SPIRAX SARCO, INC. PRODUCT HANDBOOK

SIXTH EDITION

MAY 2026 **VOLUME 2**



First for Steam Solutions

EXPERTISE | SOLUTIONS | SUSTAINABILITY

spirax sarco

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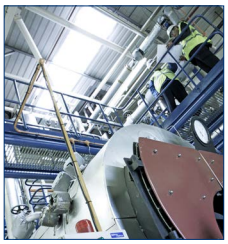
- Globe Control Valves
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CONTROL VALVES

FOR TEMPERATURE, PRESSURE AND FLOW CONTROL



Getting maximum productivity from any fluid control system requires accurate and reliable control of pressure, temperature and flow to obtain optimum conditions.

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SECTION 12 CONTENTS
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	MPC2 High Efficiency Compressed Air Filter/Regulator	TI-P436-04-US
	EP6 Electro-pneumatic Positioner	TI-P703-01-EN
	EP6 ATEX Electro-pneumatic Positioner	TI-P703-03-EN
Controllers	PN600 Series Pneumatic Controllers	TI-P320-47-EN
	Programmable Controllers GS-X1, GS-X2, GS-X3	TI-P794-01-EN
Piston Actuated Valves	PF6 Series Stainless Steel Piston Actuated On/Off Valves	TI-P373-13-EN
	PF51G Bronze Piston Actuated On/Off Valves	TI-P373-14-EN
	DM Pilot Solenoid Valves for use with Piston Actuated Valves	TI-P373-04-EN
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Desuperheater	Direct Contact Desuperheater	TI-P475-01-EN
	Desuperheater Online Program Sizing Guidance	TI-P475-06-EN
	DA Series Variable Area Desuperheater	TI-P605-10-EN
	DAB Series Steam Desuperheater	TI-P605-18-US
	DAC Series Steam Desuperheater	TI-P605-20-US
	SCVH Series Steam Conditioning Valve	TI-P419-01-US

TI-GCM-179-US
Issue 1

Steam Sizing Chart

Determining the value Cv

Cv calculation is an interactive process requiring knowledge of valve dynamics, piping geometry factors, and outlet velocities. In practice, this sizing chart is based on emperical values and will cater for most applications.

How to use the chart

Example 1 - To find Cv value for critical flow application.

Steam demand	1500 lb/hr
Upstream pressure	55 psi gauge
	70 psi absolute

Refer to selection chart opposite.

1) Draw 1500 lb/hr flow line (A-B)

2) Draw a horizontal line from 70 psi absolute to critical pressure drop line (C-D). At this intersection drop a vertical line.

3) At the crossing point of these two lines, read off the Cv value required, i.e. Cv 13

4) Select valve size required from the appropriate valve type technical information sheet.

Example 2 - To find Cv value for non critical flow application

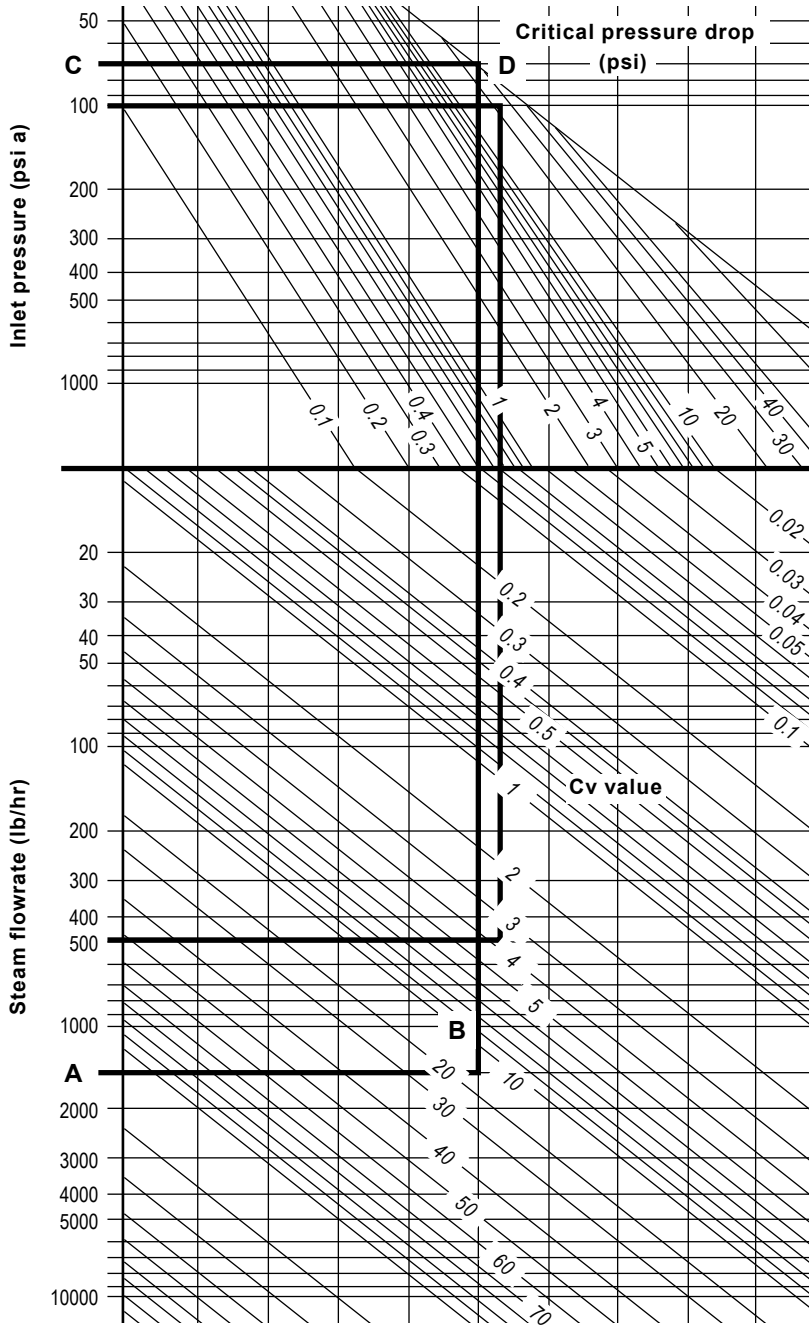
Steam demand	500 lb/hr
Upstream pressure	85 psi gauge
	100 psi absolute
Downstream pressure	65 psi gauge
	85 psi absolute

1) Draw 500 lb/hr flow line.

2) Draw a horizontal line from 100 psi absolute. At the intersection with 20 psi pressure drop, draw a vertical line.

3) At the crossing point with the 500 lb/hr horizontal line read off the Cv value required, i.e. Cv 3.8

4) Select valve size required from the appropriate valve type technical information sheet.



This chart is for example only.
A complete chart for sizing is on page 3.

How to use the formula

Proceed by calculating the required Cv from given flow data, having prior determined whether the flow is critical or sub-critical.

The following equations have been adapted from the ISA S75.01 standard to allow for practical everyday use without significant sacrifice in accuracy.

For steam service

Subcritical flow	Critical flow
When ΔP is less than .81 (P1/2)	When ΔP is greater than .81 (P1/2)

For saturated steam

Subcritical flow	Critical flow
$Cv = \frac{w}{\sqrt{2.1 \quad \Delta P\,(P_1+P_2)}}$	$Cv = \frac{w}{\sqrt{1.647\,(P_1)}}$

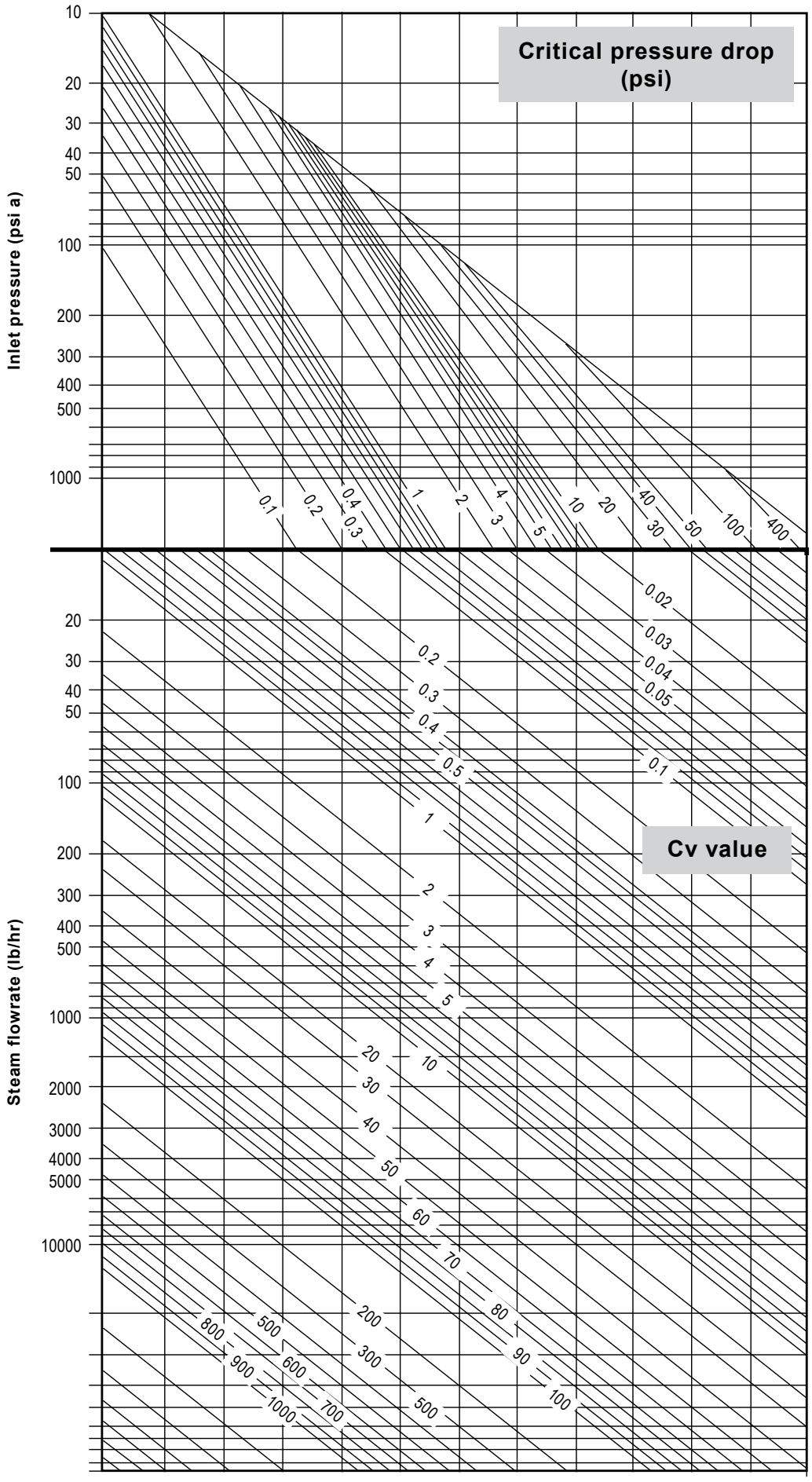
Cv = Valve coefficient

P_1 = Upstream pressure, psi a

P_2 = Downstream pressure, psi a

ΔP = Pressure drop $P_1 - P_2$, psi a

w = Flowrate, lb/h


Critical pressure drop (psi)
Inlet pressure (psi a)
10
20
30
40
50
100
200
300
400
500
1000
0.1
0.2
0.4
0.3
1
2
4
3
5
10
20
40
30
50
100
400
Cv value
Steam flowrate (lb/hr)
20
30
40
50
100
200
300
400
500
1000
2000
3000
4000
5000
10000
0.02
0.03
0.04
0.05
0.2
0.3
0.4
0.5
0.1
1
2
3
4
5
20
10
30
40
50
60
70
80
90
100
200
300
500
800
900
600
1000
700
500

TI-P331-01-US
Issue 1

B Series ½" to 2"
2-Way and 3-Way Bronze Control Valves

Description

The B Series is a light-industrial bronze control valve range for pressure, flow and temperature control of steam, gases and liquids.

Available in 2-way and 3-way body configurations for modulating control with PM Series pneumatic actuators or Belimo NV or AF Series electric actuators.

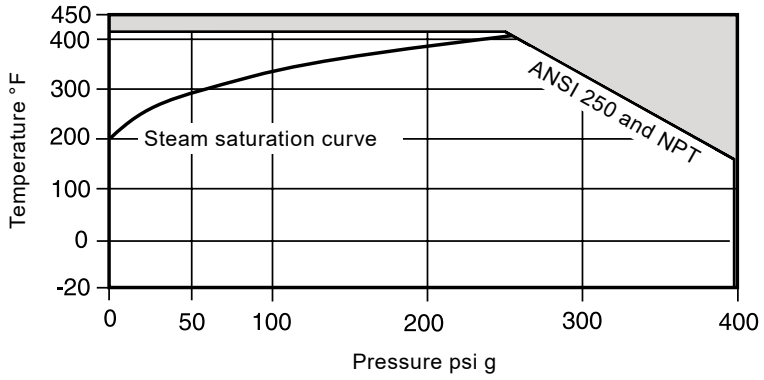
For enhanced control, any of the extensive range of Spirax Sarco positioners may be fitted to pneumatic actuators.

