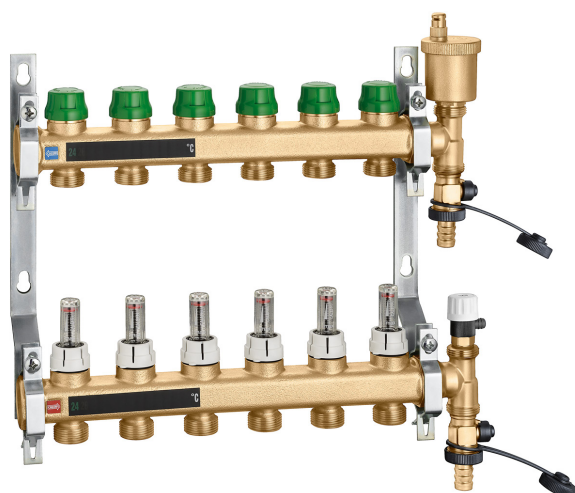


Dynamic distribution manifold for radiant panel systems DYNAMICAL®

665 series



Function

The DYNAMICAL® manifold allows the automatic dynamic balancing and pressure-independent adjustment of the thermal medium in the individual circuits of underfloor heating systems.

This series of manifolds is composed of:

- return manifold complete with DYNAMICAL® flow regulating valves fitted for a thermo-electric actuator, with a flow rate regulation range of 25–150 l/h and shut-off valves;
- flow manifold complete with flow indicators and shut-off valves;
- end fittings complete with automatic and manual air vents with fill/drain cocks;
- steel mounting brackets for box or direct wall mounting.

Product range

665 series Dynamic distribution manifold for radiant panel systems _____ size 1"

Technical specifications

Materials

Flow manifold

Body: brass EN 1982 CB753S

Flow indicator:

Stem and obturator: PA

Hydraulic seals: EPDM

Protective cover: ABS

Spring: stainless steel EN 10270-3 (AISI 302)

Return manifold

Body: brass EN 1982 CB753S

DYNAMICAL® balancing valve:

Obturator control stem: stainless steel

Hydraulic seals: EPDM

Control knob: ABS (PANTONE 356C)

Brackets and supports:

Steel EN 10027-1 S235JR

Performance

Medium: water, glycol solutions

Max. percentage of glycol: 30%

Max differential pressure with control fitted: 1.5 bar

Maximum working pressure: 6 bar

Flow rate regulation range: 25–150 l/h

Operating range Δp : (pos. 1-2-3-4) 20–150 kPa

(pos. 5-6) 25–150 kPa

Factory setting: 6

Thermal medium working temperature range: 5–60°C

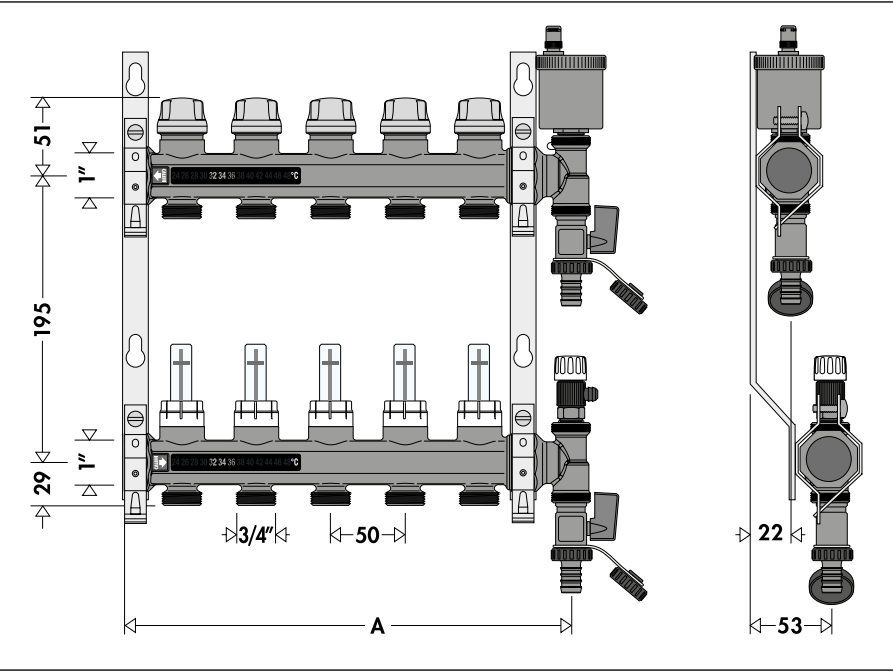
Liquid crystal digital thermometer scale: 24–48°C

Main connections: 1" F (ISO 228-1)

Outlets: 3/4" M

Centre distance: 50 mm

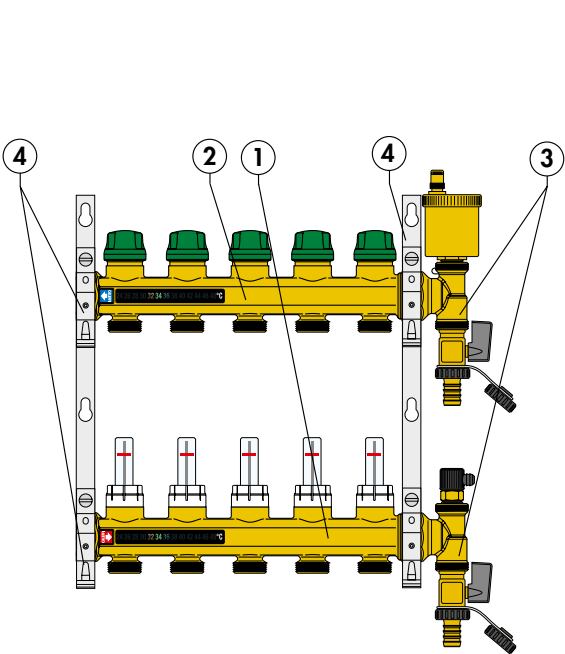
Dimensions



Code	No. of outlets	Total L (A)	Mass (kg)
6656D1	4	280	3,9
6656E1	5	330	4,6
6656F1	6	380	5,0
6656G1	7	440	5,3
6656H1	8	490	6,2
6656I1	9	540	6,9
6656L1	10	590	7,6
6656M1	11	640	8,0
6656N1	12	690	8,6

