Compact automatic flow rate regulator with polymer cartridge

127 series

AutoFlow®

CALEFFI

Function

AUTOFLOW® devices are automatic flow rate regulators capable of keeping the medium flow rate constant as the operating conditions of the hydraulic circuit change. They are used to automatically balance the hydraulic circuit, guaranteeing the design flow rate to each terminal. This series of devices is fitted with a replaceable regulating element, made of high-resistance, scale-resistant and low-noise polymer, for specific use in the circuits of heating and cooling systems and domestic water systems.

This particular AUTOFLOW® series is also supplied with a compact, small valve body for easy installation on individual terminals or in areas of the system.
PATENT.

ATTESTATION DE CONFORMITÉ SANITAIRE **ACS**

Product range

127 series Compact automatic flow rate regulator with polymer cartridge ———————— sizes 1/2", 3/4", 1", 1 1/4", 1 1/2" and 2"

Technical specifications

Materials
Body:		brass EN 12164 CW614N
AUTOFLOW® cartridge:	- 1/2"–1 1/4":	high-resistance polymer
	- 1 1/2"–2":	high-resistance polymer and stainless steel
Spring:		stainless steel
Seals:		EPDM

Performance
Medium:	water, glycol solutions
Max. percentage of glycol:	50 %
Maximum working pressure:	16 bar
Working temperature range:	0–100 °C
Δp range: 0,02–0,06 m³/h:	20–200 kPa
0,085–11 m³/h:	15–200 kPa
Flow rates:	0,02–11 m³/h
Accuracy: 0,02–0,06 m³/h:	±15 %
0,085–11 m³/h:	±10 %
Connections:	1/2"–2" F

Dimensions
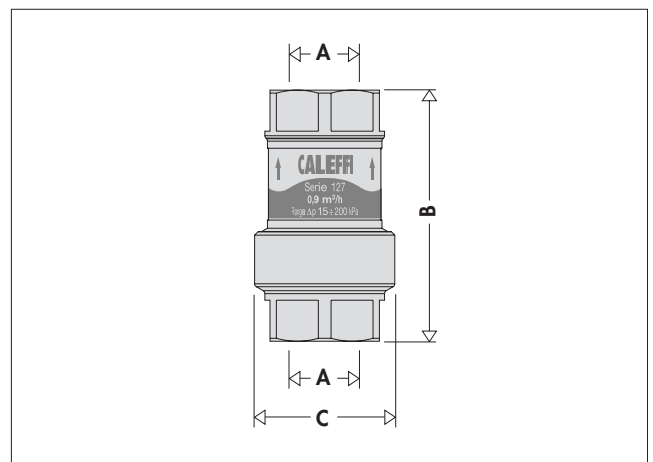
Code	A	B	C	Mass (kg)
127141	1/2"	74	41	0,24
127151	3/4"	74	41	0,25
127161	1"	120	61	0,76
127171	1 1/4"	110	61	0,75
127181	1 1/2"	170	81	2,00
127191	2"	172	81	2,35

Circuit balancing

Modern heating and cooling systems have to guarantee a high level of thermal comfort with a low consumption of energy. This means supplying the system terminals with the correct design flow rates, to produce balanced hydraulic circuits.
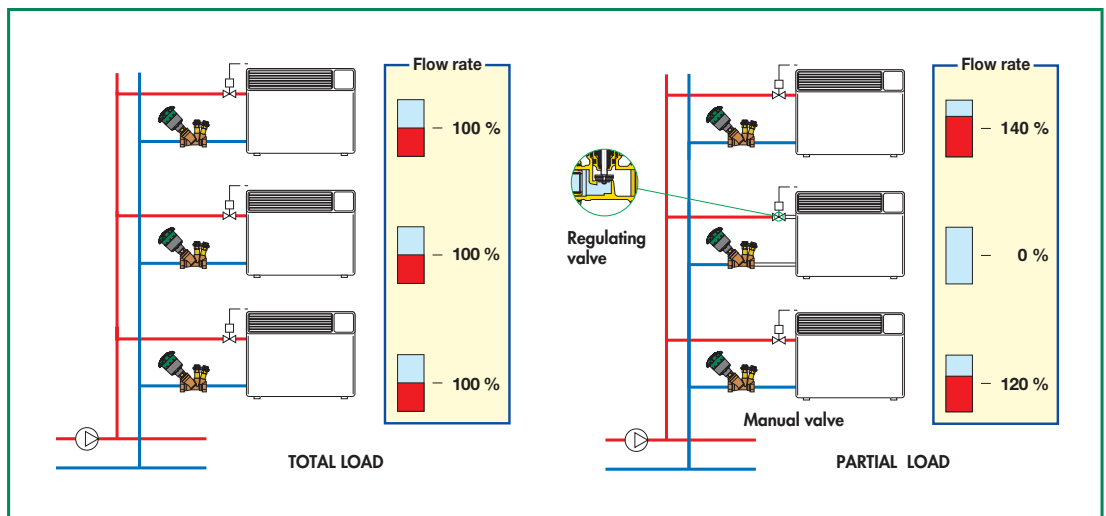
Unbalanced circuits