Technical specifications

Body sizes	½", ¾", 1", 1¼", 1½", 2"	
Body material	ASTM B62	
Connection	Screwed NPT	
Body rating	400 psi g @ 150 °F / 250 psi g @ 400 °F	
Characteristic	2-Way: Equal Percentage or Linear 3-Way: Linear	
Rangeability	50:1	
Temperature range	-20 °F to 400 °F	
Leakage rate	Metal Seating (2 Way and 3 Way Valves)	ANSI/FCI 70-2, Class IV
	PTFE Soft seating (2 Way, Equal Percentage only)	ANSI/FCI 70-2, Class VI



Operating range



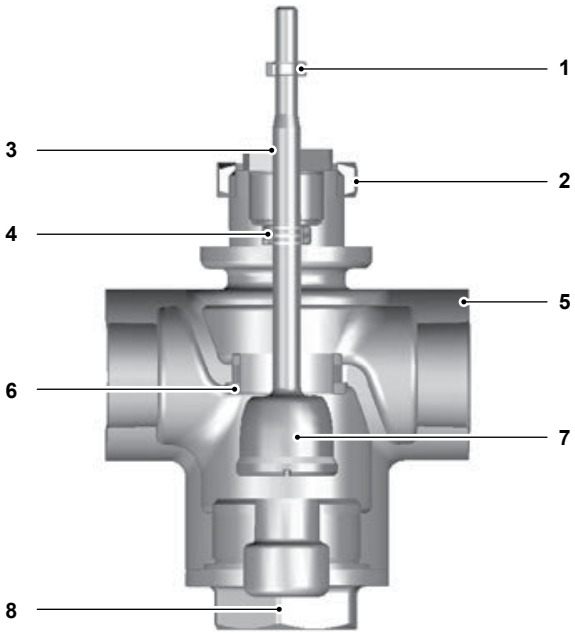
The product **must not** be used in this region.

Control valve Cv values

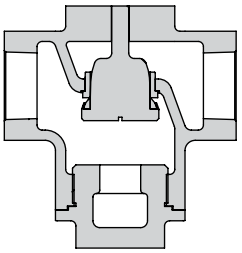
½"		¾"		1"		1¼"		1½"		2"	
Cv 6	Cv 3.5	Cv 8	Cv 6	Cv 13	Cv 8	Cv 20	Cv 13	Cv 28	Cv 20	Cv 50	Cv 28

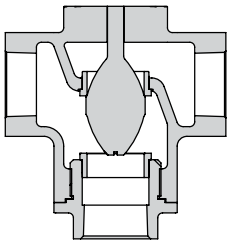
Materials

No.	Part	Material	
1	Locknut	Stainless steel	
2	Bonnet nut	Steel	
3	Gland nut	Brass	ASTM B16
4	Stem seal	PTFE/EPDM	
5	Body cast	Bronze	ASTM B62
6	Seat	Stainless steel	ASTM A561 303
7	Head and stem	Stainless steel	ASTM A561 303
8	Plug	Cast bronze	ASTM B62



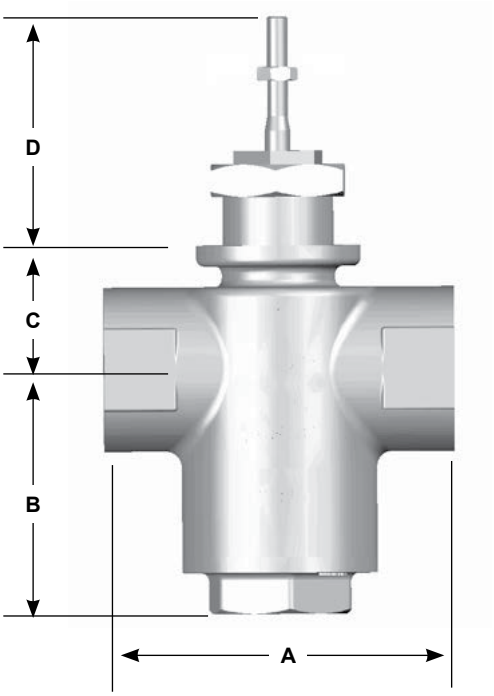
Detail of soft seal option





Detail of 3-Way option

Dimensions and weights (inches and pounds)



Size	A End to end	B Bottom to centerline	C Centerline to actuator shoulder	D Actuator shoulder to end of steam (closed position)	Weight
½"	3.5	2.5	1.4	90	4
¾"	3.5	2.5	1.4	90	4
1"	4.25	3	1.5	90	4.8
1¼"	5.3	3.8	2.0	90	10
1½"	5.3	3.8	2.0	90	10
2"	6.6	4.5	2.3	90	17

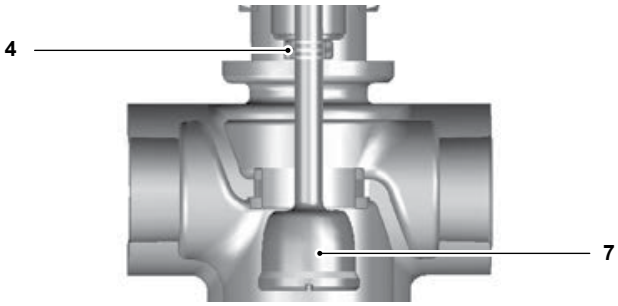
Control valve selection guide

Valve Size	½", ¾", 1", 1¼", 1½", 2"	**2"**
Valve Series	B Series	**B**
Valve Characteristic	L = Linear	**E**
	E = Equal percentage	
	M = Mixing linear (3-way)	
Design standards	A= ANSI/ASTM specifications	**A**
Body Material	5 = Bronze	**5**
Connections	1 = Threaded NPT	**1**
Seating option	G = Soft seal (PTFE) (Equal Percentage Only)	
Cv	To be specified	**50**
Connection Type	To be specified	**NPT**

Selection guide example	**2**	**B**	**E**	**A**	**5**	**1**			**C_V50**	**NPT**

Spare parts

Stem Seal	**4**
Head and Stem	**7**



How to order

Example: 1 x 2" BEA51 Cv 50 NPT. Control Valve with PM720R actuator.

TI-S52-01-US
Issue 1

PM Series Pneumatic Actuators for B Series Control Valves

Description

PM Series compact multi-spring diaphragm actuators are available in three sizes to suit the requirements of our ½" to 2" B Series control valves at various pressures. Actuators are available with an optional, top-mounted hand-wheel.

While many of these actuators will be operated directly by a 3-15 psi g control signal, any of the Spirax Sarco range of positioners can be mounted with the optional spindle adaptor (part no. 3578000).

Available types and options

Standard version with corrosion resistant paint finish.
Full stainless steel version to special enquiry.
Spring-to-retract spindle.
Spring-to-extend spindle.



Technical data

Ambient temperature range	-4 °F to 230 °F
Maximum air pressure	60 psi g
Stem travel	¾"
Air supply connection	¼" NPT

Selection guide

Type	PM		PM
Actuator size	2	= 36 in²	3
	3	= 60 in²	
	7	= 109 in²	
Spindle travel	2	= ¾"	2
Spring range	0	= 3-15 psi g	0
	1	= 3-9 psi g	
	2	= 9-15 psi g	
Spring action	E	= Spring extend	E
	R	= Spring retract	
Manual override	H	= Handwheel	

Selection example	3	2	0	E

Example: 1 x PM320E pneumatic actuator.

Materials

Diaphragm housing	Carbon Steel
Yoke	Ductile Iron
Diaphragm	Reinforced Nitrile
Gaskets	Neoprene
Springs	Steel (50CR4V2)
Bolts and nuts	Carbon/alloy steel

Maximum differential pressures for ANSI/FCI 70-2 Class IV and VI shut-off

Note: The actuator must be fully vented to achieve the differential pressures shown below. If the control system does not allow the actuator to be vented, please contact Spirax Sarco for assistance.

Spring retract

Closes B Series 2-way valve and closes top seat of B Series 3-way valve on loss of air.

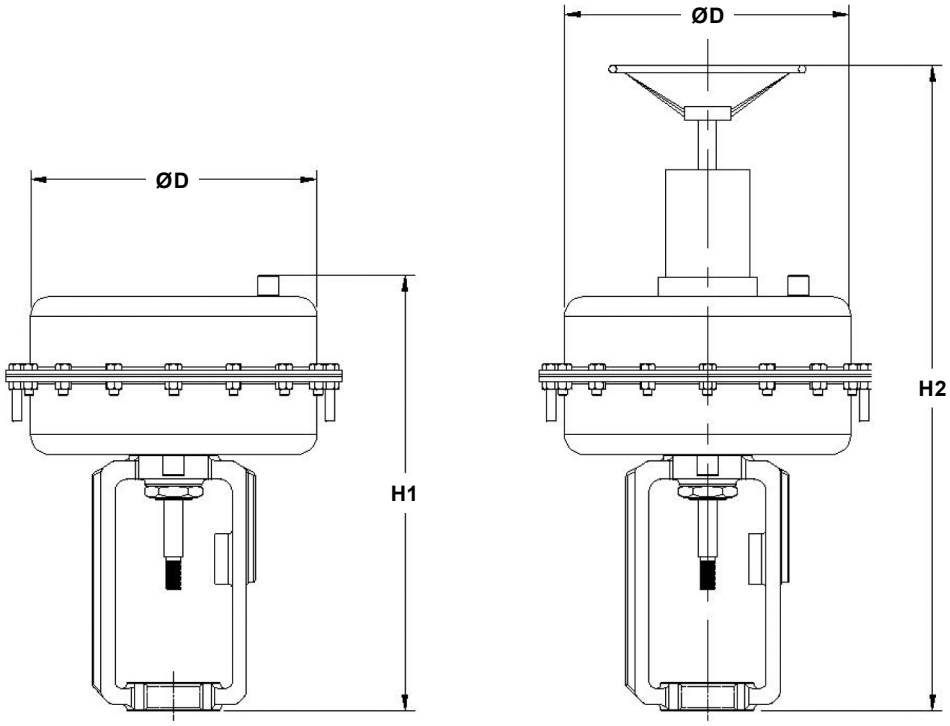
Model	Net spring range (psi g)	Minimum air pressure (psi g)	½"		¾"		1"		1¼"		1¼"		2"	
			Cv 6	Cv 3.5	Cv 8	Cv 6	Cv 13	Cv 8	Cv 20	Cv 13	Cv 28	Cv 20	Cv 50	Cv 28
PM220R	3 - 15	20	250	250	149	250	83	130	44	75	26	37	13	21
	6 - 18	23	250	250	250	250	205	250	114	197	76	107	45	71
PM221R	3 - 9	20	250	250	149	250	83	130	44	75	26	37	13	21
PM222R	9 - 15	20	250	250	250	250	250	250	184	250	126	177	77	121
PM320R	3 - 15	20					165	250	91	157	60	84	35	54
	6 - 18	23					250	250	209	250	144	202	88	138
PM321R	3 - 9	20					165	250	91	157	60	84	35	54
PM322R	9 - 15	20					250	250	250	250	228	250	141	222
PM720R	3 - 15	20							187	250	128	180	78	123
	6 - 18	23							250	250	250	250	175	250
PM721R	3 - 9	20							187	250	128	180	78	123

Spring extend

Opens B Series 2-way valve and closes bottom seat of B Series 3-way valve on loss of air.

Model	Net spring range (psi g)	Air pressure (psi g)	½"		¾"		1"		1¼"		1½"		2"	
			Cv 6	Cv 3.5	Cv 8	Cv 6	Cv 13	Cv 8	Cv 20	Cv 13	Cv 28	Cv 20	Cv 50	Cv 28
PM220E	3 - 15	18	250	250	149	250	83	130	44	75	26	37	13	21
		20	250	250	250	250	164	250	91	157	60	84	34	54
		25	250	250	250	250	250	250	208	250	143	201	87	137
		30							250	250	226	250	140	221
PM320E	3 - 15	18			250	250	165	250	91	157	60	84	35	54
		20			250	250	250	250	170	250	116	163	70	110
		25							250	250	250	250	159	250

Dimensions/weights (approximate) (inches and pounds)



Actuator model	Diameter D	H1	H2	Weight
PM200	9.25	9.31	16.67	20
PM300	11.22	11.6	22.66	42
PM700	15.43	14.7	27.52	49

Available spares

Diaphragm kit
Spring Kit
Spindle seal kit

TI-S24-71
CTLS Issue 20

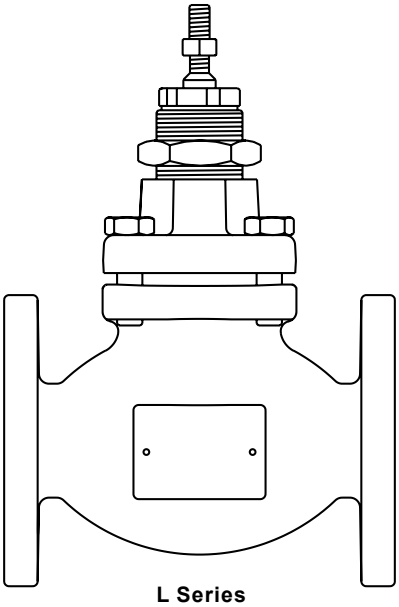
Spira-trol™ Two-port Control Valves EN Standard K and L Series DN15 to DN100 (½" to 4")

Description

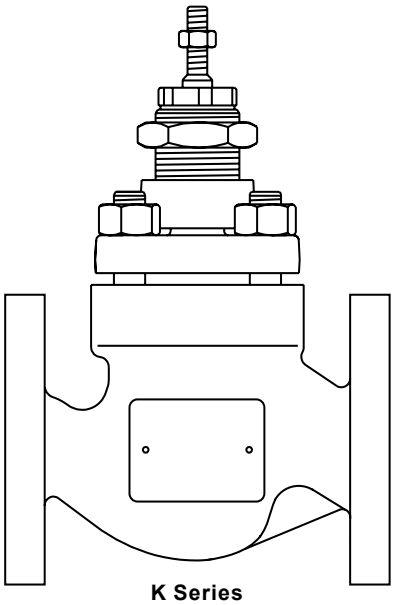
Spira-trol™ is a range of two-port single seat globe valves with cage retained seats conforming to EN standard. These valves are available in four body materials in sizes ranging from DN15 to DN100 (½" to 4"). When used in conjunction with a pneumatic or electric linear actuator they provide characterised modulating or on / off control.

