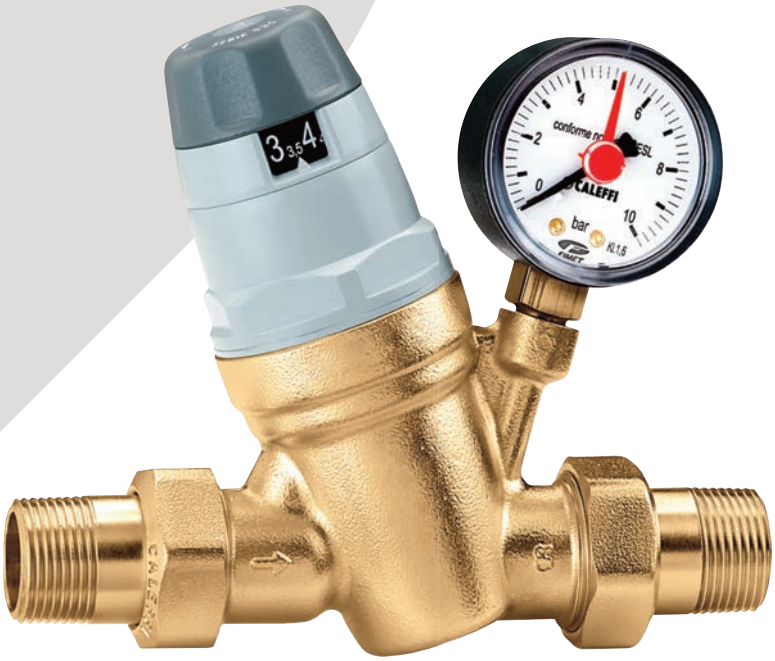
535 Prescal

dial up pressure reducing valve



WRAS APPROVED PRODUCT

535 prescal dial up pressure reducing valve

Application

Pressure reducing valves are installed in residential water systems to reduce and stabilise inlet pressures from mains water supplies or boosted water systems, which generally are too high and variable for domestic appliances to function correctly.

The 535 series is specially designed for hot and cold services in semi-commercial or public buildings to equalise either the hot or cold supplies or both and prevent excessive pressure at water outlets such as taps, basins, toilets, dishwashers and other appliances.

Design

The series 535 pressure reducing valves are pre-adjustable enabling them to be set at the required discharge pressure prior to installation, by means of the adjustment knob with pressure setting indicator.

The internal cartridge and control knob mechanism is assembled as one unit to make removal for inspection, cleaning and maintenance operations easier.

The compensated seat design means that the set downstream pressure remains independent of upstream pressure variations.

The hydraulic profile of the valve makes it possible to achieve low pressure losses, even when a large number of outlets are open.

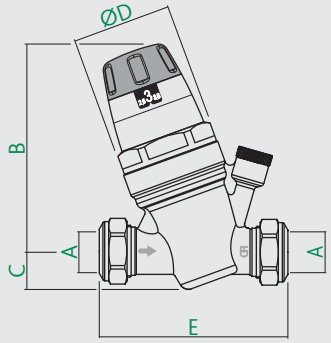
The control stem housing of the cartridge is made from a plastic material with a low co-efficient of adhesion, which reduces the probability of scale deposits forming, the main cause of pressure reducing valve malfunction.

Included in the range is a version with a high capacity strainer , located inside a transparent container. 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 Code		Size	Connections and Type
5350 Range	5351 Range		
535022		22mm	Cu x Cu with gauge port
535041	535141	½"	M x M with pressure gauge
535051	535151	¾"	M x M with pressure gauge
535061	535161	1"	M x M with pressure gauge
535071		1¼"	M x M with pressure gauge
535081		1½"	M x M with pressure gauge
535091		2"	M x M with pressure gauge
535040	535140	½"	M x M with gauge port
535050	535150	¾"	M x M with gauge port
535060	535160	1"	M x M with gauge port
535070		1¼"	M x M with gauge port
535081		1½"	M x M with gauge port
535091		2"	M x M with gauge port

