CALEFFI
Hydronic Solutions

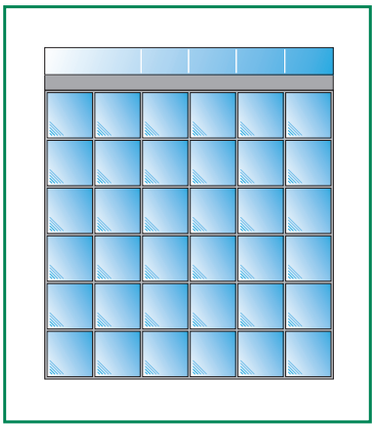




DEVICES FOR CIRCUIT BALANCING

2019

DEVICES FOR CIRCUIT BALANCING



The hydronic circuits serving air conditioning systems must be balanced, meaning that they must be constructed in such a way as to guarantee the design flow rates of the thermal medium.
Depending on the type of system and the appliances installed, and also on the type of control to be implemented, specific balancing devices are required.
Caleffi offers a complete line of products, as illustrated in this guide.

Air conditioning of modern buildings

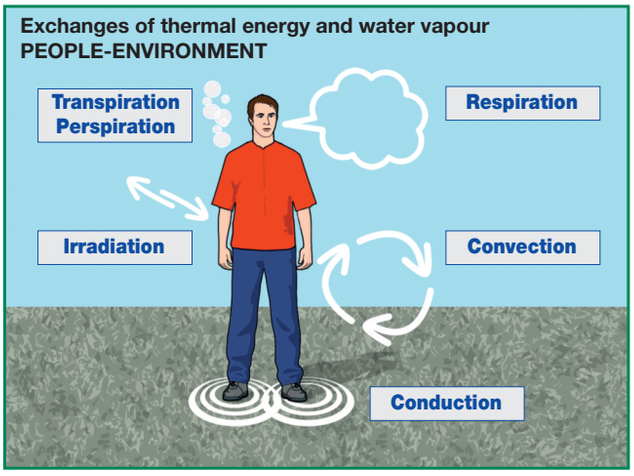
Modern buildings must be designed and built to ensure the health and general wellness of their occupants, assisting the maintenance of various types of comfort: thermal, acoustic, architectural, functional, and so forth.
In addition, the buildings must be constructed with the aim of achieving fundamental goals including energy economy and environmental protection, with reduced CO2 emissions.
Controlling the climate of a confined space means creating the necessary conditions to guarantee the **thermal comfort** of the occupants.

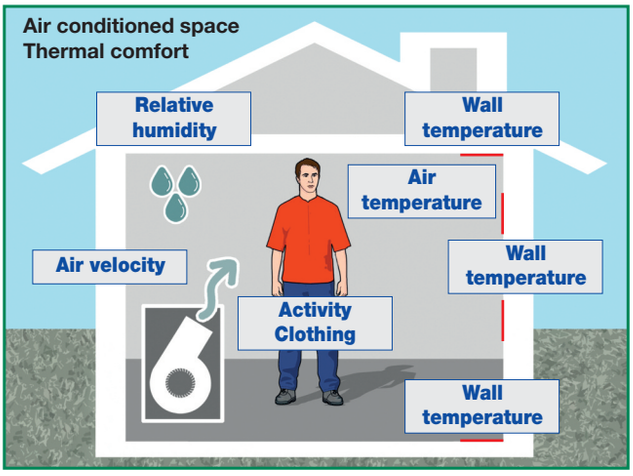
Thermal comfort

Thermal comfort is the sensation of thermohygrometric well-being that a person experiences when conducting an activity in an enclosed space. In these comfort conditions the physiological mechanisms of the human body act correctly to control body temperature by exchanging heat energy and water vapour with the surrounding environment. The ideal reference situation is designated “thermal neutrality”, wherein the person does not perceive sensations of heat or cold.
Air conditioning makes it possible to control the **temperature**, **relative humidity** and **air velocity** in living spaces irrespective of the outside climatic conditions or season.
The ASHRAE, REHVA, and ISO organisations have issued specific standards for the achievement of thermal comfort, forming a body of references for the law applied to air conditioning issues both on the national and international levels.

Average reference conditions for thermal comfort

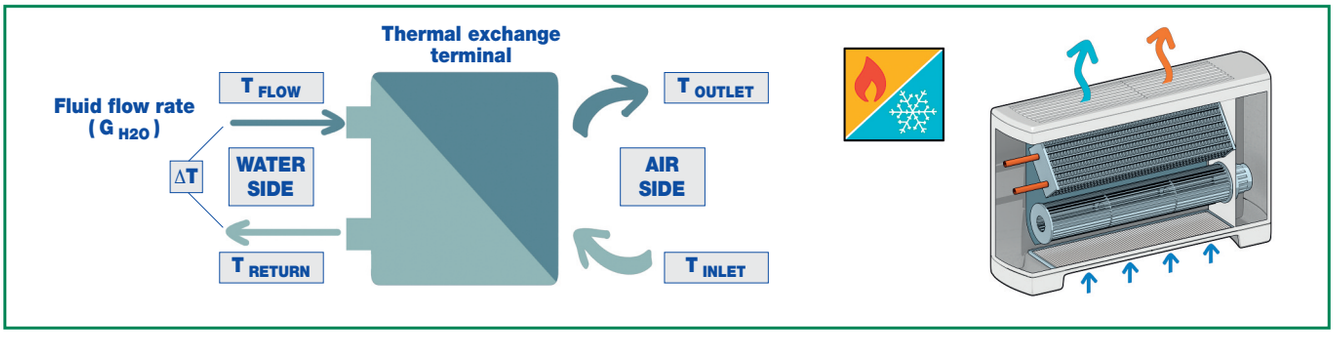
	Winter	Summer
Ambient temperature (°C)	≥20	≤26
Minimum relative humidity (%)	35	50
Maximum relative humidity (%)	45	60





Thermal exchange terminals

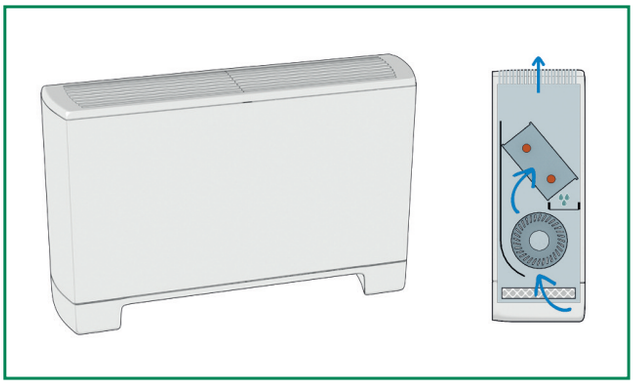
The thermal exchange terminals used for air conditioning employ a **thermal medium flow rate** to **control the thermal energy** required to manage room temperature and humidity.
The formula **P= const x G x ΔT** establishes that **the emission or subtraction of heat (P) by the terminals is a function of the flow rate of the medium (G) passing through them**, given the deltaT (ΔT) of the thermal medium in the terminal. The design flow rate at the terminal is also a necessary condition for the removal of air humidity condensing latent heat during dehumidification operation.
On the basis of these physical laws it can be asserted that **balancing and control of the flow rate** are directly connected with the achievement and maintenance of thermal comfort conditions.



Fan coils

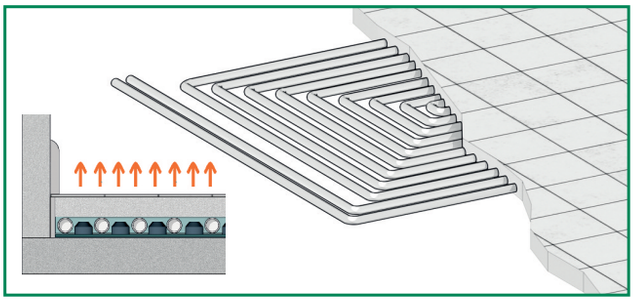
Fan coils are terminals that heat or cool the room due to forced convection. They can be floor-standing or ceiling mounted, with either exposed or recessed installation.
They are composed of:
- box
- single or double finned thermal exchange coil
- centrifugal or tangential fan
- air inlet filter
- condensate drip tray

The units function with hot or chilled medium in heating or air conditioning mode. They control room relative humidity, either totally or partially.
Hot thermal medium working T range: 45–65°C
Chilled thermal medium working T range: 7 –12°C



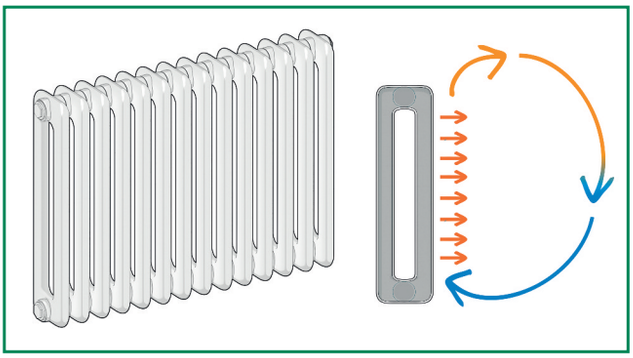
Radiant panels

Radiant panels are terminals that heat or cool the room due to irradiation. They are composed of plastic pipes embedded in the masonry structure of walls and floors.
The units function with hot or chilled thermal media in heating or cooling mode. Radiant panels do not control relative ambient humidity.
Hot thermal medium working T range: 22–45°C
Chilled thermal medium working T range: 16–20°C



Radiators

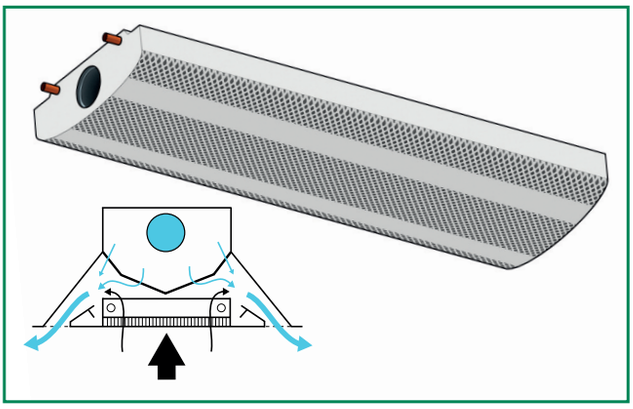
Radiators are heating terminals that heat the room air due to natural convection and irradiation. Radiators are constructed in metal and are of the elements, plate or pipes type.
They function exclusively with hot thermal medium in heating mode.
Hot thermal medium working T range: 55–90°C



Chilled beams

Chilled beams are terminals that heat or cool the room by the combined action of primary air and inlet air from the room. The beams are installed on the ceiling in either exposed or recessed configuration.
They are composed of:
- a pressurised primary air adduction pipe
- single or double finned thermal exchange coil
- vents to supply treated air to the room
- air enclosure and ducting structure

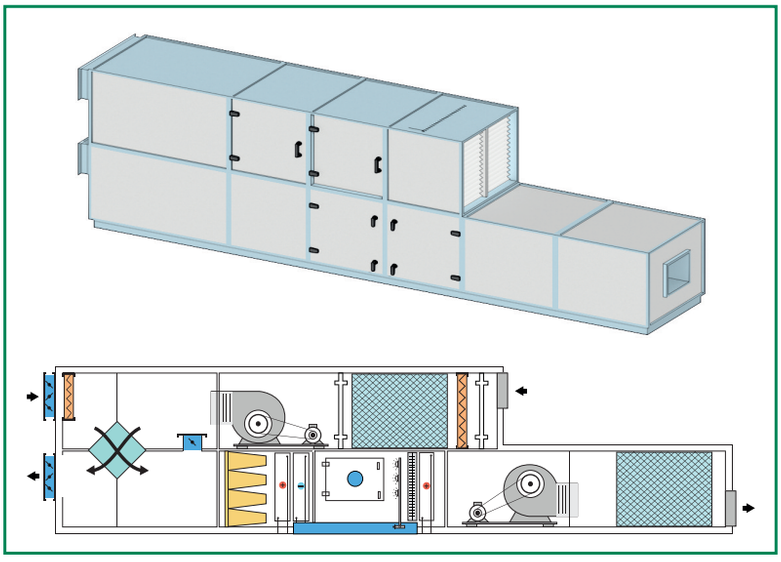
The units function with hot or chilled thermal media in heating or cooling mode. Cooling beams do not directly control relative ambient humidity, which is instead managed by the primary air.
Hot thermal medium working T range: 30–45°C
Chilled thermal medium working T range: 14–18°C



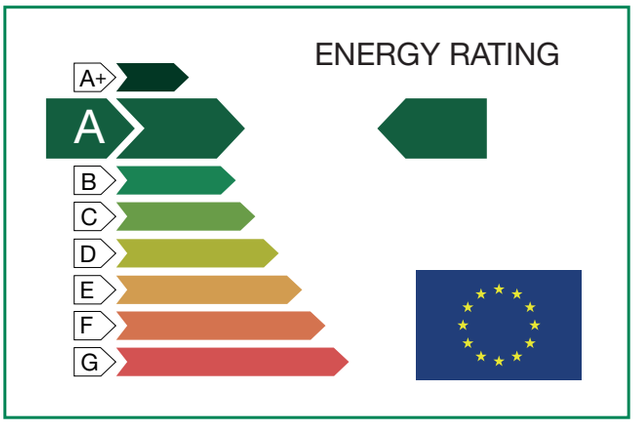
Air Handling Units (AHU)

These are modular units configured in such a way as to provide correct treatment of primary air before transferring it to the air conditioned space.
The air is controlled thermally, in terms of temperature and relative humidity, and also in terms of air quality, by means of appropriate filtration.
They are composed of:
- filter section
- heating section with finned heating coil
- cooling and dehumidification section with finned cooling coil and condensate drip tray
- humidification section, which can be of the water or vapour type
- post-heating section with finned heating coil
- flow and return section with fans
- section for heat recovery between inlet and outlet air

The units function with hot or chilled medium in heating or air conditioning mode. Air handlers also control relative ambient humidity.
Hot thermal medium working T range: 40–60°C
Chilled thermal medium working T range: 7–12°C



Energy certification of buildings



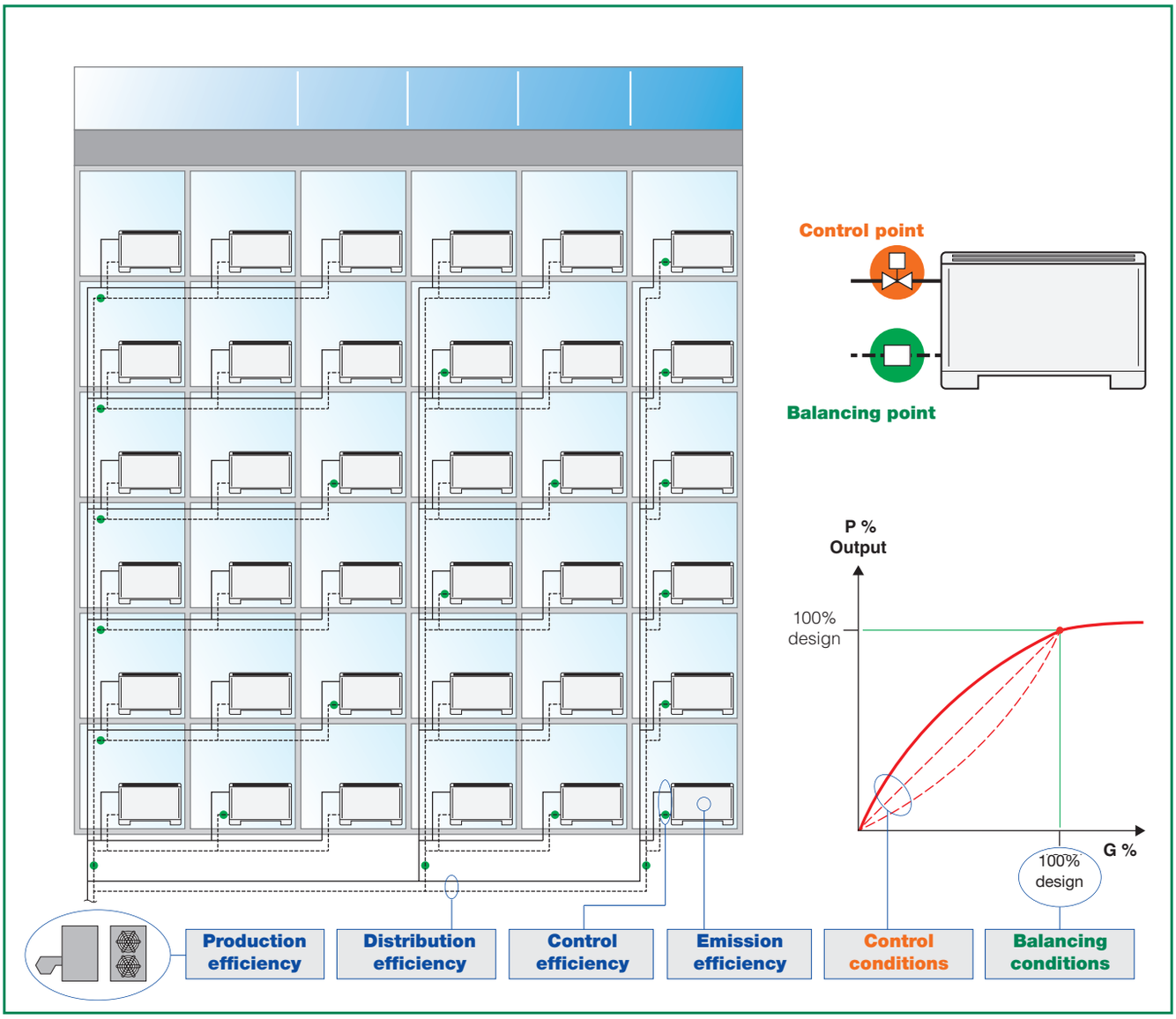
Several years ago national and international laws and regulations were put in place to ensure the energy classification of buildings. In this context, buildings are designed in such a way as to restrict thermal energy and electricity requirements and to minimise carbon dioxide emissions (CO_2).
Apart from defining the thermal insulation characteristics of the building, also the construction and operation of the air conditioning system are of critical importance and must be adequate to follow the thermal loads trend precisely during summer and winter.

The entire system, from the production zone to the area of emission or subtraction of thermal energy in the air conditioned space, must be correctly sized with a suitable choice of regulating components and must be commissioned using clearly defined instruments and procedures (test, adjustment and balancing).

Hydronic circuit - Flow rate control

Flow rate control devices can be classified in relation to the function performed in the specific points of the distribution network in which they are installed.
- **Flow rate balancing point**: guarantee the nominal design flow rate
- **Flow rate control point**: continuously adapt the flow rate in response to changes in the thermal load

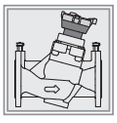
In guaranteeing the correct flow rate to the thermal exchange terminal, it is possible to manage the two forms of thermal energy supplied to or removed from the space:
- sensible heat: linked to temperature variation
- latent heat: linked to relative humidity variation



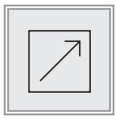
Circuit balancing devices

Circuit balancing devices **can be classified in accordance with their method of action and the type of control** they perform in relation to the hydronic circuit. In this guide the devices are **presented in accordance with a product evolution functional line**, as can be seen from the following summary table. The same description appears at the beginning of each of the product sections. Moreover, the functional details **associated with specific system design aspects are described by means of pages inserted** in the various sections of the guide, in a rational presentation designed to aid the identification of products and allow them to be selected in the optimal manner.

