Differential by-pass valve

CALEFFI

519 series

Function

The differential by-pass valve is used in systems working with variable flow rates, for example in those making widespread use of thermostatic valves or 2-way motorised valves. It ensures a flow recirculation proportional to the number of valves being closed, while limiting the maximum differential pressure value generated by the pump.

In chilled water systems with high head pumps, installation of the version with a setting range between 100 and 400 kPa is advisable.

WRAS APPROVED PRODUCT

Product range

Code 519500 Adjustable differential by-pass valve with graduated scale, setting range: 1–6 m w.g. —————————— Size 3/4"
Code 519700 Adjustable differential by-pass valve with graduated scale, setting range: 1–6 m w.g. —————————— Size 1 1/4"
Code 519504 Adjustable differential by-pass valve with graduated scale, setting range: 10–40 m w.g. —————————— Size 3/4"

Technical specifications

Materials

Body:	brass EN 12165 CW617N
Obturator:	brass EN 12164 CW614N
Obturator gasket:	EPDM
O-Ring seals:	EPDM
Union seals:	asbestos free NBR
Control knob:	ABS
Spring:	stainless steel

Performance

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

Setting range:
    10–60 kPa (1–6 m w.g.) for codes 519500 and 519700
    100–400 kPa (10–40 m w.g.) for code 519504

Connections: 3/4", 1 1/4" F x M with union

Dimensions
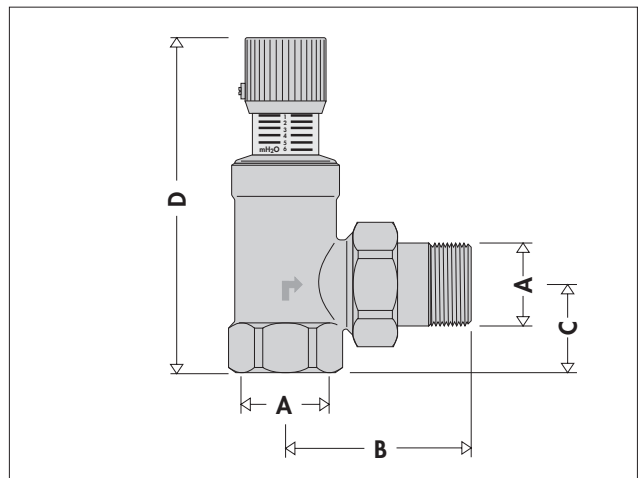
Code	A	B	C	D	Weight (Kg)
519500	3/4"	59	26	104	0,45
519700	1 1/4"	88,5	41	158	1,19
519504	3/4"	59	26	104	0,45

Operating principle

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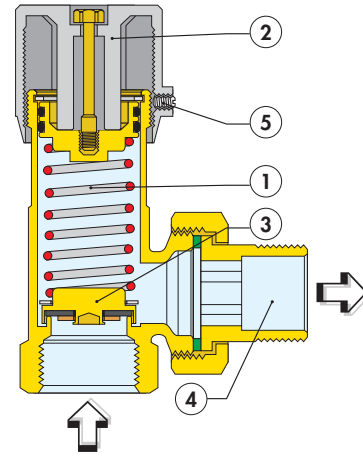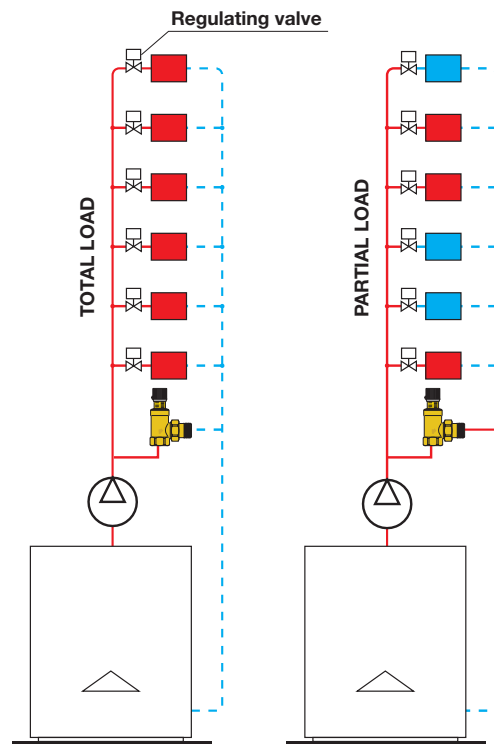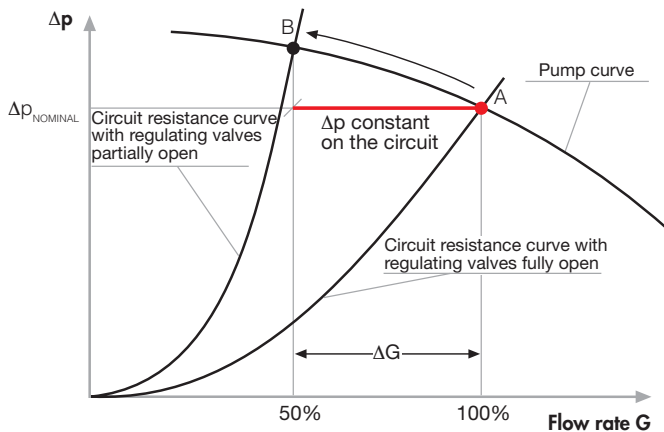
System operation

