Pressure Regulators

Pressure regulation to maximize steam system efficiency

spirax sarco®

Steam pressure reduction maxim

Distribution efficiency

The density of steam increases as the pressure rises. Because of this characteristic, more pounds of steam can be stored in a boiler operated at high pressure than one operated at low pressure. The same is true for the capacity of steam-carrying pipelines—the higher the pressure, the smaller the pipes need to be in order to carry the steam from the boiler to the point of use.

In short, steam is generated at higher pressures because this will:

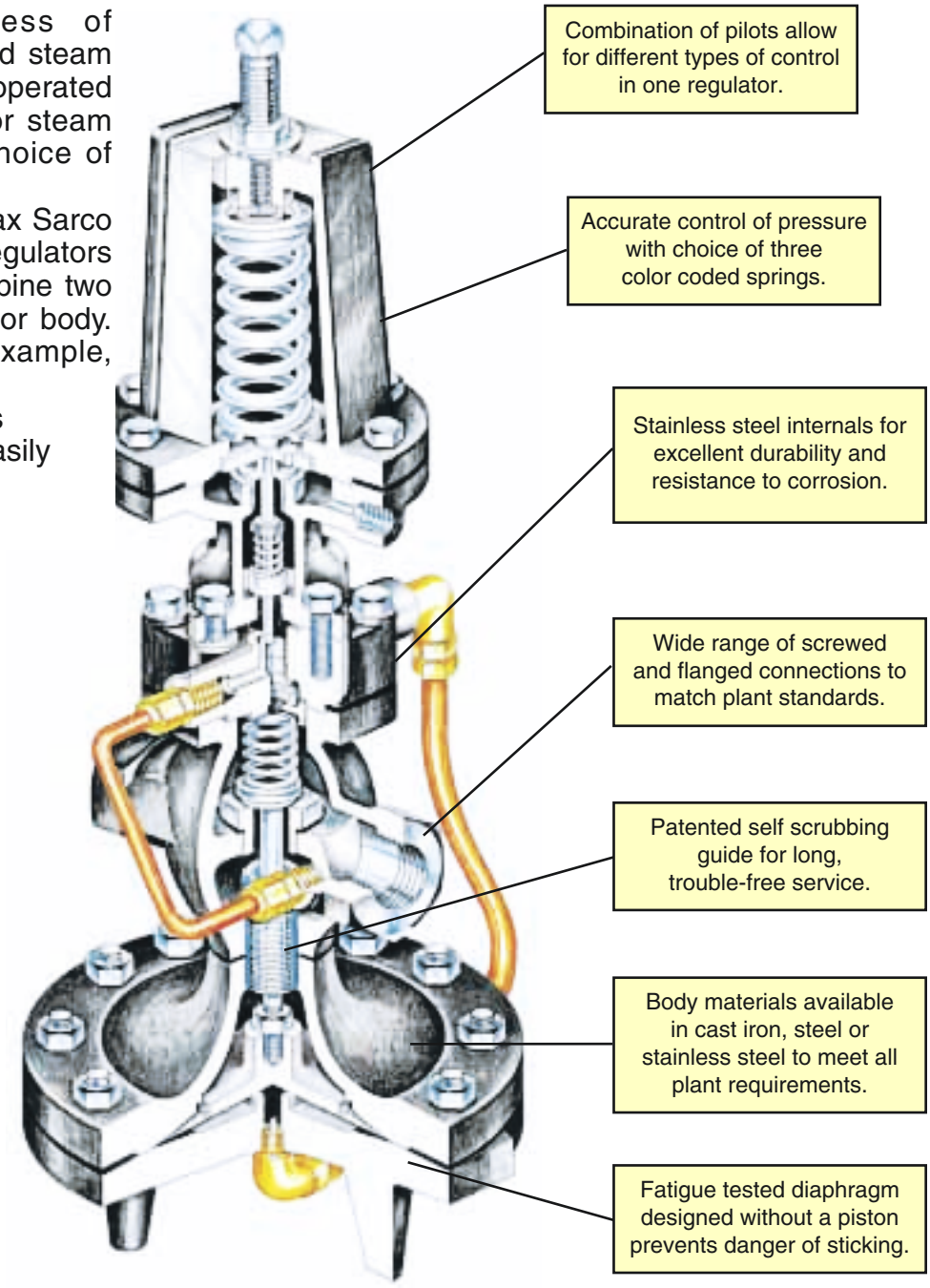
- Increase the storage capacity of boilers
- Reduce system start up time
- Reduce valve, separator, strainer and trap sizes
- Reduce distribution pipe sizes
- Reduce the standing losses from the system
- Reduce capital cost

When the steam reaches the point of use, it is reduced in pressure so that production efficiency is optimized.

Pilot Operated Pressure Regulators

These regulators are the best choice where downstream pressure must be accurately controlled regardless of variations in upstream pressure and steam load condition. Spirax Sarco pilot operated pressure regulators are suitable for steam applications and offer a wide choice of control options.

An important feature in the Spirax Sarco pilot operated range of pressure regulators is the ability to interchange or combine two or more pilots on the same regulator body. This unique feature permits, for example, remote on/off control together with pressure reduction. These variations are available factory fitted but can easily be added on site.



User benefits

- External power source is not required; therefore, reducing installation costs.*
- Improved process efficiency and product quality through accurate control of pressure.
- Reduced capital investment with pressure regulator combinations.
- Reduced stocking cost of spares due to interchangeable spare parts.
- Spirax Sarco's guarantee of technical support, knowledge and service.

