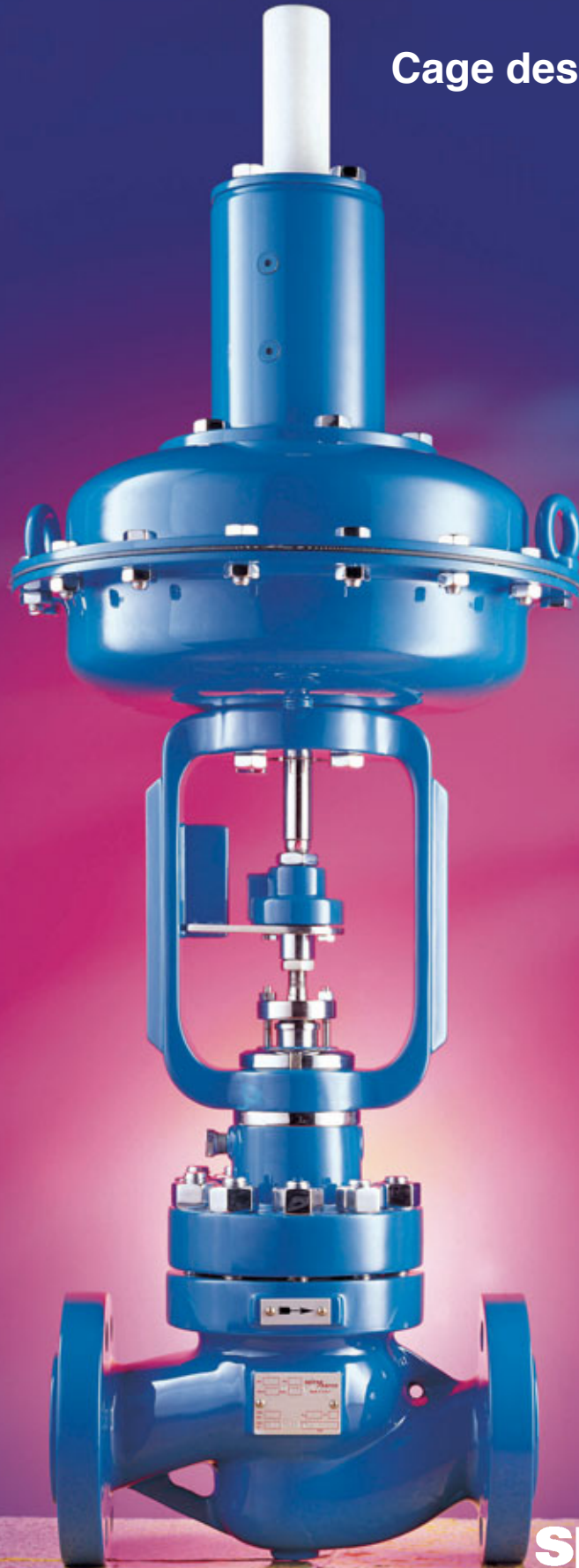


# 'C' Series control valves

Cage design control valves  
for industry



**spirax**  
**/sarco®**

# One valve . . .

The 'C' series is a cage design valve that conforms to the requirements laid down by ANSI B16.34 and ASME VIII.

At its heart is a cage guided balanced piston providing:

- Excellent control of the process over high differential pressures.
- Quick and easy maintenance.

The modular design of the valve provides flexibility, which means that many control solutions may be achieved from a single valve envelope.

Single spring actuation with different ratings for signal and process matching.

Field reversible spring extend to spring retract control action.

A range of actuator sizes to provide high closing forces.

Valve sizes from 1" to 8" (DN25 to 200).

Valve body manufactured in cast steel, stainless steel or alloy steel.

Valve body construction according to ANSI 600.

High temperature paint finish.


Valve plug closure to ANSI class IV, V and VI.

Industry standard connections include:  
Flanged ANSI or DIN with the option of RF (raised face) or RTJ (ring type joints).  
Socket weld in sizes 1" to 2" (DN25 to DN50).  
Butt weld in sizes 2" to 8" (DN50 to DN200).




# ... so many options

**Bellows sealed bonnet**




**Extended bonnet**




Extended bonnets for high and low temperature service and stainless steel bellows for low maintenance, high temperature and zero emission requirements.

**Chevron**



**Graphite**



Valve spindle sealing includes PTFE chevrons and graphite rings for high temperatures.

**Unbalanced plug**




**Balanced plug**




Balanced plug option for high differential pressures

Cage design trim gives stable control with equal percentage, linear and quick opening flow characteristic for process load matching.


**Quick opening**



**Equal percentage**




**Linear**




Single, two stage or multiple cage for noise reduction and anti-cavitation application.


**Single cage**



**Two stage cage**



**Three stage cage**



# ... providing many solutions

## User benefits

- Designed and engineered by Spirax Sarco ensuring long life and reliability.
- Cage design for excellent control performance and quick and easy maintenance.
- Numerous valve and actuator options to match a wide range of applications.
- Part of a complete controls solution for optimum plant performance.
- Backed by Spirax Sarco's guarantee of worldwide technical support, knowledge and service.

1. Wiper rings - help prevent damage to stem seals caused by the build up of particles, extending the seal life and reducing valve maintenance.

2. A unique serial number is allocated to every valve for full traceability worldwide.

3. High quality finish to the valve stem and cage, provides excellent sealing and long life performance of the stem seals and plug sealing rings.

4. Cage retained internals provide quick and easy maintenance, without the need to remove the valve from the pipe.

5. The trim design ensures low mechanical noise. One, two and three stage cage design solutions for reducing cavitation and aerodynamic noise problems.