The job of the by-pass valve is to maintain the pump operating point as close as possible to its nominal value (point A on the graph shown below). If the by-pass valve is not used, when the flow rate in the circuit decreases due to partial closure of the two-way valves, the head loss in the circuit increases, point B.
The by-pass valve, set to the nominal head value of the pump, enables to limit the pressure increase, by-passing the 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 trigger pressure value is more or less constant as the discharge flow rate varies (see hydraulic characteristic diagrams).
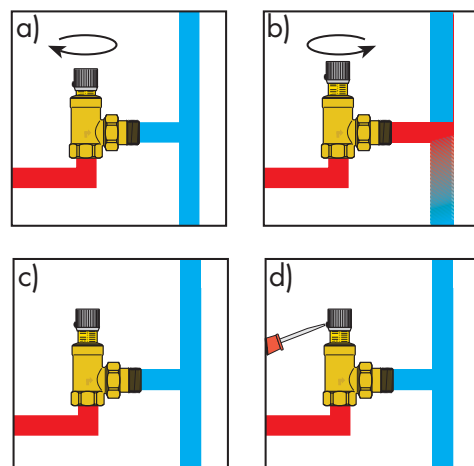A proper valve sizing must guarantee a sufficient flow rate by-pass to keep the pump at its nominal operating point in all system operating conditions, for example when the first thermostatic valves are closed.

Regulating valve

TOTAL LOAD

PARTIAL LOAD

Δp

Δp$_{NOMINAL}$

B

A

Pump curve

Circuit resistance curve with regulating valves partially open

Δp constant on the circuit

Circuit resistance curve with regulating valves fully open
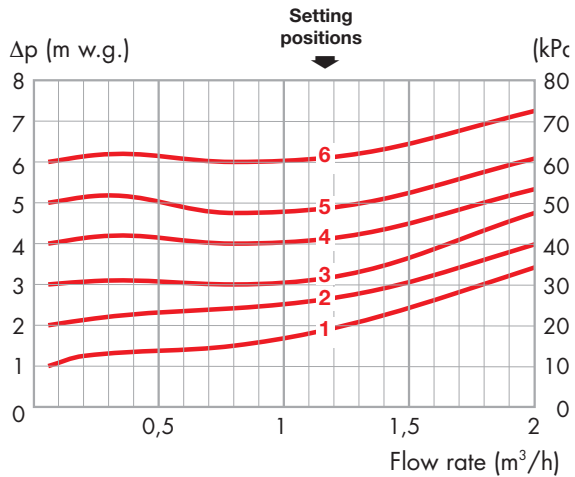
ΔG