* Except for "E" version.

izes system efficiency and safety

Safe operating conditions

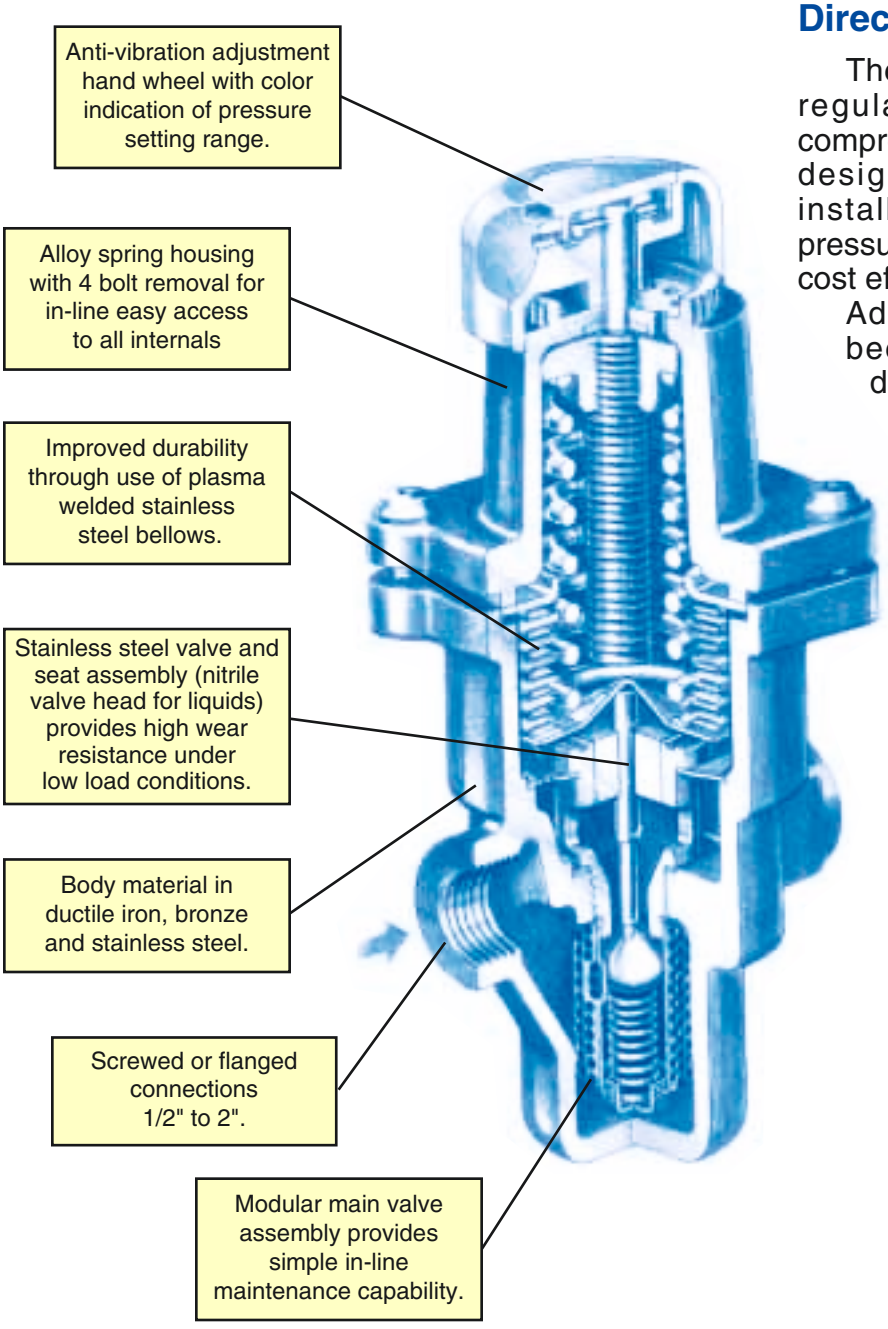
Within both steam and water piping systems, there is a need to lower pressure before processes to bring the process plant within its safe operating conditions. In addition to this, the plant operators must be protected from the risks of excess pressure and temperature. Therefore, the job fulfilled by pressure regulators at the point of use is:

- Protect process plant from overpressures
- Protection for plant operators
- Optimize the process heat transfer rates

High temperature protection

Where product must be protected from scorching, burning or caramelizing due to high temperature on the surface of vessels, rollers, coils or platens, then a combination of temperature and maximum pressure limitation of steam is required. This feature is part of the basic package of steam control solutions from Spirax Sarco to help manufacturers:

- Protect product quality
- Reduce product waste
- Optimize production speed
- Balance the steam supply to adjoining batch vessels



Direct Operated Pressure Regulators

The Spirax Sarco direct operated pressure regulators are for use on steam, liquids, compressed air and other gases. The compact design makes it ideal for point of use installations, providing accurate control of pressure under stable load conditions offering a cost effective solution.

Advanced manufacturing technology has been used to produce a range of highly durable pressure regulating valves with all stainless steel internals to meet the needs of most industrial applications.

User benefits

- Security of set pressure by use of tamper proof pin inside the hand wheel.
- Quick in-line maintenance through use of modular internals reduces down time and maintenance cost.
- Compact and lightweight design reduces piping stress and cost of installation.
- Robust design using stainless steel internals, extends working life and reduces maintenance problems.
- No multiple joints to leak — only one recessed body gasket.

Self acting pressure regula

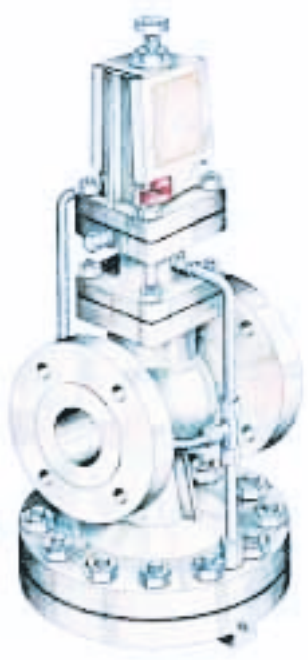
25P, 25PE and 25BP

The Spirax Sarco 25-Series regulators are a versatile family of self acting pressure regulators with control pilots and interchangeable main valves for most steam applications. Options include pressure reduction (25P), combined pressure reduction with electrical on/off override (25PE), and as a back pressure regulator (25BP). Designed with the user in mind, the 25-Series offers versatility and simplicity. Color coded, interchangeable springs allow quick and easy change of downstream pressure range eliminating the need to isolate the valve or break the steam line. The 25-Series is available in sizes 1/2" to 6" with screwed and flanged connections. Typical applications include main line pressure reduction or where high accuracy of control is required.

