Pilot operated pressure reducing valves

for steam, air and industrial gases

spirax sarco

Pilot operated pressure reducing valves for accurate and responsive pressure control

The Spirax Sarco DP series of pressure reducing valves will accurately control downstream pressure, regardless of the upstream pressure, or load variations.

Suitable for steam, air or industrial gases, the DP series offers a wide range of control options.

Combination of pilots - different types of control in one valve.

Wide range of control with 3 colour coded springs - very accurate control of pressure.

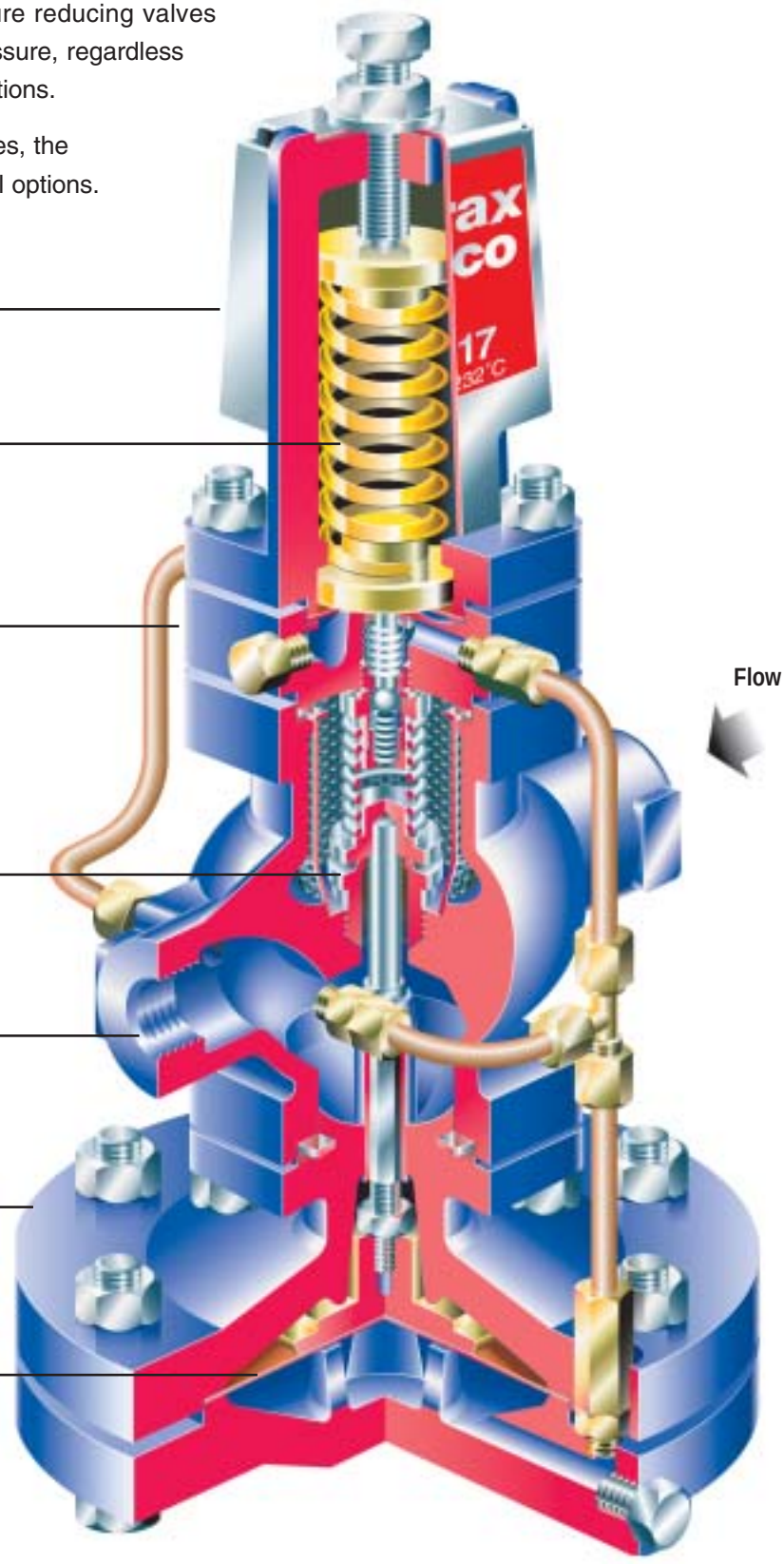
All stainless steel version body and internals meet clean steam applications.

