

Pre-adjustable pressure reducing valves with self-contained cartridge



5350 - 5351 series



01085/17 GB
replaces 01085/14 GB



Function

Pressure reducing valves are devices which, when installed on private water systems, reduce and stabilise the pressure of the water entering from the public network. This inlet pressure, in general, is too high and variable to be applied directly to domestic systems.

This series of pressure reducing valves have the feature to be pre-adjustable. The pressure reducing valve can be set to the desired pressure value before installation, using an adjustment knob with a pressure setting indicator. After installation, the system pressure will automatically adjust itself to the set value.

The internal cartridge containing all the regulating components is pre-assembled as a "self-contained unit", to facilitate inspection and maintenance procedures.

A version fitted with an inspectable high-capacity strainer, located inside a special transparent container, is also available. This ensures the pressure reducing valve and water system are well protected from any impurities in the water supply. 5350 and 5351 series pressure reducing valves are certified as compliant with European standard EN 1567.



Product range

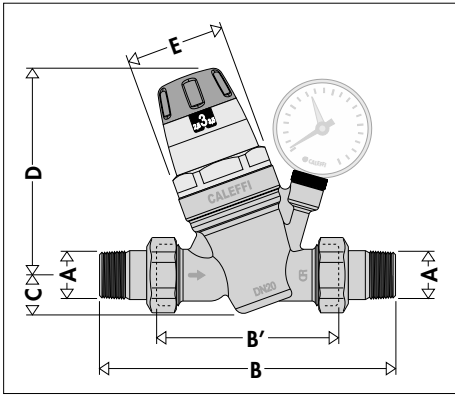
5350 series Pre-adjustable pressure reducing valve with self-contained cartridge. With or without pressure gauge _____ size DN 15 (1/2"), DN 20 (3/4"), DN 25 (1"), DN 32 (1 1/4"), DN 40 (1 1/2") and DN 50 (2") M with union

5351 series Pre-adjustable pressure reducing valve with self-contained cartridge and inspectable strainer. With or without pressure gauge _____ size DN 15 (1/2"), DN 20 (3/4") and DN 25 (1") M with union

Technical specifications

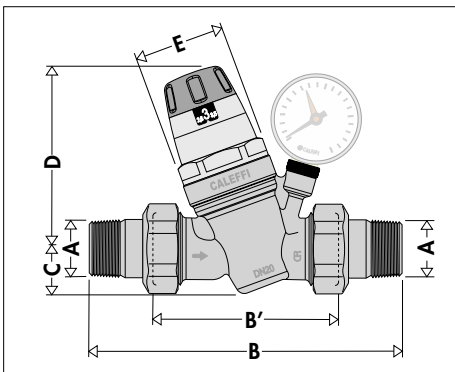
series ↔	5350	5351
Materials		
Body:	dezincification resistant alloy CR EN 1982 CC770S	brass EN 12165 CW617N
Cover:	PA66G30	PA66G30
Control stem:	stainless steel	stainless steel
Moving parts:	dezincification resistant alloy CR EN 12164 CW724R	dezincification resistant alloy CR EN 12164 CW602N
Diaphragm:	EPDM	EPDM
Seals:	EPDM	EPDM
Strainer:	stainless steel	stainless steel
Strainer container:	-	transparent PA12
Performance		
Max. upstream pressure:	25 bar	25 bar
Downstream pressure setting range:	1-6 bar	1-6 bar
Factory setting:	3 bar	3 bar
Max. working temperature:	40°C	40°C
Pressure gauge scale:	0-10 bar	0-10 bar
Strainer mesh size:	0,51 mm	0,28 mm
Medium:	water	water
Certification in compliance with standard:	EN 1567	EN 1567
Connections	1/2"-2" M (ISO 7/1) with union	1/2"-1" M (ISO 7/1) with union
Pressure gauge connections	1/4" F (ISO 228-1)	1/4" F (ISO228-1)

