

Composite manifolds specifically designed for radiant panel systems



01126/18 GB

replaces dp 01126/11 GB

670 series



Function

Composite manifolds are used to control and distribute the medium in the circuits of underfloor radiant panel systems.

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

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

Reference documentation

Tech. Brochure 01042

656. series thermo-electric actuator

Product range

670 series Composite manifolds specifically designed for radiant panel systems, pre-assembled in a box _____ size 1"

Technical specifications

Materials

Flow manifold

Body:	PA66GF
Flow rate regulating valve	
Obturator:	brass EN 12164 CW614N
Flow meter body:	PSU
Spring:	stainless steel
Hydraulic seals:	EPDM
Adjustment locking 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 body:	PA66GF
Drain/filler cock body:	brass EN 12165 CW617N
Air vent seal:	silicone rubber
Hydraulic seals:	EPDM

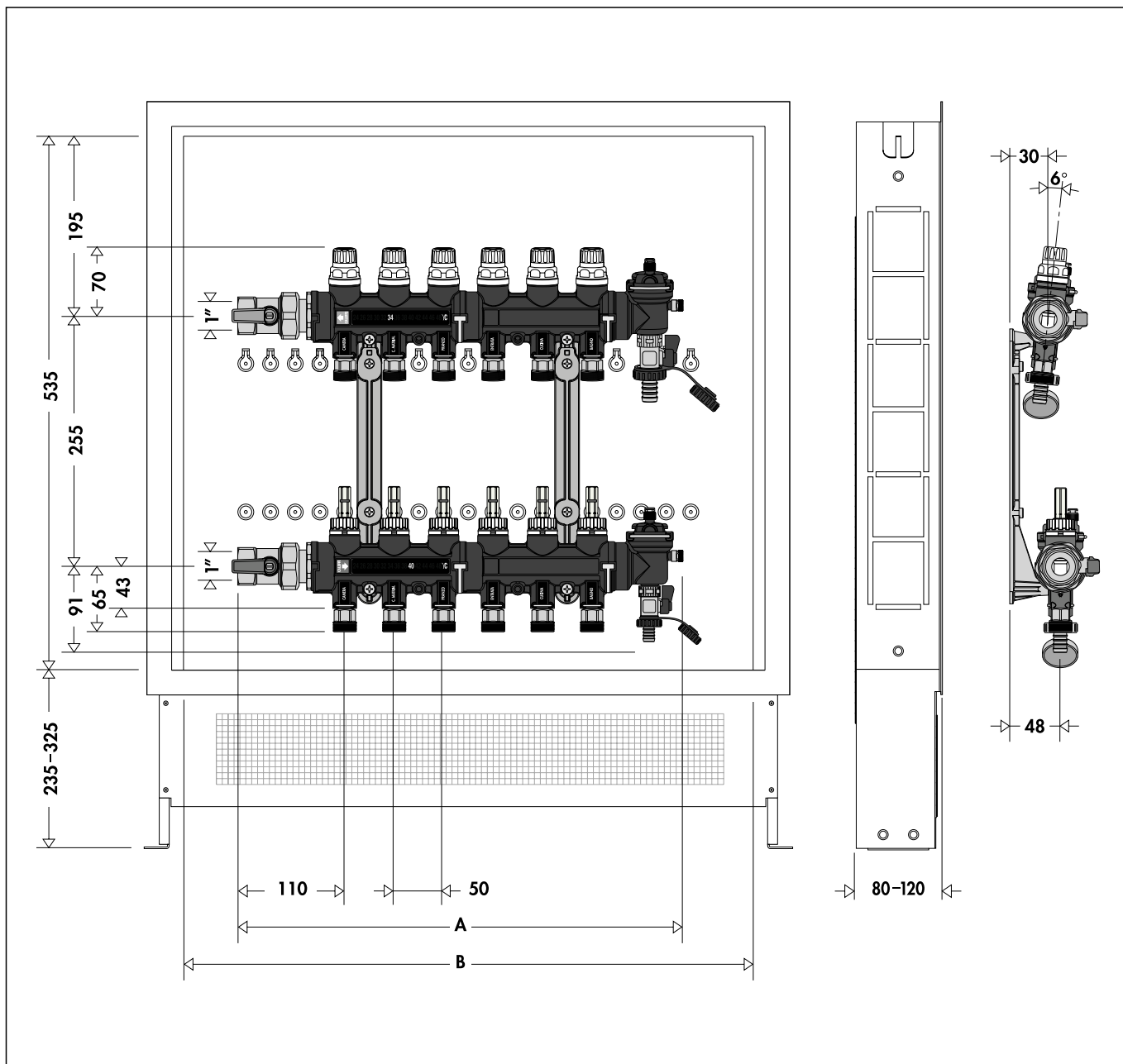
Ball shut-off valves

Valve body:	brass EN 12165 CW617N
Union seals:	EPDM
Control lever:	PA66GF

Performance

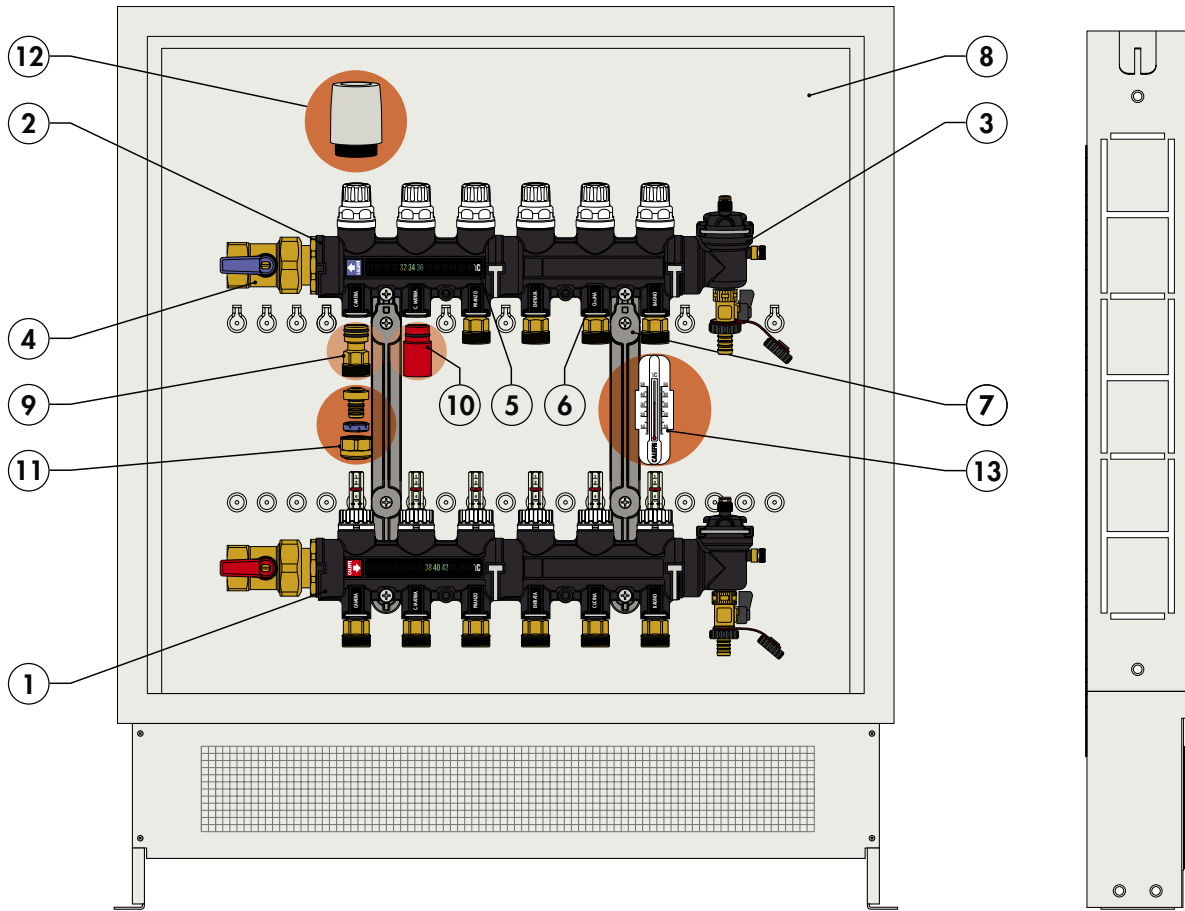
Medium:	water, glycol solutions
Max. percentage of glycol:	30%
Max. working pressure:	6 bar
Max. cold hydraulic test pressure:	6 bar
Max. air vent discharge pressure:	6 bar
Working temperature range:	5–60°C
Flow meter scale:	1–4 l/min
Accuracy:	±10%
LCD thermometers scale	24–48°C
Main connections:	1" F
Centre distance:	255 mm
Outlets:	3/4" x coupling with adapter code 675850
Centre distance:	50 mm