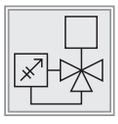
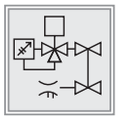
Static balancing devices

- Manual balancing valve, with Venturi device	**130 series**		
- Manual balancing valve, with variable orifice	**130 series**		
- Balancing valve with flow meter	**132 series**		

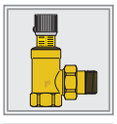
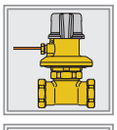
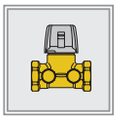
Dynamic balancing devices

- Automatic flow rate regulator, fixed flow rate	**127 - 128 - 121 126 - 120 - 125 103 series**		

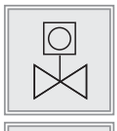
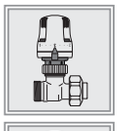
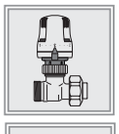
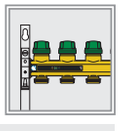
Dynamic balancing and control devices

- Pressure independent control valve (PICV)	**145 - 146 series**		
- Connection and regulation kit for HVAC terminal units	**149 series**		

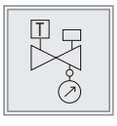
Differential pressure control devices

- Differential by-pass valve	**519 series**		
- Differential pressure control valve	**140 series**		
- Shut-off and pre-regulation valve	**142 series**		

Balancing devices for radiator and radiant panels systems

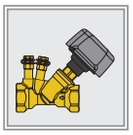
- Convertible radiator valves with pre-setting	**425 - 426 421 - 422 series**		
- Dynamic thermostatic radiator valves	**230 series**		
- Dynamic distribution manifolds for radiant panel systems	**665 series**		

Dynamic thermostatic balancing devices

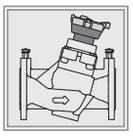
- Multifunction thermostatic regulator for domestic hot water recirculation loops	**116 series**		

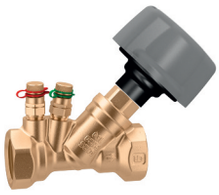
Static balancing devices

- Manual balancing valve, with Venturi device **130 series**

- Manual balancing valve, with variable orifice **130 series**



130

tech. broch. 01251

Hydraulic circuits balancing valve
with fixed orifice.
Flow meter with Venturi device.
CR dezincification resistant alloy body, obturator in stainless steel.
Complete with quick-fit pressure test ports.

Code			Kvs (m³/h)
130400	DN 15	1/2”	3,17
130500	DN 20	3/4”	4,46
130600	DN 25	1”	7,63
130700	DN 32	1 1/4”	12,10
130800	DN 40	1 1/2”	17,00
130900	DN 50	2”	26,30

130

tech. broch. 01251

Balancing valve for hydraulic systems.
Grey cast iron body,
PPS polymer obturator.
Complete with pressure ports.
Max. percentage of glycol: 50%.
Flaged connections PN 16.
To be coupled with flat counterflanges EN 1092-1.

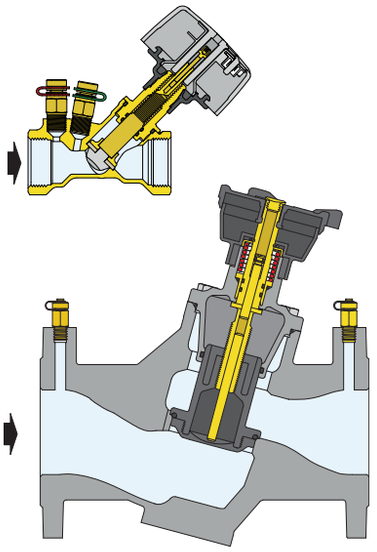
Code		Kvs (m³/h)
130062	DN 65	100
130082	DN 80	112
130102	DN 100	155
130122	DN 125	268,4
130152	DN 150	486
130202	DN 200	927
130250	DN 250	1188
130300	DN 300	1504

Technical specifications

series	130 threaded	130 flanged
Performance		
Medium:	water, non-hazardous glycol solutions excluded from the guidelines of directive 67/548/EC	water, non-hazardous glycol solutions excluded from the guidelines of directive 67/548/EC
Maximum percentage of glycol:	50%	50%
Maximum working pressure:	16 bar	16 bar
Working temperature range:	-20–120°C	-10–140°C -10–120°C (DN 250-DN 300)
Accuracy:	±10%	±10%

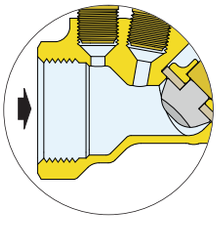
Operating principle

The balancing valve is a hydraulic device that makes it possible to regulate the medium flow rate passing through it.
Regulation is performed using a knob that governs the movement of an obturator to regulate the flow of the medium. The flow rate is controlled according to the value of Δp that is measured with two piezometric connections suitably positioned on the valve.



Venturi device for flow rate measurement

The 130 series valves of size from 1/2” to 2” are equipped with a flow rate measuring device based on the Venturi principle. It is housed in the valve body and is located upstream of the valve’s obturator, as shown in the figure.



This system provides the following benefits:

1. Provides stable measurement during flow rate regulation. Balancing valves normally have their pressure test ports upstream and downstream of the valve obturator. This means that when the valve is closed to less than 50% of its full opening, the turbulence created downstream of the obturator causes instability in the pressure signal resulting in significant measurement errors.
2. The Venturi system makes for a faster process of measurement and manual circuit balancing. The flow rate is now only a function of the Δp measured upstream and downstream of the fixed orifice of the Venturi meter, upstream of the obturator, and no longer through the entire valve.

Static balancing devices

Adjustment knob
The shape of the adjustment knob is the outcome of research into ergonomics to ensure the greatest operator comfort and accurate adjustment.

- The range of adjustment with 5 complete turns permits great accuracy when balancing hydraulic circuits.
- The micrometric scale graduations are large and clear and make it easy to refine the flow rate adjustment.
- The knob is made of high-strength, corrosion-proof, reinforced polymer.

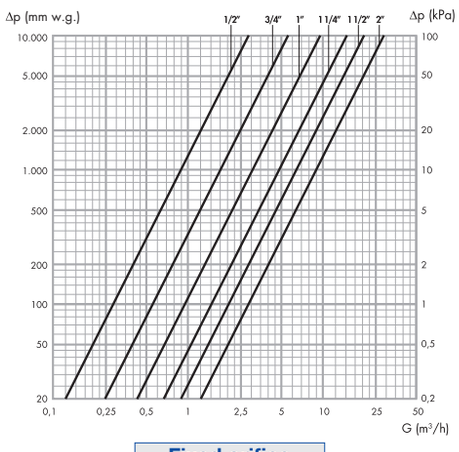
130 Tech. broch. 01251

Electronic flow rate and differential pressure measuring station.
For further details refer to pages 22-23.

Code	
130006	complete with remote control unit, with Android® app
130005	without remote control unit, with Android® app

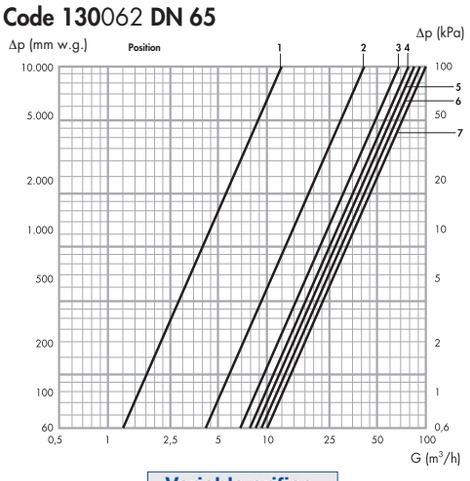
Setting the balancing valve
Flow rate regulation in the variable orifice balancing valves **calls for a suitable differential pressure measurement instrument**.
In this valve type each position of the setting knob is associated with a specific characteristic curve. This requires a fresh data entry each time the position is changed. It is thus essential to use **a specific electronic instrument** and follow a stringent calibration procedure.

Venturi



Fixed orifice

Code 130062 DN 65

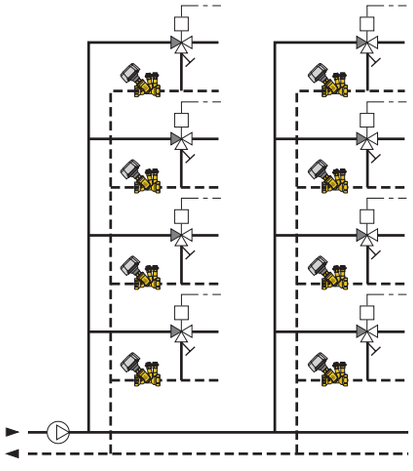


Variable orifice

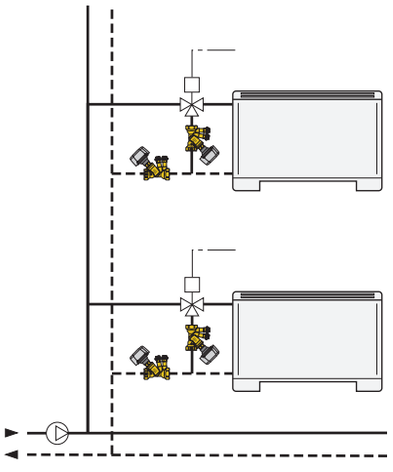
Main applications - Manual balancing valves

- ✔ **constant flow rate circuits with 3-way regulating valves**
- ✔ **chillers or heat generators connected in parallel with dedicated pumps**
- ✔ **fire fighting water distribution circuits, with hydrants**
- ✔ **flow rate and head control on pumps flow line**
- ✔ **regulating circuits with flow temperature control, with coupled primary-secondary circuits**

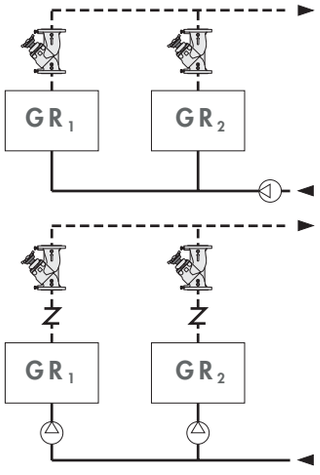
To balance zone branches in circuits with three-way valves



To balance by-pass and direct lines in circuits with three-way valves



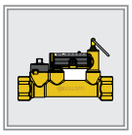
To balance the circuits that serve chiller unit evaporators or condensers



Static balancing devices

- Balancing valve with flow meter

132 series



132

tech. broch. 01149

Balancing valve with flow meter.
Direct reading of flow rate.
Brass valve body and flow meter.
Ball valve for flow rate adjustment.
Graduated scale flow meter
with magnetic movement
flow rate indicator.
With insulation.

Code		Flow rate range (l/min)
132402	DN 15	2–7
132512	DN 20	5–13
132522	DN 20	7–28
132602	DN 25	10–40
132702	DN 32	20–70
132802	DN 40	30–120
132902	DN 50	50–200

132

Balancing valve with flow meter.
Direct reading of flow rate.
Cast iron body. Brass flow meter.
Characterized ball valve
for flow rate adjustment.
Graduated scale flow meter with
magnetic movement flow rate indicator.

Code		Flow rate range (m^3/h)
132060	DN 65	6–24
132080	DN 80	8–32
132100	DN 100	12–48

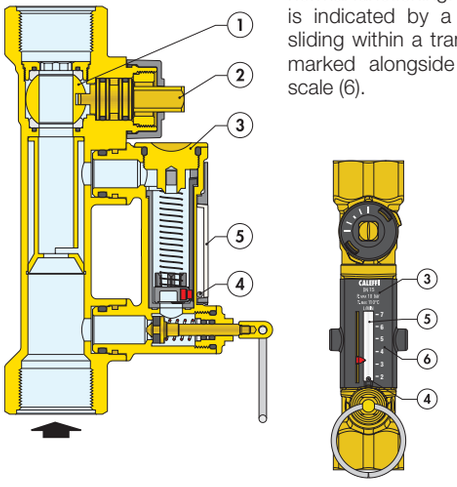
Technical specifications

Performance

Medium:	water, glycol solutions
Maximum percentage of glycol:	50%
Max. working pressure:	10 bar
Working temperature range:	-10–110°C.
Flow rate adjustment range unit of measurement:	l/min
Accuracy:	±10%

Operating principle

The balancing valve is a hydraulic device that makes it possible to regulate the medium flow rate passing through it.
The regulating action is performed by a ball obturator (1), operated by a control stem (2). The flow rate is controlled by means of a flow meter (3) housed in a by-pass circuit on the valve body, that can be shut off during normal functioning. The flow rate value is indicated by a metal sphere (4) sliding within a transparent guide (5) marked alongside by a graduated scale (6).

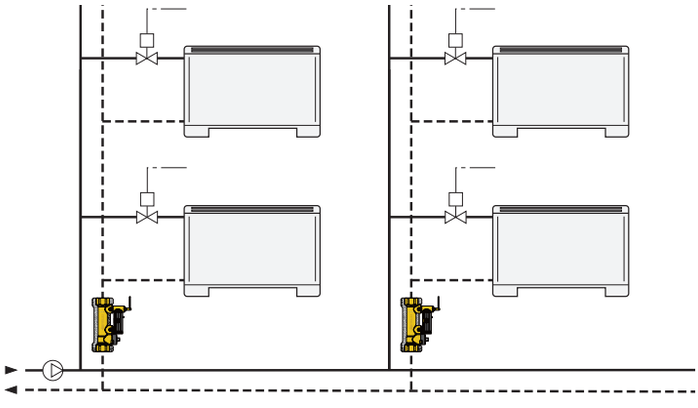


Flow meter for flow rate measurement
Flow rate measurement is provided directly by a flow meter housed in a by-pass circuit on the valve body, which can be automatically excluded during normal operation.

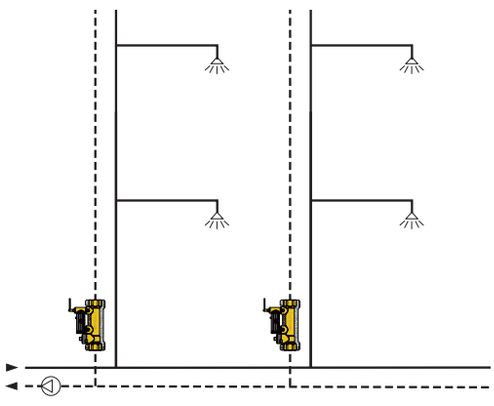
Main applications - Manual balancing valves with flow meter

✔ **constant flow rate circuits, with limited extension**
✔ **domestic hot water recirculation circuits**
✔ **circuits with closely spaced pipes, for easy reading and setting**

To adjust the flow rate supplied to each riser



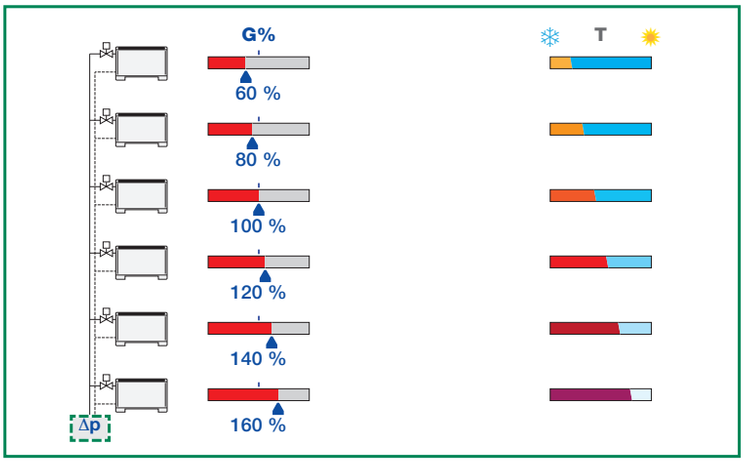
To balance domestic water distribution circuits



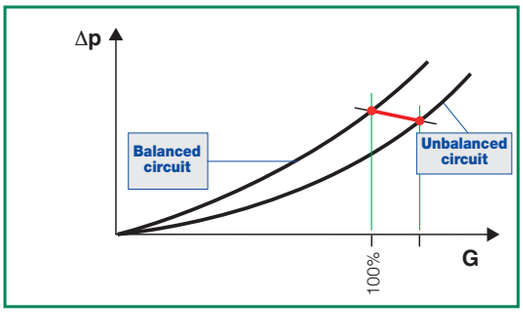
STATIC BALANCING - DYNAMIC BALANCING

Unbalanced circuits have characteristics such as to create problems in distributing the flow rates to the terminals. To overcome these problems it is normal practice to fit two types of balancing device:
- **static devices**. These are conventional devices suitable for use in constant flow rate circuits or circuits subject to limited load variations.
- **dynamic devices**. Modern automatic devices, mainly suitable for variable flow rate systems with thermal loads that change frequently.

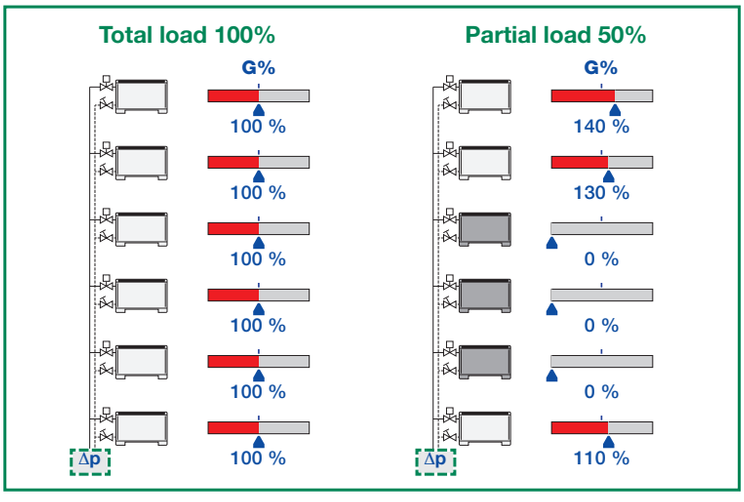
Unbalanced circuits



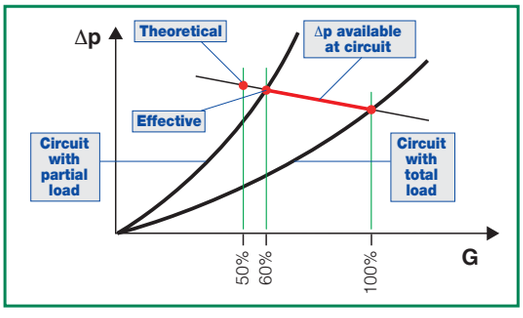
In the case of unbalanced circuits, the hydraulic imbalance between terminals creates areas with non-uniform temperatures, and as a consequence, problems with thermal comfort and higher energy consumption.



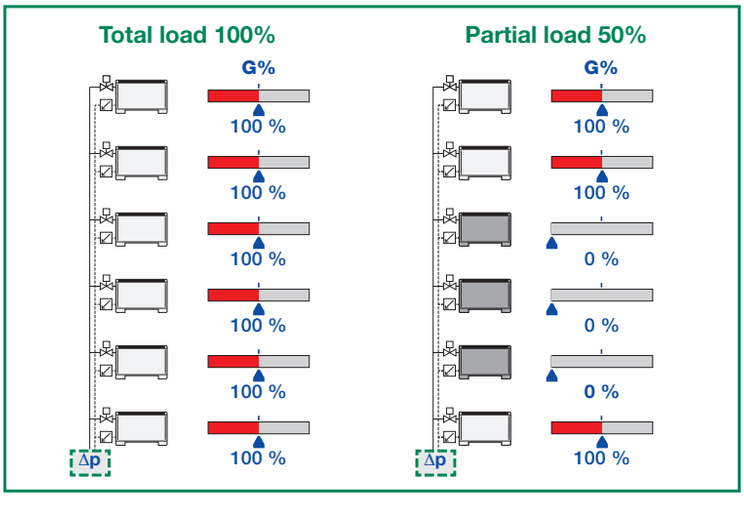
Static balancing



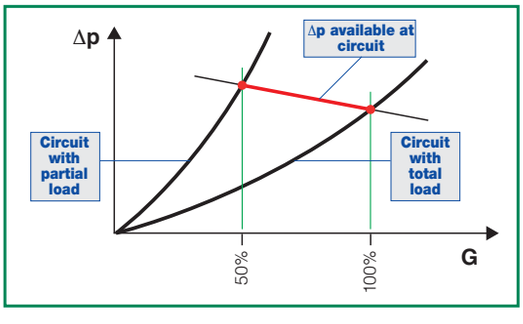
Traditionally, hydraulic circuits are balanced using manual calibration valves. With these static-type devices, such circuits are difficult to balance perfectly and have **operating limitations** in the case of partial closure by means of the control valves. The flow rate in the open circuits **does not remain constant at the nominal value**.



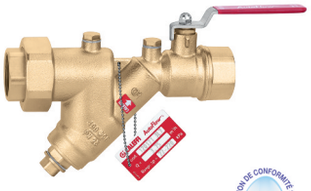
Dynamic balancing



Dynamic devices can balance the hydraulic system automatically, ensuring each terminal receives the design flow rate. Even in the case of partial circuit closure by means of the control valves, the flow rates in the open circuits **remain constant at the nominal value**. The system always guarantees the greatest comfort and the highest energy savings.