Dimensions

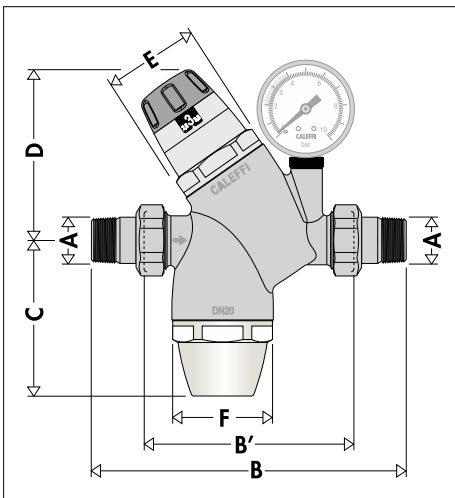


Code	DN*	A**	B	B'	C	D	E	Mass (kg)
535040/1	15	1/2"	140	76*	20,5	112	Ø 54	0,92
535050/1	20	3/4"	160	90*	20,5	112	Ø 54	1,06
535060/1	25	1"	180	95*	20,5	112	Ø 54	1,38
535070/1	32	1 1/4"	200	110*	40	178	Ø 73	2,6
535080/1	40	1 1/2"	220	120*	40	178	Ø 73	3,4
535090/1	50	2"	250	130	40	178	Ø 73	4,3

* Interchangeable with 5360 series



Code	DN*	A**	B	B'	C	D	E	Mass (kg)
535074/5	32	1 1/4"	197	103	25	113	Ø 56	1,65



Code	DN*	A**	B	B'	C	D	E	F	Mass (kg)
535140/1	15	1/2"	169	105	86,5	100,5	Ø 54	Ø 58	1,50
535150/1	20	3/4"	180	110	89	98	Ø 54	Ø 58	1,57
535160/1	25	1"	205	120	88,5	99,5	Ø 54	Ø 58	1,92

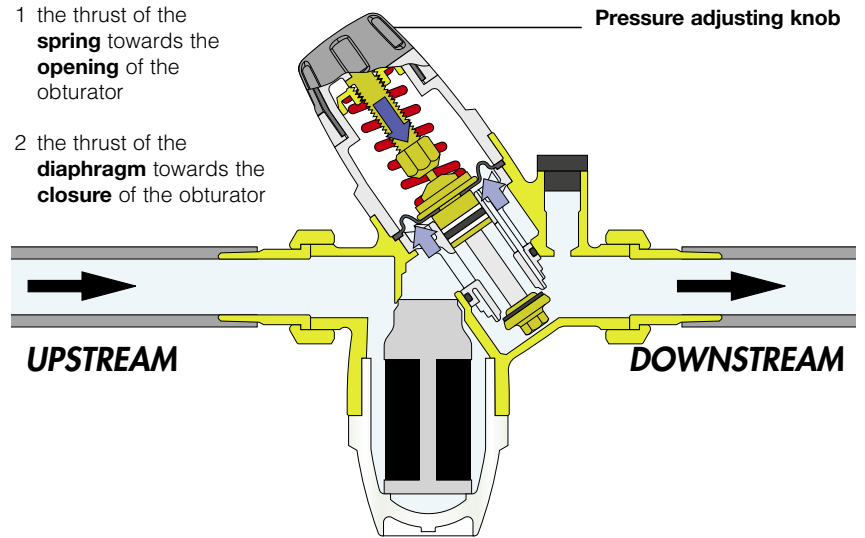
* Valve body

** Connections

Operating principle

The functioning of the pressure reducing valve is based on the balance between two opposing forces:

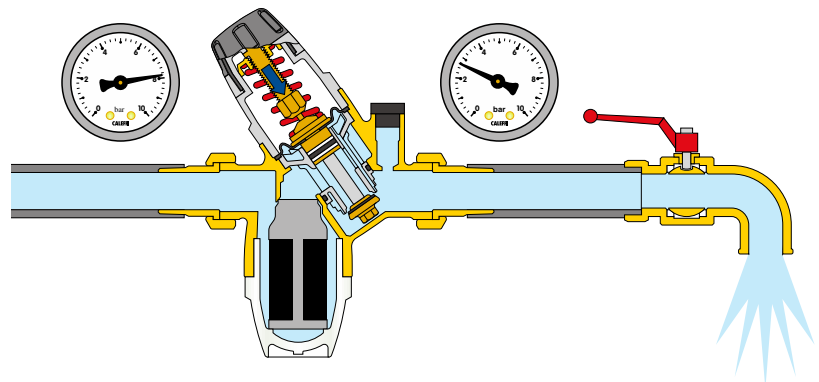
- 1 the thrust of the **spring** towards the **opening** of the obturator
- 2 the thrust of the **diaphragm** towards the **closure** of the obturator



Operation with water flow

When a draw-off outlet is opened on the water system, the force of the spring becomes greater than that of the diaphragm; the obturator moves downwards opening the valve to the flow of water.

