Manifolds in composite specifically designed for radiant panel systems

670 series

cert. n° 0003 ISO 9001

01126/05 GB

Function

Manifolds in composite are used to control and distribute the fluid in the circuits of floor radiant panel systems.

This particular series of manifolds, made in a specific composite material for use in air-conditioning systems, is composed of: flow manifold, with flow meters and built-in balancing valves; return manifold, with shut-off valves fitted for thermo-electric actuator; end fittings with automatic air vent valves and filler/drain cocks; ball shut-off valves; liquid crystal digital thermometers, on the flow and return manifolds.

They are supplied pre-assembled in a special box with reduced depth and height-adjustable supports to facilitate installation and plumbing connections.

Reference documents

Tech. Broch. 01042 Thermo-electric actuator

Product range

670 series	Manifolds in composite specifically designed for radiant panel systems, pre-assembled in box	Size 1”

Technical specifications

Materials:

Flow manifold

- body:	PA66GF
Flow-rate balancing valve	
- obturator:	brass EN 12164 CW614N
- flow meter body:	PSU
- spring:	stainless steel
- hydraulic seals:	EPDM
- balancing unit cover:	ABS

Return manifold

- body:	PA66GF
Shut-off valve	
- obturator:	EPDM
- obturator stem:	stainless steel
- spring:	stainless steel
- hydraulic seals:	EPDM
- control knob:	ABS

End fittings

- body:	PA66GF
- air vent valve body:	PA66GF
- filler/drain cock body:	brass EN 12165 CW617N
- air vent valve seal:	silicone rubber
- hydraulic seals:	EPDM