Characteristic components

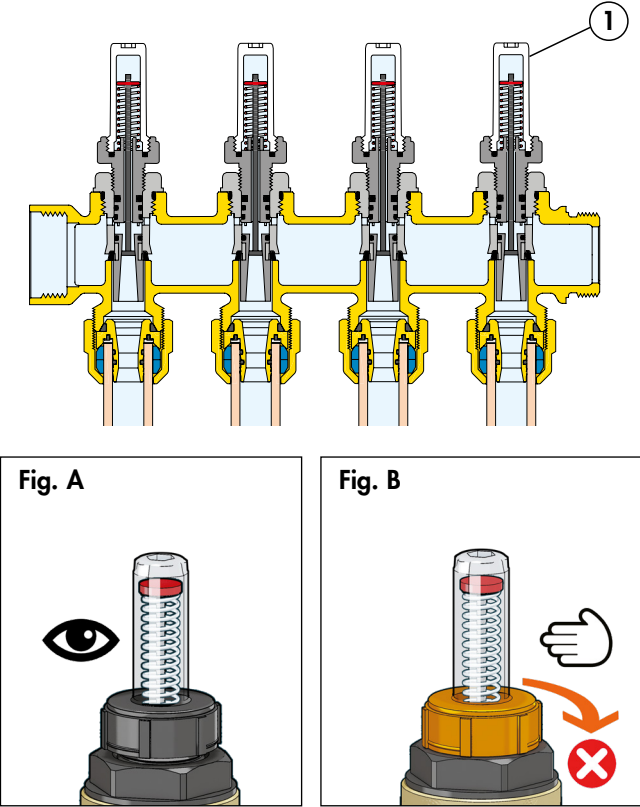
- 1. Flow manifold equipped with a flow indicator.
- 2. Return manifold equipped with DYNAMICAL® balancing valves that ensure automatic dynamic balancing and flow regulation of the medium, regardless of the pressure.
- 3. End fittings complete with manual and automatic air vents, double radial end fitting, drain cocks and plugs.
- 4. Pair of mounting brackets for manifold box or wall installation.



Construction details

Flow manifold

The flow manifold is equipped with a medium flow indicator. (1). During operation, the indicator must always be in the fully opened position (fig. A). The indicators may also be used to shut off flow to the corresponding circuit (fig. B).



Return manifold

The return manifold is equipped with DYNAMICAL® balancing valves (2) that ensure automatic dynamic balancing and flow regulation of the medium, regardless of the pressure.

To preset the flow rate, simply turn the control stem, using the corresponding shaped locking nut, to the desired setting position (fig. C).

They can also be fitted with a thermo-electric actuator that, when used with a room thermostat, maintains the ambient temperature at the set values regardless of thermal load variations (fig. D).

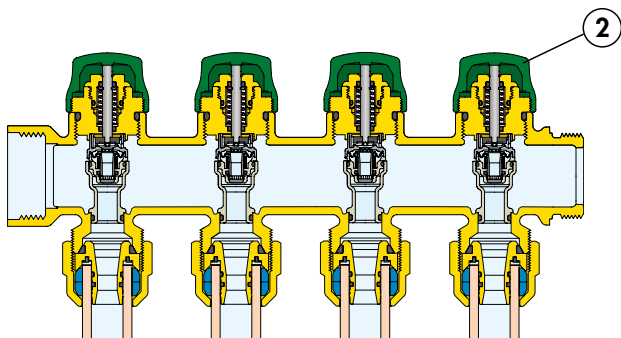
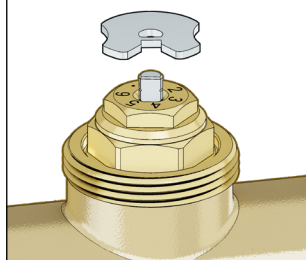


Fig. C



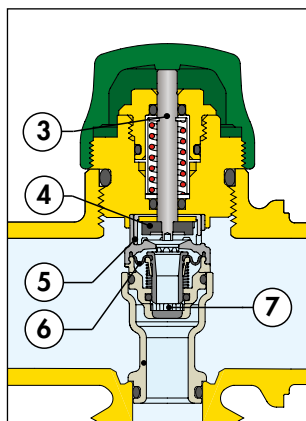
The stainless steel control stem (3) has a double EPDM O-Ring seal.

The obturator (4) is in EPDM and the internal pre-setting device (5) is made of anti-seizing polymer.

The balancing diaphragm (6) made of EPDM with high mechanical sensitivity, combined with the spring and control device, allows adjustment of the differential pressure.

There is a protective casing (7) to minimise the risk of dirt getting into the dynamic component.

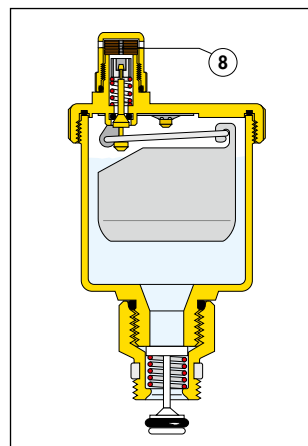
Fig. D



Return manifold end fitting

The automatic air vent automatically expels the air accumulating in the circuits of the air conditioning system.

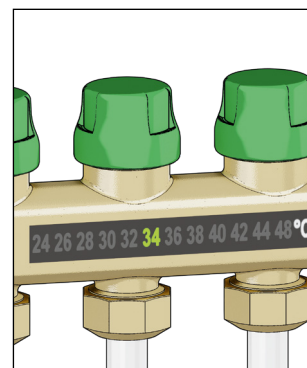
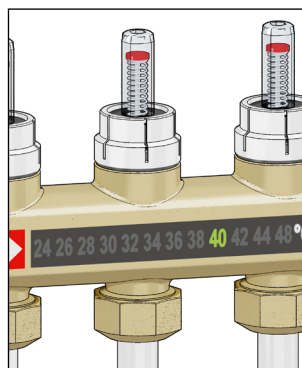
It is equipped with a hygroscopic safety cap (8) that prevents water from getting out in order to protect the installation.



Digital temperature gauges

An LCD thermometer with a working temperature range 24-48°C is supplied with the product, and can be applied to the visible side of the manifold after installation. 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.



Ease of design

The internal device, which is able to regulate the flow rate and stabilise the working Δp , allows faster design and balancing operations: no other support elements are required for calculations and presetting is very simple.