The greater the demand for water the lower the pressure under the diaphragm with a resulting greater flow of water through the valve.

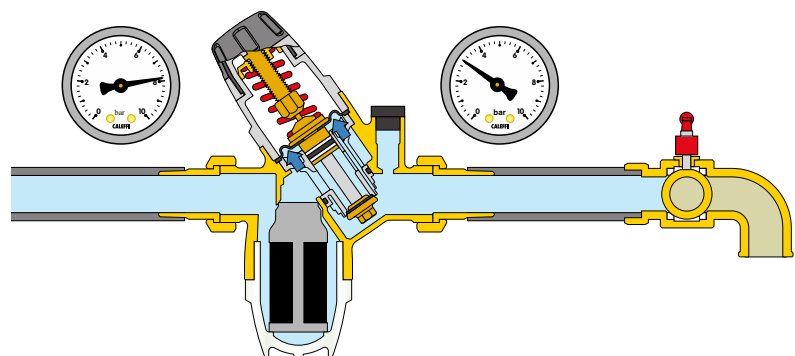


Operation without water flow

When the draw-off outlet is closed, the downstream pressure rises and pushes the diaphragm upwards.

As a result the obturator closes the valve to the passage of water and maintains the pressure constant at the calibrated pressure.

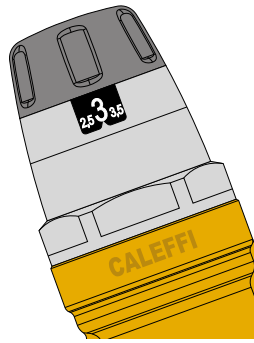
The slightest difference in favour of the force exercised by the diaphragm, in relation to that of the spring, causes the device to close.



Construction details

Pre-adjustment

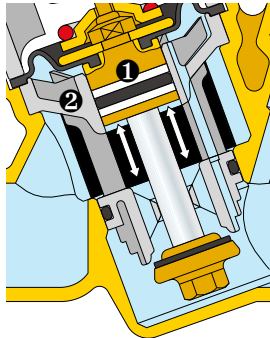
The 5350 and 5351 series pressure reducing valves are fitted with an operating knob and a pressure setting indicator which is visible on both sides. This pressure indicator features incremental step operation, therefore the pressure can be adjusted continuously with the value displayed at 0,5 bar increments. The system pressure can therefore be pre-set to the desired value, even before the pressure reducing valve is installed.



Compensated seat

Caleffi pressure reducing valves are fitted with compensated seats. This means the set pressure value remains constant, regardless of variations in the upstream pressure value.

In the figure, the thrust towards the opening is counterbalanced by the force created by the closing pressure acting on the compensating piston. Since the piston has a surface area equal to the obturator one, the two forces cancel each other out.



Low head loss

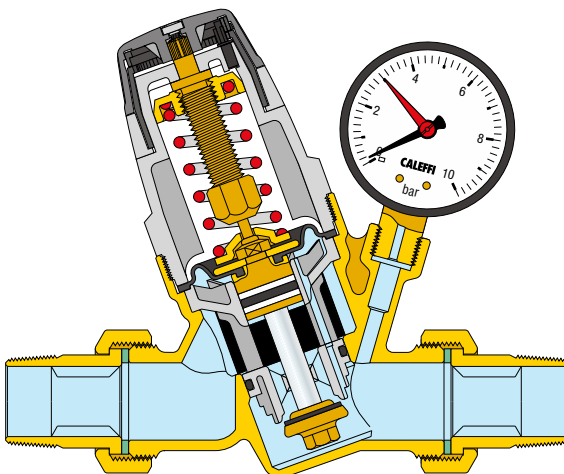
The internal fluid-dynamic shape of the pressure reducing valve allows to obtain particularly low pressure losses, even if a large number of user outlets are opened.