Dimensions



Code	6706C1	6706D1	6706E1	6706F1	6706G1	6706H1	6706I1	6706L1	6706M1	6706N1
N° outlets	3	4	5	6	7	8	9	10	11	12
A	300	350	400	450	500	550	600	650	700	750
B (Box width)	600	600	600	600	800	800	800	800	800	800
Mass (kg)	14,8	15,0	15,2	15,4	19,4	19,6	19,8	20,0	20,2	20,4

Characteristic components



Pre-assembled unit complete with:

- 1) Flow manifold with built-in flow meters and flow-rate balancing valves
- 2) Return manifold with built-in shut-off valves fitted for electro-thermal control
- 3) End fittings with automatic air vent with hygroscopic plug, bleed valve and filler/drain cock
- 4) Pair of ball shut-off valves
- 5) LCD thermometers on the flow and return manifolds
- 6) Adhesive labels indicating the rooms
- 7) Pair of mounting brackets for box
- 8) Box with adjustable height and depth
- 9) Coupling adapter with clip code 675850
- 10) Template for cutting pipe code 675002

Accessories

- 11) 680 series DARCAL self-adjustable diameter fitting for single and multi-layer plastic pipe
- 12) 6561 series electro-thermal actuator
- 13) Quick-fit temperature gauge for panel circuit code 675900

Construction details

Specific composite material

The manifolds are made using a polymer specifically selected for heating and cooling system applications. The basic characteristics required for this purpose are:

- high strain strength while maintaining good ultimate elongation
- good resistance to crack propagation
- very low humidity absorption, for consistent mechanical behaviour
- high resistance to abrasion caused by continuous medium flow
- performance maintained over temperature variations
- compatibility with glycols and additives used in circuits

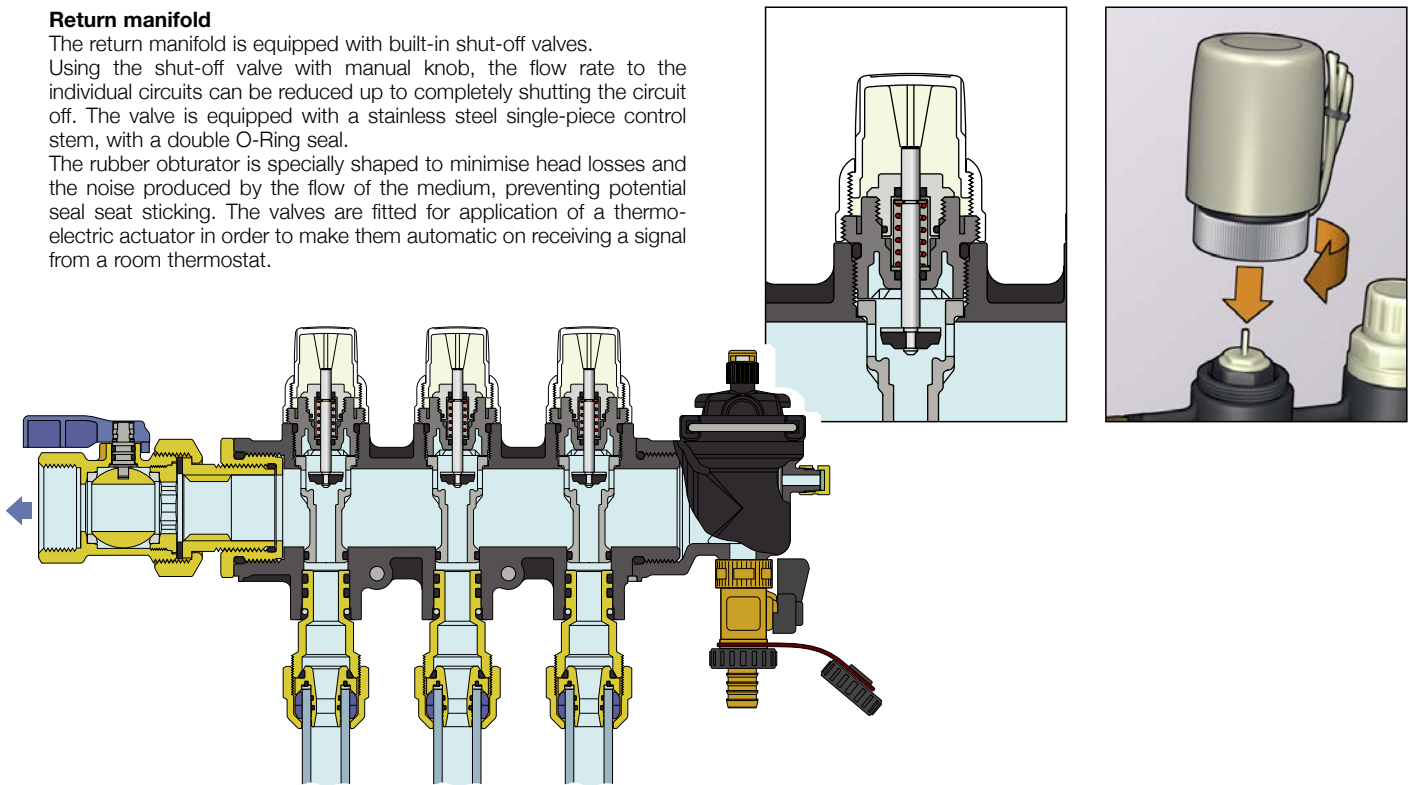
These basic material characteristics, combined with the appropriate shaping of the most highly stressed areas, enable a comparison with the metals typically used in the construction of distribution manifolds.