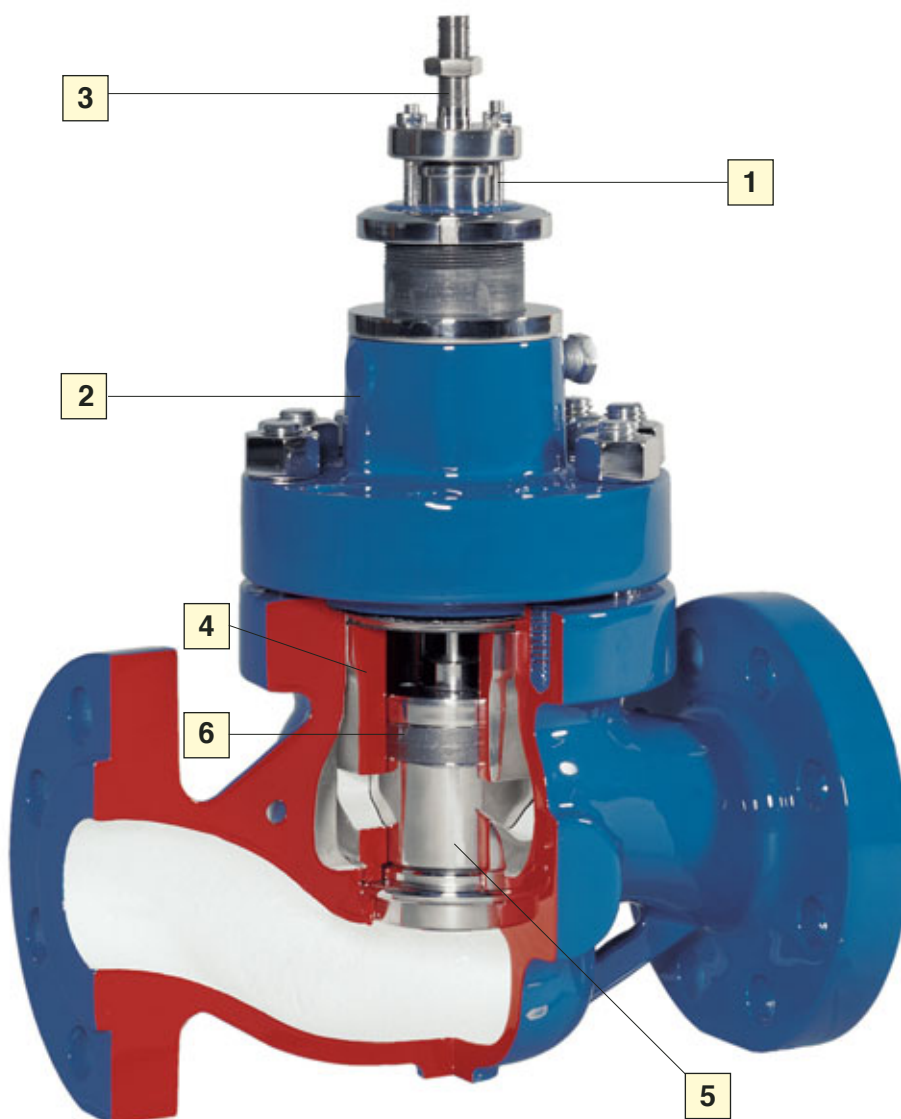
6. The balanced plug option has a standard, energized, PTFE sealing ring with the option of precision cut graphite rings for high temperature applications, ensuring high performance sealing and stability of plug position.

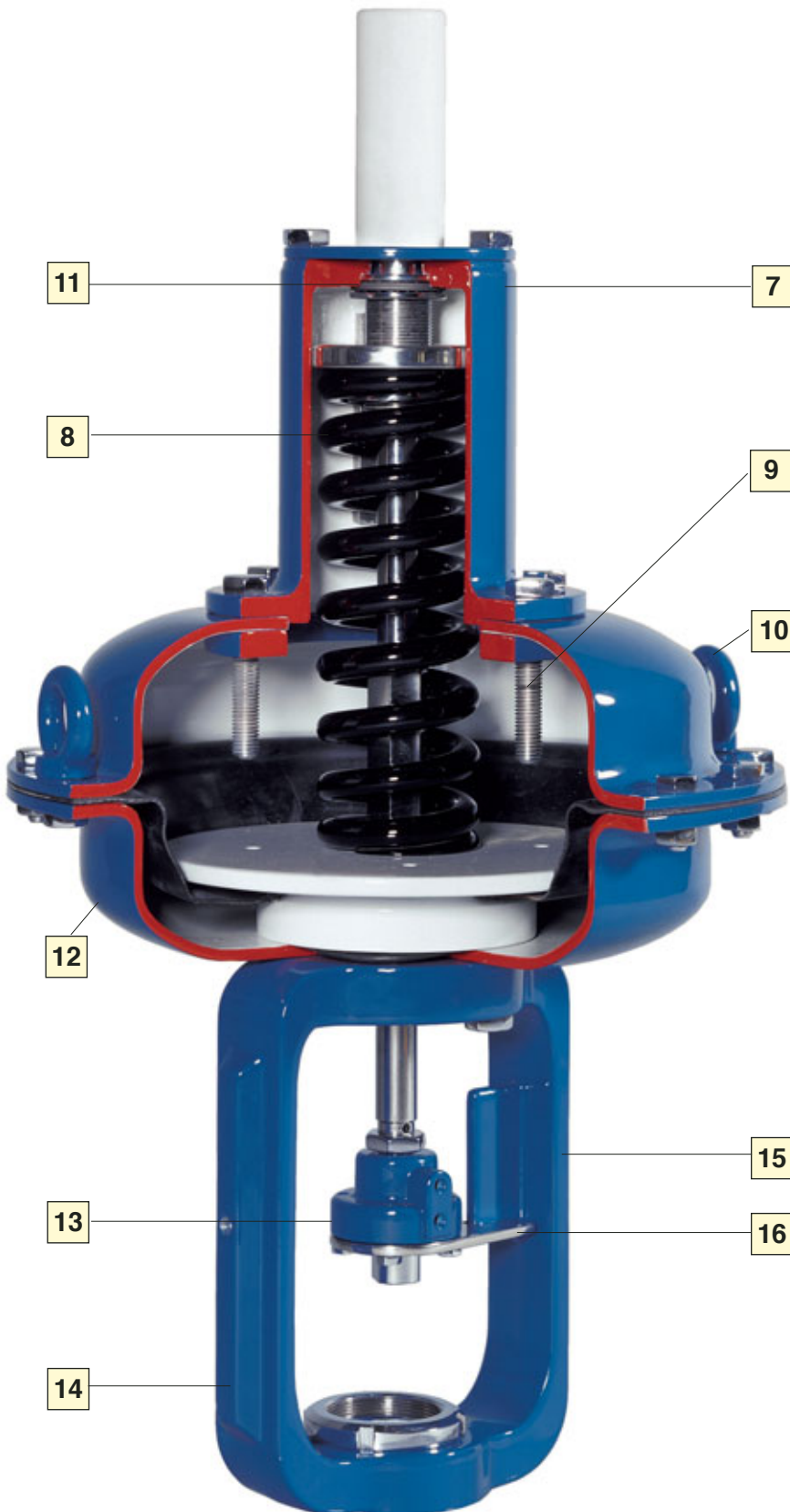
## Design detail makes all the difference

The range of 'C' series control valves have benefited from over 50 years of valve design, manufacture and application expertise. This accumulated knowledge has been applied to every detail of the valve design.

