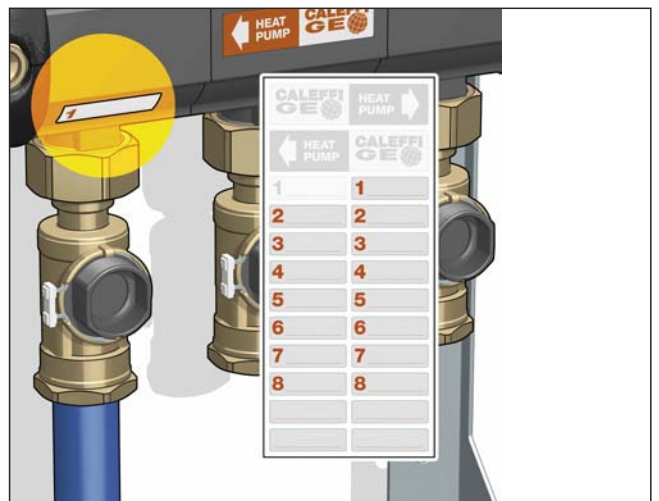
Snugly tighten the locking nut



Do not disassemble the fitting and then put the elements on the pipe.



- 3) Stick the circuit label beside the appropriate outlet. This can be very useful for system maintenance or leakages.

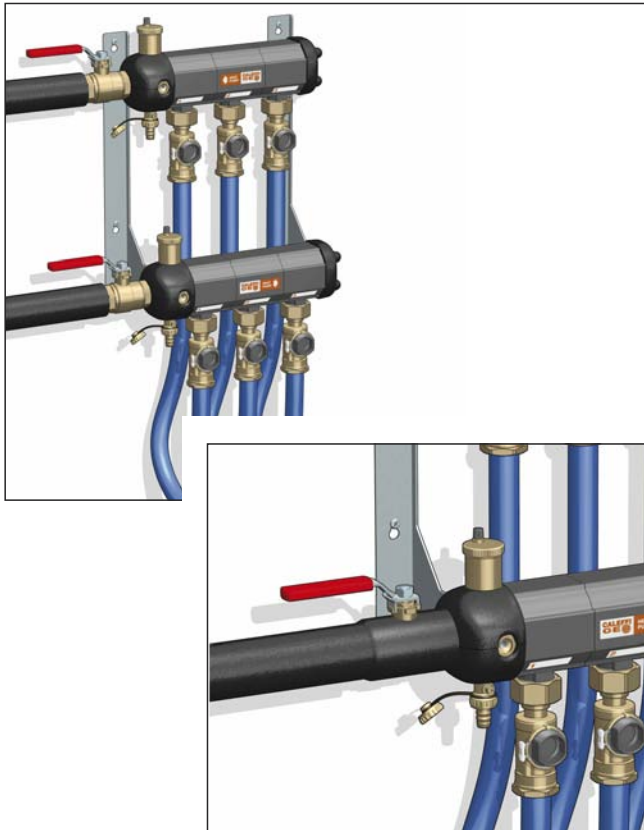


- 4) Repeat the above steps for all the pipes, paying attention to the bending of the pipes in the area under the manifolds.

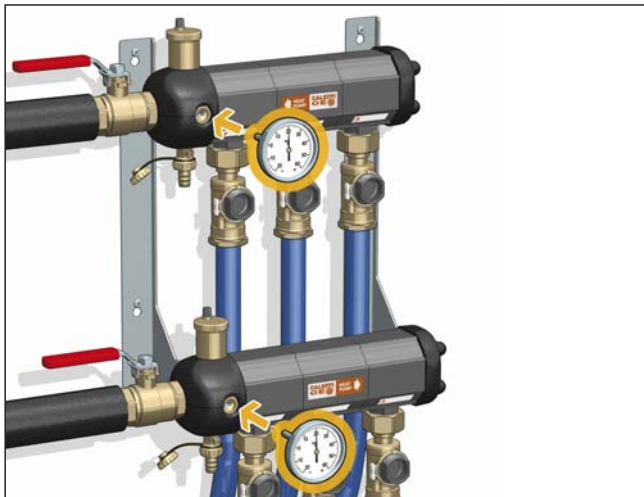


5) Connect main pipes.

It is advisable to insert a ball valve between the manifold and the main pipe so that the geothermal circuits can be excluded easily.

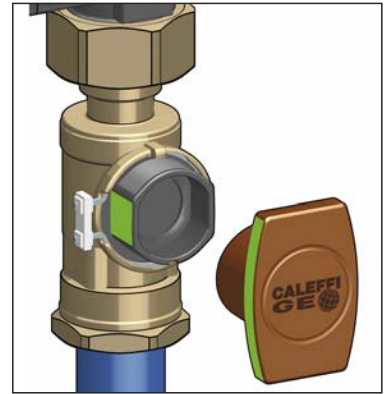


6) When the manifold is fully installed, check that the insulations are closed and insert the temperature gauges into the pockets mounted previously. Tighten the screw on the pockets to keep the temperature gauge in position.

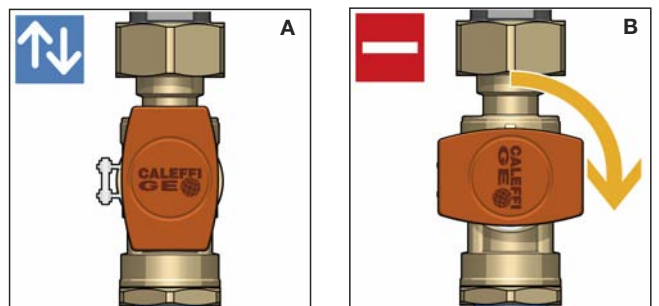


Closing and opening shut-off valves

The control lever opens and closes the ball valve. The lever must be positioned parallel with the bevelled edges of the closure cap, aligned with the slots so as to correctly guide the cap.