25P Model Shown

DP163

The DP163 is a self-powered, pilot operated, pressure reducing regulator constructed entirely of stainless steel. Its self-acting operation eliminates the cost of an external power source. Color coded, interchangeable springs allow quick and easy change of downstream pressure range eliminating the need to isolate the valve or break the steam line. Downstream pressure is sensed either internally or through an external sensing pipe. The DP163 is available in sizes 1/2" to 3" with flanged connections. Typical applications include main line pressure reduction or where high accuracy of control is required.



Pilot operated pressure regulator overview

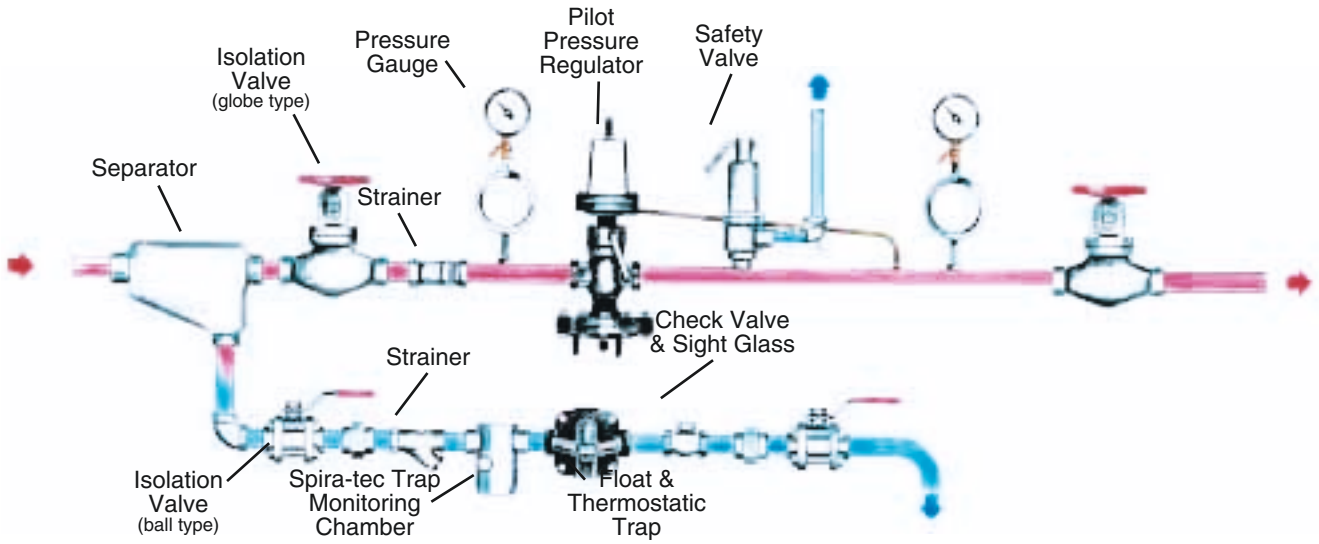
Product Type	Connections					Body Material			Max. Operating Conditions		TIS #
	NPT	ANSI 125	ANSI 150	ANSI 250	ANSI 300	Cast Iron	Cast Steel	Stainless Steel	°F	psig	
25P 25PE	1/2"-2"	2 1/2"-6"	2 1/2"-6"	2 1/2"-6"	2"-6"	Yes	Yes	—	CI = 0-450 CS = 0-600	250 300	3.015 3.0151
25BP	1/2"-2"	2 1/2"-6"	2 1/2"-6"	2 1/2"-6"	2 1/2"-6"	Yes	Yes	—	CI = 0-450 CS = 0-600	250 300	3.023 3.024
DP163	No	No	Option	No	1/2"-3"	—	—	Yes	SS = 0-423	304	3.080

*25P series may be fitted with additional pressure and temperature control pilots, plus solenoid valves.

Pilot operated pressure regulator C_V values

Type	25P Series										DP163						
Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	6"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	3"
C_V	3.48	6.5	10.5	14	20	35	56	74	115	260	3.2	6.4	9.4	14	19.8	32.7	74.8

Typical pressure reducing station using a pilot operated regulator



tors – A range of solutions

Direct operated pressure regulator overview

Product Type	Connections NPT	Body Material: Bronze	Cast Iron	Ductile Iron	Cast Steel	Stainless Steel	Max. Operating Conditions °F	Max. Operating Conditions psig	TIS #
25MP	1/2"	—	Yes	—	Yes	—	CI = 0-450 CS = 0-600	250 300	3.104
LRV2	1/2", 3/4", 1"	Yes	—	—	—	—	CI = 0-167	200	3.102
BRV2	1/2", 3/4", 1"	—	—	Yes	—	—	410	250	3.107
BRV71 & 73	1, 1 1/4", 1 1/2", 2"	—	—	Yes	—	—	365	150	3.109
SRV2	1/2", 3/4", 1"	—	—	—	—	Yes	413	275	3.108
SRV461*	1/2"-2"	—	—	—	—	Yes	Metal seat = 0-374 Soft seat = 0-266	174	3.110

*For 316Ti, all stainless steel construction is used for steam applications.

25MP

The 25MP direct operated pressure regulator is designed for accurate control of very light loads. The 25MP is available in the 1/2" size with screwed connections, and cast iron or steel body construction. Color coded interchangeable springs allow quick and easy changes of downstream pressure ranges. This durable, compact regulator offers a competitive solution to uncomplicated steam applications.

BRV, LRV and SRV

These simple, rugged pressure regulators are designed for applications where great accuracy is not essential and where loads are relatively light and constant. They are easy to fit, simple to maintain and are adjusted by hand. They are available in two ranges: BRV and SRV for use with steam, compressed air and other gases; and LRV for use with liquids. Bodies are of bronze, ductile iron and stainless steel with screwed connections. Operating pressure ranges are selected by changing color coded control springs (choice of three) to provide downstream pressures in the range 2-125 psi for steam and water.

