CALEFFI

Hydronic Solutions





DEVICES FOR CIRCUIT BALANCING

2017

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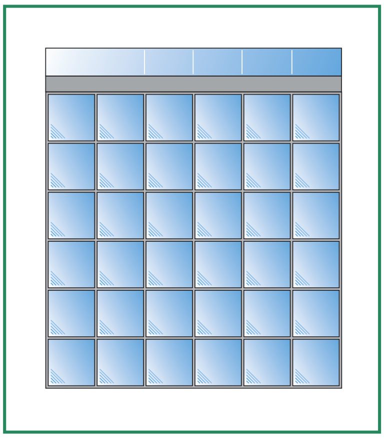


The hydronic circuits serving air conditioning systems must be balanced, meaning that they must be constructed in such a way as to guarantee the design flow rates of the thermal medium.
Depending on the type of system and the appliances installed, and also on the type of control to be implemented, specific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

Air conditioning of modern buildings

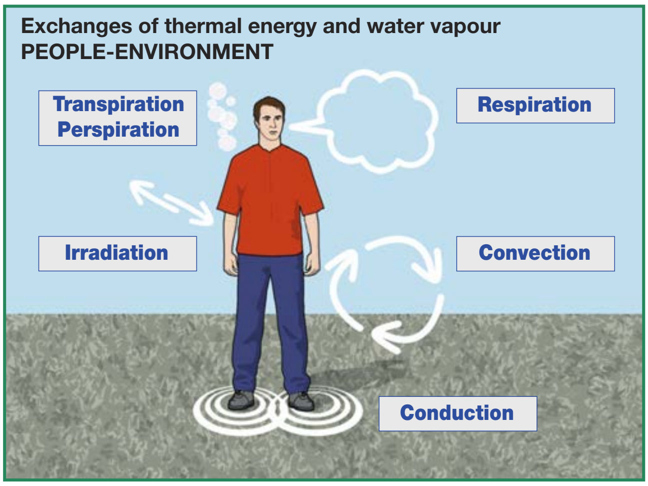
Modern buildings must be designed and built to ensure the health and general wellness of their occupants, assisting the maintenance of various types of comfort: thermal, acoustic, architectural, functional, and so forth.
In addition, the buildings must be constructed with the aim of achieving fundamental goals including energy economy and environmental protection, with reduced CO_2 emissions.
Controlling the climate of a confined space means creating the necessary conditions to guarantee the **thermal comfort** of the occupants.

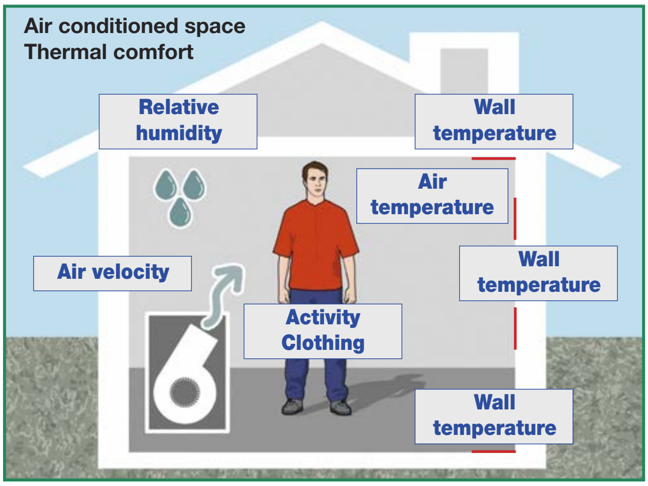
Thermal comfort

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

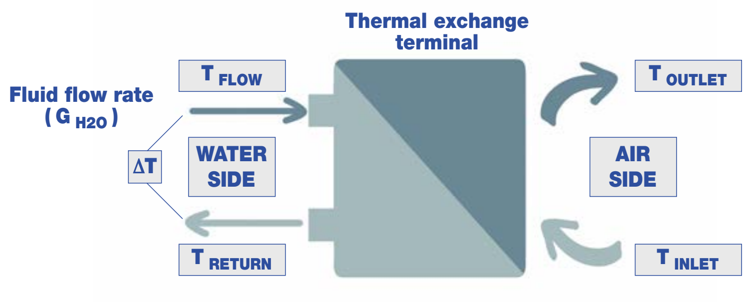
	Winter	Summer
Ambient temperature (°C)	≥20	≤26
Minimum relative humidity (%)	35	50
Maximum relative humidity (%)	45	60

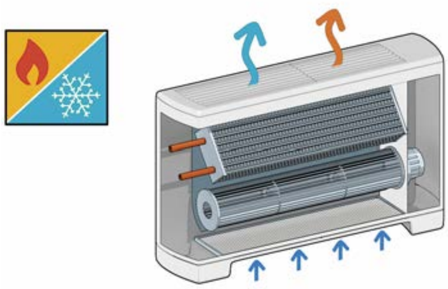




Thermal exchange terminals

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.

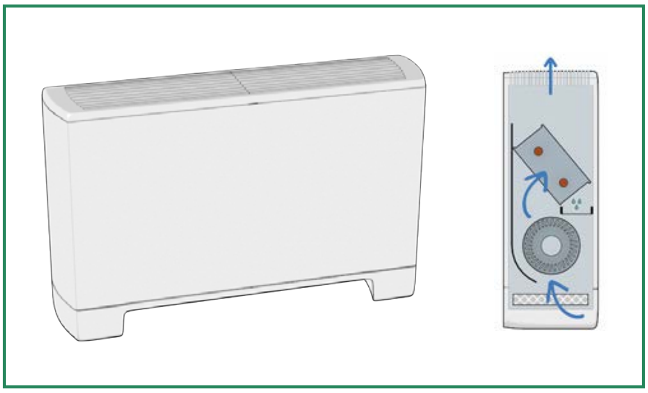
They are composed of:

- 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



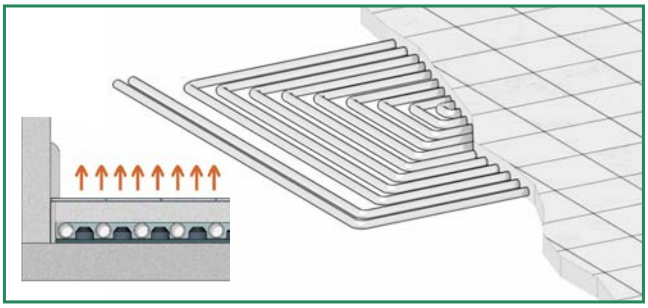
Radiant panels

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

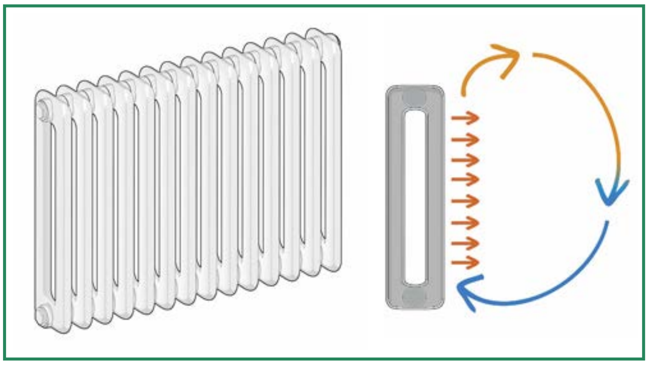


Radiators

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.

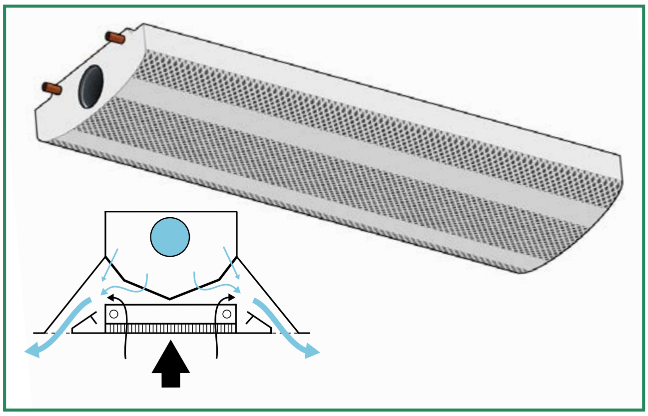
They are composed of:

- 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.

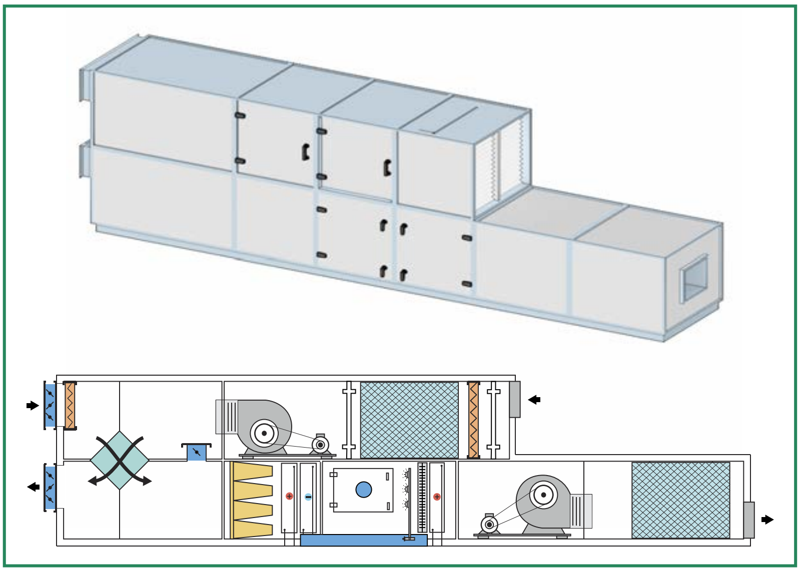
They are composed of:

- 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

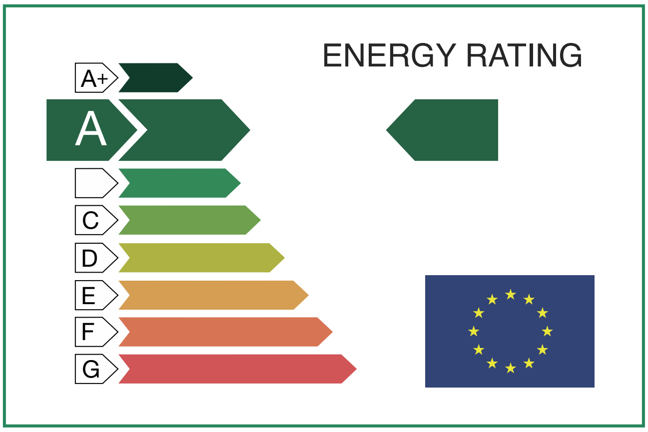
The units function with hot or chilled medium in heating or air conditioning mode. Air handlers also control relative ambient humidity.

Hot thermal medium working T range: 40–60°C

Chilled thermal medium working T range: 7–12°C



Energy certification of buildings



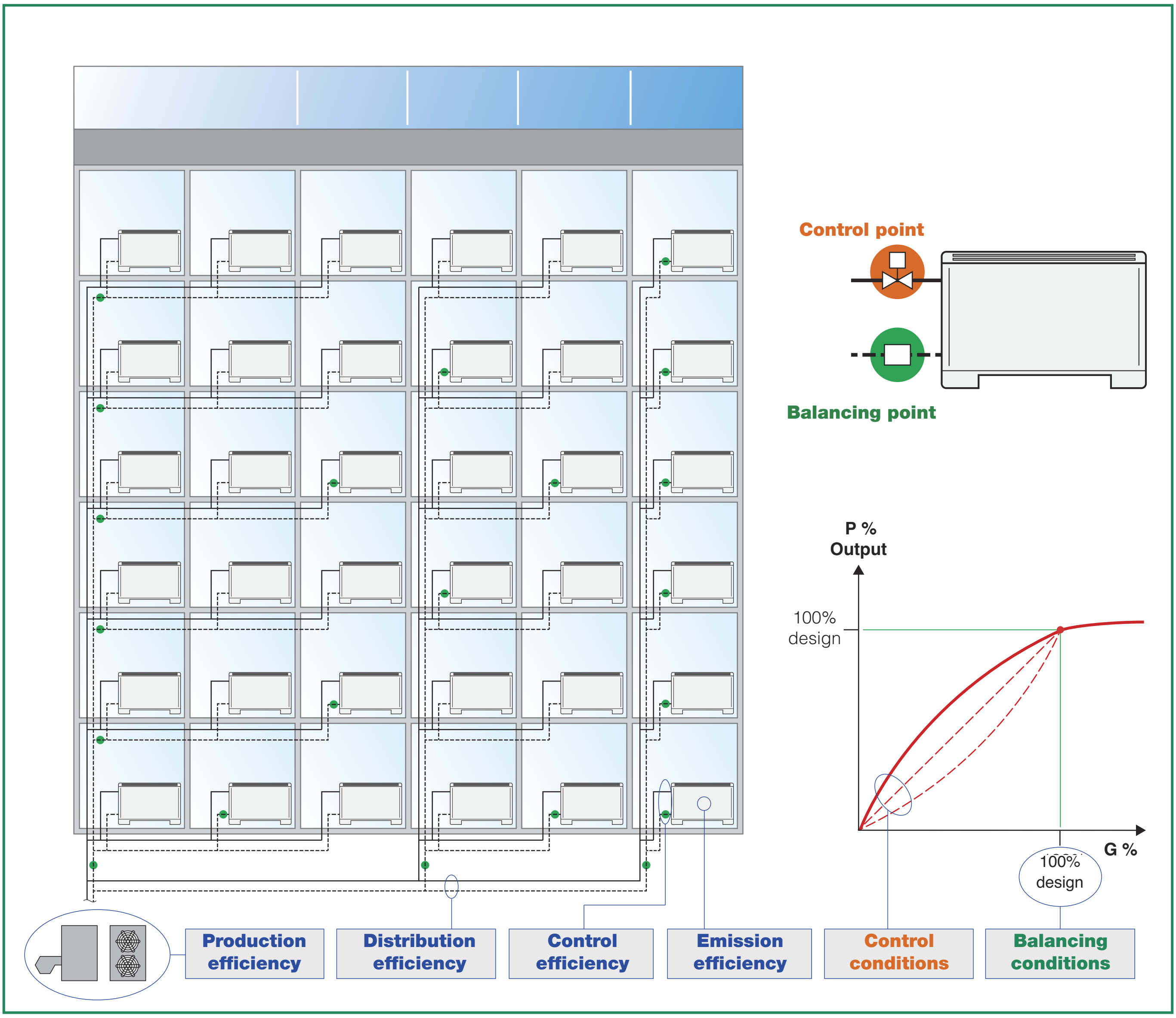
Several years ago national and international laws and regulations were put in place to ensure the energy classification of buildings. In this context, buildings are designed in such a way as to restrict thermal energy and electricity requirements and to minimise carbon dioxide emissions (CO_2).
Apart 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