All stainless steel trim extended working life.

Wide range of screwed and flanged connections to match plant standards.

Available in 3 different body materials to meet all plant requirements.

Fatigue tested diaphragm - no piston, no danger of sticking.



Valve options - core range

Series	Size range	Valve body material	Connections	Maximum operating temperature (°C)	Maximum operating pressure (bar)
DP17	DN15 to DN50	SG iron	Flanged	232	25
DP17	½" to 1"	SG iron	Screwed	232	25
DP143	DN15 to DN80	Cast steel	Flanged	300	40
DP163	DN15 to DN80	Stainless steel	Flanged	250	40

The need for pressure reduction

A well designed steam system will produce clean dry steam in the boiler house ready for delivery at high pressure through the distribution network. This maximises the potential to generate and supply saturated steam of the best quality at the lowest overall cost.

However, the needs are different at the point of use. Here, low pressure steam can offer distinct advantages, as the equipment designed and constructed to use it can:-

- Cost less to buy because of the lower pressure rating.
- Cost less to operate as flash steam loss is reduced.
- Benefit from better control due to a higher ΔP across the control valve
- Suffer fewer scaling problems due to a lower steam temperature.

On certain applications (typically autoclaves, retorts, corrugators etc.) it can be easier to control temperature by simply adjusting the steam pressure, as with saturated steam, the two are related. For these applications, proper process operation can be achieved without the need for conventional temperature controls.

Whatever the reason for reducing pressure, proper control at any time demands an automatic valve that can reduce steam pressure accurately, reliably and at a cost to suit the application.

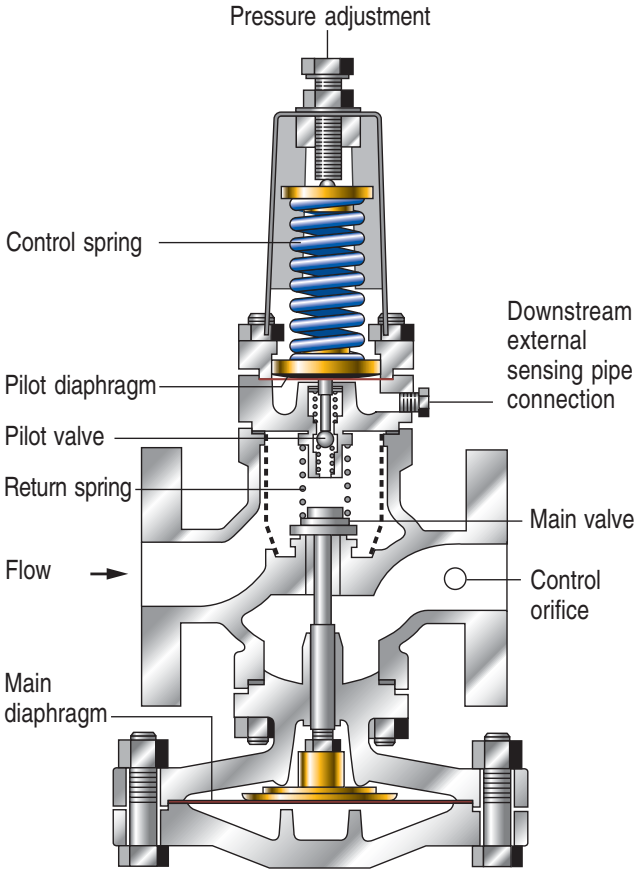
How the DP pilot operated pressure reducing valve works

The DP type pilot operated reducing valve, works by balancing the downstream pressure against a control spring. This modulates a small valve plug over a seat (the pilot). The flow through this seat is directed in turn to the main valve diaphragm, where it modulates the main valve.