In unbalanced circuits, the hydraulic imbalance between terminals creates areas with non-uniform temperatures, resulting in problems with thermal comfort and higher energy consumption.

Flow rate

— 50 %

— 140%

— 180%
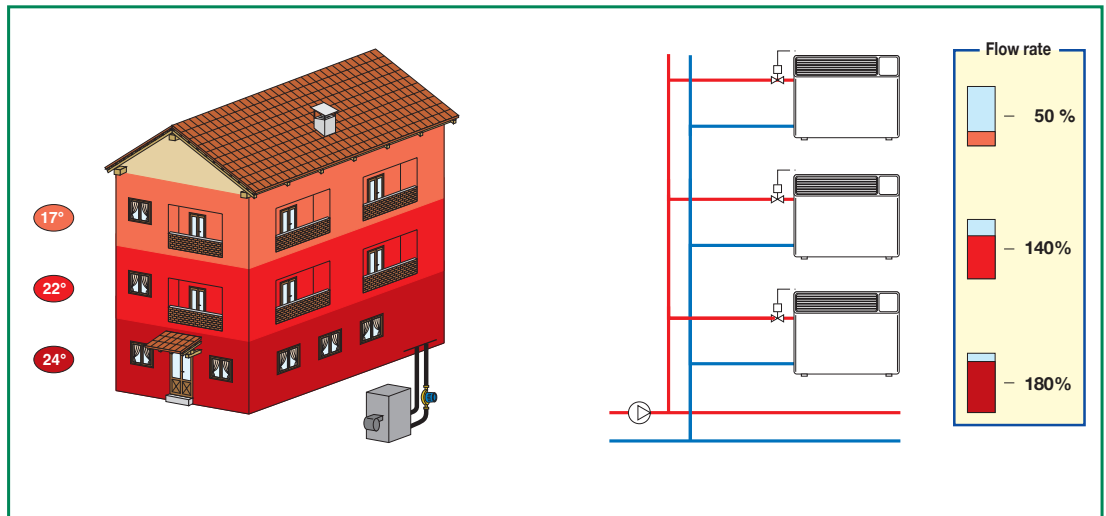
Circuits balanced with manual valves

Traditionally, hydraulic circuits are balanced using manual setting valves.
With these static devices, such circuits are difficult to balance perfectly and have operating limitations when the regulating valves are partially closed. The flow rate in the open circuits **does not remain constant at the nominal value**.

Flow rate

— 100 %

— 100 %

— 100 %

TOTAL LOAD

Regulating valve

Flow rate

— 140 %

— 0 %

— 120 %

Manual valve

PARTIAL LOAD

Circuit balanced with AUTOFLOW®

AUTOFLOW® devices balance the hydraulic circuit automatically, ensuring that each terminal receives the design flow rate.
Even when the regulating valves close the circuit partially, 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.