Return manifold

The return manifold is equipped with built-in shut-off valves.

Using the shut-off valve with manual knob, the flow rate to the individual circuits can be reduced up to completely shutting the circuit off. The valve is equipped with a stainless steel single-piece control stem, with a double O-Ring seal.

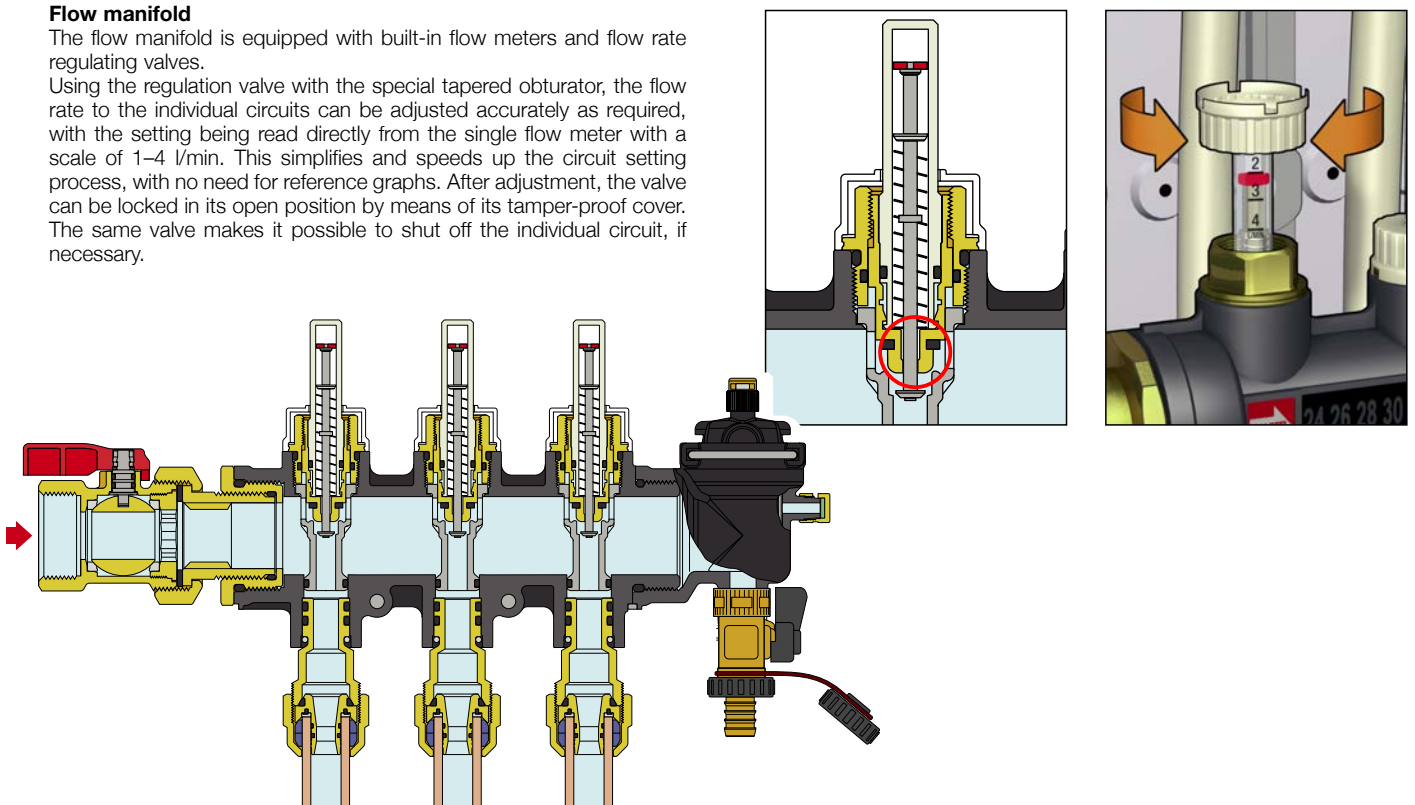
The rubber obturator is specially shaped to minimise head losses and the noise produced by the flow of the medium, preventing potential seal seat sticking. The valves are fitted for application of a thermo-electric actuator in order to make them automatic on receiving a signal from a room thermostat.



Flow manifold

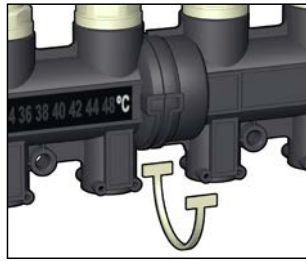
The flow manifold is equipped with built-in flow meters and flow rate regulating valves.

Using the regulation valve with the special tapered obturator, the flow rate to the individual circuits can be adjusted accurately as required, with the setting being read directly from the single flow meter with a scale of 1-4 l/min. This simplifies and speeds up the circuit setting process, with no need for reference graphs. After adjustment, the valve can be locked in its open position by means of its tamper-proof cover. The same valve makes it possible to shut off the individual circuit, if necessary.



Manifold modularity

The manifolds and end fittings can be coupled together, thanks to the threaded connections with O-Ring seals and fixing clips which prevent unscrewing. With this connection system, assembly of the various components is simplified and the watertightness is fully assured.

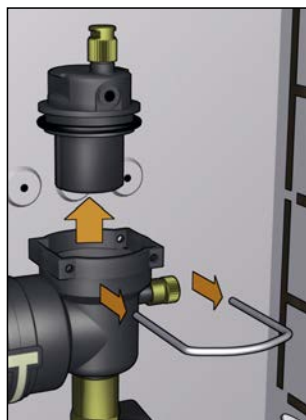
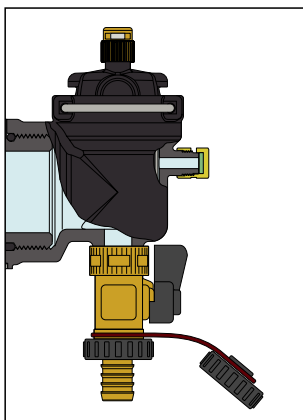
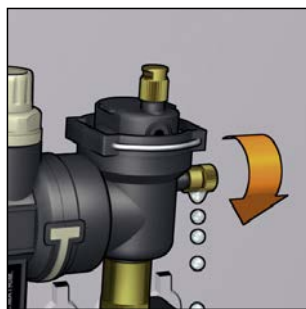
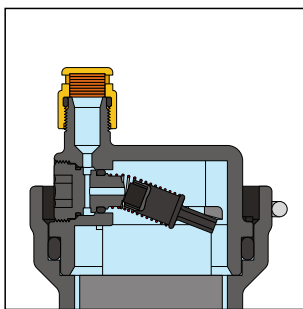


End fitting

The end fitting is equipped with an automatic air vent with hygroscopic safety cap, drain valve and fill/drain ball cock.

The air vent is equipped with a mechanism to remove air using a silicone rubber obturator. The vent mechanism is connected to the valve body by a fixing clip, making any inspection and maintenance work easier.

