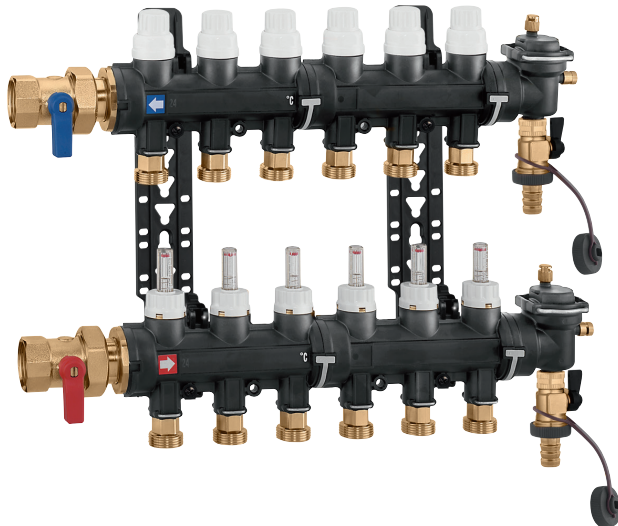


# Composite manifolds specifically designed for radiant panel systems

## 671 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 heating and cooling systems, consists of: flow manifold, complete with flow meters and built-in regulating valves; return manifold complete with shut-off valves fitted for thermo-electric actuator; end fittings complete with automatic air vent valves and filler/drain cocks; ball shut-off valves; LCD thermometers on the flow and return manifolds.

### Reference documentation

Tech. Brochure 01042

656 series thermo-electric actuator

### Product range

671 series Composite manifolds specifically designed for radiant panel systems

size 1"

### Technical specifications

#### Materials

##### Flow manifold

Body:	PA66GF
<b>Flow rate regulating valve</b>	
Obturator:	brass EN 12164 CW614N
Flow meter body:	PSU
Spring:	stainless steel
Hydraulic seals:	EPDM
Adjustment locking cover:	ABS

##### Return manifold

Body:	PA66GF
<b>Shut-off valve</b>	
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