Important note: Throughout this document, reference has been made to the standard KE or LE control valve. With the exception of trim type, the KE, LE, KF, LF, KL and LL control valves are identical.

BSP threaded connections are to standard BSP T Rp (ISO 7-1).



L Series
DN15 to DN100 **(½" to 4")**



K Series
DN15 to DN100 (½" to 4")

Sizes and pipe connections

Valve Series	Material	Screwed	Flanged					
		BSP	PN16	PN16	PN25	PN40	JIS/KS10	JIS/KS20
		Up to DN50 (2")	DN65 and DN100 (2½" and 4") [1]	DN15-DN100 (½" to 4")				
L Series	Cast Iron	●		●				
	Carbon Steel			●			●	
	Stainless Steel			●			●	
K Series	SG Iron	●	●		●		●	
	Carbon Steel					●		●
	Stainless Steel	●				●		●

[1] For others size use PN25 body which are dimensionally identical to PN16.

12.1
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Compliance

The Spira-trol™ control valve when coupled to the PN9000 series or AEL7 actuator (as defined in the technical information sheets TI-P357-30 and TI-P713-02) complies with the requirements of Machinery Directive 2006/42EC. Please refer to the installation and maintenance instructions for the PN9000 series (IM-P357-29) and the Spira-trol™ valve (IM-S24-42) and the AEL7 (IM-P713-01) for potential hazards and safety information relating to the installation, commissioning, maintenance and disposal of the product assembly and its component parts.

Standards

Designed in accordance with EN 60534. This product fully complies with the requirements of the European Pressure Equipment Directive 2014/68/EU and carries the CE mark when so required.

Certification

This product is available with certification to EN 10204 3.1.
Note: All certification/inspection requirements must be stated at the time of order placement.

Food contact

This product is not to be used on steam, liquid or gas that either forms an ingredient of, or comes into direct contact with food products in the EU.

For up to date information on product compliance please visit : **www.spiraxsarco.com/product-compliance**

Spira-trol™ valve characteristic - options:

KE and **LE**	**Equal percentage (E) -** Suitable for most modulating process control applications providing good control at all flowrates.
KF and **LF**	**Fast opening (F) -** For on/off applications only.
KL and **LL**	**Linear (L) -** Primarily for liquid flow control where the differential pressures across the valve is constant.

Spira-trol™ valve options:

Stem sealing	**PTFE chevron seals (P-N)**	Standard	
	Graphite packing (H)	High temperature applications	
	Bellows/graphite secondary seals (D)	Zero emissions and high temperature applications	PN25 - Up to 400 °C (752 °F)
Seating	**Metal-to-metal**	431 stainless steel - standard	
		316L stainless steel	
	Soft seating	Up to 152 °C (305.6 °F) - PTFE for Class VI shut-off for low temperature applications.	
		Up to 220°C (428 °F) - PEEK (C and P) for Class VI shut-off	
	Hard facing	316L stainless steel with Stellite™ 6 facing	
Bonnet type	Standard bonnet		
	Extended bonnet for hot/cold applications (Only available on K Series)		
Trim	Standard trim		
	Low noise and anti-cavitation trim (see TI-S24-59). Not available with Reverseable PEEK Seat (C)		

Spira-trol™ is a modular valve based on 4 body sizes covering DN15-100 (DN15-25, DN32-50, DN65-80, DN100) sizes in order to reduce the number of spare parts. The valves are available with a range of accessories including actuators, positioners, solenoid valves, limit switches.

12.1
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Please refer to respective data sheets.

For Special trims please refer to	TI-S24-59
For ASME version please refer to	TI-S24-72
For smart positioner please refer to	TI-P706-01, TI-P706-04 and TI-P707-02
For pneumatic positioners please refer to	TI-P704-01
For electro-pneumatic positioners please refer to	TI-P703-01 and TI-P703-03
For large size Spira-trol™ please refer to	TI-S24-73

Materials - DN15 to DN100 (½" to 4")

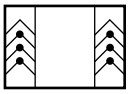
		LE3		KE7	LE-KE4		LE-KE6	
		DN15-50 (½"-2")	DN65-100 (2½"-4")	DN15-100 (½"-4")	DN15-50 (½"-2")	DN65-100 (2½"-4")	DN15-50 (½"-2")	DN65-100 (2½"-4")
1	**Body**	EN1563 : ENGJS-400-18		EN1563 : ENGJS-400-18LT	EN10273 : 1.0460	EN10213 : 1.0619N	EN10213 : 1.4408	
2	**Bonnet**	EN1563 : ENGJS-400-18	EN1561 : ENGJL-250	EN1563 : ENGJS-400-18LT	EN10213 : 1.0619N		EN10213 : 1.4408	
2a	**Bonnet extension**	EN10213 : 1.0619N					EN10213 : 1.4408	
2b	**Bellows**	Stainless steel 316L						
2c	**Extended bonnet**	EN10213 : 1.0619N					EN10213 : 1.4408	

Alternative body and bonnet material available on request

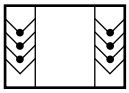
*** Graphite packing**

High temperature packing	**9** **16**	Lower and upper stem guide	Stelite 6
	14	Grafoil packing	Graphite rings
	10, 11, 12, 15, 17 and **19** Not used		

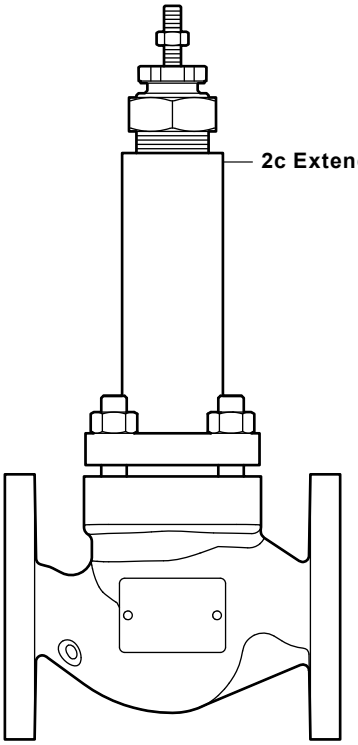
*** PTFE stem sealing**

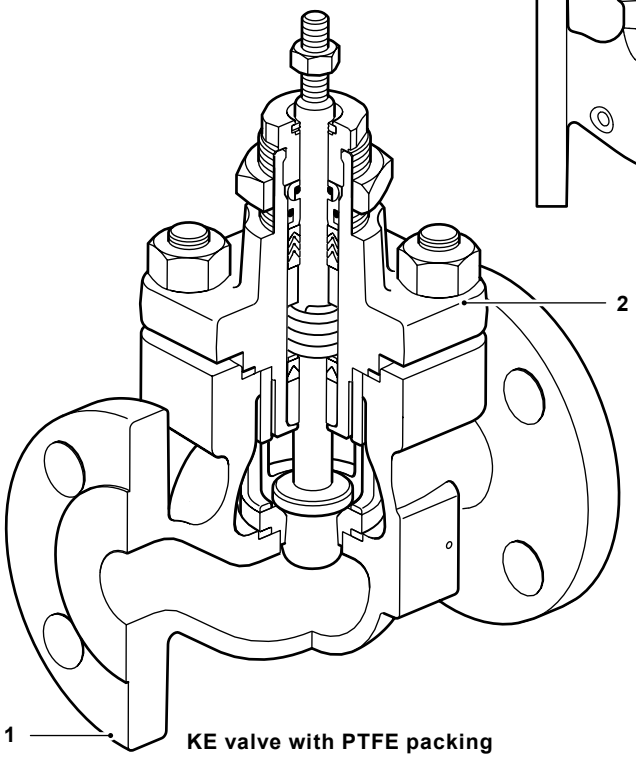


PTFE stem sealing for vacuum service

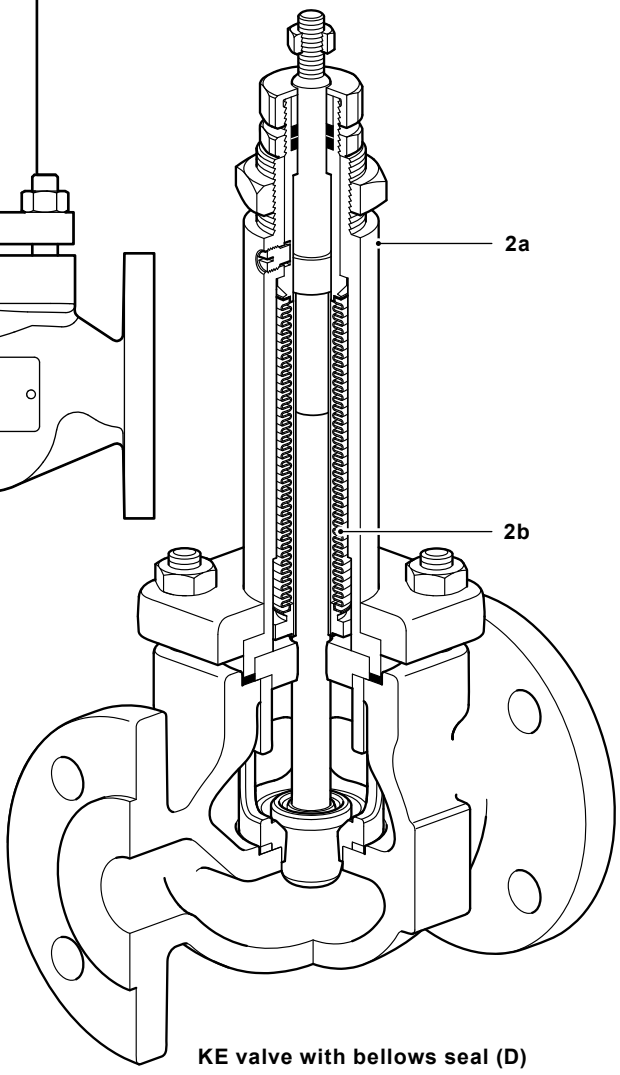


KE valve with extended bonnet (E)





KE valve with PTFE packing

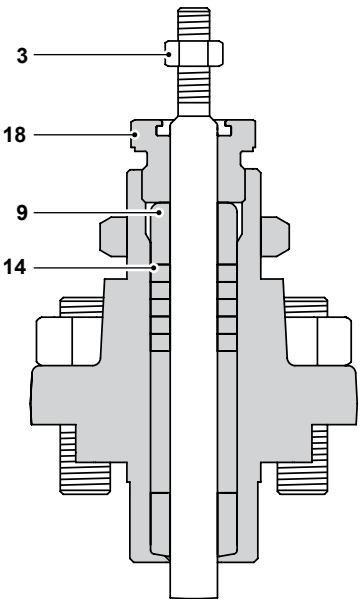


KE valve with bellows seal (D)

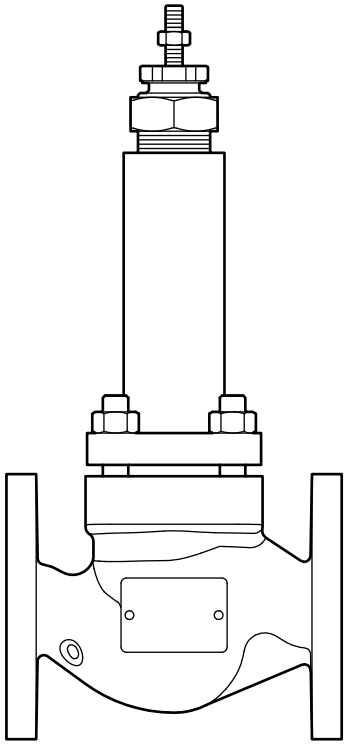
Materials - DN15 to DN100 (½" to 4") continued

3	Stem lock-nut			Stainless steel A2-70
4	Bonnet gasket			Graphite and stainless steel
5	Seat retainer			Duplex stainless steel ASME A994 CD4MCuN
6	Valve seat ring	Seat option	T	Stainless steel 431
		Seat option	S	Stainless steel 316L
		Seat option	W	Stainless steel 316L + Stellite™ 6
		Seat option	C and P	PEEK
		Seat option	G	Stainless Steel 316L + PTFE
7	Seat gasket			Graphite and stainless steel
8	Valve plug and stem	Seat option	T	Stainless steel 431
		Seat option	S	Stainless steel 316L
		Seat option	W	Stainless steel 316L + Stellite™ 6
		Seat option	C/G/P	Stainless steel 316L for stainless steel valve and Stainless steel 431 for all other materials
9	Lower stem guide	Bonnet option	P	PTFE glass filled
		Bonnet option	N	Nitronic™ 60
		Bonnet option	H	Stellite™ 6
10	Lower stem wiper	Bonnet option	P - N	PTFE
11	Packing guard washer			Stainless steel 316L
12	Spring	Bonnet option	P - N	Stainless steel 316L
13	Packing spacer			Stainless steel 316L
14	Packing set	Bonnet option	P - N	PTFE chevron
		Bonnet option	H	Graphite rings
15	Outer 'O' ring	Bonnet option	P - N	VITON™
16	Upper stem guide	Bonnet option	P	PTFE glass filled
		Bonnet option	N	Nitronic™ 60
		Bonnet option	H	Stellite™ 6
17	Inner 'O' ring	Bonnet option	P - N	VITON™
18	Gland nut			Stainless steel 316L for stainless steel valve and stainless steel 431 for all others materials
19	Scrapper ring	Bonnet option	P - N	PTFE
20	Actuator clamp nut	Stainless steel valve		Nickel plated carbon steel
		All others		Zinc plated carbon steel
22	Bonnet extension gasket			Graphite and stainless steel
26	Spindle lock and anti-rotation nut			Stainless steel
27	Nut	Bolting option	S	Stainless steel A2-70 for stainless steel valve and carbon steel Gr.8 for all others
		Bolting option	H	Stainless steel A2-70
28	Stud	Bolting option	S	Stainless steel A2-70 for stainless steel valve and carbon steel 8.8 for all others
		Bolting option	H	Stainless steel A2-70