BRV Model Shown

SRV461/463

The simple and accurate pressure controlling SRV461 (threaded)/ 463 (flanged) regulators with 316 Ti wetted parts ensure corrosion resistance against aggressive steam and process fluids. The choice of metal to metal or soft valve seating also makes this range suitable for use with a variety of liquids and gases. The SRV461/463 range is available in sizes 1/2" to 2".

Direct operated pressure regulator C_V values

Type	25MP	LRV2			BRV2			BRV71 & 73				SRV2			SRV461					
Size	1/2"	1/2"	3/4"	1"	1/2"	3/4"	1"	1"	1 1/4"	1 1/2"	2"	1/2"	3/4"	1"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
C_V	.49	2.46	4.2	5	1.76	2.93	3.5	8	11.1	13.5	12.5	1.76	2.93	3.5	4.7	5.9	7	14	18.8	20.5

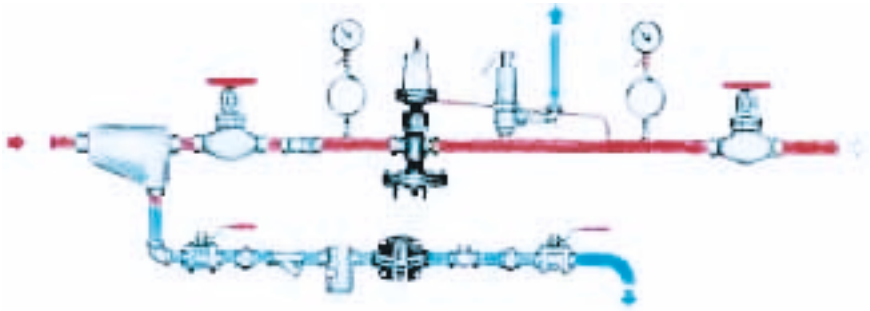
Pressure reducing station component overview

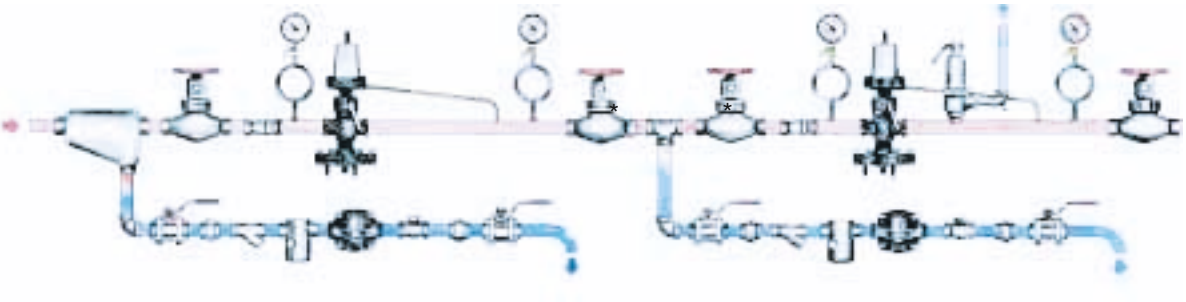
No.	Description	Model	Size	Connection
1	Isolation valves (globe type)	A3S, BSA3	1/2"-8"	Screwed & Flanged
2	Separator (target type)	Model S1, S2, S3, S4A	1/2"-8"	Screwed & Flanged
3	Strainer	Model IT, CT, Fig. 34	1/2"-8"	Screwed & Flanged
4	Pressure Gauge	By others		
5	Pressure Regulator	See tables above	1/2"-6"	Screwed & Flanged
6	Safety Valve	Series 19, SVI	1/2"-6"	Screwed & Flanged
7	Spira-tec Trap Monitoring Chamber	Model ST17SG	1/2"-1"	Screwed
8	Float & Thermostatic Trap	Model FTI	1/2", 3/4"	Screwed
9	Check Valve & Sight Glass	SG	1/2"-1"	Screwed
10	Isolation valves (ball type)	Model 10, 20	1/2"-6"	Screwed & Flanged

Typical applications for self acting pressure regulators

Single pilot operated pressure reducing station

This is the most common application for pressure regulators within manufacturing and HVAC steam systems. Its composition dries and cleans the steam by removing condensate and dirt, then reduces it accurately so that process receives steam in good condition. The downstream safety valve protects the upper limits of process pressure to keep the plant safe, should the reducing station fail for any reason.





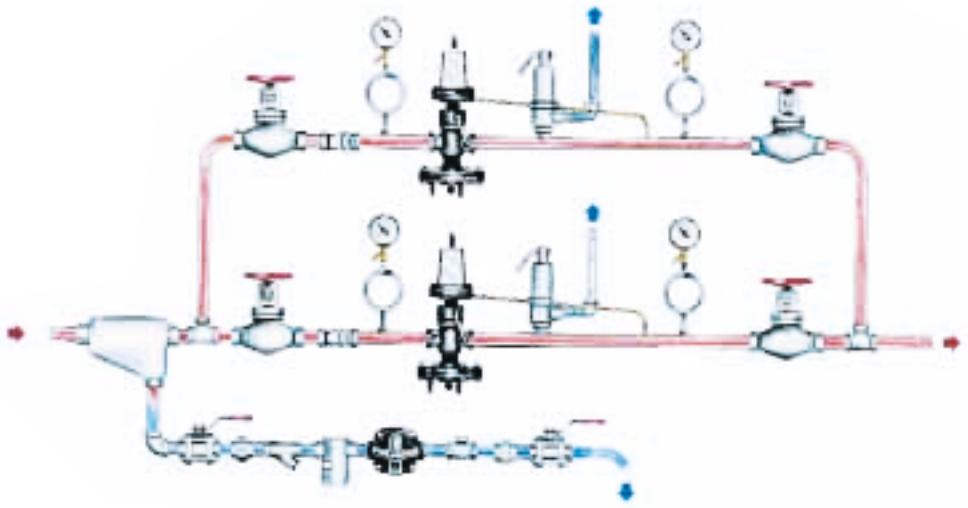
Series pilot operated pressure reducing station