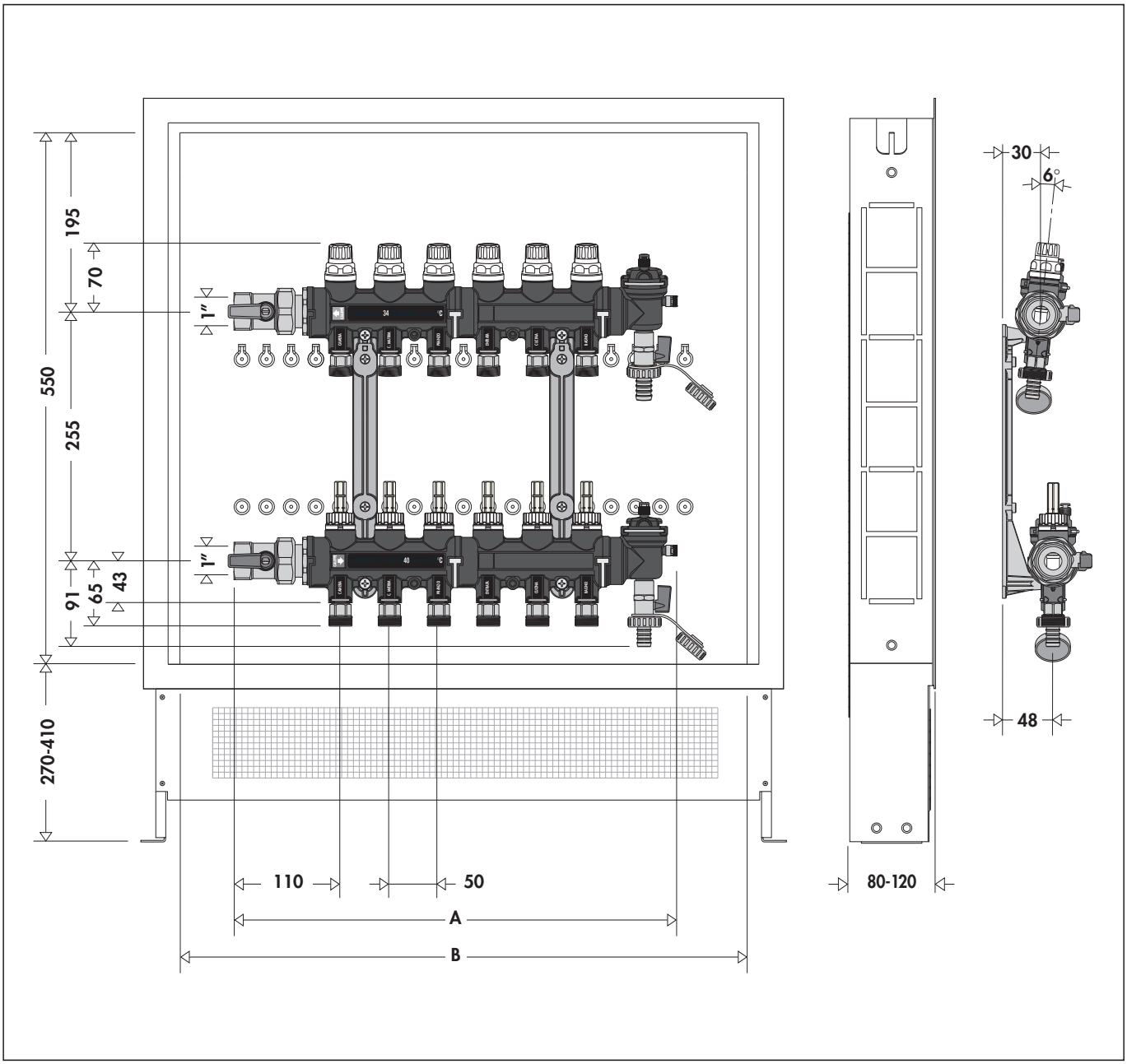
Ball shut-off valves

- valve body:	brass EN 12165 CW617N
- union seals:	EPDM
- control lever:	PA66GF

Performance

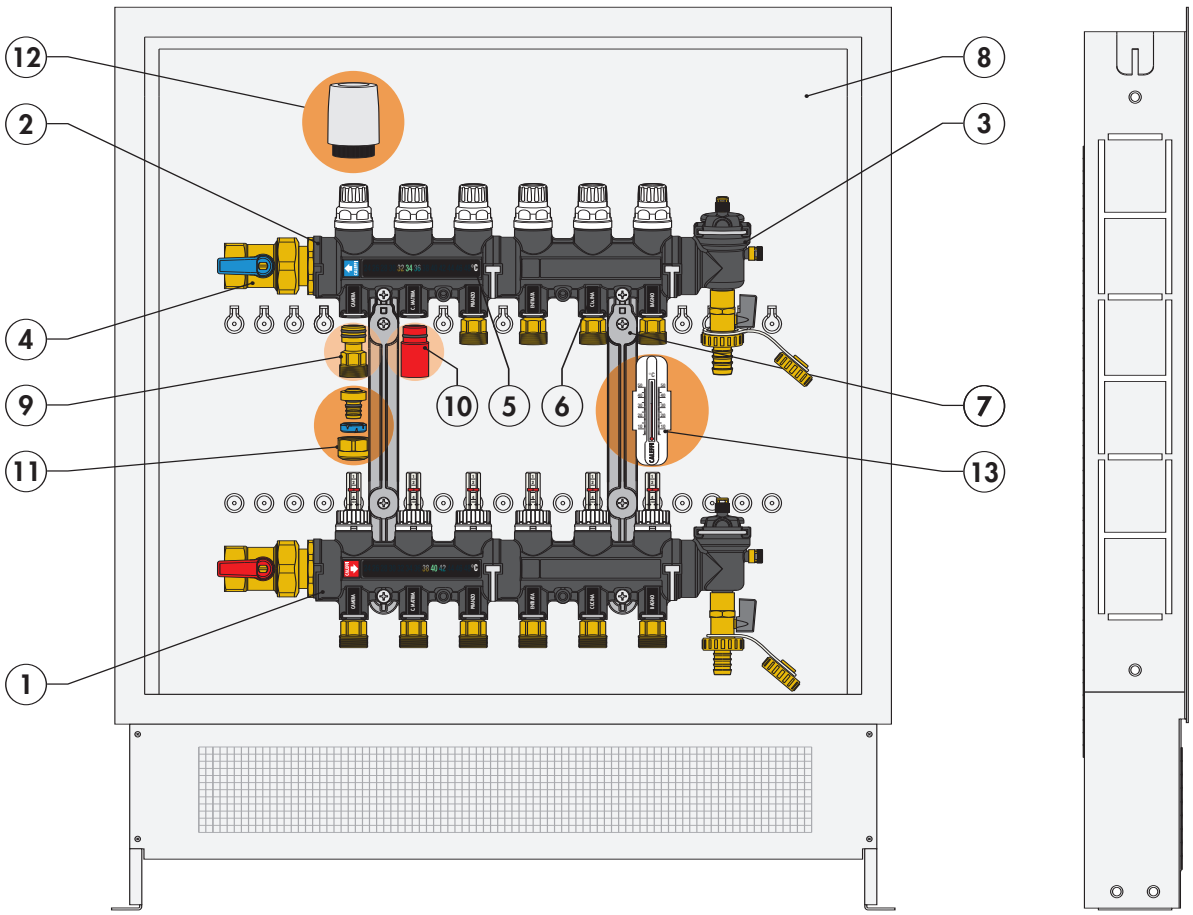
Medium:	water, glycol solutions
Max. percentage of glycol:	30%
Max. working pressure:	4 bar
Max. cold hydraulic test pressure:	6 bar
Max. air vent valve discharge pressure:	6 bar
Temperature range:	5-60°C
Flow meter scale:	1-4 l/min
Accuracy:	± 10%
Liquid crystal digital thermometer scale	24-48°C
Manifold connections	
- main:	1” F
- outlets:	3/4” x coupling with adapter code 675850

Dimensions



Code	**670**6C1	**670**6D1	**670**6E1	**670**6F1	**670**6G1	**670**6H1	**670**6I1	**670**6L1
Nr. outlets	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
A	300	350	400	450	500	550	600	650
B (Wall box width)	600	600	600	600	800	800	800	800
Weight (kg)	14,8	15,0	15,2	15,4	19,4	19,6	19,8	20,0

Characteristic components



Pre-assembled unit complete with:

1) Flow manifold with flow meters and built-in flow rate balancing valves
2) Return manifold with built-in shut-off valves fitted for thermo-electric actuator
3) End fittings with automatic air vent with hygroscopic cap, discharge valve and filler/drain cock
4) Pair of ball shut-off valves
5) Liquid crystal digital thermometers on the flow and return manifolds
6) Adhesive labels indicating the rooms
7) Pair of brackets fastening to the box
8) Box with adjustable height and depth
9) Coupling adapter with clip 675850 code
10) Template for cutting pipe 675002 code

Accessories

11) 680 series single and multi-layer plastic pipe fitting with self-adjustable diameter
12) 656 series thermo-electric actuator
13) Push-fit thermometer for panel circuit 675900 code

Construction details

Specific plastic material

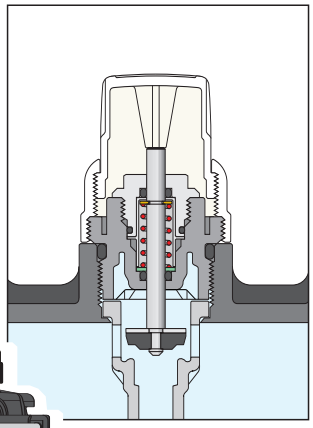
The manifolds are made with a specifically selected polymer for heating and cooling system applications. The basic characteristics for this use are:

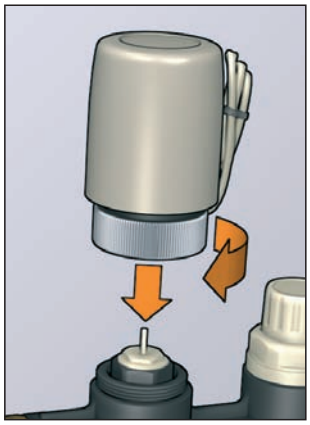
- high strain resistance while maintaining good ultimate elongation
- good resistance to crack propagation
- very low moisture absorption, for constant mechanical behaviour
- high abrasion resistance due to medium constant flow
- performance stability to temperature changes
- compatibility with the glycols and additives used in the circuits

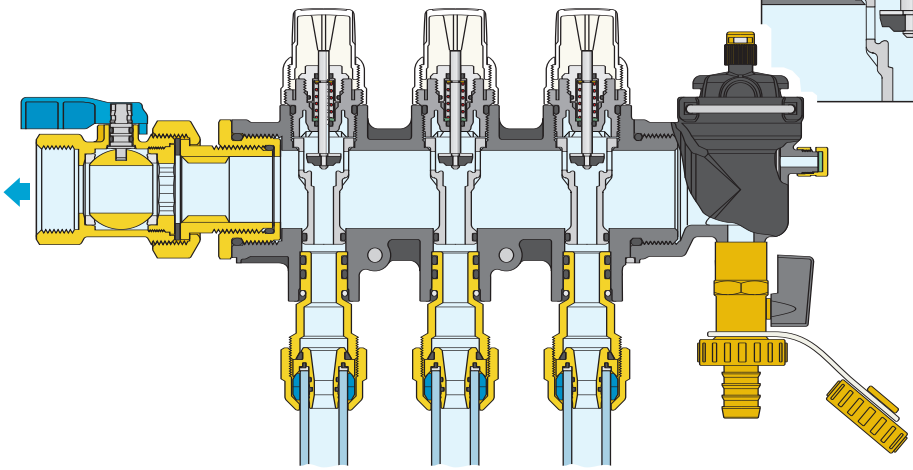
These basic material characteristics, combined with the appropriate shaping of the most highly stressed areas, enable a comparison with the metals typically used in the construction of distribution manifolds.

Return manifold

The return manifold is equipped with built-in shut-off valves. Using the shut-off valve with a manual knob, the flow rate to the single circuits can be reduced so much as to shut off the circuit completely. The valve is equipped with a stainless steel control stem in a single piece, with a double O-ring seal. The rubber obturator is specially shaped to minimize the losses of head and the noise produced by the flow of the medium, preventing the seal seat from possibly sticking.
The valves are fitted to accommodate thermo-electric actuator in order to automate their action upon receiving a signal from an ambient thermostat.