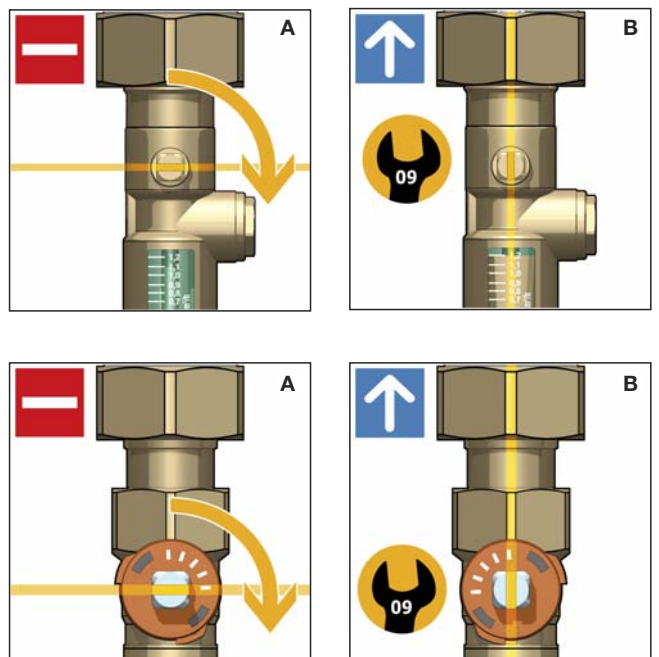


When the control lever is in the vertical position, the ball is open and the medium is flowing (A). When the lever is in the horizontal position the ball is closed: the seats ensure a tight seal and impede the flow of medium (B).



Closing and opening regulating valves

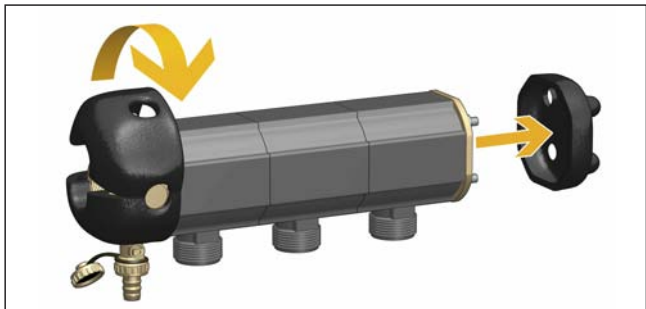
On the **float flow meter (113 series)** and **balancing valve (112 series)** there is a slot for the complete opening or closing of the valve. A slot on the obturator stem indicates the status of the valve. When the control stem is turned clockwise 90° and the slot is perpendicular to the valve axis, this indicates that the valve is fully closed (A); when the stem is turned 90° anti-clockwise to the end stop and the slot is parallel with the valve axis, this indicates that the valve is fully open (B).



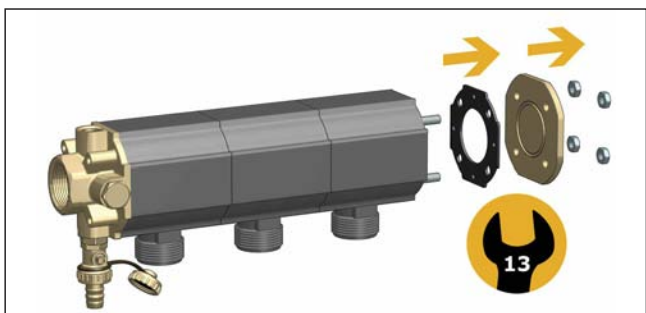
Left-side version installation

The standard right-side version of the manifold can be installed in the left-side version by proceeding as follows:

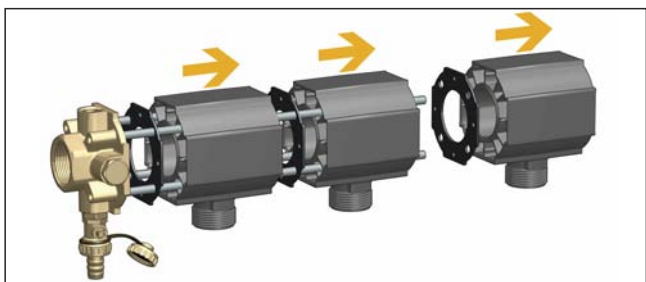
- 1) Remove the insulation from the manifold.



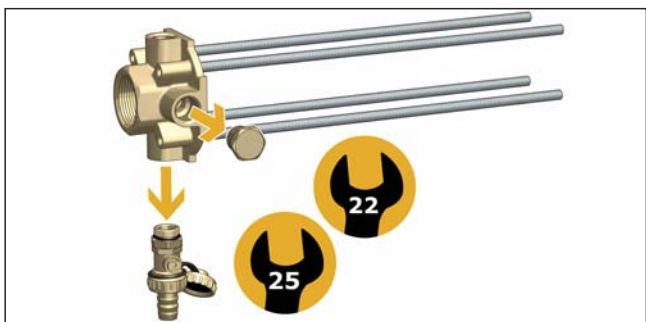
- 2) Undo the four nuts and take out the closure plate and the seal.



- 3) Extract the modules from the threaded bars.