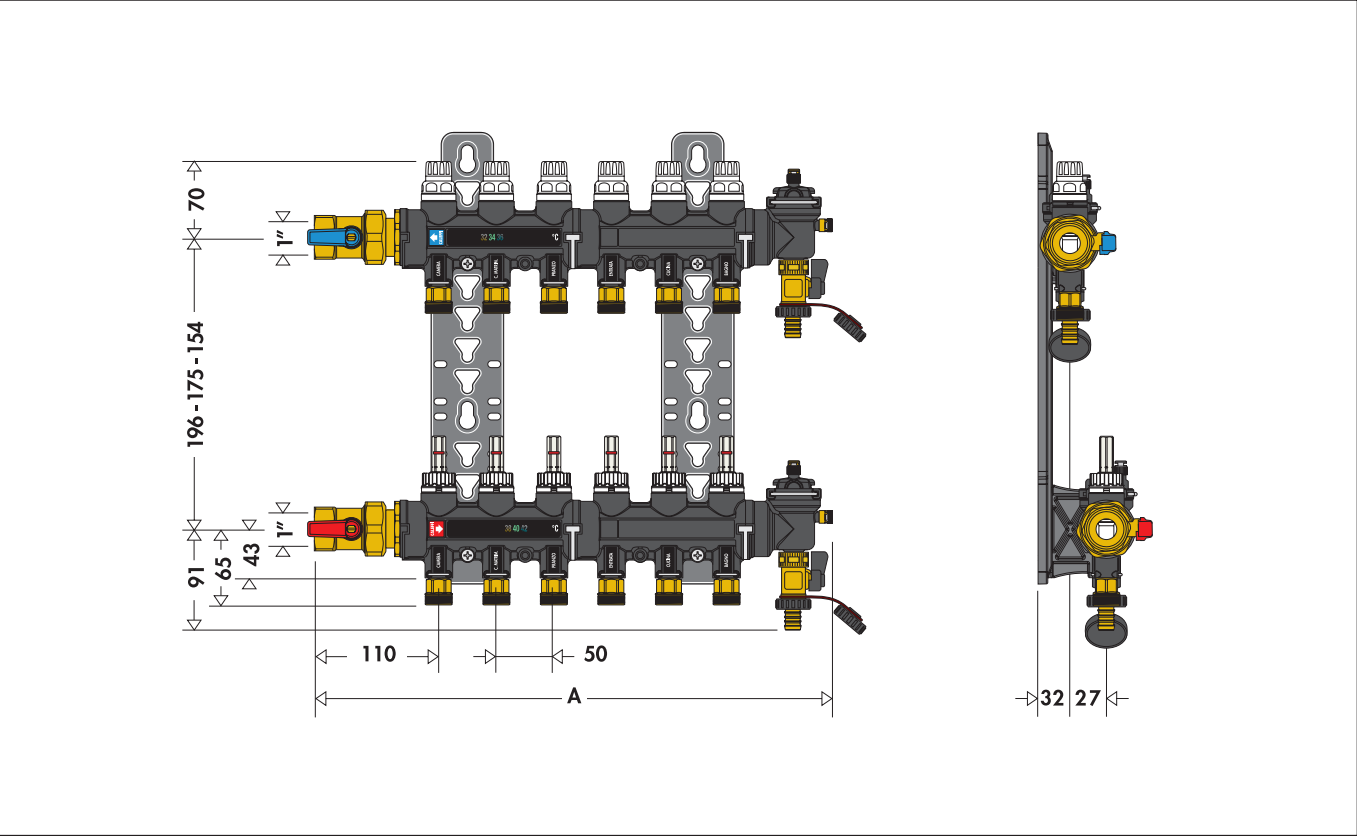
#### Ball shut-off valves

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

#### Performance

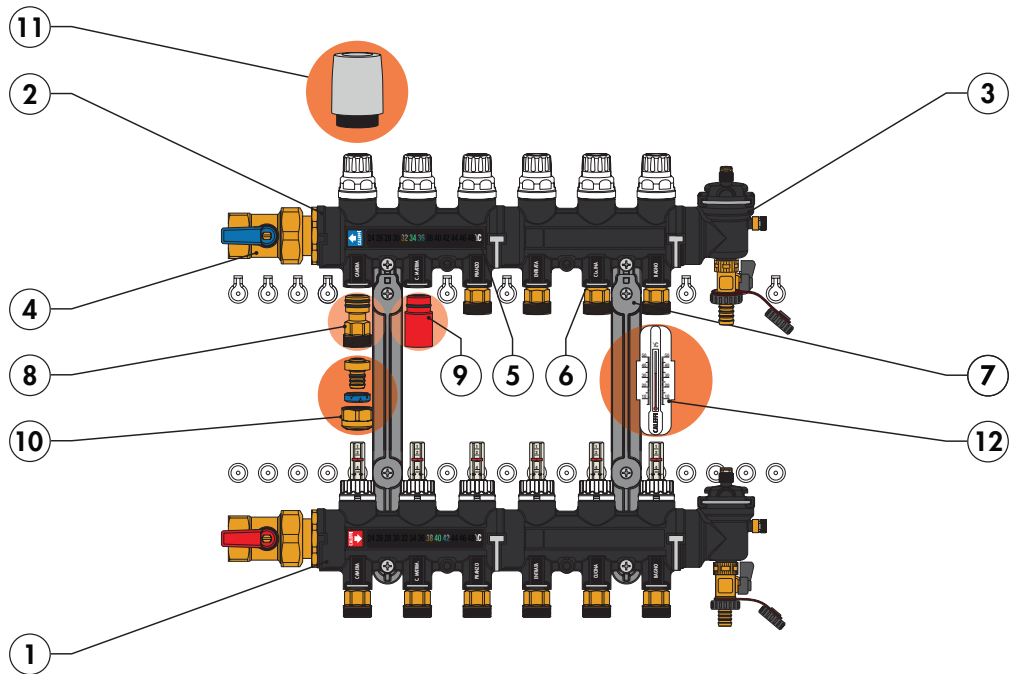
Medium:	water, glycol solutions
Max. percentage of glycol:	30 %
Maximum working pressure:	6 bar
Max. cold hydraulic test pressure:	6 bar
Max. air vent discharge pressure:	6 bar
Working temperature range:	5–60 °C
Flow meter scale:	1–4 l/min
Accuracy:	±10 %
LCD thermometers scale	24–48 °C
Main connections: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

Dimensions



No. of outlets	3	4	5	6	7	8	9	10	11	12	13	14
A	300	350	400	450	500	550	600	650	700	750	800	850

## 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
- 8) Coupling adapter with clip code 675850
- 9) Template for cutting pipe code 675002

### Accessories

- 10) 680 series DARCAL self-adjustable diameter fitting for single and multi-layer plastic pipe
- 11) 6561 series electro-thermal actuator
- 12) 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 for this use 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 across 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.