High pressures

The zone exposed to the upstream pressure is constructed so that it can even operate at high pressure. The PTFE anti-extrusion rings (1) on the compensating piston make it possible for the valve to be used continuously at upstream pressures of up to 25 bar.

Non-sticking materials

The central support assembly (2), containing the moving parts, is made of plastic material with a low adherence coefficient. This solution minimises the chance of lime scale formation, the main cause of malfunctions.

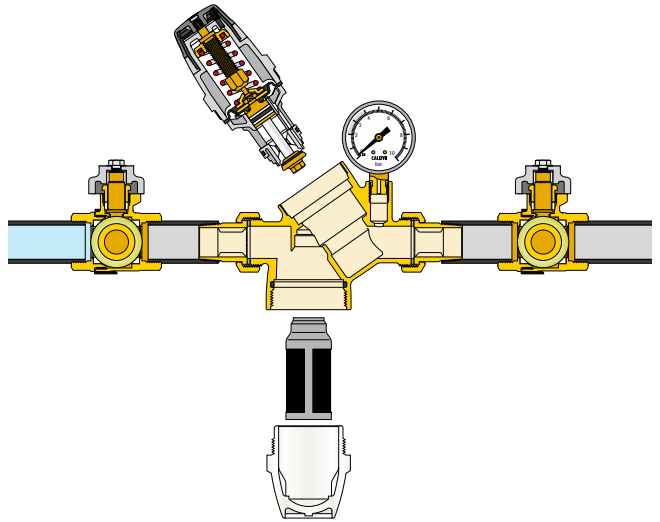


Removable self-contained cartridge

The cartridge, containing the diaphragm, strainer, seat, obturator and compensating piston, is pre-assembled as a "self-contained unit" with a cover and can be easily removed for inspection and maintenance procedures.

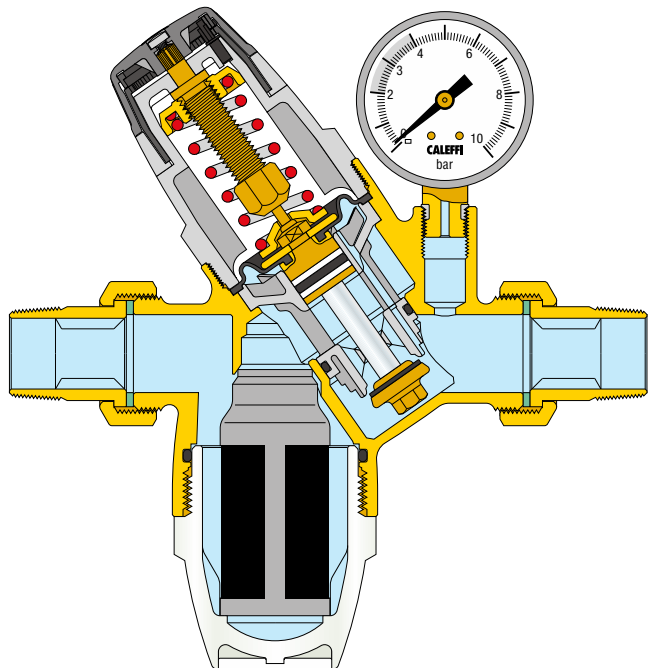
Inspectable strainer

The 5351 series pressure reducing valves are fitted with a high-capacity inspectable strainer, located in a special transparent container. This means it is possible to view its condition and carry out inspection and maintenance procedures as necessary.



Pressure gauge

The pressure gauge used in the 5351 series has stainless steel casing and a connection with a PTFE ring, which guarantees the hydraulic seal without the need for any further sealing.