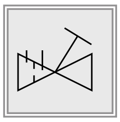
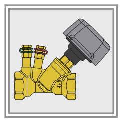


Circuit balancing devices

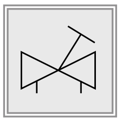
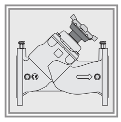
Circuit balancing devices **can be classified in accordance with their method of action and the type of control** they perform in relation to the hydronic circuit. In this guide the devices are **presented in accordance with a product evolution functional line**, as can be seen from the following summary 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

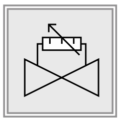
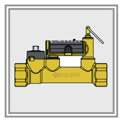
- Manual balancing valve, with Venturi device — **130 series**

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

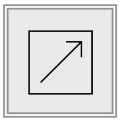
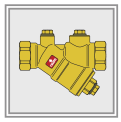



- Balancing valve with flow meter — **132 series**

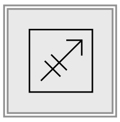
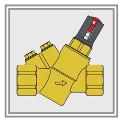



Dynamic balancing devices

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

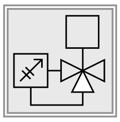
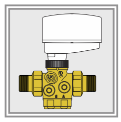



- Automatic flow rate regulator, adjustable flow rate — **118 series**

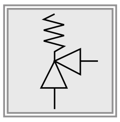
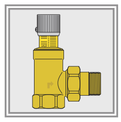
Dynamic balancing and control devices

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

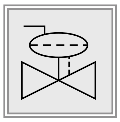
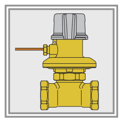



Differential pressure regulating devices

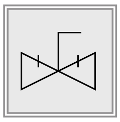
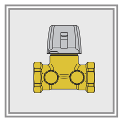
- Differential by-pass valve — **519 series**

- Differential pressure regulating valve — **140 series**

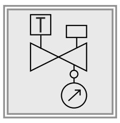
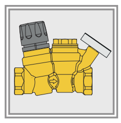



- Shut-off and pre-regulation valve — **142 series**

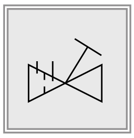



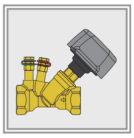
Dynamic thermostatic balancing devices

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

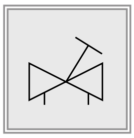



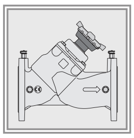
- Manual balancing valve, with Venturi device **130 series**





- 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.

ACS

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

Balancing valve for hydraulic systems. Grey cast iron body, PPS polymer obturator.
Complete with pressure ports.
Max. working pressure: 16 bar.
Temperature range:
DN 65–DN 150: -10–140°C
DN 200–DN 300: -10–120°C.
Max. percentage of glycol: 50%.
Flaged connections PN 16.
To be coupled with flat counterflanges EN 1092-2.

Code		Kvs (m³/h)
130062	DN 65	129
130082	DN 80	148
130102	DN 100	296
130122	DN 125	509
130152	DN 150	699
130200	DN 200	710
130250	DN 250	1188
130300	DN 300	1504

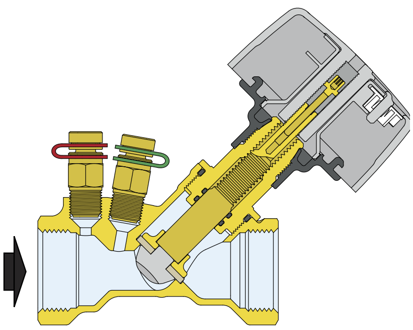
Technical specifications

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 200 - DN 250 - DN 300)
Accuracy:	±10%	±10%

Operating principle

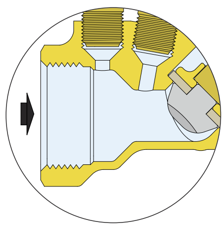
The balancing valve is a hydraulic device that makes it possible to regulate the medium flow rate passing through it.

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.

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

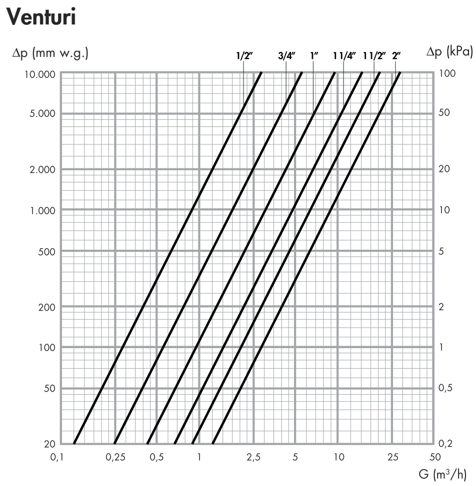
broch. 01251

Electronic flow rate and differential pressure measuring station.

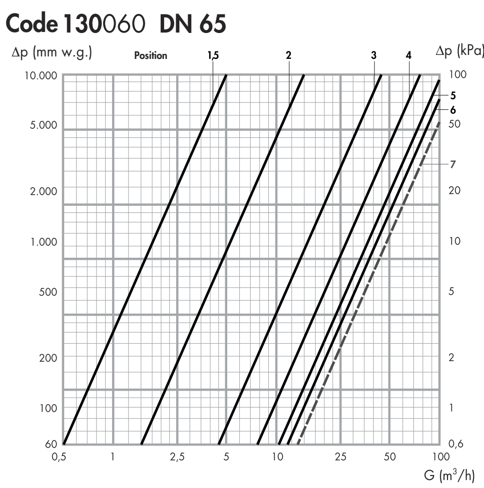
For further details refer to pages 22-23.

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.



Fixed orifice

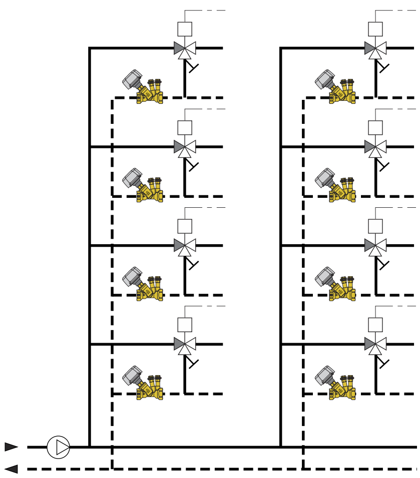


Variable orifice

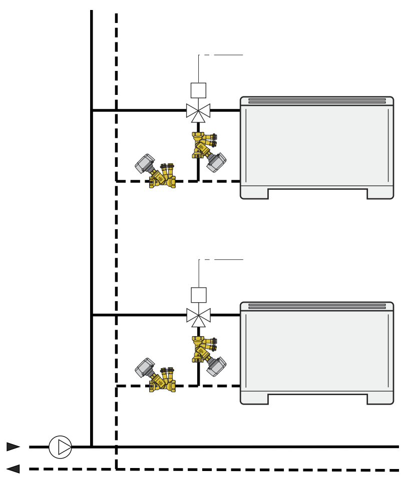
Main applications - Manual balancing valves

- ✔ **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**

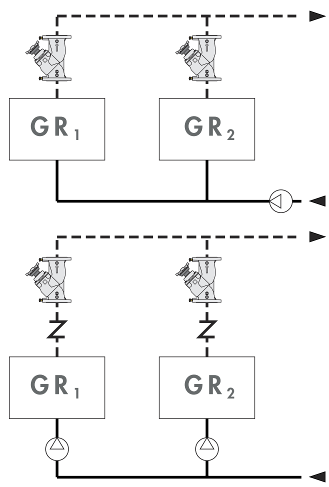
To balance zone branches in circuits with three-way valves



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

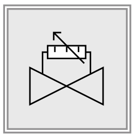
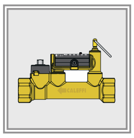


To balance the circuits that serve chiller unit evaporators or condensers



- 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 mete 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 (l/min)
132060	DN 65	5–24
132080	DN 80	8–32
132100	DN 100	12–48

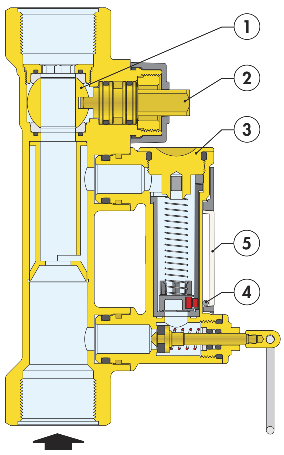
Technical specifications

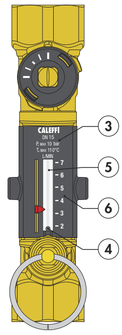
Performance

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).



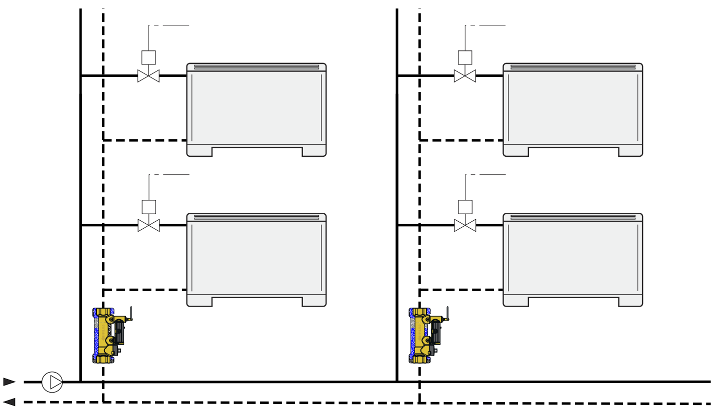


Flow meter for flow rate measurement
Flow rate measurement is provided directly by a flow meter housed in a by-pass circuit on the valve body, which can be automatically excluded during normal operation.

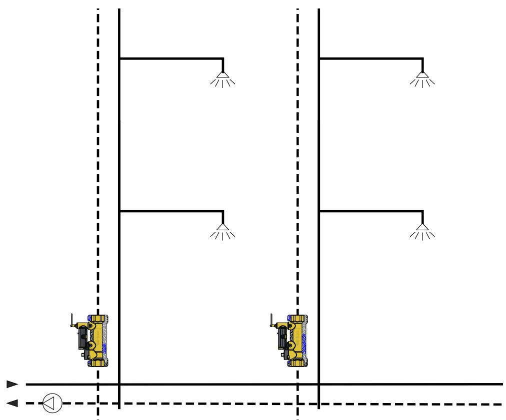
Main applications - Manual balancing valves with flow meter

- ✔ 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



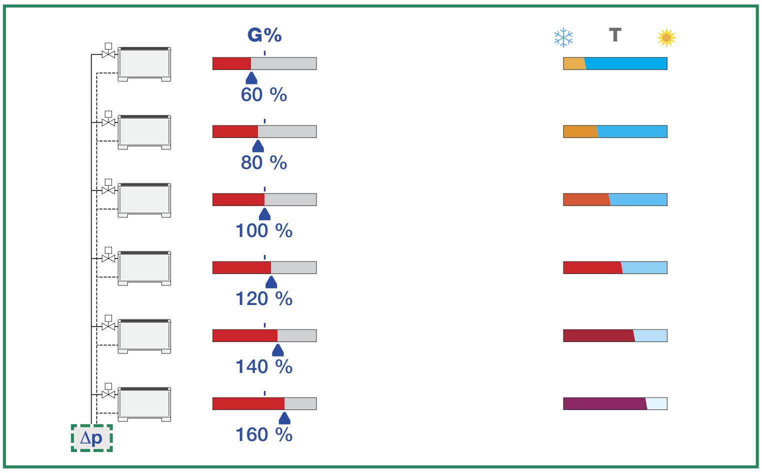
To balance domestic water distribution circuits



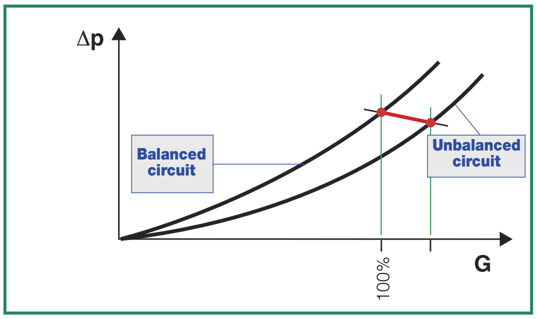
STATIC BALANCING - DYNAMIC BALANCING

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.