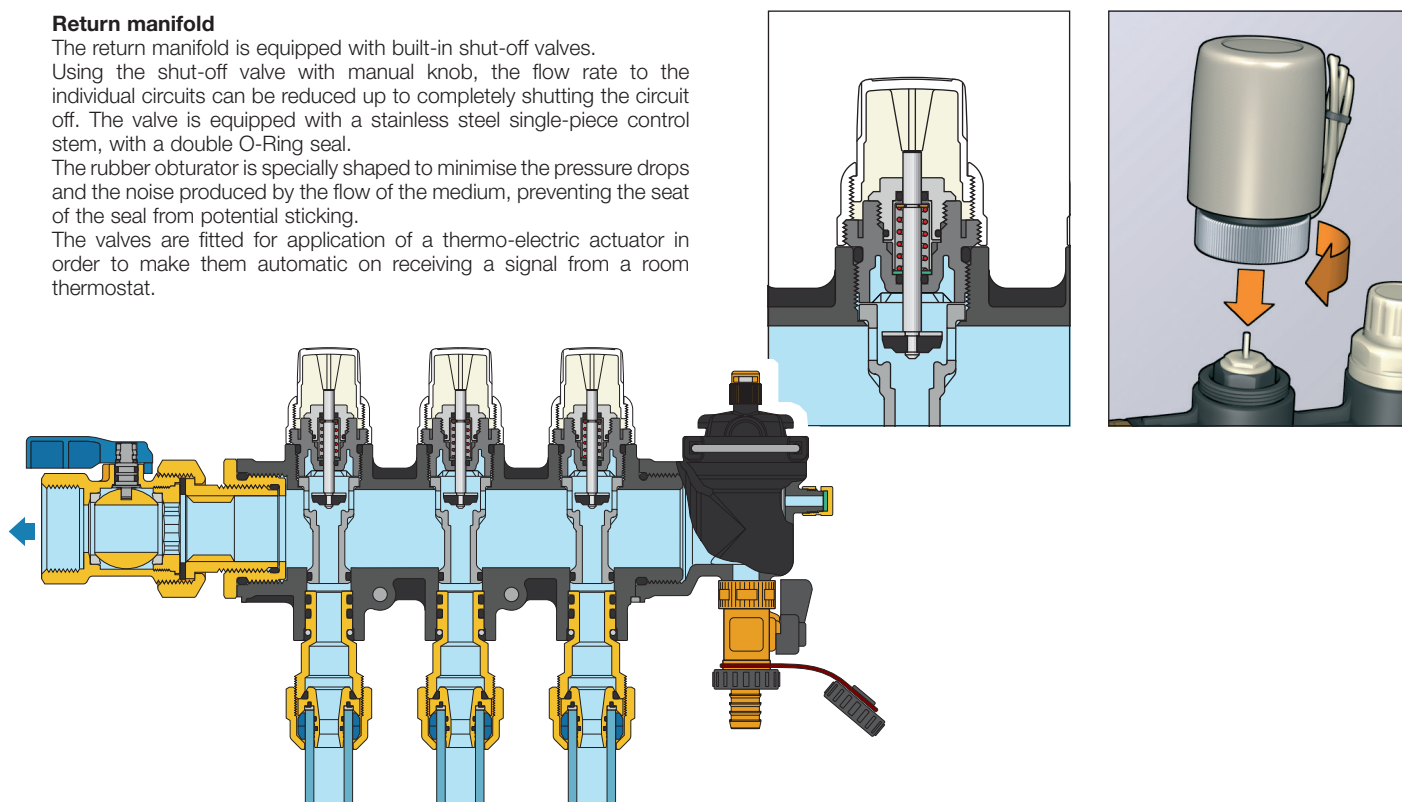
### Return manifold

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 the pressure drops and the noise produced by the flow of the medium, preventing the seat of the seal from potential 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.

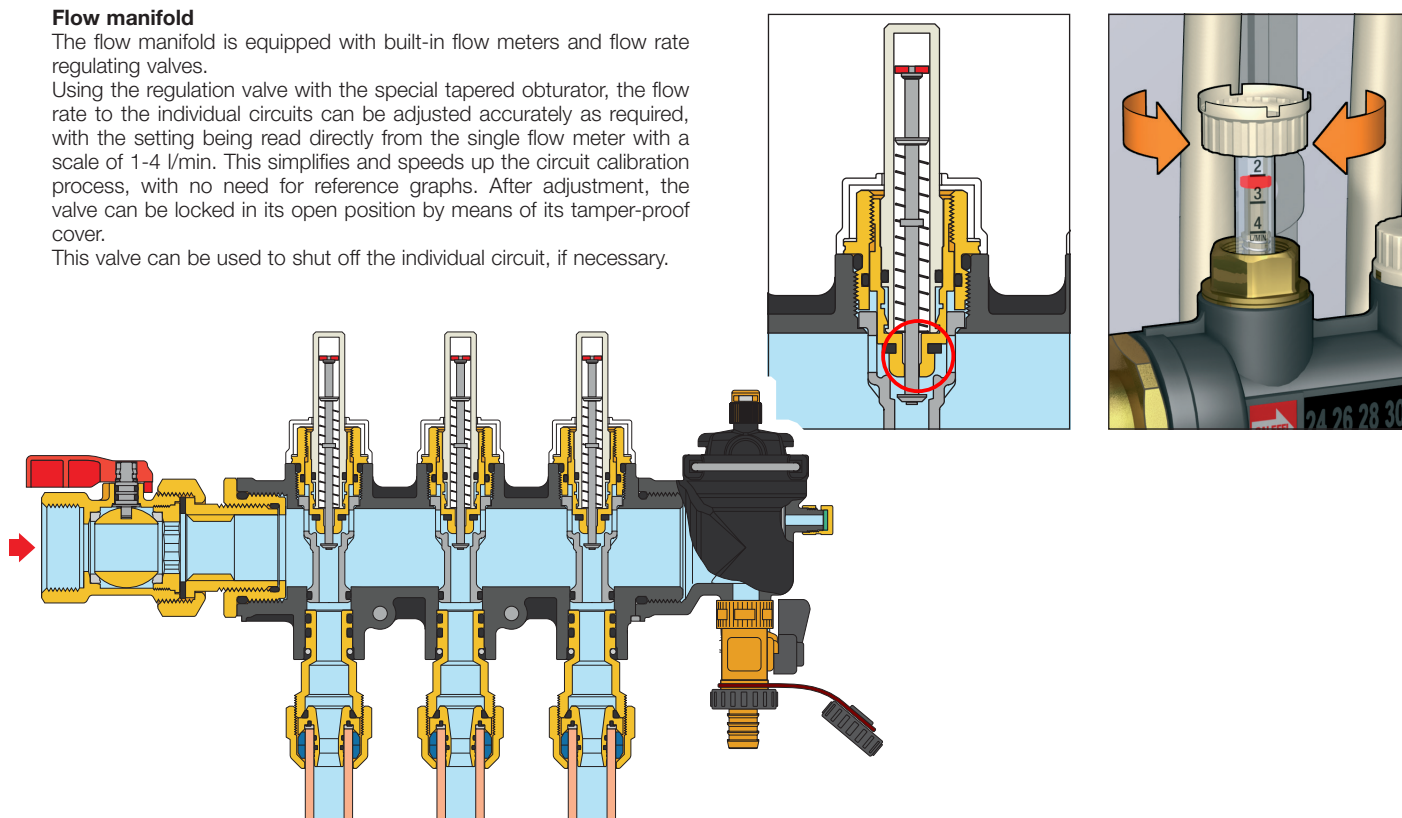


### Flow manifold

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

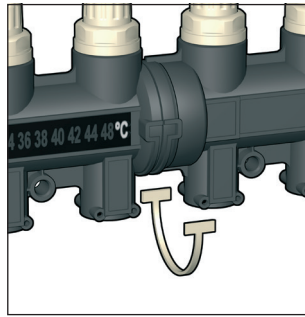
Using the regulation valve with the special tapered obturator, the flow rate to the individual circuits can be adjusted accurately as required, with the setting being read directly from the single flow meter with a scale of 1-4 l/min. This simplifies and speeds up the circuit calibration process, with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

This valve can be used to shut off the individual circuit, if necessary.