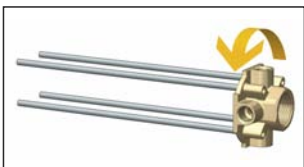
- 4) Undo the drain and the closure cap.



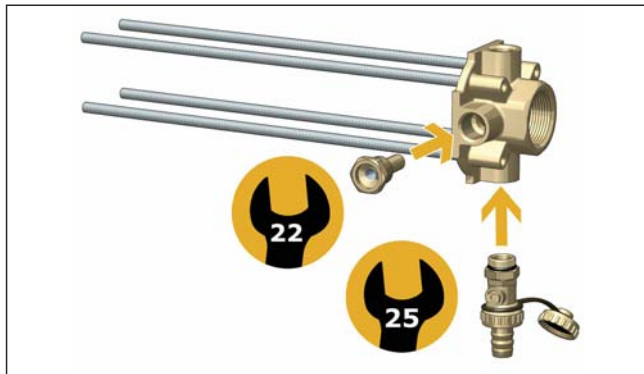
- 5) Turn the end fitting with steel rods upside down 180°.



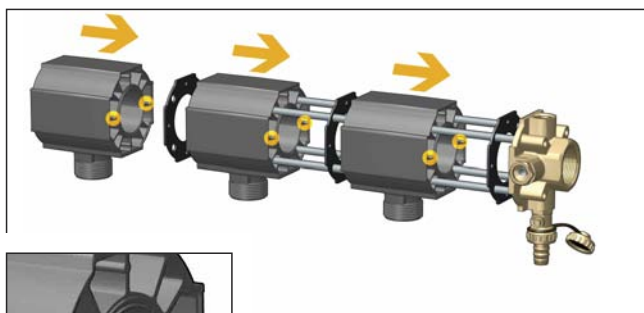
- 6) Rotate the end fitting 180° lengthwise so that the front connection is positioned as shown in the following figure.



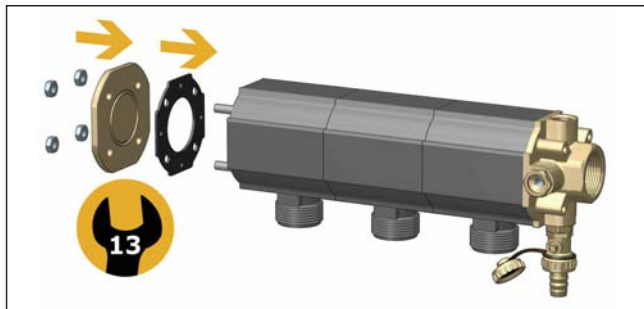
- 7) Install the drain fully into the lower connection and the pocket for the temperature gauge into the front connection.



- 8) Reassemble the manifold by alternately inserting a seal and a module, using the studs as a reference: the studs on each module should be aligned with the end cap.



- 9) After having inserted the same number of modules to match the number of outlets, assemble the manifold with seal, closure plate with grooves facing the inside, and the tightening nuts.



- 10) To tighten the nuts, follow the adjustment diagram shown opposite with the following procedure:
 - tighten with torque wrench to 5 N·m.
 - retighten with torque wrench to 5 N·m.



NOTE: With a higher number of outlets it may be necessary to repeat the tightening sequence several times.

To mount the manifold on the brackets follow the instructions under "Mounting brackets – manifold".

MODULAR MANIFOLD

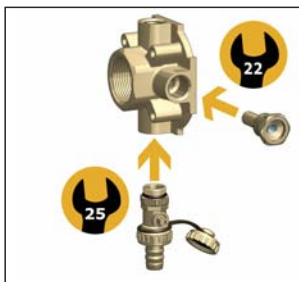
The distribution manifold has been designed so that it is easy to mount on a bench.

Since the manifold is reversible, it can be mounted with the main connections on the right or left depending on the heat pump position.

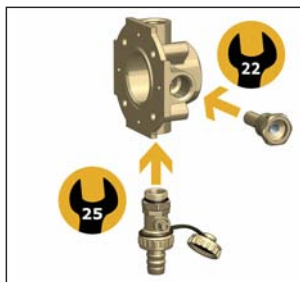
The following instructions refer to the manifold with right-side connections, although it is also possible to mount the left-side version following the same procedure.

- 1) Fully tighten the drain cock on the lower thread of the end cap and the pocket for the temperature gauge on the front thread.