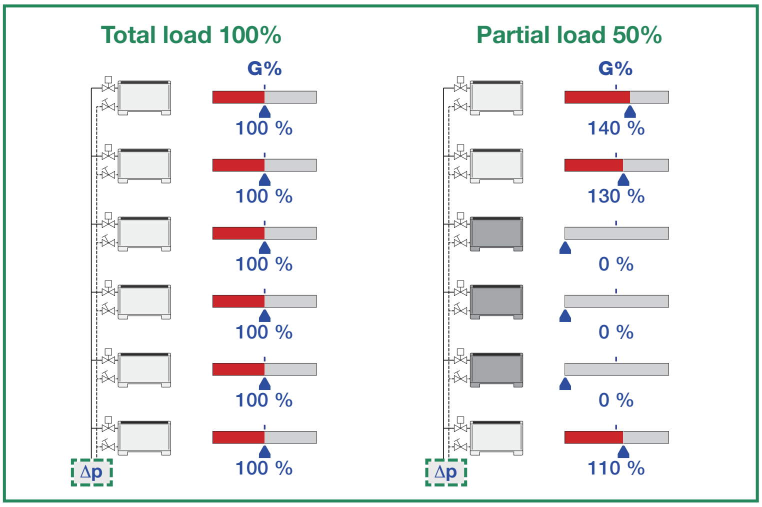
Unbalanced circuits



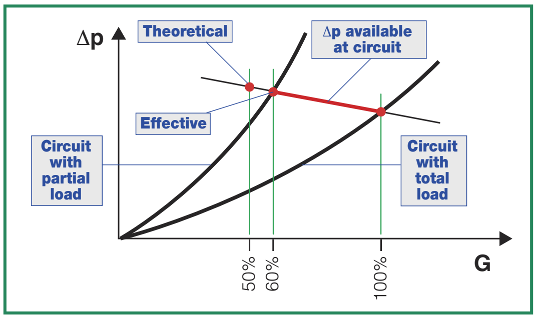
In the case of unbalanced circuits, the hydraulic imbalance between terminals creates areas with non-uniform temperatures, and as a consequence, problems with thermal comfort and higher energy consumption.



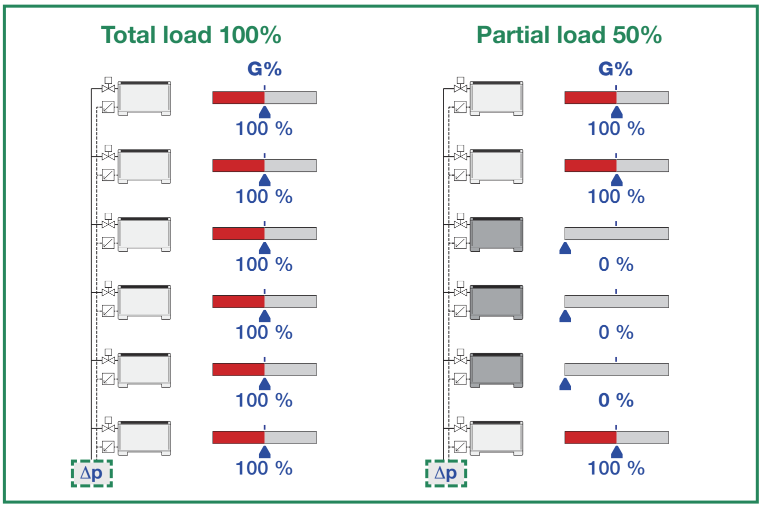
Static balancing



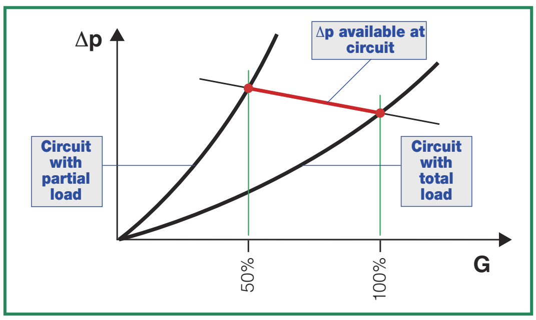
Traditionally, hydraulic circuits are balanced using manual calibration valves. With these static-type devices, such circuits are difficult to balance perfectly and have **operating limitations** in the case of partial closure by means of the control valves. The flow rate in the open circuits **does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



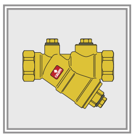
Dynamic balancing



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 — tech. broch. 01041
AUTOFLOW

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 — tech. broch. 01041
AUTOFLOW

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”	6,5–22,5

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

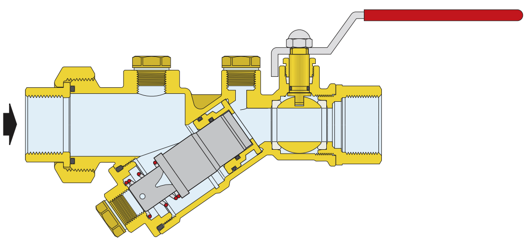
103 — tech. broch. 01041
AUTOFLOW flanged

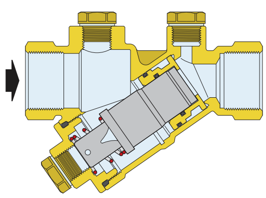
Automatic flow rate regulator.
Cast iron body
Stainless steel filter cartridge.

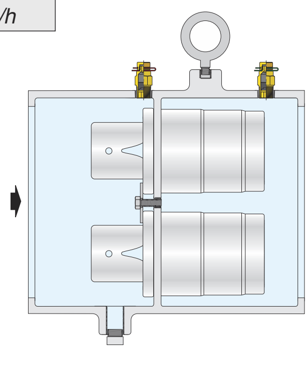
Supplied complete with EN 1092-1 flanges PN 16, tie-rods, gaskets and quick-fit pressure test ports.

Code	DN	Minimum working Δp (kPa)	Flow rates (m³/h)	Δp range (kPa)
103111 ●●●	65	22	9–17	22–220
103113 ●●●	65	35	18–22	35–410
103121 ●●●	80	22	9–17	22–220
103123 ●●●	80	35	18–22	35–410
103131 ●●●	100	22	9–17	22–220
103133 ●●●	100	35	18–22	35–410
103141 ●●●	125	22	20–47	22–220
103143 ●●●	125	35	20–59	35–410
103151 ●●●	150	22	40–93	22–220
103153 ●●●	150	35	40–118	35–410
103161 ●●●	200	22	80–169	22–220
103163 ●●●	200	35	80–213	35–410
103171 ●●●	250	22	150–262	22–220
103173 ●●●	250	35	150–331	35–410
103181 ●●●	300	22	95–460	22–220
103183 ●●●	300	35	115–580	35–410
103191 ●●●	350	22	160–580	22–220
103193 ●●●	350	35	190–730	35–410

Available up to DN 800 and with flow rates up to 3850 m³/h







Technical specifications

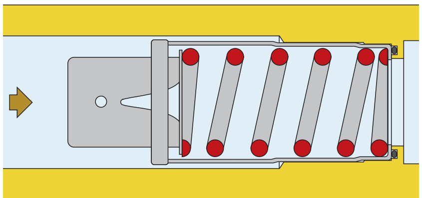
series ⇨	120	125	103
Performance Medium: Maximum percentage of glycol:	 water, glycol solutions 50%	 water, glycol solutions 50%	 water, glycol solutions 50%
Maximum working pressure: Working temperature range:	25 bar 0–110°C	25 bar -20–110°C	16 bar -20–110°C
Δp range: Flow rates: Accuracy:	7–100 kPa; 22–220 kPa; 35–410 kPa 0,12–15,5 m³/h ±5%	7–100 kPa; 22–220 kPa; 35–410 kPa 0,12–22,5 m³/h ±5%	22–220 kPa; 35–410 kPa 9–3850 m³/h ±5%

Dynamic balancing devices

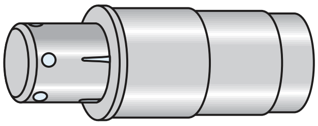
Operating principle

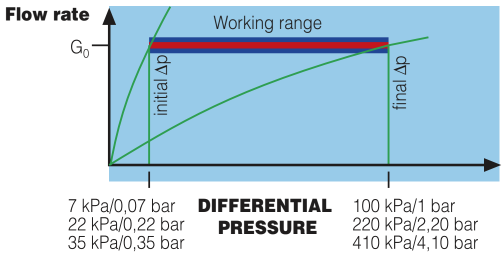
The regulating element of these devices is composed of a cylinder and a piston with fixed and variable geometry side open tubes through which the fluid flows. These apertures are governed by the piston movement actuated by the pressure of the medium. A specially calibrated spring counteracts this movement.
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.

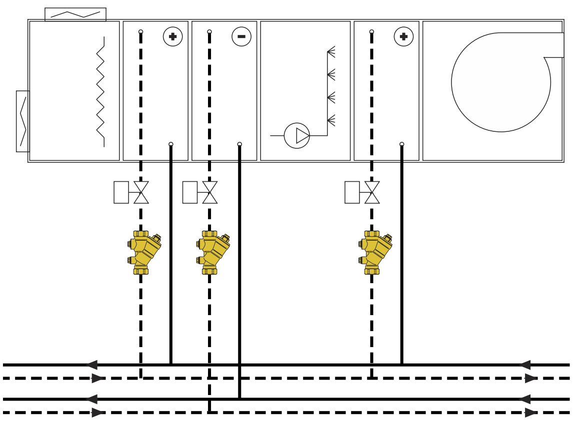




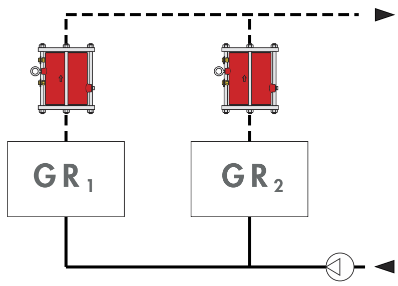
Main applications - AUTOFLOW automatic flow rate regulators

- ✔ **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**

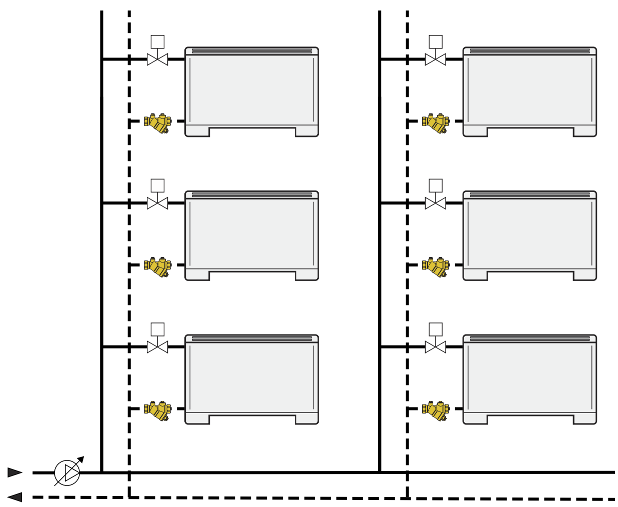
To balance circuits that serve air handling units



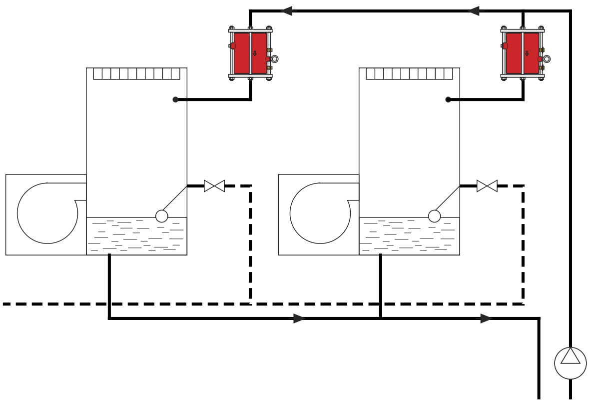
To balance the circuits that serve chiller unit evaporators or condensers

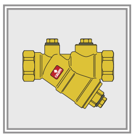


To ensure the required amount of medium flows through each terminal



To balance circuits serving cooling towers





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

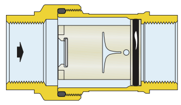
127 tech. broch. 01166
AUTOFLOW

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 (m^3/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

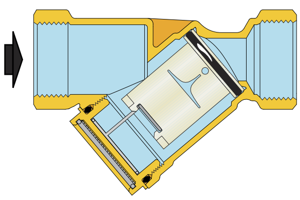
New polymer regulator
The flow-rate regulator element is made entirely of high resistance polymer, specially chosen for use in air-conditioning and plumbing systems. Its mechanical behaviour is excellent in a wide range of working temperatures, it features high abrasion resistance due to the medium flowing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



128 tech. broch. 01269
AUTOFLOW

Compact automatic flow rate regulator.
Brass body.
AUTOFLOW cartridge in high resistance polymer.
Max. working pressure: 16 bar.
Temperature range: 0–100°C.
Max. percentage of glycol: 50%. Δp range: 15–200 kPa.
Flow rates: 0,085–1,4 m^3/h. Accuracy: ±10%.