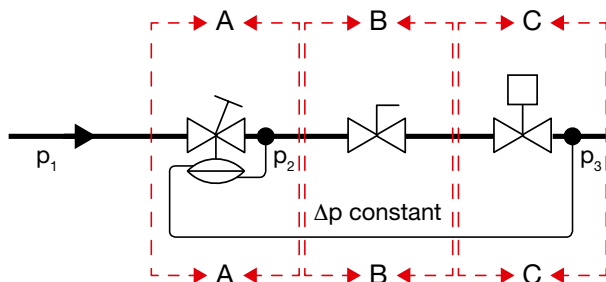
Operating principle

The dynamic manifold is designed to control the flow rate in individual circuits of underfloor heating systems. This flow rate should be:

- adjustable in accordance with the requirements of the part of the circuit controlled by the device;
- constant despite any variation in differential pressure conditions in the circuit.

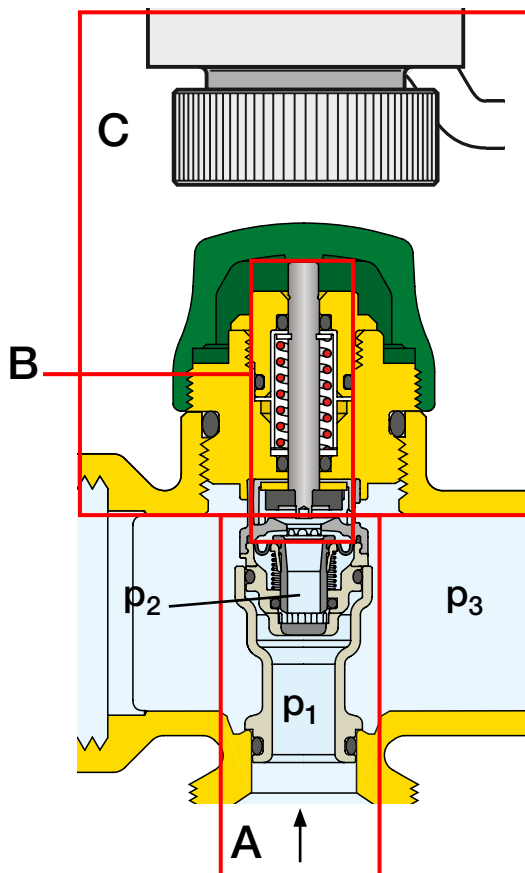
The device, in conjunction with a thermo-electric actuator, combines different functions in a single component:

- Differential pressure regulating valve**, which automatically cancels the effect of the pressure fluctuations typical of variable flow rate systems and prevents noisy operation.
- Device for presetting the flow rate**, which allows direct setting of the maximum flow rate value, thanks to its combination with the differential pressure regulating valve.
- Flow rate control depending on the ambient temperature**, thanks to its combination with a thermo-electric actuator. Flow rate control is optimised because it is pressure-independent.



Where:

p_1 = upstream pressure
 p_2 = intermediate pressure
 p_3 = downstream pressure
 $(p_1 - p_3)$ = total valve Δp
 $(p_2 - p_3)$ = constant Δp



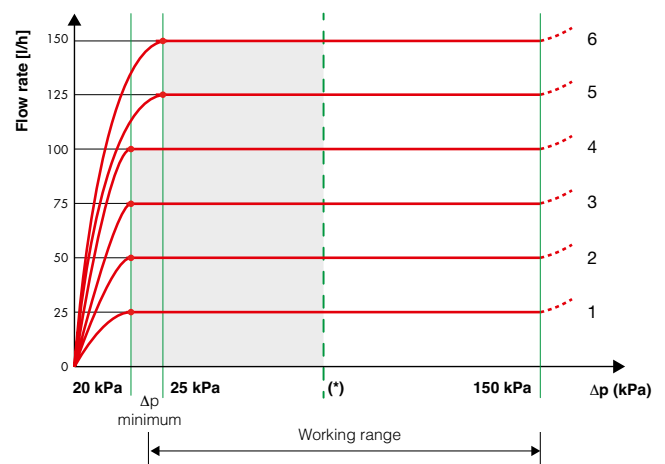
Device (A) regulates the Δp and keeps it constant across the device (B+C), by means of an automatic action (balancing between the force generated by the differential pressure and the internal opposing spring). If $(p_1 - p_3)$ increases, the internal Δp regulator reacts to close the bore and maintains Δp constant; in these conditions the flow rate will remain constant.

Device (B) regulates flow rate G by changing its bore cross section. The change in bore cross section determines the hydraulic coefficient value (K_v) of the regulator device (B), which remains constantly at:

- a manually preset value
- a value determined by the actuator's regulating action.

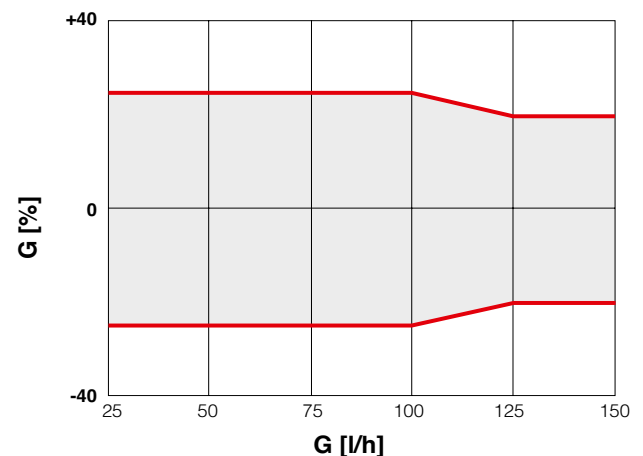
Working range

For the device to keep the flow rate constant independently from the circuit's differential pressure conditions, the total valve Δp ($p_1 - p_3$) must be in the range between the minimum Δp value (20 kPa for adjustments from 1 to 4 and 25 kPa for adjustments 5 and 6) and the maximum value of 150 kPa.



(*) Recommended working range: for the best dynamic behaviour without problems linked to the passage of the water flowing through the valve it is recommended to work with $\Delta p < 70$ kPa.