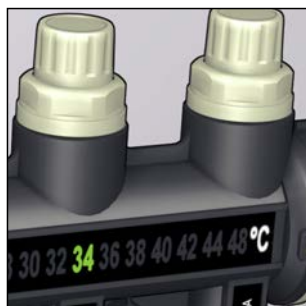
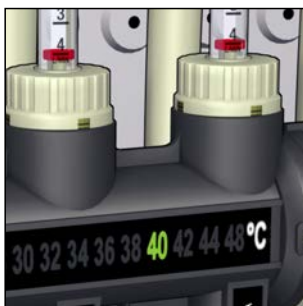
Nevertheless, the hygroscopic safety cap prevents water from getting out in order to protect the installation. The manual drain valve speeds up circuit filling, which takes place using the drain/fill ball cock.



Digital temperature gauges

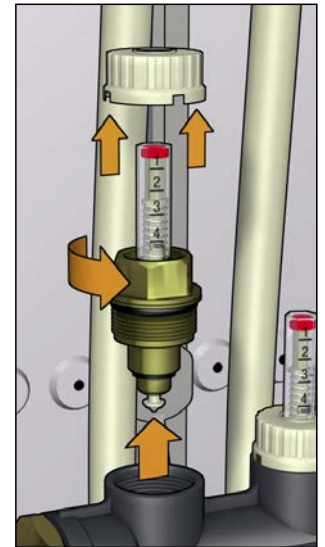
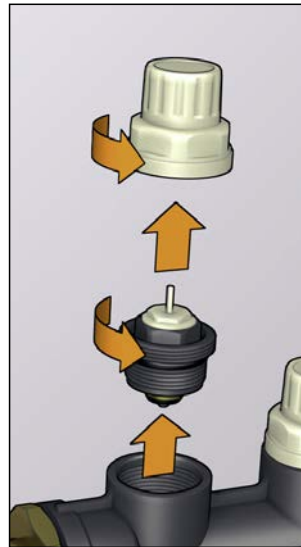
An LCD thermometer is fitted on the flow and return manifold body, on both sides, with temperature range of 24–48°C. The liquid crystals automatically light up green to indicate the measured temperature, making it easy to read even in poor lighting conditions.

This temperature gauge is calibrated to display the actual temperature of the medium, which is essential in evaluating the operating conditions and thermal load of the system.



Replaceable components

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

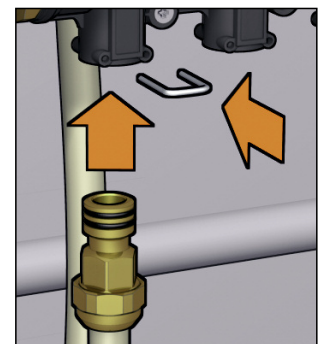
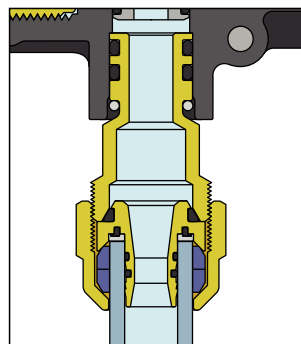
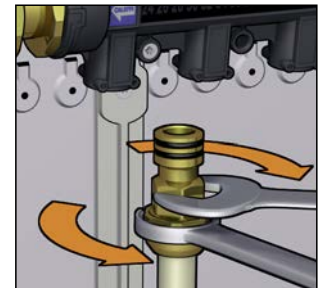


Panel circuit outlets

The outlet connections of the individual panel circuits are designed for use with a special coupling adapter, with fixing clip, that can be removed. The brass adapter has a double O-Ring seal and a hexagonal control on its surface.

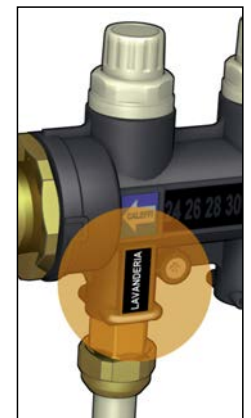
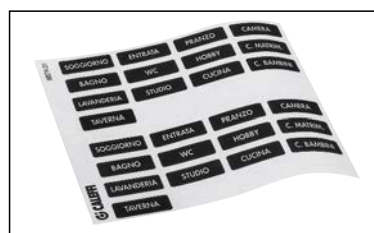
The panel circuit pipe fitting is connected directly onto the threaded side.

With this particular connection system, the fitting with the adapter can be tightened onto the pipe outside the box and then coupled onto the manifold body later, making hydraulic installation simpler and more practical.



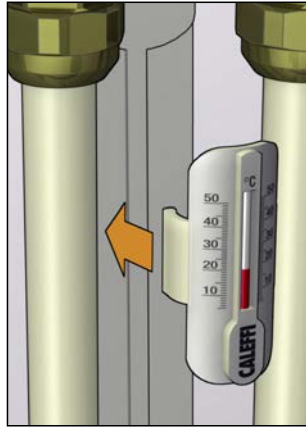
Room identification

On the manifold body, at each individual panel circuit outlet, there is a special seat for affixing an adhesive label identifying the corresponding room.



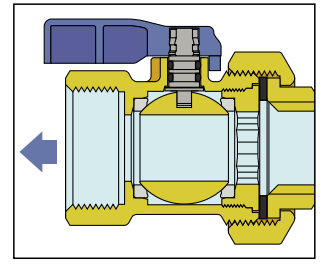
Temperature gauges for panels pipe

A special spirit temperature gauge with a scale of 5–50°C is available as an accessory; it is equipped with a push-fit plastic body for the individual panel pipe, with external diameter of 15 to 18 mm. When installed on the return pipe, this temperature gauge measures the actual temperature of the medium returning from the circuit, making it easy to accurately check the thermal exchange condition of the individual panel.



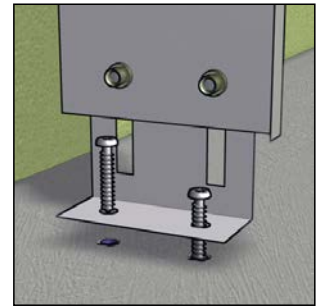
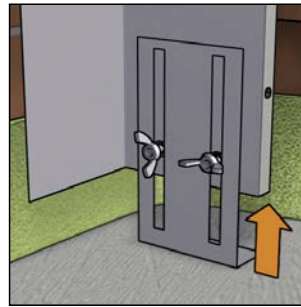
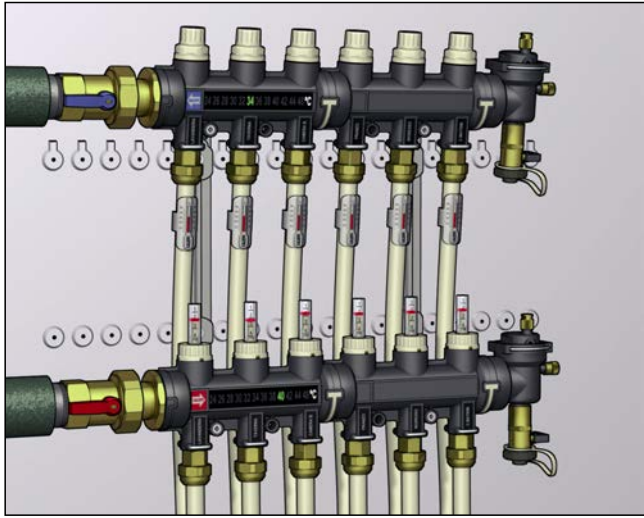
Shut-off valves

The ball shut-off valve on the flow and return of the circuits is the union type with an EPDM flat-seat seal.