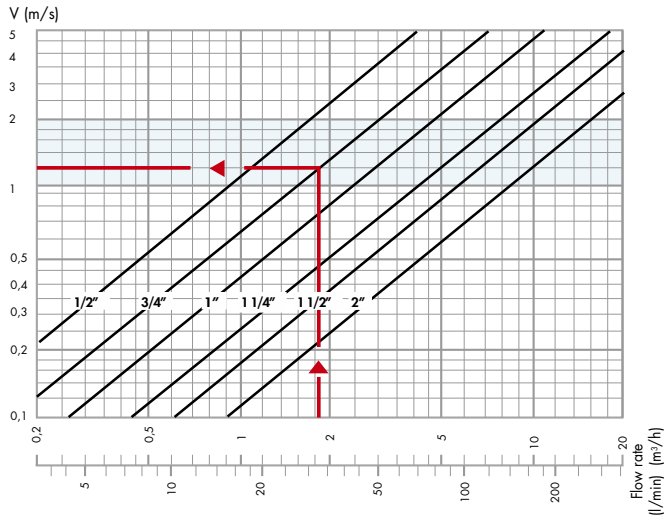


Certification

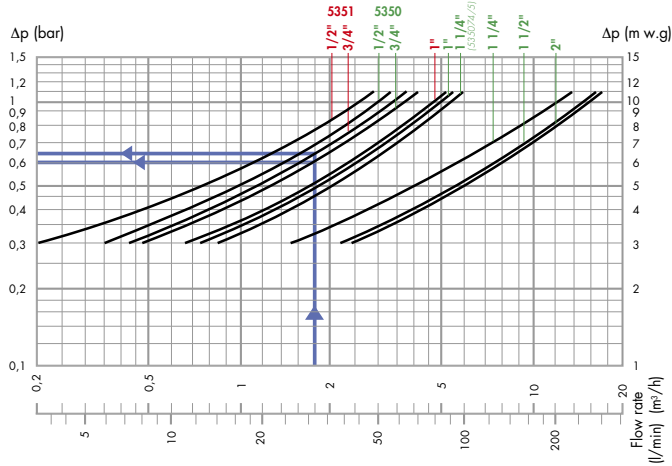
The 5350 and 5351 pressure reducing valves are approved by the SVGW, DVGW, WRAS and ACS bodies as compliant with the specifications of European standard EN 1567.

Hydraulic characteristics

Graph 1 (Water velocity)



Graph 2 (Pressure drop)



- Reference values: Upstream pressure = 8 bar
Downstream pressure = 3 bar

Sizing

The typical flow rates of equipment commonly used in domestic water systems are shown below, to help in the selection of correct pipe diameters:

Table of typical flow rates

Bathtub, kitchen sink, dishwasher	12 litres/min
Shower.	9 litres/min
Washbasin, bidet, washing machine, WC	6 litres/min

To prevent oversizing of the pressure reducing valve and the pipes, the correct simultaneous use correction factor must be taken into account. Basically, the more outlets within the system, the lower the percentage of draw-off outlets opened simultaneously will be.

Table of simultaneous use factors (%)

Number of devices	Private dwelling %	Public building %	Number of devices	Private dwelling %	Public building %	Number of devices	Private dwelling %	Public building %
5	54	64,5	35	23,2	30	80	16,5	22
10	41	49,5	40	21,5	28	90	16	21,5
15	35	43,5	45	20,5	27	100	15,5	20,5
20	29	37	50	19,5	26	150	14	18,5
25	27,5	34,5	60	18	24	200	13	17,5
30	24,5	32	70	17	23	300	12,5	16,5

Correct sizing should take place as follows:

- The total flow rate is calculated from the number and type of appliances present by taking the sum of the individual flow rates.

Example:

Residence with 2 bathrooms

2 bidets	G = 12 l/min
1 shower	G = 9 l/min
2 washbasins	G = 12 l/min
2 WCs	G = 12 l/min
1 bathtub	G = 12 l/min
1 kitchen sink	G = 12 l/min
1 washing machine	G = 12 l/min

$G_{tot} = 81 \text{ l/min}$
No. of devices = 10

- The design flow rate is calculated from the table of simultaneous use factors.

Example:

$$G_{DS} = G_{tot} \cdot \% = 81 \cdot 41 \% = 33 \text{ l/min}$$

It is recommended that flow velocity is kept within 1 to 2 metres per second when calculating the correct reducing valve size. This will prevent noise in the pipes and rapid wear of appliances.

- The correct diameter of the reducing valve is taken from diagram 1 on the basis of the design flow rate taking into account an ideal flow velocity of between 1 and 2 m/s (blue band).