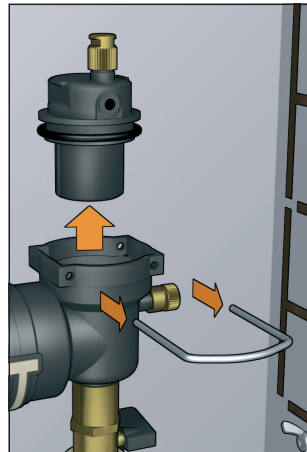
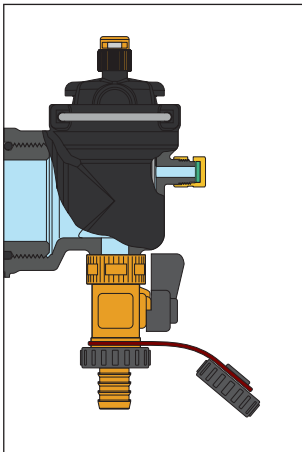
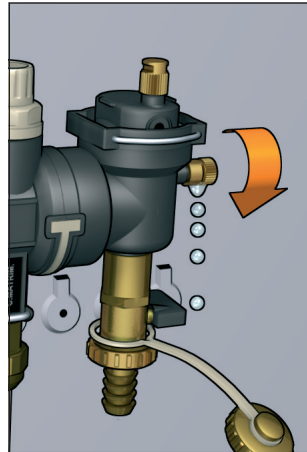
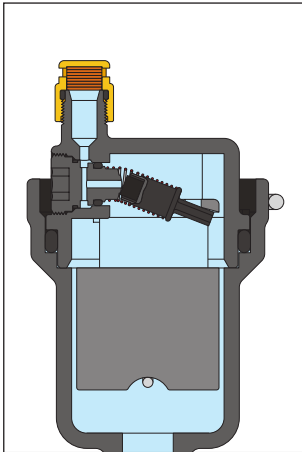
### Manifold modularity

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

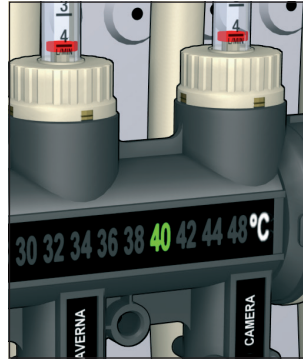
The end fitting is equipped with an automatic air vent with hygroscopic safety cap, drain valve and fill/drain ball cock. The air vent is equipped with a mechanism to remove air using a silicone rubber obturator. The vent mechanism is connected to the valve body by a fixing clip, making any inspection 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

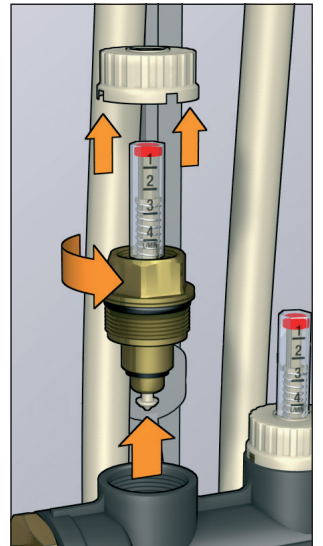
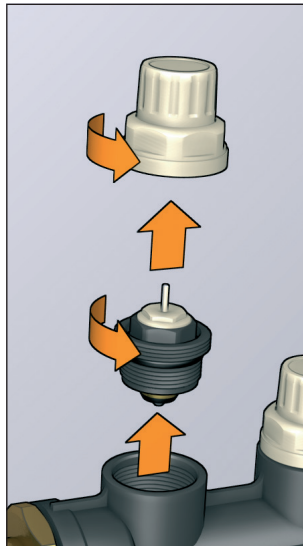
Both sides of the flow and return manifold body are equipped with an LCD thermometer, with 24–48 °C temperature range. The LCDs automatically illuminate green in correspondence with the measured temperature value to ensure easy reading even in low light conditions.

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.



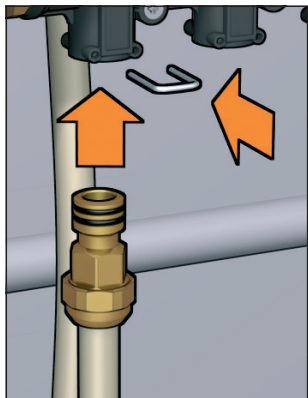
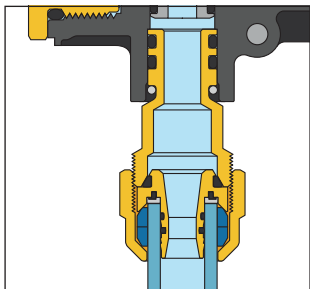
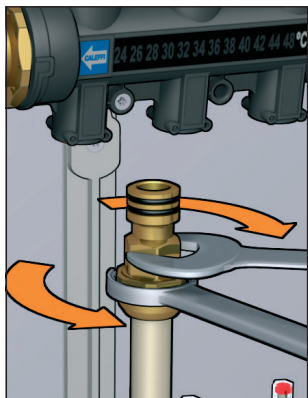
### Renewable Components

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



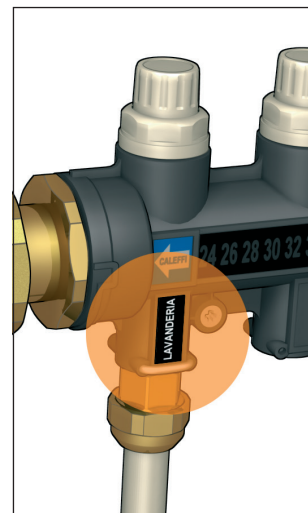
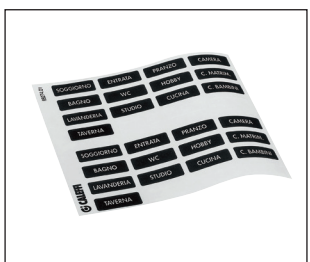
### Panel circuit outlets

The branch connections of the individual 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 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.