Similarly, the associated PN1000 and PN2000 series actuators have benefited from our experience and careful design.

The outcome of this approach is a modern, high performance, valve and actuator combination that is ideally suited to the needs of today's industry.





**7.** Field reversible spring extend to spring retract (or vice versa) without the need of special tools.

**8.** Springs can be replaced without having to open the diaphragm chamber minimizing maintenance downtime.

**9.** The valve stroke is limited by the actuator preventing over stressing of the valve stem.

**10.** Lifting eyes are standard, making installation easier.

**11.** Single spring actuation with ball thrust bearing for easier calibration, ensuring precision and repeatability of actuation.

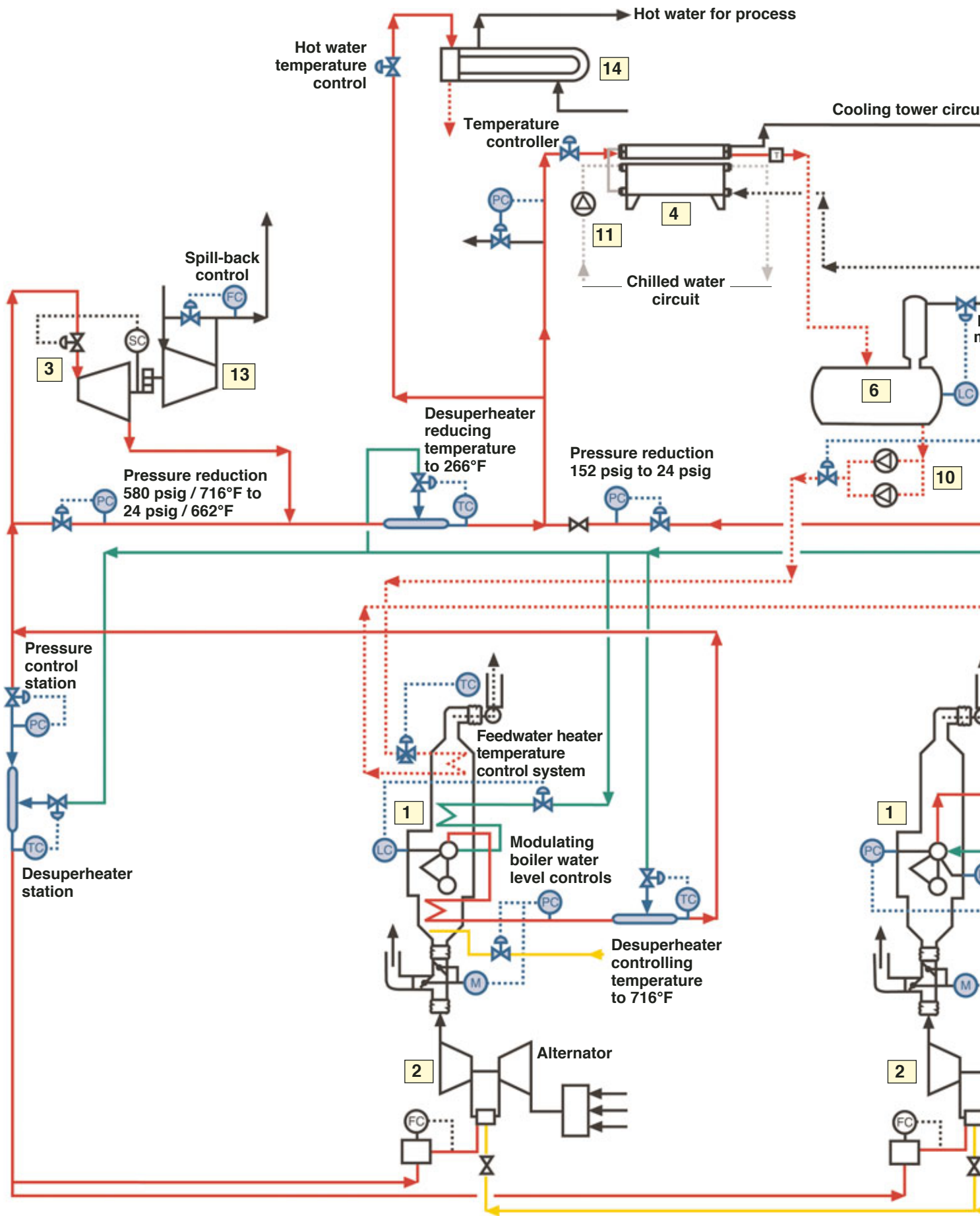
**12.** The actuator is internally treated to protect against atmospheric corrosion.

**13.** An anti-rotation device is standard; helping to prevent damage to the stem, plug, bellows and diaphragm.

**14.** The high-strength actuator yoke is made entirely of steel.

**15.** Standard IEC 60534-6-1 (previously NAMUR) mounting means industry standard valve positioners and other accessories can be easily fitted.