Flow rate

— 100 %

— 100 %

— 100 %

TOTAL LOAD

Regulating valve

AUTOFLOW®

Flow rate

— 100 %

— 0 %

— 100 %

PARTIAL LOAD
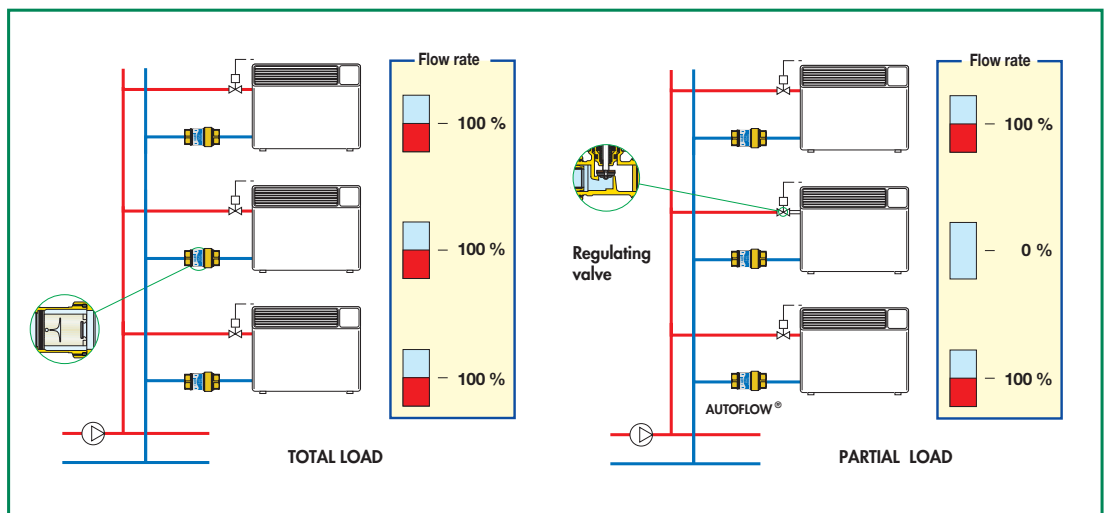
AUTOFLOW® devices

Function

The AUTOFLOW® device must guarantee a constant flow rate when the upstream/downstream differential pressure varies.

It is therefore necessary to refer to the Δp - flow rate diagram and a basic diagram illustrating the operating modes and effects of the relevant variables.

Operating principle

The regulating element of these devices consists of a cylinder and a piston which has dedicated lateral openings with fixed and variable geometry through which the medium flows. These openings are governed by the piston movement, on which the pressure of the medium acts. A specially calibrated spring counteracts this movement.

AUTOFLOW® devices are high-performance automatic regulators. They regulate the chosen flow rates within very tight tolerances (approximately 10 %) and offer an unusually wide working range.
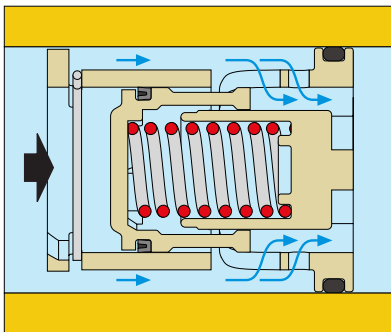
Below the working range
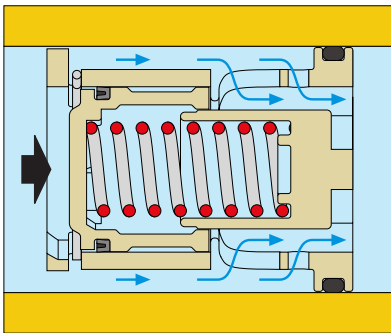
In this case, the regulating piston remains in equilibrium without compressing the spring and gives the medium the maximum free flow area. In practice, the piston acts as a fixed regulator, and so the flow through the AUTOFLOW® depends solely on the differential pressure.
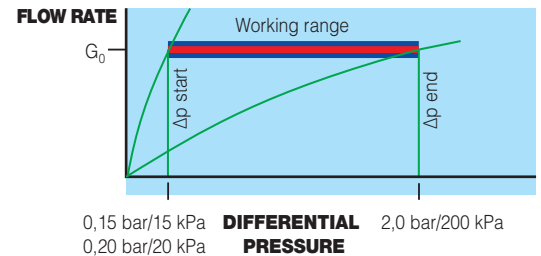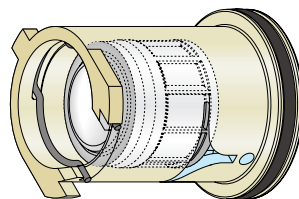
FLOW RATE