50%

100%

Flow rate G

Setting

To regulate the valve, turn the knob to the required value on the graduated scale: the values correspond to the differential pressure in metres w.g. to open the by-pass.
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 thermostatic 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 the 30% of the thermostatic valve. 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 rise in the temperature is noted, open the thermostat valves again and check that the hot water stops flowing into the by-pass (c). Lock the knob in this position (d) with the fixing screw (5).
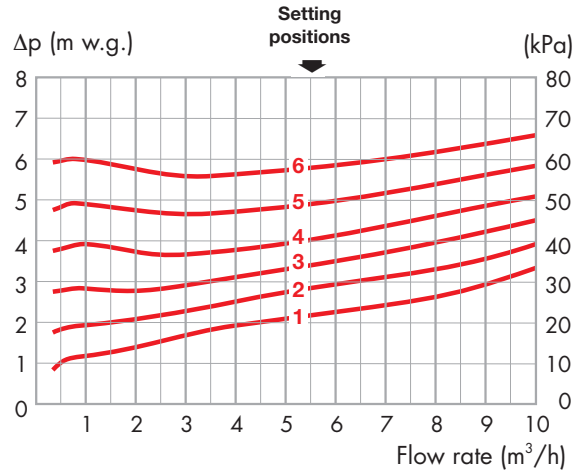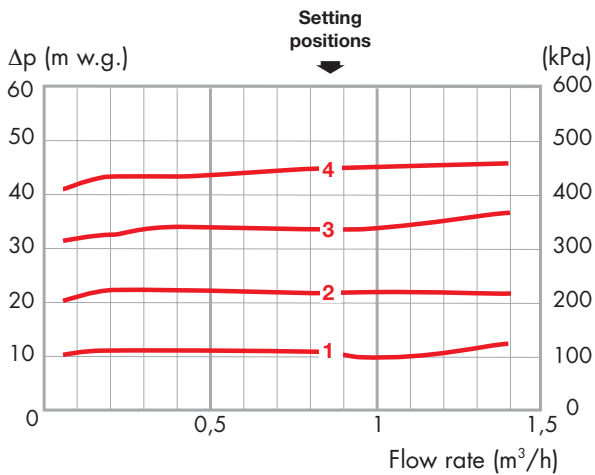
a)

b)

c)

d)

Hydraulic characteristics

code 519500 (3/4")

Δp (m w.g.) — Setting positions — (kPa)

Flow rate (m³/h)

code 519700 (1 1/4")

Δp (m w.g.) — Setting positions — (kPa)

Flow rate (m³/h)

code 519504 (3/4")

Δp (m w.g.) — Setting positions — (kPa)