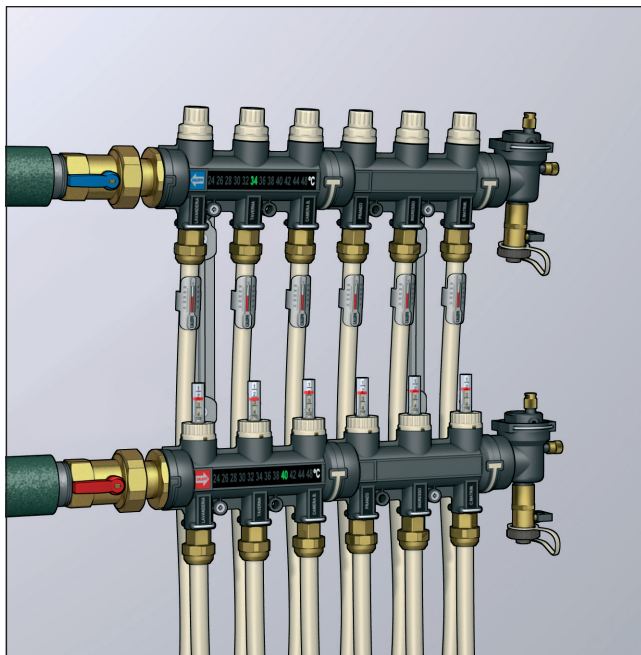
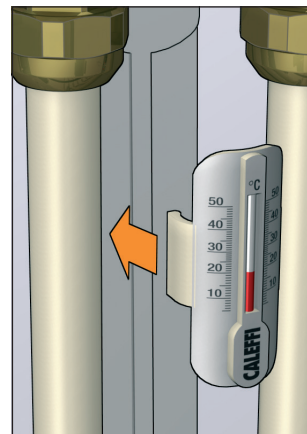
### Room identification

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



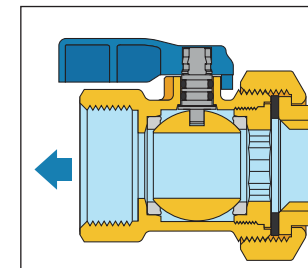
### Temperature gauges for panels pipe

As an accessory, there is a special spirit thermometer with a scale of 5–50 °C, equipped with a quick-fit plastic body for the individual panel piping, with an outer diameter between 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.

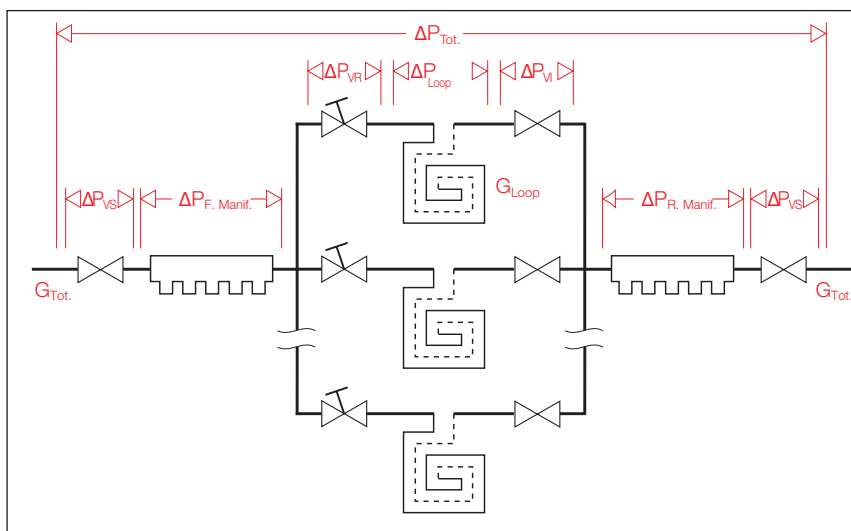
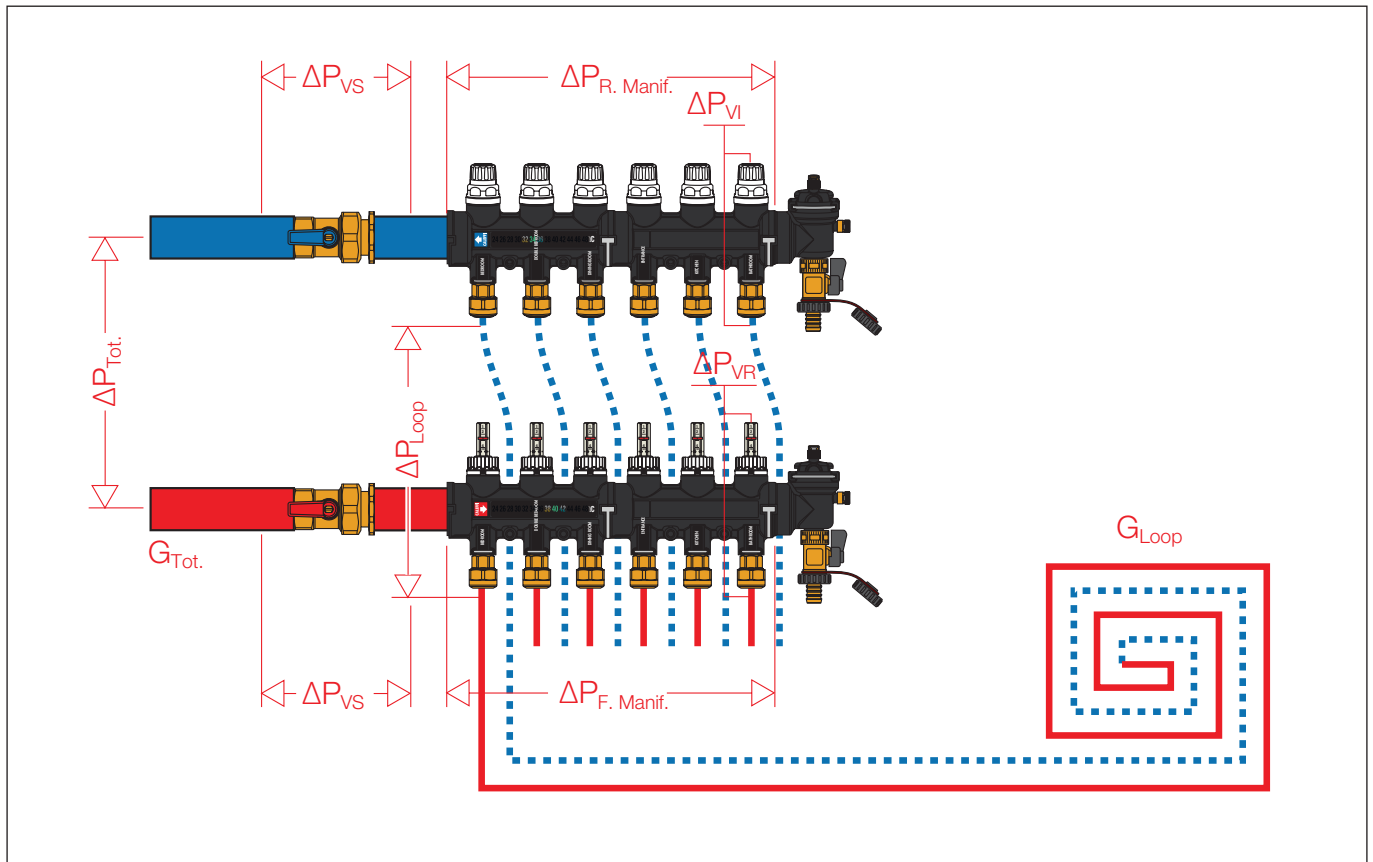