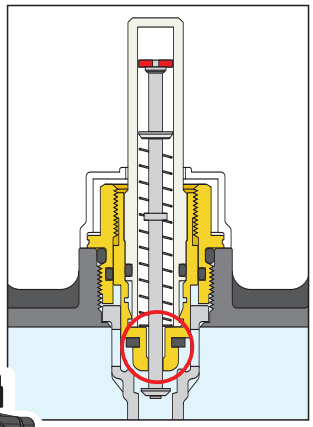


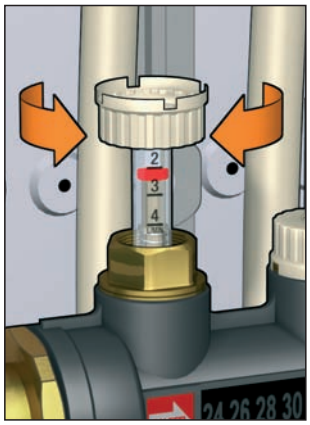


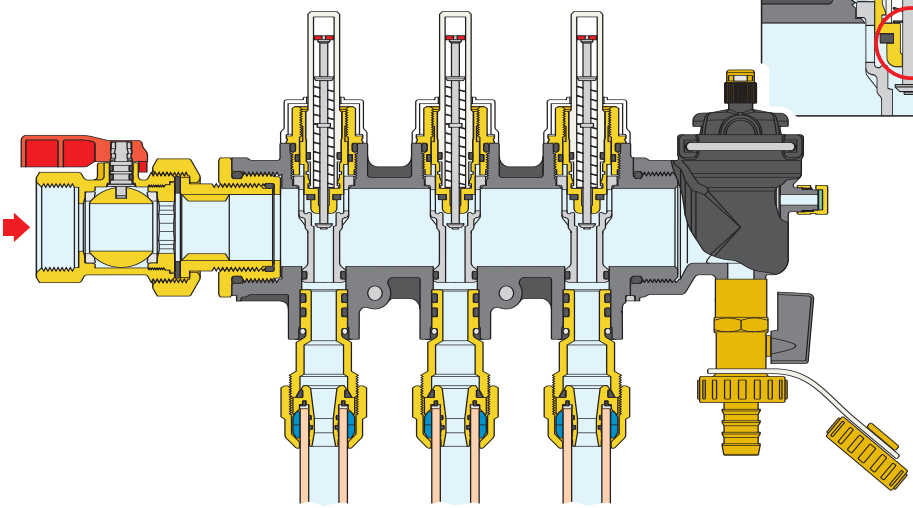


Flow manifold

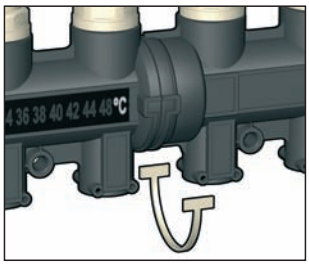
The flow manifold is equipped with flow meters and built-in flow rate balancing valves.
Using the balancing valve with the special tapered obturator, the flow rate to the single circuits can be adjusted accurately as required, with the setting being read off the single flow meter with a scale of 1-4 l/min. This simplifies and speeds up the operation of calibrating the circuit, with no need for reference graphs. After balancing, the valve can be locked in position by means of its tamper-proof cover.
This valve makes it possible to seal off the single circuit should this be necessary.



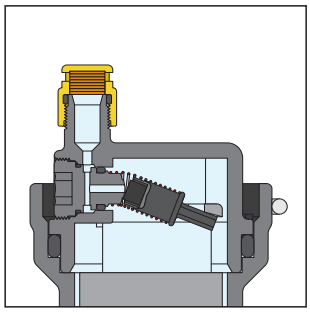


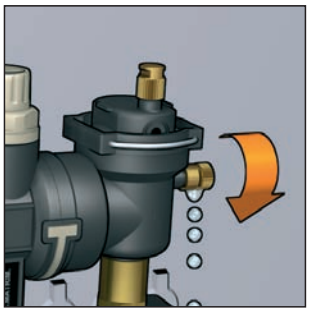


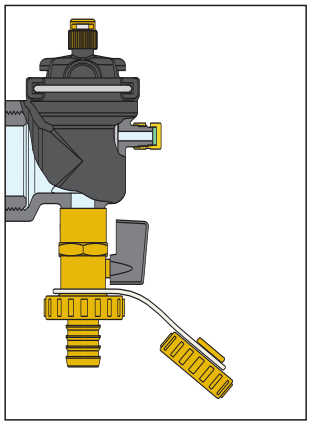
Modular manifolds
The manifolds and end fittings are modular thanks to the threaded connections with O-ring seals and lock clips preventing unscrewing. With this connection system, the operation of assembling the various components is simplified and the hydraulic seal is fully assured.

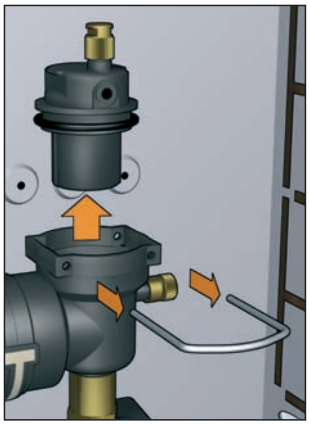


End fitting
The end fitting is equipped with an automatic air vent with hygroscopic safety cap, discharge valve and filler/drain ball cock.
The automatic air vent is equipped with a removal mechanism air with a silicone rubber obturator. The vent mechanism is connected to the valve body by a fixing clip, making any inspection and maintenance work easier.
The hygroscopic safety plug anyhow prevents water leaking to protect the installation. The manual discharge valve speeds up the operation of filling the circuit, done by using the drain/filler ball cock.



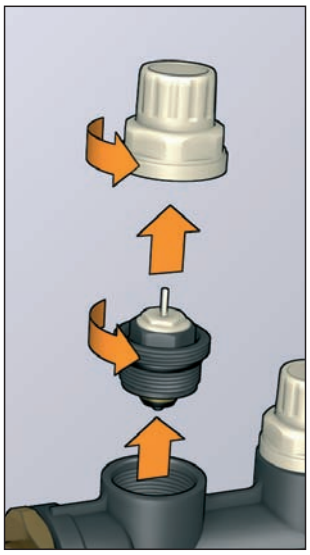


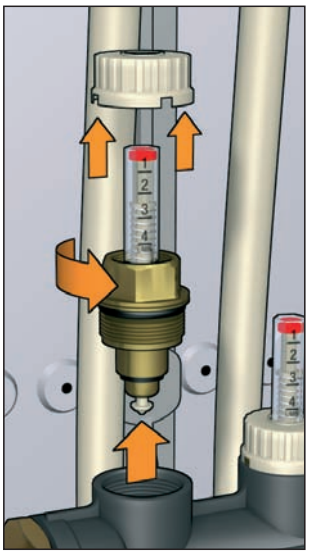




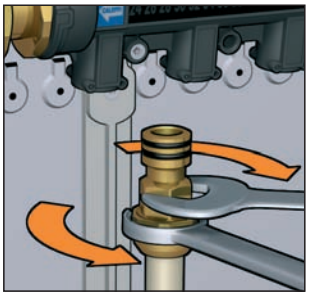
Digital thermometers
A liquid crystal digital thermometer is fitted on the flow and return manifold body, on both sides, with a temperature range of 24-48°C. The liquid crystals automatically light up green at the measured temperature, making it easy to read even when there is poor lighting. This thermometer is calibrated to display the actual temperature of the medium, which is essential to evaluate the system's thermal load and operating conditions.

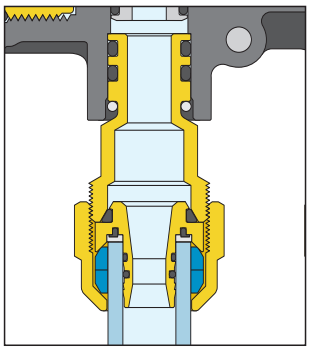
Replaceable components
The headworks of the balancing valve with flow meter and of the shut-off valve can be removed and replaced with spare parts.