Flow rate (m³/h)
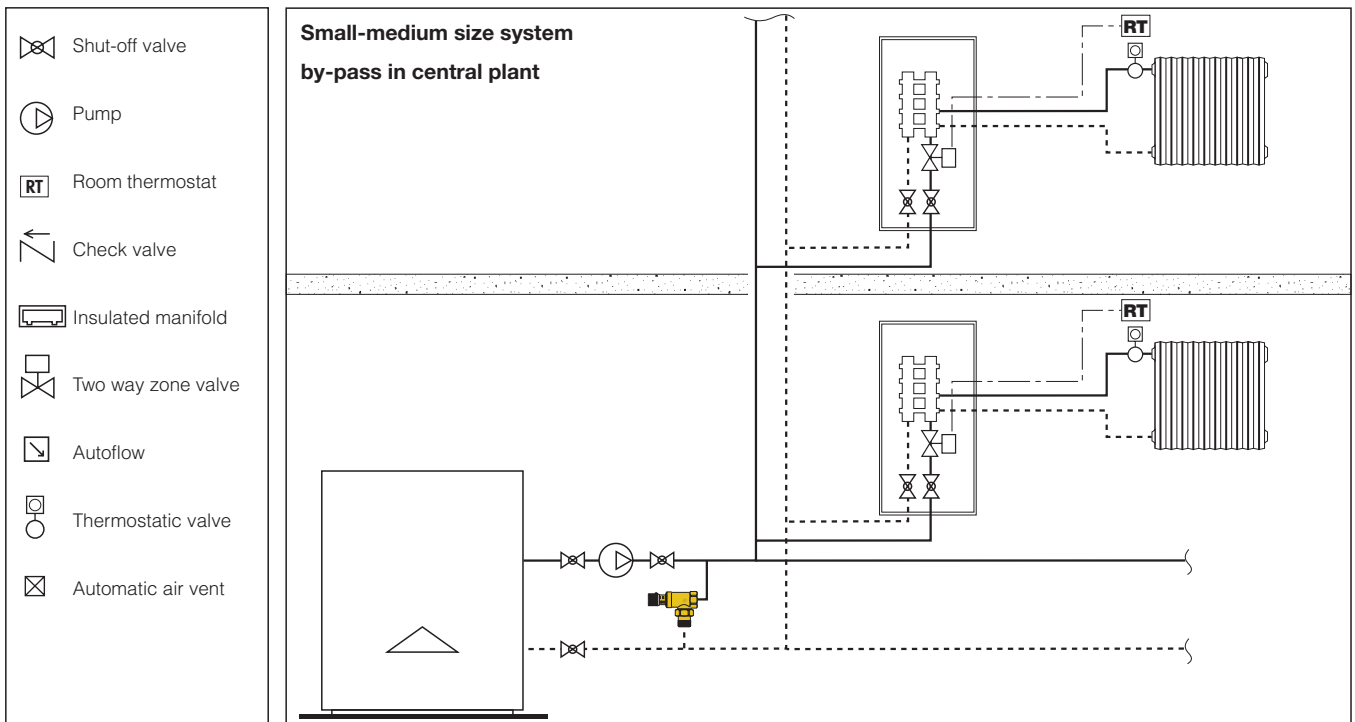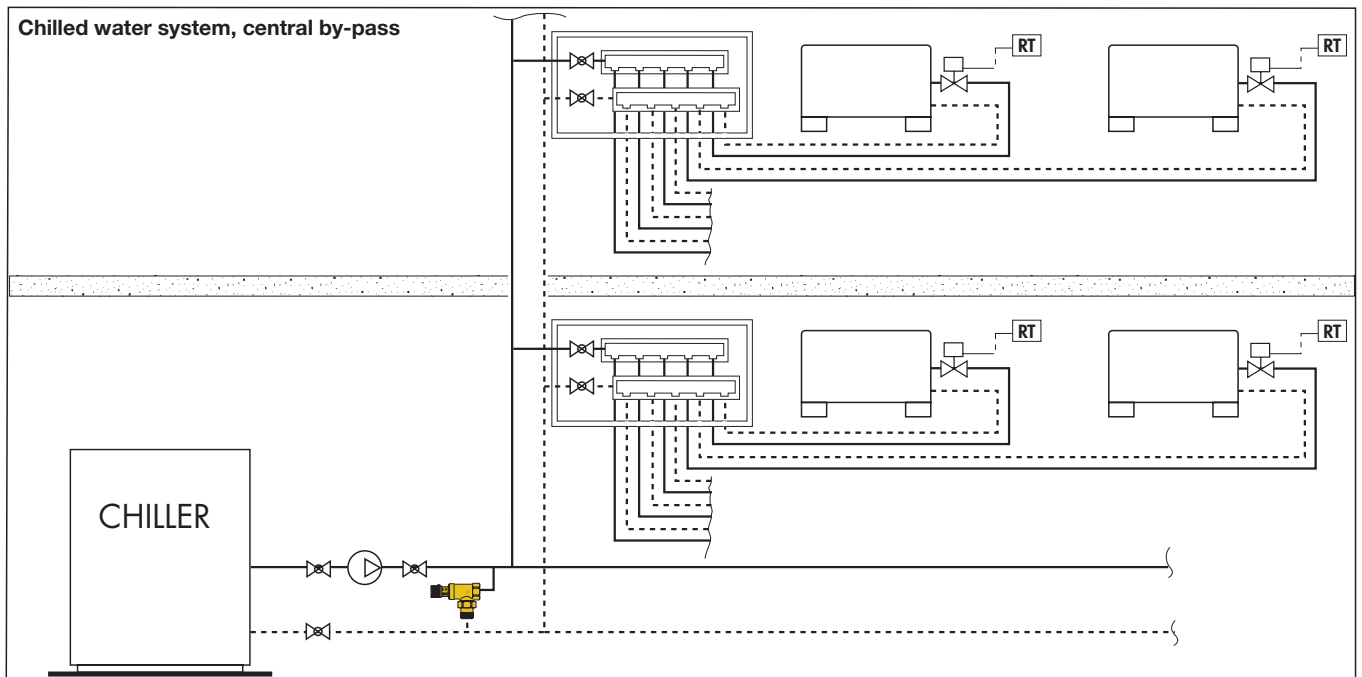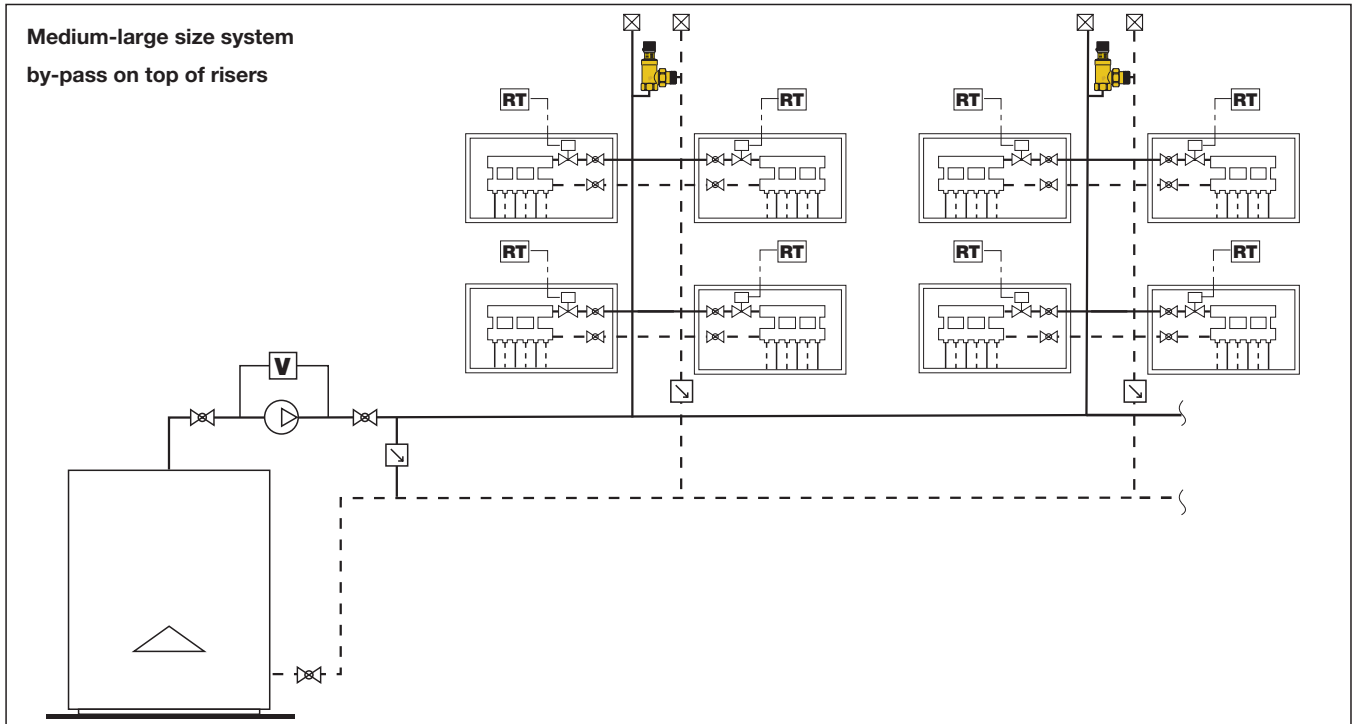
Installation