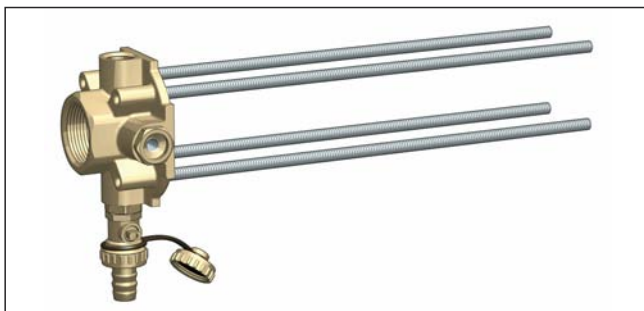
right-side version



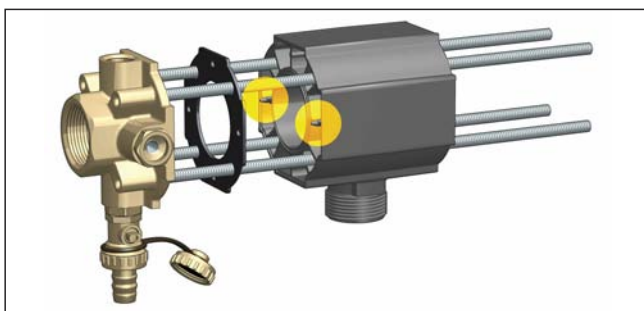
left-side version



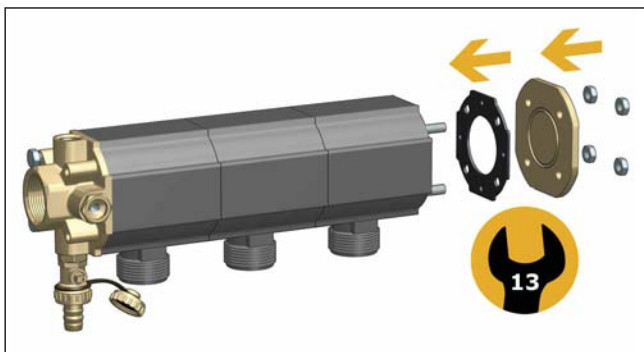
- 2) Tighten the steel rods to the end stop.



- 3) Insert a seal and a manifold body on the rods, using the studs as a reference: the studs on each module should be aligned with the end cap.



- 4) After having inserted the same number of modules to match the number of outlets, assemble the manifold with seal, closure plate with grooves facing the inside, and the tightening nuts.

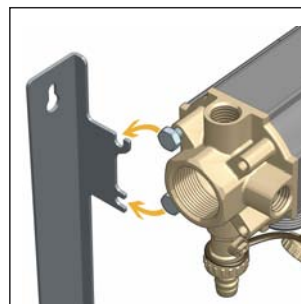
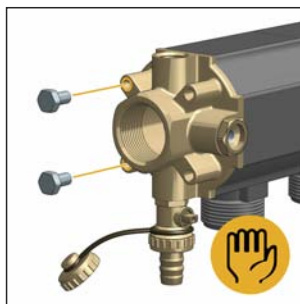


- 5) To tighten the nuts follow the adjustment diagram shown opposite with the following procedure:
 - tighten with torque wrench to 5 N·m.
 - retighten with torque wrench to 5 N·m.

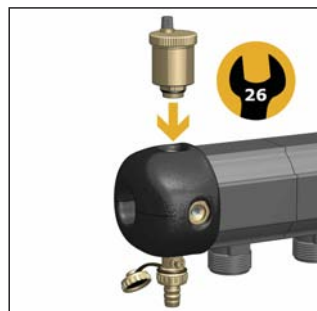
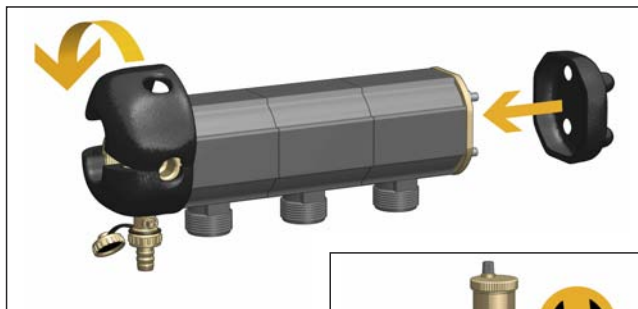


NOTE: With a higher number of outlets it may be necessary to repeat the tightening sequence several times.

- 6) Hand thread the furnished screws several turns into the rear threads: do not tighten them to the end stop since they are the anchor point between the manifold and the brackets.

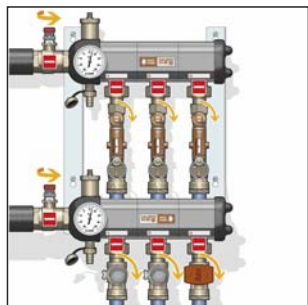
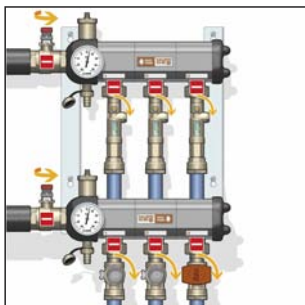
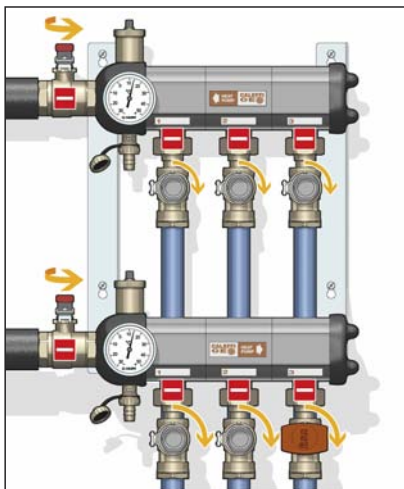


- 7) Close the insulation and fit the air vent snugly into the upper connection.

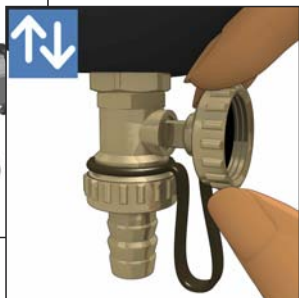
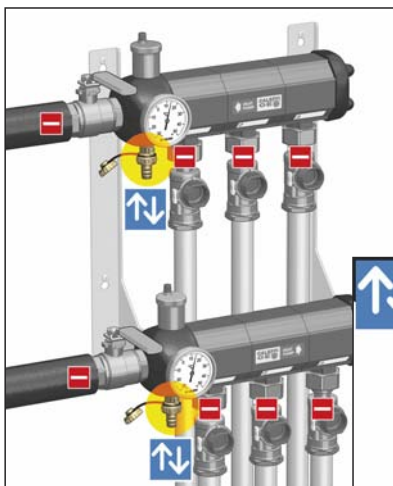


Filling the circuits

- 1) Close all the outlets to the geothermal circuits using the shut-off and regulating valves.