Box

The manifolds are supplied bracketed in a recessed sheet steel box with an adjustable depth of 80 to 120 mm. The box, specifically designed for use with radiant panel systems, is equipped with floor brackets adjustable in height from 235 to 325 mm, the height being selected in accordance with the slab thickness. With these floor brackets, the pipes passageway is clear of obstructions; a double curtain wall then allows direct application of plaster and correct fitting of frame and cover. The bottom wall of the box has grooves and holes to secure the manifold brackets; the side and upper walls feature holes for the passage of the main pipes. The cover is opened and closed using a special handle with a push-fit clamp, without using any spanners or tools.

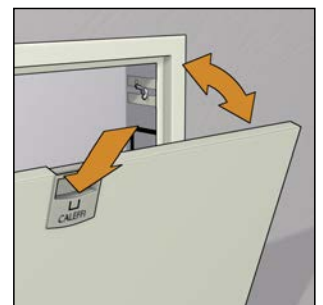
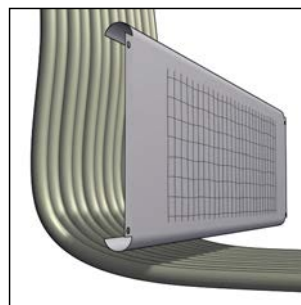
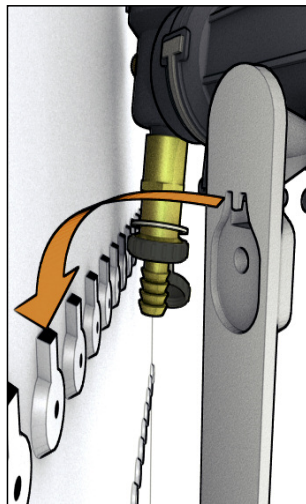


Bracketing

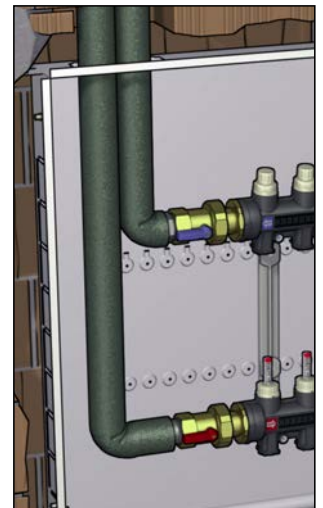
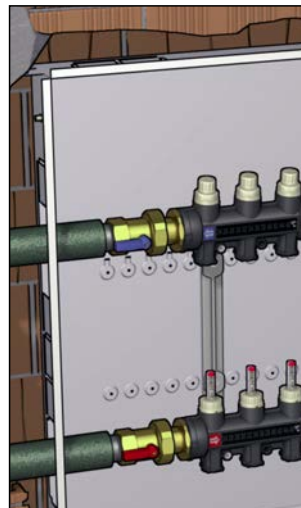
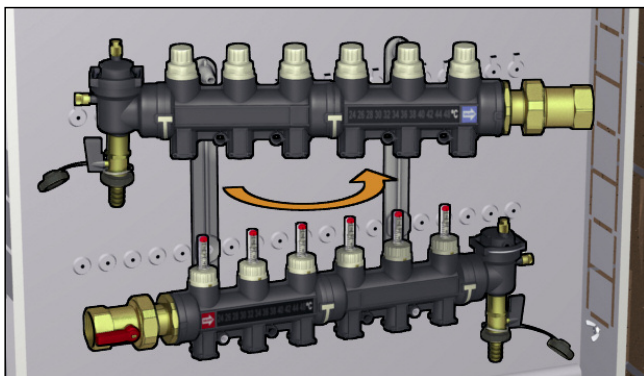
The manifolds have holes for fixing to brackets, so they can be housed in a box. The manifolds are reversible, so they can be positioned with the inlet on the right or left.

The return manifold, located at the top, is installed at a specific angle to make it easier for the panel circuit pipes to pass through, with diameters up to 20 mm.

The manifolds can thus be bracketed in a box just 80 mm deep, which can even be installed in walls with reduced thickness.



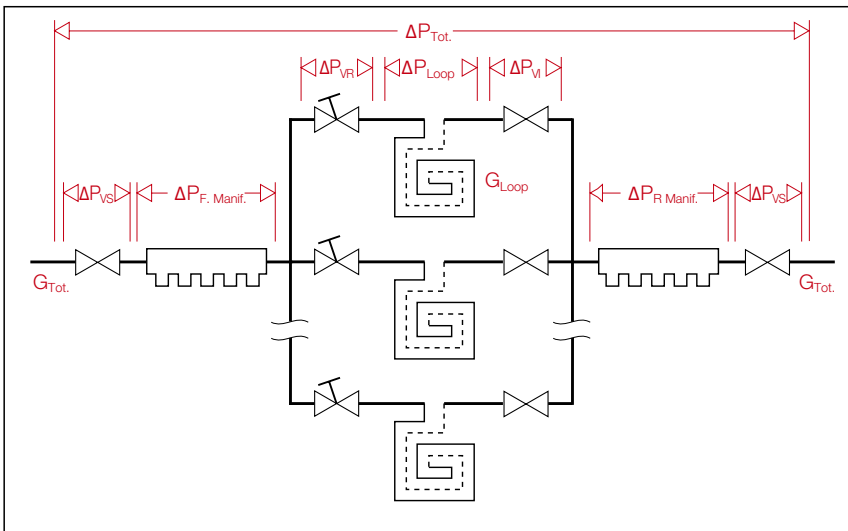
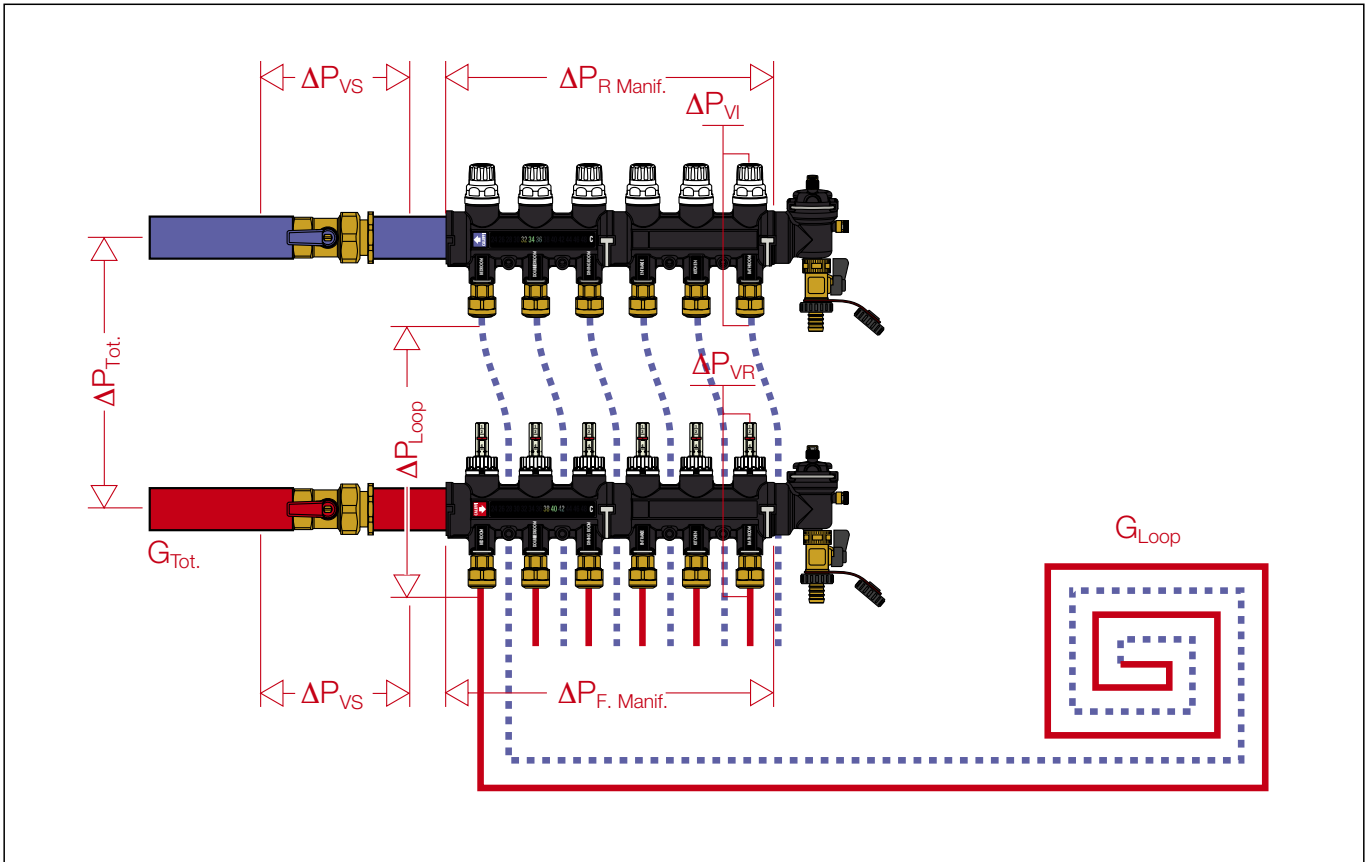
The box is also fitted for connection to the main pipes coming in from the top.