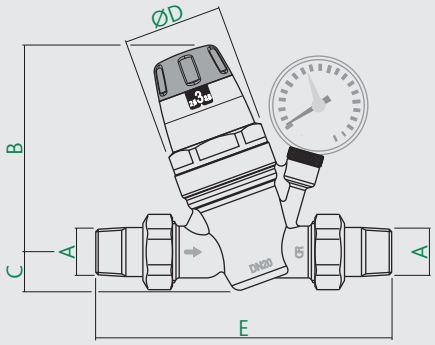
Dimensions

Compression Ends

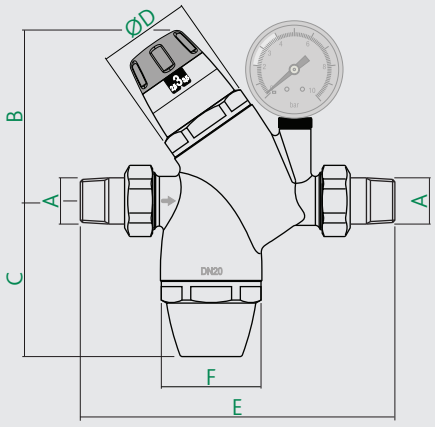


Prod Code	A	B	C	D	E	kg
535022	Ø22	112	20.5	54	101	0.41

Threaded Ends



Prod Code	A	B	C	D	E	kg
5350 40 & 41	R½	112	20.5	54	140	0.92
5350 50 & 51	R¾	112	20.5	54	160	1.06
5350 60 & 61	R1	112	20.5	54	180	1.38
5350 70 & 71	R1¼	178	40	73	200	2.6
5350 80 & 81	R1½	178	40	73	220	3.4
5350 90 & 91	R2	178	40	73	250	4.3



Prod Code	A	B	C	D	E	F	kg
5351 40 & 41	R½	101	87	54	169	58	1.50
5351 50 & 51	R¾	98	89	54	180	58	1.57
5351 60 & 61	R1	100	89	54	205	58	1.92

535 prescal dial up pressure reducing valve

Construction Details

Component	Material	Grade
Body - 5350	DZR alloy	BS EN 1982 CC770S
Body - 5351	Brass	BS EN 12165 CW617N
Cover	Polymer	PA66G30
Stem	Stainless steel	
Moving parts - 5350	DZR alloy	BS EN 12164 CW724R
Moving parts - 5351	DZR alloy	BS EN 12164 CW602N
Diaphragm	EPDM rubber	
Seals	EPDM rubber	
Strainer element	Stainless steel	
Strainer container	transparent	PA12

Technical Data

Max inlet pressure:	25 bar
Outlet pressure setting range:	1 to 6 bar
Factory setting:	3 bar
Max working temperature:	40˚C^
Pressure gauge range:	0 to 10 bar
Pressure gauge connection:	G¼
Filter mesh size:	0.51 mm
Medium:	potable water
Complies with:	BS EN 1567
Screwed ends:	BS EN 10226
Compression Ends:	BS EN 1254-2*
WRAS approved products	

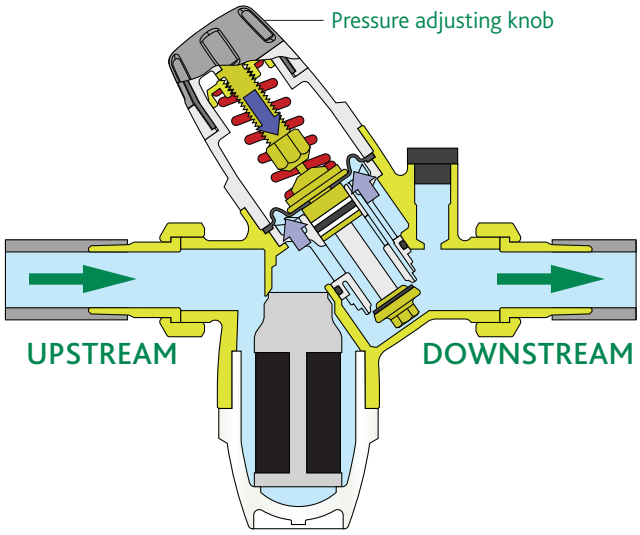
^ For temperatures up to 90˚C refer to 535H
* Use with R250 (half hard) copper tube

Operating Principle

The operation 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.