Example:

for $G_{DS} = 33 \text{ l/min}$, select the 3/4" diameter.
(see Graph 1)

- The pressure drop is taken from diagram 2 again on the basis of where the design flow rate intersects the curve for the relative diameter already selected (the downstream pressure falls by an amount equal to the pressure drop, with respect to the set pressure at no flow condition).

Example:

for $G_{DS} = 33 \text{ l/min}$ for 5350 $\Delta p = 0,60 \text{ bar}$
for 5351 $\Delta p = 0,65 \text{ bar}$
(see Graph 2)

Nominal flow rates

Water flow rates corresponding to each diameter are shown below, for an average velocity of 2 m/s, in accordance with the specifications of the standard EN 1567.

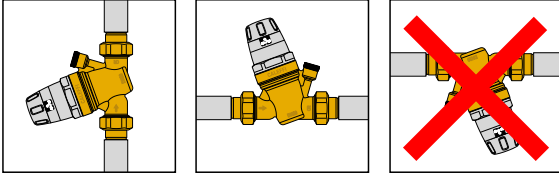
Diameter	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
Flow rate (m³/h)	1,27	2,27	3,6	5,8	9,1	14.
Flow rate (l/min)	21,16	37,83	60	96,66	151,66	233,33



Sizing software is available on
www.caleffi.com
Apple Store and Google play.

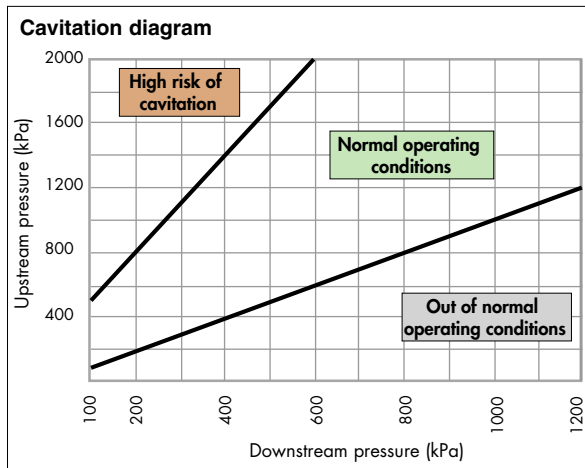
Installation

- 1) Turn all the taps on before installing the pressure reducing valve, to flush the system and expel any air remaining in the pipes.
- 2) Install shut-off valves upstream and downstream to facilitate maintenance operations.
- 3) The pressure reducing valve may be installed on either vertical or horizontal pipe. However, it must not be installed upside down.



- 4) Close the downstream shut-off valve.
- 5) This mechanical pre-adjustment system, with the operating knob and pressure indicator visible from both sides, allows the pressure reducing valve to be set to the required value in the system prior to installation. The pressure indicator features incremental step movement, so that the pressure can be adjusted continuously and the value displayed at 0,5 bar increments.
- 6) Set using the operating knob on the upper part of the device. The pressure reducing valves are factory set to a pressure of 3 bar.
- 7) In view of the pre-adjustment function, the presence of a pressure gauge downstream of the device is not essential.
- 8) After installation, the internal mechanism will automatically control the pressure, until the set value has been reached
- 9) Slowly reopen the downstream shut-off valve.

Installation recommendations



In order to minimise the risk of cavitation in the reducing valve, which could cause malfunctions with the risk of erosion in the seal area, vibration and noise, you are strongly advised to refer to the operating conditions specified in the diagram. Due to numerous factors and variable conditions, such as: system pressure, temperature, presence of air, flow rate and speed, which could affect the performance of the pressure reducing valve; it is advisable to keep the ratio between upstream and downstream pressure ideally at 2:1 and no more than 3:1 (for example, upstream pressure 10 bar, downstream pressure 5 bar, pressure ratio = $10/5 = 2:1$) In these conditions, the risk of cavitation is minimised, but this does not preclude the possible effects of the many other factors in play in the system during operation. If the pressure ratio exceeds the specified limit, you should consider the design pressure of the system or the use of a first stage pressure reducing valve (e.g. first stage pressure reducing valve from 16 to 8 bar and second stage from 8 to 4 bar). The upstream and downstream pipes of the pressure reducing valve must be secured with brackets in accordance with the manufacturer's instructions and local requirements, in order to avoid generating and transmitting noise and/or vibration in the installation.