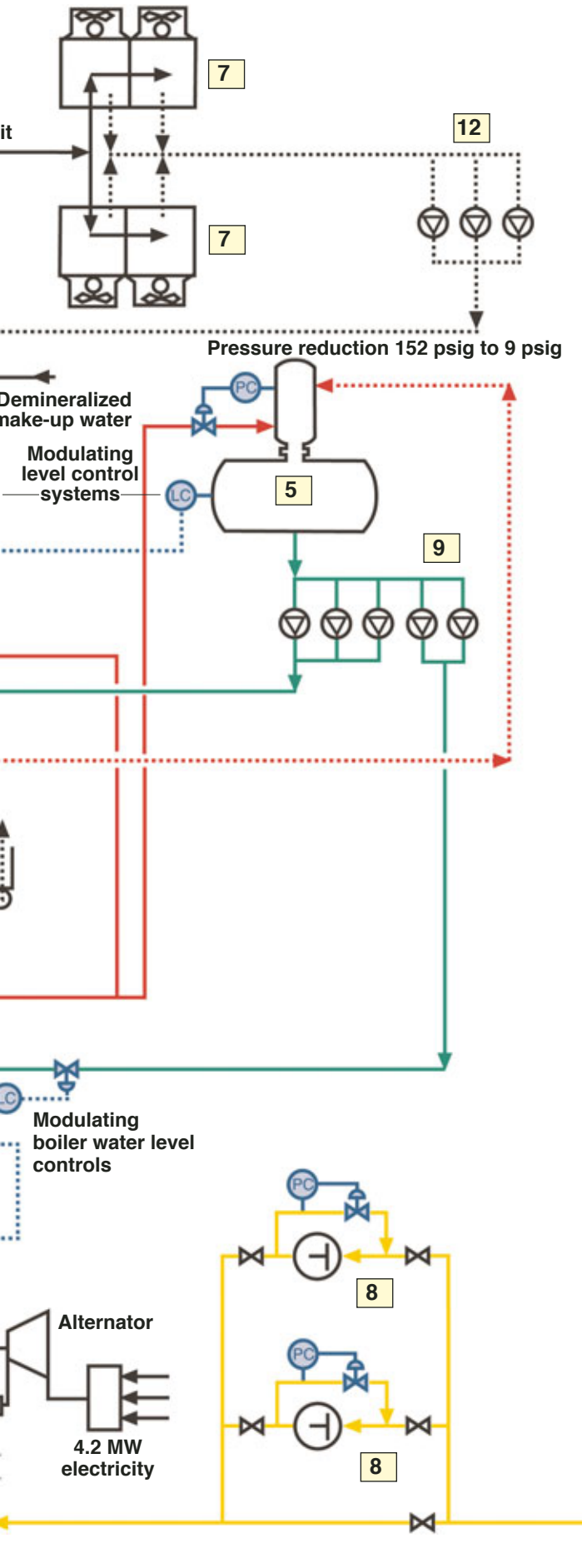
**16.** The valve travel indicator makes visual identification of the valve operation easy.



# A modern valve for today's integrated industries:

- Pharmaceuticals
- Chemical plants
- Power generation
- Oil and gas
- Ship yards
- Textiles
- Foods
- Paper

The integrated system shown is one example of the many solutions Spirax Sarco provide to today's industry. Here, gas turbines are used to drive alternators for the production of electricity. Hot exhaust from the gas turbine is used to produce steam and superheated steam. The superheated steam drives a turbine for plant compressed air production. Saturated steam is used for heating, cooling and hot water for process production. Level, pressure, flow, speed and temperature controls all feature in the plant.




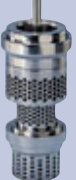

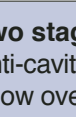


- 1 Boiler
- 2 Gas turbine
- 3 Steam turbine
- 4 Absorption chiller
- 5 Deaerator
- 6 Condensate tank
- 7 Cooling tower
- 8 Gas compressor
- 9 Feedwater pump
- 10 Condensate pump
- 11 Refrigerated water pump
- 12 Fresh water
- 13 Air compressor
- 14 Domestic water heater

- Spirax Sarco solutions
- Steam
- - - Condensate
- Feedwater
- Water
- - - Chilled water circuit
- Cooling tower circuit
- Methane

# Valve capacities

## Flow coefficient $C_v$ (US) depending on the various types of 'trim'

Type of cage trim	Flow characteristic	Cv (US) by valve size and trim reduction										
		Valve size	1" DN25	1-1/2" DN40	2" DN50	2-1/2" DN65	3" DN80	4" DN100	5" DN125	6" DN150	8" DN200	
		Travel	3/4" 20 mm		1-3/16" 30 mm	1-1/2" 38 mm		2" 50 mm	2-1/2" 65 mm		3" 75 mm	
	One stage standard (Flow over)	Full area	19	35	63	95	130	216	293	386	560	
	Equal % Fast opening and Linear	Reduction 1	-	19	35	63	95	130	216	293	386	
		Reduction 2	-	-	18	36	60	99	136	223	304	
		Reduction 3	-	-	-	19	35	63	95	130	216	
	One stage low noise (Flow over)	Linear	Maximum	15	35	60	100	140	250	320	425	650
			Reduction 1	-	15	35	60	100	140	250	320	425
			Reduction 2	-	-	15	35	60	100	140	250	320
			Reduction 3	-	-	-	15	35	60	100	140	250
	Modified equal percentage	Maximum	15	30	55	85	120	200	250	360	530	
		Reduction 1	-	15	30	55	85	120	200	250	360	
		Reduction 2	-	-	15	30	55	85	120	200	250	
		Reduction 3	-	-	-	15	30	55	85	120	200	
	Equal percentage	Maximum	15	25	45	75	95	150	210	280	425	
		Reduction 1	-	15	25	45	75	95	150	210	280	
		Reduction 2	-	-	15	25	45	75	95	150	210	
		Reduction 3	-	-	-	15	25	45	75	95	150	
	Two stage low noise (Flow noise)	Linear	Maximum	-	17	28	46	70	125	170	250	440
			Reduction 1	-	-	17	28	46	70	125	170	250
			Reduction 2	-	-	-	17	28	46	70	125	170
			Reduction 3	-	-	-	-	17	28	46	70	125
	Modified equal percentage	Maximum	-	15	26	43	65	115	155	230	400	
		Reduction 1	-	-	15	26	43	65	115	155	230	
		Reduction 2	-	-	-	15	26	43	65	115	155	
		Reduction 3	-	-	-	-	15	26	43	65	115	
	Equal percentage	Maximum	-	13	22	40	60	110	145	210	370	
		Reduction 1	-	-	13	22	40	60	110	145	210	
		Reduction 2	-	-	-	13	22	40	60	110	145	
		Reduction 3	-	-	-	-	13	22	40	60	110	
	Three stage low noise (Flow under)	Linear	Maximum	-	13	20	35	50	85	105	155	280
			Reduction 1	-	-	13	20	35	50	85	105	155
			Reduction 2	-	-	-	13	20	35	50	85	105
			Reduction 3	-	-	-	-	13	20	35	50	85
	Modified equal percentage	Maximum	-	10	15	30	45	75	95	145	250	
		Reduction 1	-	-	10	15	30	45	75	95	145	
		Reduction 2	-	-	-	10	15	30	45	75	95	
		Reduction 3	-	-	-	-	10	15	30	45	75	
	Equal percentage	Maximum	-	7	10	25	30	55	75	115	200	
		Reduction 1	-	-	7	10	25	30	55	75	115	
		Reduction 2	-	-	-	7	10	25	30	55	75	
		Reduction 3	-	-	-	-	7	10	25	30	55	
	One stage Anti-cavitation (Flow over)	Linear	Maximum	15	30	55	85	120	200	250	360	530
			Reduction 1	-	15	30	55	85	120	200	250	360
			Reduction 2	-	-	15	30	55	85	120	200	250
			Reduction 3	-	-	-	15	30	55	85	120	200
	Two stage Anti-cavitation (Flow over)	Linear	Maximum	-	15	26	43	65	115	155	230	400
			Reduction 1	-	-	15	26	43	65	115	155	230
			Reduction 2	-	-	-	15	26	43	65	115	155
			Reduction 3	-	-	-	-	15	26	43	65	115