Under stable load conditions, the pressure under the pilot diaphragm balances the force set on the adjustment spring. This settles the pilot valve, allowing a constant flow across the main diaphragm. This ensures that the main valve is also settled to give a stable downstream pressure.

When downstream pressure rises, the pilot valve closes, and pressure is released from the main valve diaphragm through the control orifice, to close the main valve.

Any variations in load or pressure will immediately be sensed on the pilot diaphragm, which will act to adjust the position of the main valve, ensuring a constant downstream pressure.



To achieve stable operating conditions, the use of an external pressure sensing pipe is recommended, particularly when the valve is used near its maximum capacity or under critical flow conditions.

User benefits

- No external power source required - reduced installation costs (except for 'E' version).
- Pressure and temperature control valve combinations - reduces total control investment.
- Accurate control of pressure for constant process temperatures improves process efficiency and product quality.
- Interchangeability of many spares reduces spares stocking costs.
- Intrinsically safe as standard, for use in hazardous areas (except for 'E' version).
- Spirax Sarco's worldwide guarantee of technical back-up, knowledge and service.

DP pilot operated pressure reducing valves opt

DP17

DP17G

DP17R

DP17

The DP17 features a metal-to-metal seat which allows precise control of pressure, under all conditions.

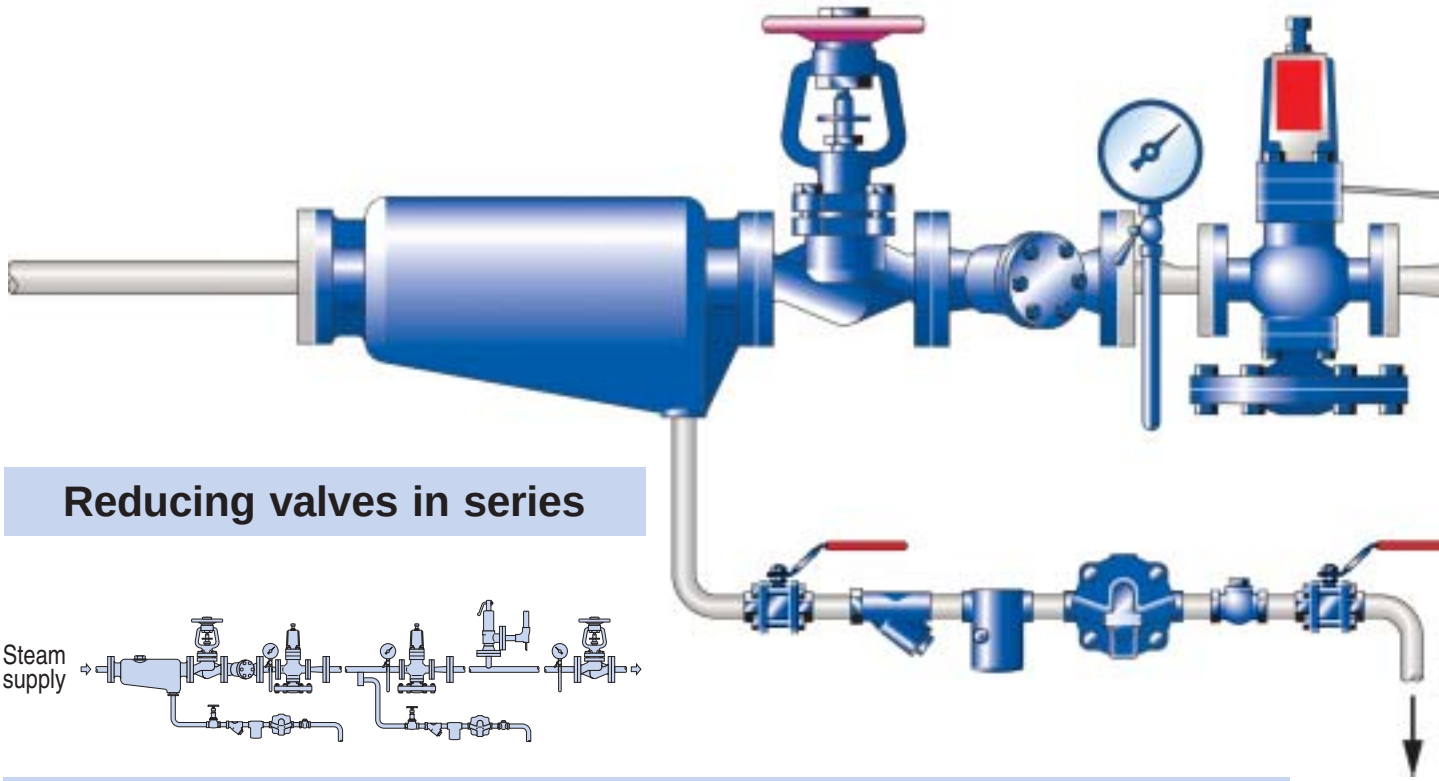
DP17G

The DP17G features a soft seat for tight shut-off, which provides precise control of pressure, under all conditions.

DP17R - Remote pressure control

The DP17R features a fully adjustable remote set point, by using an air driven pilot.
The set point can then be adjusted via a compressed air regulator situated away from the valve.
For example the valve may be high up in a pipeline but adjustment can be made from an
air regulator at ground level.

Typical pilot operated pressure reducing valve



Reducing valves in series

An individual valve can be used to give substantial reductions in pressure, but if the turndown is greater than 10 to 1, consideration should be given to using two reducing valves in series giving more accurate control.

tions

DP17E

DPP17E

DP17T

DP17E

AThe DP17E features an electrical solenoid for remote on/off control.