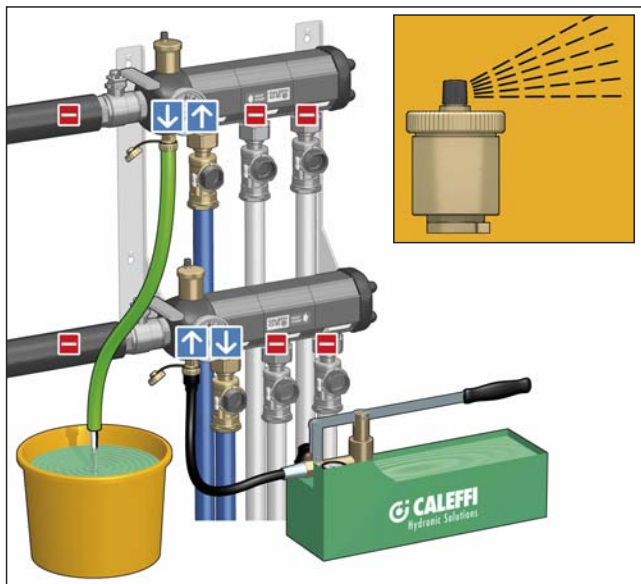
- 2) Open the fill and drain cocks using the specific cap and make sure that the shut-off valves are closed.



- 3) Connect the system testing pump to the fill cock on the flow manifold and a drain pipe to the cock on the return manifold. Direct the drain pipe into a container if the medium in the system contains glycol.



- 4) Fill the first circuit by opening the corresponding valves, making sure that all the air in the circuit is removed. Check that the cap on the air vent is open.



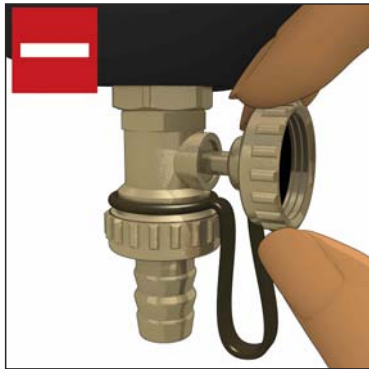
- 5) When filling is complete, close the valves in the first circuit and repeat the same sequence of operations for all the other circuits.



Hydraulic test

1) When all circuits have been filled the system seal test can be carried out.

2) Disconnect the drain pipe and close the corresponding drain cock. Leave the system testing pump connected.



3) Open all the circuit shut-off valves.



4) Bring the circuit up to pressure, to a maximum of 10 bar, for the set period of time.

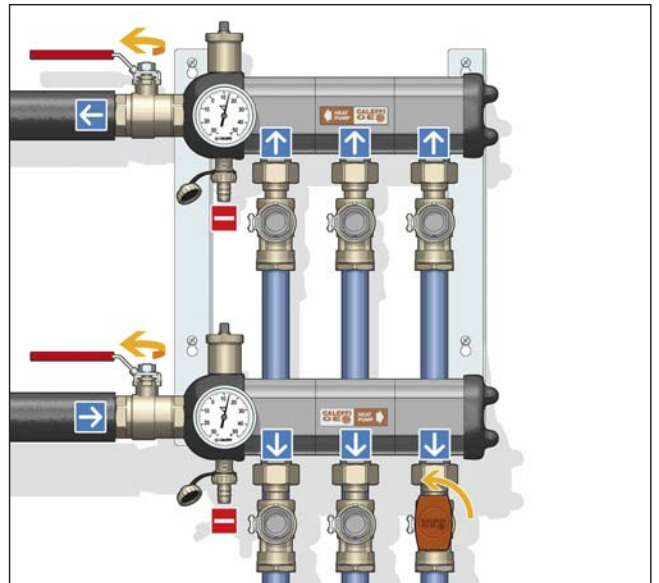


During the test, the pressure must not exceed 10 bar

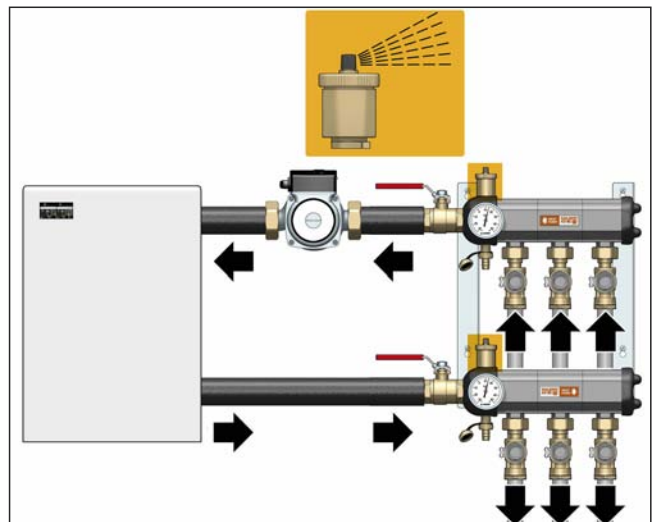


Commissioning and circuit balancing

1) Open all the circuit shut-off valves and the ball valves on the main pipes, if any.



2) Let the medium circulate so as to completely eliminate the air in the system.