Hydraulic characteristics

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

From a hydraulic point of view, the system consisting 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_{VR} = Localized loss at loop balancing valve (loop flow rate)

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

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

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

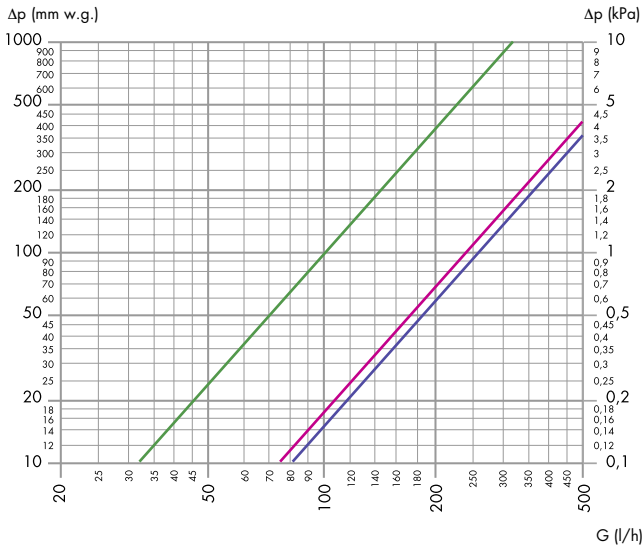
$\Delta P_{Manif. R}$ = Distributed loss of the return manifold (total flow rate)

ΔP_{Vs} = Ball valve loss (total flow rate)

$$\Delta P_{Tot.} = \Delta P_{VR} + \Delta P_{Loop} + \Delta P_{Vi} + \Delta P_{Manif. F} + \Delta P_{Manif. R} + \Delta P_{Vs} \times 2 \quad (1.1)$$

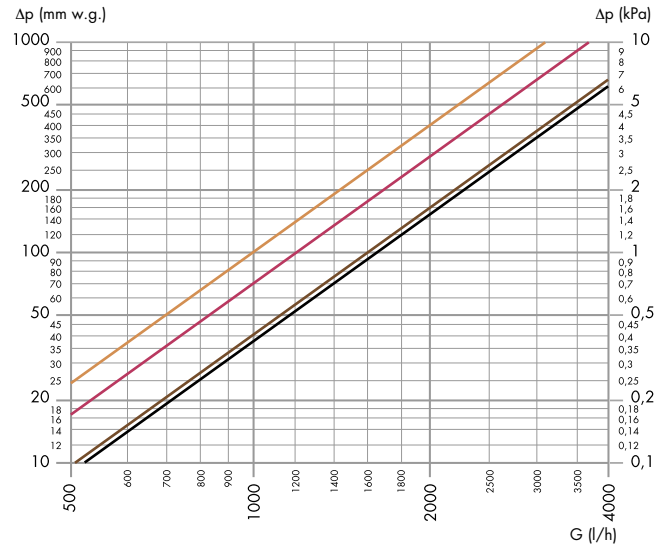
When the hydraulic characteristics of each component and the design flow rates are known, the total loss can be calculated as the sum of the partial head losses for each specific component in the system, as indicated by the formula (1.1).

Hydraulic characteristics



	Kv	Kv _{0,01}
Flow rate regulating valve fully open (671 series)	1,00	100
Fully open lockshield valve (673 series)	2,68	268
Shut-off valve	2,40	240

- Kv = flow rate in m³/h for a head loss of 1 bar
 - Kv_{0,01} = flow rate in l/h for a head loss of 1 kPa



	Kv	Kv _{0,01}
Flow or return manifold 3-6 starts	16,0*	1600*
Flow or return manifold 7-10 starts	12,0*	1200*
Flow or return manifold 11-12 starts	10,0*	1000*
Ball valve	16,5	1650

* Average value

Example of total head loss calculation

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

Total manifold flow rate: 350 l/h

The flow rate and head loss of the three loops are as follows:

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	

Each segment of the formula (1.1) is calculated using the following relationship:

$$\Delta P = G^2 / K_{v0,01}^2$$

- G = flow rate in l/h
- ΔP = head loss 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 ΔP_{Tot.} must be carried out taking account of the circuit in which there are the greatest head losses distributed along the entire panel pipe loop.

In the case we are examining, the relevant circuit is No. 2.

It follows that:

$$\left. \begin{aligned} \Delta P_{VR} &= 150^2 / 100^2 = 2,25 \text{ kPa} \\ \Delta P_{Loop} &= 15 \text{ kPa} \\ \Delta P_{VI} &= 150^2 / 240^2 = 0,39 \text{ kPa} \\ \Delta P_{Manif. F} &= 350^2 / 1600^2 = 0,05 \text{ kPa} \\ \Delta P_{Manif. R} &= 350^2 / 1600^2 = 0,05 \text{ kPa} \\ \Delta P_{VS} &= 350^2 / 1650^2 = 0,04 \text{ kPa} \end{aligned} \right\} \text{Values obtained by disregarding the changes due to the flow rate sent to each branch circuit}$$

Using formula (1.1), adding up all the calculated terms, we obtain:

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

Note:

We can ignore the three terms for the head losses associated with the ball valves and manifolds because of their low values.