G_0

0,15 bar/15 kPa   **DIFFERENTIAL**   2,0 bar/200 kPa
0,20 bar/20 kPa   **PRESSURE**
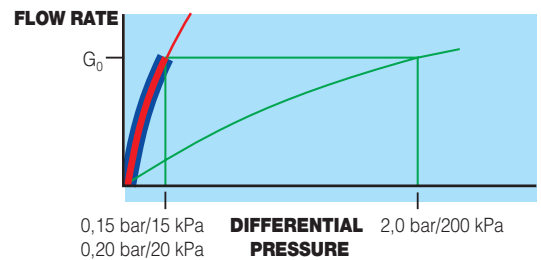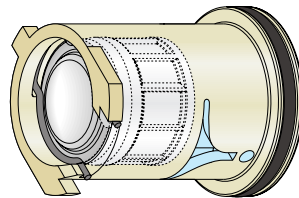
$Kv_{0,01} = 0,258 \cdot G_0$ *where G_0= nominal flow rate*
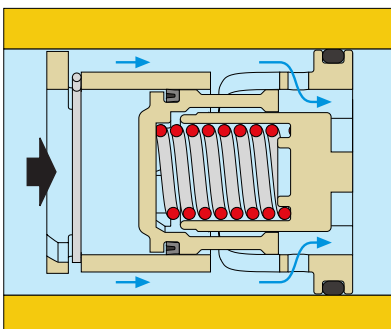
Within the working range

If the differential pressure is contained within the working 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.

FLOW RATE

G_0 Working range

Δp start   Δp end

0,15 bar/15 kPa   **DIFFERENTIAL**   2,0 bar/200 kPa
0,20 bar/20 kPa   **PRESSURE**

Above the working range

In this case, the piston compresses the spring fully and only leaves the fixed geometry aperture for the medium to pass through.

As in the first case above, the piston acts as a fixed regulator. The flow rate through the AUTOFLOW® therefore depends solely on the differential pressure.

FLOW RATE

G_0

0,15 bar/15 kPa   **DIFFERENTIAL**   2,0 bar/200 kPa
0,20 bar/20 kPa   **PRESSURE**
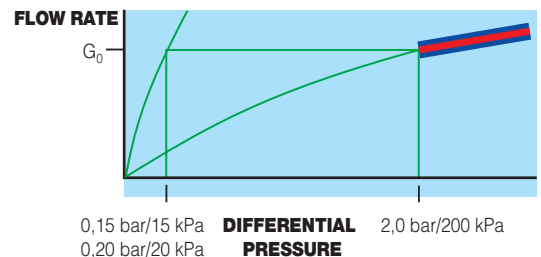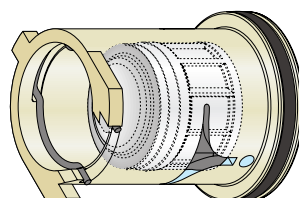
$Kv_{0,01} = 0,070 \cdot G_0$ *where G_0 = nominal flow rate*

Construction details

New polymer regulator

The flow-rate regulator element is made entirely of high resistance polymer, specially chosen for use in heating and cooling systems and domestic water systems.

It offers excellent mechanical behaviour over a wide range of working temperatures, features high abrasion resistance because the medium flows continuously, is insensitive to limescale deposits and is fully compatible with the glycols and additives used in the circuits.
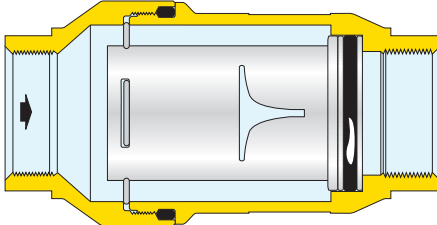
1/2" - 3/4"
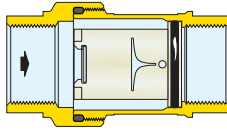
1" - 1 1/4"
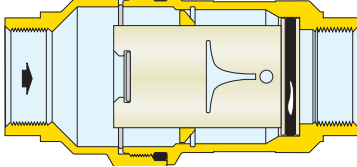
1 1/2" - 2"

Exclusive design

With its exclusive design, the new regulator is able to accurately regulate the flow rate over a wide range of operating pressures. A special internal chamber acts as a damper for the beating and vibration triggered by the flow of the medium, making sure the device works quietly.

For these reasons it can be used in system circuits on both zone outlets and directly at the terminal emitters.

Cartridge removal

The device is easy to remove for inspection or manual replacement of the regulating element by unscrewing the cartridge locking nut from the valve body.