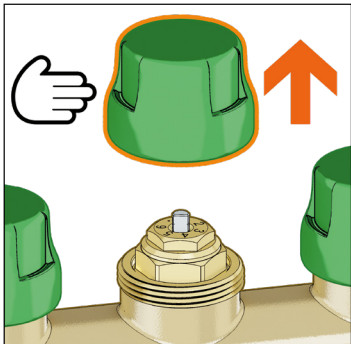
Flow rate accuracy



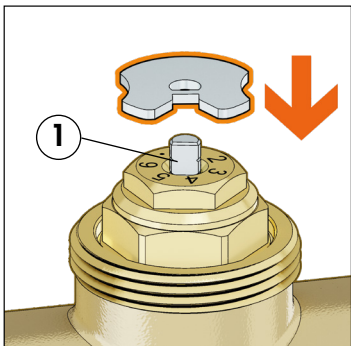
Δp min (25-100 l/h): 20 kPa
 Δp min (125-150 l/h): 25 kPa

Presetting and installation of thermo-electric actuators

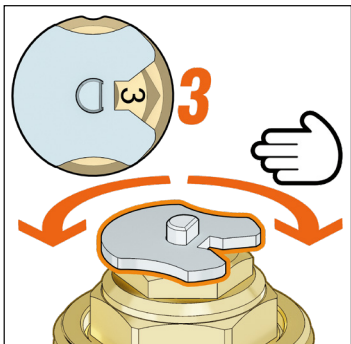
Remove the knob from the valve.



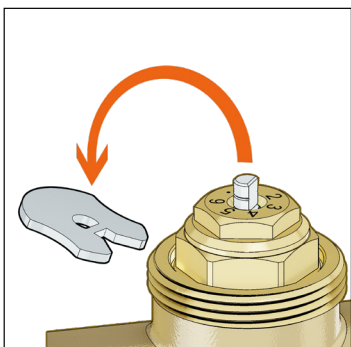
To preset the flow rate, position the appropriate shaped nut. The reference of the setting position is defined by the orientation of the flat side surface (1) of the control stem.



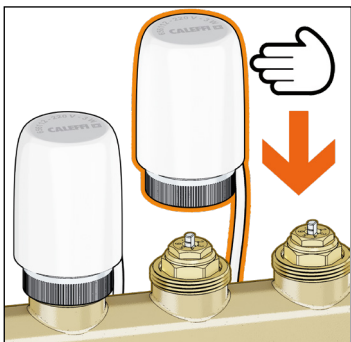
Rotate the control stem to select the desired position.



Remove the adjustment nut.

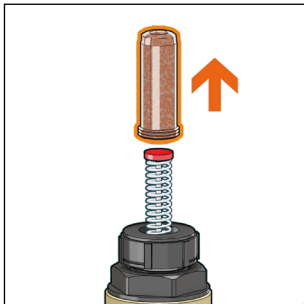


Install the thermo-electric control on the valve.



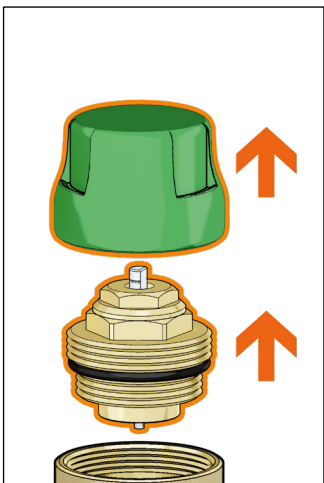
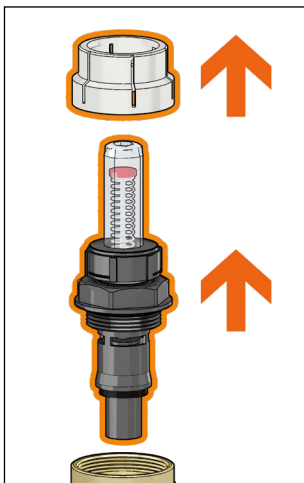
Cleaning or changing flow indicators

The flow indicators, supplied with the flow manifold, are easily removed for cleaning purposes without having to empty the system.



Replaceable components

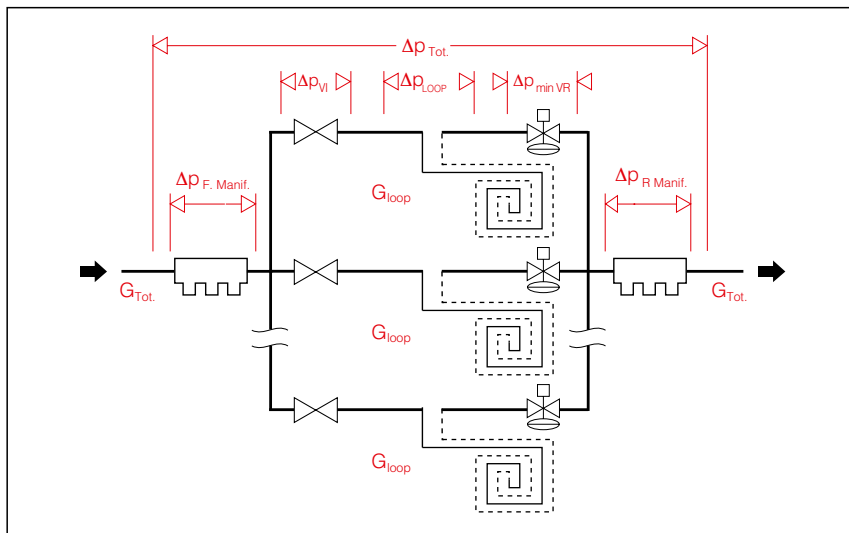
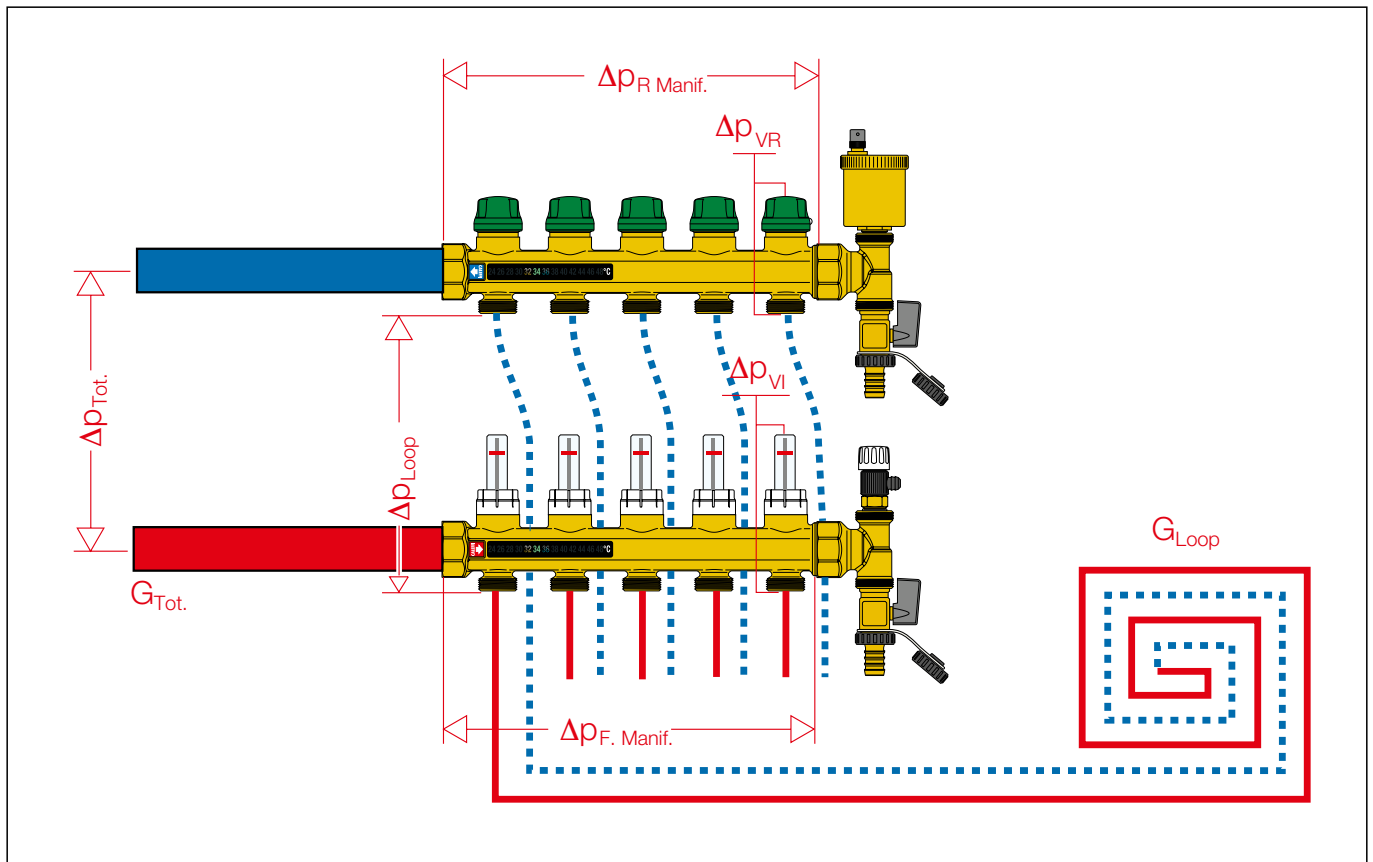
The headwork of the balancing valve with flow meter and the shut-off valve can be removed and replaced with spare parts.