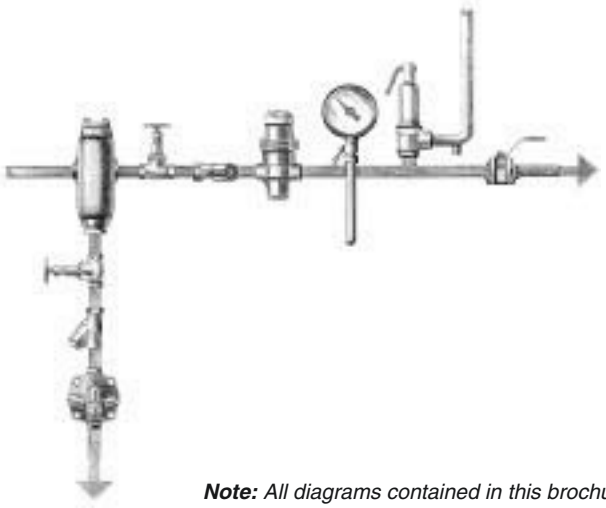
Series pressure reducing stations cope with high pressure or volume turndown by two stage pressure reduction. Normally this is done when the turndown is greater than 10 to 1.

* Isolation valves only required if bypass line is fitted.

Parallel pilot operated pressure reducing station

A pressure regulator will modulate from its maximum capacity down to zero load, when it will shut. However, if the regulator is to work under low load conditions for much of its life, there may be a good case for fitting two smaller regulators in parallel. There is no hard and fast rule, but if the low load is 10% (or less) of the maximum load then two regulators are preferred. Parallel regulators are also used where it is vital that the steam supply is not interrupted. This arrangement ensures proper control when either regulator is being overhauled.



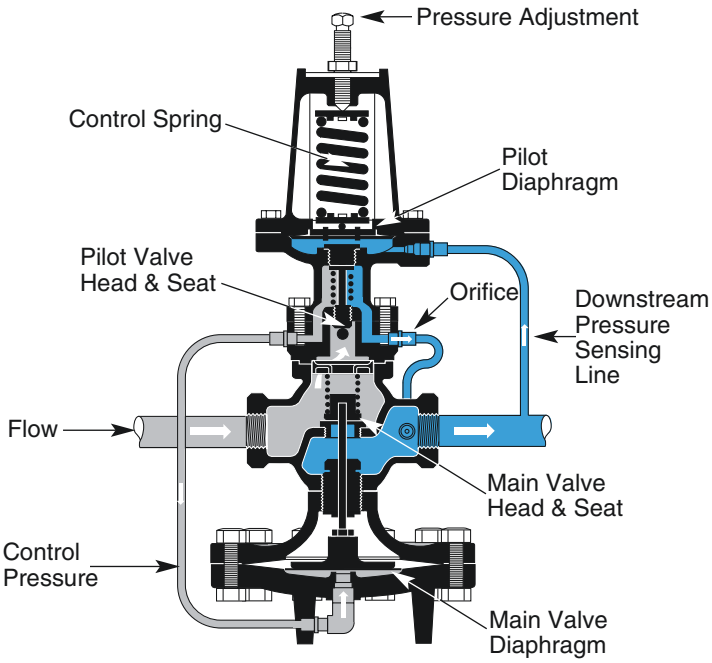


Direct operated pressure reducing station

Direct operated regulators are suitable for steam and water supplies to sterilizers, washing machines, ironers, platens and molding machines. In their stainless steel versions, they are used on dairy equipment, bioreactors, centrifuges and batch process equipment. Liquid versions are used on potable and non-potable water supplies, to balance networks and reduce pressure and noise in rising mains within office and dwelling tower blocks.

Note: *All diagrams contained in this brochure are schematic representations only—not to be used for construction.*

How self acting pressure regulators work



How the 25P pilot regulator works

The Spirax Sarco pilot operated pressure regulator works by balancing the downstream pressure against a control spring. This modulates a small valve head 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.

In order to achieve the most stable operating condition, an external pressure sensing line must be used. This allows downstream pressure to feed back to the underside of the pilot diaphragm, balancing the spring force, causing the pilot valve to throttle. This settles the pilot valve, allowing a constant flow across the main diaphragm. This enures that the main valve is also settled to give a stable downstream pressure.

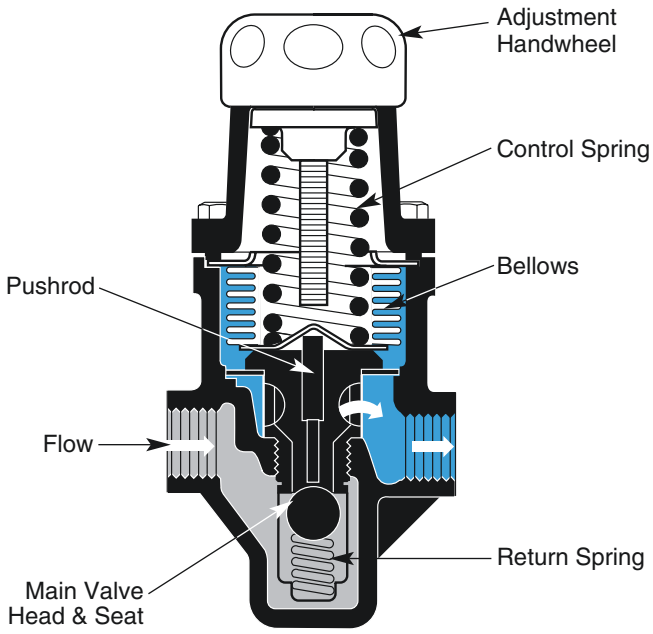
When downstream pressure rises, the pilot valve closes, and pressure is released from the main valve diaphragm through the control orifice, to close the main valve. Any variations in load or pressure will immediately be sensed on the pilot diaphragm, which will act to adjust the position of the main valve, ensuring a constant downstream pressure.