Compact valve body with reduced dimensions

This special series of devices is also supplied with a compact, simplified valve body for easy fitting on pipes and more cost-efficient installation.
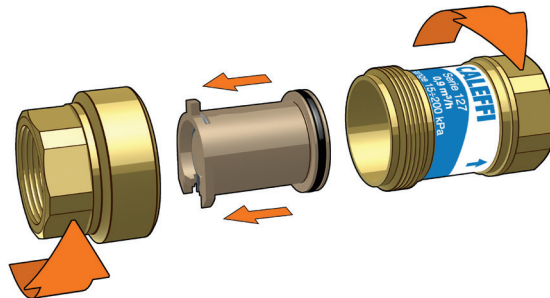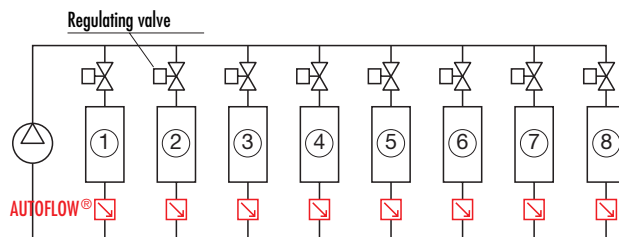
Sizing the circuit with AUTOFLOW®

It is particularly easy to size a circuit containing AUTOFLOW®. As illustrated by the example diagrams shown alongside, the pressure drop caused by the choice of pump is calculated by referring to the hydraulically most disadvantaged circuit and adding this value to the minimum differential pressure required by the AUTOFLOW®.

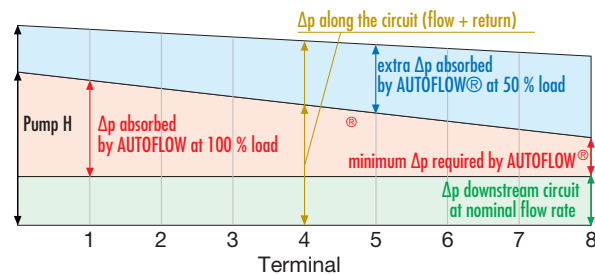In the example the circuits have the same nominal flow rate.

The AUTOFLOW® devices on the intermediate circuits automatically absorb the excess differential pressure to ensure the corresponding nominal flow rate.

As the regulating valves open or close, the AUTOFLOW® repositions itself dynamically to maintain the nominal flow rate (50 % load = circuits 3, 5, 7, 8 closed).

For more detailed information on sizing a system with AUTOFLOW®, please refer to the 2nd volume of the Caleffi handbooks and the technical bulletin "Dynamic balancing in plumbing circuits". They give theoretical calculations, numerical examples and notes on the application of the above-mentioned devices in circuits.

Regulating valve

AUTOFLOW®

Differential pressures (Δp)

Δp along the circuit (flow + return)

Pump H

extra Δp absorbed by AUTOFLOW® at 50 % load

Δp absorbed by AUTOFLOW at 100 % load

minimum Δp required by AUTOFLOW®

Δp downstream circuit at nominal flow rate

Terminal

Flow-rate table

Code	Minimum working Δp (kPa)	Δp range (kPa)	Flow rates (m³/h)
127141 ●●●	15	15–200 (20–200*)	0,02*; 0,04*; 0,06*; 0,085; 0,12; 0,15; 0,2; 0,25; 0,3; 0,35; 0,4; 0,5; 0,6; 0,7; 0,8; 0,9; 1,0; 1,2; 1,4
127151 ●●●	15	15–200 (20–200*)	0,02*; 0,04*; 0,06*; 0,085; 0,12; 0,15; 0,2; 0,25; 0,3; 0,35; 0,4; 0,5; 0,6; 0,7; 0,8; 0,9; 1,0; 1,2; 1,4; 1,6
127161 ●●●	15	15-200	0,5; 0,6; 0,7; 0,8; 0,9; 1,0; 1,2; 1,4; 1,6; 1,8; 2,0; 2,25; 2,5; 2,75; 3,0; 3,25; 3,5; 3,75; 4,0; 4,25; 4,5; 4,75; 5,0
127171 ●●●	15	15-200	0,5; 0,6; 0,7; 0,8; 0,9; 1,0; 1,2; 1,4; 1,6; 1,8; 2,0; 2,25; 2,5; 2,75; 3,0; 3,25; 3,5; 3,75; 4,0; 4,25; 4,5; 4,75; 5,0
127181 ●●●	15	15-200	4,5; 4,75; 5,0; 5,5; 6,0; 6,5; 7,0; 7,5; 8,0; 8,5; 9,0; 9,5; 10,0; 11,0
127191 ●●●	15	15-200	4,5; 4,75; 5,0; 5,5; 6,0; 6,5; 7,0; 7,5; 8,0; 8,5; 9,0; 9,5; 10,0; 11,0