Code		Flow rates (m^3/h)
128141 ●●●	1/2”	0,02–1,2
128151 ●●●	3/4”	0,02–1,4



121 tech. broch. 01141
AUTOFLOW

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 (m^3/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

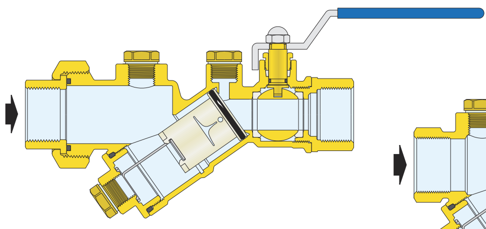
126 tech. broch. 01141
AUTOFLOW

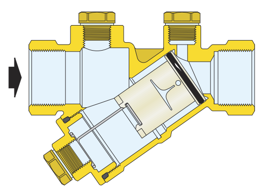
Automatic flow rate regulator.
CR dezincification resistant alloy body.

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

Code			Flow rates (m^3/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

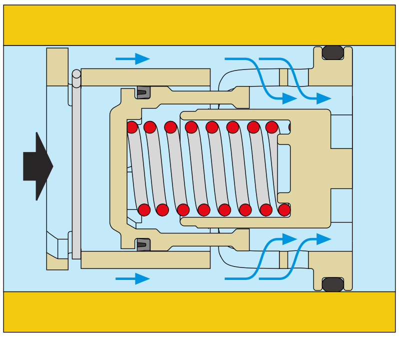
series ⇨	127	121-126	128
Performance			
Medium:	water, glycol solutions	water, glycol solutions	water, glycol solutions
Maximum percentage of glycol:	50%	50%	50%
Maximum working pressure:	16 bar	25 bar	16 bar
Working temperature range:	0–100°C	-20–100°C	0–100°C
Δp range:	15–200 kPa	15–200 kPa	15–200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

Dynamic balancing devices

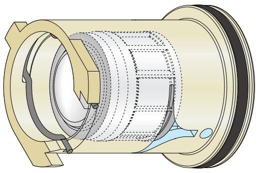
Operating principle

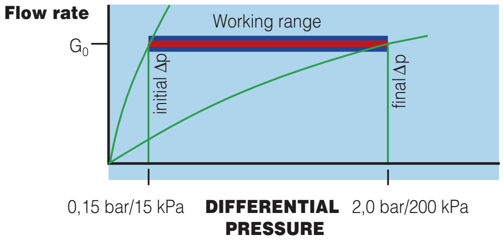
The regulating element of these devices is composed of a cylinder and a piston with fixed and variable geometry side open tubes, which the fluid flows through. These apertures are governed by the piston movement actuated by medium fluids. A specially calibrated spring counteracts this movement.
AUTOFLOW 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.

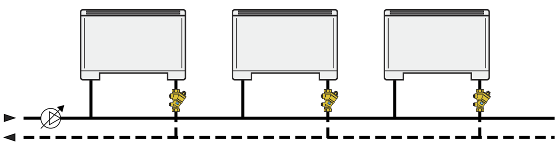




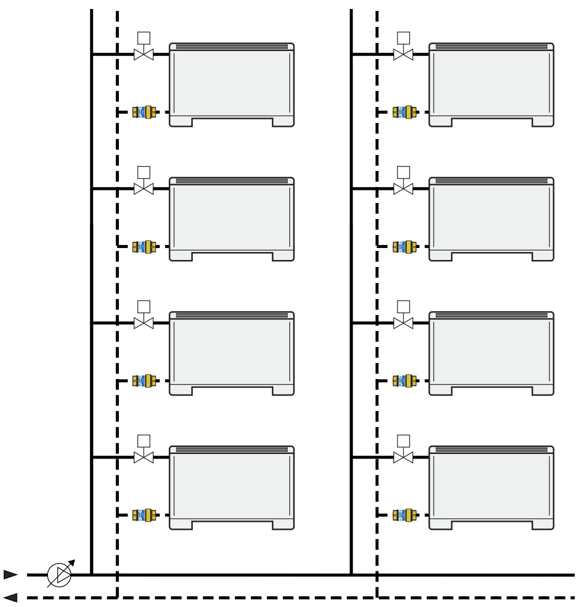
Main applications - AUTOFLOW automatic flow rate regulators

- ✔ **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**

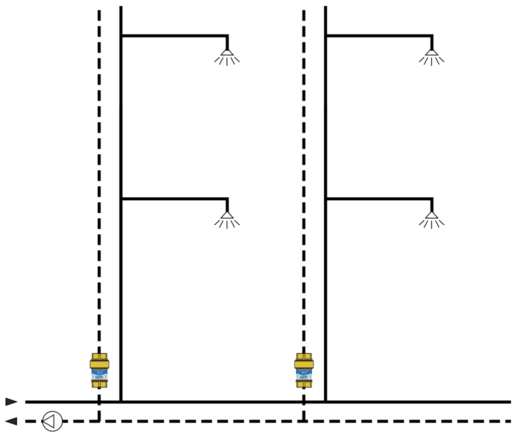
To use in line with various types of heat emitters: radiators, convectors, fan coils, fan convectors, thermal strips, etc.



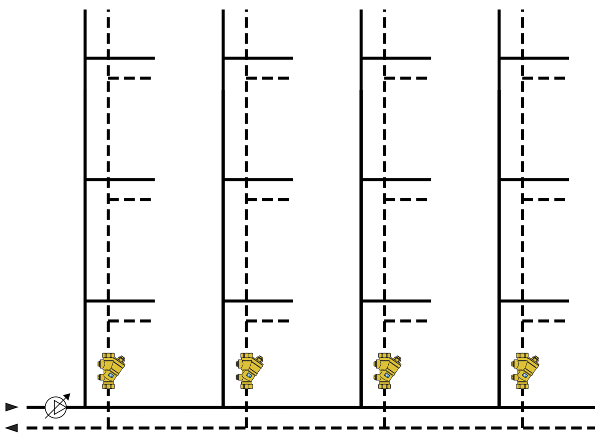
To ensure the required amount of medium flows through each terminal



To balance domestic water distribution circuits

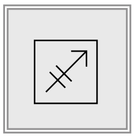


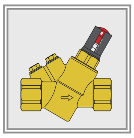
To adjust the flow rate to each riser or secondary branch of a system



- Automatic flow rate regulator, adjustable flow rate

118 series





118

tech. broch. 01138

Automatic flow rate regulator with cartridge adjustable from the outside
CR dezincification resistant alloy body.
Polymer adjustable cartridge
with HNBR diaphragm.

Code

118141 ●●●	DN 15	1/2”
118151 ●●●	DN 20	3/4”
118161 ●●●	DN 25	1”
118171 ●●●	DN 32	1 1/4”

Body size	Cartridge size	Δp range (kPa)	Flow rate range (m³/h)	Cartridge colour	Cartridge code number
1/2” - 3/4”	DN 20	**17–210**	**0,10–0,40**	Black	**1YB**
	DN 20	**17–210**	**0,15–0,60**	Green	**1YG**
	DN 20	**35–400**	**0,14–0,60**	Black	**1GB**
	DN 20	**35–400**	**0,24–0,90**	Green	**1GG**
	DN 20	**30–400**	**0,40–1,30**	Red	**1YR**
1” - 1 1/4”	DN 40	**17–400**	**0,54–5,80**	Green	**2YG**

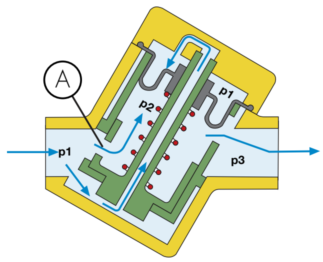
Flow rate adjustment
With this type of cartridge the flow rate can be set to the required value operating from the outside and without having to shut off the valve. The special operating spanner is used to set the adjustment mechanism, reading off the desired position on the graduated reference scale.
Precise flow rate regulation is possible thanks to a double gauge with scale from 1 to 5 and decimal division from 1 to 9.
Depending on the pressure range and the flow rate range, the cartridges are available in various colours to permit easy identification The same colours appear on the outside, on the adjuster screw and on the safety cover.

Technical specifications

Performance

Medium:	water, glycol solutions
Max. percentage of glycol:	50%
Maximum working pressure:	25 bar
Working temperature range:	0–100°C
Δp range:	17–210 kPa; 17–400 kPa; 30–400 kPa; 35–400 kPa
Flow rates:	0,10–5,80 m³/h
Accuracy:	±5%

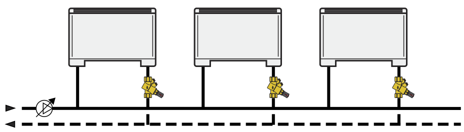
Operating principle
With reference to the drawing shown, p1 and p3 are the pressures in the circuit
Δp = (p1-p3) is the total pressure difference between upstream and downstream of the valve
Pressure p2 is determined by the diaphragm in reaction to the pressure p1 that acts on the upper chamber of the diaphragm.
Interacting with the spring, the difference (p1-p2) remains constant, keeping a constant Δp_A through the orifice (A).
The outcome is a constant flow rate through the valve irrespective of changes in the upstream/downstream pressure difference.



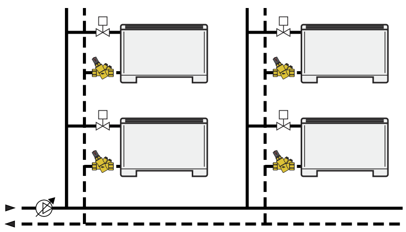
Main applications - Adjustable automatic flow rate regulators

- ✔ **variable flow rate circuits with 2-way regulating valves and limited extension networks**
- ✔ **circuits subject to design flow rate modification**
- ✔ **circuits for which the design flow rate is not known with sufficient precision**

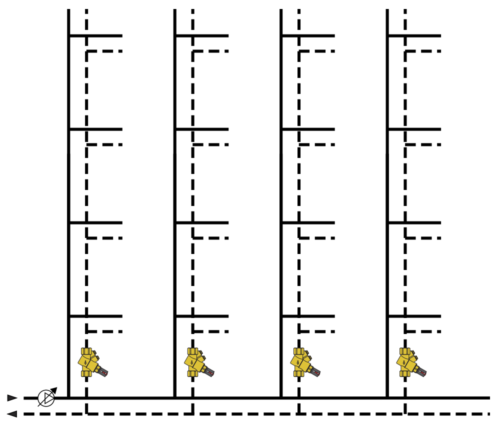
To use in line with various types of heat emitters: radiators, convectors, fan coils, fan convectors, thermal strips, etc.