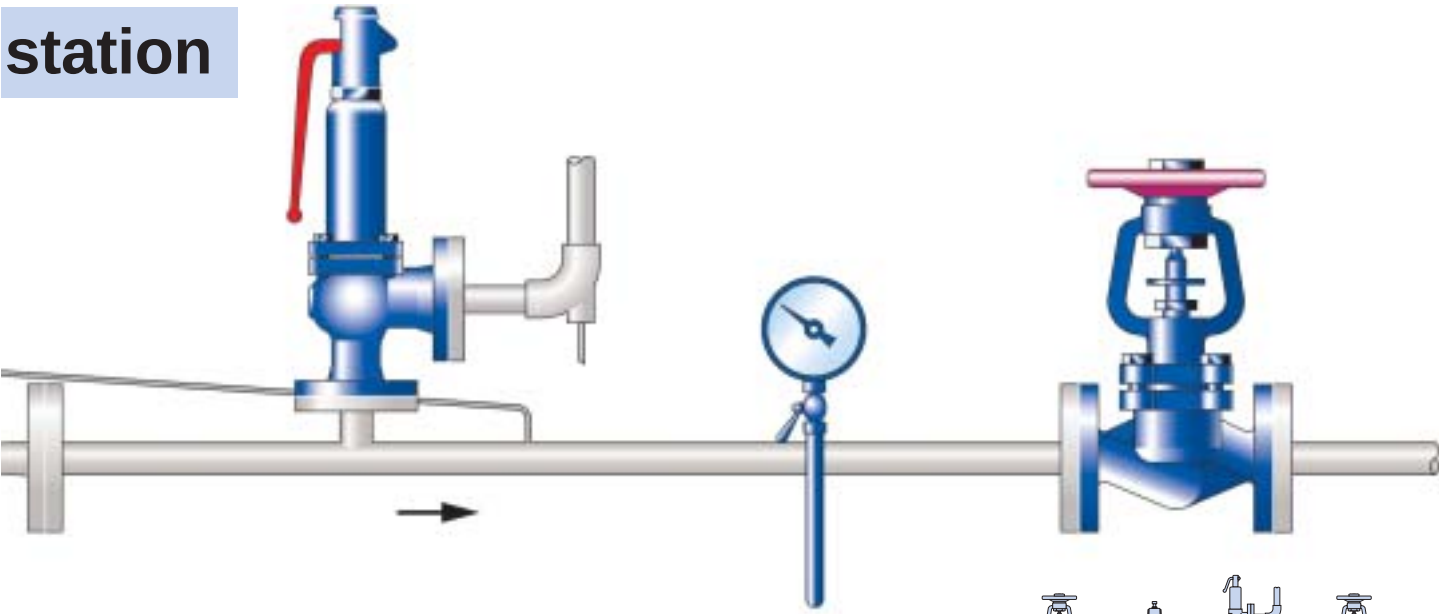
DPP17E - Additional pilots

An important feature in the Spirax Sarco DP range of pressure reducing valves is the unique ability to combine two or more pilots on the same valve body i.e. temperature control and pressure reduction, of the DP17T valve. The additional pressure pilot of the DPP17E illustrated above allows stepped pressure control by utilising an electrically switched solenoid valve.

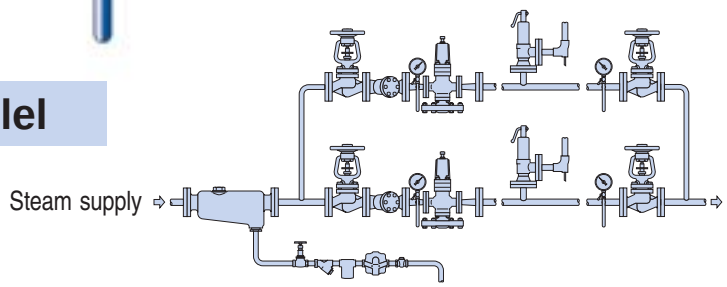
DP17T - Control of hot water storage calorifier

Pressure reduction leads to high heat exchanger efficiency and the additional temperature control supplies the exact amount of steam to reach and maintain temperature economically.