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 head loss across the manifold (Flow + Return + Loop)

$\Delta p_{min VR} =$ minimum working Δp of the DYNAMICAL[®] valve

$\Delta p_{Loop} =$ Loop pressure drop (loop flow rate)

$\Delta p_V =$ Local pressure drop at panel circuit shut-off valve (loop flow rate)

$\Delta p_{Manif. F} =$ Distributed pressure drop for the flow manifold (total flow rate)

$\Delta p_{Manif. R} =$ Distributed pressure drop for the return manifold (total flow rate)

$$\Delta p_{Tot.} = \Delta p_{min VR} + \Delta p_{Loop} + \Delta p_{VI} + \Delta p_{Manif. F} + \Delta p_{Manif. R} \quad (1.1)$$

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

Manifold

	Kv	Kv _{0,01}
Flow manifold 4-7 ports	11,10*	1110*
Return manifold 4-7 ports	12,30*	1230*
Flow manifold 8-12 ports	6,90*	690*
Return manifold 8-12 ports	9,00*	900*

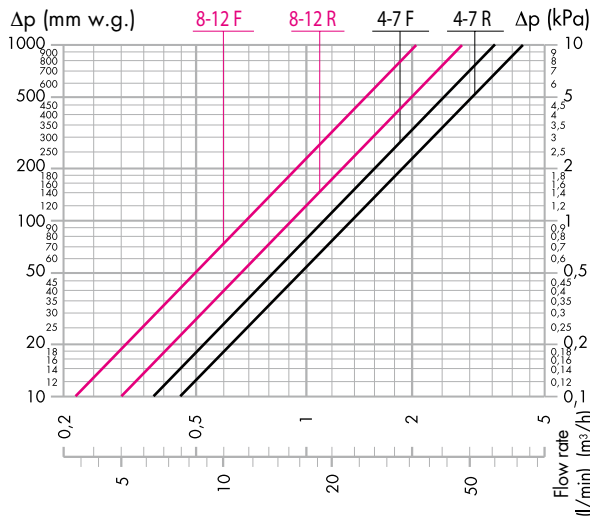
* Average value

Shut-off valve and flow indication

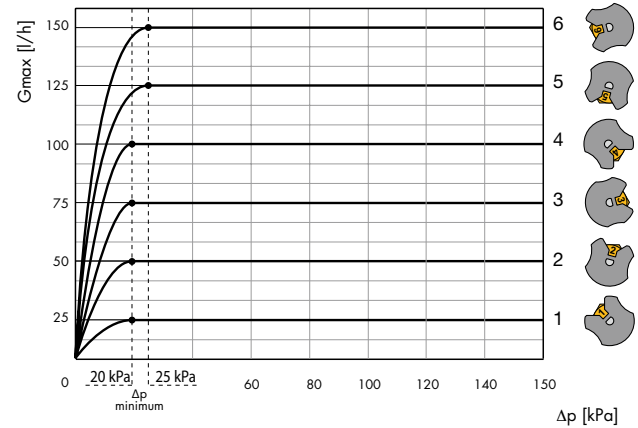
	Kv	Kv _{0,01}
Flow indicator valve (fully open)	1,10	110

DYNAMICAL® balancing valves

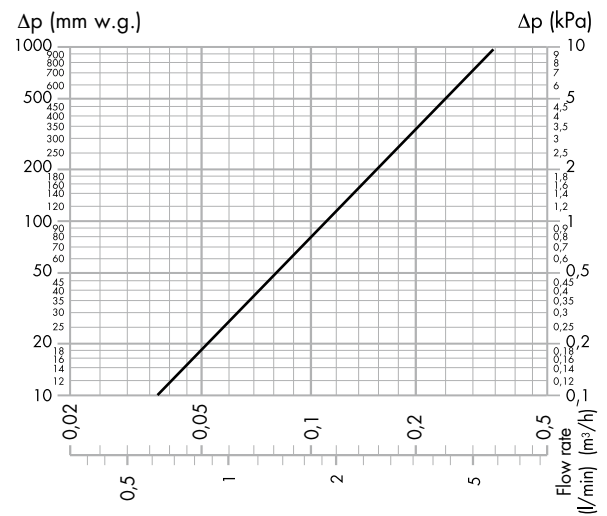
Manifold



DYNAMICAL® regulating valves



Shut-off valve and flow indication



Example of total pressure drop calculation

Supposing we need to calculate the pressure drop of a four-port manifold with the following characteristics:

- total manifold flow rate: 430 l/h

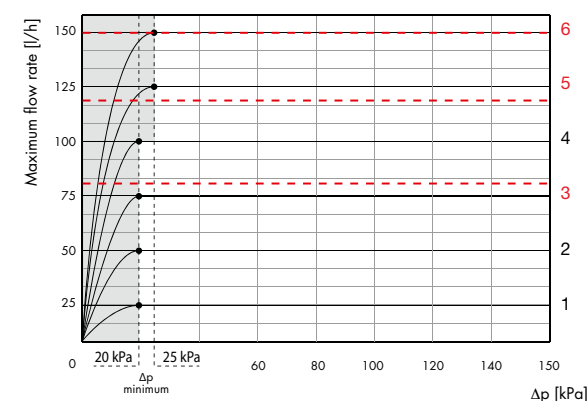
The flow rate and pressure drop for the pipes in the the four loops are as follows:

Circuit 1	Circuit 2	Circuit 3 and circuit 4
$\Delta p_1 = 10 \text{ kPa}$	$\Delta p_2 = 15 \text{ kPa}$	$\Delta p_3 = 7 \text{ kPa}$
$G_1 = 120 \text{ l/h}$	$G_2 = 150 \text{ l/h}$	$G_3 = 80 \text{ l/h}$

Presetting and effective flow rate

The setting positions can be easily determined based on the design flow rates from the graph or from the table shown in the paragraph "Hydraulic characteristics".

Circuit 1	pos. 5	$G_1 = 125 \text{ l/h}$
Circuit 2	pos. 6	$G_2 = 150 \text{ l/h}$
Circuit 3 - 4	pos. 4	$G_3 = 75 \text{ l/h}$



Pressure drop calculation

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

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

where:

G = flow rate in l/h

Δp = pressure drop in kPa (1 kPa = 100 mm w.g.)

$Kv_{0,01}$ = flow rate in l/h through the device that corresponds to a pressure drop of 1 kPa.

Circuit 1	Circuit 2	Circuit 3 - 4
$\Delta p_{\min VR} = 25 \text{ kPa}$	$\Delta p_{\min VR} = 25 \text{ kPa}$	$\Delta p_{\min VR} = 20 \text{ kPa}$
$\Delta p_{\text{Loop}} = 10 \text{ kPa}$	$\Delta p_{\text{Loop}} = 15 \text{ kPa}$	$\Delta p_{\text{Loop}} = 7 \text{ kPa}$
$\Delta p_{VI} = 1,3 \text{ kPa}$	$\Delta p_{VI} = 1,9 \text{ kPa}$	$\Delta p_{VI} = 0,5 \text{ kPa}$

$\Delta p_{\text{TOT}} = 36,3 \text{ kPa}$	$\Delta p_{\text{TOT}} = 41,9 \text{ kPa}$	$\Delta p_{\text{TOT}} = 27,5 \text{ kPa}$
--	--	--

The Δp_{TOT} to be taken into consideration corresponds to the value for the circuit in which the greatest pressure drops occur. In the case we are examining, the relevant circuit is No. 2.

Let us calculate the pressure drops for the manifold with a flow rate of 350 l/h.

$\Delta p_{\text{Manif. F}} = 0,10 \text{ kPa (*)}$

$\Delta p_{\text{Manif. R}} = 0,08 \text{ kPa (*)}$

The total pressure drop is as follows:

$$\Delta p_{\text{TOT}} = 41,9 + 0,10 + 0,08 \approx 42$$

Note:

In this example, because of the low pressure drops associated with the manifolds, the two terms relating to them can be disregarded.

ACCESSORIES



Insulation for 662, 664 and 665 series manifolds
For heating and cooling.
Use box, code 659..4
(depth 110-140 mm).

Code

CBN6646F1 for manifolds with 2 to 6 connections

CBN6646N1 for manifolds with 7 to 12 connections

CBN6646O1 for manifolds with 13 connections

Bypass kit



662010

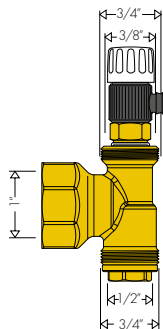
Off-centre bypass kit
fixed setting 25 kPa (2500 mm w.g.)
For 664 and 665 series manifolds.
Max. working pressure: 10 bar.
Working temperature range:
-10–110°C.

End fitting

599662



End fitting composed of air vent
cock, double radial connection
and plug.
Max. working pressure: 10 bar.
Working temperature range:
5–100°C.
Main connection: 1" F.
Lower connection: 3/4" M.
Upper air vent connection: 3/8" F.
Lower plug connection: 1/2" F.



Air vent



502033

Automatic air vent.
In hot stamped brass.
With hygroscopic safety cap.
Max. working pressure: 10 bar.
Max. drain pressure: 2.5 bar.
Max. working temperature: 120°C.
Connection 3/8" M

R59681 AQUASTOP®

Hygroscopic safety cap.
For air vents
5020 and 5021 series.

337231

Mini drain cock
with metal seal.

Adjustable drain.

PTFE seal on thread.
Max. working pressure: 10 bar.
Max. working temperature: 100°C.
Connection 3/8" M.



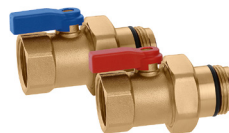
Drain cock



538400

Drain cock
with hose connection and cap.
Max. working pressure: 10 bar.
Max. working temperature: 110°C.
Connection 1/2" M.

Shut-off valves



391066

Pair of ball shut-off valves with
female-male connections and union
with O-ring seal.
For 664 and 665 series manifolds.
Max. working pressure: 10 bar.
Working temperature range: 5–100°C.
connection 1".

Brackets



658101

Pair of steel mounting brackets
for 662, 664 and 665 series manifolds.
For use with boxes in the 659..5 series
or for direct wall mounting.

Fittings



680 DARGAL

Self-adjustable diameter fitting for single
and multi-layer plastic pipes.
Max. working pressure: 10 bar.
Working temperature range: 5–80°C (PE-X),
5–75°C (Multi-layer marked 95°C).