KE valve with graphite packing



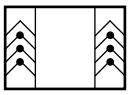
KE valve with extended bonnet (E)



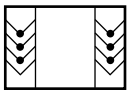
*** Graphite packing**

High temperature packing	**9** **16**	Lower and upper stem guide	Stelite 6
	14	Grafoil packing	Graphite rings
	10, 11, 12, 15, 17 and **19** **Not used**		

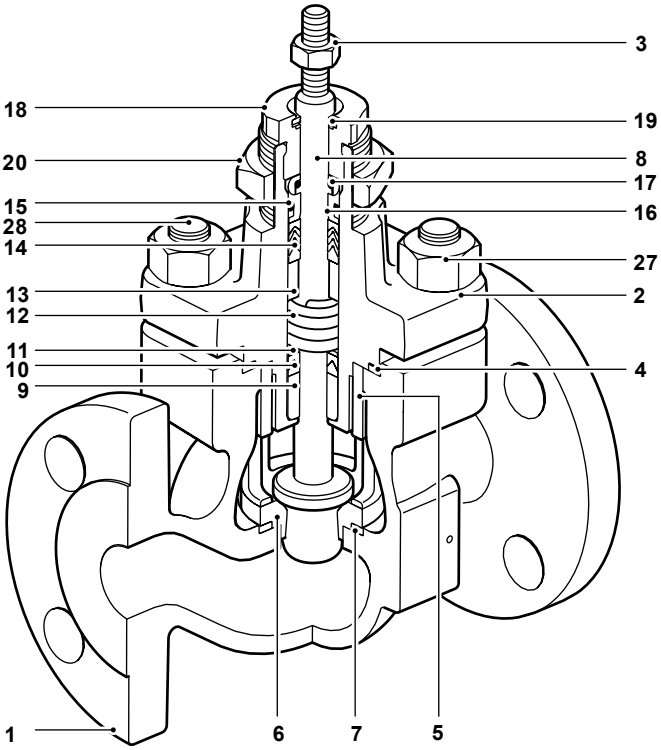
*** PTFE stem sealing**

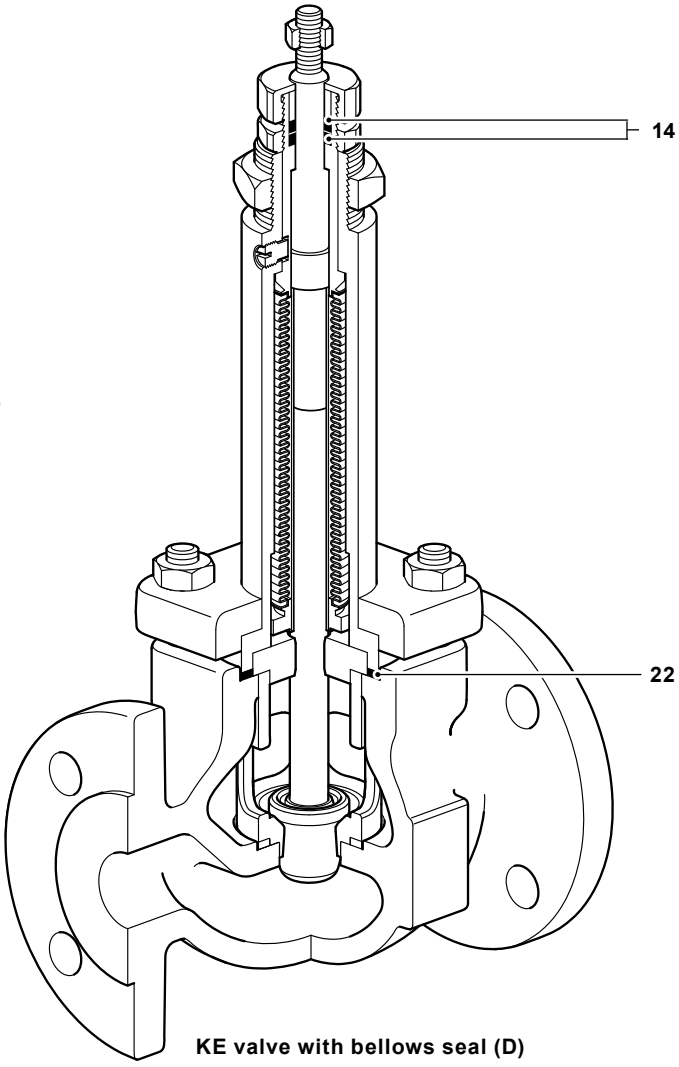


PTFE stem sealing for vacuum service



KE valve with PTFE packing





KE valve with bellows seal (D)

K_V values

Valve size			DN15 (½")	DN20 (¾")	DN25 (1")	DN32 (1¼")	DN40 (1½")	DN50 (2")	DN65 (2½")	DN80 (3")	DN100 (4")
High capacity		Equal %	4.9	7.2		17.5	31.0	46.0			
Standard trim	**Full port**	Equal %	4.0	6.3	10.0	16.0	25.0	36.0	73	100	160
		Linear	4.0	6.3	10.0	16.0	25.0	36.0	73	100	160
		Fast opening	4.9	7.2	11.0	18.0	31.0	50.0	90	117	180
	Reduced trim 1	Equal %	2.5	4.0	6.3	10.0	16.0	25.0	36	73	100
		Linear	2.5	4.0	6.3	10.0	16.0	25.0	36	73	100
	Reduced trim 2	Equal %	1.6	2.5	4.0	6.3	10.0	16.0	25	36	63
		Linear	1.6	2.5	4.0	6.3	10.0	16.0	25	36	63
	Reduced trim 3	Equal %	1.0	1.6	2.5	4.0	6.3	10.0	16	25	36
		Linear	1.0	1.6	2.5	4.0	6.3	10.0	16	25	36
	Reduced trim 4	Equal %		1.0	1.6		4.0	6.3		16	
		Linear		1.0	1.6		4.0	6.3		16	
	Reduced trim 5	Equal %			1.0			4.0			
		Linear			1.0			4.0			
Microflute (Linear only) (not available with C Seat option)			0.5	0.5	0.5						
			0.2	0.2	0.2						
			0.1	0.1	0.1						
			0.07	0.07	0.07						
			0.01	0.01	0.01						

Note: For low noise and anti-cavitation K_V please see TI-S24-59

Bellows D Service Life Expectancy

Valve			Process		Estimated life expectancy (operations)	
Inlet Size	**Stem Ø**	**No. Ply**	**Pressure**	**Temperature**	**100% Stroke**	**25-75% modulation**
DN15-50 (½"-2")	12 mm (0.47")	3	10.6 bar g (153.7 psi g)	20 °C (68 °F)	220,000	>2,000,000
			10.6 bar g (153.7 psi g)	185 °C (365 °F)	150,000	>2,000,000
			17.1 bar g (247.9 psi g)	400 °C (752 °F)	30,000	750,000
DN65-100 (2½"-4")	16 mm (0.63")	3	10.6 bar g (153.7 psi g)	20 °C (68 °F)	200,000	>2,000,000
			10.6 bar g (153.7 psi g)	185 °C (365 °F)	140,000	2,000,000
			17.1 bar g (247.9 psi g)	400 °C (752 °F)	30,000	150,000

Note: 316L material. Refer to IM-S24-42 for valve body material pressure and temperature limitations

For Full Temperature/Pressure Operating Curves, please refer to IM-S24-42

Spira-trol series valve

Nominal Pressure			PN16	PN25	PN16	PN40	PN16	PN40
Body Material			LE3	KE7	LE4	KE4	LE6	KE6
Connection type	Flanged	PN16	DN15-100 (½"-4")	DN65 and 100 (2½"-4")	DN15-100 (½"-4")		DN15-100 (½"-4")	N/A
		PN25		DN15-100 (½"-4")				
		PN40				DN15-100 (½"-4")		DN15-100 (½"-4")
		JIS/ KS10		DN15-100 (½"-4")	DN15-100 (½"-4")		DN15-100 (½"-4")	N/A
		JIS/ KS20				DN15-100 (½"-4")		DN15-100 (½"-4")
	Threaded	BSP	DN15-50 (½"-2")				DN15-50 (½"-2")	
Maximum operating pressure	Flanged	PN16	16 bar @ 120 °C (232 psi @ 248 °F)		16 bar @ 50 °C (232 psi @ 122 °F)		16 bar @ 100 °C (232 psi @ 212 °F)	
		PN25		25 bar @ 120 °C 362 psi @ 248 °F)				
		PN40				40 bar @ 50 °C (580 psi @ 122 °F)		40 bar @ 100 °C (580 psi @ 212 °F)
		JIS/ KS10		13.7 bar @ 120 °C (199 psi @ 248 °F)	14 bar @ 120 °C (203 psi @ 248 °F)		14 bar @ 120 °C (203 psi @ 248 °F)	
		JIS/ KS20				34 bar @ 120 °C (493 psi @ 248 °F)		34 bar @ 120 °C (493 psi @ 248 °F)
	Threaded	BSP	16 bar @ 120 °C 232 psi @ 248 °F)	25 bar @ 120 °C (362 psi @ 248 °F)				40 bar @ 100 °C (580 psi @ 212 °F)
Maximum operating temperature Seat	PEEK	C and P	220 °C (428 °F)					
	PTFE insert	G	152 °C (305 °F)					
	431S29	T	400 °C (752 °F)					
	316L	S						
	316L/ Stellite6	W						
Operating temperature range		Std. Bonnet	-10 to +300 °C (14 to 572 °F)					
		Ext. Bonnet		-10 to +350 °C (14 to 662 °F)		-10 to +400 °C (14 to 752 °F)		-10 to +400 °C (14 to 752 °F)

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Spira-trol series valve (continued on next page)

Spira-trol series valve (continued)

				Body Material	LE3	KE7	LE4	KE4	LE6	KE6
Maximum operating temperature	Stem Seal	P and N			250 °C (482 °F)					
		H			400 °C (752 °F)					
		Bellows D								
Maximum operating temperature		Flanged	PN16		300 °C (572 °F)	350 °C (662 °F)	400 °C (752 °F)		400 °C (752 °F)	
			PN25			350 °C (662 °F)				
			PN40					400 °C (752 °F)		400 °C (752 °F)
			JIS/KS10			300 °C (572 °F)			300 °C (572 °F)	
			JIS/KS20					400 °C (752 °F)		400 °C (752 °F)
		Threaded	BSP		300 °C (572 °F)	350 °C (662 °F)	400 °C (752 °F)			
Maximum saturated steam service	Body	Flanged	PN16		12.9 bar g (187 psi g)	14.6 bar g (212 psi g)	13.3 bar g (193 psi g)		13.4 bar g (194 psi g)	
			PN25			22.5 bar g (326 psi g)				
			PN40					31.1 bar g (451 psi g)		32.2 bar g (467 psi g)
			JIS/KS10			12.4 bar g (180 psi g)	13 bar g (189 psi g)	N/A	13 bar g (189 psi g)	
			JIS/KS20					30.1 bar g (437 psi g)		30.1 bar g (437 psi g)
		Threaded	BSP		12.9 bar g (187 psi g)	22.5 bar g (326 psi g)				32.2 bar g (467 psi g)
	Seat	C and P			19 bar g (276 psi g)					
		G			4 bar g (58 psi g)					
	Bellows	D			12.9 bar g (187 psi g)	22.5 bar g (326 psi g)	13.3 bar g (193 psi g)	20.2 bar g (293 psi g)	13.4 bar g (194 psi g)	20.6 bar g (299 psi g)
Leakage class	In accordance to IEC 60534-4		PEEK		Class VI					
			PTFE							
			Metal		Class IV (Class V on request)					
			Stellite™							
			Balanced		Class IV					
Characteristic					Equal %		Linear		Fast Acting	
Rangeability					50 : 1		30 : 1		10 : 1	
Travel					DN15 to DN50 (½" to 2"): 20 mm (0.79") DN65 to DN100 (2½" to 4"): 30 mm (1.18")					

Note: Consider the limitation of all of the constructive components when selecting a valve

Maximum differential pressures for Class IV shut-off in bar g (psi g)
- Metal Seated (T&S)
- FLOW UNDER
- standard trim
- (Pneumatic Actuators)

Acuator Type	Valve DN	DN15 to DN25 (½" to 1")																													
	Kvs	0.01-0.07-0.1-0.2			0.5-1.0			1.6			2.5			4.0			4.9-6.3			7.2			10			11		
	Stem sealing	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D
	Actuator thrust in N (lbf)																												
PN9120E 0.2-1.0	192 (43)	40 (580)																											
PN9120E 0.4-1.2	384 (86)	40 (580)		25 (363)	40 (580)		17.6 (255)	26.5 (384)		0.6 (9)	12.2 (178)			5.1 (74)															
PN9126E 1.0-2.0	960 (216)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	27.8 (403)	12.9 (187)	21.3 (308)	20.5 (297)	8.7 (126)	15.4 (223)	15.4 (223)	5.8 (84)	11.2 (162)	11.4 (165)	3.7 (54)	8 (116)
PN9123E 2.0-4.0	1920 (432)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	36.4 (528)	25 (363)	36.2 (525)	28.5 (413)	25 (363)

Maximum differential pressures for Class IV shut-off in bar g (psi g)
- Metal Seated (T&S)
- FLOW UNDER
- standard trim
- (Pneumatic Actuators)
- continued