- Automatic variable flow rate regulator, fixed flow rate **120-125-103 series**



120 AUTOFLOW®

tech. broch. 01041

Combination of automatic flow rate regulator and ball valve.
CR dezincification resistant alloy body.
Stainless steel cartridge.

Code			Flow rates (m³/h)
120141 ●●●	DN 15	1/2”	0,12–2,75
120151 ●●●	DN 20	3/4”	0,12–2,75
120161 ●●●	DN 25	1”	0,7–6,00
120171 ●●●	DN 32	1 1/4”	0,7–6,00
120181 ●●●	DN 40	1 1/2”	2,75–15,5
120191 ●●●	DN 50	2”	2,75–15,5

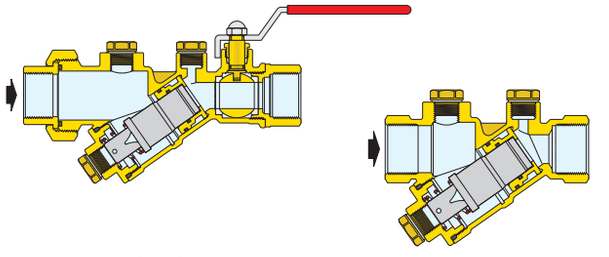
125 AUTOFLOW®

tech. broch. 01041

Automatic flow rate regulator.
CR dezincification resistant alloy body.
Stainless steel cartridge.

Code			Flow rates (m³/h)
125141 ●●●	DN 15	1/2”	0,12–2,75
125151 ●●●	DN 20	3/4”	0,12–2,75
125161 ●●●	DN 25	1”	0,7–6,00
125171 ●●●	DN 32	1 1/4”	0,7–6,00
125181 ●●●	DN 40	1 1/2”	2,75–15,5
125191 ●●●	DN 50	2”	2,75–15,5
125101 ●●●	DN 65	2 1/2”	6,5–17

For the choice of single flow rates, Δp range and complete code, refer to the price list or technical brochure.



103 AUTOFLOW® flanged

tech. broch. 01041

Automatic flow rate regulator.
Cast iron body
Stainless steel filter cartridge.
Supplied complete with EN 1092-1 flanges PN 16, tie-rods, gaskets and quick-fit pressure test ports.

Code	DN	Minimum working Δp (kPa)	Flow rates (m³/h)	Δp range (kPa)
103111 ●●●	65	22	9– 17	22–210
103113 ●●●	65	40	18– 22	40–390
103114 ●●●	65	55	25– 36	55–210
103121 ●●●	80	22	9– 17	22–210
103123 ●●●	80	40	18– 22	40–390
103124 ●●●	80	55	25– 36	55–210
103131 ●●●	100	22	9– 17	22–210
103133 ●●●	100	40	18– 22	40–390
103134 ●●●	100	55	25– 36	55–210
103431 ●●●	100*	22	18– 34	22–210
103433 ●●●	100*	40	23– 45	40–390
103434 ●●●	100*	55	46– 73	55–210
103141 ●●●	125**	22	18– 34	22–210
103143 ●●●	125**	40	23– 45	40–390
103144 ●●●	125**	55	46– 73	55–210
103151 ●●●	150	22	40– 68	22–210
103153 ●●●	150	40	40– 91	40–390
103154 ●●●	150	55	92–145	55–210
103161 ●●●	200*	22	80–119	22–210
103163 ●●●	200*	40	80–159	40–390
103164 ●●●	200*	55	160–255	55–210
103171 ●●●	250*	22	110–187	22–210
103173 ●●●	250*	40	110–250	40–390
103174 ●●●	250*	55	251–400	55–210
103181 ●●●	300	22	150–255	22–210
103183 ●●●	300	40	150–341	40–390
103184 ●●●	300	55	342–545	55–210

* Supplied with 4” ANSI flanges.

** On request they are available with flanges EN 1092-1 PN 25, size DN 100

They are available on request in sizes DN 350 to DN 1000, with flow rates up to 4400 m³/h.

To identify AUTOFLOW® devices and their codes correctly, contact Caleffi technical support in advance.

Technical specifications

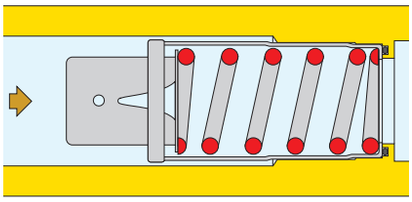
series	120	125	103
Performance			
Medium:	water, glycol solutions	water, glycol solutions	water, glycol solutions
Maximum percentage of glycol:	50%	50%	50%
Maximum working pressure:	25 bar	25 bar	16 bar
Working temperature range:	0–110°C	-20–110°C	-20–110°C
Δp range:	10–95 kPa; 22–210 kPa; 40–390 kPa	10–95 kPa; 22–210 kPa; 40–390 kPa	22–210 kPa; 40–390 kPa; 55–210 kPa
Flow rates:	0,12–15,5 m³/h	0,12–17 m³/h	9–4400 m³/h
Accuracy:	±5%	±5%	±5%

Dynamic balancing devices

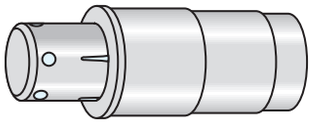
Operating principle

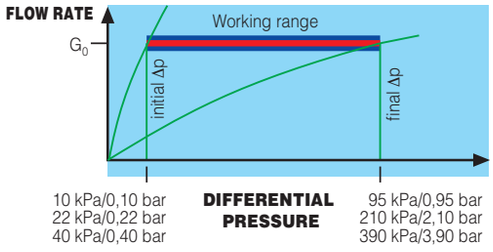
The regulating element of these devices is composed of a cylinder and a piston with fixed and variable geometry side open tubes through which the fluid flows. These apertures are governed by the piston movement actuated by the pressure of the medium. A specially calibrated spring counteracts this movement.
AUTOFLOW® devices are high-performance automatic regulators. They regulate the flow rates selected within a very tight tolerance (approx. 5%) and offer a wide control range.

Within the control range



If the differential pressure is contained within the control range, the piston compresses the spring and gives the medium a free flow area to permit regular flow at the **nominal rate** for which the AUTOFLOW® is set up.

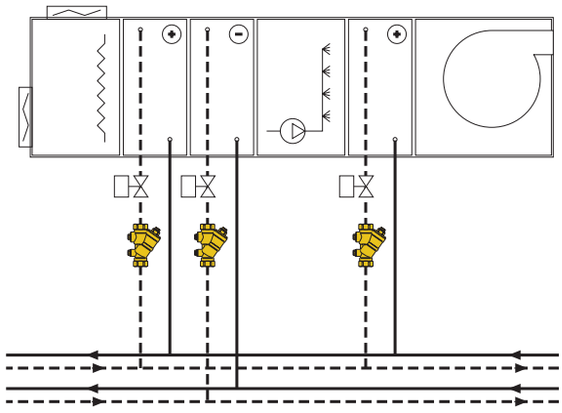




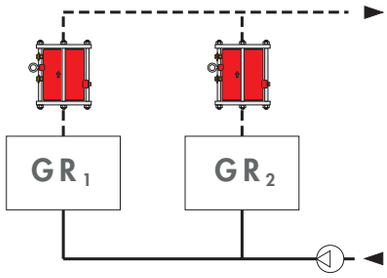
Main applications - AUTOFLOW® automatic flow rate regulators

- ✔ **variable flow rate circuits with 2-way regulating valves and complex extended networks**
- ✔ **circuits with adjustment on the terminal, with 2-way valves**
- ✔ **circuits with ON/OFF or modulating flow rate adjustment**
- ✔ **circuits to supply the Air Handling coils in air based or air-water systems**
- ✔ **district heating circuits for control of the primary side of the substations**

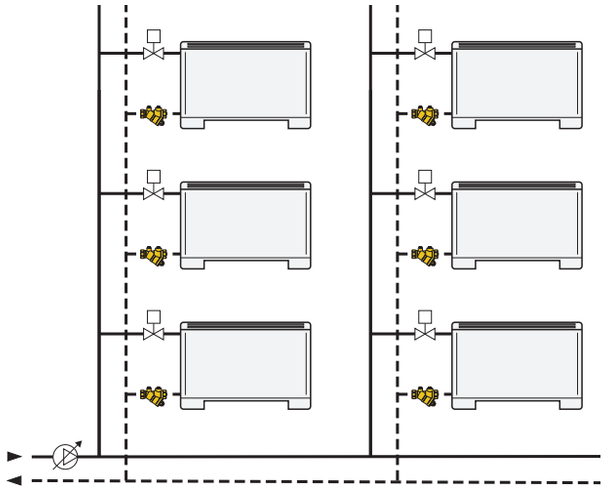
To balance circuits that serve air handling units



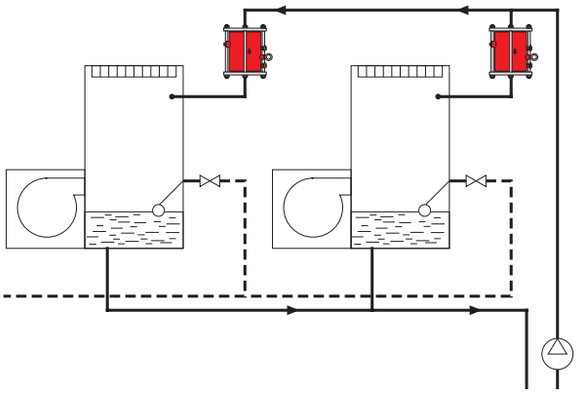
To balance the circuits that serve chiller unit evaporators or condensers



To ensure the required amount of medium flows through each terminal



To balance circuits serving cooling towers



- Automatic flow rate regulator, fixed flow rate **127-128-121-126 series**

127 AUTOFLOW®

tech. broch. 01166

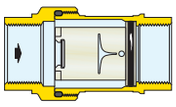
Compact automatic flow rate regulator.
Brass body.

Cartridge: 1/2"–1 1/4" high-strength polymer.
1 1/2" and 2" high-strength polymer and stainless steel.

Code			Flow rates (m³/h)
127141 ●●●	DN 15	1/2"	0,02–1,4
127151 ●●●	DN 20	3/4"	0,02–1,6
127161 ●●●	DN 25	1"	0,5–5,0
127171 ●●●	DN 32	1 1/4"	0,5–5,0
127181 ●●●	DN 40	1 1/2"	4,5–11,0
127191 ●●●	DN 50	2"	4,5–11,0

New polymer regulator

The flow-rate regulator element is made entirely of high resistance polymer, specially chosen for use in air-conditioning and plumbing systems. Its mechanical behaviour is excellent in a wide range of working temperatures, it features high abrasion resistance due to the medium flowing continuously, it is insensitive to the deposit of scale and is fully compatible with the glycols and additives used in circuits.

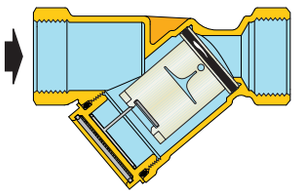


128 AUTOFLOW®

tech. broch. 01269

Compact automatic flow rate regulator.
Brass body.
AUTOFLOW cartridge in high resistance polymer.

Code		Flow rates (m³/h)
128141 ●●●	1/2"	0,02–1,2
128151 ●●●	3/4"	0,02–1,4



121 AUTOFLOW®

tech. broch. 01141

Combination of automatic flow rate regulator and ball valve.
CR dezincification resistant alloy body.

Cartridge: 1/2"–1 1/4" high-strength polymer.
1 1/2" and 2" high-strength polymer and stainless steel.

Code			Flow rates (m³/h)
121141 ●●●	DN 15	1/2"	0,085–1,2
121151 ●●●	DN 20	3/4"	0,085–1,6
121161 ●●●	DN 25	1"	0,5–5,0
121171 ●●●	DN 32	1 1/4"	0,5–5,0
121181 ●●●	DN 40	1 1/2"	5,5–11,0
121191 ●●●	DN 50	2"	5,5–11,0

126 AUTOFLOW®

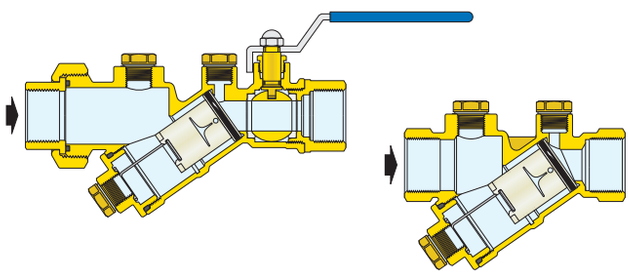
tech. broch. 01141

Automatic flow rate regulator.
CR dezincification resistant alloy body.

Cartridge: 1/2"–1 1/4" high-strength polymer.
1 1/2" and 2" high-strength polymer and stainless steel.

Code			Flow rates (m³/h)
126141 ●●●	DN 15	1/2"	0,085–1,2
126151 ●●●	DN 20	3/4"	0,085–1,6
126161 ●●●	DN 25	1"	0,5–5,0
126171 ●●●	DN 32	1 1/4"	0,5–5,0
126181 ●●●	DN 40	1 1/2"	5,5–11,0
126191 ●●●	DN 50	2"	5,5–11,0

For the choice of single flow rates, Δp ranges and complete code, refer to the price list or technical brochure.



Technical specifications

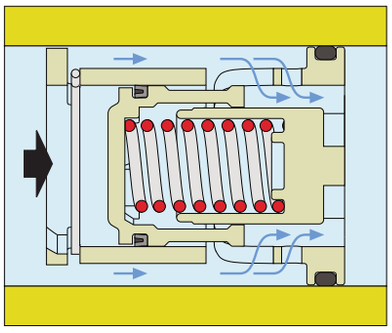
series	127	121-126	128
Performance			
Medium:	water, glycol solutions	water, glycol solutions	water, glycol solutions
Maximum percentage of glycol:	50%	50%	50%
Maximum working pressure:	16 bar	25 bar	16 bar
Working temperature range:	0–100°C	-20–100°C	0–100°C
Δp range:	15–200 kPa and 20–200 kPa	15–200 kPa	15–200 kPa and 20–200 kPa
Flow rates:	0,02–11,0 m³/h	0,085–11,0 m³/h	- 1/2" 0,02–1,2 m³/h - 3/4" 0,02–1,4 m³/h
Accuracy:	±10% and ±15%	±10%	±10% and ±15%

Dynamic balancing devices

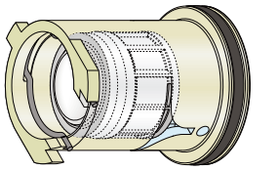
Operating principle

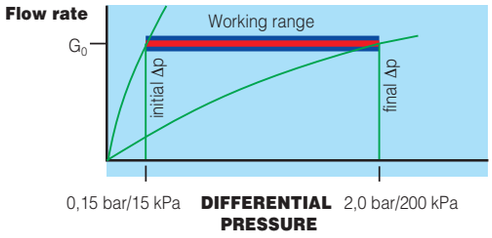
The regulating element of these devices is composed of a cylinder and a piston with fixed and variable geometry side open tubes, which the fluid flows through. These apertures are governed by the piston movement actuated by medium fluids. A specially calibrated spring counteracts this movement. AUTOFLOW® devices are high-performance automatic regulators. They regulate the flow rates selected within a very tight tolerance (approx. 10%) and offer a wide control range.

Within the control range



If the differential pressure is contained within the control range, the piston compresses the spring and gives the medium a free flow area to permit regular flow at the **nominal rate** for which the AUTOFLOW® is set up.

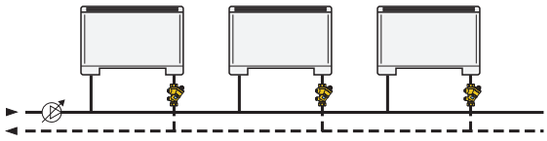




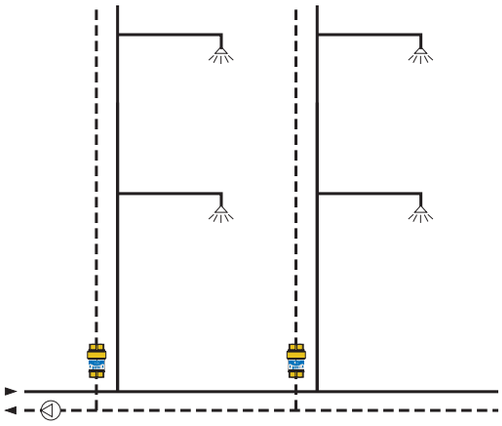
Main applications - AUTOFLOW automatic flow rate regulators

- ✔ **variable flow rate circuits with 2-way regulating valves and complex extended networks**
- ✔ **circuits with adjustment on the terminal, with 2-way valves**
- ✔ **circuits with ON/OFF or modulating flow rate adjustment**
- ✔ **circuits to supply Air Handling coils in air based or air-water systems**

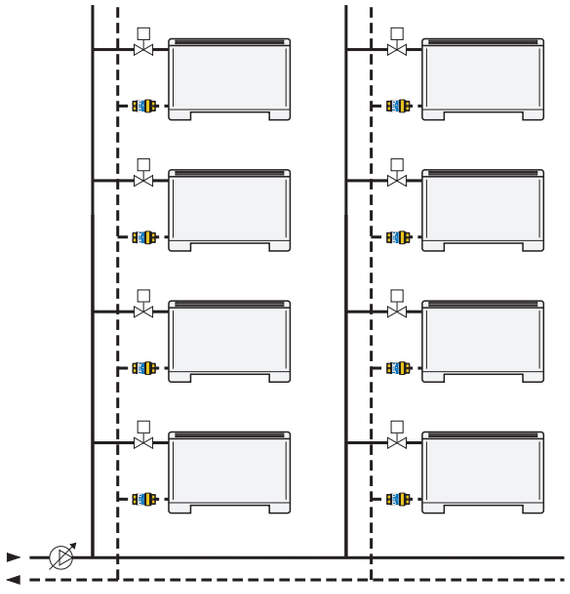
To use in line with various types of heat emitters: radiators, convectors, fan coils, fan convectors, thermal strips, etc.



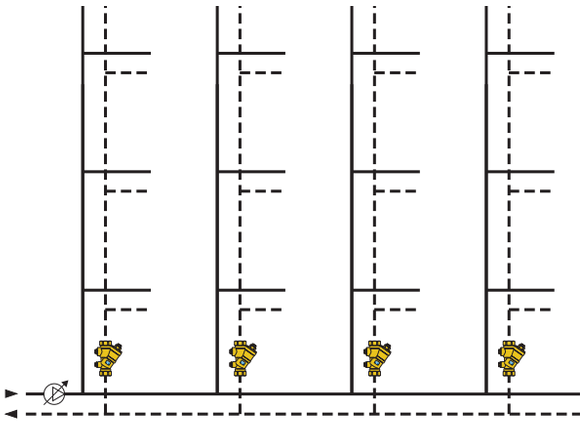
To balance domestic water distribution circuits



To ensure the required amount of medium flows through each terminal

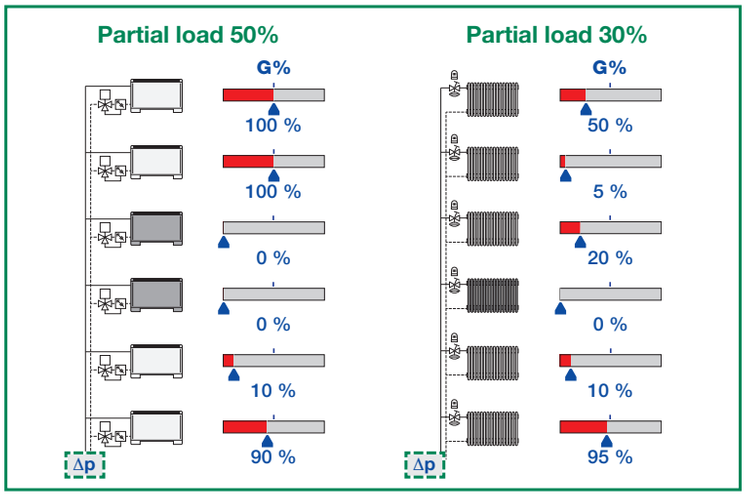


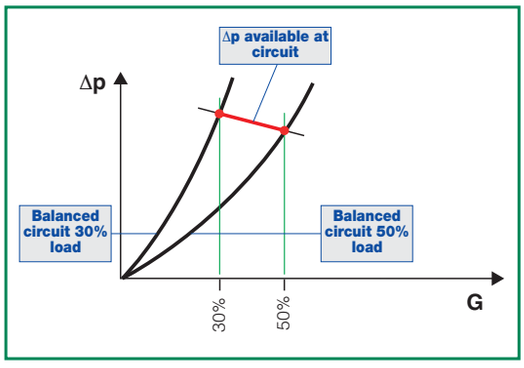
To adjust the flow rate to each riser or secondary branch of a system



DYNAMIC BALANCING AND CONTROL

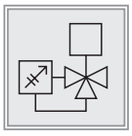
If the two functions of dynamic balancing and control are combined in the same device, the hydraulic circuit is balanced **with continuous control of thermal loads**. All the circuits supplied remain independent and the flow rate remains constantly at the value corresponding to each partial load, irrespective of the operating conditions of the circuit. Flow rate modulation to the necessary value for each circuit is not affected by the closure or partial control of the other circuits.