To ensure that the required amount of medium flows through each terminal

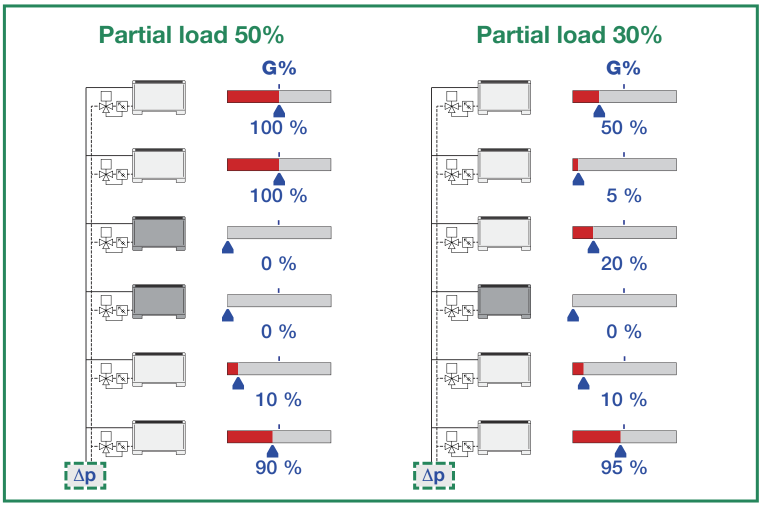


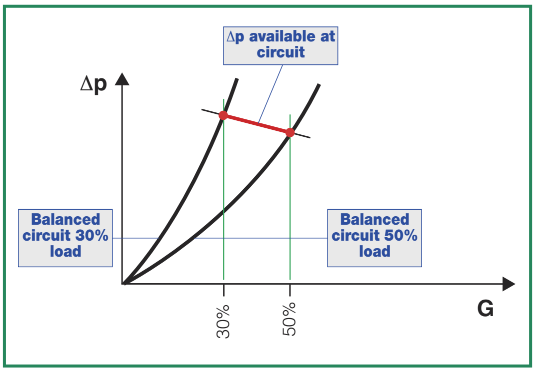
To adjust the flow rate to each riser or secondary branch of a system



DYNAMIC BALANCING AND CONTROL

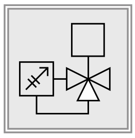
If the two functions of dynamic balancing and control are combined in the same device, the hydraulic circuit is balanced **with continuous control of thermal loads**. All the circuits supplied remain independent and the flow rate remains constantly at the value corresponding to each partial load, irrespective 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.

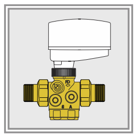




Dynamic balancing and control devices

- Pressure independent control valve (PICV) **145 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 connection of pressure test ports.
Fitted for 145 series actuators and 656. series thermo-electric actuators.

Male threaded union connections.

Code	DN	Connection	Flow rate range (m³/h)
145430 H40	15	3/8"	0,08–0,40
145430 H80	15	3/8"	0,08–0,80
145440 H40	15	1/2"	0,08–0,40
145440 H80	15	1/2"	0,08–0,80
145550 H40	20	3/4"	0,08–0,40
145550 H80	20	3/4"	0,08–0,80
145550 1H2	20	3/4"	0,12–1,20
145550 1H8	25	3/4"	0,18–1,80
145560 H40	20	1"	0,08–0,40
145560 H80	20	1"	0,08–0,80
145560 1H2	20	1"	0,12–1,20
145660 1H8	25	1"	0,18–1,80
145660 3H0	25	1"	0,30–3,00
145770 1H8	25	1 1/4"	0,18–1,80
145770 3H0	25	1 1/4"	0,30–3,00

Euroconus male connections.

Code	DN	Connection	Flow rate range (m³/h)
145552 H40	20	3/4"	0,08–0,40
145552 H80	20	3/4"	0,08–0,80
145552 1H2	20	3/4"	0,12–1,20

Technical specifications

145 series control valve performance.
Medium: water, glycol solutions
Max. percentage of glycol: 50%
Maximum working pressure: 16 bar
Max. differential pressure with actuator
code 145014 and 656**.** series thermo-electric actuators: 5 bar
Temperature range: -20–120°C
Nominal Δp control range: 25-400 kPa
Flow rate regulation range: 0,08–0,4 m³/h
0,08–0,8 m³/h
0,12–1,2 m³/h
Accuracy: ±15%

145 FLOWMATIC

tech. broch. 01262

Proportional linear actuator
for 145 series control valve.

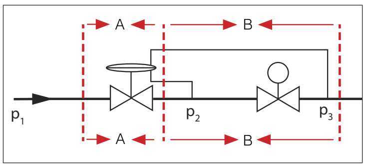
Code	Voltage V	Control
145014	24	0–10 V

Actuator code 145014 performance.
Proportional linear actuator
Electric supply: 24 V (ac/dc)
Power consumption: 2,5 VA (ac)
1,5 W (dc)
Control signal: 0–10 V
Protection class: IP 43
Ambient temperature range: 0–50°C
Supply cable length: 1,5 m
Connection: M30 p.1,5

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:



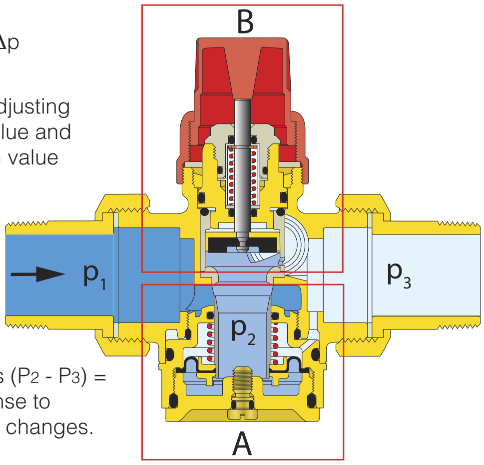
Where:

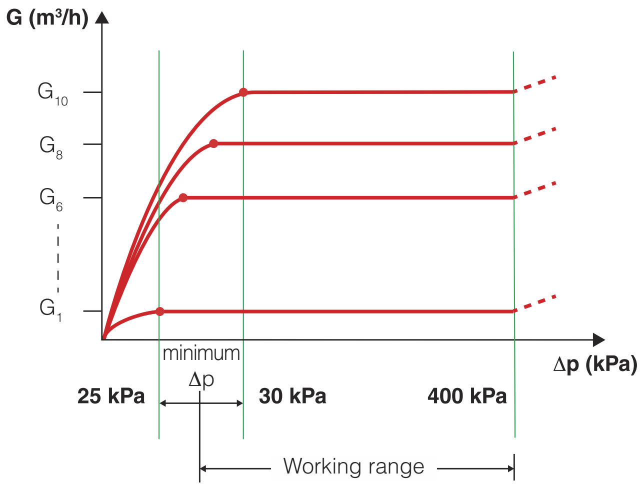
p_1 = upstream pressure
p_2 = intermediate pressure
p_3 = downstream pressure
$(p_1 - p_3)$ = total valve **Δp**

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.

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.

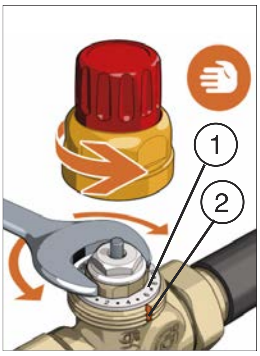




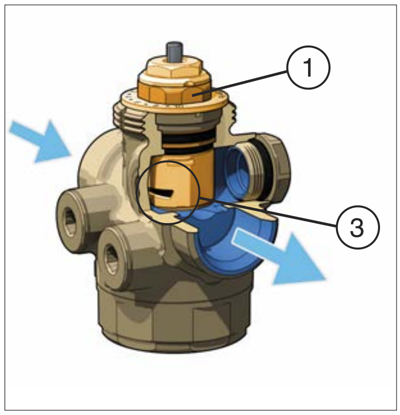
Adjustment procedure

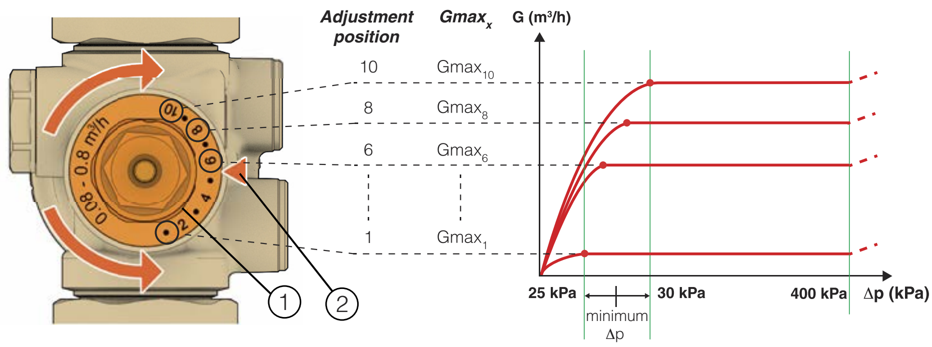
Maximum flow rate adjustment

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.

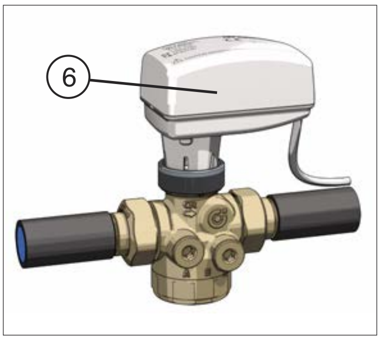


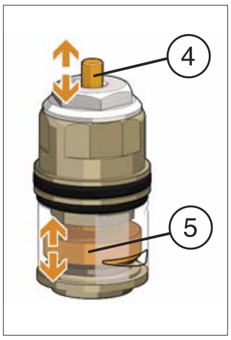


Automatic flow rate adjustment with actuator and external regulator

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 following advantages are obtained thanks to this characteristic: the flow rate can be fine-tuned to intermediate/partial values that can be fully controlled in terms of modulation for optimal tracking of changes in thermal load; automatic and servo-assisted control is achieved with 0–10 V actuators, which are widely used for applications of this type.





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.

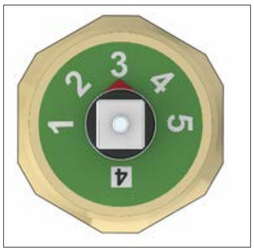
Code	DN	Conn.	Flow rate range (m³/h)
145771	32	1 1 /4"	0,86–4,63
145881	40	1 1 /2"	1,9–13,65
145991	50	2"	1,9–13,65

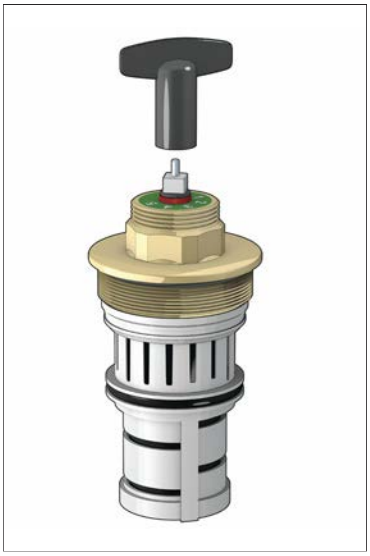
145

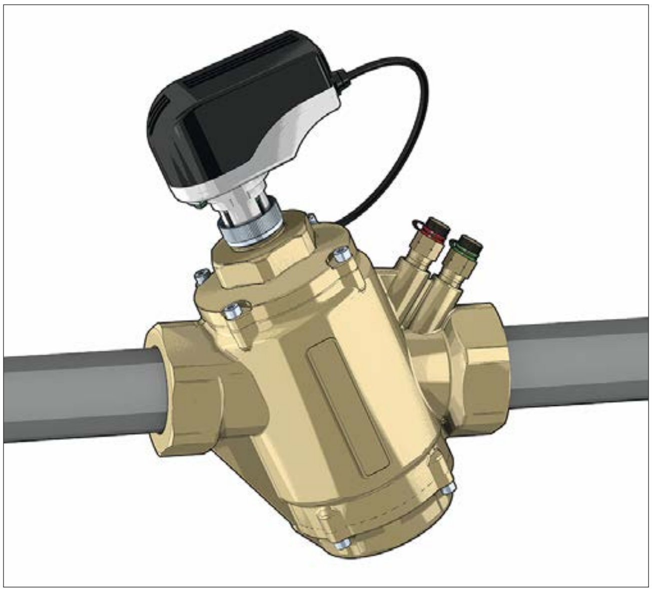
Proportional linear actuator
for control valve 145 series.
Supply: 24 V (ac/dc).
Ambient temperature range: -18–50°C.
Protection class: IP 54.
Connection: M30 p.1,5.
Lenght of supply cable: 1 m.

Code	Tension V	Control	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.



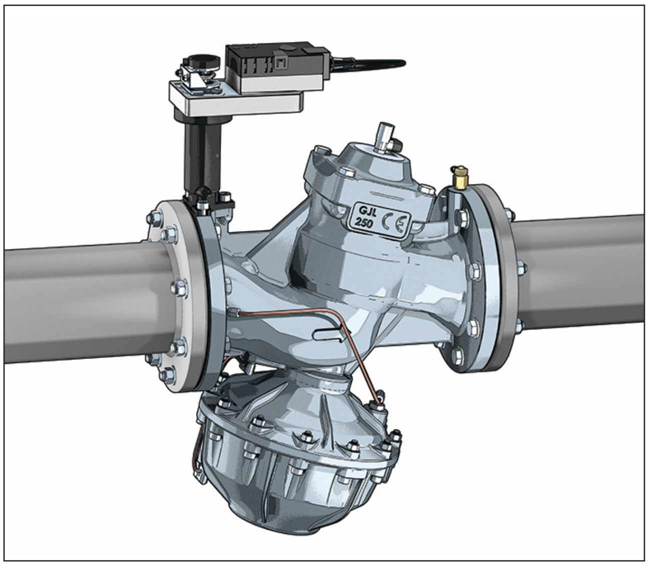




146

Pressure independent control valve.
Grey cast iron body.
Flanged connections PN 16.
Max. working pressure: 16 bar.
Temperature range: -10–120°C.
Max. percentage of glycol: 50%.
Δp range: 30–400 kPa.
With pressure ports.
To be coupled with
flat counterflanges EN 1092-2.