For conversion

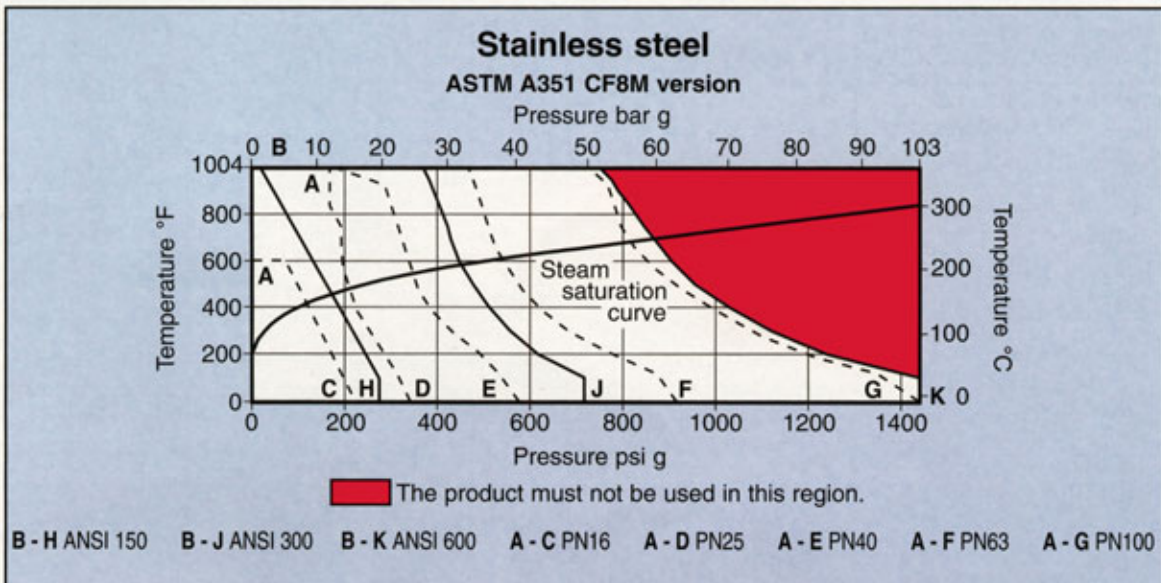
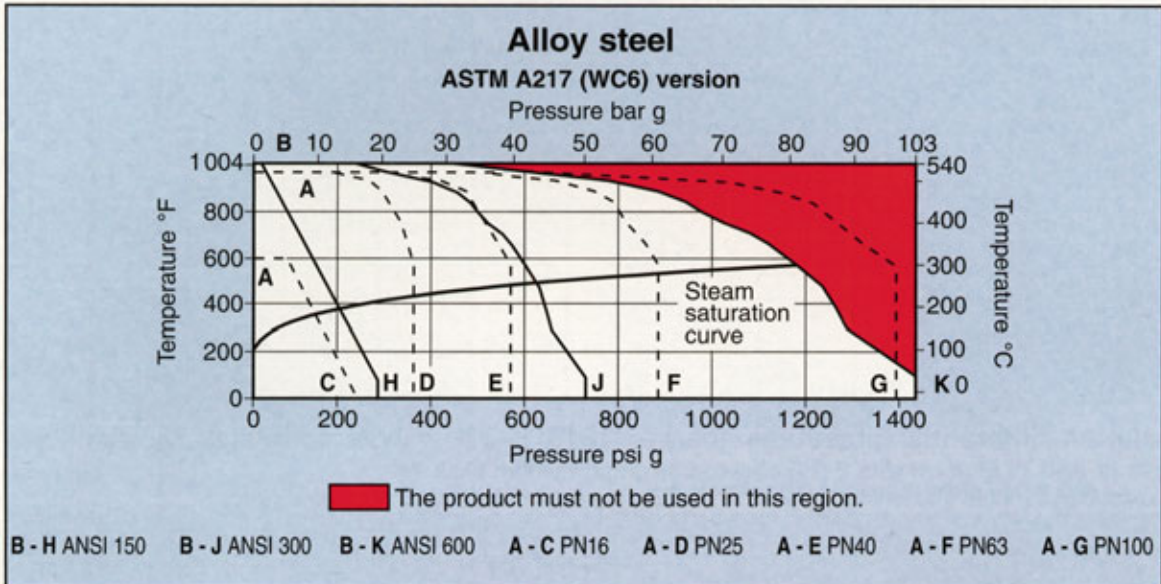
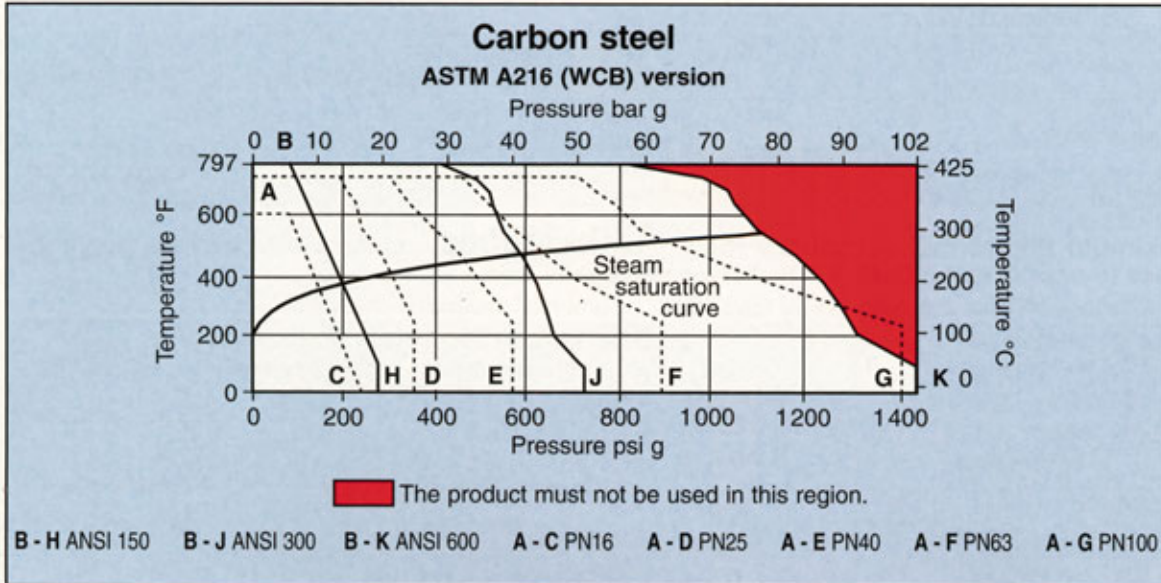
$$Cv \text{ (UK)} = Cv \text{ (US)} \times 0.833$$