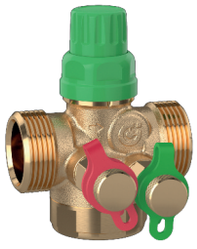




Dynamic balancing and control devices

- Pressure independent control valve (PICV) **145 - 146 series**





145 FLOWMATIC®

tech. broch. 01262

Pressure independent control valve (PICV).
CR dezincification resistant alloy body.
Flow rate regulator in polymer with membrane in EPDM.
Graduated scale indicator.
Fitted for 145 series actuators and 6565 series thermo-electric actuators.

With pressure test ports

Code	DN	Connection	Flow rate range (m³/h)
145437 H20	15	1/2”	0,02–0,20
145447 H40	15	3/4”	0,08–0,40
145447 H80	15	3/4”	0,08–0,80
145557 H40	20	1”	0,08–0,40
145557 H80	20	1”	0,08–0,80
145557 1H2	20	1”	0,12–1,20
145667 1H8	25	1 1/4”	0,18–1,80
145667 3H0	25	1 1/4”	0,30–3,00

Fitted for connections of pressure test ports

Code	DN	Connection	Flow rate range (m³/h)
145434 H20	15	1/2”	0,02–0,20
145444 H40	15	3/4”	0,08–0,40
145444 H80	15	3/4”	0,08–0,80
145554 H40	20	1”	0,08–0,40
145554 H80	20	1”	0,08–0,80
145554 1H2	20	1”	0,12–1,20
145664 1H8	25	1 1/4”	0,18–1,80
145664 3H0	25	1 1/4”	0,30–3,00

Technical specifications

145 series control valve performance

Medium:	water, glycol solutions
Max. percentage of glycol:	50%
Maximum working pressure:	25 bar
Max. differential pressure with actuator code 145014 and 6565 series thermo-electric actuators:	4 bar
Temperature range:	-20–120°C
Nominal Δp control range:	25–400 kPa
Flow rate regulation range:	0,02–0,2 m³/h 0,08–0,4 m³/h 0,08–0,8 m³/h 0,12–1,2 m³/h 0,18–1,8 m³/h 0,30–3,0 m³/h
Accuracy:	±5% of the setpoint
Leakage:	class V in accordance with EN 60534-4

Union with gasket.

Code	
145001	1/2” F x 3/8” M
145003	3/4” F x 1/2” M
145005	1” F x 3/4” M
145006	1” F x 1” M
145007	1 1/4” F x 1” M
145008	1 1/4” F x 1 1/4” M

145 FLOWMATIC®

tech. broch. 01262

Proportional linear actuator
for FLOWMATIC® 145 series control valve and 149 series kit.
Supply: 24 V (ac/dc).
Control signal: 0–10 V.
Ambient temperature range: 0–50°C.
Protection class: IP 43.
Connection: M 30 p.1,5.
Supply cable length: 1,5 m.

Code	Voltage (V)	Control signal
145014	24	0–10 V

6565

tech. broch. 01262

Proportional thermo-electric actuator
for FLOWMATIC® 145 series control valve and 149 series kit.
Quick-coupling installation, with a clip adapter. Normally closed.
Supply: 24 V (ac)/(dc).
Control signal: 0–10 V.
Feedback signal: 0–10 V.
Power consumption: 1,2 W.
Ambient temperature range: 0–60°C.
Protection class: IP 54.
Connection: M 30 p.1,5.
Supply cable length: 1 m.

Code	Voltage (V)	Control signal
656524	24	0–10 V

6565

tech. broch. 01262

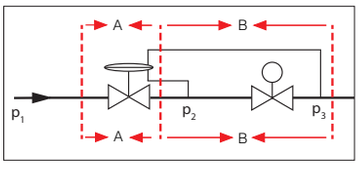
Thermo-electric actuator
for FLOWMATIC® 145 series control valve and 149 series kit.
Quick-coupling installation, with a clip adapter. Normally closed.
Supply: 230 V (ac) o 24 V (ac)/(dc).
Control signal: ON/OFF.
Power consumption: 1 W.
Ambient temperature range: 0–60°C.
Protection class: IP 54.
Connection: M 30 p.1,5.
Supply cable length: 1 m.

Code	Voltage (V)	Control signal
656502	230	ON/OFF
656504	24	ON/OFF

Operating principle

The pressure independent control valve (PICV) is designed to regulate a flow rate of fluid that is:
- 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 layout is shown in the diagram below:

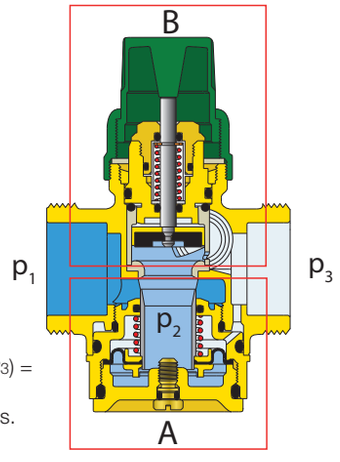


Where:

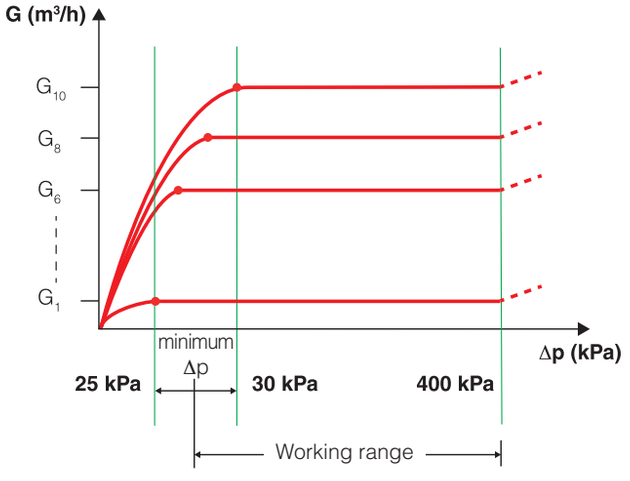
p_1 = upstream pressure
p_2 = intermediate pressure
p_3 = downstream pressure
(p_1 - p_3) = total valve **Δp**

Concisely:
Since G = Kv x √Δp

- by manually or automatically adjusting device B, Kv value and consequently G value can be set;
- once G value has been set, it remains constant thanks to the action of (A), which maintains (P_2 - P_3) = const. in response to circuit pressure changes.



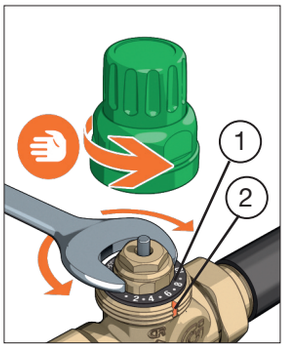
Working range
For the device to keep the flow rate constant independently from the circuit's differential pressure conditions, total valve Δp (p_1-p_3) must be in the range from the minimum Δp value and the maximum value of 400 kPa.



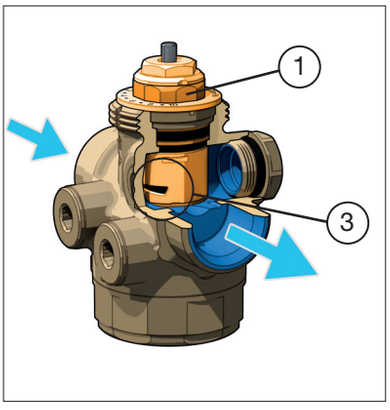
Adjustment procedure

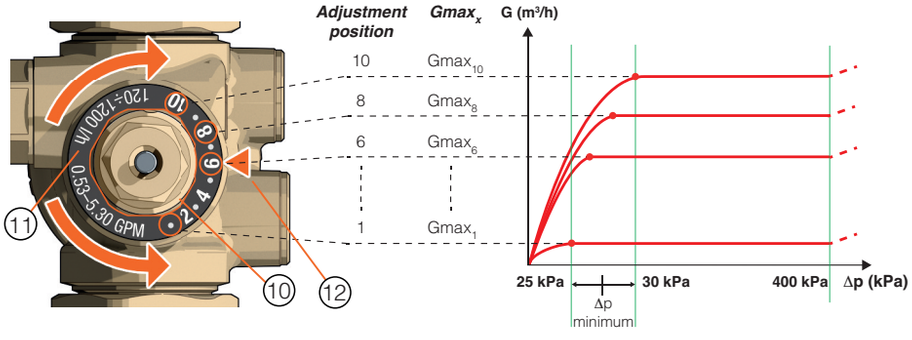
Maximum flow rate adjustment

Unscrew the protective plug by hand to gain access to the maximum flow rate adjustment nut, which can be turned with a hexagonal wrench. The adjustment nut is fixed to a 10-position graduated scale, divided into steps corresponding to 1/10 of the maximum available flow rate, which is also shown on the scale (1). Turn the adjustment nut to the numerical position corresponding to the required flow rate (design flow rate), referring to the "Flow rate adjustment table" in the technical brochure. The notch (2) on the valve body is the physical positioning reference.



Turning adjustment nut (1), which determines the number associated with the '***Adjustment position***', results in opening/closing of the bore cross section in the external obturator (3). Hence, each bore cross section set on the adjustment nut corresponds to a specific $\boldsymbol{Gmax_x}$ value.



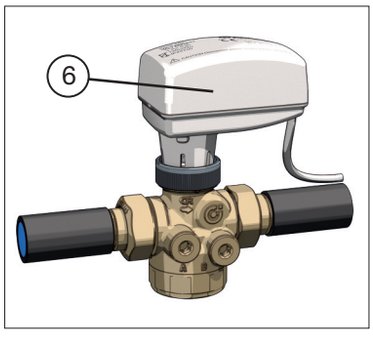


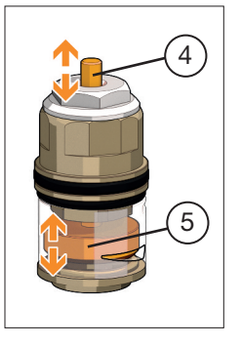
Automatic flow rate adjustment with actuator and external regulator

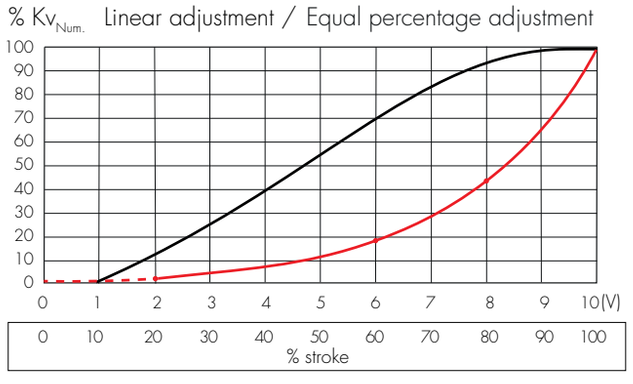
After adjusting the maximum flow rate, fit the actuator (0–10 V) code 145014 (6) to the valve. Under the control of an external regulator the actuator can automatically adjust the flow rate from the maximum set value (*E.g.:* $\boldsymbol{Gmax_8}$) to the minimum value in accordance with the thermal load to be controlled. The actuator acts on the vertical displacement of control stem (4). This results in additional opening/closing, on the maximum bore cross section, by the internal obturator (5). *For example, if the maximum flow rate has been set to position 8, the flow rate can be adjusted automatically by the actuator from* $\boldsymbol{Gmax_8}$ *to completely closed (zero flow rate).*

Flow rate adjustment curve

The valve adjustment curve is of the linear type. An increase or decrease in the valve opening cross section corresponds to a directly proportional increase or decrease of the device's hydraulic coefficient Kv. The motor is factory configured with linear adjustment. It is possible to obtain an equal-percentage adjustment (see diagram below) setting the actuator (code 145014) for this operation by means of the dedicated switch inside it. (see specific instruction sheet). In this way the control signal is managed to obtain an equal percentage adjustment.







145

Pressure independent control valve.
Brass body.
Female connections.
Graduated scale indicator.
Max. working pressure: 25 bar.
Temperature range: -20–120°C.
Max. percentage of glycol: 50%.
Δp range: 16–400 kPa.
With pressure ports.

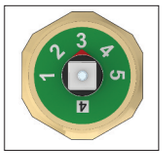
Code	DN	Conn.	Flow rate range (m³/h)
145771	32	1 1 /4”	0,86–4,63
145881	40	1 1 /2”	1,9–13,65
145991	50	2”	1,9–13,65

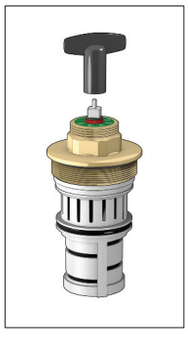
145

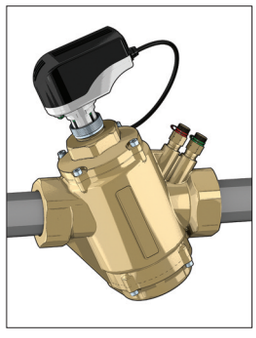
Proportional linear actuator
for pressure independent control valve
145 series.
Supply: 24 V (ac/dc).
Feedback signal: 0–10 V.
Ambient temperature range: -18–50°C.
Protection class: IP 54.
Connection: M30 p.1,5.
Lenght of supply cable: 1 m.

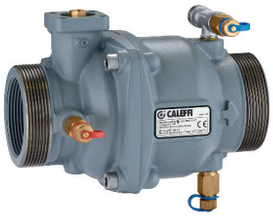
Code	Voltage V	Control signal	Use
145015	24	0–10 V	DN 32
145016	24	0–10 V	DN 40-DN 50

The micrometric adjustment of the valve is performed by using the specific key.









145

Pressure independent control valve.
Cast iron body.
Max. working pressure: 25 bar.
Temperature range: -10–120°C.
Max. percentage of glycol: 50%.
Δp range: 30–400 kPa.
With pressure test ports.

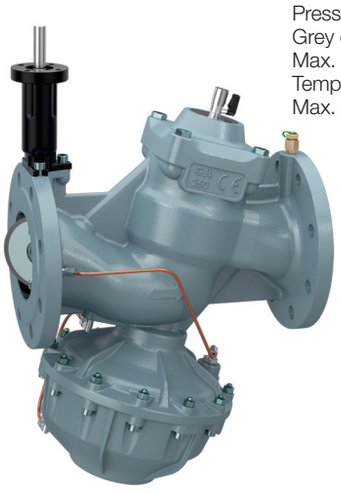
Code	DN	Conn.	Flow rate range (m³/h)
145895	40	2” M	2– 9
145905	50	2 1/2” M	3–14

145

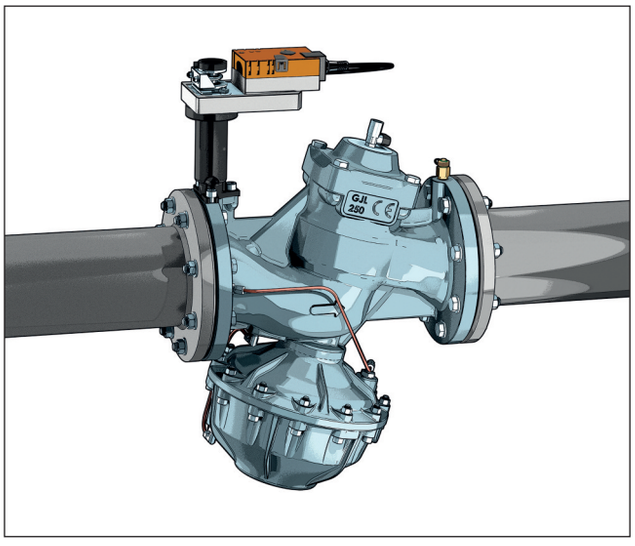
Rotational proportional actuator for
pressure independent control valve
145 series.
Supply: 24 V (ac/dc).
Control signal: 0–10 V.
Feedback signal: 0–10 V.
Ambient temperature range: -30–50°C.
Protection class: IP 54.
Manual override.

Code	Voltage V	Control signal	Use
145017	24	0–10 V	DN 40-DN 50

146



Pressure independent control valve.
Grey cast iron body.
Max. working pressure: 16 bar.
Temperature range: -10–120°C.
Max. percentage of glycol: 50%.
Δp range: 30–400 kPa.
With pressure test ports.
Flanged connections PN 16.
To be coupled with flat counterflanges EN 1092-1.



Code	DN	Flow rate range (m³/h)
146060	65	6–26
146080	80	8–36
146100	100	16–82,5
146120	125	20–125
146150	150	27–160

146

Manual actuator for pressure independent control valve 146 series.

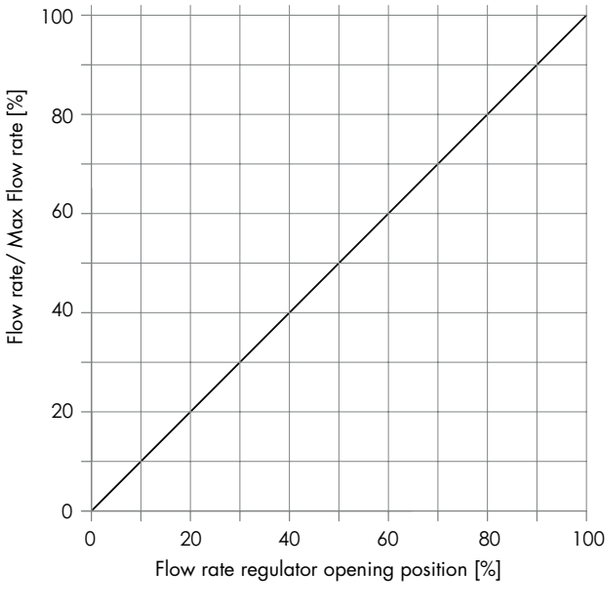
Code
146000

146

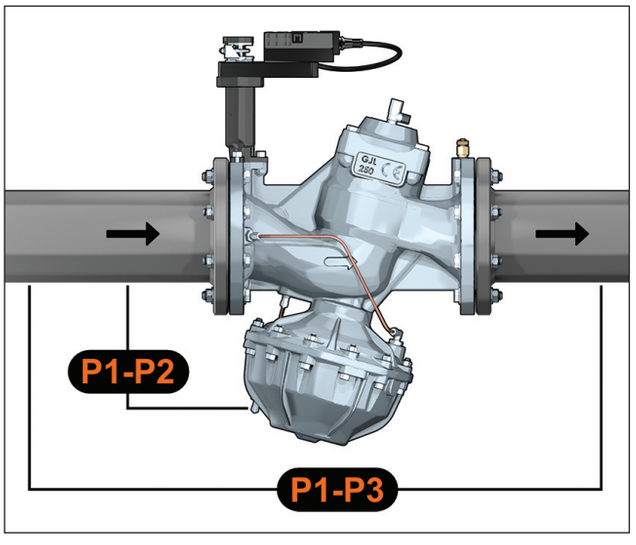
Rotational proportional actuator for pressure independent control valve 146 series.
Supply: 24 V (ac/dc).
Control signal: 0–10 V.
Feedback signal: 0–10 V.
Ambient temperature range: -30–50°C.
Protection class: IP 54.
Manual override.

Code	Voltage V	Control signal	Use
146014	24	0–10 V	DN 65-DN 80
146015	24	0–10 V	DN 100–DN 150

Control characteristic (linear)



After installing the rotational actuator or the manual actuator on the valve body, the valve regulation is performed by setting the maximum flow rate value through the graduated handle.