## Hydraulic characteristics

In order to determine the hydraulic characteristics of the circuit, it is necessary to calculate the total pressure drop 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.

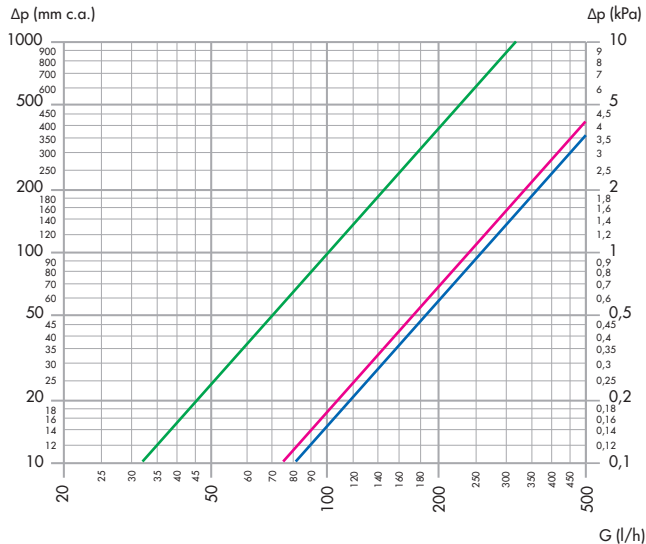


- $\Delta P_{Tot.}$  = Total pressure drop across the manifold (Flow + Return + Loop)
- $\Delta P_{Vr}$  = Local pressure drop at loop regulating valve (loop flow rate)
- $\Delta P_{Loop}$  = Loop pressure drop (loop flow rate)
- $\Delta P_{Vi}$  = Local pressure drop at panel circuit shut-off valve (loop flow rate)
- $\Delta P_{Man. M}$  = Distributed pressure drop in the flow manifold (total flow rate)
- $\Delta P_{Man. R}$  = Distributed pressure drop in the return manifold (total flow rate)
- $\Delta P_{Vs}$  = Ball valve pressure drop (total flow rate)

$$\Delta P_{Tot.} = \Delta P_{Vr} + \Delta P_{Loop} + \Delta P_{Vi} + \Delta P_{Man. M} + \Delta P_{Man. R} + \Delta P_{Vs} \times 2 \quad (1.1)$$

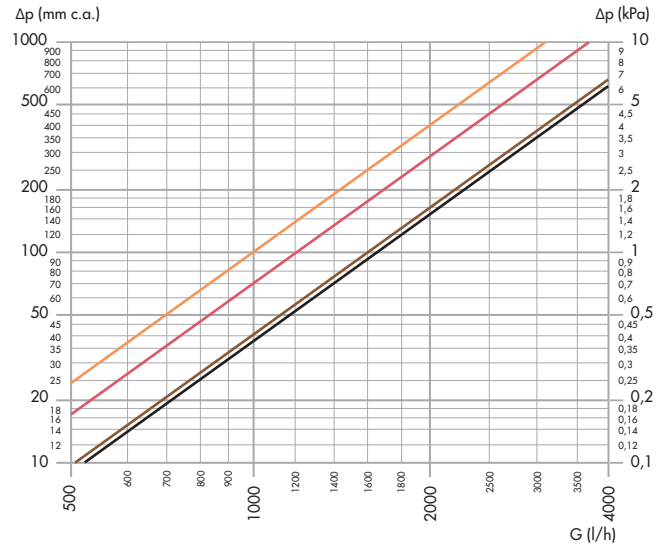
When the hydraulic characteristics of each component and the design flow rates are known, the total pressure drop can be calculated as the sum of the partial pressure drops for each specific component in the system, as given by the formula (1.1).