Minimum differential pressure required

This is equal to the minimum working Δp for the AUTOFLOW® cartridge (15 or 20 kPa).

Example

AUTOFLOW® 127 series size 3/4" with flow rate G_0 = 1200 l/h and Δp range 15–200 kPa:
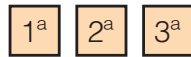
$\Delta p_{required} = \Delta p_{Autoflow}$ = 15 kPa   Pump head H = $\Delta p_{circuit} + \Delta p_{required}$

Method of coding for AUTOFLOW® 127 series

For proper identification of the device, fill in the chart indicating: the size, the flow rate and the Δp range.

Full code

1ª	2ª	3ª	4ª	5ª	6ª	7ª	8ª	9ª
1	2	7	1		1			

SERIES   SIZE   FLOW RATE AND Δp RANGE
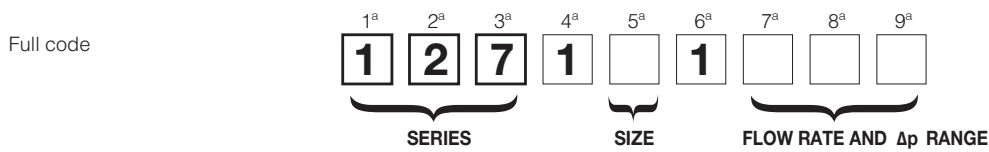
SERIES   1ª   2ª   3ª   The first three digits indicate the series:

127	AUTOFLOW regulator ®

DIAMETER   5ª   The fifth digit indicates the size:

Diameter	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
Digit	4	5	6	7	8	9

FLOW RATE AND Δp RANGE   7th   8th   9th

The last three digits indicate the available flow rate values

with Δp range 20–200 kPa

m³/h	digit	m³/h	digit	m³/h	digit
0,02	M02	0,04	M04	0,06	M06

with Δp range 15–200 kPa

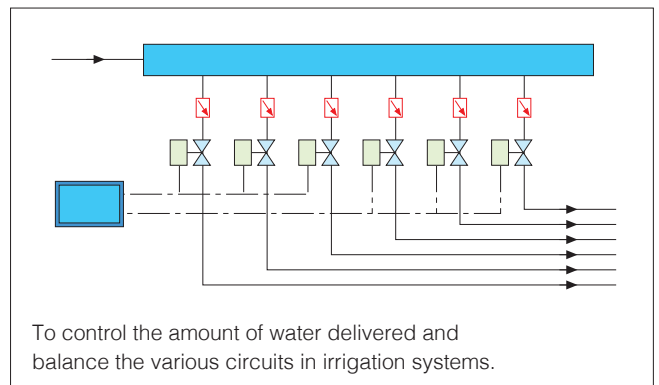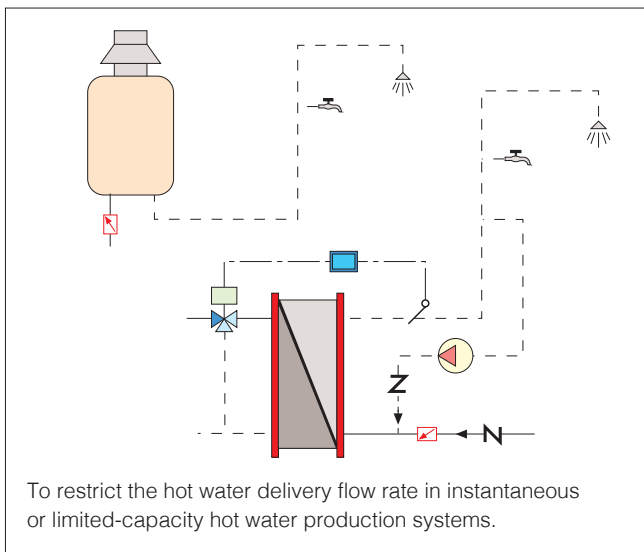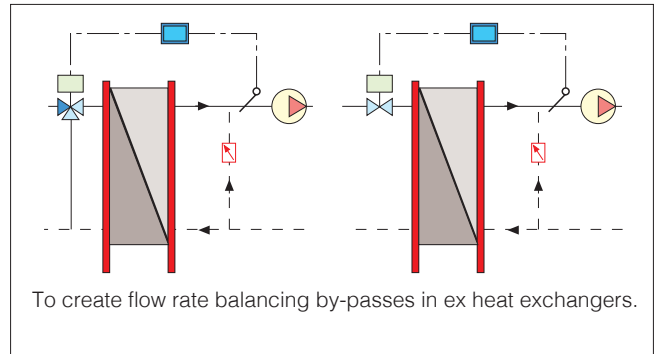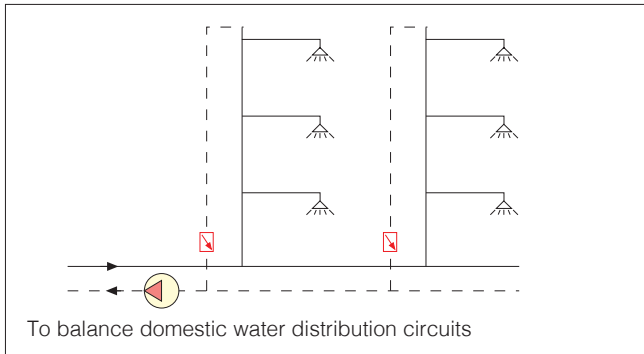| m³/h	digit	m³/h	digit	m³/h	digit	m³/h	digit	m³/h	digit	m³/h	digit
0,085	M08	0,40	M40	1,20	1M2	2,75	2M7	4,50	4M5	7,50	7M5
0,12	M12	0,50	M50	1,40	1M4	3,00	3M0	4,75	4M7	8,00	8M0
0,15	M15	0,60	M60	1,60	1M6	3,25	3M2	5,00	5M0	8,50	8M5
0,20	M20	0,70	M70	1,80	1M8	3,50	3M5	5,50	5M5	9,00	9M0
0,25	M25	0,80	M80	2,00	2M0	3,75	3M7	6,00	6M0	9,50	9M5
0,30	M30	0,90	M90	2,25	2M2	4,00	4M0	6,50	6M5	10,0	10M
0,35	M35	1,00	1M0	2,50	2M5	4,25	4M2	7,00	7M0	11,0	11M

Applications of AUTOFLOW® (⤢)

Installation of AUTOFLOW®

In heating and cooling systems, AUTOFLOW® devices must be installed on the circuit return pipe. Some typical installation examples are given below.

To serve a number of heating elements:
radiators, convectors, fan-coils, unit heaters, heating strips, etc...

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

F.O.

F.O.

F.O.

To guarantee the design flow rates (both with open valve and fully closed valve) to the various system zones.

To allow constant flow rates (in every valve position) in circuits with traditional outside compensated temperature regulation.

Applications of AUTOFLOW® (⬀)

To balance domestic water distribution circuits

To create flow rate balancing by-passes in ex heat exchangers.

To restrict the hot water delivery flow rate in instantaneous or limited-capacity hot water production systems.

To control the amount of water delivered and balance the various circuits in irrigation systems.

For more details please refer to Application Sheets no 04301, 04302 and 04303 and the Technical Bulletin "Dynamic balancing in plumbing circuits".

SPECIFICATION SUMMARY

127 series

AUTOFLOW® compact automatic flow rate regulator. Connections 1/2" (from 1/2" to 2") F x F. Brass body. High-resistance polymer cartridge (1 1/2" and 2" high-resistance polymer and stainless steel). Stainless steel spring. EPDM seals. Medium water and glycol solutions. Max. percentage of glycol 50 %. Maximum working pressure 16 bar. Working temperature range 0–100 °C. Δp range 15–200 (20–200) kPa. Range of available flow rates: 0,085–11 (0,02–0,06) m³/h. Accuracy ±10–15 %. PATENT.