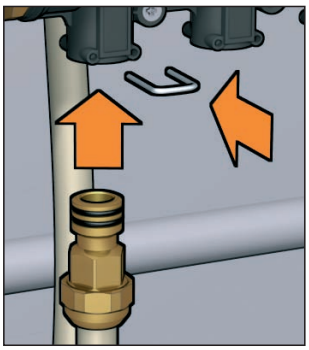




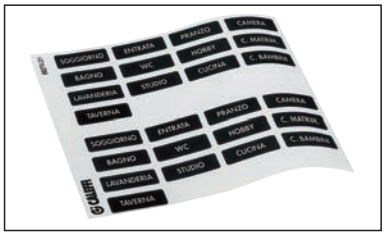
Panel circuit outlets
The outlet connections of the single panel circuits are designed to use a special coupling adapter that can be removed with a fixing clip. The brass adapter has a double O-ring seal and a hexagon on its surface. The pipe fitting is connected straight onto the threaded side. With this particular connection system, the fitting with the adapter can be tightened onto the piping outside the box and then coupled on the manifold body later, making the plumbing installation simpler and more practical.

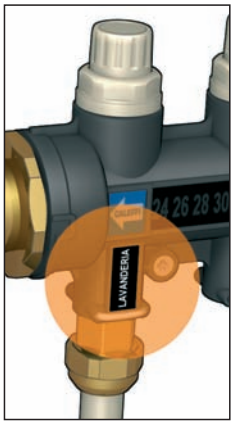




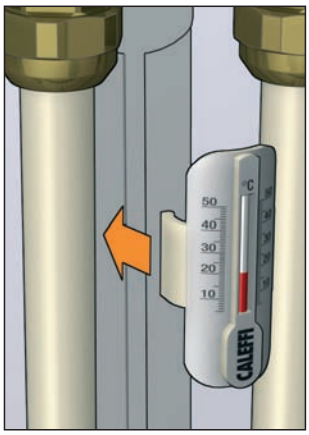


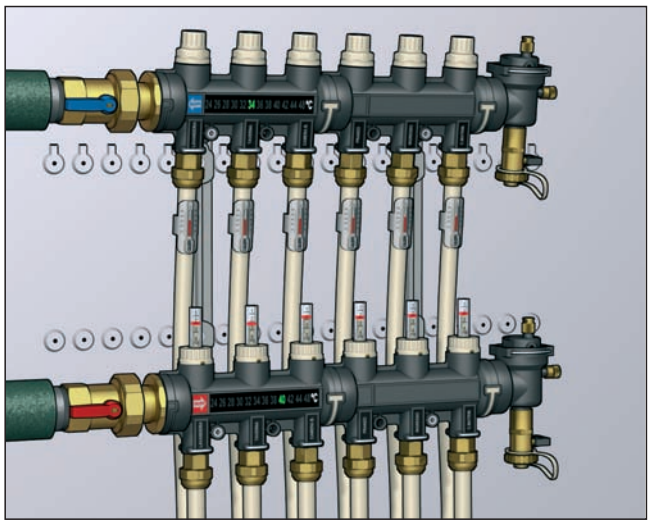
Room identification
On the manifold body, at the outlet of each panel circuit, there is a special surface for affixing an adhesive label identifying the corresponding room.



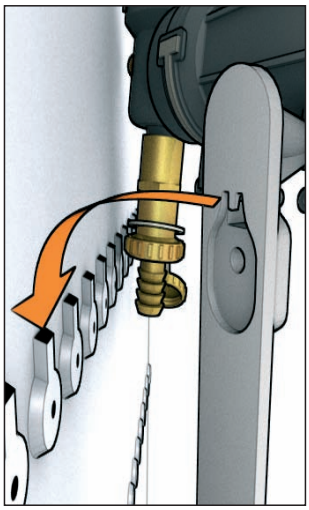


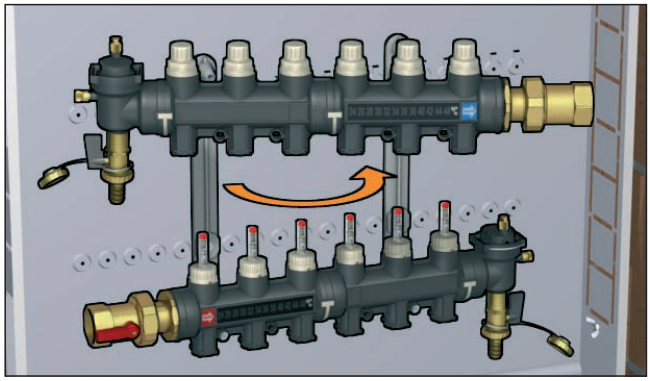
Thermometers for loop piping
As an accessory, a special spirit thermometer with a scale of 5-50°C is available, equipped with a push-fit plastic body, for the single loop piping, with an outside diameter from 15 to 18 mm. This thermometer, installed on the return line, measures the actual temperature of the medium returning from the circuit making it possible to check the state of the single panel's heat transfer accurately.



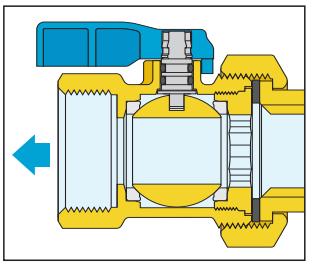


Bracketing
The manifolds have holes to secure them on brackets to allow housing them in boxes.
The manifolds are reversible, in that they can be positioned with the entry from the right or left. The return manifold, located at the top, is installed at an angle on purpose in order to make it easier for the panel circuit pipes to pass through, up to 20 mm in diameter.
The manifolds can thus be bracketed in a box just 80 mm deep, allowing for installation in thin walls.

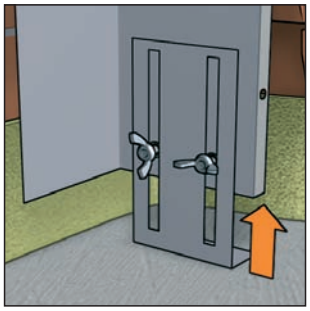


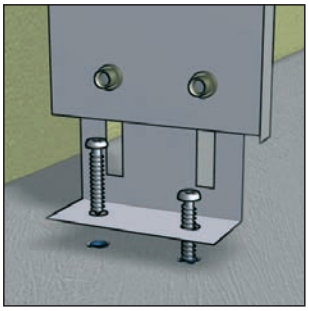


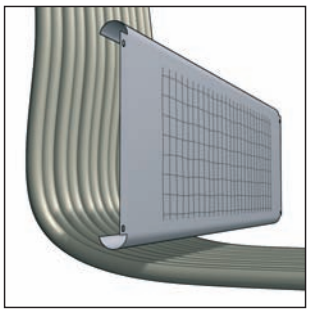
Shut-off valves
The ball shut-off valves on the flow and return of the circuits are the union-type with a flat-seat seal made of EPDM.