Actuator type	Valve size		DN32 to DN50 DN32 to DN50 (1 ¼" to 2")																													
	Kvs		4.0			6.3			10			16			17.5 - 18			25			31-36			46-50								
	Stem sealing		N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D						
	Actuator thrust in N (lbf.)																															
PN9120E 0.4-1.2	384 (84)		7.9 (115)																													
PN9126E 1.0-2.0	960 (216)		40 (580)	31.5 (457)	25 (363)	30.3 (439)	15.4 (223)	23.8 (345)	17.4 (252)	7.8 (113)	13.2 (191)	13.5 (196)	5.6 (81)	10.1 (146)	9.5 (138)	3.4 (49)	6.9 (100)	3.6 (52)	0.3 (4)	2.2 (32)	2.3 (33)	1.2 (17)	1 (15)								
PN9123E 2.0-4.0	1290 (290)		40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	38.4 (560)	25 (363)	38.8 (563)	30.9 (448)	25 (363)	29.1 (422)	23 (334)	25 (363)	14.2 (206)	10.9 (158)	12.7 (184)	10.8 (157)	8.1 (117)	9.6 (139)	7 (102)	5.1 (74)	6.2 (90)						
PN9220E 0.2-1.0	680 (153)		33.2 (482)	7.6 (110)	22.1 (321)	16.3 (236)	1.4 (20)	9.9 (144)	8.5 (123)		4.3 (62)	6.2 (90)		2.7 (39)	3.8 (55)		1.2 (17)	0.5 (7)														
PN9220E 0.4-1.2	1360 (306)		40 (580)	40 (580)	25 (363)	40 (580)	35.2 (511)	25 (363)	40 (580)	20.6 (299)	25 (363)	24.1 (350)	16.2 (335)	20.6 (299)	17.7 (257)	11.6 (168)	15 (218)	8 (116)	4.7 (68)	6.6 (96)	5.8 (84)	3.2 (46)	4.7 (68)	3.5 (51)	1.6 (23)	2.7 (39)						
PN9226E 1.0-2.0	3400 (764)		40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	30.5 (442)	27.2 (395)	25 (363)	23.8 (345)	21.2 (307)	22.7 (329)	16.3 (236)	14.4 (209)	15.5 (225)						
PN9223E 2.0-4.0	6800 (1439)		40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	37.7 (547)	35.8 (519)	25 (363)						

Maximum differential pressures for Class IV shut-off in bar g (psi g)
- Metal Seated (T&S)
- FLOW UNDER
- standard trim
- (Pneumatic Actuators)
- continued

Actuator Type	Valve size		DN65 to 100 (2½" to 4")																					
	Kvs		16			25			36			63-73-90			100-117			160-180						
	Stem sealing	Actuator thrust in N (lbf.)	P	H	D	P	H	D	P	H	D	P	H	D	P	H	D	P	H	D	P	H	D	
PN9230E 0.2-1.0	680 (153)		2.8 (41)		1.2 (17)																			
PN9230E 0.4-1.2	1360 (306)		16.6 (241)	6.3 (91)	15 (218)	5.4 (78)	0.9 (13)	4.7 (68)	3.2 (46)		2.7 (39)	0.9 (13)		0.7 (10)											
PN9236E 1.0-2.0	3400 (764)		40 (580)	40 (580)	25 (363)	23.4 (339)	18.9 (274)	22.7 (329)	16 (232)	12.8 (186)	15.5 (225)	8.2 (119)	6.4 (93)	7.9 (115)	4.7 (68)	3.5 (51)	4.5 (65)	2.5 (36)	1.8 (26)	2.4 (35)				
PN9233E 2.0-4.0	6800 (1529)		40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	37.4 (542)	34.2 (496)	21 (305)	20.2 (293)	18.4 (267)	19.9 (289)	12.4 (180)	11.2 (162)	12.2 (177)	7.3 (106)	6.6 (96)	7.2 (104)				
PN9330E 0.2-1.0	1340 (301)		16.2 (234)	5.9 (86)	14.6 (212)	5.2 (75)	0.7 (10)	4.5 (65)	3 (44)		2.5 (36)	0.9 (13)		0.6 (9)	3.1 (45)	1.9 (28)	2.9 (42)	1.5 (22)	0.7 (10)	1.4 (20)				
PN9330E 0.4-1.2	2680 (602)		40 (580)	33.2 (482)	25 (363)	17 (247)	12.5 (181)	16.3 (236)	11.5 (645)	8.3 (120)	11 (160)	5.6 (81)	3.8 (55)	5.3 (77)	3.1 (45)	1.9 (28)	2.9 (42)	1.5 (22)	0.7 (10)	1.4 (20)				
PN9336E 1.0-2.0	6700 (1506)		40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	36.7 (532)	33.5 (486)	25 (363)	19.8 (287)	18 (261)	19.5 (283)	12.2 (108)	11 (160)	12 (174)	7.1 (103)	6.4 (93)	7 (102)				
PN9337E 2.5-3.5	16750 (3766)		40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	34.9 (506)	33.8 (490)	25 (363)	21.3 (304)	20.6 (299)	21.2 (307)				

Maximum differential pressures for Class IV shut-off in bar g (psi g)
- Metal Seated (T&S)
- FLOW UNDER
- standard trim
- (Electric Actuators)

Acuator Type	Valve DN	DN15 to DN25 (½" to 1")																													
	Kvs	Up to 0,2			0.5-1.0			1.6			2.5			4.0			4.9-6.3			7.2			10			11					
	Stem sealing	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D			
	Actuator thrust in N (lbf.)																														
AEL3	2000 (450)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	38.9 (564)	25 (363)	38.3 (555)	30.5 (442)	25 (363)			
AEL71T	900 (202)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	39.7 (576)	25 (363)	40 (580)	24.2 (351)	25 (363)	40 (580)	24.8 (360)	18.3 (265)	18.1 (263)	6.3 (91)	13 (189)	13.5 (196)	3.9 (57)	9.3 (135)	9.9 (144)	2.1 (30)	6.5 (94)			
AEL71	1200 (270)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	39.7 (576)	25 (363)	29.9 (434)	18.1 (263)	24.8 (360)	23 (334)	13.5 (196)	18.9 (274)	17.6 (255)	9.9 (144)	14.2 (206)			
AEL72/82	2000 (450)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	38.9 (564)	25 (363)	38.3 (555)	30.5 (442)	25 (363)			
AEL72T	2100 (472)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	33.1 (480)	25 (363)			
AEL73	4000 (899)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)			
AEL83	4500 (1012)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)			

Maximum differential pressures for Class IV shut-off in bar g (psi g)
- Metal Seated (T&S)
- FLOW UNDER
- standard trim
- (Electric Actuators)
- continued

Actuator type	Valve size		DN32 to DN50 (1¼" to 2")																									
	Kvs	Stem sealing	4.0			6.3			10			16			17.5 - 18			25			31-36			46-50		
	Actuator thrust in N (lbf.)		N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D
AEL3	2000 (450)		40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	33 (479)	25 (363)	30.7 (445)	24.6 (357)	25 (363)	15 (218)	11.7 (170)	13.6 (197)	11.5 (167)	8.8 (128)	10.3 (149)	7.5 (109)	5.6 (81)	6.7 (93)
AEL71T	900 (202)		40 (580)	26.4 (383)	25 (363)	27.3 (396)	12.4 (180)	20.8 (302)	15.5 (225)	5.9 (86)	11.3 (164)	12 (174)	4.1 (59)	8.5 (123)	8.3 (120)	2.2 (32)	5.6 (81)	2.9 (42)		1.5 (21.8)	1.8 (26)		0.6 (9)	0.6 (9)			
AEL71	1200 (270)		40 (580)	40 (580)	25 (363)	40 (580)	27.3 (396)	25 (363)	25 (363)	15.5 (225)	20.9 (303)	19.8 (287)	12 (174)	16.4 (238)	14.4 (209)	8.3 (120)	11.8 (171)	6.2 (90)	2.9 (42)	4.8 (70)	4.4 (64)	1.8 (26)	3.3 (48)	2.5 (36)	0.6 (9)	1.7 (25)
AEL72/82	2000 (450)		40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	33 (479)	25 (363)	30.7 (445)	24.6 (357)	25 (363)	15 (218)	11.7 (170)	13.6 (197)	11.5 (167)	8.8 (128)	10.3 (149)	7.5 (109)	5.6 (81)	6.7 (93)
AEL72T	2100 (472)		40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	35.6 (516)	25 (363)	32.7 (474)	26.6 (386)	25 (363)	16.1 (234)	12.8 (186)	14.7 (213)	12.4 (180)	9.7 (141)	11.2 (162)	8.1 (117)	6.2 (90)	7.3 (106)
AEL73	4000 (899)		40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	37.1 (538)	33.8 (490)	25 (363)	29.1 (422)	26.5 (384)	25 (363)	20.1 (292)	18.2 (264)	19.3 (180)
AEL74/84	6000 (1349)		40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)
AEL83	4500 1012)		40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)

Maximum differential pressures for Class IV shut-off in bar g (psi g)
- Metal Seated (T&S)
- FLOW UNDER
- standard trim
- (Electric Actuated)
- continued

Actuator Type	Valve size		DN65 to DN100 (2½" to 4")																					
	Kvs		16			25			36			63-73			100-117			160-180						
	Stem sealing		P	H	D	P	H	D	P	H	D	P	H	D	P	H	D	P	H	D	P	H	D	
	Actuator thrust in N (lbf.)																							
AEL71T	900 (202)		7.3 (106)		5.6 (81)	1.3 (19)		0.6 (9)	0.3 (4)															
AEL71	1200 (270)		13.4 (194)	3 (44)	11.8 (171)	4 (58)		3.3 (48)	2.2 (32)		1.7 (25)	0.4 (6)		0.1 (1.5)										
AEL72/82	2000 (450)		29.7 (431)	19.3 (280)	25 (363)	11 (160)	6.6 (96)	10.3 (149)	7.2 (104)	4 (58)	6.7 (97)	3.2 (46)	1.4 (20)	2.9 (42)	1.5 (22)	0.4 (6)	1.3 (19)	0.5 (7)		0.4 (6)				
AEL72T	2100 (472)		31.7 (460)	21.3 (309)	25 (363)	11.9 (173)	7.4 (107)	11.2 (162)	7.8 (113)	4.6 (67)	7.3 (106)	3.6 (52)	1.8 (26)	3.3 (48)	1.7 (25)	0.6 (9)	1.6 (23)	0.6 (9)		0.5 (7)				
AEL73	4000 (899)		40 (580)	40 (580)	25 (363)	28.7 (416)	24.2 (351)	25 (363)	19.8 (287)	16.6 (241)	19.3 (180)	10.3 (149)	8.5 (123)	10 (145)	6 (87)	4.9 (71)	5.9 (86)	3.3 (48)	2.6 (38)	3.2 (46)				
AEL74/84	6000 (1349)		40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	32.3 (468)	29.1 (422)	25 (363)	17.4 (252)	15.6 (226)	17.1 (248)	10.6 (153)	9.4 (136)	10.4 (151)	6.1 (88)	5.4 (78)	6 (87)				
AEL75/85	8000 (1798)		40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	24.4 (354)	22.6 (323)	24.1 (350)	15.1 (219)	13.9 (202)	14.9 (216)	9 (131)	8.2 (119)	8.9 (129)				
AEL76/86	12000 (2698)		40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	38.6 (560)	36.8 (534)	25 (363)	24.2 (351)	23 (334)	24 (348)	14.6 (212)	13.9 (202)	14.5 (210)				
AEL77/87	15000 (3372)		40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	30.9 (448)	29.8 (432)	25 (363)	18.8 (273)	18.1 (263)	18.7 (271)				
AEL78	20000 (4496)		40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	25.9 (376)	25.2 (365)	25 (363)				
AEL83	4500 (1012)		40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	40 (580)	40 (580)	25 (363)	25.9 (376)	25.2 (365)	25 (363)				
Only for 431 trim																								

Maximum differential pressures for Class VI shut-off in bar g (psi g)
- Resilient Seated (P&C)
- FLOW UNDER
- standard trim
- (Pneumatic Actuators)

Actuator Type	Valve size	DN15 to DN25 (½" to 1")																											
	Kvs	0.01-0.07			0.1-0.2			0.5			1.0			1.6			2.5			4.0			4.9-6.3			7.2		
	Stem sealing	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D
	Actuator thrust in N (lbf.)																												
PN9126E 1.0-2.0	960 (216)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	17.6 (255)	19 (276)
PN9123E 2.0-4.0	1920 (432)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)

Actuator Type	Valve size	DN15-25 (½" to 1")					
	Kvs	10			11		
	Stem sealing	N-P	H	D	N-P	H	D
	Actuator thrust in N (lbf.)						
PN9126E 1.0-2.0	960 (216)	19 (276)	13.8 (200)	19 (276)	18.6 (270)	10.9 (158)	15.3 (222)
PN9123E 2.0-4.0	1920 (432)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)

Note : Maximum differential pressure for saturated steam. Refer to Spirax Sarco for other liquids or gases.