station



Reducing valves in parallel

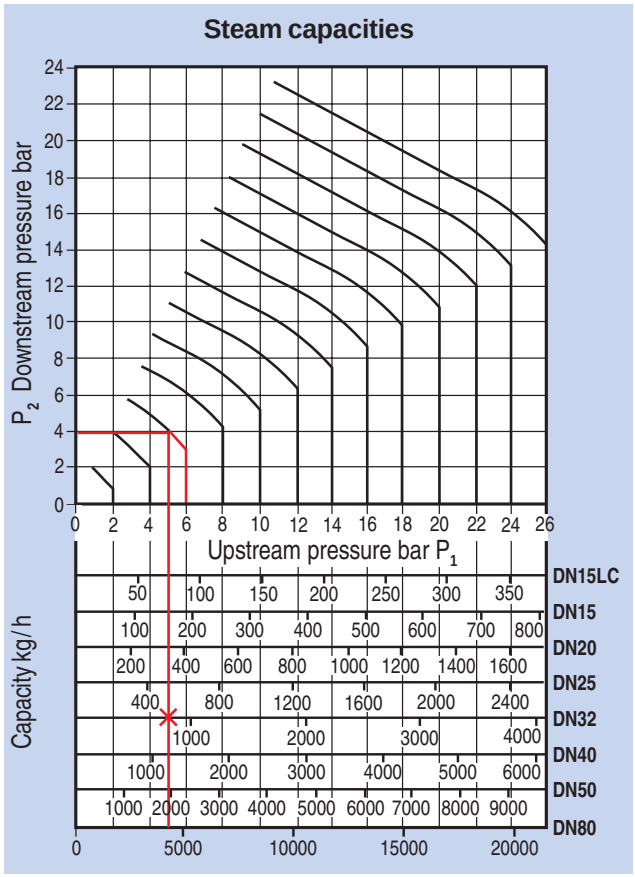


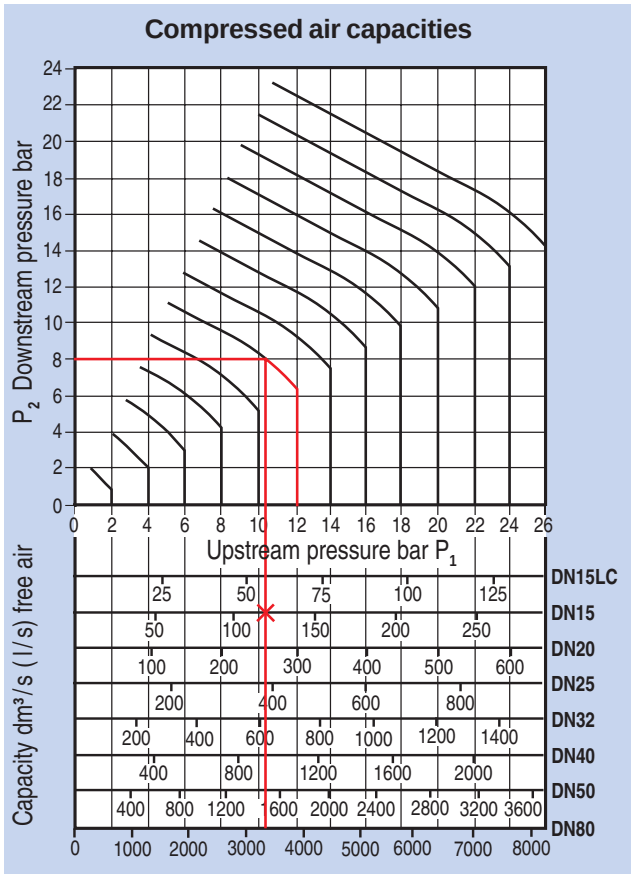
A reducing valve will modulate from its maximum capacity down to zero load, when it will shut. However, if the valve is to work under low load conditions for much of its life there may be a good case for fitting two smaller valves in parallel. If the low load is 10% (or less) of the maximum load then two valves are preferred. Valves in parallel are also used where it is vital that the steam supply is not interrupted. This arrangement ensures proper control of pressure when either valve is being overhauled.

Sizing and specification

How to select a DP type pressure reducing valve

1. Determine maximum upstream pressure in bar g (P_1), required set pressure in bar g (P_2), and maximum flow through the valve.
2. From sizing charts below select valve size following the example shown in red (charts are based upon use of external pressure sensing pipe).
3. Determine body type and end connection from the 'Selection information Table on page 7'.
4. Consider required options given on page 7, ensuring options do not restrict valve limits below those required.
Note: For industrial gases contact Spirax Sarco.





How to use the chart

Saturated steam

Required: A valve to pass 600 kg/h of steam reducing from 6 bar to 4 bar. Find the point at which the curved 6 bar upstream pressure line crosses the horizontal 4 bar downstream pressure line. A perpendicular dropped from this point gives the capacities of all DP sizes under these conditions. A DN32 valve, is the smallest size which will carry the required load.

Superheated steam

Because of the higher specific volume of superheated steam a correction factor must be applied to the figure obtained from this chart. For 55°C of superheat the factor is 0.95 and for 100°C of superheat a factor of 0.9 needs to be applied.

Using the example given, for saturated steam, the DN32 valve would pass 740 x 0.95 = 703 kg/h if the steam had 55°C of superheat. It is still big enough to pass the required load of 600 kg/h.

Compressed air

Required: A valve to pass 100 dm³/s (l/s) of free air reducing from 12 bar to 8 bar. Find the point at which the curved 12 bar upstream pressure line crosses the horizontal 8 bar downstream pressure line. A perpendicular dropped from this point shows that whereas a DN15LC valve will only pass 57 dm³/s (l/s) and is therefore not large enough, a DN15 valve will pass about 120 dm³/s (l/s) under these conditions and is the correct valve.