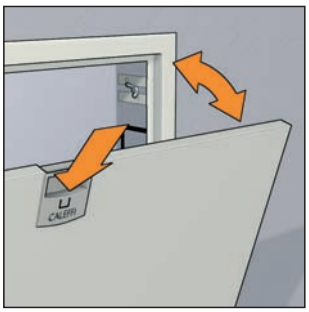


Box
The manifolds are supplied bracketed in a recess-mounting plate box with an adjustable depth from 80 to 120 mm. The box, specifically designed to be used with radiant panel systems, is equipped with floor supports that are adjustable in height from 270 to 410 mm, the height being chosen according to the thickness of the slab. With these supports, the pipe passageway is clear of obstruction; a double curtain wall then enables the plastering to be done directly and the correct fitting of frame and cover. The back wall of the box has grooves and holes to secure the manifold brackets; the side and top walls have holes for the main pipes to pass through. The cover is opened and closed using a special handle with a push-fit clamp, without using any keys or tools.

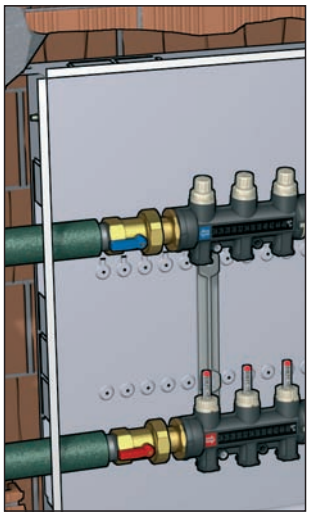


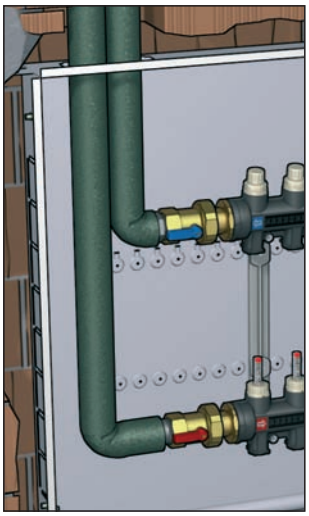






The box is also customizable for connecting the main pipes coming in from the top.

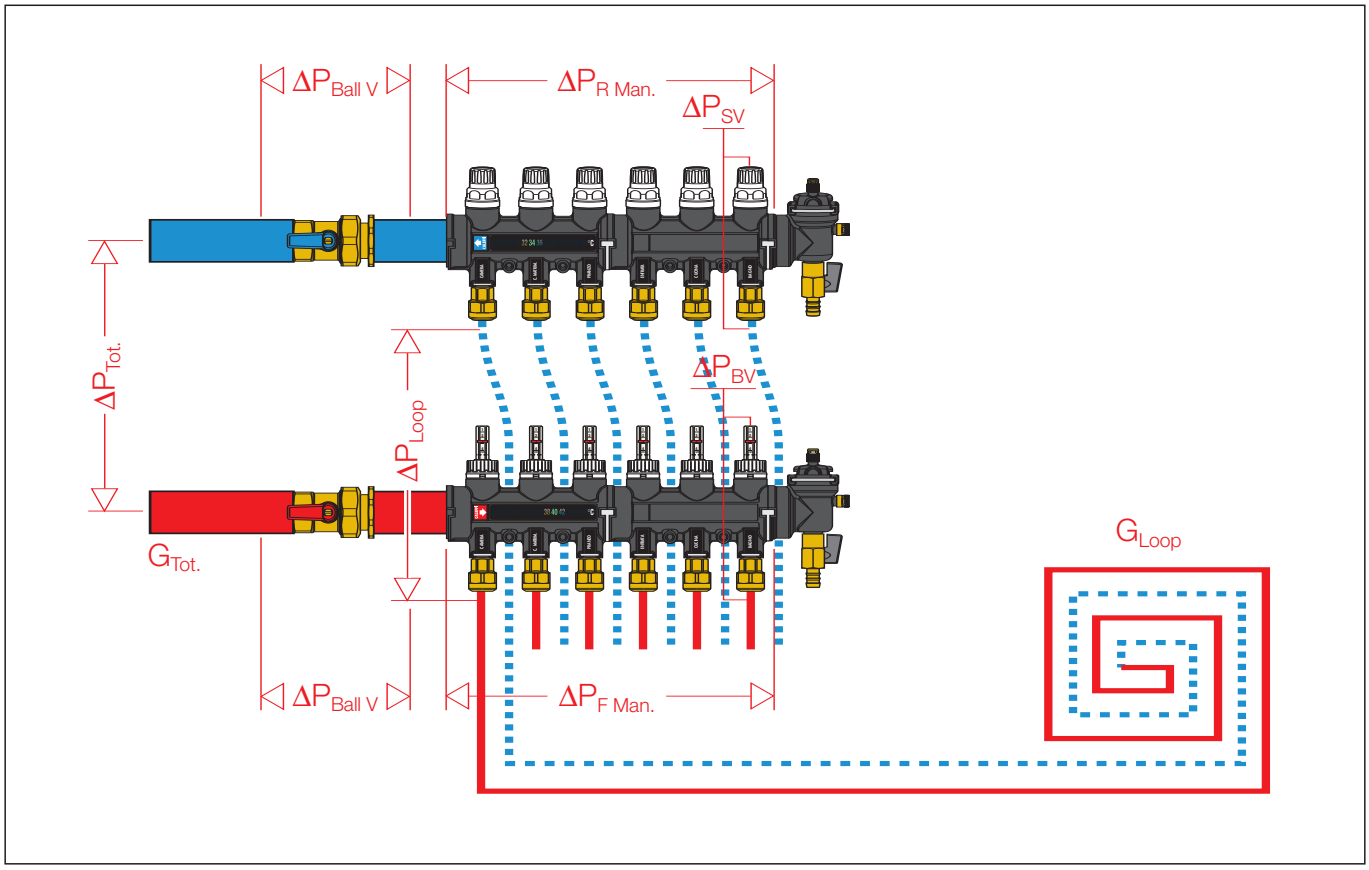


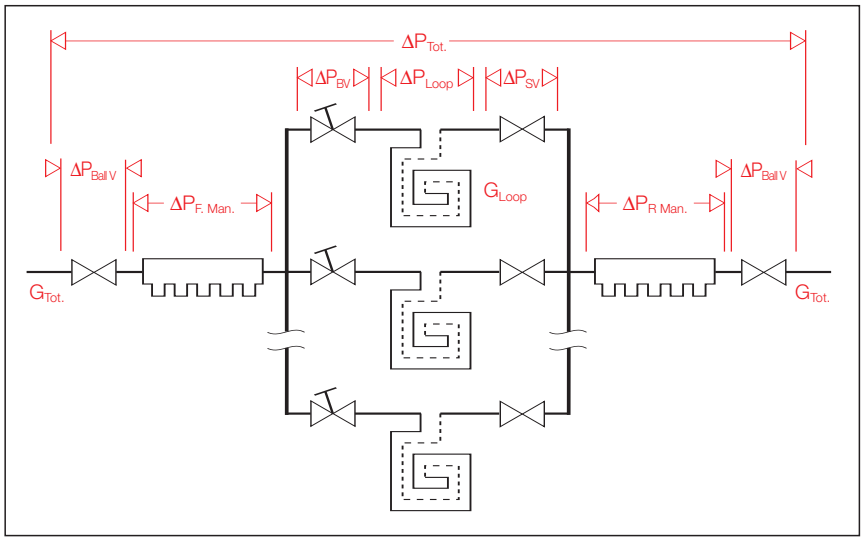


Hydraulic characteristics

In order to determine the hydraulic characteristics of the circuit, it is necessary to calculate the total loss of head suffered by the flow of medium on passing through the devices forming the manifold assembly and the radiant panel circuits.