Maximum differential pressures for Class VI shut-off in bar g (psi g)
- Resilient Seated (P&C)
- FLOW UNDER
- standard trim
- (Pneumatic Actuators)
- continued

Actuator Type	Valve size	DN32 to DN50 (1¼" to 2")																													
	Kvs	4.0				6.3				10				16				17.5 - 18				25				31-36				46-50			
	Stem sealing	N-P	H	D		N-P	H	D		N-P	H	D		N-P	H	D		N-P	H	D		N-P	H	D		N-P	H	D		N-P	H	D	
	Actuator thrust in N (lbf.)																														
PN9126E 1.0-2.0	960 (216)	19 (276)	19 (276)	16 (232)		19 (276)	19 (276)	16 (232)		19 (276)	13.8 (200)	16 (232)		19 (276)	11.1 (161)	15.6 (226)		14.3 (207)	8.2 (119)	11.7 (170)		7.1 (103)	3.8 (55)	5.7 (83)		5.5 (80)	2.8 (41)	4.3 (62)		3.6 (52)	1.7 (25)	2.8 (41)	
PN9123E 2.0-4.0	1920 (432)	19 (276)	19 (276)	16 (232)		19 (276)	19 (276)	16 (232)		19 (276)	19 (276)	16 (232)		19 (276)	19 (276)	16 (232)		19 (276)	19 (276)	16 (232)		17.7 (257)	14.4 (209)	16 (232)		13.9 (202)	11.3 (164)	12.8 (186)		9.7 (141)	7.8 (113)	8.8 (128)	
PN9220E 0.2-1.0	680 (153)	19 (276)	17.4 (252)	16 (232)		19 (276)	8.9 (129)	16 (232)		14.5 (210)	4.9 (71)	10.3 (149)		11.6 (168)	3.7 (54)	8.2 (119)		8.6 (125)	2.5 (36)	6 (87)		4 (58)	0.7 (10)	2.6 (38)		3 (44)	0.4 (6)	1.9 (28)		1.9 (28)		1.1 (16)	
PN9220E 0.4-1.2	1360 (306)	19 (276)	19 (276)	16 (232)		19 (276)	19 (276)	16 (232)		19 (276)	19 (276)	16 (232)		19 (276)	19 (276)	16 (232)		19 (276)	16.4 (238)	16 (232)		11.5 (167)	8.2 (119)	10.1 (146)		9 (131)	6.4 (93)	7.9 (115)		6.1 (88)	4.3 (62)	5.3 (77)	
PN9226E 1.0-2.0	3400 (967)																									19 (276)	19 (276)	16 (232)		19 (276)	17.1 (248)	16 (232)	

Actuator Type	Valve size	DN65 to 100 (2½" to 4")																							
	K_{vs}	16				25				36				63-73-90				100-117				160-180			
	Stem sealing	P	H	D		P	H	D		P	H	D		P	H	D		P	H	D		P	H	D	
	Actuator thrust in N (lbf.)																								
PN9230E 0.2-1.0	680 (153)	7.6 (11)		6 (87)		2.6 (38)		1.9 (28)		1.6 (23)		1.1 (16)		0.5 (7)		0.3 (4)		0.1 (1)							
PN9230E 0.4-1.2	1360 (306)	19 (276)	11.1 (161)	19 (276)		8.6 (125)	4.1 (59)	7.9 (115)		5.8 (84)	2.6 (38)	5.3 (77)		2.9 (42)	1.1 (16)	2.7 (39)		1.7 (25)	0.5 (7)	1.5 (22)		0.9 (13)	0.1 (1)	0.8 (12)	
PN9236E 1.0-2.0	3400 (967)					19 (276)	19 (276)	19 (276)		18.7 (271)	15.5 (225)	18.2 (264)		10.2 (148)	8.4 (122)	9.9 (144)		6.3 (91)	5.1 (74)	6.1 (88)		3.7 (54)	3 (44)	3.6 (52)	
PN9233E 2.0-4.0	6800 (1529)													19 (276)	19 (276)	19 (276)		14 (203)	12.8 (186)	13.8 (200)		8.5 (123)	7.8 (113)	8.4 (122)	
PN9330E 0.2-1.0	1340 (301)	19 (276)	10.7 (155)	19 (276)		8.4 (122)	3.9 (57)	7.7 (112)		5.7 (83)	2.5 (36)	5.2 (75)		2.9 (42)	1.1 (16)	2.6 (38)		1.6 (23)	0.5 (7)	1.4 (20)		0.8 (11)	0.1 (1)	0.7 (10)	
PN9330E 0.4-1.2	2680 (602)					19 (276)	15.7 (228)	19 (276)		14.1 (205)	10.9 (158)	13.6 (197)		7.6 (110)	5.8 (84)	7.3 (106)		4.7 (68)	3.5 (51)	4.5 (65)		2.7 (39)	2 (29)	2.6 (38)	
PN9336E 1.0-2.0	6700 (1506)													19 (276)	19 (276)	19 (276)		13.8 (200)	12.6 (183)	13.6 (197)		8.4 (122)	7.7 (112)	8.3 (120)	
PN9337E 2.5-3.5	16750 (3766)																					19 (276)	19 (276)	19 (276)	

Note : Maximum differential pressure for saturated steam. Refer to Spirax Sarco for other liquids or gases.

Maximum differential pressures for Class VI shut-off in bar g (psi g)
- Resilient Seated (P&C)
- FLOW UNDER
- standard trim
- (Electric Actuators)

Actuator Type	Valve size	DN15 to DN25 (½" to 1")																			
	Kvs	Upto Kv6.3			7.2			10			11										
	Stem sealing	P	H	D	P	H	D	P	H	D	P	H	D								
	Actuator thrust in N (lbf.)																				
AEL3	2000 (450)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)								
AEL71T	900 (202)	19 (276)	19 (276)	19 (276)	19 (276)	15.2 (220)	19 (276)	19 (276)	11.9 (173)	17.3 (251)	17.1 (248)	9.3 (135)	13.7 (199)								
AEL71	1200 (270)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	17.1 (248)	19 (276)								
AEL72/82	2000 (450)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)								

Actuator Type	Valve size	DN32 to DN50 (1¼" to 2")																			
	Kvs	4			6.3			10			16			17.5-18			25			31-36			46-50		
	Stem sealing	P	H	D	P	H	D	P	H	D	P	H	D	P	H	D	P	H	D	P	H	D	P	H	D
	Actuator thrust in N (lbf.)																								
AEL3	2000 (450)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10 (145)	10.2 (148)	8.3 (120)	9.4 (136)
AEL71T	900 (202)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	17.4 (252)	9.5 (138)	14 (203)	13.1 (190)	7 (102)	10.4 (151)	6.5 (94)	3.2 (46)	5 (73)	4.9 (71)	2.3 (33)	3.8 (55)	3.3 (48)	1.4 (20)	2.4 (35)
AEL71	1200 (270)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	17.4 (252)	19 (276)	19 (276)	13.1 (190)	16.6 (241)	9.8 (142)	6.5 (94)	8.3 (120)	7.6 (110)	4.9 (71)	6.4 (93)	5.1 (74)	3.3 (48)	4.3 (62)
AEL72/82	2000 (450)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	19 (276)	18.6 (270)	15.3 (222)	17.1 (248)	14.6 (212)	12 (174)	13.5 (196)	10.2 (148)	8.3 (120)	9.4 (136)
AEL72T	2100 (472)																15.5 (225)	12.9 (187)		14.6 (212)	12.1 (175)	14.1 (205)	10.8 (157)	8.9 (129)	10 (145)
AEL83	2300 (517) (reduced thrust)																17.3 (251)	14.6 (212)		16.1 (234)	12.1 (175)	16.1 (234)	10.2 (148)	10.2 (148)	11.2 (162)

Note : Maximum differential pressure for saturated steam. Refer to Spirax Sarco for other liquids or gases.

Maximum differential pressures for Class VI shut-off in bar g (psi g)
- Resilient Seated (P&C)
- FLOW UNDER
- standard trim
- (Electric Actuators)
- continued

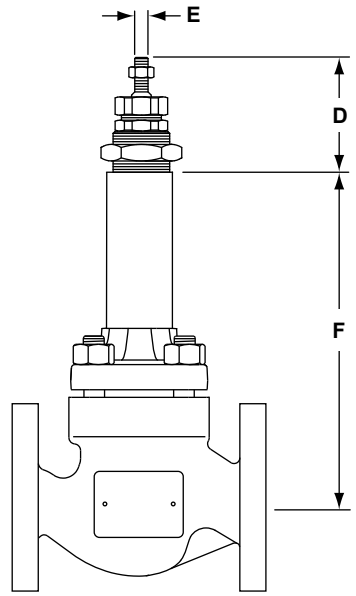
Actuator Type	Valve size		DN65 to DN100 (2½" to 4")																							
	Kvs		16			25			36			63-90			100-117			160-180								
	Stem sealing		P	H	D	P	H	D	P	H	D	P	H	D	P	H	D	P	H	D	P	H	D	P	H	D
	Actuator thrust in N (lbf.)																									
AEL71T	900 (202)		12.1 (175)	1.7 (25)	10.4 (151)	4.5 (65)		3.8 (55)	2.9 (42)		2.4 (35)	1.3 (19)		1 (15)												
AEL71	1200 (270)		18.2 (264)	7.8 (118)	16.6 (241)	7.2 (104)	2.7 (39)	6.4 (93)	4.8 (70)	1.6 (23)	4.3 (62)	2.4 (35)	0.6 (9)	2.1 (30)	1.3 (19)		1.1 (16)	0.6 (9)			0.5 (7)					
AEL72/82	2000 (450)		19 (276)	19 (276)	19 (276)	14.2 (206)	9.7 (141)	13.5 (196)	9.9 (144)	6.6 (96)	9.4 (136)	5.2 (75)	3.4 (49)	4.9 (71)	3.1 (45)	2 (29)	2.9 (42)	1.8 (26)	1 (15)	1.7 (25)						
AEL72T	2100 (472)		15.1 (219)	4.7 (68)	19 (276)	14.2 (206)	9.7 (141)	13.5 (196)	10.5 (152)	7.3 (106)	10 (145)	5.6 (81)	3.8 (55)	5.3 (77)	3.3 (48)	2.2 (32)	3.2 (46)	1.9 (28)	1.2 (17)	1.8 (26)						
AEL73	4000 (899)											12.3 (178)	10.5 (152)	12 (174)	7.6 (110)	6.5 (94)	7.5 (109)	4.6 (67)	3.9 (57)	4.5 (65)						
AEL74/84	6000 (1349)											19 (276)	17.6 (255)	19 (276)	12.2 (177)	11 (160)	12 (174)	7.4 (107)	6.7 (97)	7.3 (106)						
AEL75/85	8000 (1798)														16.7 (242)	15.5 (225)	16.5 (239)	10.2 (148)	9.5 (138)	10.1 (146)						
AEL76/86	12000 (2698)																	15.9 (231)	15.2 (220)	15.8 (229)						
AEL77/87	15000 (3372)																	19 (276)	19 (276)	19 (276)						
AEL83	2300 (517) (reduced thrust)		19 (276)	19 (276)	19 (276)	16.8 (244)	12.3 (178)	16.1 (234)	10.5 (152)	7.3 (106)	10 (145)															
	4500 (1012)											12.3 (178)	10.5 (152)	12 (174)	7.6 (110)	6.5 (94)	7.5 (109)	4.6 (67)	3.9 (57)	4.5 (65)						

Note : Maximum differential pressure for saturated steam. Refer to Spirax Sarco for other liquids or gases.

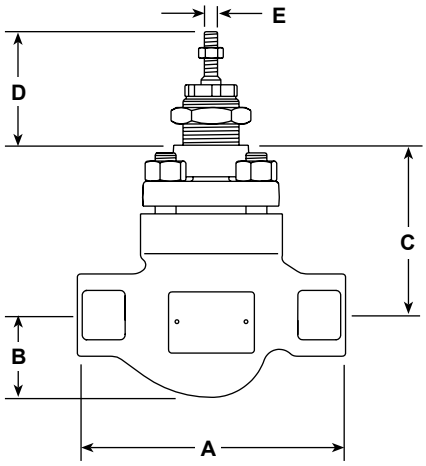
Dimensions for the Spira-trol™ two-port control valve approximate in mm and (inches)

Valve size	Screwed BSP			Flanged				Thread	Bellows seals and extended bonnet	
	A	B	C	A1		C1	D	E	F	
				All (except LE43/LE63 JIS/KS10)	LE43/63 JIS/KS10				mm	inches
DN15 (½")	130 (5.1)	40 (1.6)	103 (4.1)	130 (5.1)	124 (4.9)	103 (4.1)	69 (2.7)	M8	216	8.5
DN20 (¾")	155 (6.1)	45 (1.8)	103 (4.1)	150 (5.9)	144 (5.7)	103 (4.1)			218	8.58
DN25 (1")	160 (6.3)	50 (2.0)	103 (4.1)	160 (6.3)	160 (6.3)	103 (4.1)			214	8.42
DN32 (1¼")	185 (7.3)	60 (2.4)	132 (5.2)	180 (7.1)	176 (7.0)	132 (5.2)			243	9.57
DN40 (1½")	205 (8.1)	65 (2.6)	132 (5.2)	200 (7.9)	198 (7.8)	132 (5.2)				
DN50 (2")	230 (9.1)	80 (3.1)	127 (5.0)	230 (9.1)	222 (8.7)	127 (5.0)			238	9.37
DN65 (2½")				290 (11.4)	290 (11.4)	201 (7.9)	81 (3.2)	M12	351	13.82
DN80 (3")				310 (12.2)	310 (12.2)	201 (7.9)				
DN100 (4")				350 (13.8)	350 (13.8)	216 (8.5)			365	14.37

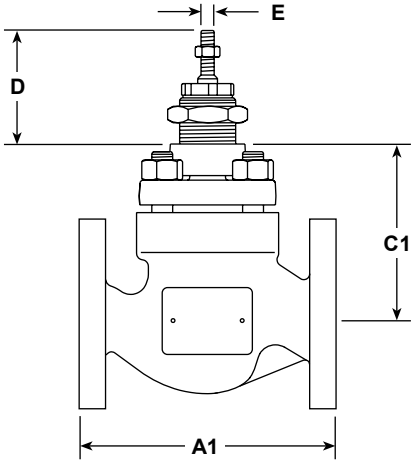
Bellows sealed or extended bonnet version