K_{VS} values

DN15LC	DN15	DN20	DN25	DN32	DN40	DN50	DN80
1.0	2.8	5.5	8.1	12.0	17.0	28.0	64.0

For conversion C_V (UK) = K_V x 0.97 C_V (US) = K_V x 1.17

Note: The K_{VS} values shown are full capacities and should be used for safety valve sizing purposes where they are required.

Selection information

Series / sizes	Pipe connections					Options						
	BSP	PN25	PN40	ANSI 150	ANSI 300	G	E*	T	P	R	S	H
DP17 DN15 - DN25	●	●		●	●	●	●	●	●	●		
DP17 DN32 - DN50		●		●	●	●	●	●	●	●	●	
DP143 DN15 - DN80			●	●	●	●						●
DP163 DN15 - DN80			●	●	●	●						

***** Option E is not available with DP17G valves

Optional extras

G - Soft seat version for compressed air and industrial gases. Maximum temperature with soft seating is 120°C.

E - Fitted with on/off electrical solenoid valve which allows the valve to be remotely closed or in control. Maximum temperature 190°C, Maximum upstream pressure 10 bar g, 220/240 V or 110 V 50 Hz, 24 V 50 Hz.

T - Additional temperature control pilot to control the main valve so that the temperature is maintained while the maximum steam pressure is limited. Temperature ranges:- **A:** 16°C to 49°C, **B:** 38°C to 71°C, **C:** 49°C to 82°C, **D:** 71°C to 104°C, **E:** 93°C to 127°C.

P - Additional pressure control pilot for steam pressure control.

R - Remote control pilot - the downstream pressure can be remotely adjusted by varying an air pressure signal to the pilot diaphragm.

S - All yellow metal parts replaced with ferrous materials.

H - High temperature parts fitted, enabling the DP143 to be used up to 350°C.

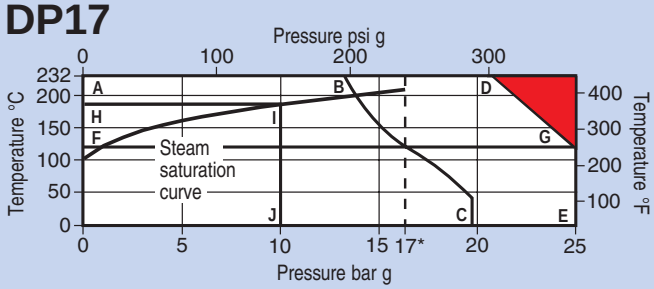
Pressure ranges

Ranges are denoted by spring colour:-

Yellow = 0.2 to 3.0 bar. **Blue** = 2.5 to 7.0 bar. **Red** = 6.0 to 17.0 bar. **Grey** = 16.0 to 24.0 bar (DP143 and DP163 series only).

Technical specifications

DP17



The product should not be used in this region.

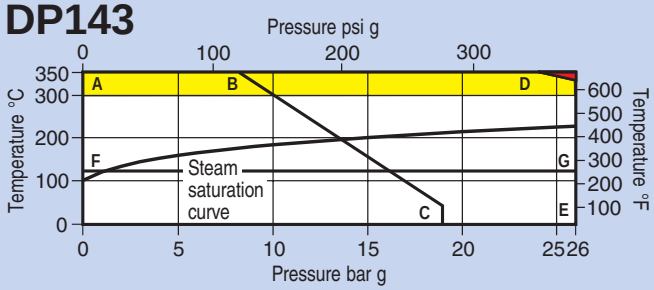
*PMO Maximum steam pressure recommended 17 bar g.

Operating range

Body design conditions	PN25	
Maximum design temperature	DP17	232°C
	DP17G	120°C
Cold hydraulic test pressure	38 bar g	

A - D - E Screwed and flanged BS 4504 PN25, ANSI 300.
A - B - C ANSI 150.
H - I - J DP17E limited to 10 bar g and 190°C
F - G - E DP17G limited to 120°C and 25 bar g.

DP143



The product must not be used in this region.