From a hydraulic point of view, the system composed of the manifold assembly and the circuits can be represented as a set of hydraulic elements arranged in series and in parallel.





$\Delta P_{Tot.}$ = Total loss at the ends of the manifold (Flow + Return + Loop)

ΔP_{BV} = Localized loss at loop balancing valve (loop flow rate)

ΔP_{Loop} = Loop loss (loop flow rate)

ΔP_{SV} = Localized loss at panel circuit shut-off valve (loop flow rate)

$\Delta P_{F.\ Man.}$ = Distributed loss of the flow manifold (total flow rate)

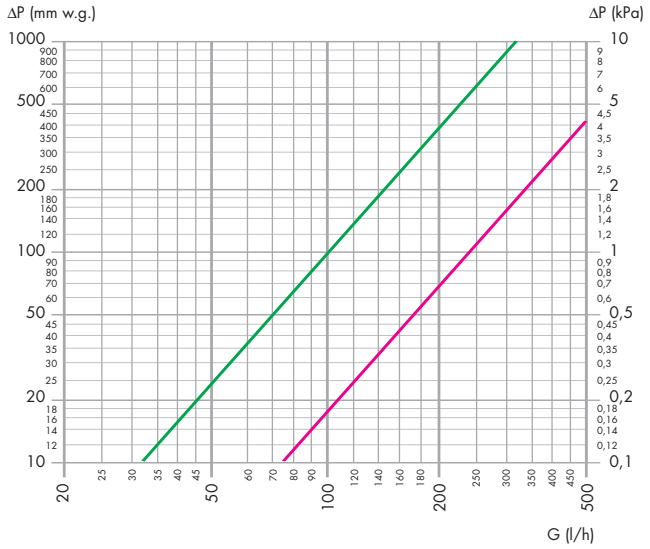
$\Delta P_{R.\ Man.}$ = Distributed loss of the return manifold (total flow rate)

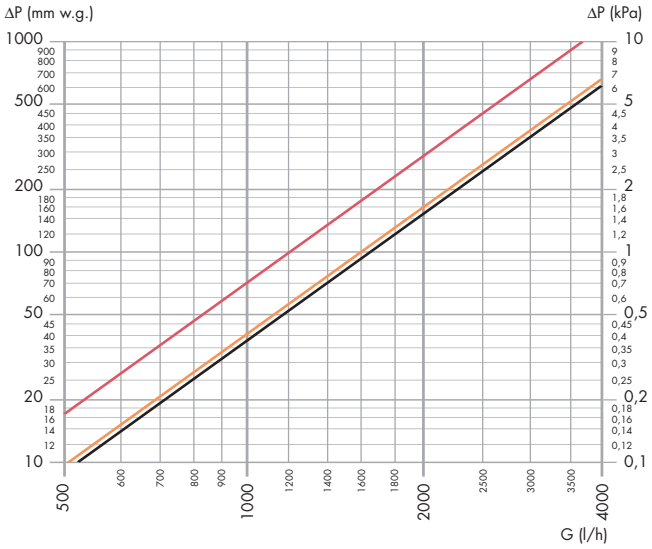
$\Delta P_{Ball\ V.}$ = Ball valve loss (total flow rate)

$$\Delta P_{Tot.} = \Delta P_{BV} + \Delta P_{Loop} + \Delta P_{SV} + \Delta P_{F\ Man.} + \Delta P_{R\ Man.} + \Delta P_{Ball\ V} \times 2 \qquad (1.1)$$

When the hydraulic characteristics of each component and the design flow rates are known, the total loss can be calculated as the sum of the partial losses of head for each specific component of the system, as indicated with the formula (1.1).

Hydraulic characteristics





	Kv	$Kv_{0,01}$
Flow rate balancing valve fully open	1,00	100
Shut-off valve	2,40	240

- Kv = flow rate in m^3/h for a loss of head of 1 bar
- $Kv_{0,01}$ = flow rate in l/h for a loss of head of 1 kPa

	Kv	$Kv_{0,01}$
Flow or return manifold 3÷6 outlets	16,0*	1600*
Flow or return manifold 7÷10 outlets	12,0*	1200*
Ball valve	16,5	1650

** Average value*

Example of calculation of total loss of head

Supposing we need to calculate the loss of head of a manifold with three outlets with the following characteristics:

Total manifold flow rate: 350 l/h

The pipes of the three loops have the following characteristics of flow rate and loss of head:

Circuit 1	Circuit 2	Circuit 3	
ΔP1 = 10 kPa	ΔP2 = 15 kPa	ΔP3 = 7 kPa	(1.2)
G1 = 120 l/h	G2 = 150 l/h	G3 = 80 l/h	

We calculate each term of the formula *(1.1)*, using the relationship:

$\Delta P = G^2/Kv_{0.01}^2$

· G = flow rate in l/h
· ΔP = loss of head in kPa (1 kPa =100 mm w.g.)
· $Kv_{0,01}$ = flow rate in l/h through the device, which corresponds to a head loss of 1 kPa

It should be stressed that the calculation of $\Delta P_{Tot.}$ must be made taking account of the circuit in which there are the greatest head losses distributed along the entire loop of the panel piping.
In the case we are examining, the relevant circuit is No. 2.

It follows that:

$\Delta P_{BV} = 150^2/100^2 = 2,25$ kPa
$\Delta P_{Loop} = 15$ kPa
$\Delta P_{SV} = 150^2/240^2 = 0,39$ kPa
$\Delta P_{F\ Man.} = 350^2/1600^2 = 0,05$ kPa
$\Delta P_{R\ Man.} = 350^2/1600^2 = 0,05$ kPa
$\Delta P_{Ball\ V} = 350^2/1650^2 = 0,04$ kPa

} Values obtained by disregarding variations due to flow rate to each branch circuit

By means of *(1.1)* adding up all the calculated terms, we have:

$\Delta P_{Tot.} = 2,25 + 15 + 0,39 + \cancel{0,05} + \cancel{0,05} + \cancel{0,04} = 17,64$ kPa

Note:
Because of the low head losses for the ball valves and the manifolds, the three terms relating to them can be neglected.
In general, the total head loss is reasonably approximate to that of the branched circuit of the panel.

Using balancing valves with flow meter

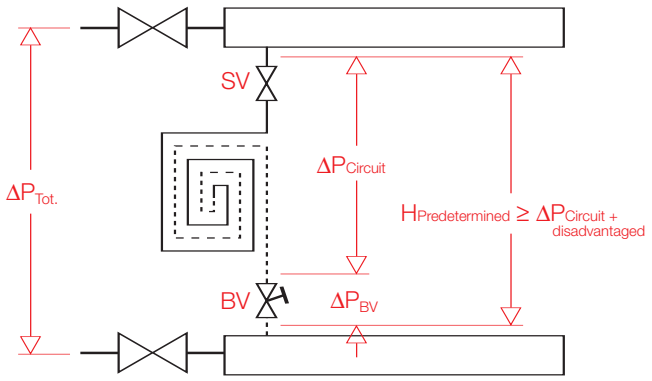
The balancing valves in the flow manifold make it possible to balance each single circuit of the panels to obtain the actual design flow rates.