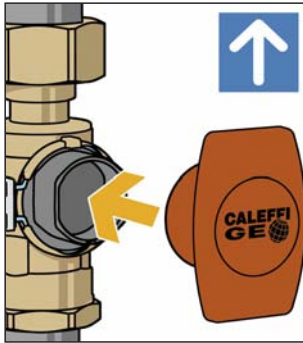
3) Balance the circuits by operating the regulating valves or shut-off valves based on the configuration of the manifold.

Shut-off valve fitted for flow rate measuring sensor with Vortex effect – 111 series

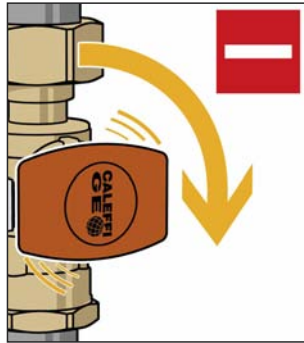
Correct installation of the sensor

The sensor is positioned in place of the end cap of the shut-off valve on the flow manifold when the valve is in the closed position. To swap the cap with the sensor you need to:

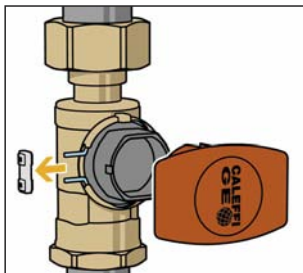
- 1)** Turn the control knob to the open position.



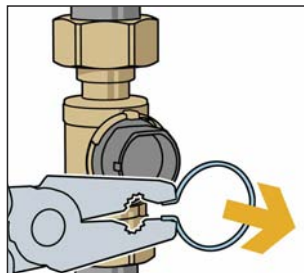
- 2)** Close the valve.



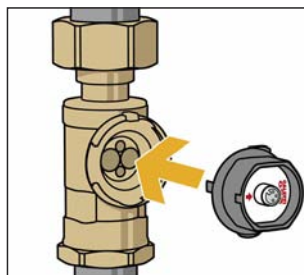
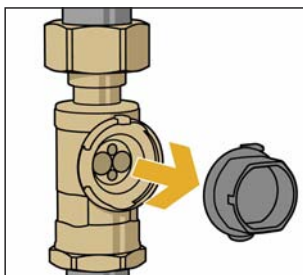
- 3)** Remove the knob and the ring stop.



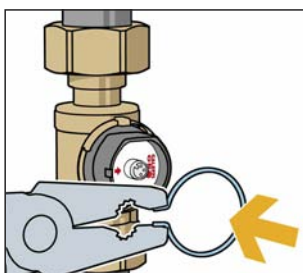
- 4)** Remove the seal ring.



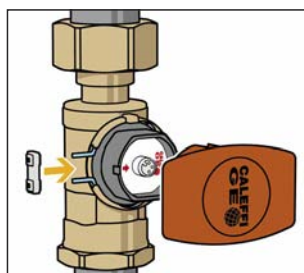
- 5)** Take out the cap and insert the measuring sensor, making sure that it is correctly positioned by means of the holder tabs. The tabs, when seated, must slide underneath the sealing profile when the sensor rotates.



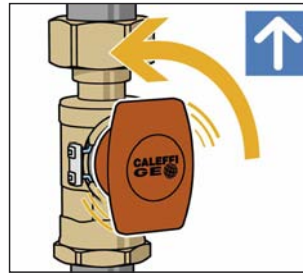
- 7)** Insert the measuring sensor and retain it with the seal ring.



- 8)** Insert the spacer so as to ensure the correct position of the ring and turn the control knob to the closed position.

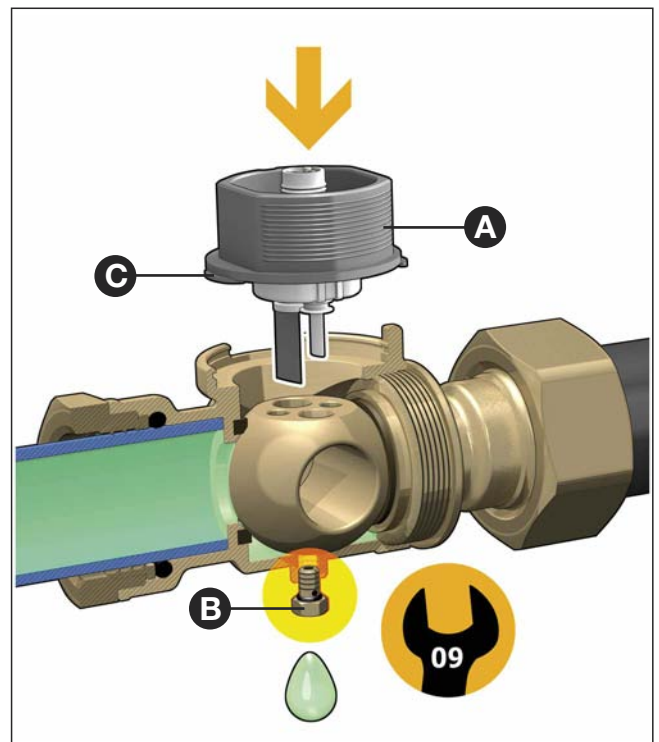


- 9)** Open the ball using the specific knob. These operations must also be repeated carefully when replacing the sensor with the closure cap after the balancing operations are complete. For balancing remove the knob and insert the plug of the flow rate meter.



In the case of horizontal installations, before inserting the sensor (A) drain the liquid contained in the ball using the rear cock (B). The presence of liquid may impede the correct positioning of the sensor in the valve body.

Ensure that the sensor is correctly inserted without exerting force on the lower tabs (C).