Screwed version



Flanged version

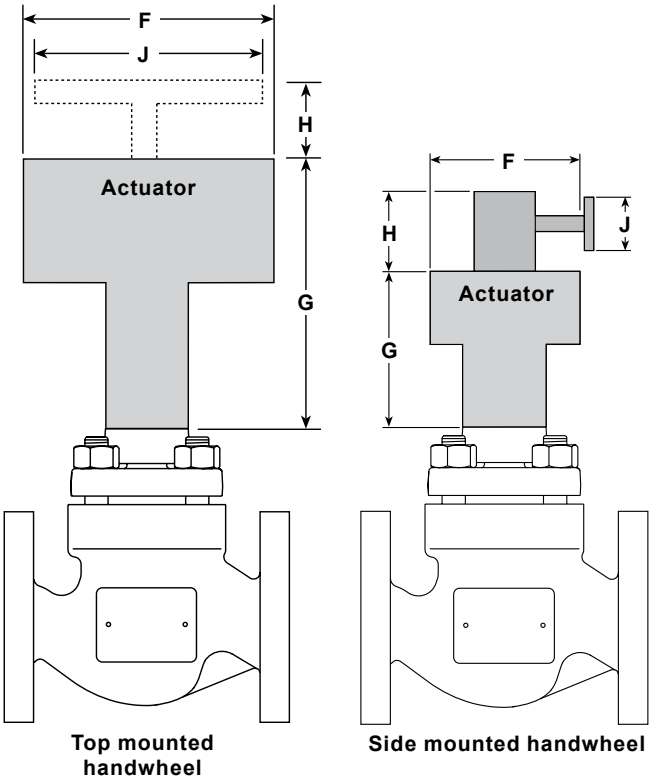


Weights approximate in kg (and lbs)

Valve size	KE valves					LE valves				Additional bellows and Extended bonnet
	KE43	KE61	KE63	KE71	KE73	LE31	LE33	LE43	LE63	
DN15 (½")	6.0 (13)	4.5 (10)	5.5 (12)	4.5 (10)	5.5 (12)	4.0 (9)	5.0 (11)	5.0 (11)	5.0 (11)	4.5 (10)
DN20 (¾")	6.8 (15)	5.5 (12)	6.8 (15)	5.5 (12)	6.8 (15)	5.0 (11)	6.0 (13)	6.0 (13)	6.0 (13)	
DN25 (1")	7.0 (15)	6.0 (13)	7.0 (15)	6.0 (13)	7.0 (15)	5.5 (12)	6.5 (14)	6.5 (14)	6.5 (14)	
DN32 (1¼")	13.5 (30)	11.5 (25)	13.5 (30)	11.5 (25)	13.5 (30)	9.0 (20)	10.0 (22)	10.0 (22)	10.0 (22)	5.5 (12)
DN40 (1½")	14.0 (31)	12.0 (26)	14.0 (31)	12.0 (26)	14.0 (31)	10.0 (22)	12.8 (28)	12.8 (28)	12.8 (28)	
DN50 (2")	17.0 (37)	13.0 (29)	17.0 (37)	13.0 (29)	17.0 (37)	11.0 (24)	15.0 (33)	15.0 (33)	15.0 (33)	
DN65 (2½")	35.0 (77)		35.0 (77)		35.0 (77)	-	32.0 (71)	32.0 (71)	32.0 (71)	10 (21)
DN80 (3")	40.0 (88)		40.0 (88)		40.0 (88)	-	36.0 (79)	36.0 (79)	36.0 (79)	
DN100 (4")	54.0 (119)		54.0 (119)		54.0 (119)	-	53.0 (117)	53.0 (117)	53.0 (117)	13 (28)

Dimensions/weights for the PN actuator range approximate in mm and kgs (inches and lbs)

Actuator range and variants	F		G		H		J		Weight			
									Actuator		With handwheel	
	mm	inches	mm	inches	mm	inches	mm	inches	kg	lbs	kg	lbs
PN9100E	170	6 1/16"	275	10 7/8""	55	2 3/16"	225	8 7/8"	6	13.25	+5.86	+13.00
PN9100R					140	5 1/2"					+2.50	+5.50
PN9200E	300	11 7/8"	300	11 7/8"	55	2 3/16"	225	8 7/8"	17	37.50	+7.20	+15.75
PN9200R					140	5 1/2"					+3.77	+8.50
PN9320E	390	15 1/2"	325	12 7/8"	65	2 9/16"	350	13 3/4"	27	59.50	+7.20	+15.75
PN9320R					150	15 7/8"					+3.77	+8.50
PN9330E	390	15 1/2"	335	13 3/8"	65	2 9/16"	350	13 3/4"	27	59.50	+7.20	+15.75
PN9330R					150	15 7/8"					+3.77	+8.50
TN2100E	405	16"	369	14 1/2"	402	15 53/64"	330	13"	37	83.25	+23.00	+51.75
TN2100R												
TN2100DA	405	16"	369	14 1/2"					30	67.50		



Dimensions/weights for the AEL actuator ranges

approximate in mm and kgs (and in inches and lbs)

Actuator	F		G		Weight	
	mm	inches	mm	inches	kg	lbs
AEL3	230	9	283	11 1/4	5.7	12.5
AEL71T	162	6	490	19 1/4	8.7	19.5
AEL72T			508	20	9.3	20.5
AEL71	129	5	292	11 1/2	2.1	5
AEL72-3	173	7	379	15	4.8	11
AEL74	211	8 1/4	474	18 3/4	8.0	18
AEL75-7	259	10 1/4	527	20 3/4	15.0	33
AEL78	283	11 1/4	657	26	19.0	42
AEL62-3	180	7	459	18	5.0	11
AEL64			490	19 1/4	7.0	15.5
AEL65			557	22	10.0	22
AEL66	226	9	760	30	20.0	44

Spare parts

Spira-trol™ two-port control valve
DN15 to DN100 - ½" to 4"

The spare parts available are shown in solid outline. Parts drawn in a grey line are not supplied as spares.

Note: When placing an order for spare parts please specify clearly the full product description as found on the label of the valve body, as this will ensure that the correct spare parts are supplied.

Available spares - K series

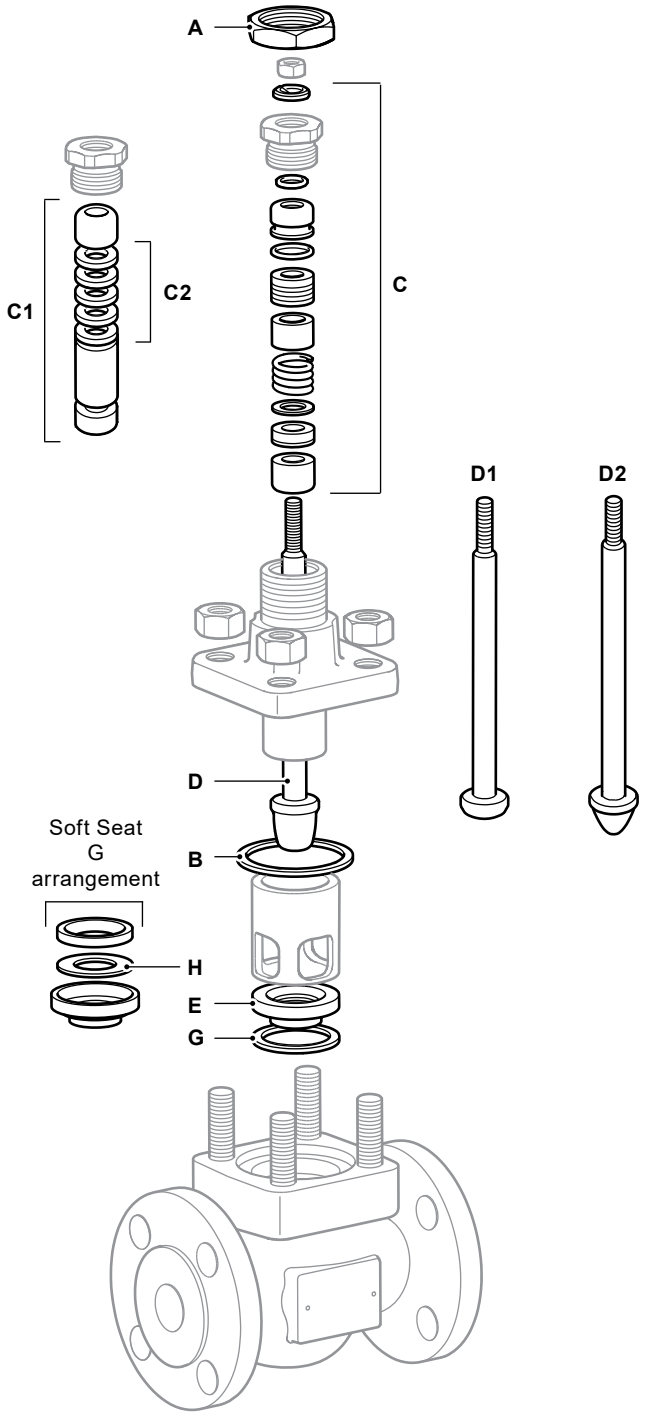
Actuator clamping nut		**A**
Gasket set	(Non-bellows sealed)	**B**, **G**
Stem seal kits	**PTFE** packing	**C**
	Graphite packing	**C1**
	Graphite seal set	**C2**
Plug stem and seat kit	*** Equal percentage trim** (No gaskets supplied)	**D**, **E**
	Fast opening trim (No gaskets supplied)	**D1**, **E**
	Linear trim (No gaskets supplied)	**D2**, **E**
PTFE soft seat seal		**H**

***** Specify if reduced trim.

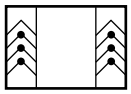
How to order spares
Always order spares by using the description given in the column headed 'Available spares', and state the size and type of valve including the full product description of the product.

Example:
1 - PTFE stem seal kit for a Spirax Sarco DN25 Spira-trol™ two-port KE43 PTSUSS.2 K_V 10 control valve.

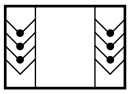
How to fit spares
Full fitting instructions are given in the Installation and Maintenance Instructions supplied with the spare.



*****
PTFE
stem sealing



PTFE
stem sealing for
vacuum service



Spare parts

Spira-trol™ two-port control valve with bellows seal - Type D
DN15 to DN100 - ½" to 4"

The spare parts available are shown in solid outline. Parts drawn in a grey line are not supplied as spares.

Note: When placing an order for spare parts please specify clearly the full product description as found on the label of the valve body, as this will ensure that the correct spare parts are supplied.

Available spares - K series

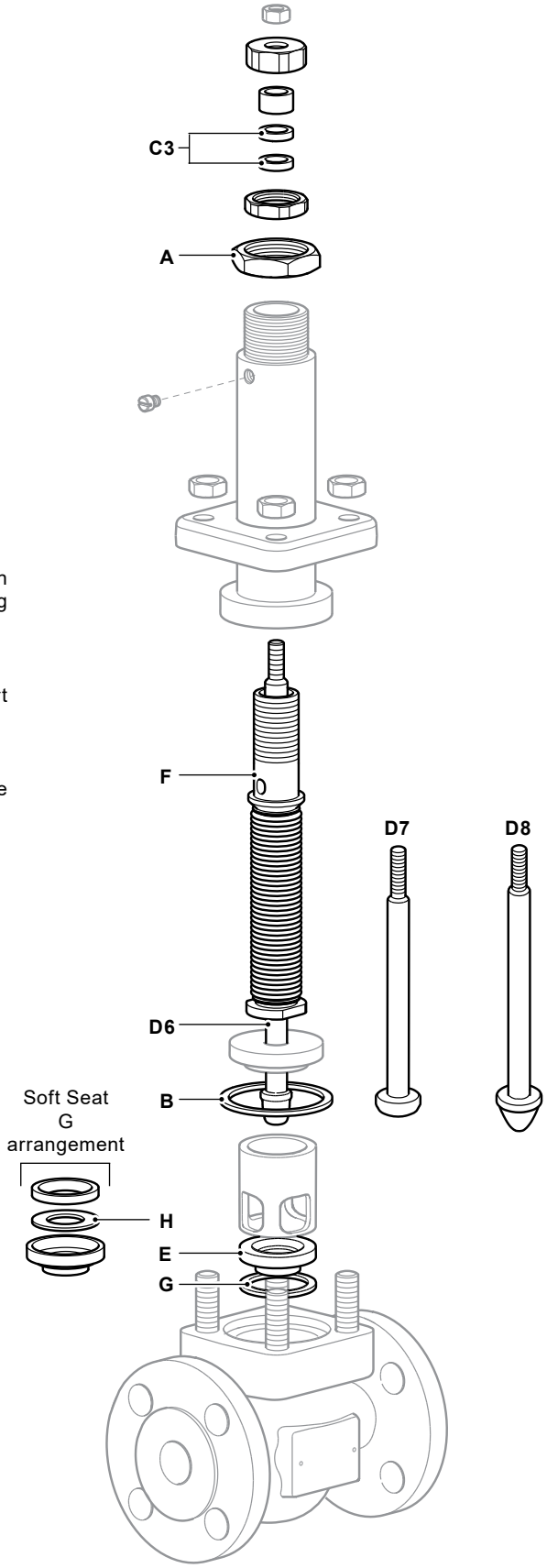
Actuator clamping nut		**A**
Gasket set	(Bellows sealed)	**B, G**
Stem seal kit	**Graphite** secondary seal and gasket set	**C3**
Plug stem and seat kit	***Equal percentage trim** (No gaskets supplied)	**D6, E**
	Fast opening trim (No gaskets supplied)	**D7, E**
	Linear trim (No gaskets supplied)	**D8, E**
Bellows seal assembly		**F**
PTFE soft seat seal		**H**

* Specify if reduced trim.

How to order spares
Always order spares by using the description given in the column headed 'Available spares', and state the size and type of valve including the full product description of the product.