$$Kvs = Cv \text{ (US)} \times 0.855$$



# Valve operating ranges (for body material and flange type only)

Note: See Technical Information Sheets for stem and plug limitations



# Closing pressures using PN1000 / PN2000 pneumatic actuators

For reduced trims C<sub>V</sub>(US) use the equivalent standard trim. For details of Class V shut-off, and further details contact our technical sales office.

## 'C' series valve

Valve size	1" DN25	1-1/2" DN40	2" DN50	2-1/2" DN65	3" DN80	4" DN100	5" DN125	6" DN150	8" DN200
Standard travel	3/4" (20 mm)		1-3/16" (30 mm)	1-1/2" (38 mm)		2" (50 mm)	3" (75 mm)		
Equal % C <sub>V</sub> (US)	19	35	63	95	130	216	293	386	560

## Maximum differential pressures (psig) - **unbalanced** valves controlled by positioner Class IV and VI shut-off with PTFE chevron or graphite stem seal.

For extended bonnets and bellows seal read 'PTFE' or 'graphite' depending on seal chosen.

Actuator	Spring range		Spring holder	Maximum differential pressure (psig) for standard valve trim with either graphite or PTFE stem seal																
	Spring extend PN1000	Spring retract PN2000		PTFE	Graphite	PTFE	Graphite	PTFE	Graphite	PTFE	Graphite	PTFE	Graphite	PTFE	Graphite	PTFE	Graphite	PTFE	Graphite	
PN_300	0.4 - 1.2	0.2 - 1.0	1	72	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PN_400	0.4 - 1.2	0.2 - 1.0	2	188	159	72	58	43	29	-	-	-	-	-	-	-	-	-	-	-
PN_500	0.4 - 1.2	0.2 - 1.0	2	362	333	145	145	87	87	43	43	-	-	-	-	-	-	-	-	-
PN_600	0.4 - 1.2	0.2 - 1.0	2	-	-	246	232	159	145	87	87	58	58	-	-	-	-	-	-	-
PN_700	0.4 - 1.2	0.2 - 1.0	4	-	-	507	493	333	319	203	203	130	130	72	72	58	58	44	29	-
PN_300	1.0 - 2.0	0.2 - 1.0	2	377	348	159	145	101	87	-	-	-	-	-	-	-	-	-	-	-
PN_400	1.0 - 2.0	0.2 - 1.0	2	652	623	290	275	188	174	116	101	72	72	-	-	-	-	-	-	-
PN_500	1.0 - 2.0	0.2 - 1.0	3	1073	1044	507	478	333	319	203	188	130	130	72	72	-	-	-	-	-
PN_600	1.0 - 2.0	0.2 - 1.0	3	-	-	739	725	478	478	290	290	203	203	116	116	87	87	58	58	29
PN_700	1.0 - 2.0	0.2 - 1.0	4	-	-	1406	1377	928	913	580	565	406	391	246	232	174	174	116	116	73
PN_300	2.0 - 4.0	0.2 - 1.0	2	870	841	391	362	246	232	-	-	-	-	-	-	-	-	-	-	-
PN_400	2.0 - 4.0	0.2 - 1.0	3	1421	1377	667	652	435	420	261	261	188	174	-	-	-	-	-	-	-
PN_500	2.0 - 4.0	0.2 - 1.0	4	1493	1493	1073	1058	710	696	435	435	304	304	188	174	-	-	-	-	-
PN_600	2.0 - 4.0	0.2 - 1.0	4	-	-	1493	1493	1044	1029	652	638	449	449	275	275	203	203	145	131	73
PN_700	2.0 - 4.0	0.2 - 1.0	4	-	-	-	-	1493	1493	1203	1189	841	841	507	507	392	377	261	261	145

## Maximum differential pressures (psig) - **balanced** valves controlled by positioner Class IV and VI shut-off with PTFE chevron or graphite stem seal.

For extended bonnets and bellows seal read 'PTFE' or 'graphite' depending on seal chosen.