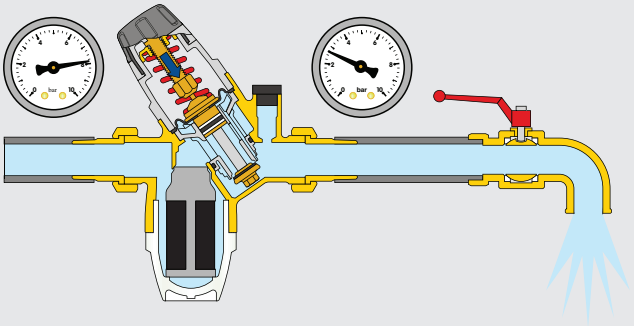
2 the thrust of the **diaphragm** towards the **closure** of the obturator.



Operation with water flow

When a tap or shower valve is opened, the force of the spring becomes greater than that of the diaphragm; the obturator moves downwards opening the pressure reducing 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.

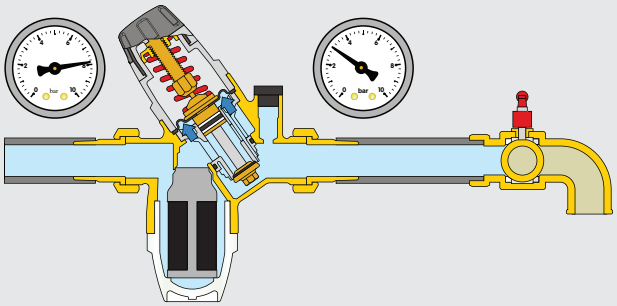


Operation without water flow

When the tap or shower valve 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.



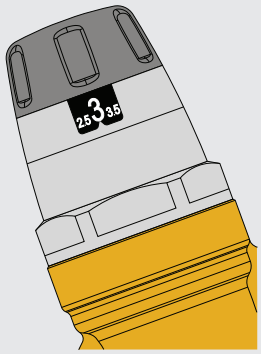
Construction Details

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.

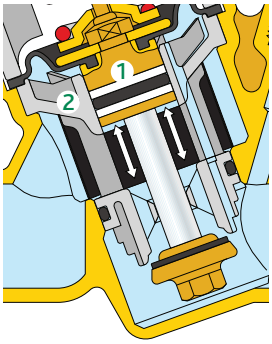


535 prescal dial up pressure reducing valve

Construction Details

Compensated seat

Altecnic 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 illustration, 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 headloss

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

High pressures

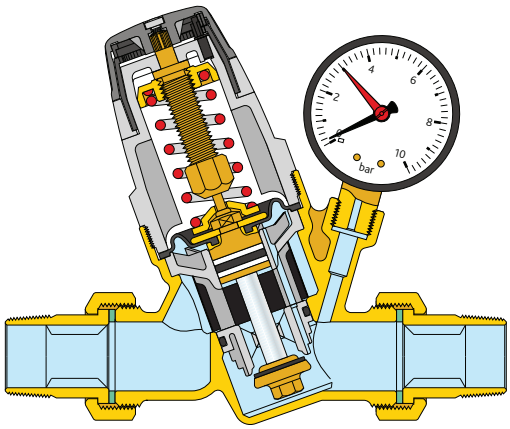
The zone exposed to the upstream pressure is constructed so that it can even operate at high pressure.

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.

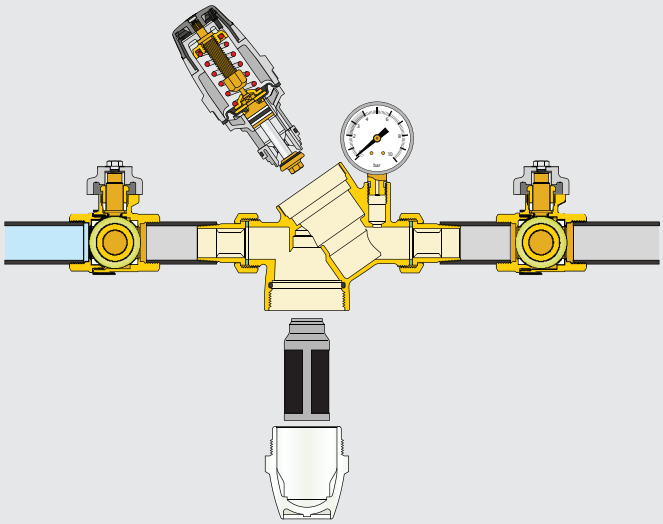


Removable self contained cartridge

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.