How to order

When ordering a Spirax Sarco 25P regulator, include the following:

- Valve size and connection type
- Body material, e.g. cast iron
- Set range for downstream pressure
- Steam supply pressure

For example: Spirax Sarco 1" Cast Iron Pressure Regulator, Type 25P for 150 psig inlet pressure, yellow spring for 3 to 30 psig reduced pressure, for 15 psig process heating.



How direct operated regulators work

On start-up, upstream pressure, aided by a return spring, holds the valve head against the seat in the closed position.

Downstream pressure is set by rotating the hand wheel in a clockwise direction which compresses the control spring and extends the bellows. This downward movement is transmitted via a push rod which causes the main valve to open.

Steam then passes through the open valve into the downstream pipework and also surrounds the bellows.

As downstream pressure increases, it acts through the bellows to counteract the spring force and closes the main valve when the set pressure is reached. The main valve modulates to give constant pressure.

How to order

When ordering a Spirax Sarco BRV2, include the following:

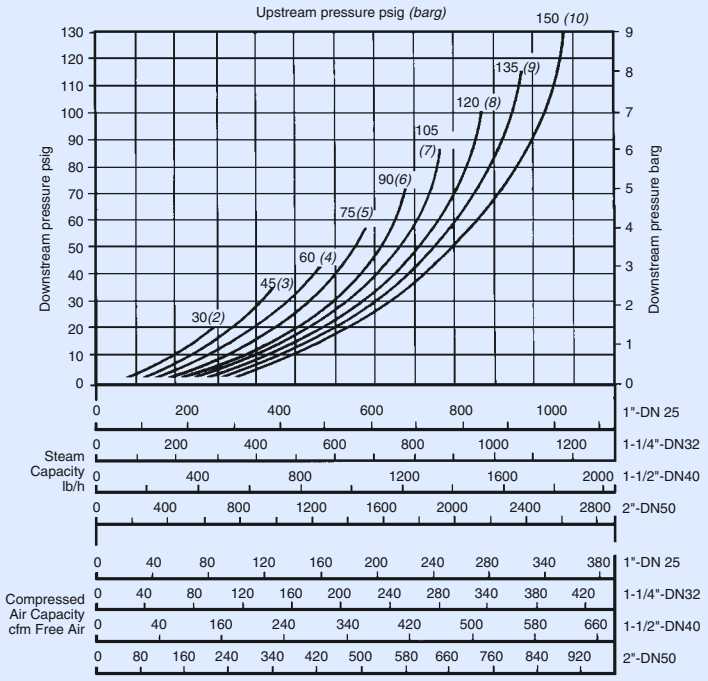
- Valve size and connection type
- Body material, e.g. cast iron
- Set range for downstream pressure
- Steam supply pressure

For example: Spirax Sarco 1/2" NPT Ductile Iron BRVS. Steam supply pressure, 100 psig. Set pressure, 50 psig.

Pressure Regulator sizing and selection

BRV71 & 73

Capacities – Steam & compressed air capacity chart



How to use the chart

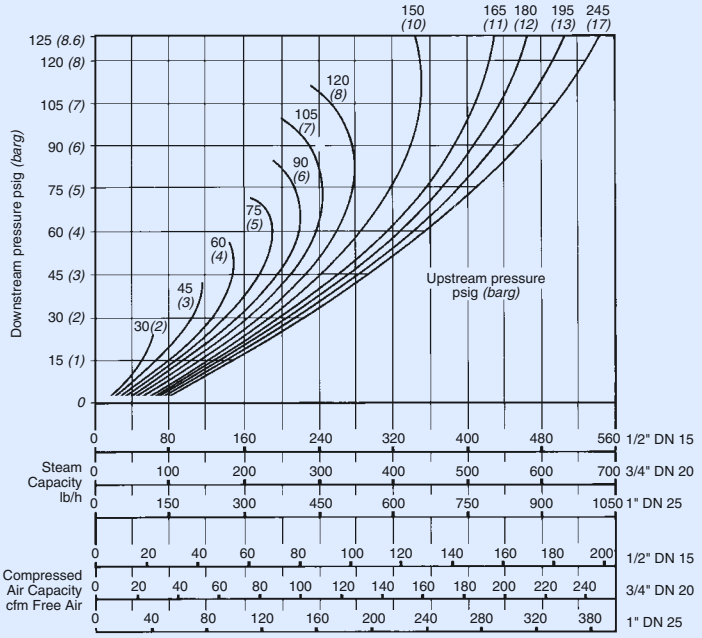
The curved lines labelled 30, 45, 60, etc., represent upstream pressures. Downstream pressures are read along the vertical line on the left hand side of the chart.

Example:

Required, a reducing valve to pass 400 lb/h reducing from 105 to 60 psi. From the downstream pressure of 60 psi on the left hand side of the chart extend out horizontally until the line meets the curved 105 psi upstream line. At this point, read vertically downward where it will be seen that a 1" BRV71/73 will be required.

BRV2

Capacities – Saturated steam capacities in lb/h

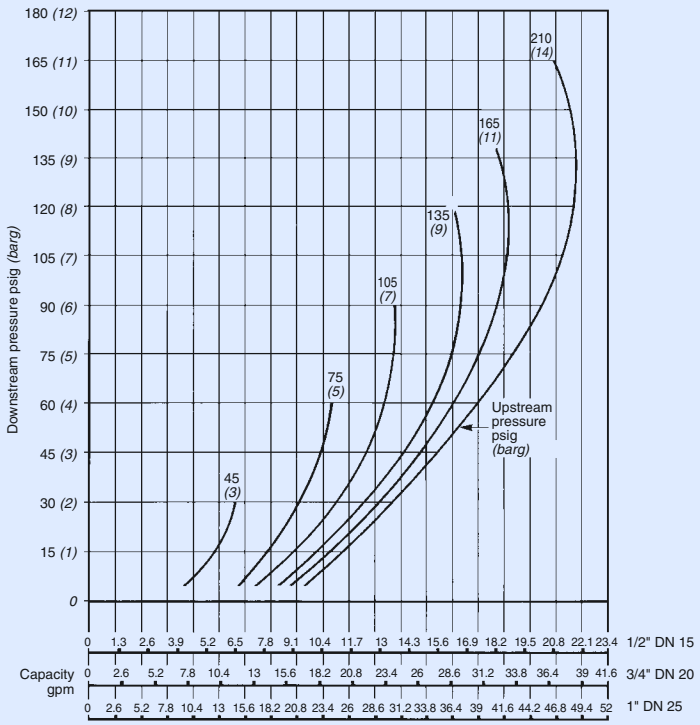


How to use the chart

The curved lines labelled 30, 45, 60, etc., represent upstream pressures. Downstream pressures are read along the vertical line on the left hand side of the chart.