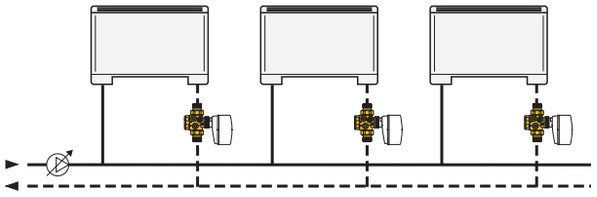


Dynamic balancing and control devices

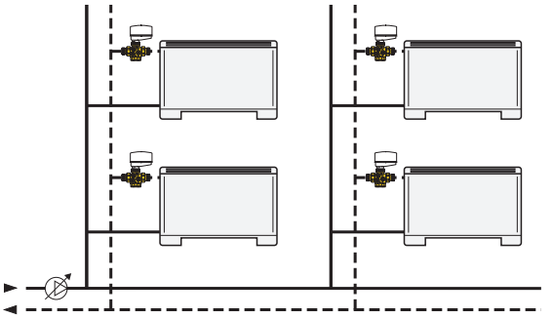
Main applications - Pressure independent control valve

- ✔ **variable flow rate circuits with adjustment on the terminal, in complex extended networks**
- ✔ **circuits with modulating flow rate control, with limited adjustment requirements**
- ✔ **circuits controlled by building automation systems**
- ✔ **circuits to supply the Air Handling coils in air based or air-water systems**

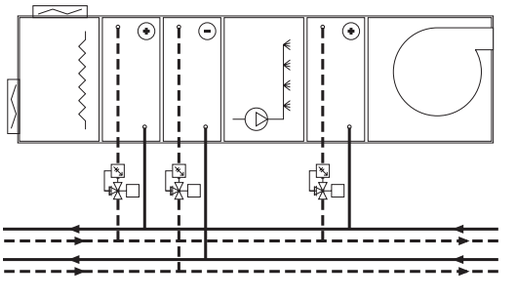
To use in line with various types of heat emitters: radiators, convectors, fan coils, fan convectors, thermal strips, etc.



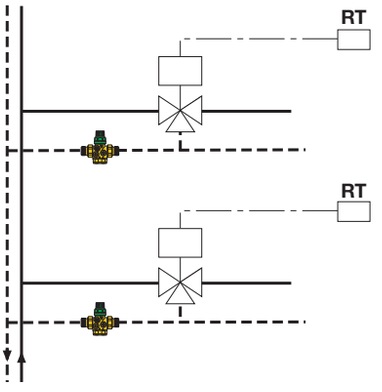
To ensure the required amount of medium flows through each terminal



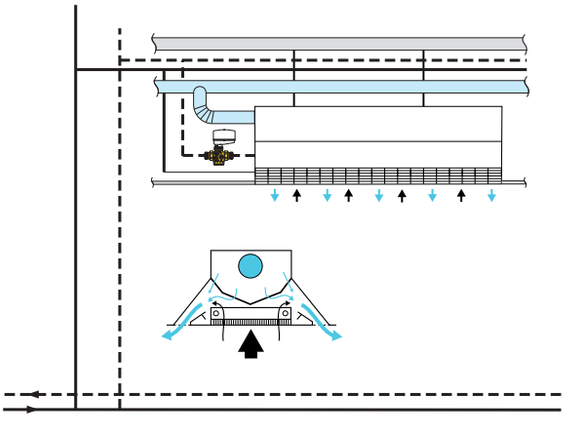
To balance circuits that serve air handling units



To guarantee the design flow rates (with open or closed valve) to the various zones of a system.

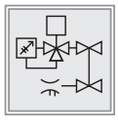


To adjust flow rate in applications with chilled beams.



Connection and regulation kit for HVAC terminal units

149 series



tech. broch. 01336

Function

The connection unit is a pre-assembled compact unit designed to control, adjust, filter the circuit of the terminal unit.
Moreover, it allows for carrying out plant maintenance and calibration operations.
It allows the connection of fan coils, cold beams or ceiling conditioning systems with the main distribution network.
Complete with insulation suitable for both heating and cooling.

Product range

149 series Connection and regulation kit — sizes DN 15 (1/2" F x 3/4" M), DN 20 (3/4" F x 1" M), DN 25 (1" F x 1 1/4" M)

Performance

Medium:	water, glycol solutions
Max. percentage of glycol:	50%
Max. working pressure:	25 bar
Max. differential pressure with code 145014 and 6565 series thermo-electric actuators:	4 bar
Working temperature range:	-10–120°C
Nominal Δp control range:	25–400 kPa
Flow rate regulation range:	0,02–3,00 m³/h
PICV accuracy:	±5% of the setpoint
Leakage:	class V in accordance with EN 60534-4

For the selection of the individual models see the technical brochure.

145 FLOWMATIC®

tech. broch. 01262

Proportional linear actuator
for FLOWMATIC® 145 series control valve and 149 series kit.
Supply: 24 V (ac/dc).
Control signal: 0–10 V.
Ambient temperature range: 0–50°C.
Protection class: IP 43.
Connection: M 30 p.1,5.
Supply cable length: 1,5 m.

Code	Voltage (V)	Control signal
145014	24	0–10 V

6565

tech. broch. 01262

Proportional thermo-electric actuator
for FLOWMATIC® 145 series control valve and 149 series kit.
Quick-coupling installation, with a clip adapter. Normally closed.
Supply: 24 V (ac)/(dc).
Control signal: 0–10 V.
Feedback signal: 0–10 V.
Power consumption: 1,2 W.
Ambient temperature range: 0–60°C.
Protection class: IP 54.
Connection: M 30 p.1,5.
Supply cable length: 1 m.

Code	Voltage (V)	Control signal
656524	24	0–10 V

6565

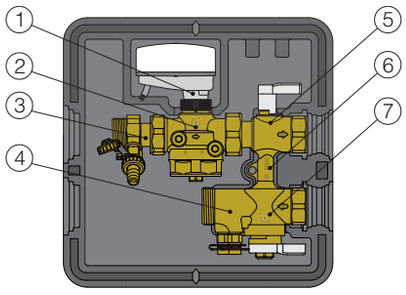
tech. broch. 01262

Thermo-electric actuator
for FLOWMATIC® 145 series control valve and 149 series kit.
Quick-coupling installation, with a clip adapter. Normally closed.
Supply: 230 V (ac) o 24 V (ac)/(dc).
Control signal: ON/OFF.
Power consumption: 1 W.
Ambient temperature range: 0–60°C.
Protection class: IP 54.
Connection: M 30 p.1,5.
Supply cable length: 1 m.

Code	Voltage (V)	Control signal
656502	230	ON/OFF
656504	24	ON/OFF

Operating principle

The device layout is shown in the diagram below:



1. Actuator (optional)
2. Pressure independent control valve (PICV)
3. Fill/drain cock (optional)
4. Venturi device for flow rate measurement with connections for pressure test ports for flow rate measurement (present only in 149.00 codes)
5. Three-way shut-off valve
6. By-pass
7. Shut-off valve with integrated strainer

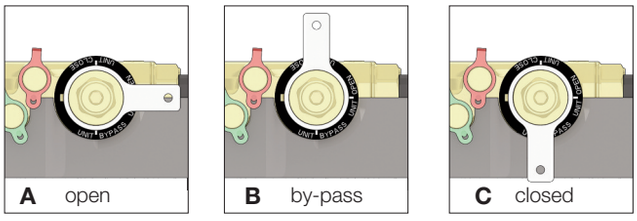
The group allows to:

- adjust and maintain the flow rate of the terminal unit constant as the differential pressure conditions of the main circuit changes due to the pressure independent control valve (2);
- isolate the terminal unit through the three-way shut-off valves (5/7);
- by-pass the flow through the three-way shut-off valves and the integrated by-pass (6);
- filter the inlet water to the terminal unit through the strainer located inside a shut-off valve (7);
- measure the flow rate passing through the terminal unit using the Venturi effect device (4) and the pressure test ports with which the connection of the measuring instrument is easy;
- clean the circuit and drain the water through the optional drain cock (3).

Construction details

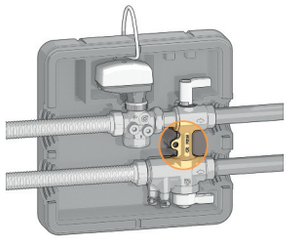
Compact body
The kit is designed specifically for small dimensions, compact and easy to install to facilitate the terminal unit connection to the main circuit.

Three-way ball valve
The shut-off valves have been designed at three-way to minimize the dimensions and connections of the kit. The internal ball is designed to open the straight path (for normal operation), the by-pass path (for passage through the by-pass) or to completely close the passage and isolate the circuit of the terminal unit.



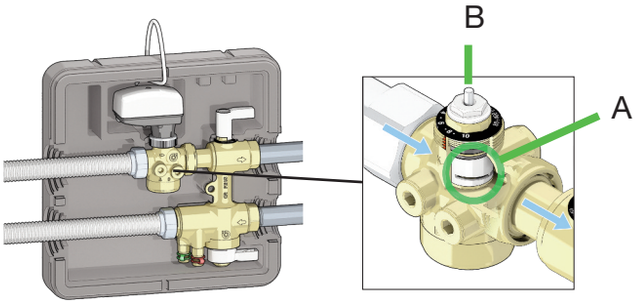
Integrated by-pass
The kit is complete with by-pass, which is an indispensable element for each terminal circuit. The by-pass allows to:

- perform the flushing, washing and cleaning operations of the main circuit tubes without water passage through the terminal unit;
- perform the shut-off and maintenance operations of the terminal unit.



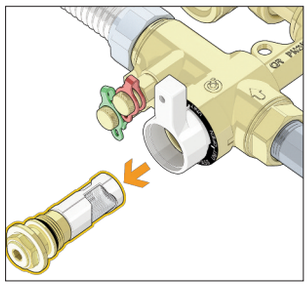
Integrated PICV (145 series)
The kit is equipped with a pressure independent control valve (PICV) capable of adjusting and maintaining the constant the flow rate even when the differential pressure conditions of the terminal unit changes.
The flow rate is adjusted:

- **manually** on the automatic flow rate regulator, to restrict the maximum value. The adjustment is made turning the ring nut and positioning it on the relative adjustment number: this causes the passage section opening/closing (A)
- **automatically** by the control valve in combination with a proportional (0–10 V) or ON/OFF actuator, in accordance with the thermal load requirements of the section of the circuit to be controlled. The actuator adjusts the flow rate from the maximum value to the minimum value acting on the vertical displacement of the control stem (B).



Flow rate metering device
The group contains a flow rate metering device based on Venturi effect. The possibility of measuring the flow rate in a simple way facilitates the system setting and set-up operations.

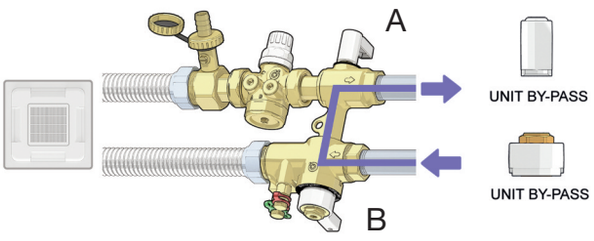
Integrated strainer
The components of a heating and air conditioning system are exposed to degradation caused by the impurities contained in the system's circuit. The cartridge filter contained inside the kit mechanically blocks the impurities contained in the thermal medium and retains them by mechanical selection through a specific mesh wire filtering strainer.



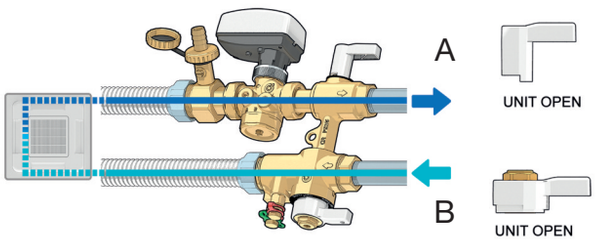
Dynamic balancing and control devices

Operations

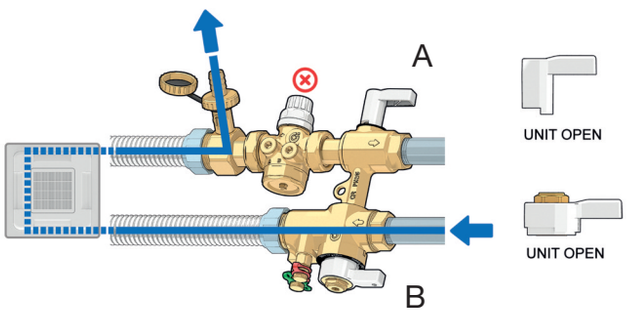
Wash in by-pass
Clean the main circuit, by simple washing or adding specific products, with the exception of the single terminal unit.
Place both lever A and lever B on “UNIT BY-PASS”.



Normal operation
Normal operation involves positioning both valves on “OPEN”.
Water passes through the strainer before entering in the terminal unit, protecting the unit against any residues and impurities present in the main circuit water.

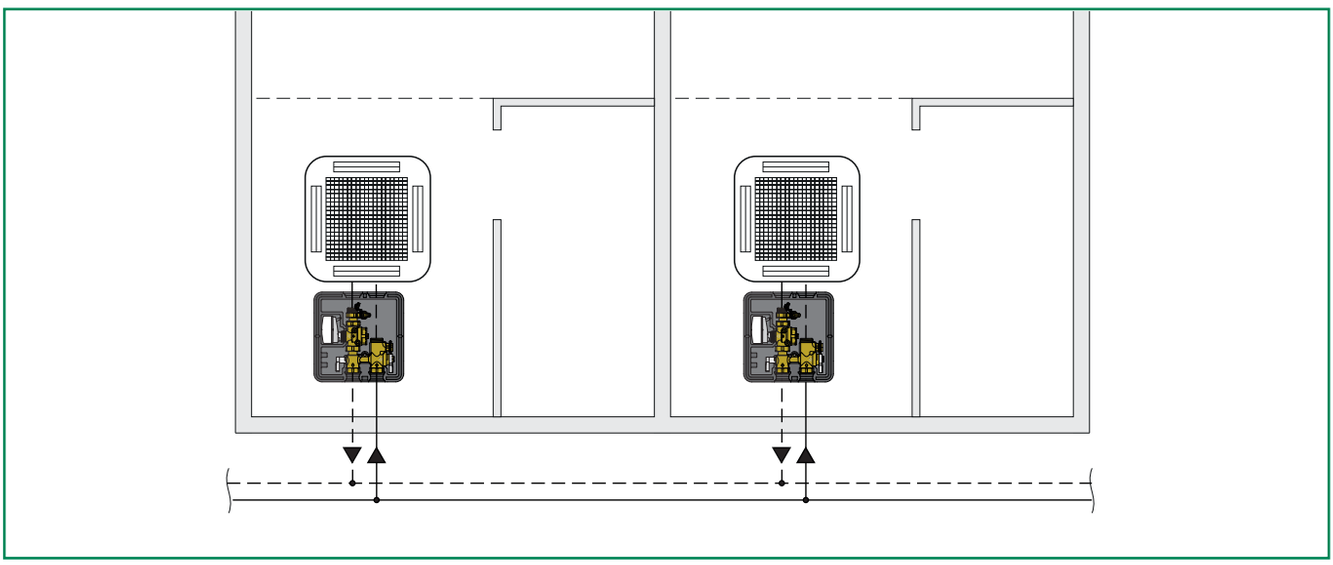


Terminal unit washing
Position both levers on “UNIT OPEN”, close the PICV using the knob and open the optional drain cock: in this way it is possible to flush the terminal unit using water coming from the main circuit without passing through the PICV.



Main applications - Connection group for terminal units

✔ **circuits in order to service the fan-coil and cold beams**



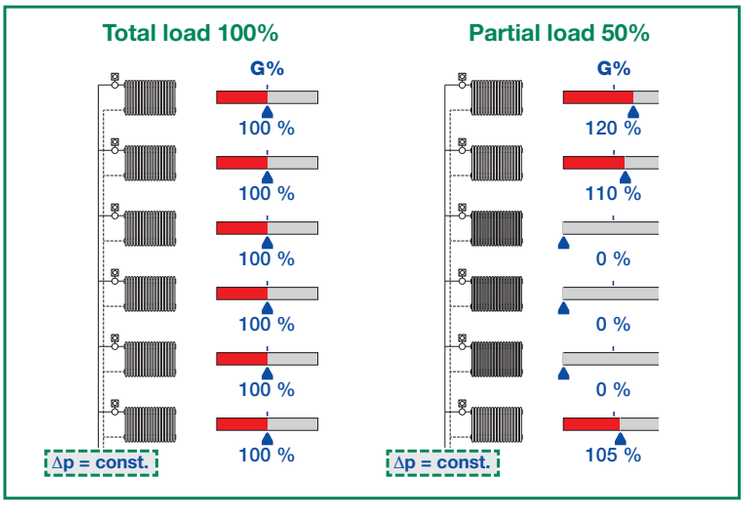
DIFFERENTIAL PRESSURE CONTROL

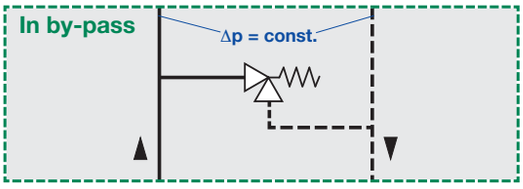
Continuous regulation of the flow rate to track the requirements for adaptation to variable thermal loads causes continuos changes in the differential pressure on the terminal. To solve problems of noise emissions, over-stressing of the components and rapid wear of the system, suitable devices should be installed to regulate and control the differential pressure in the various points of the distribution circuit. There are essentially two methods for this type of control:

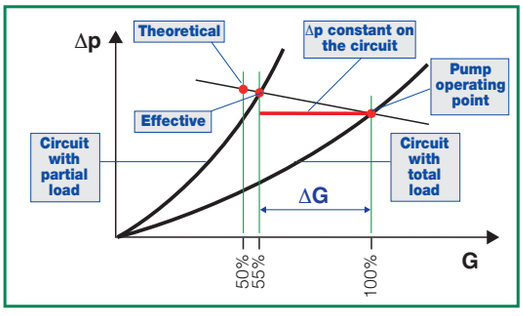
- **Δp control devices in by-pass**. These are simple conventional devices designed to control systems operating with fixed speed pumps having globally constant flow rates. In these applications control of the temperature on the return flow from circuit to central heating system is secondary with respect to the solution's simplicity and economy.
- **Δp control devices in line**. These are more complex devices designed to control systems operating with variable speed pumps and globally variable flow rates. In these applications, temperature control of the return flow from circuit to central heating room is optimal, as required in systems with condensing boilers or connected to district heating networks.

Δp control in by-pass

The job of the by-pass valve is to maintain the pump operating point as close as possible to its nominal value. Starting from a situation of circuit that is manually balanced at the individual terminal, without the use of the by-pass valve, when the flow rate in the circuit decreases due to partial closure of the two-way valves, the head losses increase in the circuit.
The by-pass valve, set to the nominal head value of the pump, makes it possible to limit the pressure increase, by-passing flow rate ΔG. This behaviour is guaranteed at any closing condition of the system regulating valves. In fact, once the position of the valve control knob has been established, the operating pressure value is more or less constant as the discharge flow rate varies.

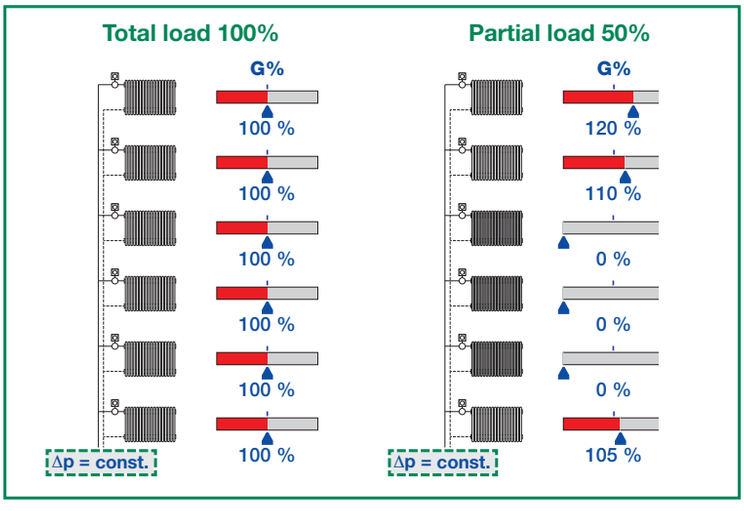


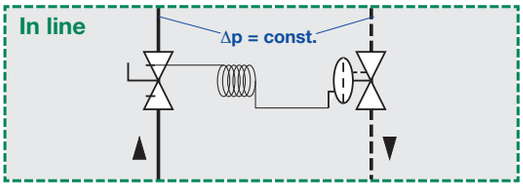


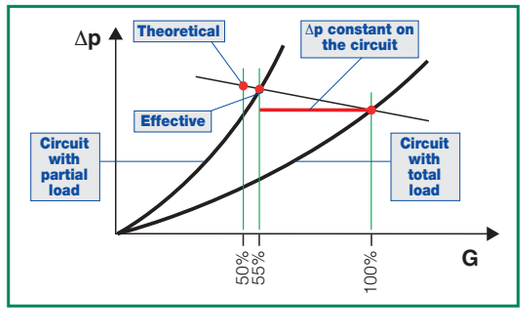


Δp control in line

The circuit is regulated by the combined action of two devices: the balancing valve and the Δp regulating valve. By means of a capillary tube that connects them, they control the flow rate and differential pressure in the zone of the circuit concerned, as the operating conditions vary in the whole system. Starting from a situation of circuit that is manually balanced at the individual terminal, gradual closing of the room temperature control devices, e.g. thermostatic valves, causes an increase in the pressure differential between flow and return of the circuit zone. The in line regulator uses the flow pressure signal received on the capillary tube and closes the passage of the medium to absorb the pressure differential increase that has arisen and return to the set value.
The pressure differential value is kept constant between flow and return of the circuit zone, even when, according to the inverse physical process, the thermostatic valves open to increase the flow rate to the heating terminals.