Considering the following data:

- flow rate of medium that must flow through each circuit
- head loss that for this flow rate is generated in each circuit:
  $\Delta P_{Circuit} = \Delta P_{Loop} + \Delta P_{SV}$ ($\Delta P_{Shut\text{-}off\ valve}$)

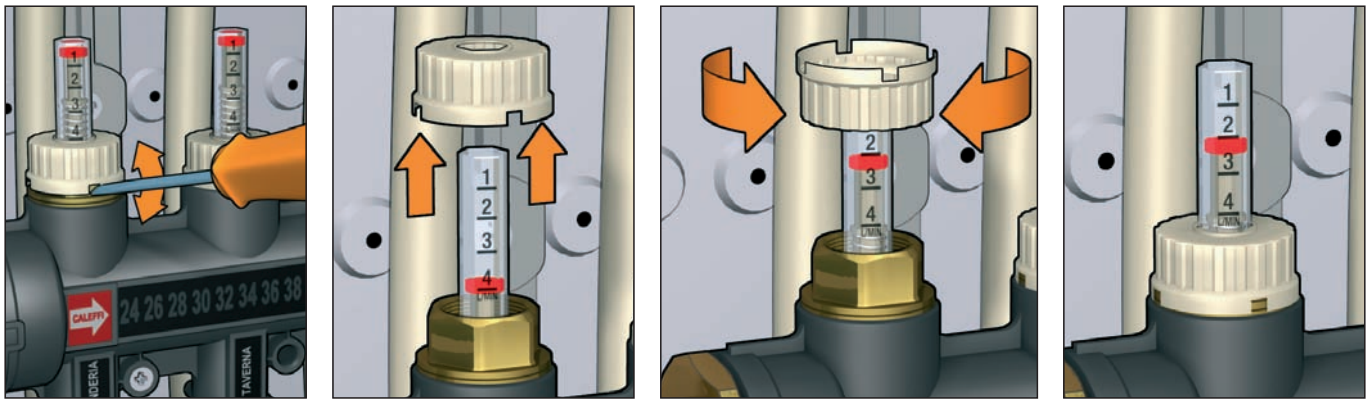
- available head on the panel circuit or predetermined head:
  $H_{Predetermined} \geq \Delta P_{Circuit\ +\ disadvantaged} = \Delta P_{BV} + \Delta P_{Loop} + \Delta P_{SV}$

Referring to the diagram alongside, the balancing valve must, for the loop flow rate, provide an additional head loss equal to the difference ΔP_{BV} ($\Delta P_{Balancing\ valve}$).



Flow rate adjustment and reading

Raise the block cover with the aid of a screwdriver and turn it over onto the flow meter. Adjust the flow rate of the single panels by turning the flow meter body that acts on the built-in balancing valve.
The flow rate must be read off the graduated scale, expressed in l/min, printed on the flow meter.
After making all the adjustments, reposition all the knobs and hook them in their seat to prevent tampering.



SPECIFICATION SUMMARIES

670 series

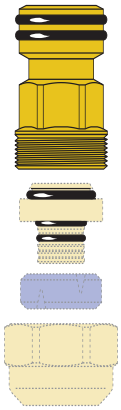
Manifold in composite specifically designed for radiant panel systems with 3 (from 3 to 10) outlets. Body of PA66GF. Seals of EPDM. Head connections: 1" F threaded. Outlet connections: 3/4" M. Media: water and glycol solutions. Maximum percentage of glycol 30%. Maximum working pressure 4 bar. Temperature range 5-60°C. Maximum automatic air vent discharge pressure 6 bar.
Complete with:
- Flow manifold with flow-rate balancing valves and flow meter with graduated scale 1-4 l/min. Accuracy ± 10%.
- Return manifold with shut-off valves fitted for thermo-electric actuator.
- Pair of end fittings with automatic air vent with hygroscopic cap, discharge valve, filler/drain cock.
- Pair of ball shut-off valves, brass body. Union seals made of EPDM.
- Liquid crystal digital thermometers on the flow and return manifolds. Scale 24-48°C.
- Adhesive labels indicating the rooms.
- Pair of fixing brackets.
- Box made of painted sheet steel with clamp; adjustable depth of from 80 to 120 mm; with floor supports that are adjustable from 270 to 410 mm.
- Coupling adapter with clip 675850 code for manifold outlet and pipe fitting connection 680 series.
- Template for pipe cutting 675002 code.

Accessories

675

Coupling adapter with clip code 675850 for manifold outlet 670 series and pipe fitting connection 680 series.

Size: 3/4" M - Ø 18-clip coupling.



Technical and construction specifications

Materials:	- body:	brass EN 12164 CW614N
	- seal:	double O-ring of EPDM
	- clip:	stainless steel
Medium:		water, glycol solutions
Max. percentage of glycol:		30%
Max. working pressure:		10 bar
Temperature range:		0-100°C
		5-60°C (coupled in the manifold 670)
Connection:		3/4" M - Ø 18-clip coupling

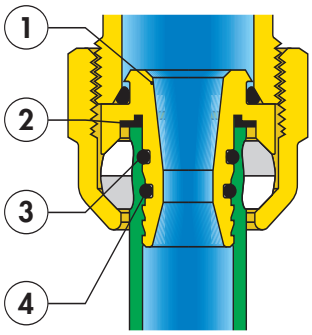
680

Single and multi-layer plastic pipe fitting with self-adjustable diameter.

Size 3/4".

Technical and construction specifications

Materials:	- adapter:	brass EN 12164 CW614N
	- nut:	brass EN 12164 CW614N
	- pipe clenching ring:	PA66GF
	- seals:	EPDM
	- dielectric seal ring:	EPDM
Medium:		water, glycol solutions
Max percentage of glycol:		30%
Max working pressure:		10 bar
Temperature range:		5-80°C (PEX)
		5-50°C (Multi-layer)
Connection:		3/4"



Construction details

Pipe-fitting coupling flexibility
This fitting has been specifically designed in order to adjust to several pipe diameters. The great variety of plastic pipes, single and multi-layer, on the market and the breadth of permissible tolerances have made it necessary to design a specific fitting.
Keeping the nominal dimensions of the fittings currently on the market, the new construction solution makes it possible to use the same fitting for pipes with differences on their outside diameter of up to 2 mm and on their inside diameter of up to 0,5 mm.

Pull-out resistance
This fitting opposes high resistance to pipe pull-out. Its special tightening system makes it suitable for all applications, ensuring a perfect hydraulic seal.

Low head losses
The internal profile of the adapter (1) is shaped to obtain a Venturi effect as the medium flows. It permits having a head loss 20% lower than that corresponding to passages of the same diameter.

Dielectric seal ring
The fitting is equipped with a rubber insulating element (2) to prevent contact between the aluminium in the multi-layer pipe and the brass of the fitting. This prevents any galvanic corrosion generated by two different metals.

Double O-ring seal
On the adapter there are two O-ring seals (3) – (4) made of EPDM in order to avoid potential leaks even at high working pressures.