Example:

Required, a reducing valve to pass 160 lb/h reducing from 150 to 60 psi. From the downstream pressure of 60 on the left hand side of the chart extend out horizontally until the line meets the curved 150 psi upstream line. At this point, read vertically downward where it will be seen that 1/2" BRV2 will be required.



LRV2

Capacities – Water capacities in gpm

How to use the chart

The curved lines labelled 45, 70, 105, etc., represent upstream pressures. Downstream pressure is read along the vertical line on the left hand side of the chart.

Example:

Required, a reducing valve to pass water at the rate of 11.7 gpm reducing from 105 to 60 psi. From the downstream pressure of 60 psi on the left hand side of the chart extend out horizontally until the line meets the curved 105 upstream line. At the point read vertically downwards where it will be seen that a 1/2" valve (with a 51-125 psi spring) will be required.

Pressure Regulator sizing and selection

25P, 25PE, 25PA, and all combinations

Capacities in pounds of saturated steam per hour for standard valves

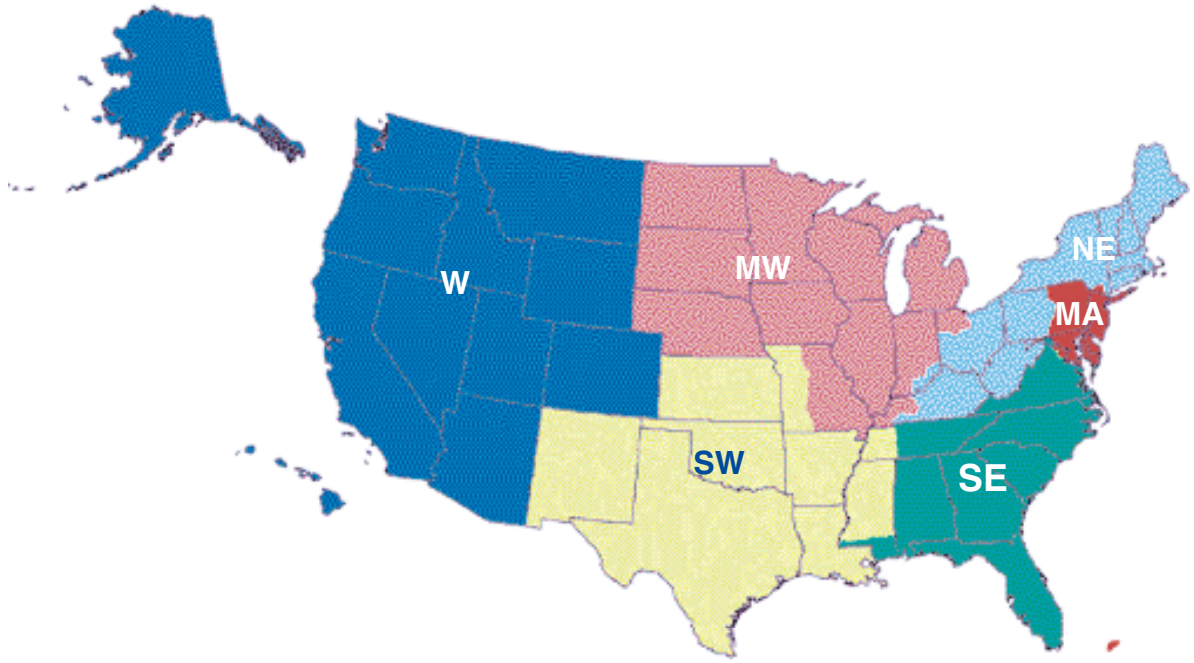
Inlet Steam Pressure psig	Outlet Steam Pressure psig	NOMINAL VALVE SIZE									
		1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	6"
	C.V. Factors	3.48	6.5	10.5	14	20	35	56	74	115	260
	10	95	175	285	380	540	950	1,500	2,000	3,100	7,000
15	5	135	250	405	545	780	1,365	2,185	2,890	4,480	10,170
	3	155	285	465	620	880	1,550	2,470	3,260	5,080	11,440
	12	120	230	365	490	700	1,225	1,960	2,590	4,025	9,100
20	8	155	290	470	630	900	1,575	2,520	3,330	5,175	11,700
	0-5	180	335	540	720	1,025	1,795	2,870	3,790	5,895	13,325
	15	145	270	435	580	830	1,450	2,325	3,070	4,770	10,790
25	10	195	360	580	775	1,110	1,950	3,110	4,110	6,385	14,430
	0-7	205	385	620	825	1,180	2,065	3,305	4,360	6,785	15,340
	20	155	290	470	630	900	1,575	2,520	3,330	5,175	11,700
30	15	220	410	665	890	1,270	2,220	3,555	4,700	7,300	16,510
	0-12	230	430	695	925	1,320	2,310	3,695	4,885	7,590	17,160
	30	155	290	470	630	900	1,575	2,520	3,330	5,175	11,700
40	25	250	470	755	1,010	1,440	2,520	4,030	5,330	8,280	18,720
	0-18	280	525	850	1,135	1,620	2,835	4,535	5,995	9,315	21,060
	40	190	355	575	770	1,100	1,925	3,080	4,070	6,325	14,300
50	30	315	585	955	1,275	1,820	3,185	5,095	6,735	10,465	23,660
	0-21	350	650	1,050	1,400	2,000	3,500	5,600	7,400	11,500	26,000
	45	280	520	840	1,120	1,600	2,800	4,480	5,920	9,200	20,800
60	35	360	670	1,080	1,440	2,060	3,605	5,770	7,620	11,845	26,780
	0-27	385	720	1,165	1,555	2,220	3,885	6,215	8,215	12,765	28,860
	60	280	525	850	1,135	1,620	2,835	4,535	5,995	9,315	21,060
75	50	415	775	1,250	1,665	2,380	4,165	6,665	8,800	13,685	30,940
	0-35	470	875	1,415	1,890	2,700	4,725	7,560	9,990	15,525	35,100
	70	290	540	870	1,160	1,660	2,905	4,650	6,140	9,545	21,580
85	50	490	915	1,480	1,965	2,820	4,935	7,895	10,435	16,215	36,660
	0-43	515	960	1,555	2,070	2,960	5,180	8,290	10,950	17,020	38,480
	80	370	690	1,115	1,485	2,120	3,710	5,935	7,845	12,190	27,560
100	60	580	1,080	1,740	2,325	3,320	5,810	9,295	12,285	19,090	43,160
	0-48	600	1,120	1,815	2,420	3,460	6,055	9,690	12,800	19,895	45,000
	100	440	825	1,335	1,780	2,540	4,445	7,110	9,400	14,600	33,000
125	80	680	1,275	2,060	2,745	3,920	6,860	10,975	14,500	22,540	50,960
	0-62	730	1,365	2,200	2,940	4,200	7,350	11,760	15,540	24,150	54,600
	125	490	910	1,470	1,960	2,800	4,900	7,840	10,360	16,100	36,400
150	100	800	1,490	2,400	3,205	4,580	8,015	12,825	16,945	26,335	59,540
	0-76	860	1,600	2,590	3,460	4,940	8,645	13,830	18,280	28,400	64,220
	150	490	915	1,480	1,975	2,820	4,935	7,895	10,435	16,125	36,660
175	125	870	1,630	2,635	3,515	5,020	8,785	14,055	18,570	28,865	65,260
	0-87	985	1,840	2,970	3,960	5,660	9,900	15,850	20,950	32,545	73,580
	150	840	1,600	2,540	3,390	4,840	8,470	13,550	17,900	27,830	65,920
200	125	1,075	2,000	3,240	4,330	6,180	10,815	17,300	22,870	35,530	80,340
	0-103	1,125	2,100	3,390	4,520	6,460	11,300	18,000	23,900	37,145	83,980
	175	840	1,650	2,670	3,560	5,080	8,890	14,225	18,800	29,210	66,000
225	150	1,160	2,180	3,500	4,660	6,660	11,655	18,650	24,640	38,300	86,600
	0-117	1,250	2,340	3,780	5,000	7,200	12,600	20,160	26,640	41,400	93,600
	200	925	1,730	2,790	3,720	5,320	9,300	14,900	19,680	30,600	69,200
250	150	1,340	2,500	4,050	5,400	7,720	13,500	21,600	28,600	44,400	100,360
	0-131	1,385	2,590	4,180	5,570	7,960	13,930	22,300	29,450	45,800	103,500
	225	880	1,640	2,650	3,530	5,050	8,830	14,130	18,670	29,000	
*273	200	1,240	2,320	3,750	4,990	7,130	12,480	19,960	26,400	41,000	
	0-145	1,510	2,830	4,570	6,090	8,700	15,230	24,360	32,200	50,000	
	250	920	1,720	2,780	3,700	5,290	9,250	14,800	19,600	30,400	
*300	225	1,250	2,330	3,770	5,020	7,170	12,550	20,100	26,500	41,300	
	0-160	1,640	3,070	4,960	6,600	9,440	16,520	26,400	34,900	54,300	