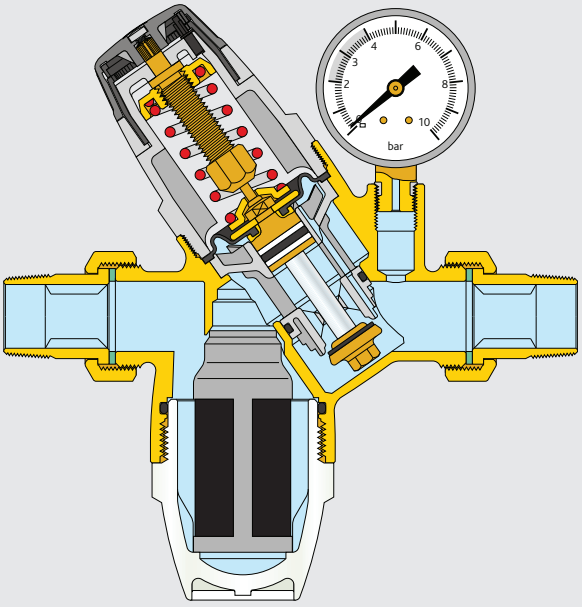
Condition of strainer element

The 5351 pressure reducing valves are fitted with a high-capacity strainer, located in a special transparent container, this means it is possible to view it's condition and determine if it needs cleaning and maintenance.



Pressure gauge

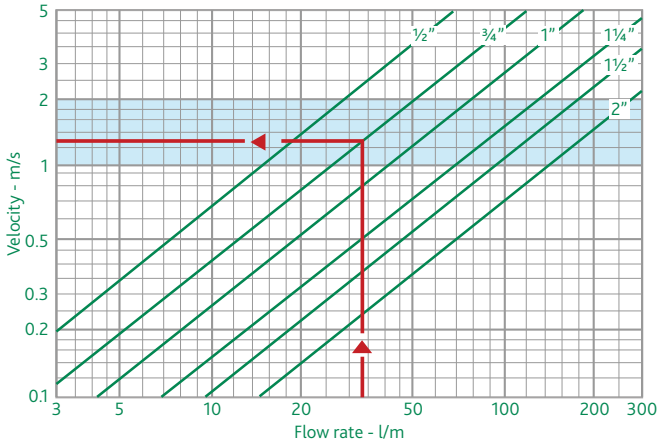
The pressure gauge used in the 5351 has stainless steel casing and a connection with a PTFE ring, which guarantees the hydraulic seal without the need for any further sealing.



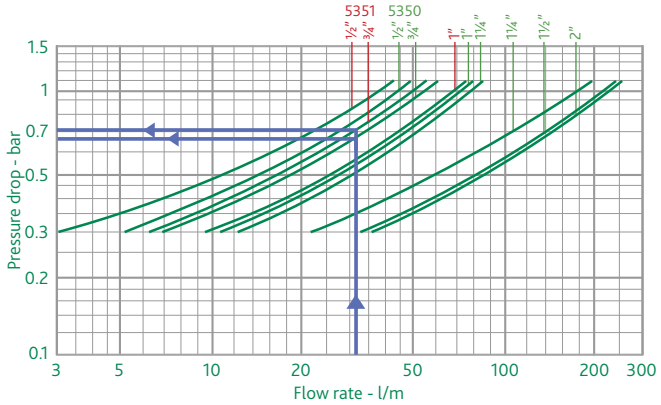
535 prescal dial up pressure reducing valve

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 outlets 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, dish washer	12 l/min
Shower	9 l/min
Wash basin, bidet, washing machine, WC	6 l/min

To prevent over sizing 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 (%)

No of devices	Private dwelling %	Public building %
5	54	64.5
10	41	49.5
15	35	43.5
20	29	37
25	27.5	34.5
30	24.5	32

No of devices	Private dwelling %	Public building %
35	23.2	30
40	21.5	28
45	20.5	27
50	19.5	26
60	18	24
70	17	23

No of devices	Private dwelling %	Public building %
80	16.5	22
90	16	21.5
100	15.5	20.5
150	14	18.5
200	13	17.5
300	12.5	16.5

Sizing

Correct sizing should take 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
No. of devices = 10	G_{tot} = 81 l/min

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

  Example:

  $G_{ds} = G_{tot}$ % = 41% * 81 l/min = 33 l/min.