Code	DN	Flow rate range (m^3/h)
146060	65	5–28
146080	80	6–38
146100	100	8–75
146120	125	14–125
146150	150	16–160



146

Manual actuator
for pressure independent
control valve 146 series.

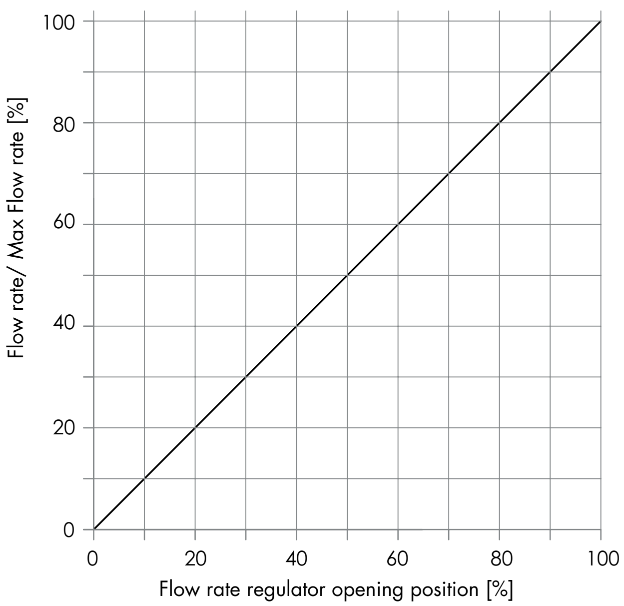
Code
146000

146

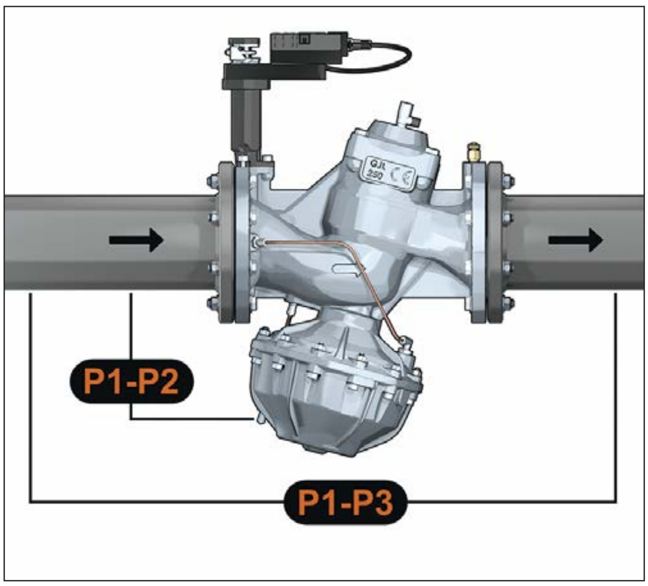
Rotational proportional actuator
for regulating valve 146 series.
Supply: 24 V (ac/dc).
Ambient temperature range:
-30–50°C.
Protection class: IP 54.
Manual override.

Code	Tension V	Control	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 regulating devices

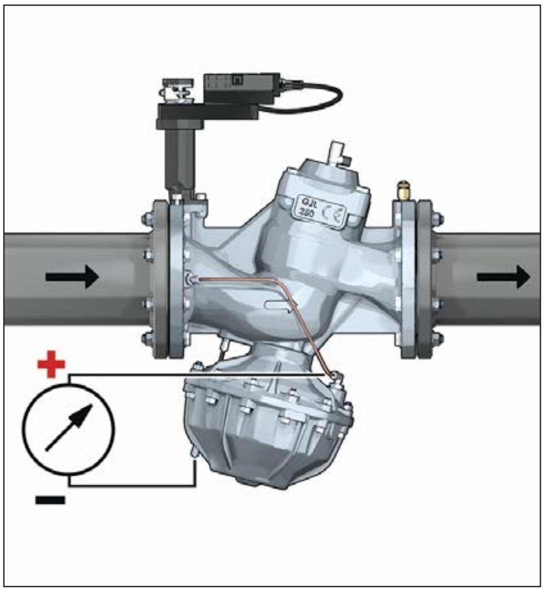
Regulation position

Following data and instruction for flow rate measurement are given as check purposes in case of system or valve malfunctioning.

Opening position [°]	Kv_{1-2} [m³/h]				
	DN 65	DN 80	DN 100	DN 125	DN 150
10	6,2	7,5	15,5	27,4	42,2
20	12,2	14,5	32,0	53,9	68,3
30	18,2	21,6	50,7	69,7	93,2
40	24,2	30,7	67,6	87,9	124,4
50	31,8	39,8	83,7	112,2	169,5
60	36,2	49,5	100,0	136,5	201,3
70	40,4	59,2	129,1	167,4	257,2
80	46,7	71,0	153,1	204,2	307,2
90	51,5	77,7	175,2	222,3	326,8

Connect a differential pressure gauge to the test point shown, and measure the differential pressure ΔP 1-2. Calculate the flow rate by the means of the formula:

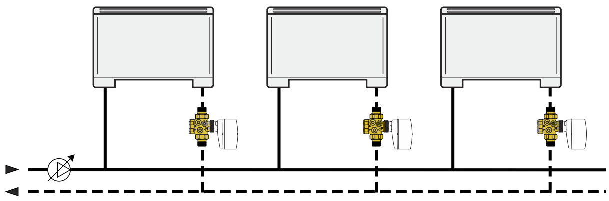
$$Q = Kv_{1-2} * \sqrt{\Delta P_{1-2}}$$



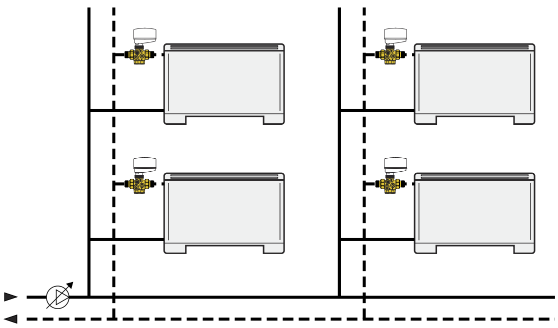
Main applications - Pressure independent control valve

- **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**

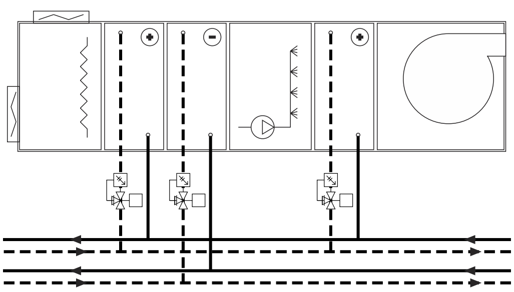
To use in line with various types of heat emitters: radiators,



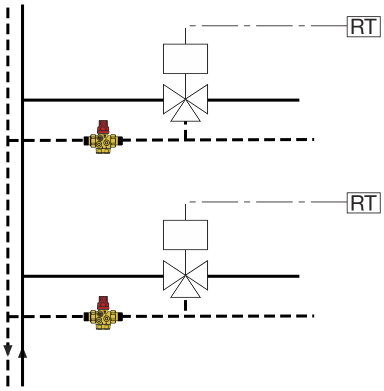
To ensure the required amount of medium flows through each terminal



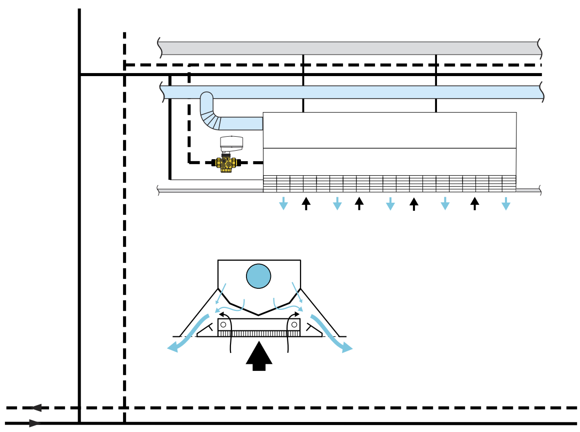
To balance circuits that serve air handling units



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.



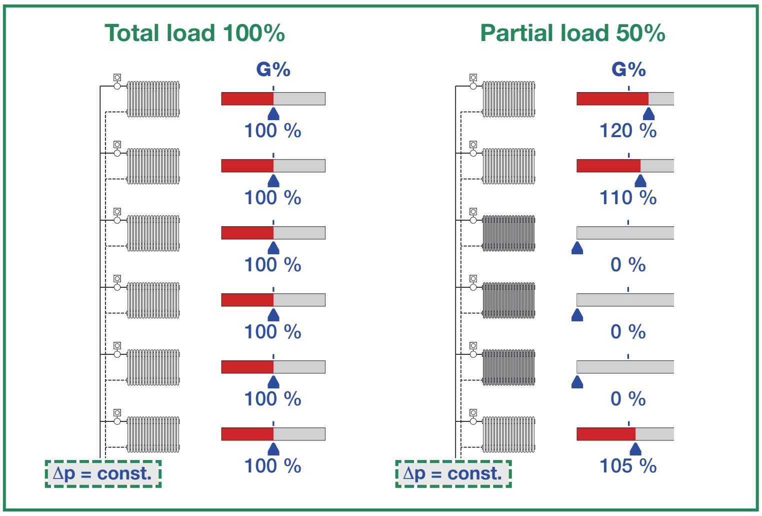
DIFFERENTIAL PRESSURE CONTROL

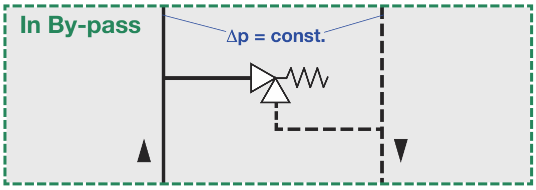
Continuous regulation of the flow rate to track the requirements for adaptation to variable thermal loads causes continuos changes in the differential pressure on the terminal. To solve problems of noise emissions, over-stressing of the components and rapid wear of the system, suitable devices should 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:

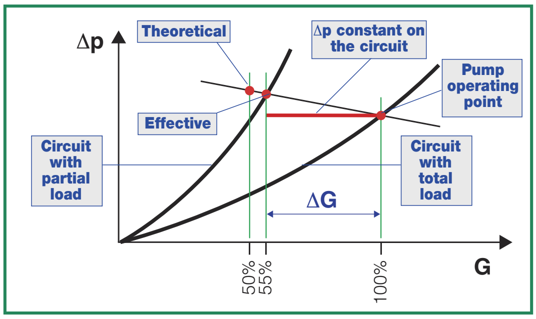
- **Δp control devices in by-pass**. These are simple conventional devices designed to control systems operating with fixed speed pumps having globally constant flow rates. In these applications control of the temperature on the return flow from circuit to central heating system is secondary with respect 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.

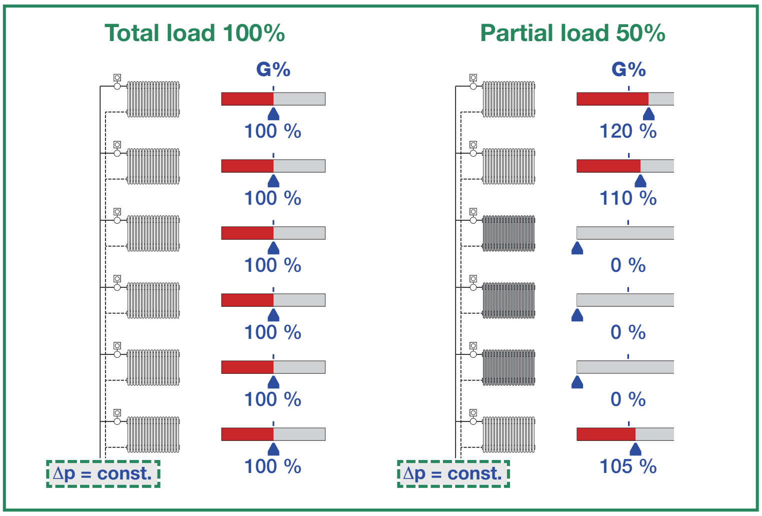


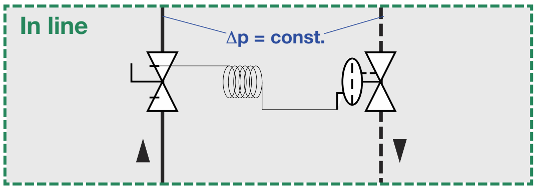


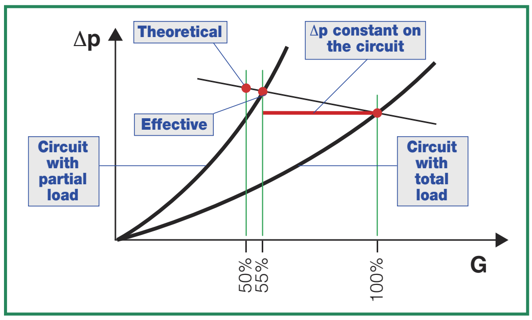


Δp control in line

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.