The differential by-pass valve can be fitted in any position, respecting the flow direction indicated by the arrow on the valve body.

In systems with a traditional boiler it is normally fitted between the system flow and return ends, which allows the control of the pressure and the passage of a minimum flow through the heat generator.

In systems with a condensation boiler, it is preferable to fit the by-pass directly between the upstream and downstream sections of the pump, as this allows a higher ΔT in the circuit, with lower return temperatures and therefore better operation of the system. In the event of high by-pass flow rate levels, it is recommended to fit the valve between the flow and return ends of each column, rather than fitting a number of valves in parallel at the central boiler.

Application diagrams

Shut-off valve

Pump

RT Room thermostat

Check valve

Insulated manifold

Two way zone valve

Autoflow

Thermostatic valve

Automatic air vent

Small-medium size system by-pass in central plant

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

Chilled water system, central by-pass

CHILLER

SPECIFICATION SUMMARIES

519 series

Differential by-pass valve. Threaded connections 3/4" (1 1/4") F x M with union. Brass body. Brass obturator. EPDM obturator gasket. EPDM O-Ring seals. Asbestos free NBR union seals. ABS control knob. Stainless steel spring. Medium: water, glycol solutions. Maximum percentage of glycol 30%. Temperature range 0–110°C. Maximum working pressure 10 bar. Setting range 10–60 kPa size 3/4" and 1 1/4", 100–400 kPa size 3/4".

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.