1. Installation below ground

Installing pressure reducing valves below ground is not recommended, for four reasons:

- there is a risk of the reducing valve being damaged by frost
- inspection and maintenance is difficult
- reading the pressure gauge is difficult.
- impurities may enter the device through the holes designed for the release of the volumetric compression present in the casing.

2. Water hammer

This is one of the main causes of faults in pressure reducing valves. It is best to fit special devices to absorb water hammer when installing pressure reducers in at-risk systems.

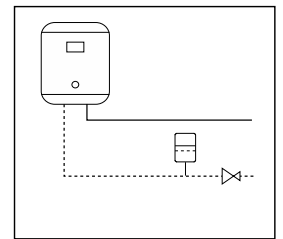
Trouble-shooting

Certain types of fault, which are generally due to faulty design of the system, are often wrongly attributed to pressure reducing valves. The most frequent cases are as follows:

1. Increased downstream pressure in the presence of a water heater

This problem is due to heating of the water caused by the water heater. There is no relief of the pressure because the reducing valve is rightly closed.

The solution is to install an expansion vessel (between the heater and the reducing valve) to "absorb" the pressure increase.



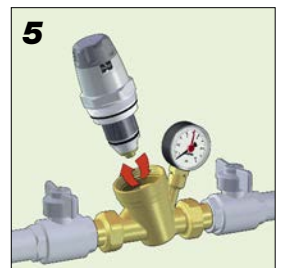
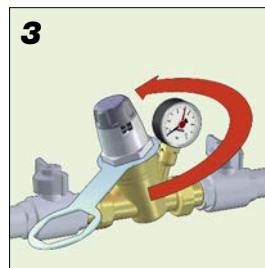
2. The pressure reducing valve does not maintain its calibrated value

In most cases this is the result of impurities that deposit on the valve seat causing leakage with a resulting increase in pressure downstream. It is advised to carry-out maintenance and cleaning of the removable cartridge (see maintenance).

Maintenance

Proceed as follows for periodic cleaning of the strainer and inspection or replacement of the cartridge:

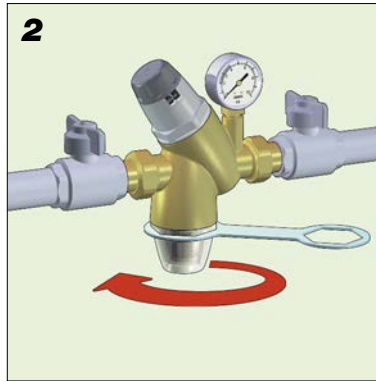
- 1 Shut off the reducing valve
- 2 Unscrew (anticlockwise) the calibrating screw to decompress the spring inside.
- 3 Unscrew the cover.
- 4 Extract the cartridge with the aid of pliers on the hexagonal part.
- 5 The cartridge can be fitted back into the valve after inspection and cleaning or alternatively a replacement cartridge can be fitted.
- 6 Recalibrate the reducing valve.