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

- The correct diameter of the reducing valve is taken from Graph 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 l/min, select the 3/4" diameter - see Graph 1.

- The pressure drop is taken from Graph 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 l/min — for 5350 Δp = 0.67 bar - see Graph 2.
  for 5351 Δp = 0.71 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 BS EN 1567.

Size	½"	¾"	1"	1¼"	1½"	2"
Flow rate - l/min	21.1	37.8	60	96.6	151.6	233.3
Flow rate - m^3/h	1.27	2.27	3.6	5.8	9.1	14

Valve sizing software

Valve sizing software is available, please contact Altecnic for details.

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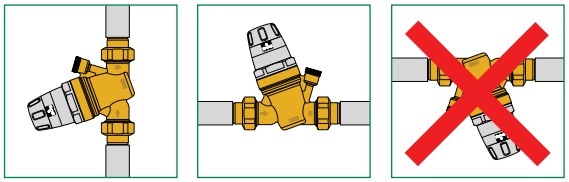
Installation

1 Install isolation valves upstream and downstream to facilitate future maintenance.

2 Open all the taps before installing the pressure reducing valve, to flush the system and expel any air remaining in the pipes.

3 The pressure reducing valve may be installed on either vertical or horizontal pipes, however, it must not be installed upside down.



4 Close the downstream shut-off valve.

5 The pre-adjustment, using the operating knob and pressure indicator, which is visible from both sides, allows the pressure reducing valve to be set to the required value 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 Using the operating knob set the required outlet pressure. The valves are factory set to a pressure of 3 bar.

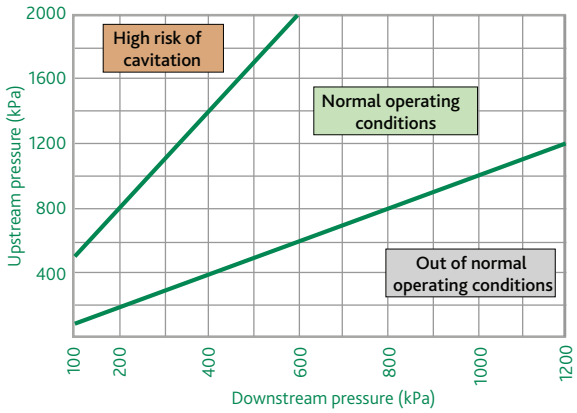
7 The presence of a pressure gauge downstream of the valve is not essential due to the pre-adjustment function although is advisable for confirmation.

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

Cavitation diagram



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.

example: upstream pressure 10 bar, downstream pressure 5 bar, pressure ratio = 10/5 = 2:1.

Installation recommendation

In these conditions, the risk of cavitation is minimised, but this does not preclude the possible effects of the many other factors system during system 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

example: 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 pipework.

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 valve.

2 Water hammer

This is one of the main causes of faults in pressure reducing valves.

It is recommended to fit special devices to absorb water hammer when installing in systems where this is likely to occur.

Resolving Problems

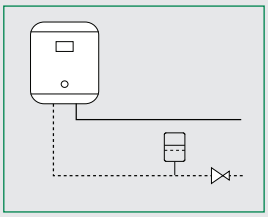
Certain types of fault, which are generally due to faulty design of the system, are often wrongly attributed to pressure reducing valves. The most frequent cases are as follows:

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 due to the reducing valve being 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 the resulting increase in pressure downstream.

It is advised to carry-out maintenance and clean the removable cartridge (see Maintenance).