For other capacities, please consult factory.

*Capcaities are based on an accuracy regulation of 1 PSI and with pipe sizes to insure reasonable velocities. Refer to pipe sizing chart. * Cast steel construction required for service above 250 psig*

Local regulation may restrict the use of this product below the conditions quoted. Limiting conditions refer to standard connections only.

In the interests of development and improvement of the product, we reserve the right to change the specification.



For more information on Spirax Sarco, contact your Regional Hub Office below, or call 1-800-883-4411 and you will be connected to the location nearest you.

REGIONAL OFFICES

NORTHEAST

Spirax Sarco, Inc.
New England Hub Office
209 W. Central Street
Suite 228
Natick, MA 01760
Phone: (508) 651-3200
Fax: (508) 655-9434

Spirax Sarco, Inc.
Columbus, Ohio Hub Office
7760 Olentangy River Road
Suite 120
Columbus, OH 43235
Phone: (614) 436-8055
Fax: (614) 436-8479

MID-ATLANTIC

Spirax Sarco, Inc.
4647 Saucon Creek Road
Suite 102
Center Valley, PA 18034
Phone: (610) 432-4557
Fax: (610) 432-2595

SOUTHEAST

Spirax Sarco, Inc.
200 Centre Port Drive
Suite 170
Greensboro, NC 27409
Phone: (336) 605-0221
Fax: (336) 605-1719

MIDWEST

Spirax Sarco, Inc.
2806 Centre Circle Drive
Downers Grove, IL 60515
Phone: (630) 268-0330
Fax: (630) 268-0336

SOUTHWEST

Spirax Sarco, Inc.
203 Georgia Ave.
Deer Park, TX 77536
Phone: (281) 478-4002
Fax: (281) 478-4615

WEST

Spirax Sarco, Inc.
1930 East Carson Street
Suite 102
Long Beach, CA 90810
Phone: (310) 549-9962
Fax: (310) 549-7909

1150 Northpoint Blvd. • Blythewood, SC 29016
Phone: (803) 714-2000 • Fax: (803) 714-2200
www.spiraxsarco.com/us

spirax sarco®