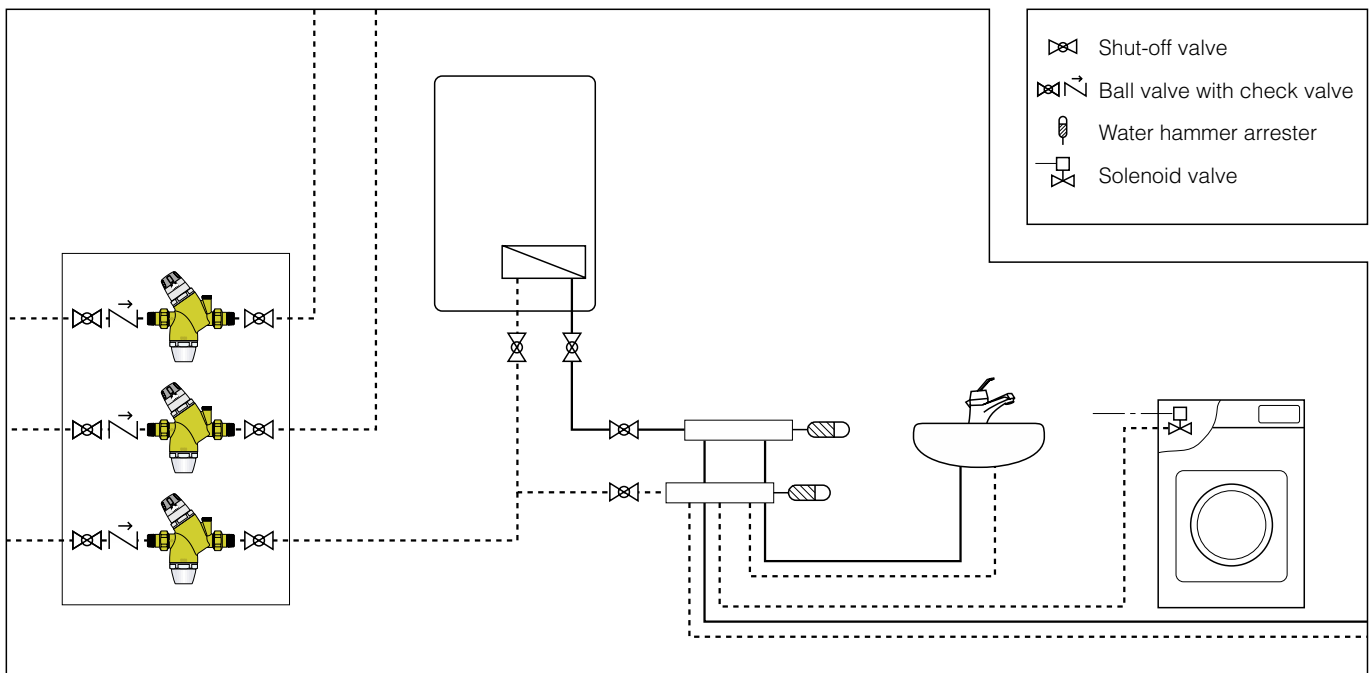
Cleaning the 5351 series strainer

To clean the strainer cartridge, proceed as follows:

- 1) Shut off the pressure reducing valve.
- 2) Unscrew the transparent strainer cartridge container using the spanner provided.
- 3) After cleaning, the entire strainer cartridge can be re-fitted or replaced with a spare part.
- 4) Screw the container back on again using the spanner provided and reopen the shut-off valves.



Application diagram



SPECIFICATION SUMMARIES

5350 series

Pre-adjustable pressure reducing valve with compensated seat and self-contained cartridge, compliant to standard EN 1567. Size DN 15 (from DN 15 to DN 50). Connections 1/2" (from 1/2" to 2") M (ISO 7/1) with union. Dezincification resistant alloy body and internal moving parts. PA66G30 cover. Stainless steel strainer, mesh size 0,51 mm. EPDM diaphragm and seals. Maximum working temperature 40°C. Maximum upstream pressure 25 bar. Downstream pressure setting range from 1 to 6 bar. Extractable self-contained cartridge for maintenance operation. Complete with: adjustment knob with downstream pressure regulating scale for manual setting, pressure gauge with scale 0–10 bar (version with pressure gauge). Pressure gauge connection 1/4" F (version without pressure gauge).

5351 series

Pre-adjustable pressure reducing valve with compensated seat, self-contained cartridge and inspectable strainer, compliant to standard EN 1567. Size DN 15 (from DN 15 to DN 25). Connections 1/2" (from 1/2" to 1") M (ISO 7/1) with union. Brass body. Dezincification resistant alloy internal moving parts. PA66G30 cover. Stainless steel strainer, mesh size 0,28 mm. Transparent PA12 strainer container. EPDM diaphragm and seals. Maximum working temperature 40°C. Maximum upstream pressure 25 bar. Downstream pressure setting range from 1 to 6 bar. Extractable self-contained cartridge for maintenance operation. Complete with: adjustable knob with downstream pressure regulating scale for manual setting, pressure gauge with scale 0–10 bar (version with pressure gauge). Pressure gauge connection 1/4" F (version without pressure gauge).

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