Actuator	Spring range		Spring holder	Maximum differential pressure (psig) for standard valve trim with either graphite or PTFE stem seal																
	Spring extend PN1000	Spring retract PN2000		PTFE	Graphite	PTFE	Graphite	PTFE	Graphite	PTFE	Graphite	PTFE	Graphite	PTFE	Graphite	PTFE	Graphite	PTFE	Graphite	
PN_300	0.4 - 1.2	0.2 - 1.0	1	261	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PN_400	0.4 - 1.2	0.2 - 1.0	2	827	421	377	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PN_500	0.4 - 1.2	0.2 - 1.0	2	1494	1320	1015	580	711	392	522	-	319	-	-	-	-	-	-	-	-
PN_600	0.4 - 1.2	0.2 - 1.0	2	1494	1494	1494	1421	1334	1015	1117	769	812	479	595	-	290	-	-	-	-
PN_700	0.4 - 1.2	0.2 - 1.0	4	-	-	-	-	-	-	1494	1494	1494	1494	1494	1494	1204	856	841	522	406
PN_300	1.0 - 2.0	0.2 - 1.0	2	1494	1407	1073	725	769	450	-	-	-	-	-	-	-	-	-	-	-
PN_400	1.0 - 2.0	0.2 - 1.0	2	1494	1494	1494	1494	1494	1276	1378	1015	1030	682	-	-	-	-	-	-	-
PN_500	1.0 - 2.0	0.2 - 1.0	3	-	-	1494	1494	1494	1494	1494	1494	1494	1494	1494	1421	-	-	-	-	-
PN_600	1.0 - 2.0	0.2 - 1.0	3	-	-	-	-	-	-	-	-	1494	1494	1494	1494	1494	1494	1494	1175	856
PN_700	1.0 - 2.0	0.2 - 1.0	4	-	-	-	-	-	-	-	-	-	-	-	-	1494	1494	1494	1494	1494
PN_300	2.0 - 4.0	0.2 - 1.0	2	1494	1494	1494	1494	1494	1494	-	-	-	-	-	-	-	-	-	-	-
PN_400	2.0 - 4.0	0.2 - 1.0	3	-	-	-	-	1494	1494	1494	1494	1494	1494	-	-	-	-	-	-	-
PN_500	2.0 - 4.0	0.2 - 1.0	4	-	-	-	-	-	-	-	-	-	-	1494	1494	1494	1494	1494	1494	1233
PN_600	2.0 - 4.0	0.2 - 1.0	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1494
PN_700	2.0 - 4.0	0.2 - 1.0	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

# Selection guide for the 'C' series valve and actuator

## Valve Selection

<b>Valve size</b>	1", 1-1/2", 2", 2-1/2", 3", 4", 5", 6" & 8" DN25, 40, 50, 65, 80, 100, 125, 150 and 200	<b>2"</b>
<b>Valve series</b>	<b>C</b> = Cage trim	<b>C</b>
<b>Valve characteristics</b>	<b>L</b> = Linear <b>E</b> = Equal percentage <b>F</b> = Fast opening <b>M</b> = Modified/special	<b>E</b>
<b>Body material</b>	<b>4</b> = Cast steel <b>6</b> = Stainless steel <b>8</b> = Alloy steel	<b>4</b>
<b>Connections</b>	<b>2</b> = Butt weld (2" to 8") <b>3</b> = Flanged <b>4</b> = Socket weld (1", 1-1/2", 2")	<b>3</b>
<b>Stem sealing options</b>	<b>P</b> = PTFE chevron <b>H</b> = Graphite <b>B</b> = Bellows	<b>P</b>
<b>Seating options</b>	<b>T</b> = AISI 431 Hardened <b>G</b> = PTFE soft seat <b>W</b> = Hard face AISI 316	<b>T</b>
<b>Type of trim</b>	<b>C</b> = Standard cage <b>P</b> = Noise reducing perforated cage <b>A</b> = Anti-cavitation cage	<b>C</b>
<b>Number of stages</b>	<b>1</b> = One <b>2</b> = Two <b>3</b> = Three <b>Other</b> = To be specified	<b>1</b>
<b>Trim balancing</b>	<b>B</b> = Balanced <b>U</b> = Unbalanced	<b>U</b>
<b>Bonnet type</b>	<b>S</b> = Standard <b>H</b> = Extended for high temperature <b>L</b> = Extended for low temperature	<b>S</b>
<b>Reduced trim</b>	<b>0</b> = No reductions <b>1</b> = 1 reduction <b>2</b> = 2 reductions <b>3</b> = 3 reductions	<b>1</b>
<b>C<sub>v</sub></b>	To be specified	<b>C<sub>v</sub> 35</b>
<b>Connection type</b>	To be specified	<b>ANSI 300</b>

## Actuator Selection

<b>Actuation</b>	<b>PN</b> = Pneumatic	<b>PN</b>
<b>Actuator action</b>	<b>1</b> = Spring to extend <b>2</b> = Spring to retract	<b>1</b>
<b>Diaphragm size</b>	<b>3, 4, 5, 6 or 7</b>	<b>5</b>
<b>Actuator travel</b>	<b>2</b> = 3/4" (20 mm) <b>3</b> = 1-3/16" (30 mm) <b>4</b> = 1-1/2" (38 mm) <b>5</b> = 2" (50 mm) <b>6</b> = 3" (75 mm)	<b>2</b>
<b>Spring range</b>	<b>0</b> = If PN1000 selected: 6 to 18 psi (0.4 to 1.2 bar) If PN2000 selected: 3 to 15 psi (0.2 to 1.0 bar) <b>3</b> = 30 to 60 psi (2.0 to 4.0 bar) <b>6</b> = 15 to 30 psi (1.0 to 2.0 bar)	<b>0</b>
<b>Yoke type</b>	<b>A</b> = Type A for valve sizes 1" to 2" (DN25 - DN50) <b>B</b> = Type B for valve sizes 2-1/2" to 4" (DN65 - DN100) <b>C</b> = Type C for valve sizes 5" to 8" (DN125 - DN200)	<b>A</b>
<b>Spring-holder size</b>	<b>1</b> = Type 1 <b>2</b> = Type 2 <b>3</b> = Type 3 <b>4</b> = Type 4	<b>2</b>