## Hydraulic characteristics



	Kv	Kv <sub>0,01</sub>
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 m<sup>3</sup>/h for a pressure drop of 1 bar  
 - Kv<sub>0,01</sub> = flow rate in l/h for a pressure drop of 1 kPa



	Kv	Kv <sub>0,01</sub>
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 pressure drop calculation

Supposing we need to calculate the pressure drop of a manifold with three circuits with the following characteristics:

Total manifold flow rate: 350 l/h

The flow rate and pressure drop of the three loops are as follows:

Circuit 3	Circuit 1	Circuit 2	
$\Delta P_1 = 10$ kPa	$\Delta P_2 = 15$ kPa	$\Delta P_3 = 7$ kPa	(1.2)
$G_1 = 120$ l/h	$G_2 = 150$ l/h	$G_3 = 80$ l/h	

Each term in the formula (1.1) is calculated using the following relationship:

$$\Delta P = G^2 / Kv_{0,01}^2$$

- G = flow rate in l/h
- $\Delta P$  = pressure drop in kPa (1 kPa = 100 mm w.g.)
- Kv<sub>0,01</sub> = flow rate in l/h through the device that corresponds to a pressure drop of 1 kPa

It should be stressed that the  $\Delta P_{Tot.}$  must be calculated while taking account of the circuit that has greatest pressure drops distributed along the entire panel pipe loop.

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

It follows that:

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

Using formula (1.1) and 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 pressure drops associated with the ball valves and manifolds because of their low values. In general, the total pressure drop is fairly close to the branched panel circuit pressure drop.



## Using the balancing valves with flow meter

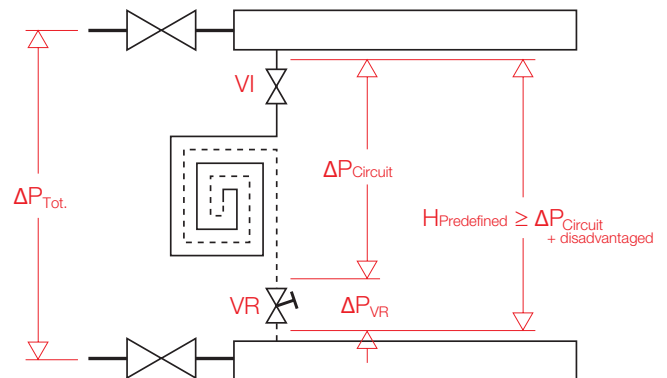
The regulating valves in the flow manifold make it possible to balance each individual panel circuit to obtain the design flow rates in each loop.

Considering the following data:

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

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

Referring to the diagram shown opposite, for the loop flow rate the regulating valve must provide an additional pressure drop equal to the difference  $\Delta P_{\text{VR}}$  ( $\Delta P_{\text{Regulating valve}}$ ).

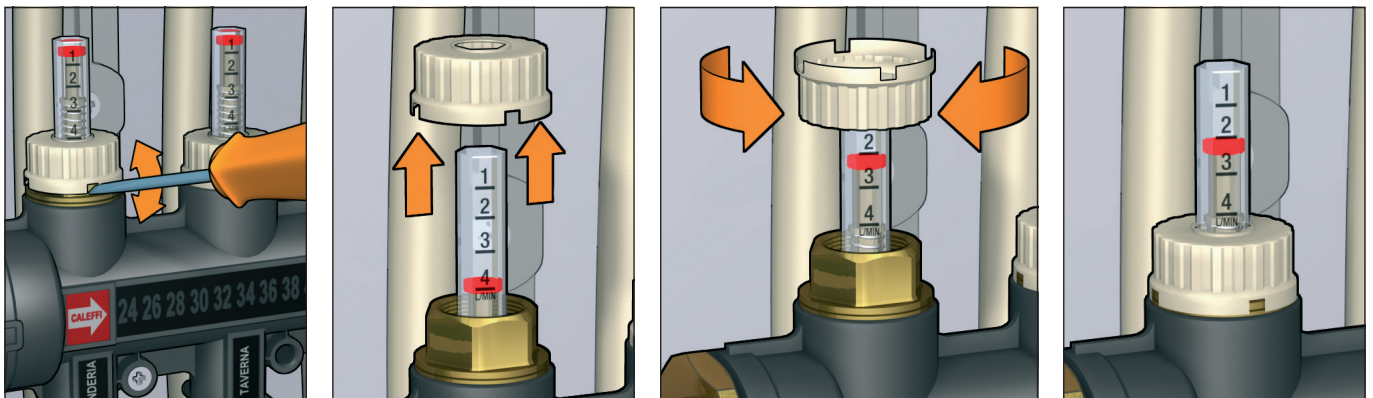


## Flow rate balancing and reading

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

### 671 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.

Consisting of:

- 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 ball shut-off 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 mounting brackets.
- Coupling adapters with fixing clip code 675850 for manifold outlet and 680 series fitting connection.
- Pipe cutting template code 675002.

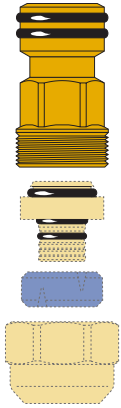
### Accessories



**675**

Coupling adapter with fixing clip code 675850 for 671 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, glycol solutions  
Max. percentage of glycol: 30 %  
Maximum working pressure: 10 bar  
Working temperature range: 0–100 °C  
5–60 °C (coupled in manifold 671)

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



**680 DARCAL**

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

Size: 3/4".