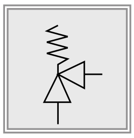


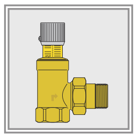




- Differential by-pass valve

519 series





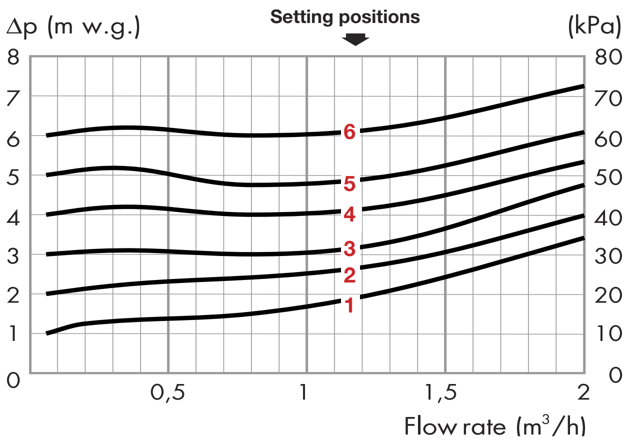
519

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



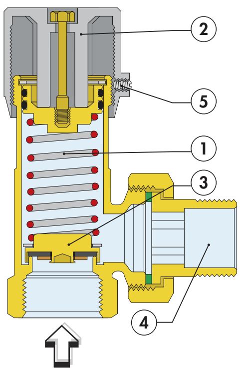
Technical specifications

Performance

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

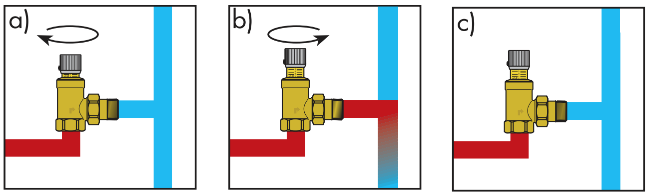
Operating principle

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.



Setting

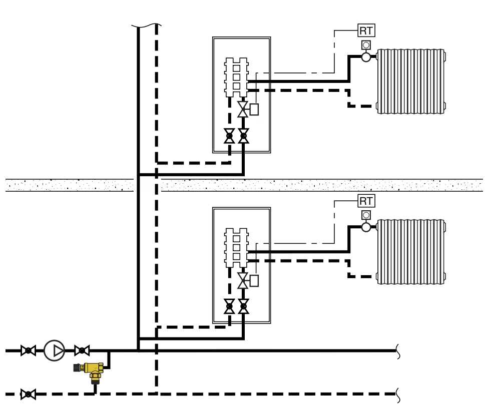
To regulate the valve, turn the knob to the value required on the graded scale: the values correspond to the differential pressure in m w.g. at which the by-pass is opened.
To carry out rapid adjustment of the by-pass valve it is possible to use the following practical method, which can be applied, for 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).



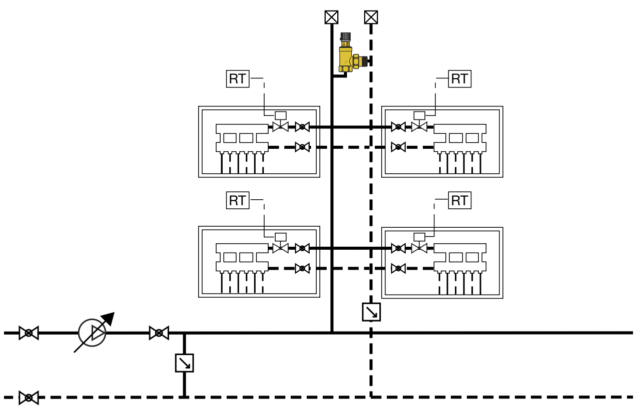
Main applications - By-pass valves

- ✔ **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

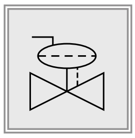


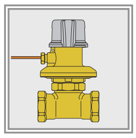
Medium-large size system, by-pass on top of risers



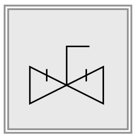
Differential pressure regulating devices

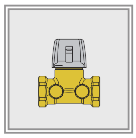
- Differential pressure regulating valve 140 series





- Shut-off and pre-regulation valve 142 series





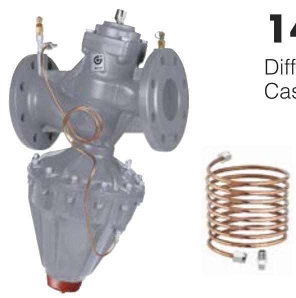
140

tech. broch. 01250

Differential pressure regulating 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 regulating 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*

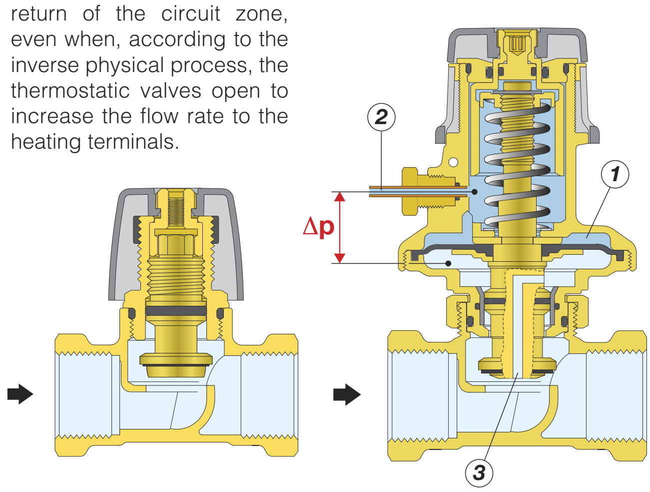
Technical specifications

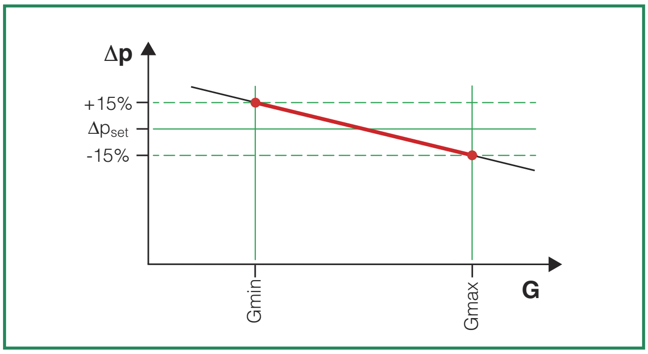
Performance

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%

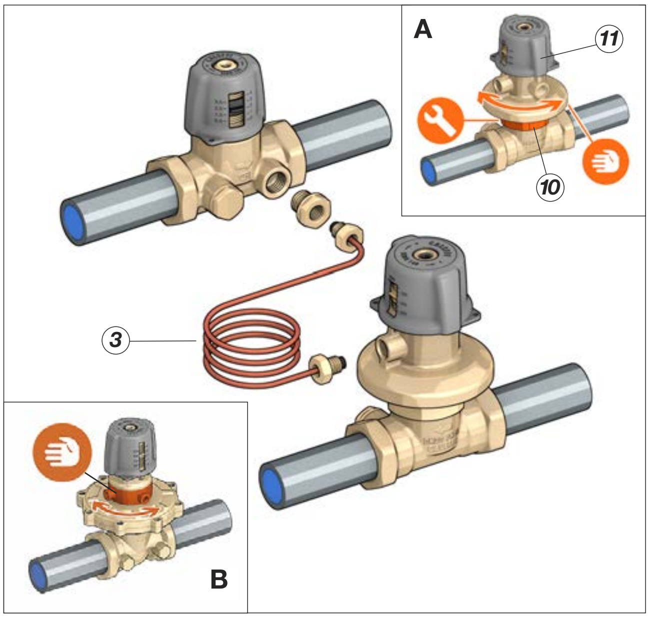
Operating principle

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.



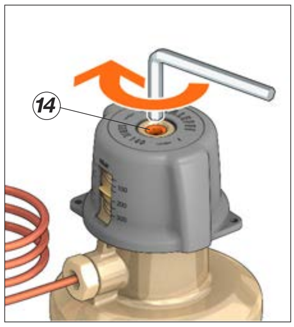


Differential pressure regulating devices



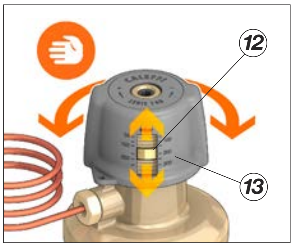
Shut-off and maintenance of the Δp setting, 140 series

The circuit is closed by inserting an Allen wrench in the hole (14) and turning it fully clockwise. The Δp setting position is not changed. This operation makes it possible to shut off the flow for system maintenance and restore operation without having to reset the valves.



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.

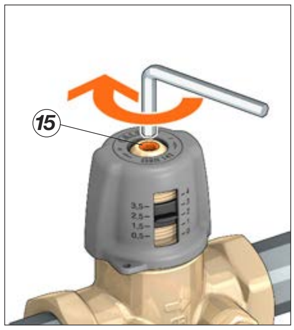


Shut-off and Memory stop, 142 series

Once the flow rate has been balanced, you can use the “Memory stop” mechanism by inserting an Allen wrench in the hole (15) on the balancing valve and turning it fully clockwise without exerting excessive force.

This operation ensures that the valve is set at maximum open position: if necessary the circuit can be closed by turning the knob manually fully clockwise.

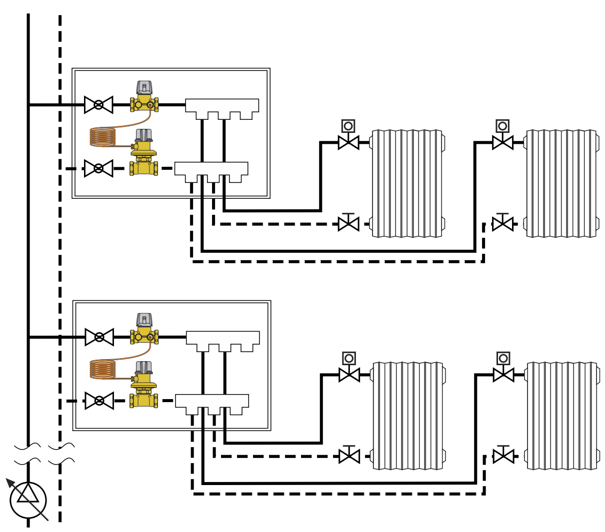
To return the valve to the set balancing position turn the knob fully counterclockwise.



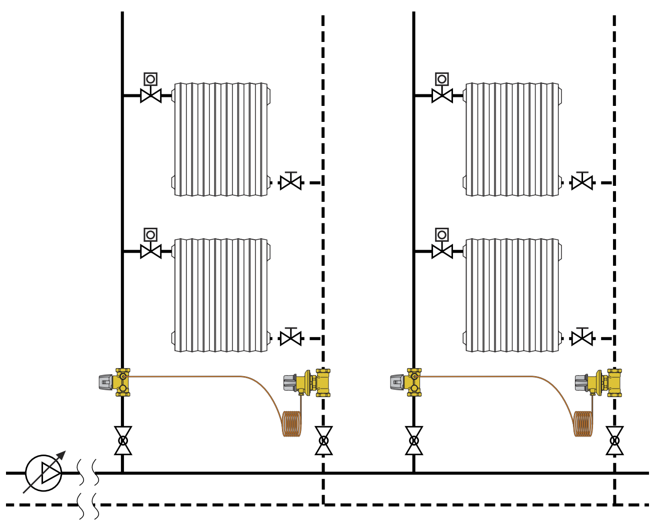
Main applications - Δp regulators

- ✔ **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.