Flow rate regulation is performed by using the special knob to control the shut-off valve on the return manifold in correspondence with the same circuit, until the instrument indicates the design setting. This operation must be repeated on the following branches to obtain the desired flow rate.



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

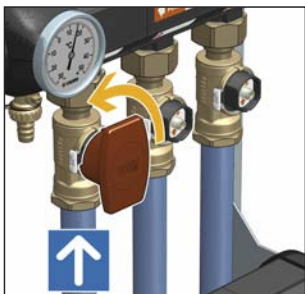
- 10)** Close the valve using the specific knob and take out the sensor by removing the ring stop and the seal ring.



- 11)** Fit the cap back in and secure it with the seal ring and the stop.



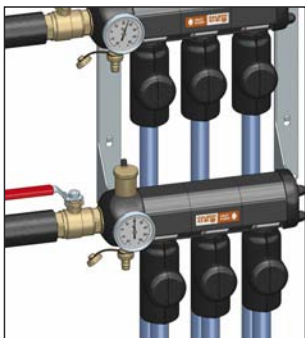
- 12)** Reopen the valve with the knob.



Repeat the operations for all the circuits.

The sensors, the electronic meter and the control lever are only used for start-up. The installer requires a single kit to operate all systems of this type: this notably reduces costs and prevents needless system head loss caused by the presence of an obstacle in the flow.

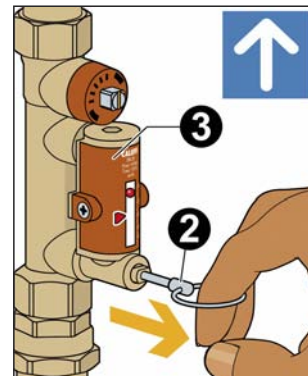
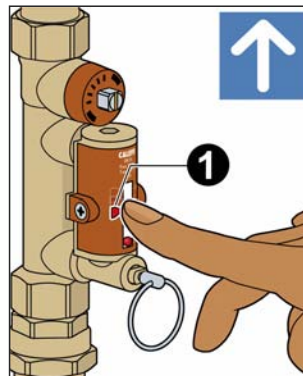
- 13)** After balancing the system insert the insulation and ensure that it is correctly closed.



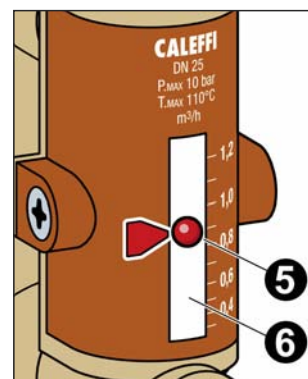
Balancing valve – 112 series

Flow rate regulation is carried out as follows:

- 1)** With the aid of the indicator (1), mark the reference flow rate on 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.

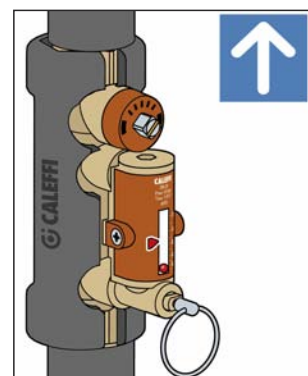


- 3)** Keeping the obturator open, use a 9 mm fixed hex spanner on the valve's control stem (4) to regulate the flow rate. The flow rate is indicated by a metal ball (5) running inside a transparent guide (6) along a graduated scale in m^3/min .



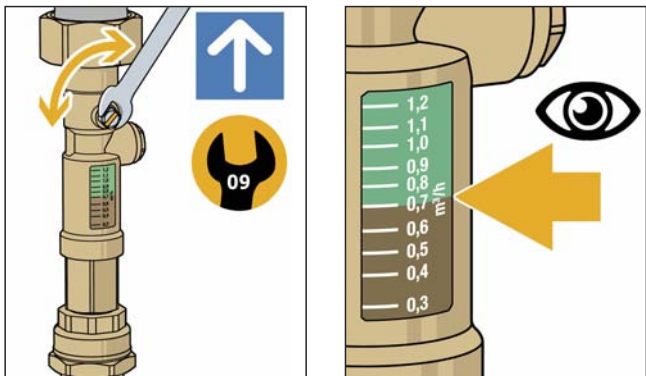
- 4)** After completing the balancing, release the ring (2) of the flow meter obturator which, thanks to an internal spring, will automatically go back into the closed position.

- 5)** After balancing the system insert the insulation and ensure that it is correctly closed.



Float flow meter – 113 series

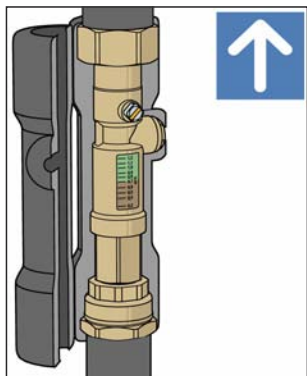
- 1) Adjust the flow rate by using a 9 mm fixed hex spanner on the ball valve.
- 2) The flow rate can be read on the graduated scale in correspondence with the upper edge of the float.



- 3) Carry out the balancing operations on all circuits.

To obtain 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 correction factor of:
 -0.9 for concentrations of 20-30%
 -0.8 for concentrations of 40-50%.

- 4) After balancing the system insert the insulation and ensure that it is correctly closed.



Installation in external pocket

The manifold, if coupled with the 111 series shut-off valve or 112 series balancing valve, can also be installed in external pocket in the horizontal position.