### Technical specifications

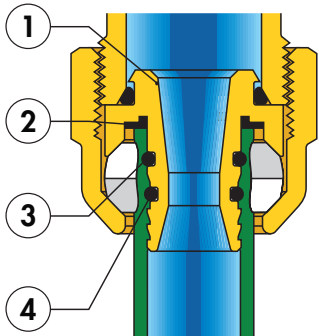
#### Materials

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 (Multi-layer marked 95 °C)

Connection:



### 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 pressure drops

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 O-Ring seals (3) – (4) made of EPDM in order to avoid potential leaks even at high working pressures.

Code		Pipe (mm)	
		Ø <sub>internal</sub>	Ø <sub>outside</sub>
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  
Maximum ambient temperature: 50 °C  
Operating time: opening and closing from 120 s to 180 s  
Electric supply cable length: 80 cm.



### 675

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

### 659

tech. broch. 01180



Box for manifolds - 349, 350, 592,  
662, 671, 664 and 665 series.  
Complete with special support for  
manifold mounting brackets.  
Closure with a quick-fit clamp. Made of  
painted sheet steel.

**Depth adjustable from 80 to 120 mm.**

## 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<sub>e</sub>): 15 to 18 mm  
Conducting paste supplied in package

Code	Useful dim. (h x b x d)
659045	500 x 400 x 80–120
659065	500 x 600 x 80–120
659085	500 x 800 x 80–120
659105	500 x 1000 x 80–120

## SPECIFICATION SUMMARY

### 680 series

Self-adjusting diameter fitting for single and multi-layer plastic pipes with internal profile offering a Venturi effect to limit pressure drops. 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 (Multi-layer marked 95 °C).

### 675 series

Quick-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.

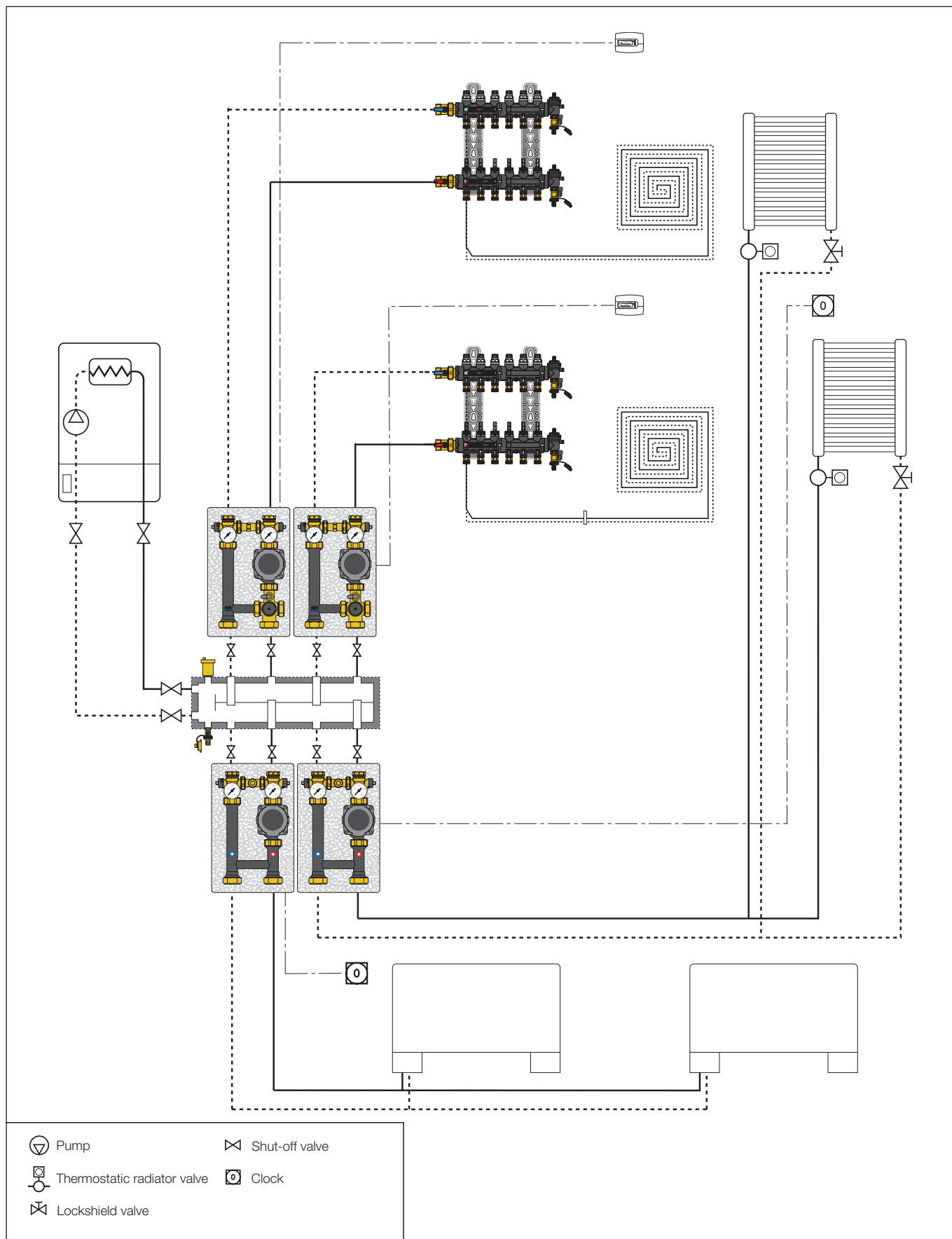
### 6561 series

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. Electric supply cable length 80 cm.

### 659 series

Box for manifolds - 349, 350, 592, 662, 671, 664 and 665 series. Complete with special support for manifold mounting brackets. Closure with a quick-fit clamp. Made of painted sheet steel. Depth adjustable from 80 to 120 mm.

## Application diagram



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