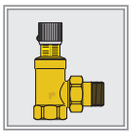






- Differential by-pass valve

519 series



519

tech. broch. 01007

Adjustable differential by-pass valve with graduated scale.

WRAS APPROVED PRODUCT CERTIFICATION MARK

Code		Setting range m w.g.
519500	3/4”	1–6
519504	3/4”	10–40
519700	1 1/4”	1–6

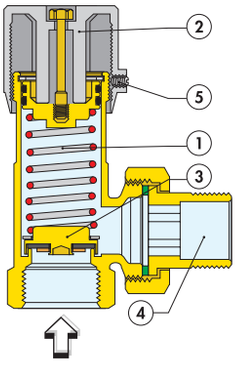
Technical specifications

Performance

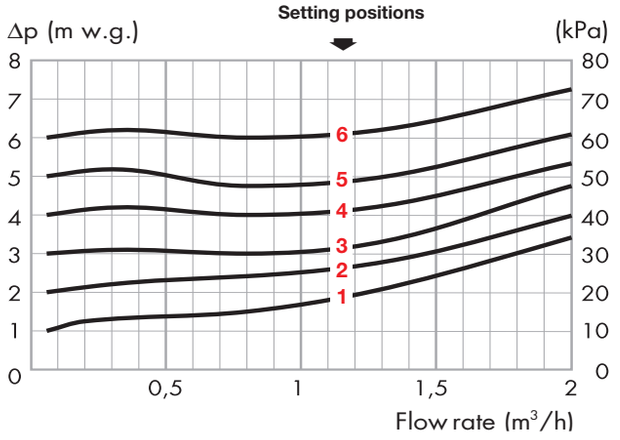
Medium:	water, glycol solutions
Max percentage of glycol	30%
Temperature range:	0–110°C.
Maximum working pressure:	10 bar

Operating principle

When the compression spring (1) is adjusted using the control knob (2), the force acting on the obturator (3) changes, thus modifying the differential activation pressure value of the valve The obturator only opens, activating the by-pass circuit, when it is subjected to a differential pressure sufficient to generate a greater thrust than that exerted by the contrast spring. This allows flow discharge through outlet (4), limiting the pressure difference between the two points in the system where the valve is fitted.

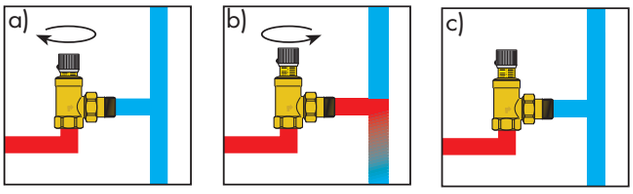


code 519500 3/4”



Setting

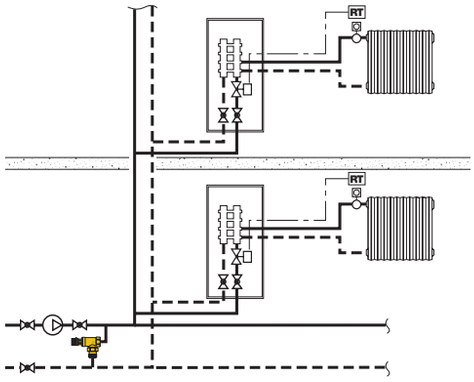
To regulate the valve, turn the knob to the value required on the graded scale: the values correspond to the differential pressure in m w.g. at which the by-pass is opened.
To carry out rapid adjustment of the by-pass valve it is possible to use the following practical method, which can be applied, for example, to the system in an apartment fitted with thermostat valves:
the system must be operating, the regulating valves must be fully open and the by-pass valve must be set to the maximum value (a). Close approximately 30% of the thermostatic valves. Gradually open the valve using the control knob. Use a thermometer, or simply your hand, to check that the hot water is flowing into the by-pass circuit (b). As soon as a temperature rise is noted, open the thermostatic valves again and check that the hot water stops flowing into the by-pass (c).



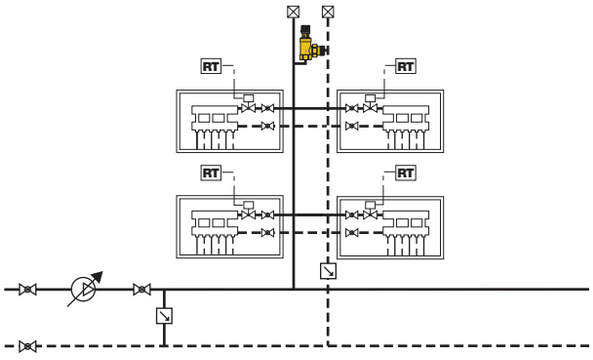
Main applications - By-pass valves

- ✔ **simple circuits with constant overall flow rate with thermostatic valves, of limited extension**
- ✔ **circuits with constant speed pumps**
- ✔ **circuits with conventional type generators**

Small-medium size system, by-pass in central plant

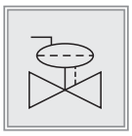
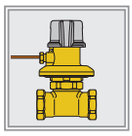


Medium-large size system, by-pass on top of risers

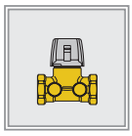


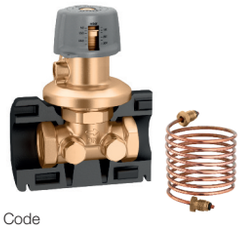
Differential pressure control devices

- Differential pressure control valve **140 series**

- Shut-off and pre-regulation valve **142 series**



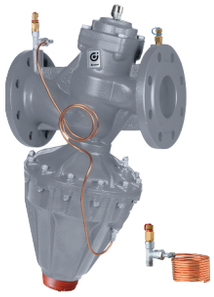
140

tech. broch. 01250

Differential pressure control valve.
CR dezincification resistant alloy body.
Complete with capillary tube to connect to the valve on the flow pipe.
With insulation.

Code			Adjustable differential pressure setting (mbar)
140340*	DN 15	1/2”	50–300
140440*	DN 15	1/2”	250–600
140350*	DN 20	3/4”	50–300
140450*	DN 20	3/4”	250–600
140360*	DN 25	1”	50–300
140460*	DN 25	1”	250–600
140370*	DN 32	1 1/4”	50–300
140470*	DN 32	1 1/4”	250–600
140380*	DN 40	1 1/2”	50–300
140480*	DN 40	1 1/2”	250–600
140392	DN 50	2” (without insulation)	50–300
140492	DN 50	2” (without insulation)	250–600

** Available also in version without insulation*



140

tech. broch. 01250

Differential pressure control valve.
Cast iron body.

Code			Adjustable differential pressure setting (mbar)
140506	DN 65		200– 800
140606	DN 65		800–1600
140508	DN 80		200– 800
140608	DN 80		800–1600
140510	DN 100		200– 800
140610	DN 100		800–1600
140512	DN 125		200– 800
140515	DN 150		200– 800

142

tech. broch. 01250

Shut-off and pre-regulation valve.
CR dezincification resistant alloy body.
Complete with pressure test ports for capillary tube connection.
With insulation.

Code		
142140*	DN 15	1/2”
142150*	DN 20	3/4”
142160*	DN 25	1”
142170*	DN 32	1 1/4”
142180*	DN 40	1 1/2”
142290	DN 50	2” (without insulation)

** Available also in version without insulation*

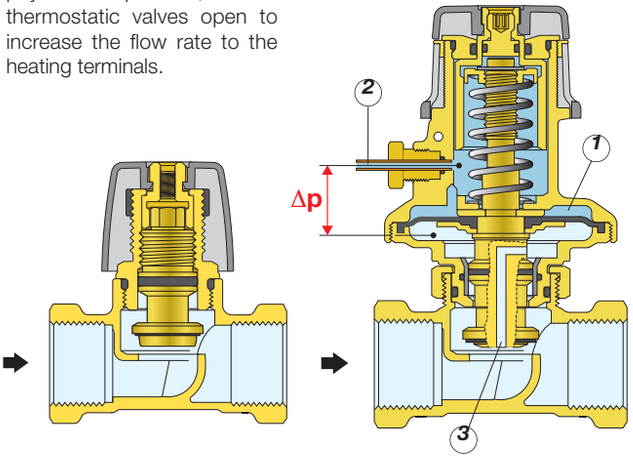
Technical specifications

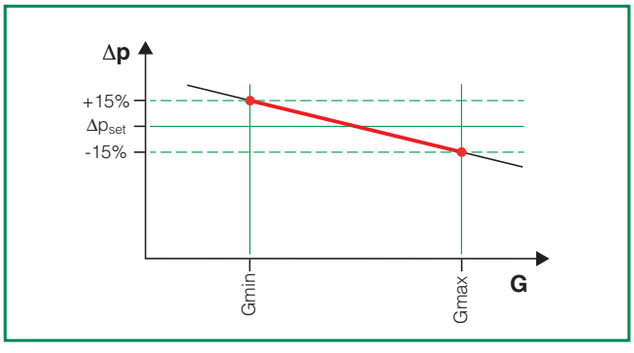
Performance

Medium:		water, glycol solutions
Max. percentage of glycol:		50%
Maximum working pressure:	- 142 series:	16 bar
	- 140 series (DN 15–DN 25):	16 bar
	- 140 series (DN 32–DN 50):	10 bar
	- 140 series (DN 65–DN 150):	16 bar
Temperature range:		-10–120°C
Membrane maximum differential pressure (140 series):		
	- (DN 15–DN 25):	6 bar
	- (DN 32–DN 50):	2,5 bar
	- (DN 65–DN 150):	16 bar
Accuracy (140 and 142 series):		±15%

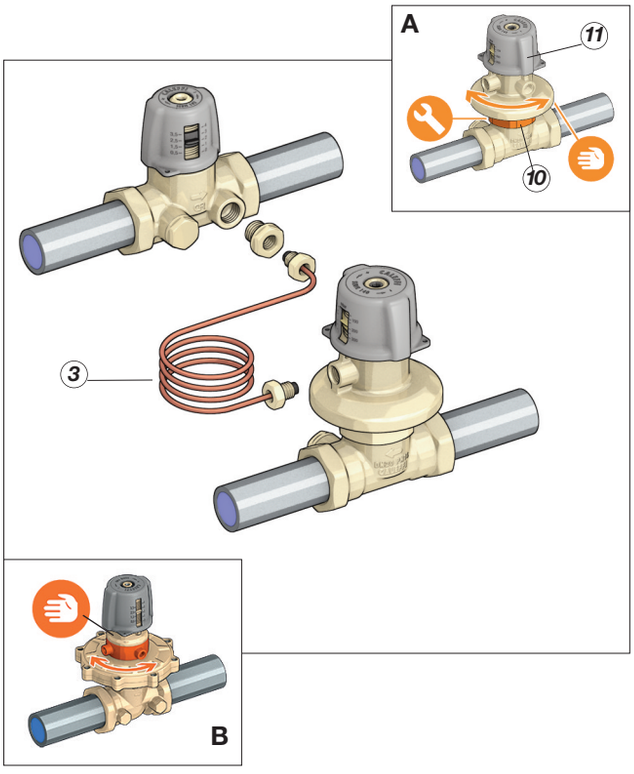
Operating principle

The flow pressure value is brought to the top surface of the membrane (1) by means of the connecting capillary tube (2); the return pressure value is brought to the bottom surface of the membrane through the connecting passage inside the control stem (3). The force generated by the pressure differential on the membrane exerts a thrust on the obturator stem, closing the passage of medium on the return of the circuit zone until the thrust force of the membrane and the counter-thrust force of the counter-spring reach equilibrium on the set Δp value. This is the pressure differential value that is kept constant between flow and return of the circuit zone, even when, according to the inverse physical process, the thermostatic valves open to increase the flow rate to the heating terminals.





Differential pressure control devices

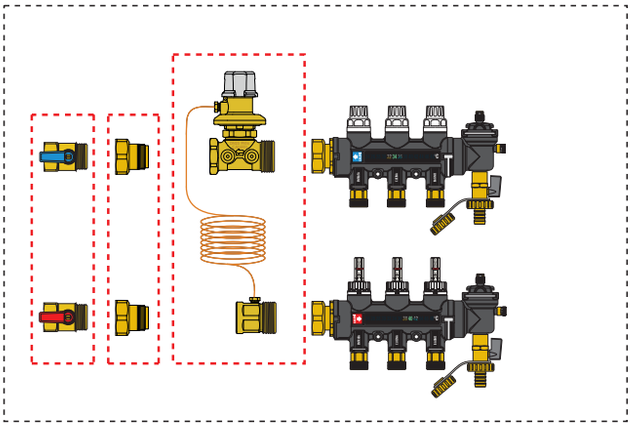


140

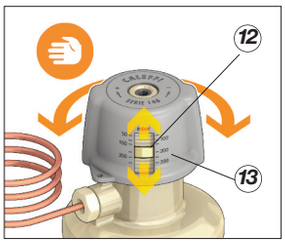
Differential pressure control valve for 1” manifolds, 671, 662 and 664 series. Complete with capillary pipe and metering device for connection.
Max. working pressure: 16 bar.
Temperature range: -10÷120°C.
Max. percentage of glycol: 50%.
Length of Ø 3 mm capillary pipe: 1,5 m.

Code		Adjustable differential pressure setting (mbar)
140300	1”	50–300

Connection of the pressure regulator 140 series with the manifold 671 series



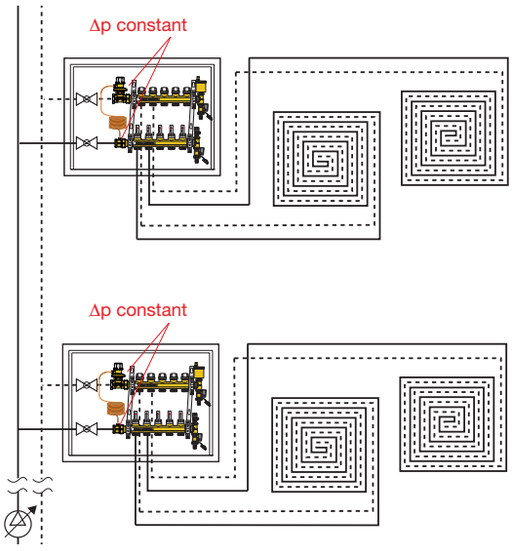
Δp indicator on 140 series
The operation to set up the Δp differential regulator is simplified by the presence of the mobile indicator (12) and the graduated scale (13) in mbar on the valve knob.



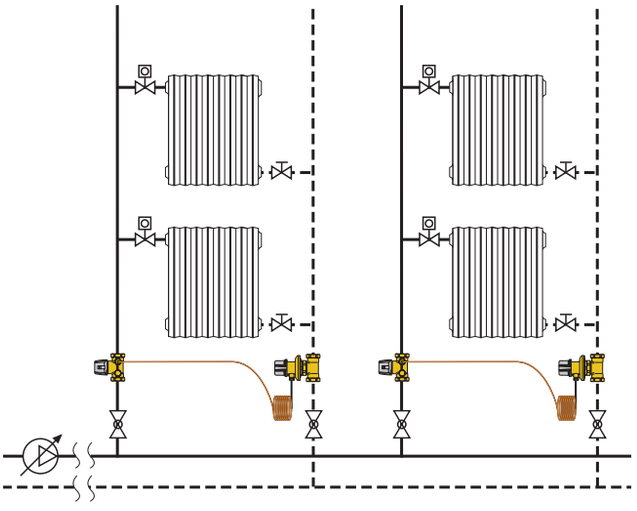
Main applications - Δp regulators

- ✔ **variable flow rate circuits with thermostatic valves, in extended networks**
- ✔ **circuits with variable speed pumps**
- ✔ **circuits with condensing boiler type generators or district heating**
- ✔ **circuits with modulating regulating valves with high control requirements**

Δp control on manifold type systems



Δp control on riser type systems



Commissioning

After selecting and installing the components, the system commissioning stage is of fundamental importance for correct operation. In practice, the first requirement is to prepare the system with the specific flow rate and temperature measuring devices. Then the regulating and balancing devices must be adjusted to ensure the hydraulic circuit is operating in the design conditions.
- Fully open all the control valves, all the circuits and all the devices.
- Set the static and dynamic balancing valves to the required flow rate value.

In this delicate stage the choice of the measuring instruments and optimal use of the same in accordance with specific procedures may prove decisive for the purpose of rapid and accurate system set-up.

Electronic flow rate and differential pressure measuring station 130 series
The electronic measuring station makes it possible to measure the water flow rate in air-conditioning systems. The system is composed of a Δp measuring sensor and a remote control unit (terminal) including the Caleffi Balance programming software. The terminal can be supplied already in the package or you can use your own Android® device by downloading the special app.
The sensor measures the differential pressure and communicates with the terminal via Bluetooth®.
The software also contains the data of most commercially available balancing valves.

Smart Balancing Caleffi
Available app for smartphone.
Download for your Android® mobile phone.

Product range

Code 130006 Electronic flow rate and differential pressure measuring station complete with remote control unit, with Android® app
Code 130005 Electronic flow rate and differential pressure measuring station without remote control unit, with Android® app

Technical specifications

Range of measurement

Differential pressure:	0–1000 kPa
Static pressure:	< 1000 kPa
System temperature:	-30–120°C

Measurement accuracy

Differential pressure:	< 0,1% of full scale

Sensor

Battery capacity:	6600 mAh
Operating time:	35 hours of continuous operation
Charging time:	6 hours
IP class:	IP 65

Ambient temperature of the instrument

During operation and charging:	0–40°C
During storage:	-20–60°C
Ambient humidity:	maximum 90% relative humidity

Sensor weight:	540 g
Full case:	2,8 kg

Characteristic components
- Measuring sensor
- 2 measuring pipes
- 2 measuring needles
- Touchscreen terminal with active licence and accessories
- Sensor battery charger
- Terminal battery charger
- Communication cable between terminal and PC
- Instructions with licence to download the Android® app (for code 130005)
- Instruction manual
- CD containing the instruction manual, measurement and balancing software, valves database and the report viewing tool
- Calibration protocol. The sensor is supplied with a specific calibration protocol drawn up by a certified laboratory.

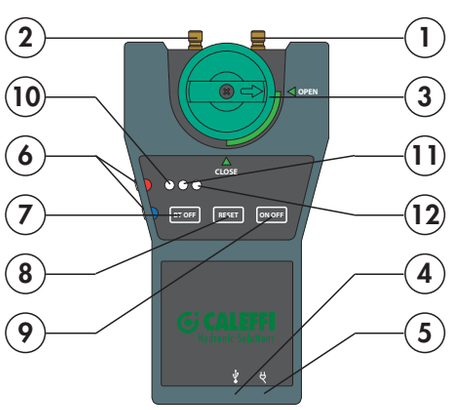
Operating principle

The operator chooses the balancing valve from the list on the terminal (manufacturer, model, size and position with the corresponding Kv). The data of the valve, together with the measured Δp, are the basis for calculating the flow rate that is displayed on the terminal screen. If the valve on which you are making the measurement is not available in the database, it is still possible to enter the Kv value manually.