In general, the total head loss is fairly close to the branched panel circuit head loss.

Using the balancing valves with flow meter

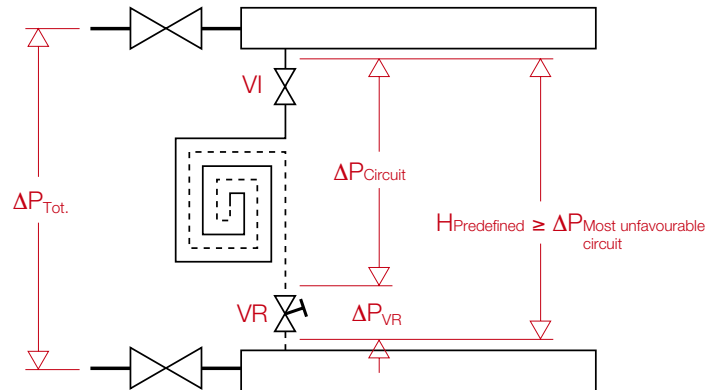
The balancing valves in the flow manifold make it possible to balance each individual panel circuit to obtain the design flow rates in each loop.

Considering the following data:

- medium flow rate across each circuit
- head loss generated in each circuit by this flow rate:
 $\Delta P_{\text{Circuit}} = \Delta P_{\text{Loop}} + \Delta P_{\text{SV}}$ ($\Delta P_{\text{Shut-off valve}}$)

- available head on the panel circuit or predefined head:
 $H_{\text{Predefined}} \geq \Delta P_{\text{Most disadvantaged circuit}} + \Delta P_{\text{VR}} + \Delta P_{\text{Loop}} + \Delta P_{\text{SV}}$

Referring to the adjacent diagram, for the loop flow rate the regulation valve must provide an additional head loss equal to the difference ΔP_{VR} ($\Delta P_{\text{Regulation valve}}$).

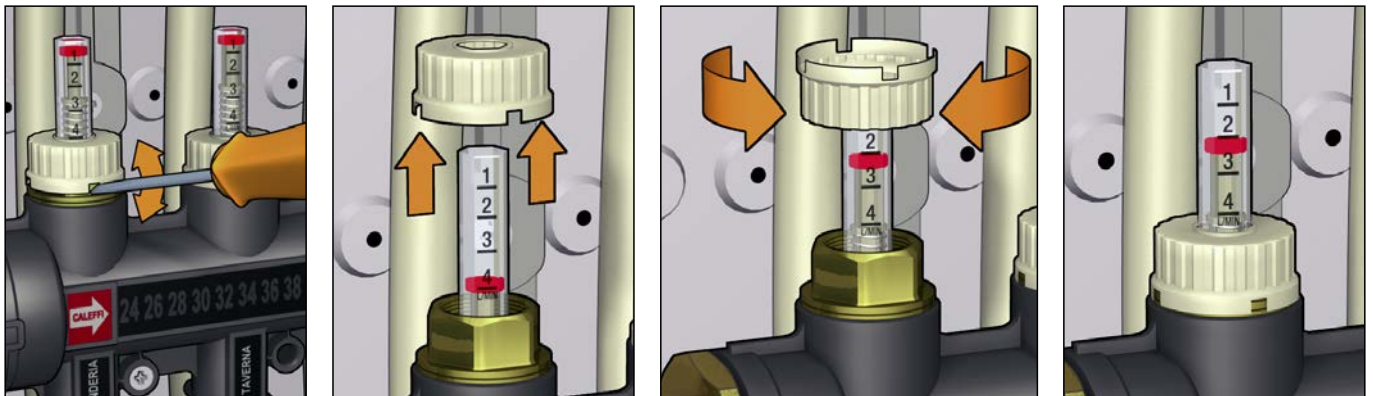


Flow rate balancing and reading

Lift the locking cover with the aid of a screwdriver and turn it over onto the flow meter. Adjust the flow rate of the individual panels by turning the flow meter body acting on the built-in regulating valve.

The flow rate must be read on the graduated scale, expressed in l/min, printed on the flow meter itself.

After making all the adjustments, reposition and lock all the knobs in their seats to prevent tampering.



SPECIFICATION SUMMARY

670 series

Composite distribution manifold specifically designed for radiant panel systems with 3 (from 3 to 12) outlets. PA66GF body. EPDM seals. Main connections 1" F. Outlet connections 3/4" M. Water and glycol solutions medium. Max. percentage of glycol 30%. Maximum working pressure 6 bar. Working temperature range 5–60°C. Maximum automatic air vent discharge pressure 6 bar.

Complete with:

- Flow manifold with flow rate regulating valves and flow meter with 1–4 l/min graduated scale. Accuracy $\pm 10\%$.
- Return manifold complete with shut-off valves fitted for thermo-electric actuator.
- Pair of end fittings complete with automatic air vent with hygroscopic cap, bleed valve and fill/drain cock.
- Pair of shut-off ball valves, brass body. EPDM union seals.
- LCD thermometers on the flow and return manifolds. Scale 24–48°C.
- Adhesive labels indicating the rooms.
- Pair of fixing brackets.
- Painted sheet metal box with closure clamp, depth adjustable from 80 to 120 mm, including floor supports adjustable in height from 235 to 325 mm.
- Coupling adapters with fixing clip code 675850 for manifold outlet and connection of 680 series fitting.
- Pipe cutting template code 675002.

Accessories



675

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

Size: 3/4" M - Ø 18 for clip coupling.

Technical specifications

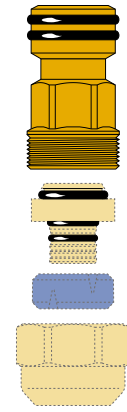
Materials

Body: brass EN 12164 CW614N
 Seal: double EPDM O-Rings
 Fixing clips: stainless steel

Performance

Medium used: water, glycolate solutions
 Max. percentage of glycol: 30%
 Maximum working pressure: 10 bar
 Working temperature range: 0–100°C
 5–60°C (coupled in the manifold 670)

Connection: 3/4" M - Ø 18 for clip coupling



680 DARCAL

Self-adjusting diameter fitting for single and multi-layer plastic pipe.

Size: 3/4".

Technical specifications

Materials

Nut and adapter: brass EN 12164 CW614N
 Seals: EPDM
 Dielectric seal ring: EPDM
 Olive: PA66G50

Performance

Medium: water, glycol solutions
 Max. percentage of glycol: 30%
 Maximum working pressure: 10 bar
 Working temperature range: 5–80°C (PE-X)
 5–75°C (Multilayer marked 95°C)
 Connection: 3/4"

Construction details

Pipe-fitting coupling flexibility

This fitting is specifically designed in order to adjust to several pipe diameters. The great variety of single and multi-layer plastic pipes on the market, and the range 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 external diameter differences of up to 2 mm and internal diameter differences of up to 0,5 mm.