535 prescal dial up pressure reducing valve

Maintenance

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

1 Isolate the pressure reducing valve.

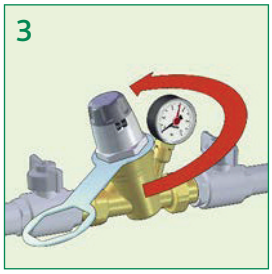
2 Unscrew (anticlockwise) the calibrating screw to decompress the spring inside.

3 Unscrew the cover as shown below.

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.



Maintenance

Cleaning the 5351 strainer

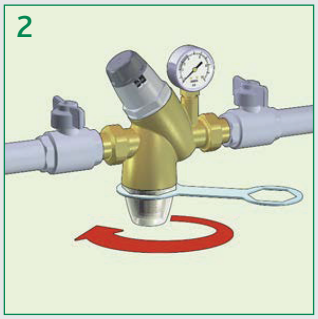
To clean the strainer cartridge, proceed as follows:

1 Isolate the pressure reducing valve.

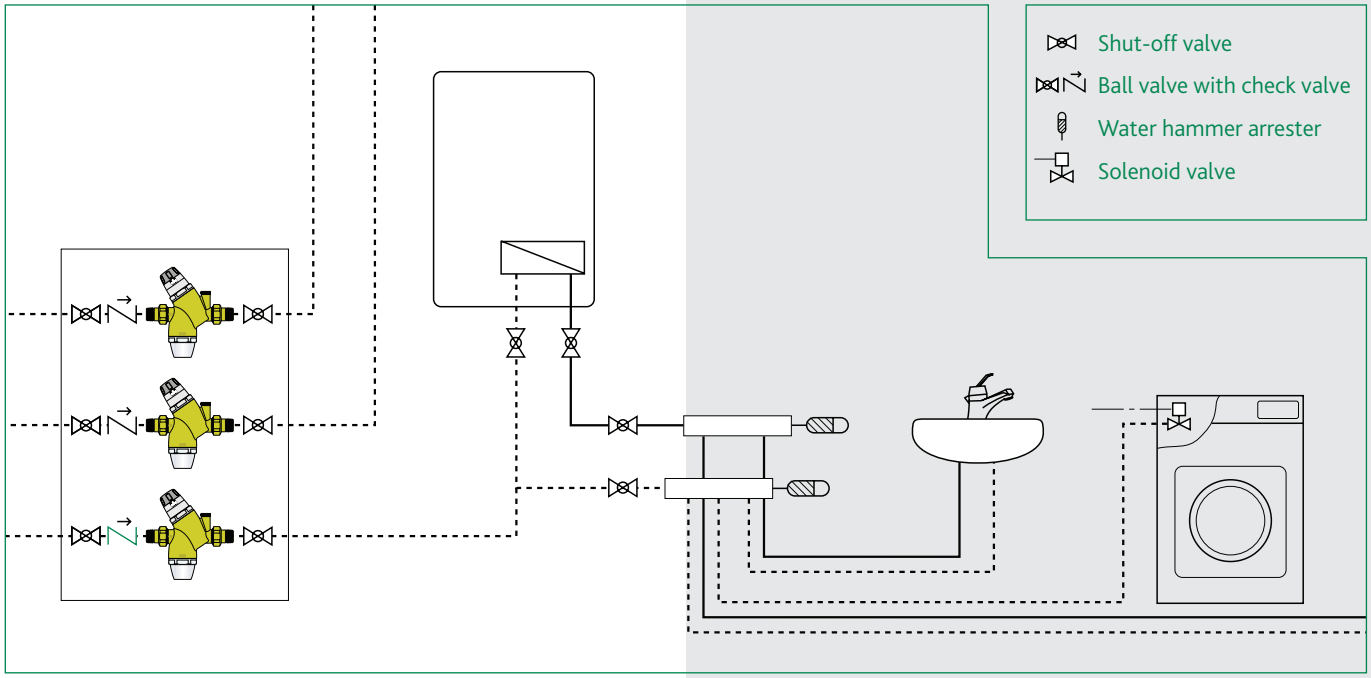
2 Unscrew the transparent strainer cartridge container using the spanner provided as shown below.

3 After cleaning the entire strainer cartridge it can be re-fitted or replaced with a spare filter element.

4 Refit the container using the spanner provided and re-open the isolating valves.



Typical Application



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