Methods of measurement
The complete device allows to choose 3 methods of measurement:

1) Measurement with set position. The display shows the flow rate calculated by the device in relation to the chosen valve and assigned position.
2) Measurement with set flow rate. The position is calculated to assign to the valve in order to obtain the desired flow rate.
3) Simple measurement Δp. The screen shows the differential pressure value measured by the sensor.

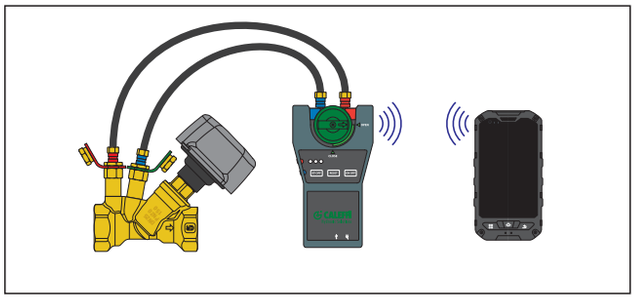
Characteristic components of the Δp measuring station



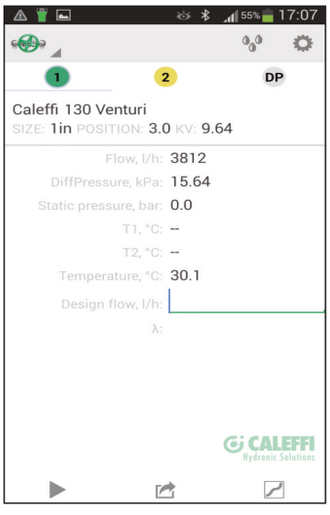
1. Upstream pressure test port
2. Downstream pressure test port
3. Setting by-pass knob
4. Mini USB port
5. Socket for charging
6. Ports for temperature probes *(optional)*
7. Bluetooth® OFF
8. Reset button
9. ON/OFF button
10. Bluetooth® ON indicator
11. Battery charging indicator
12. ON/OFF indicator

Commissioning

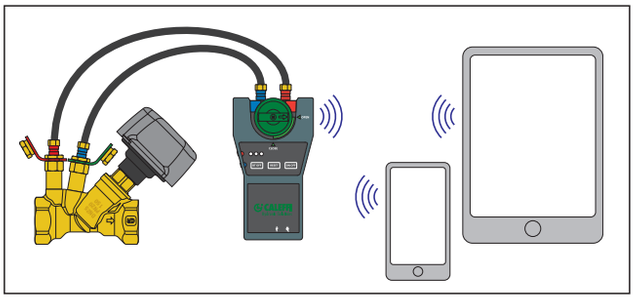
Transmission via Bluetooth® to the terminal with Android® application



The terminal provided in the package is already equipped with the Caleffi Balance software which is loaded with all the data relating to Caleffi balancing valves and the main commercially available balancing valves.
The device allows you to make measurements using the methods described above, view the results and save them.

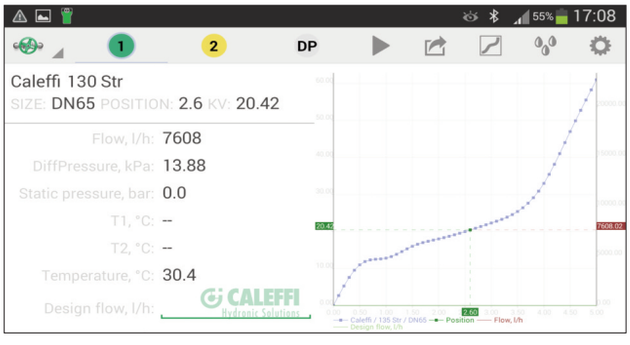


Transmission via Bluetooth® to Smartphone/Tablet with Android® application



Following the procedure described in the package you can download the Caleffi Balance app to your terminal running the Android® operating system (Smartphone or Tablet).
It includes all the data relating to Caleffi balancing valves and the main balancing valves that are commercially available.

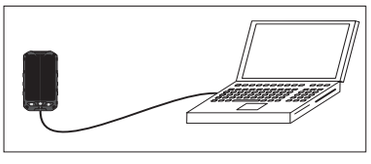
The device allows you to make measurements using the methods described above, view the results and save them.
In addition it enables a graphic display of the results.

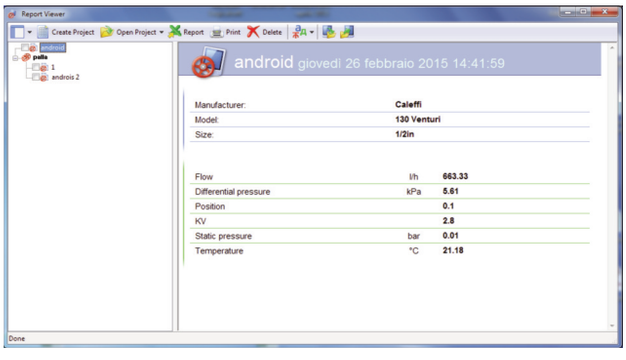


PC connection

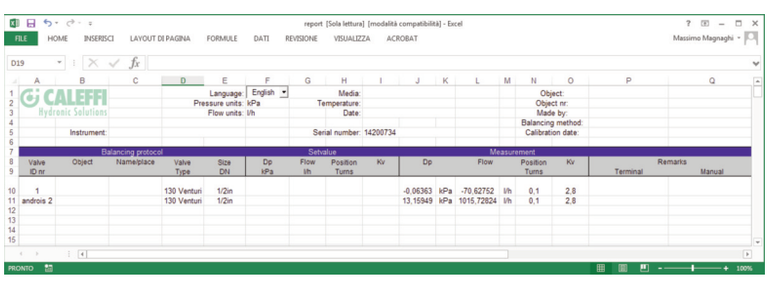
The values obtained with the measurements, and the corresponding valve data, can be saved and viewed directly on the terminal screen or sent to a PC for later processing.

The Report Viewer software supplied on the CD-ROM in the package can be installed on a PC. It enables collecting the measured data and drafting a report. In addition, this software allows you to load the project before making any measurements and export the data on the terminal to help save the measurements in an orderly fashion.





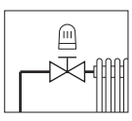
The CD-ROM also contains the Valve Browser software which provides a simulation of the measurement in order to estimate the behaviour of the various valves during the design phase.

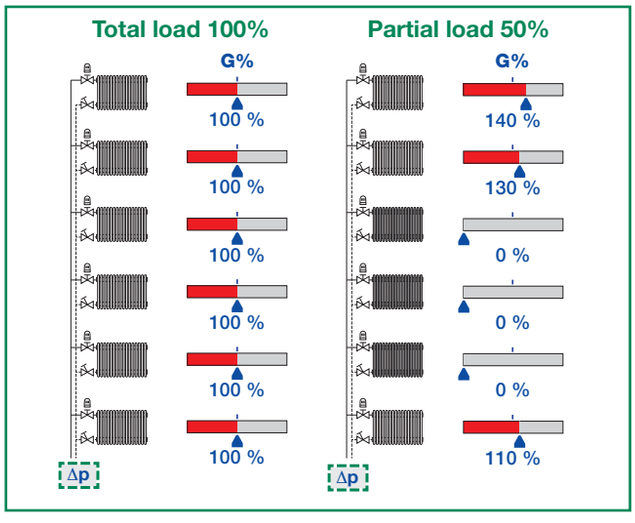


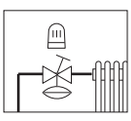
Radiator circuit balancing devices

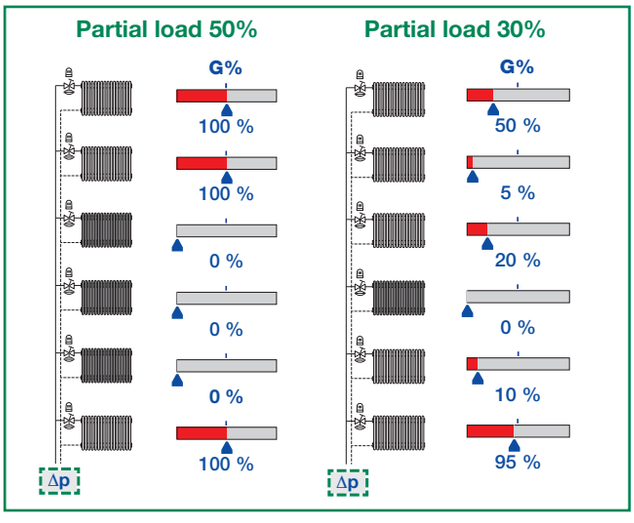
Static balancing
Static-type devices are conventional devices suitable for use in constant flow rate circuits or circuits subject to limited load variations. With static-type devices, the individual radiators are difficult to balance perfectly and have operating limitations in the case of partial closure by means of the regulating valves. The flow rate in the open circuits does not remain constant at the nominal value.

Dynamic balancing
Dynamic devices are modern automatic devices, mainly suitable for variable flow rate systems with thermal loads that change frequently. They can balance the circuit automatically, ensuring each radiator receives the design flow rate. Even in the case of partial circuit closure by means of the regulating valves, the flow rates in the open circuits remain constant at the nominal value. This behaviour is maintained even if there is modulation of the loads; the flow rate value remains constant at the value corresponding to each partial load.





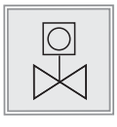


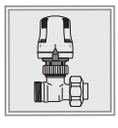


Static balancing devices

- Convertible radiator valves with pre-setting

425 - 426 - 421 - 422 series





Product range

For copper and simple plastic and multi-layer pipes:
425 series. Angled convertible radiator valve with pre-setting sizes 3/8", 1/2" radiator x 23 p.1,5 pipe

426 series. Straight convertible radiator valve with pre-setting sizes 3/8", 1/2" radiator x 23 p.1,5 pipe

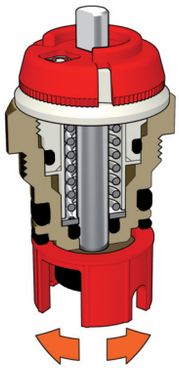
For steel pipes:
421 series. Angled convertible radiator valve with pre-setting sizes 3/8, 1/2" and 3/4" (*)

422 series. Straight convertible radiator valve with pre-setting sizes 3/8, 1/2" and 3/4" (*)

** 3/4" without rubber seal*

Operating principle

The convertible radiator valves are equipped with an internal device for pre-setting the pressure drop hydraulic characteristics.
Specific passage cross sections can be selected by means of the control locking nut, in order to generate the required resistance to the motion of the medium.
Each cross section equates to a specific Kv value to create the head loss corresponding to a given setting position on a graduated scale.

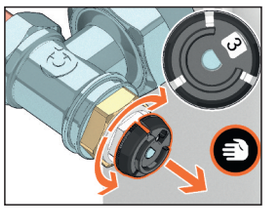


Performance

Mediums:	water, glycol solutions
Max. percentage of glycol:	30%
Max. differential pressure with control fitted:	1 bar
Max. working pressure:	10 bar
Thermal medium working temperature range:	5–100°C
Factory pre-setting:	position 5

Pre-setting and installation of thermostatic control heads or thermo-electric actuators

Lift the special control ring nut of the pre-setting device and turn the control stem to select the required position. Take care not to completely remove the nut from the control stem. The selected pre-setting number must appear perfectly in the centre of the window.

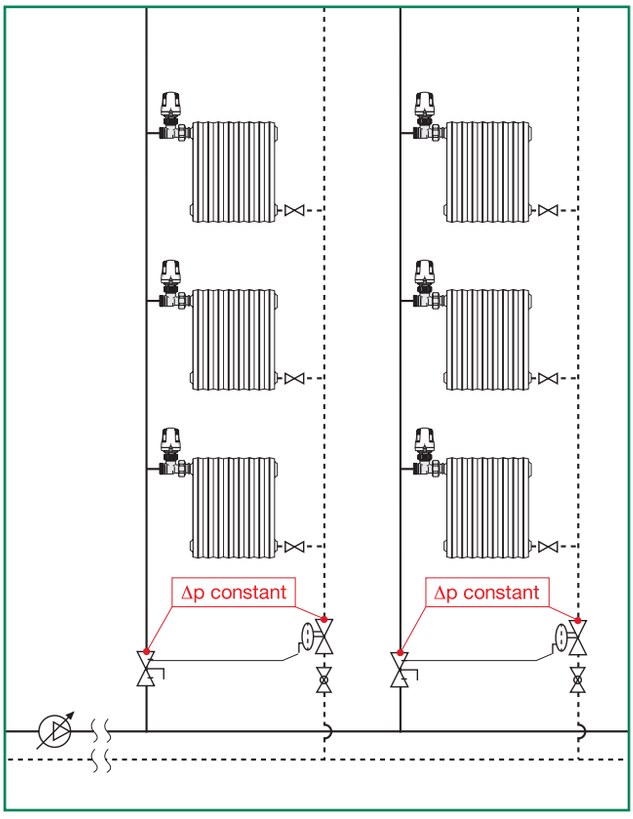


Pre-settable convertible radiator valves with thermostatic control head, proportional band 2K

Pre-setting position	Kv (m³/h) (Proportional band 2K)** 3/8" angled	3/8" straight	1/2" angled	1/2" straight	3/4" angled	3/4" straight
1	**0,08**	0,08	0,09	0,09	0,12	0,12
2	**0,15**	0,15	0,16	0,16	0,20	0,20
3	**0,22**	0,22	0,23	0,23	0,32	0,32
4	**0,35**	0,35	0,36	0,36	0,50	0,50
5	0,50	0,50	0,55	0,55	0,72	0,72

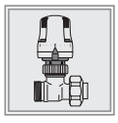
Main applications - Pre-setting valves

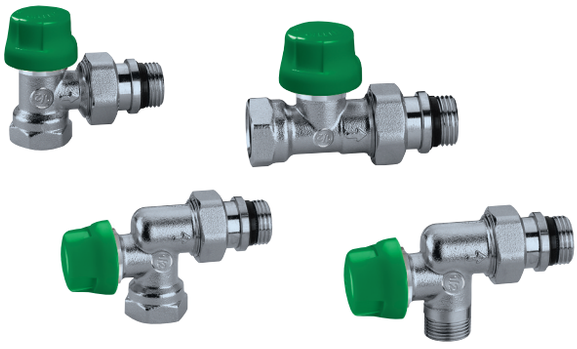
✔ **circuits with riser distribution**
✔ **circuits with manifold distribution**



Dynamic balancing devices

- Dynamic thermostatic radiator valves **230 series**





Product range

For steel pipes:
230 series: sizes 3/8", 1/2" and 3/4" (*)

231 series: sizes 3/8", 1/2" and 3/4" (*)

234 series: sizes 3/8", 1/2"

PCT INTERNATIONAL APPLICATION PENDING

For copper, simple plastic and multi-layer pipes:
232 series. Dynamic thermostatic radiator valve, angled version sizes 3/8", 1/2" radiator x 23 p.1,5 piping

233 series. Dynamic thermostatic radiator valve, straight version sizes 3/8", 1/2" radiator x 23 p.1,5 piping

237 series. Dynamic thermostatic radiator valve, reverse-angled version sizes 3/8", 1/2" radiator x 23 p.1,5 piping

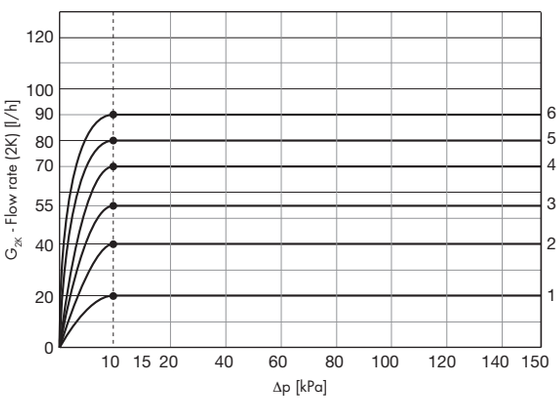
** 3/4" without rubber seal*

Performance

Medium:	water, glycol solutions
Max percentage of glycol:	30%
Max differential pressure with control fitted:	1,5 bar
Maximum working pressure:	10 bar
Nominal Δp control range:	(reg. 1-4) 10–150 kPa (reg. 5-6) 15–150 kPa
Flow rate regulation range:	20–120 l/h
Thermal medium working temperature range:	5–95°C
Factory pre-setting:	position 6

Hydraulic characteristics

With thermostatic control head and 2K proportional band



Operating principle

The dynamic thermostatic valve has been designed with the purpose of controlling a flow rate of thermal medium in the radiators of two-pipe heating systems that is:

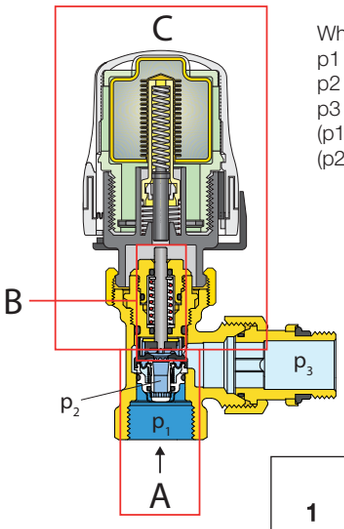
- adjustable in accordance with the requirements of the part of the circuit controlled by the device;
- constant despite any variation in differential pressure conditions in the circuit.

The device, in conjunction with a thermostatic control head, combines different functions in a single component:

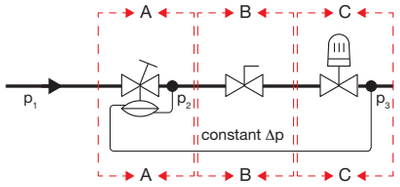
A. Differential pressure regulator, which automatically cancels the effect of the pressure fluctuations typical of variable flow rate systems and prevents noisy operation.

B. Device for pre-setting flow rate, which allows direct setting of the maximum flow rate value, thanks to the combination with the differential pressure regulator.

C. Flow rate control depending on the ambient temperature, thanks to the combination with a thermostatic control head. The flow rate control is optimised because it is pressure-independent.



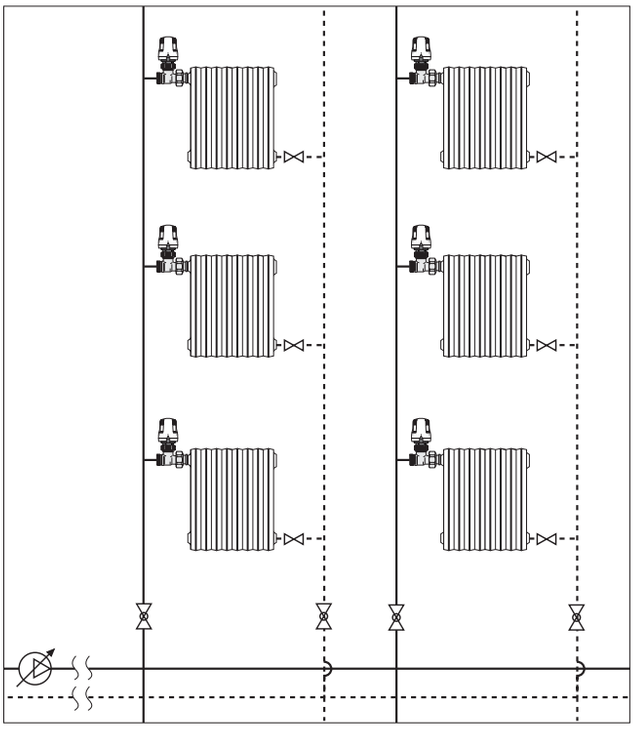
Where:
p1 = upstream pressure
p2 = intermediate pressure
p3 = downstream pressure
(p1 - p3) = total valve Δp
(p2 - p3) = constant Δp



	Pre-setting position					
	1	2	3	4	5	6
G_{max} (l/h)	20	40	60	80	100	120
G_{2K} (l/h)	20	40	55	70	80	90

Main applications - Dynamic valves

✔ **circuits with riser distribution**
✔ **circuits with manifold distribution**



Controls for valves

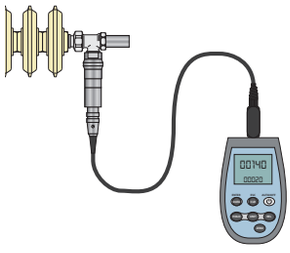
Fitted for thermostatic, thermo-electric and electronic control heads

The valves are fitted for combination with thermostatic control heads and thermo-electric actuators, for regulating the ambient temperature automatically or under a room thermostat control respectively. Combining the valves with these devices guarantees considerable energy saving, since the ambient temperature is kept constant at the set value taking into consideration any gratuitous heat inputs (solar radiation or internal thermal loads).