Code		Piping (mm) $Ø_{inside}$	$Ø_{outside}$
680502	3/4"	7,5- 8	12-14
680503	3/4"	8,5- 9	12-14
680500	3/4"	9 - 9,5	14-16
680501	3/4"	9,5-10	12-14
680506	3/4"	9,5-10	14-16
680515	3/4"	10,5-11	14-16
680517	3/4"	10,5-11	16-18
680524	3/4"	11,5-12	14-16
680526	3/4"	11,5-12	16-18
680535	3/4"	12,5-13	16-18
680537	3/4"	12,5-13	18-20
680544	3/4"	13,5-14	16-18
680546	3/4"	13,5-14	18-20
680555	3/4"	14,5-15	18-20
680564	3/4"	15,5-16	18-20
680505	3/4"	17	22,5

Thermo-electric actuators

6561

Tech. brosch. 01042

Thermo-electric actuator.
Normally closed.

Code	Voltage (V)
656102	230
656104	24

Thermo-electric actuator.
Normally closed.
With auxiliary microswitch.

Code	Voltage (V)
656112	230
656114	24

Technical and constructional specifications

Materials:	- protective shell	self-extinguishing polycarbonate
	- colour	RAL 9010 white version with micro: RAL 9002 grey
Normally closed		
Electric supply:		230 V (ac) - 24 V (ac) - 24 V (dc)
Starting current:		≤ 1 A
Working current:		230 V (ac) = 13 mA 24 V (ac) - 24 V (dc) = 140 mA
Power consumption:		3 W
Auxiliary microswitch contacts rating (code 656112/114):		0,8 A (230 V)
Protection class:		IP 44 (in vertical position)
Double insulation construction:		CE
Max. ambient temperature:		50°C
Operating time:		opening and closing from 120 s to 180 s
Length of supply cable:		80 cm
Approval:		CE

675

Push-fit thermometer for panel piping, code 675900.

Technical and constructional specifications

Material:	- body:	PA6GF
Thermometer fluid:		alcohol
Thermometer scale:		5-50°C
Max. working temperature:		60°C
Range of use of pipe outside ($Ø_e$) diam.:		from 15 to 18 mm
Conducting paste supplied in package		

695

System test pump code 695000. Comprehensive of pressure gauge and hose for connecting to the system.

Technical and constructional specifications

Materials:	- body:	bronze
	- piston:	brass
	- control lever:	galvanized steel
Max. working pressure:		50 bar
Water content:		12 l
Pressure gauge scale:		0-60 bar
Hose connection:		1/2”
Hose length:		1,5 m

SPECIFICATION SUMMARIES

680 series

Self-adjustable diameter fitting for single and multi-layer plastic pipes with internal profile having a Venturi effect to limit head losses. Size 3/4” F. Nut and adapter made of brass, seals of EPDM, dielectric seal ring of EPDM, pipe clenching ring of PA66GF. Media: water and glycol solutions. Maximum percentage of glycol 30%. Maximum working pressure 10 bar. Temperature range 5-80°C (PEX); 5-50°C (Multi-layer).

675 series

Push-fit thermometer for panel piping. Range of use of pipe outside diameter: from 15 to 18 mm. Body of PA6GF. Thermometer fluid: alcohol. Thermometer scale 5-50°C. Maximum working temperature 60°C.

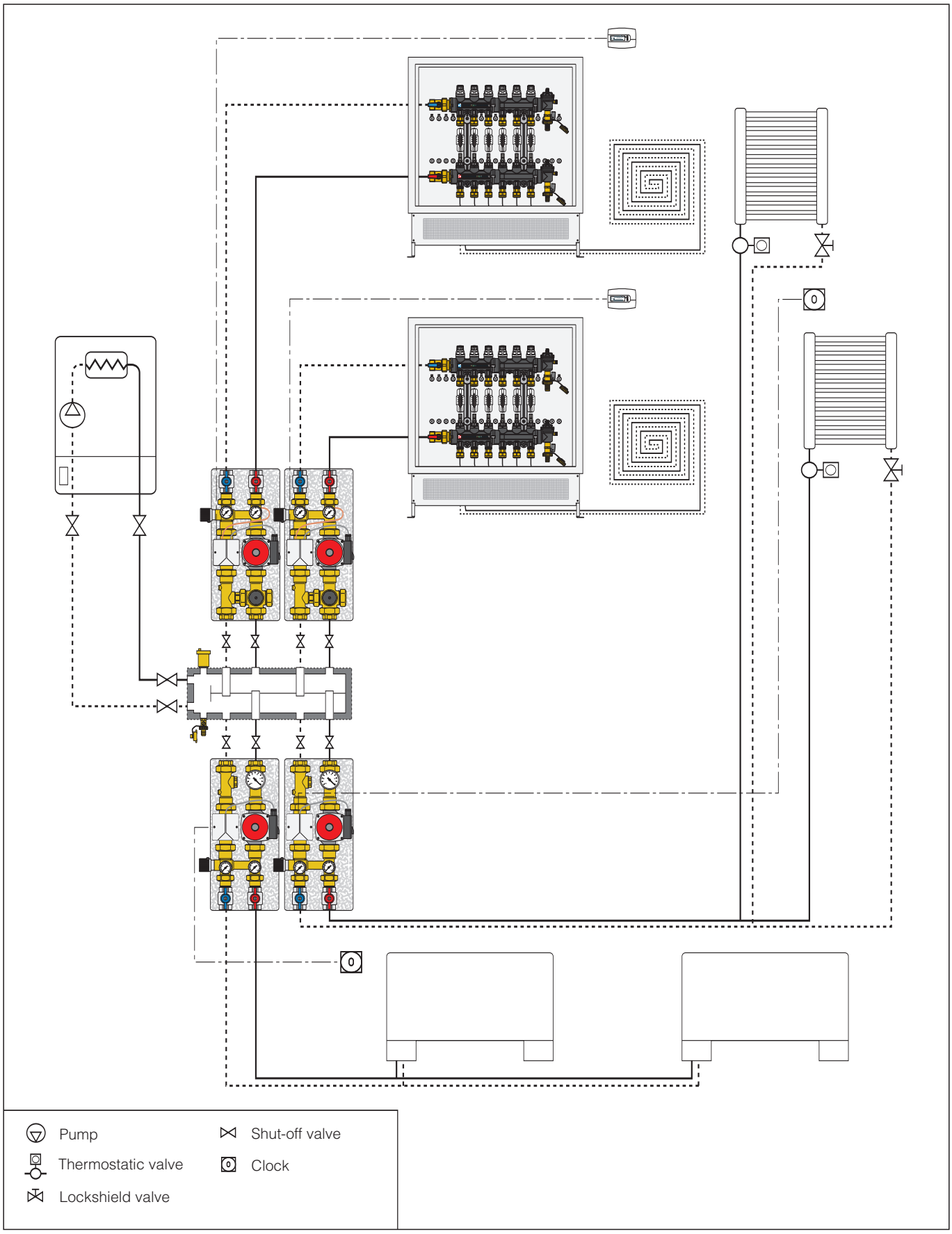
6561 series

Thermo-electric actuator. Normally closed (Normally closed with auxiliary microswitch). Electric supply 230 V (ac); 24 V (ac); 24 V (dc). Starting current ≤ 1 A. Working current 13 mA (230 V (ac)), 140 mA (24 V (ac) - 24 V (dc)). Power consumption 3 W. Protection class IP 44 (in vertical position). Maximum ambient temperature 50°C. Operating time from 120 to 180 seconds. Length of supply cable 80 cm.

695 series

System test pump with 0-60 bar pressure gauge and 1,5 m hose. Hose connection of 1/2”. Maximum working pressure: 50 bar. Water content: 12 l.

Application diagram



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