### Selection and nomenclature example

#### Valve nomenclature example:

1 off 2" **CE43PTC1US1** C<sub>v</sub> 35 flanged to ANSI 300

#### Actuator nomenclature example:

1 off **PN1520A2** set to 6 - 18 psig

### How to specify the 'C' series valve and actuator

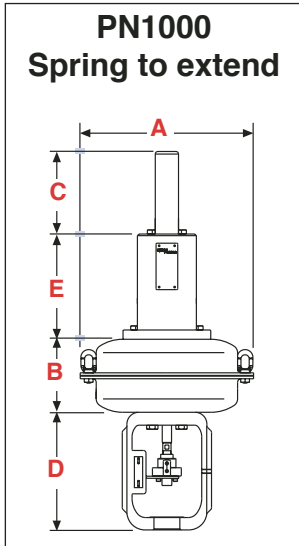
Control valves shall be Spirax Sarco 'C' series with steel bodies, cage design and ANSI 300 or ANSI 600 flanged connections. They must be two port single seat, available with varying flow characteristics and stainless steel internals. They shall be coupled to a PN1000 single spring pneumatic actuator offering on-site conversion from fail-close to fail-open, plus an SP2 intelligent positioner and MPC2 filter / regulator set.

## Spirax Sarco customer care policy

Each 'C' series valve and actuator combination is given a unique serial number against which all customer data i.e., application, valve and actuator information is stored.

# Dimensions/weights (approximate) in ins (mm) and lbs (kgs)

## PN1000 and PN2000 actuators



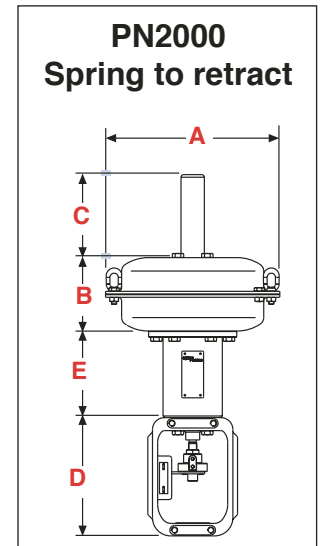
Actuator	Actuator diaphragm			Actuator Weights
	A	B	C	
PN_300	11.2 (285)	15.2 (385)	4.3 (110)	50.7 (23)
PN_400	13.2 (336)	16.2 (411)	4.3 (110)	72.7 (33)
PN_500	15.9 (405)	20.2 (513)	5.9 (150)	121.3 (55)
PN_600	18.3 (465)	20.3 (515)	5.9 (150)	154.3 (70)
PN_700	22.0 (560)	20.8 (530)	5.9 (150)	176.4 (80)

### Actuator yoke

Actuator	D		
	Type A	Type B	Type C
PN1000 / PN2000 series	9.1 (231)	9.7 (247)	11.8 (299)

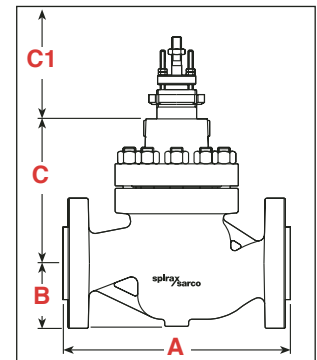
### Actuator spring-holder

Actuator	E		
	Type 1	Type 2 & 3	Type 4
PN1000 / PN2000 series	5.6 (144)	8.0 (247)	9.8 (250)



## 'C' series valve body

Size	A			B	C	C1		Valve weights
	ANSI 150 PN16	ANSI 300 PN25-PN40	ANSI 600 PN63-PN100			Extended bonnet	Bellows sealed bonnet	
1" DN25	7.2 (184)	7.7 (197)	8.3 (210)	2.4 (62)	5.5 (141)	10.0 (255)	15.0 (380)	28.6 (13)
1-1/2" DN40	8.7 (222)	9.3 (235)	9.8 (250)	3.1 (80)	7.0 (179)	11.5 (293)	16.5 (419)	48.5 (22)
2" DN50	10.0 (254)	10.5 (267)	11.2 (286)	3.1 (80)	7.2 (183)	11.6 (296)	18.9 (480)	59.5 (27)
2-1/2" DN65	10.8 (276)	11.5 (292)	12.2 (311)	3.7 (95)	8.2 (209)	13.5 (344)	19.9 (506)	92.6 (42)
3" DN80	11.7 (298)	12.5 (317)	13.2 (336)	4.1 (105)	8.2 (209)	13.5 (344)	19.9 (506)	130.0 (59)
4" DN100	13.9 (353)	14.4 (368)	15.5 (394)	5.0 (128)	9.7 (247)	15.0 (382)	24.9 (634)	213.8 (97)
5" DN125	16.7 (425)	16.7 (425)	16.7 (457)	6.5 (165)	11.4 (290)	16.7 (425)	27.1 (690)	264.5 (120)
6" DN150	17.7 (451)	18.6 (473)	20.0 (508)	7.0 (178)	13.3 (339)	18.7 (474)	29.0 (739)	396.8 (180)
8" DN200	21.3 (543)	22.4 (568)	24.0 (610)	8.3 (210)	14.6 (370)	19.8 (505)	30.3 (770)	661.4 (300)



## Accessories for the 'C' series control valve

A complete range of accessories is available to complete the 'C' series control valve package, including traditional valve positioners, digital valve positioners and air conditioning sets (MPC2 air conditioning set required with positioner).

Valve positioner model type	PP5	EP5	SP2 (smart)
Operating mode	Pneumatic / pneumatic	Electropneumatic	
Casing protection	IP54	IP 54 (EEx version on request)	IP65
Air connection	1/4" NPT		
Maximum air pressure	6 bar g		
Electrical connection	Pg 13.5		
Input signal	0.2 - 1 bar (3 - 15 psi)	4 - 20mA	4 - 20mA
Output signal	0 - 100% of supply pressure		
Sensitivity	< 0.2% of span	< 0.2% of span	8 000 steps maximum
Ambient temperature limits	-20 to + 80°C	-15 to + 65°C	-20 to + 80°C

1150 Northpoint Blvd. • Blythewood, SC 29016

Phone: (803) 714-2000 • Fax: (803) 714-2222

www.spiraxsarco.com/us

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