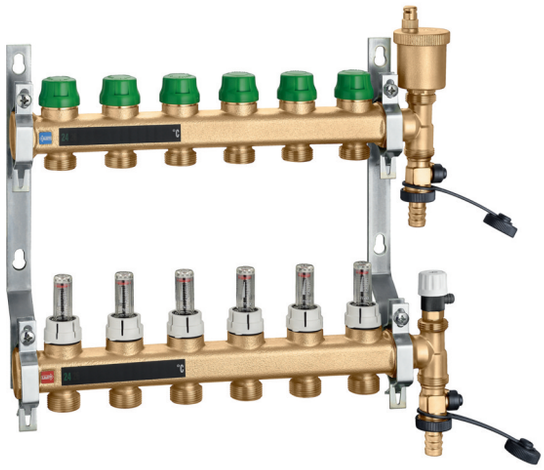
230100

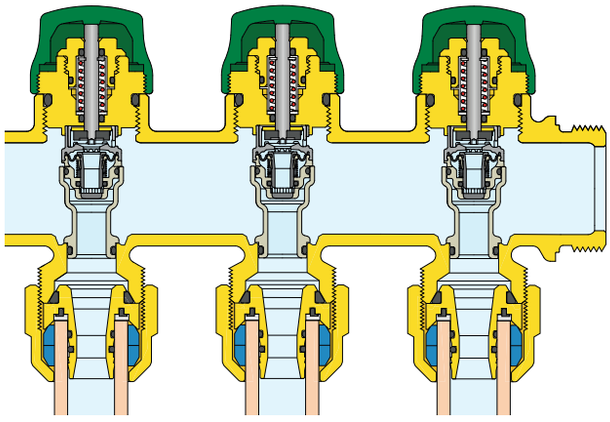
Kit for measuring Δp in the circuits with dynamic valves.

To use the instrument, the headwork replacement kit is necessary (code 387201), which allows you to extract the headwork of the dynamic thermostatic radiator valve and to insert the appropriate headwork for the measuring instrument.



Balancing devices for radiant panels systems





665
DYNAMICAL®

Pre-assembled manifolds.
Maximum working pressure: 6 bar.
Working temperature range: 5–60°C.
Outlet centre distance: 50 mm.

Consisting of:
- return manifold complete with flow adjustment valves DYNAMICAL® fitted for thermo-electric actuator with flow rate adjustment range 25–150 l/h and shut-off valves;
- flow manifold complete with flow indicators;
- end fittings with automatic air vent with hygroscopic cap and drain cock;
- steel mounting brackets for box or direct wall mounting.

Operating principle

The dynamic manifold has been designed to control a flow rate of thermal medium in the panel circuit which is:
- 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 control head, combines different functions in a single component:

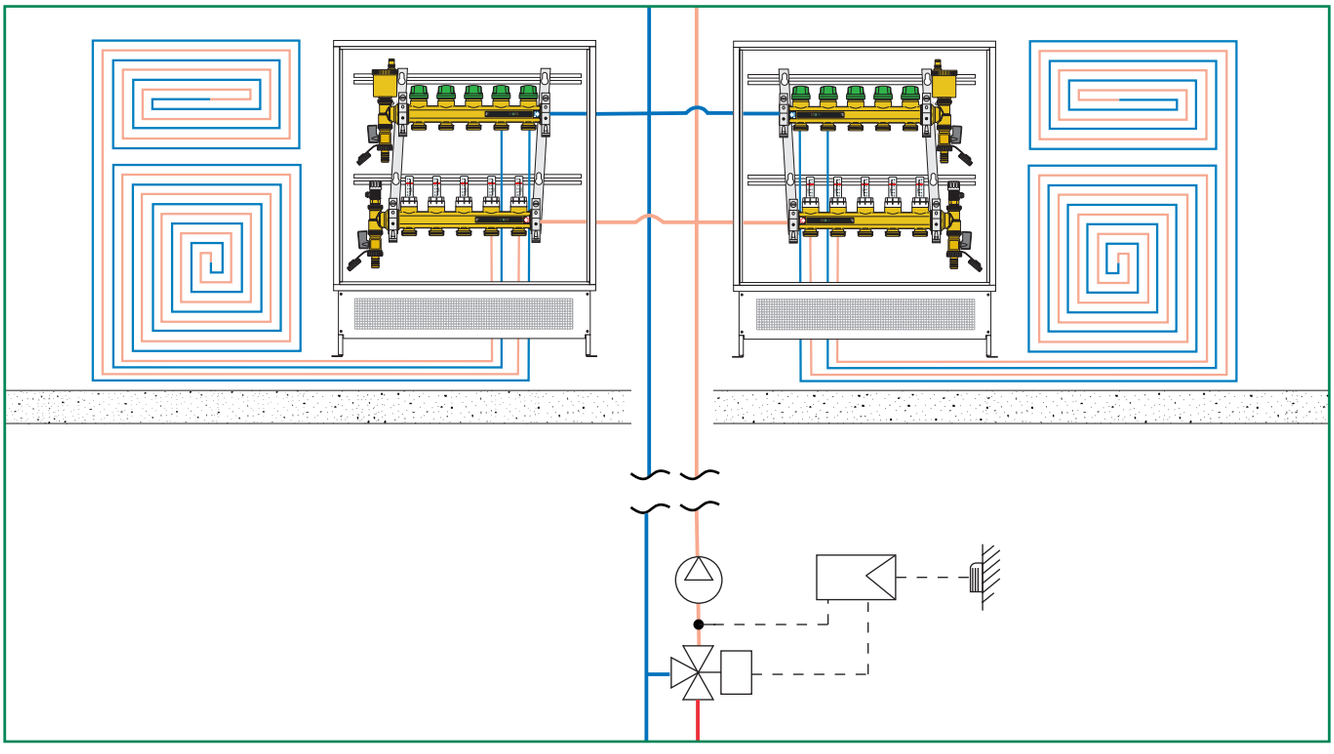
A Differential pressure regulator, which automatically cancels the effect of the pressure fluctuations typical of variable flow rate systems and prevents noisy operation.

B Device for pre-setting flow rate, which allows direct setting of the maximum flow rate value, thanks to the combination with the differential pressure regulator.

C Flow rate ON/OFF control depending on the ambient temperature, thanks to the combination with an electronic control head.

Main applications

✔ **distribution circuits for panel system**



Balancing devices for recirculation loops

Legionella control

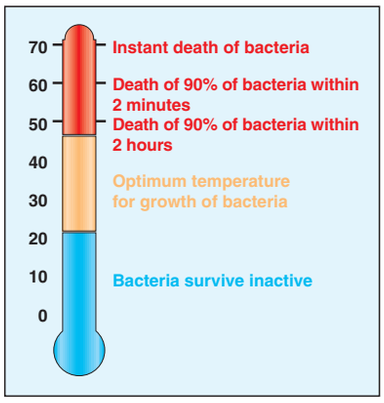
According to the most recent legislation and standards, in order to prevent the growth of the dangerous Legionella bacterium in centralised systems producing domestic hot water, the hot water must be stored and distributed at very controlled temperature values.

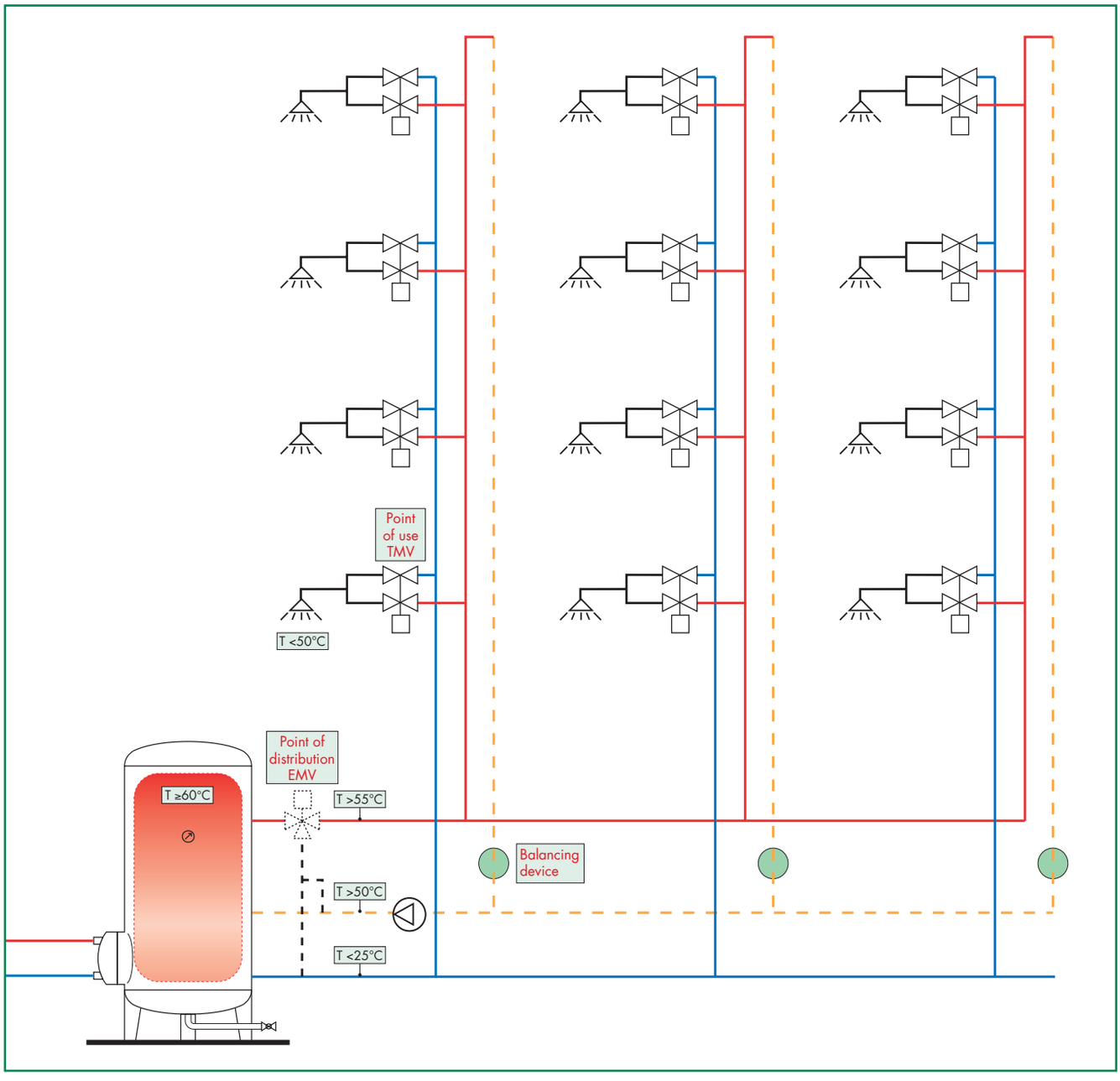
General rules:

- Storage T ≥ 60°C
- Distribution T ≥ 55°C
- Distribution return T ≥ 50°C
- (Drawn water T ≤ 50°C)
- Cold water T ≤ 25°C

Every branch in the recirculation loop has to be balanced to ensure the correct temperature.

The adjacent diagram shows the behaviour of *Legionella Pneumophila* bacteria as the temperature conditions of the water containing the bacteria vary.
To ensure correct thermal disinfection, it is necessary to go up to values of at least 60°C.

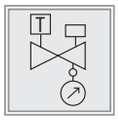




MULTIFUNCTION THERMOSTATIC REGULATOR

- Multifunction thermostatic regulator for domestic hot water recirculation loops

116 series



116

tech. broch. 01325

Thermostatic regulator for domestic hot water recirculation loops.
Complete with automatic thermostatic thermal disinfection function.
With temperature gauge for circuit temperature check.
CR dezincification resistant alloy body "**LOW LEAD**". Female connections.
Max. working pressure: 16 bar.
Adjustment temperature range: 35–60°C.
Disinfection temperature: 70°C.

Code	DN	Conn.
116240	15	Rp 1/2"
116250	20	Rp 3/4"

116

tech. broch. 01325

Thermostatic regulator for domestic hot water recirculation loops.
Fitted for automatic or controlled thermal disinfection function.
With pocket for temperature gauge.
CR dezincification resistant alloy body "**LOW LEAD**". Female connections.
Max. working pressure: 16 bar.
Adjustment temperature range: 35–60°C.

Code	DN	Conn.
116140	15	Rp 1/2"
116150	20	Rp 3/4"

Operating principle

In domestic hot water distribution circuits, to respect modern plant requirements for the prevention of Legionnaires' disease, it is essential to ensure that all sections are kept at the correct temperature. The recirculation network must be balanced, to avoid non-uniform temperature distribution, with cold sections at risk of Legionella proliferation. The thermostatic regulator, installed on each return branch of the recirculation circuit, automatically maintains the set temperature. This device modulates the medium flow rate in accordance with the water inlet temperature by means of the action of a dedicated internal thermostatic cartridge. When the water temperature approaches the set value, the obturator progressively reduces the passage. The medium flow rate supplied by the recirculation pump is thus distributed to the other network branches, resulting in effective automatic thermal balancing.

116000

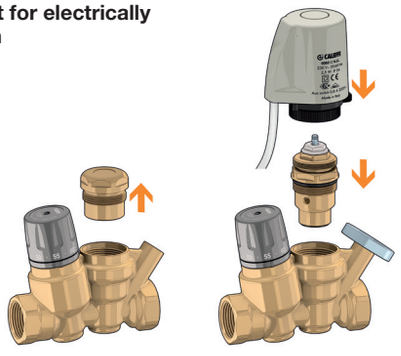
tech. broch. 01325

Cartridge for thermal disinfection function controlled by an actuator.
For use with 116 series combined with 656. series actuators.

Thermal disinfection

If necessary, the regulator is already equipped with a thermal disinfection function, which is useful if the system temperature is to be increased to values over 55–60°C. This function can be completely automatic, activated by a dedicated second thermostatic cartridge that trips at 70°C, or controlled with a thermo-electric actuator.

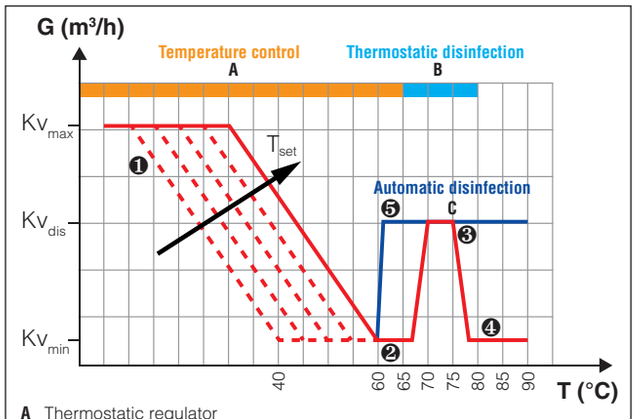
Cartridge replacement for electrically controlled disinfection



Operating modes

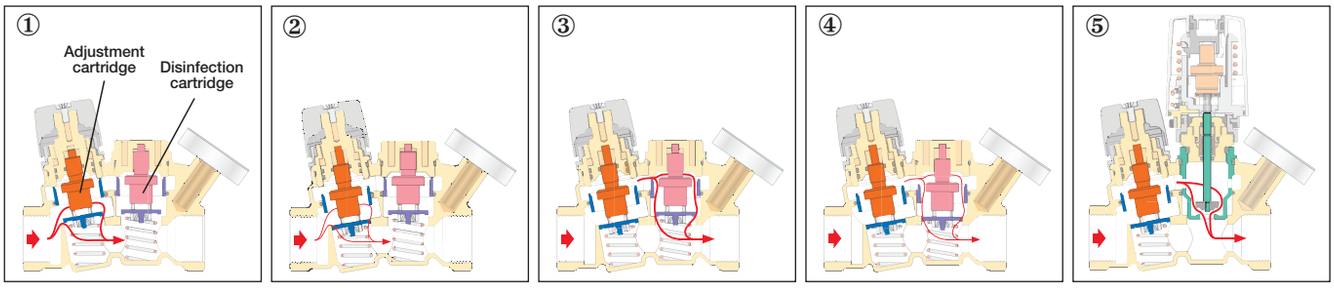
Here following the regulator's operating modes according to the variation of the water temperature of the circuit it is installed on.

Diagram of thermostatic regulator 116 series



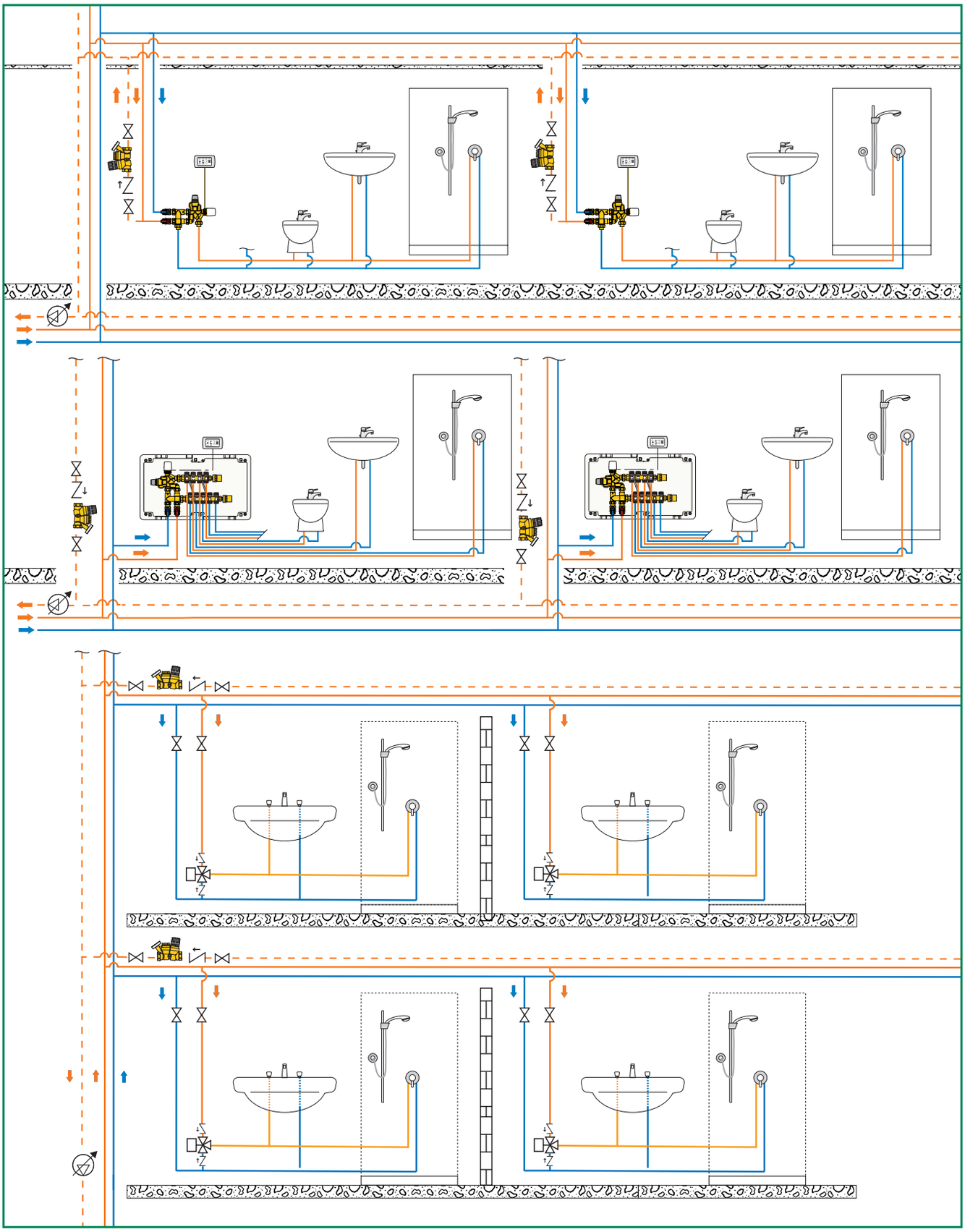
A Thermostatic regulator
B Thermostatic regulator with automatic thermostatic disinfection function
C Thermostatic regulator with disinfection function controlled by an actuator

Thermostatic adjustment | **Minimum flow rate** | **Thermostatic disinfection** | **Thermal closing** | **Electrically controlled disinfection**



Main applications - Multifunction thermostatic regulator

✔ **Domestic water recirculation loops, installation on risers and branches**



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