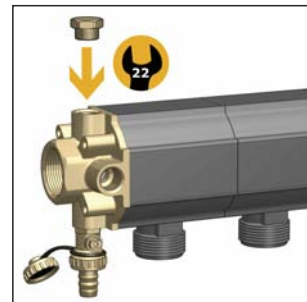
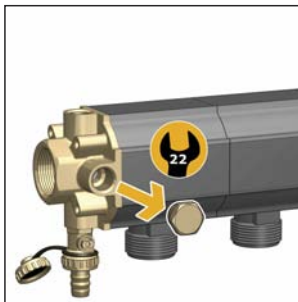


When the manifold is coupled with the 113 series flow meter, horizontal installation is not possible due to the gravity operation of the flow meter.

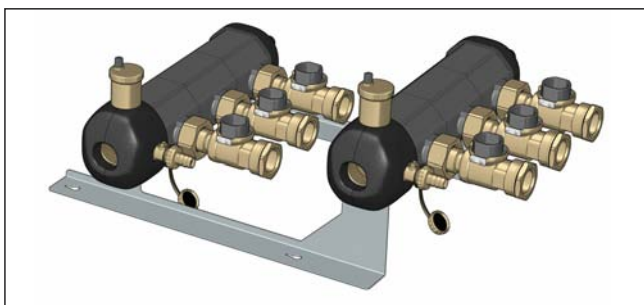


For horizontal installation, simply install the air vent in the central position.

- 1) Take the cap out of the central connection of the end cap.
- 2) Fully insert the cap into the upper connection.



- 3) Close the insulation, making holes where necessary.
- 4) Fully install the air vent in the central connection.



Accessories



111

Ball shut-off valve fitted for integrated flow rate measuring sensor. Brass body. Polymer top cap. Female connections with captive nut. Complete with fitting for polyethylene pipe. Max. working pressure: 6 bar. Max. system test pressure: 10 bar. Working temperature range: -10–60°C. Ambient temperature range: -20–60°C. Medium: water, glycol solutions, saline solutions. Max. percentage of glycol: 50%. Connection to manifold: 42 p.2,5 TR.

Patent application No. MI2010A000476.

Code	Connection
111620	Ø 25
111630	Ø 32
111640	Ø 40



111

Insulation for shut-off valves. Material: closed cell expanded PE-X. Thickness: 10 mm. Density: int. part 30 kg/m³, ext. part 80 kg/m³. Thermal conductivity (DIN 52612): at 0°C: 0,038 W/(m·K) at 40°C: 0,045 W/(m·K). Coefficient of resistance to steam (DIN 52615): > 1.300. Working temperature range: 0–100°C. Reaction to fire (DIN 4102): class B2.

Code	Application
111001	Ø 25 - Ø 32
111003	Ø 40



112

Balancing valve with flow meter. Direct reading of flow rate. Ball valve for flow rate adjustment. Graduated scale flow meter with magnetic movement flow rate indicator. Brass valve body and flow meter. Female connections with captive nut. Complete with 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. Max. percentage of glycol: 50%. Accuracy: ±10%. Connection to manifold: 42 p.2,5 TR.

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



112

Insulation for balancing valves. Material: closed cell expanded PE-X. Thickness: 10 mm. Density: int. part 30 kg/m³, ext. part 80 kg/m³. Thermal conductivity (DIN 52612): at 0°C: 0,038 W/(m·K) at 40°C: 0,045 W/(m·K). Coefficient of resistance to steam (DIN 52615): > 1.300. Working temperature range: 0–100°C. Reaction to fire (DIN 4102): class B2.

Code	Application
112001	Ø 25 - Ø 32
112003	Ø 40



113

Float flow meter. Direct reading of flow rate. Ball valve for flow rate adjustment. Brass body. Female connections with captive nut. Complete with 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. Max. percentage of glycol: 50%. Accuracy: ±10%. Connection to manifold: 42 p.2,5 TR.

Code	Connection	Scale (m³/h)
113621	Ø 25	0,3–1,2
113631	Ø 32	0,3–1,2



113

Insulation for float flow meter. Material: closed cell expanded PE-X. Thickness: 10 mm. Density: int. part 30 kg/m³, ext. part 80 kg/m³. Thermal conductivity (DIN 52612): at 0°C: 0,038 W/(m·K) at 40°C: 0,045 W/(m·K). Coefficient of resistance to steam (DIN 52615): > 1.300. Working temperature range: 0–100°C. Reaction to fire (DIN 4102): class B2.

Code	Application
113001	Ø 25 - Ø 32



130

Flow rate electronic measuring station for connecting sensor with Vortex effect. Complete with:

- box;
- power supply;
- control lever;
- measuring sensor with Vortex effect;
- connecting cable;
- sensor seal ring;

9 V-NiMH rechargeable battery.

Complete with power supply for battery charger.

Flow rate measurement scale: l/h - l/min - GPM.

Flow rate: 300–1400 l/h.

Accuracy of flow rate reading with Vortex sensor: ±10%.

Protection class: IP 44.

Code
130010



111

Integrated flow rate measuring sensor with Vortex effect. Accuracy of flow rate reading: ±10%.

Code
111010



111

Control lever for shut-off valves. Polymer body.

Code
111002

115

Instrument and accessories holder for heat pumps complete with steel anchoring base.

Connections: 1 1/4" F.
Max. working pressure: 2,5 bar.
Working temperature range: -20–90°C (temperature gauges 50°C).
Ambient temperature range: -10–55°C.
Medium: water, glycol solutions, saline solutions.
Max. percentage of glycol: 50%.
A saline solution can be used as the medium, changing the provided pressure gauge with the stainless steel version, code 557596.



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 b x d)
115080	900 x 860 x 175