Code

Ø_{internal} Ø_{outside}

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

347



Mechanical fitting
for annealed copper, hard copper, brass,
mild steel and stainless steel pipes.
O-Ring seal.

Max. working pressure: 10 bar.
Working temperature range: -25–120°C.

Code

347510 3/4" - Ø 10

347512 3/4" - Ø 12

347514 3/4" - Ø 14

347515 3/4" - Ø 15

347516 3/4" - Ø 16

347518 3/4" - Ø 18



386500

Screw plug with nut,
for manifold outlets.
3/4" connection.

Thermo-electric actuators



6561

tech. broch. 01042

Thermo-electric actuator. Normally closed.
With auxiliary microswitch.
Electric supply: 230 V (ac) or 24 V (ac)/(dc).
Auxiliary microswitch contact rating:
0,8 A (230 V).
Running power consumption: 3 W.
Starting current: ≤ 1 A.
Ambient temperature range: 0–50°C.
Protection class: IP 44 (in vertical position).



Code	Voltage (V)	
656102	230	
656104	24	
656112	230	With auxiliary microswitch
656114	24	With auxiliary microswitch

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
Ambient temperature range: 0–50°C
Operating time: opening and closing from 120 s to 180 s
Electric supply cable length: 80 cm

Thermo-electric actuators with manual opening knob and position indicator



6563

tech. broch. 01142

Thermo-electric actuator. Normally closed.
With manual opening knob and position indicator.
With auxiliary microswitch.
Electric supply: 230 V (ac) or 24 V (ac)/(dc).
Auxiliary microswitch contact rating: 0,8 A (230 V).
Running power consumption: 3 W.
Starting current: ≤ 1 A.
Ambient temperature range: 0–50°C.
Protection class: IP 40. PATENTED



Code	Voltage (V)	
656302	230	
656304	24	
656312	230	With auxiliary microswitch
656314	24	With auxiliary microswitch

Technical specifications

Materials

Protective shell: self-extinguishing polycarbonate
Colour: (code 656302/04) white RAL 9010
(code 656312/14) 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 656312/14): 0,8 A (230 V)
Protection class: IP 40
Double insulation construction: ☒ CE
Ambient temperature range: 0–50°C
Operating time: opening and closing from 120 s to 180 s
Electric supply cable length: 80 cm

Thermo-electric actuator, quick-coupling installation with clip adaptor



6562/4

tech. broch. 01198

Thermo-electric actuator. Normally closed.
With opening position indicator.
Quick-coupling installation with clip adaptor.
With auxiliary microswitch.
Electric supply: 230 V (ac) or 24 V (ac)/(dc).
Auxiliary microswitch contact rating: 0,8 A (230 V).
Running power consumption: 3 W.
Starting current: ≤ 1 A.
Ambient temperature range: 0–50°C.
Protection class: IP 54.



Code	Voltage (V)	
656202	230	
656204	24	
656212	230	With auxiliary microswitch
656214	24	With auxiliary microswitch

Low power consumption version

Code	Voltage (V)	
656402	230	
656404	24	
656412	230	With auxiliary microswitch
656414	24	With auxiliary microswitch

Technical specifications

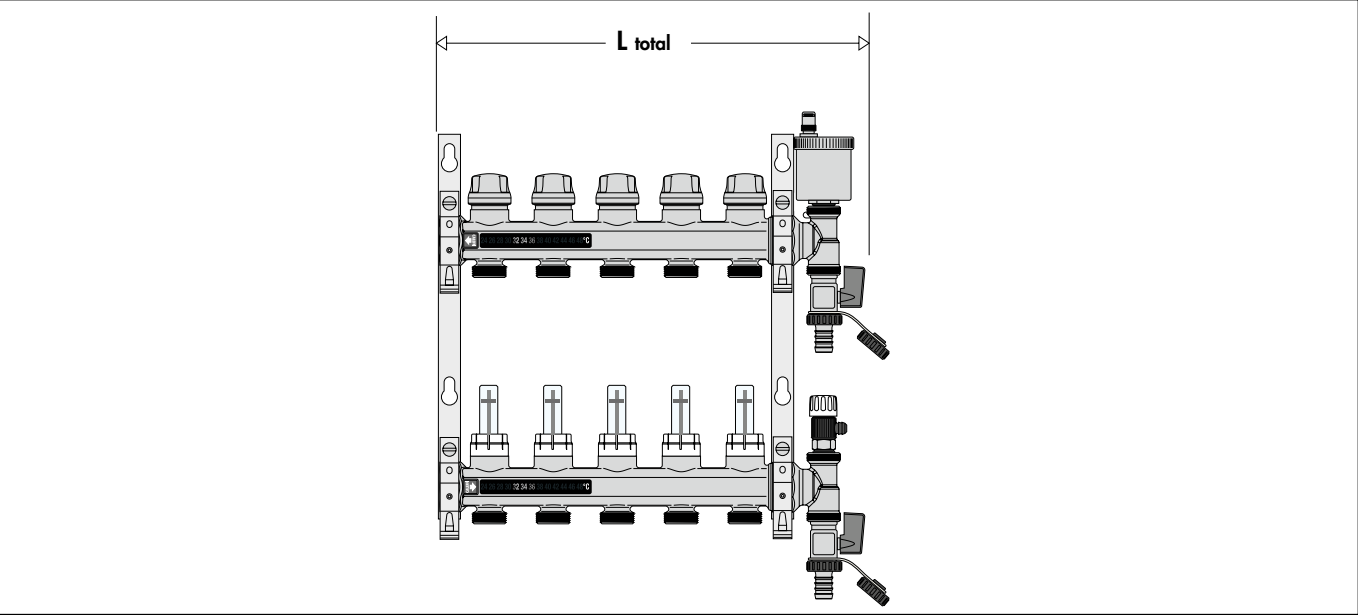
Materials

Protective shell: self-extinguishing polycarbonate
Colour: (code 656.02/04) white RAL 9010
(code 656.12/14) grey RAL 9002