Pull-out resistance

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

Low head losses

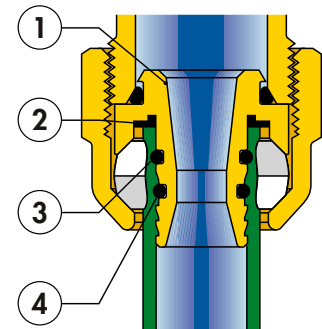
The internal profile of the adapter (1) is shaped to obtain a Venturi effect as the medium flows. It allows for a head loss 20% lower than that corresponding to passages of the same diameter.

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 the two different metals.

Double O-Ring seal

On the adapter there are two EPDM O-Ring seals (3) – (4) in order to avoid potential losses even at high working pressures.



Code	3/4"	Pipe (mm)	
		Ø _{inner}	Ø _{outer}
680507	3/4"	7,5– 8	10,5–12
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
680556	3/4"	15 –15,5	18 –20
680564	3/4"	15,5–16	18 –20
680505	3/4"	17	22,5

Standard thermo-electric actuators



6561

tech. broch. 01042

Thermo-electric actuator for manifolds.
Normally closed.

Code	Voltage (V)
656102	230
656104	24



6561

tech. broch. 01042

Thermo-electric actuator for manifolds.
Normally closed.

With auxiliary microswitch.

Code	Voltage (V)
656112	230
656114	24



Technical specifications

Materials

Protective shell: self-extinguishing polycarbonate
Colour: (code 656102/04) white RAL 9010
(code 656112/14) grey RAL 9002

Performance

Normally closed
Electric supply: 230 V (ac) - 24 V (ac) - 24 V (dc)
Starting current: ≤ 1 A
Running current: 230 V (ac) = 13 mA
24 V (ac) - 24 V (dc) = 140 mA
Running power consumption: 3 W
Auxiliary microswitch contact 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
Supply cable length: 80 cm



675

Push-fit temperature gauge for panel pipe,
code 675900.

Technical specifications

Material

Body: PA6GF
Temperature gauge medium: alcohol

Performance

Temperature gauge scale: 5–50°C
Max. working temperature: 60°C
Working range of external pipe diameter (Ø_e): from 15 to 18 mm
Conducting paste supplied in package



695

System test pump
code 695000.
Complete with pressure gauge
and system connection hose.
Also suitable for use with glycol
solutions for solar thermal
systems.

Technical specifications

Material

Body: bronze
Piston: brass
Control lever: galvanized steel

Performance

Maximum working pressure: 50 bar
Water content: 12 l
Pressure gauge scale: 0–60 bar
Hose connection: 1/2"
Length of hose: 1,5 m

SPECIFICATION SUMMARY

680 series

Self-adjusting diameter fitting for single and multi-layer plastic pipes with internal profile offering a Venturi effect to limit head losses. Size 3/4" F Ø 18. Brass nut and adapter, EPDM seals, EPDM dielectric ring, PA66G50 olive. Medium water and glycol solutions. Max. percentage of glycol 30%. Maximum working pressure 10 bar. Working temperature range 5–80°C (PE-X); 5–75°C (Multilayer marked 95°C).

675 series

Push-fit temperature gauge for panel pipe. Working range of external pipe diameter: from 15 to 18 mm. PA6GF body. Temperature gauge medium alcohol. Temperature gauge scale 5–50°C. Maximum working temperature 60°C.

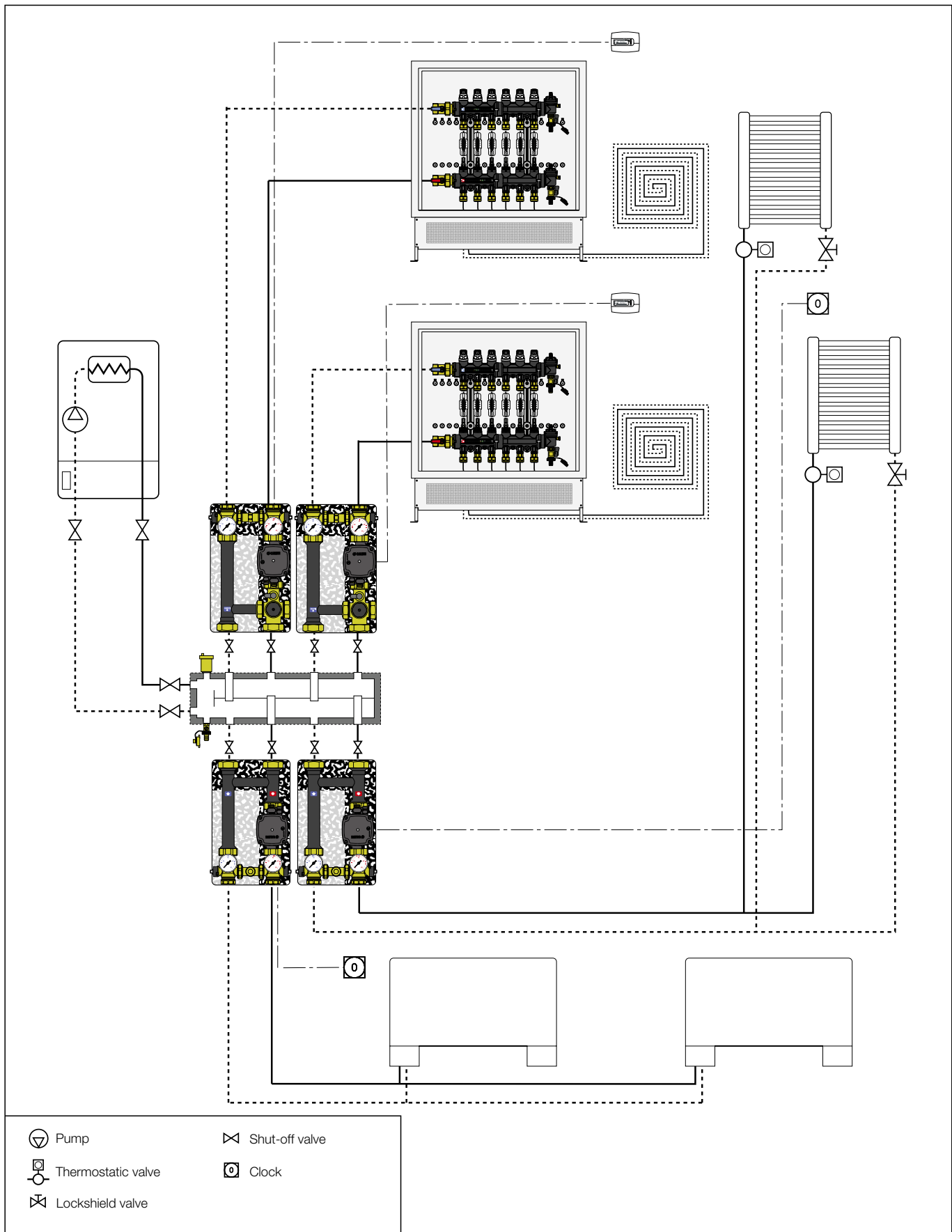
6561 series

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. Running current 13 mA (230 V (ac)); 140 mA (24 V (ac) - 24 V (dc)). Running power consumption 3 W. Protection class IP 44 (in vertical position). Maximum ambient temperature 50°C. Operating time from 120 to 180 seconds. Supply cable length 80 cm.

695 series

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

Application diagram



We reserve the right to make changes and improvements to the products and related data in this publication, at any time and without prior notice.



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