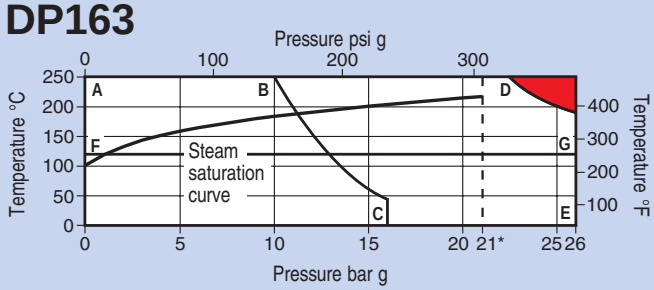
Use the high temperature DP143H version in this region.

Operating range

Body design conditions	PN40	
Maximum design temperature	DP143	300°C
	DP143H	350°C
	DP143G	120°C
Cold hydraulic test pressure	60 bar g	

A - D - E Flanged BS 4504 PN40, BS 10 Table J, ANSI 300.
A - B - C Flanged ANSI 150.
F - G - E DP143G limited to 120°C and 26 bar g.

DP163



The product must not be used in this region.

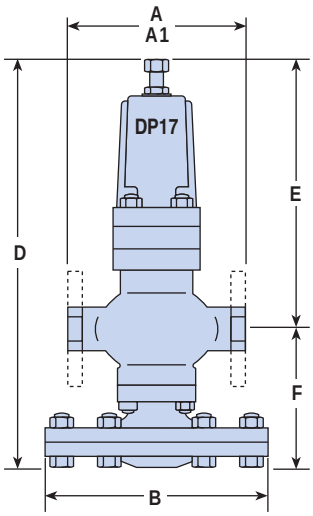
*PMO Maximum steam pressure recommended 21 bar g.

Operating range

Body design conditions	PN40	
Maximum design temperature	DP163	250°C
	DP163G	120°C
Cold hydraulic test pressure	60 bar g	

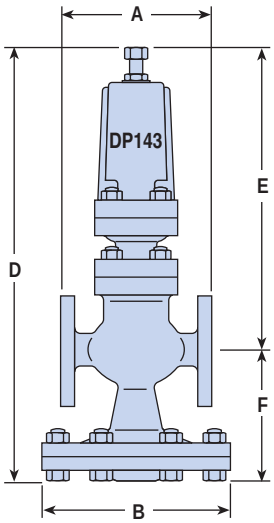
A - D - E Flanged BS 4504 PN40, BS 10 Table J, ANSI 300.
A - B - C Flanged ANSI 150.
F - G - E DP163G limited to 120°C and 26 bar g.

Dimensions / weights (approximate) in mm and kg



DP17

Size	Screwed A	PN16/25 ANSI 150 A1	ANSI 300 A1	B	D	E	F	Weight Screwed	Weight Flanged
DN15LC	160	130	120.2	126.6	185	364	234	130	12	12.8
DN15	160	130	120.2	126.6	185	364	234	130	12	12.8
DN20	160	150	139.4	-	185	364	234	130	12	13.7
DN25	180	160	160.0	160.0	207	388	240	148	13	16.0
DN32	-	180	176.0	180.0	207	388	240	148	-	17.0
DN40	-	200	199.0	200.0	255	433	255	178	-	29.0
DN50	-	230	228.0	230.0	255	433	255	178	-	31.5



DP143 and DP163

Size	BS 4504 PN40 A	ANSI 150 A	ANSI 300 A	B	D	E	F	Weight
DN15	130	122	130	175	405	277	128	15.0
DN20	150	142	150	175	405	277	128	16.0
DN25	160	156	160	216	440	288	152	23.0
DN32	180	176	183	216	440	288	152	25.0
DN40	200	200	209	280	490	305	185	40.0
DN50	230	230	236	280	490	305	185	42.0
DN80	310	310	319	350	580	322	258	103.0

How to order

State the model type, size, connection and spring range including any options as required.

Example: 1 - Spirax Sarco DP17E DN50 PN25 blue.

DPV

Some of the products shown may not be available in certain markets

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