Performance

Normally closed
Electric supply: 230 V (ac) - 24 V (ac) - 24 V (dc)
Starting current: (6562) ≤ 1 A (6564) ≤ 250 mA (230 V)
Running current:
-6562 series: 230 V (ac) = 13 mA; 24 V (ac) - 24 V (dc) = 140 mA
-6564 series: 230 V (ac) = 15 mA; 24 V (ac) - 24 V (dc) = 125 mA
Running power consumption: 3 W
Auxiliary microswitch contact rating (code 656.12/14): 0,8 A (230 V)
Protection class (fitted in all positions): IP 54
Double insulation construction: ☒ CE
Operating time 6562 series
Operating time: opening and closing from 120 s to 180 s
Aux. microswitch closing time: from 120 s to 180 s
Operating time 6564 series
Opening time: (80%): 300 s; (100%): 600 s
Closing time: 240 s
Aux. microswitch closing time: 300 s
Electric supply cable length: 80 cm

Choice of box size, 659..5 series, according to the number of outlets



Code	6656D1	6656E1	6656F1	6656G1	6656H1	6656I1	6656L1	6656M1	6656N1
No. of outlets	4	5	6	7	8	9	10	11	12
Manifold total length (mm)	280	330	380	440	490	540	590	640	690
Box length (mm)	400	600	600	600	600	800	800	800	800
Box code, 659 series	65904.	65906.	65906.	65906.	65906.	65908.	65908.	65908.	65908.

Boxes



659 tech. broch. 01144
Box for manifolds - 349, 350, 592, 662, 663, 671, 668...S1, 664 and 665 series.
Wall or floor installation (with 660 series).
Closure with a push-fit clamp.
Made of painted sheet steel.
Depth adjustable from 110 to 140 mm.

Code	(h x w x d)
659044	500 x 400 x 110–140
659064	500 x 600 x 110–140
659084	500 x 800 x 110–140



659 tech. broch. 01180
Box for manifolds - 349, 350, 592, 662, 664, 665 and 671 series.
Complete with special support for manifold mounting brackets.
Closure with a push-fit clamp.
Made of painted sheet steel.
Depth adjustable from 80 to 120 mm.

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



660 tech. broch. 01144
Floor installation KIT for 659 series box.
Consisting of:
- 2 supports - height (cm) 20,
- 2 side panels,
- 1 pipe-bending bar.

Code	
660040	for 659044
660060	for 659064
660080	for 659084



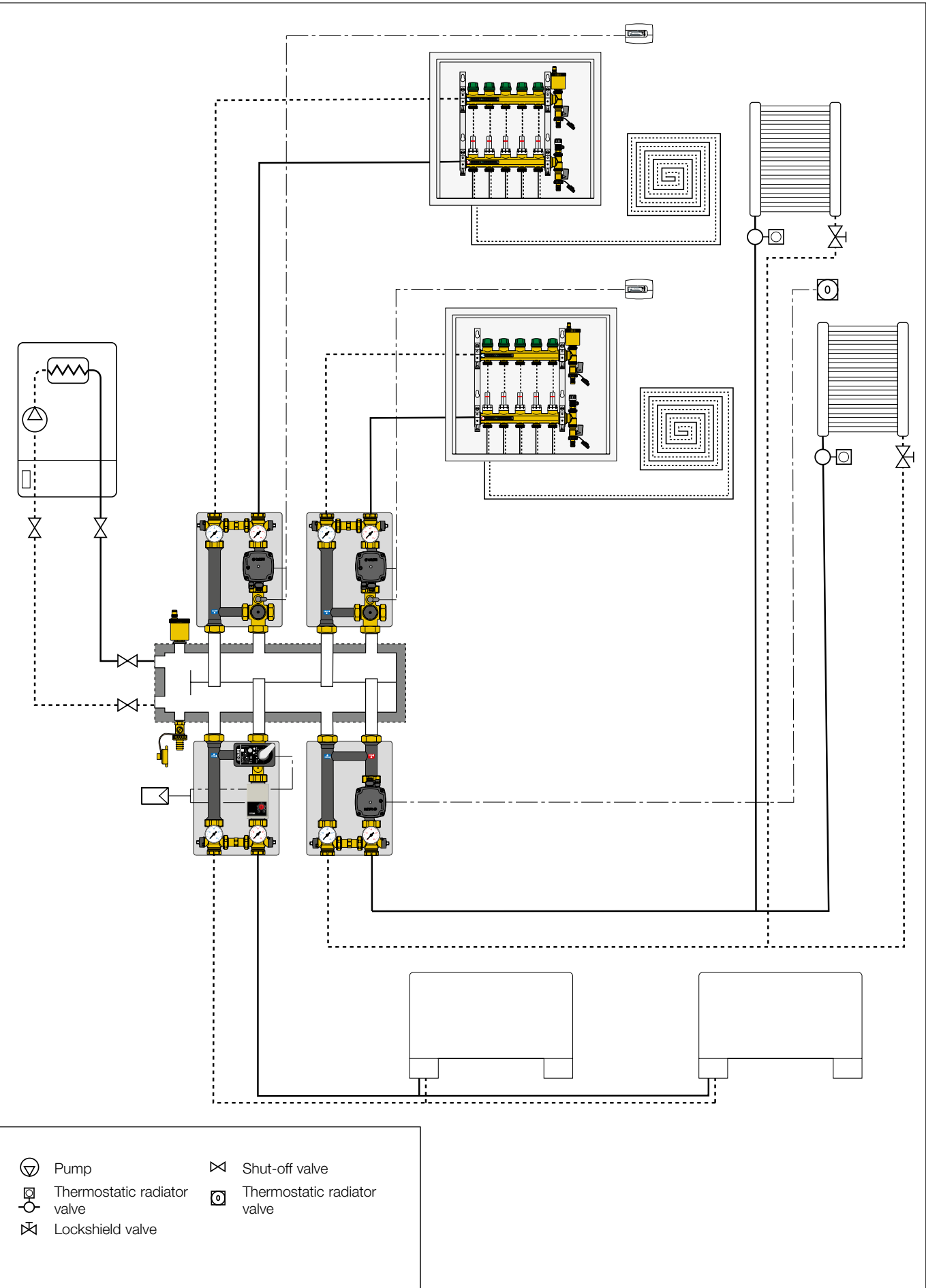
661 tech. broch. 01144
Box for manifolds- 662, 671, 668...S1, 664, 665 series and 182 series fittings.
Complete with supports for floor installation.
Closure with a push-fit clamp.

Made of painted sheet steel.
Depth adjustable from 110 to 150 mm.
Height adjustable from 270 to 410 mm.

Code	(h x w x d)
661045	500 x 400 x 110–150
661065	500 x 600 x 110–150
661085	500 x 800 x 110–150

Application diagrams

Independent zone system with dynamic distribution manifolds and zone thermostats



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