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

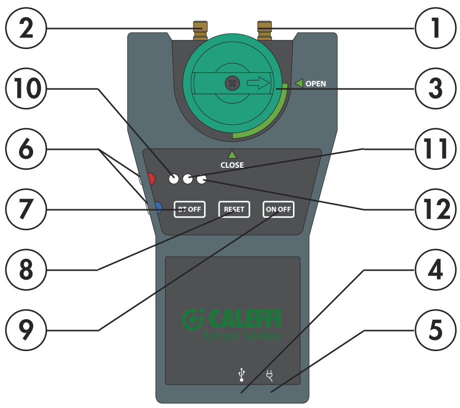
Operating principle

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:

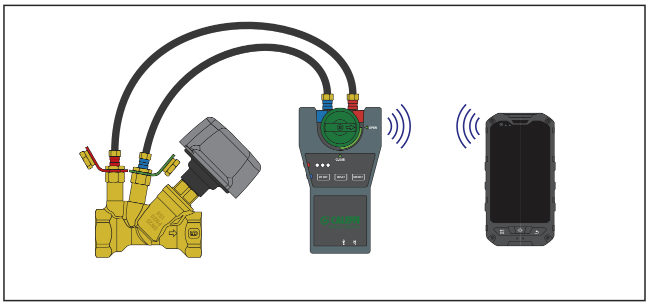
1) Measurement with set position. The display shows the flow rate calculated by the device in relation to the chosen valve and assigned position.
2) Measurement with set flow rate. The position is calculated to assign to the valve in order to obtain the desired flow rate.
3) Simple measurement Δp. The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

Characteristic components of the Δp measuring station

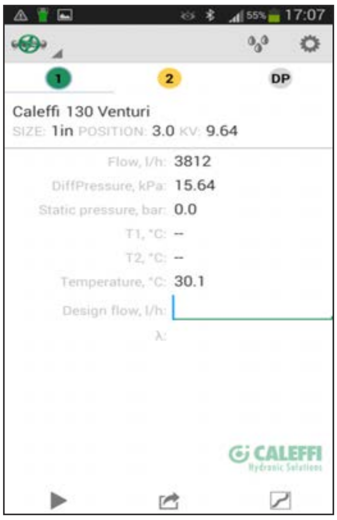


1. Upstream pressure test port
2. Downstream pressure test port
3. Setting by-pass knob
4. Mini USB port
5. Socket for charging
6. Ports for temperature probes *(optional)*
7. Bluetooth® OFF
8. Reset button
9. ON/OFF button
10. Bluetooth® ON indicator
11. Battery charging indicator
12. ON/OFF indicator

Transmission via Bluetooth® to the terminal with Windows Mobile®

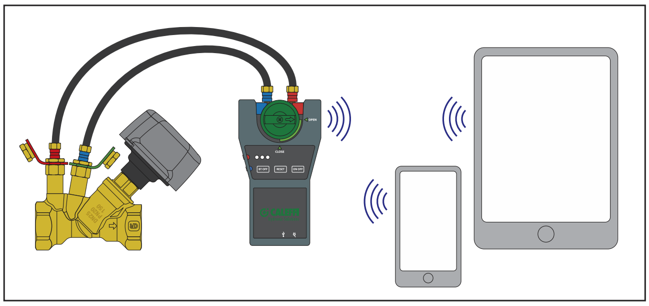


The terminal provided in the package is already equipped with the Caleffi Balance software which is loaded with all the data relating to Caleffi balancing valves and the main commercially available balancing valves.



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® app

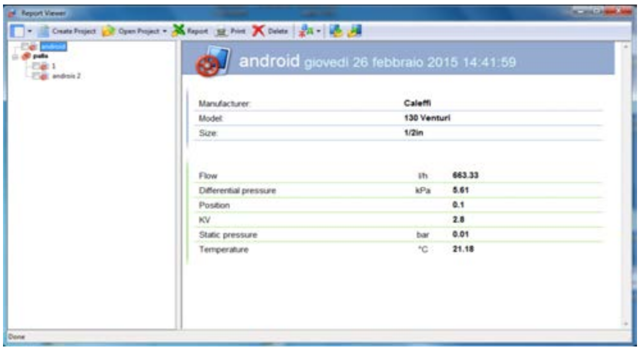


Following the procedure described in the package you can download the Caleffi Balance app to your terminal running the Android® operating system (Smartphone or Tablet).
It includes all the data relating to Caleffi balancing valves and the main balancing valves that are commercially available.

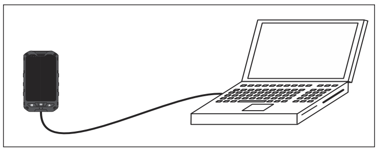
The device allows you to make measurements using the methods described above, view the results and save them.
In addition it enables a graphic display of the results.

PC connection

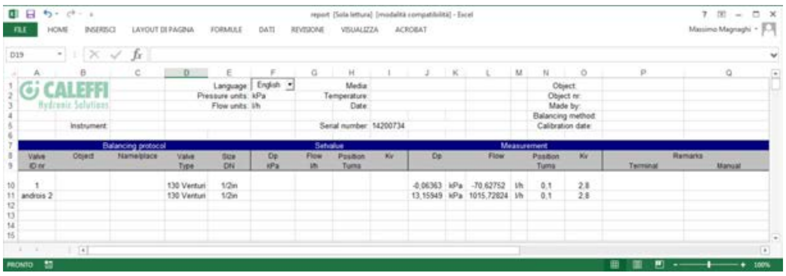
The values obtained with the measurements, and the corresponding valve data, can be saved and viewed directly on the terminal screen or sent to a PC for later processing.



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.

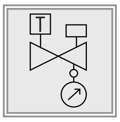


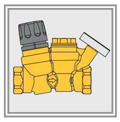
We reserve the right to make changes and improvements to the products and related data in this publication, at any time and without prior notice.

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 "low lead" dezincification resistant alloy body. Female connections.
Max. working pressure: 16 bar.
Adjustment temperature range: 35–60°C.
Disinfection temperature: 70°C.

Code	DN	Conn.
116240	15	1/2"
116250	20	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 "low lead" dezincification resistant alloy body. Female connections.
Max. working pressure: 16 bar.
Adjustment temperature range: 35–60°C.

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

116000

tech. broch. 01325

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

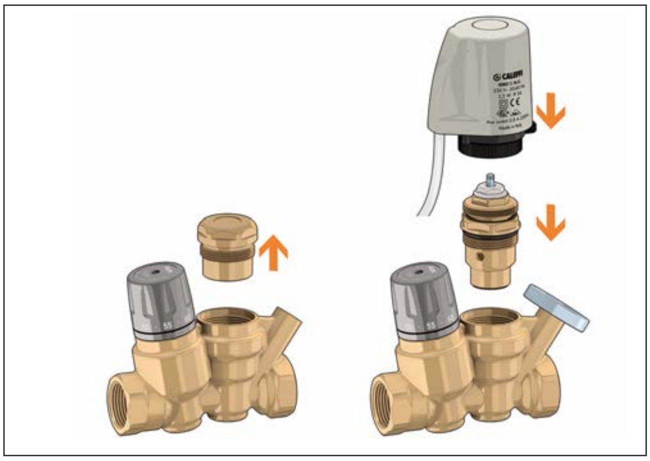
Operating principle

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.

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.

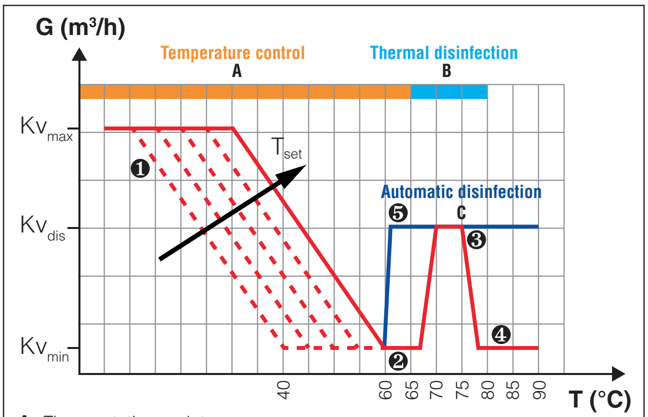
Cartridge replacement for electrically controlled disinfection



Operating modes

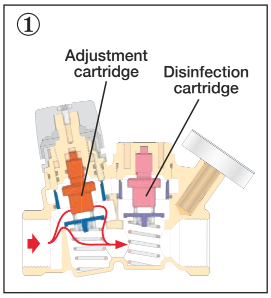
Here following the regulator's operating modes according to the variation of the water temperature of the circuit it is installed on.

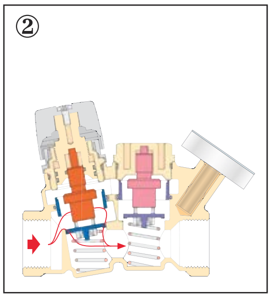
Diagram of thermostatic regulator 116 series

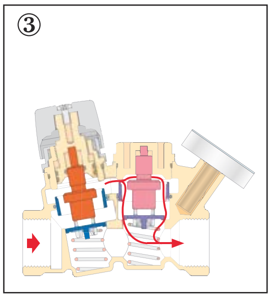


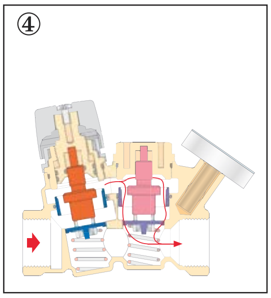
A Thermostatic regulator
B Thermostatic regulator with automatic thermostatic disinfection function
C Thermostatic regulator with disinfection function controlled by an actuator

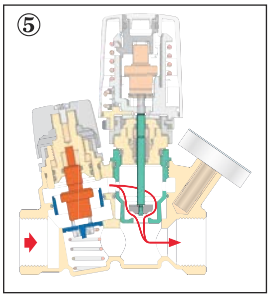
Thermostatic adjustment	Minimum flow rate	Thermostatic disinfection	Thermal closing	Electrically controlled disinfection
①	②	③	④	⑤



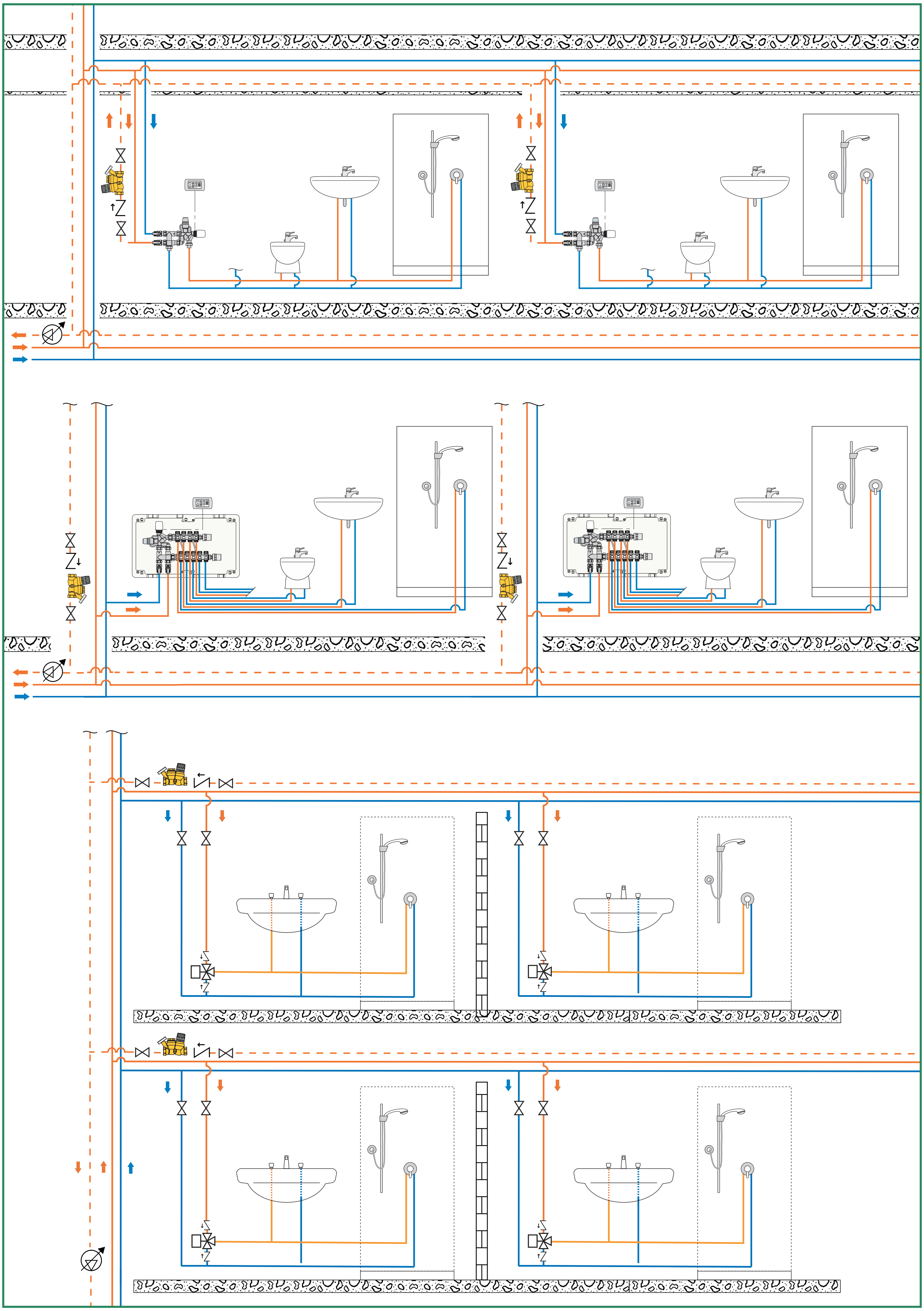








✔ **Domestic water recirculation loops, installation on risers and branches.**



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