Example:
1 - Graphite stem seal kit for a Spirax Sarco DN25 Spira-trol™ two-port KE43 DTSUSS.2 Kv 10 control valve.

How to fit spares
Full fitting instructions are given in the Installation and Maintenance Instructions supplied with the spare.



Spira-trol™ selection guide:

Valve size	EN standard	= DN15, DN20, DN25, DN32, DN40, DN50, DN65, DN80 and DN100	**DN25**
Valve series	K	= K series 2-port control valve	**K**
	L	= L series 2-port control valve	
Valve characteristic	E	= Equal percentage	**E**
	F	= Fast opening	
	L	= Linear	
Flange type	Blank	= EN (PN)	**Blank**
Flow	Blank	= under	**Blank**
	T	= over	
Body material	3	= Cast iron	**4**
	4	= Carbon steel	
	6	= Stainless steel	
	7	= SG iron	
Connections	1	= Screwed	**3**
	3	= Flanged	
Stem sealing	D	= Bellows/graphite secondary seals	**P**
	H	= Graphite	
	N	= PTFE with Nitronic bush - DN15 to DN50 only	
	P	= PTFE	
	V	= PTFE for vacuum service	
Seating	C	= Steam-Tight Reversible PEEK seat	**T**
	G	= PTFE soft seat	
	P	= Full PEEK	
	S	= 316L stainless steel	
	T	= 431 stainless steel	
	W	= 316L with stellite™ 6 facing	
Type of trim	A1	= 1 stage anti-cavitation	**S**
	A2	= 2 stage anti-cavitation	
	P1	= 1 stage low noise cage	
	P2	= 2 stage low noise cage	
	P3	= 3 stage low noise cage	
	S	= Standard trim	
Trim balancing	B	= Balanced (not available with seating option C)	**U**
	U	= Unbalanced	
Bonnet type	E	= Extended (Only available for K Series)	**S**
	S	= Standard	
Bolting	H	= High temperature	**S**
	S	= Standard	
Series	2	= .2	**.2**
Kvs		To be specified	**Kv 16**
Connection type		To be specified	**Flanged PN40**

Selection example:

DN32	-	**K**	**E**	**4**	**3**	**P**	**T**	**S**	**U**	**S**	**S**		**.2**	-	**Kv 16**	-	**Flanged PN40**

How to order

Example: 1 off Spirax Sarco Spira-trol™ DN32 KE43PTSUSS.2 K_V 16 two-port control valve having flanged PN40 connections.

TI-S24-59
CTLS Issue 7

Balanced and Multi-stage Trim Options for Spira-trol™ Two-port Control Valves

Description

The Spira-trol™ range of two-port valves is available with alternative trim options to make it possible to select a valve configuration to suit an individual application. This Technical Information sheet covers balanced and multi-stage trim options and should be used in conjunction with the appropriate valve Technical Information sheet.

Pressure/temperature limits

Please see the product specific Technical Information (TI) sheet and Installation and Maintenance Instructions (IMI) for valve limitations.

TI-S24-71 (DN15-100 K and L Series - EN)
TI-S24-72 (½" to 4" K and L Series - ASME)
TI-S24-73 (DN125-300 K Series - EN and ASME)
TI-S24-60 (DN15-200 J Series - EN and ASME)

Please refer to IM-S24-42 and IM-S24-61 for safety information related to the installation, commissioning, operation, maintenance and disposal of the products identified in this document.

Seat options DN15 to DN300 (Diameter ½" to 12") Spira-trol™

Trim type	Trim balancing	Seat options					
		T	S	G	W	P	C
Standard parabolic	Un-Balanced	•	•	•	•	•	•
	Balanced (Full KV only)	•	•	•	•	•	
1-Stage Low Noise (P1)	Un-Balanced	•	•	•	•	•	
	Balanced (All KV)	•	•	•	•	•	
2-Stage Low Noise (P2)	Un-Balanced				•	•	
	Balanced (All KV)				•	•	
3-Stage Low Noise (P3)	Un-Balanced				•		
	Balanced (All KV)				•		
1-Stage Anti-Cavitation (A1)	Un-Balanced				•		
	Balanced (All KV)				•		
2-Stage Anti-Cavitation (A2)	Un-Balanced				•		
	Balanced (All KV)				•		

Trim option materials DN15 to DN300 (Diameter ½" to 12") Spira-trol™

Trim type	Trim component	Seat options					
		T	S	G	W	P	C
Standard parabolic	Seat Material	St.St. 431S29	St.St. 316L	PTFE	St.St. 316L + Stellite 6	PEEK	
	Plug Material			St.St. 431S29*		St.St. 431S29*	
	Stem Material				St.St. 316L		
	Cage Material	St.St. 316L (CD_4MCuN for unbalanced version only)					
1-Stage Low Noise (P1)	Seat Material	St.St. 431S29	St.St. 316L	PTFE	St.St. 316L + Stellite 6	PEEK	
	Plug Material			St.St. 431S29*		St.St. 431S29*	
	Stem Material	St.St. 316L		St.St. 316L	St.St. 316L	St.St. 316L	
	Cage Material	St.St. 316L					
2-Stage Low Noise (P2)	Seat Material				316L + Stellite 6	PEEK	
	Plug Material				St.St. 316L + Stellite 6		
	Stem Material				St.St. 316L		
	Cage Material						
3-Stage Low Noise (P3)	Seat Material				St.St. 316L + Stellite 6		
	Plug Material						
	Stem Material				St.St.316L		
	Cage Material						
1-Stage Anti-Cavitation (A1)	Seat Material				St.St. 316L + Stellite 6		
	Plug Material						
	Stem Material				St.St. 316L		
	Cage Material						
2-Stage Anti-Cavitation (A2)	Seat Material				St.St. 316L + Stellite 6		
	Plug Material						
	Stem Material				St.St. 316L		
	Cage Material						

*316L for Stainless Steel valves

Trim type	Trim component	Seat options					
		T	S	G	W	P	C
All Balanced or Multi-Stage Variants	Gasket Material	Reinforced exfoliated graphite					
	Balance Seal Material	Graphite					

Trim Options DN15 to DN50 (Diameter ½" to 2") Spira-trol™

Trim type	Trim balancing	DN15-25 (Ø½" - Ø1")				DN32 (Ø1¼")			
		JE/JEA	KE/KEA	LEA	LE	JE/JEA	KE/KEA	LEA	LE
Standard parabolic	Un-Balanced	•	•	•	•	•	•		•
	Balanced (Full KV only)								
1-Stage Low Noise (P1)	Un-Balanced	•	•	•	•	•	•		•
	Balanced (All KV)					•			
2-Stage Low Noise (P2)	Un-Balanced					•	•		•
	Balanced (All KV)					•			
3-Stage Low Noise (P3)	Un-Balanced					•	•		•
	Balanced (All KV)					•			
1-Stage Anti-Cavitation (A1)	Un-Balanced	•	•	•	•	•	•		•
	Balanced (All KV)					•			
2-Stage Anti-Cavitation (A2)	Un-Balanced					•	•		•
	Balanced (All KV)					•			

Trim type	Trim balancing	DN40-50 (Ø1½" - Ø2")			
		JE/JEA	KE/KEA	LEA	LE
Standard parabolic	Un-Balanced	•	•		•
	Balanced (Full KV only)	•			
1-Stage Low Noise (P1)	Un-Balanced	•	•		•
	Balanced (All KV)	•			
2-Stage Low Noise (P2)	Un-Balanced	•	•		•
	Balanced (All KV)	•			
3-Stage Low Noise (P3)	Un-Balanced	•	•		•
	Balanced (All KV)	•			
1-Stage Anti-Cavitation (A1)	Un-Balanced	•	•		•
	Balanced (All KV)	•			
2-Stage Anti-Cavitation (A2)	Un-Balanced	•	•		•
	Balanced (All KV)	•			

Trim options DN65 to DN100 (Diameter 2½" to 4") Spira-trol™

Trim type	Trim balancing	DN65 (Ø2½")				DN80 (Ø3")			
		JE/JEA	KE/KEA	LEA	LE	JE/JEA	KE/KEA	LEA	LE
Standard parabolic	Un-Balanced	•	•	•	•	•	•	•	•
	Balanced (Full KV)	•	•	•		•	•	•	
	Balanced (Red1 KV)					•	•	•	
1-Stage Low Noise (P1)	Un-Balanced	•	•	•	•	•	•	•	•
	Balanced (All KV)	•	•	•		•	•	•	
2-Stage Low Noise (P2)	Un-Balanced	•	•	•	•	•	•	•	•
	Balanced (All KV)	•	•	•		•	•	•	
3-Stage Low Noise (P3)	Un-Balanced	•	•	•	•	•	•	•	•
	Balanced (All KV)	•	•	•		•	•	•	
1-Stage Anti-Cavitation (A1)	Un-Balanced	•	•	•	•	•	•	•	•
	Balanced (All KV)	•	•	•		•	•	•	
2-Stage Anti-Cavitation (A2)	Un-Balanced	•	•	•	•	•	•	•	•
	Balanced (All KV)	•	•	•		•	•	•	

Trim type	Trim balancing	DN100 (Ø4")			
		JE/JEA	KE/KEA	LEA	LE
Standard parabolic	Un-Balanced	•	•	•	•
	Balanced (Full KV)	•	•	•	
	Balanced (Red1 KV)				
1-Stage Low Noise (P1)	Un-Balanced	•	•	•	•
	Balanced (All KV)	•	•	•	
2-Stage Low Noise (P2)	Un-Balanced	•	•	•	•
	Balanced (All KV)	•	•	•	
3-Stage Low Noise (P3)	Un-Balanced	•	•	•	•
	Balanced (All KV)	•	•	•	
1-Stage Anti-Cavitation (A1)	Un-Balanced	•	•	•	•
	Balanced (All KV)	•	•	•	
2-Stage Anti-Cavitation (A2)	Un-Balanced	•	•	•	•
	Balanced (All KV)	•	•	•	

Trim options DN125+ (Diameter 5"+) Spira-trol™

Trim type	Trim balancing	DN125 to DN200 (Ø5" to Ø8")			DN250 to DN300 (Ø10" to Ø12")		
		JE/JEA	KE/KEA	LE/LEA	JE/JEA	KE/KEA	LE/LEA
Standard parabolic	Un-Balanced	•	•			•	
	Balanced (All KV)	•	•			•	
1-Stage Low Noise (P1)	Un-Balanced	•	•			•	
	Balanced (All KV)	•	•			•	
2-Stage Low Noise (P2)	Un-Balanced	•	•			•	
	Balanced (All KV)	•	•			•	
3-Stage Low Noise (P3)	Un-Balanced	•	•			•	
	Balanced (All KV)	•	•			•	
1-Stage Anti-Cavitation (A1)	Un-Balanced						
	Balanced (All KV)	•	•			•	
2-Stage Anti-Cavitation (A2)	Un-Balanced						
	Balanced (All KV)	•	•			•	

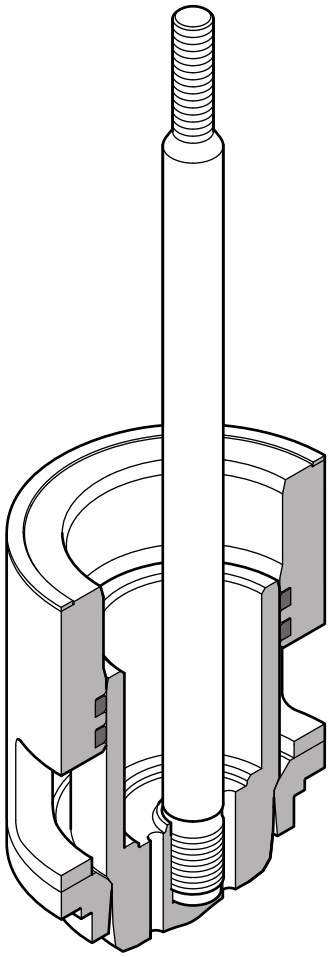
1 Stage Parabolic Balanced Trim

Model availability

DN40 to DN50 (Diameter 1½" to 2") option only available for Spira-trol™ J Series.

Technical data

Trim design		Parabolic
Leakage	Metal-to-metal	Class IV
	Soft seal	Class IV
Rangeability	Equal %	50:1
	Linear	50:1
	Fast	10:1
Travel	DN40 to DN50 (1½" to 2")	20mm (0.8")
	DN65 to DN100 (2½" to 4")	30 mm (1.2")
	DN125 to DN300 (5" to 12")	70 mm (2.8")



1 Stage Parabolic Balanced Trim (continued)

Kv (Cv US) values

For conversion: Cv (UK) = Kv x 0.963

Trim		DN40 (1½")	DN50 (2")	DN65 (2½")	DN80 (3")	DN100 (4")	DN125 (5")	DN150 (6")	DN200 (8")	DN250 (10")	DN300 (12")
Full port	Equal percentage	25 (30)	36 (45)	63 (75)	100 (120)	160 (190)	245 (283)	370 (433)	580 (679)	700 (809)	1 000 (1 156)
	Linear	25 (30)	36 (45)	63 (75)	100 (120)	160 (190)	260 (300)	390 (456)	640 (749)	780 (902)	1 100 (1 272)
Reduction 1	Equal percentage		25 (33)		63 (85)		200 (231)	287 (336)	370 (433)	580 (670)	700 (809)
	Linear		25 (33)		63 (85)		200 (231)	287 (336)	550 (433)	640 (740)	780 (902)
Reduction 2	Equal percentage						100 (116)	132 (154)	232 (271)	370 (428)	580 (670)
	Linear						100 (116)	132 (154)	232 (271)	550 (636)	640 (740)
Reduction 3	Equal percentage						63 (73)	103 (120)	163 (191)	232 (268)	370 (428)
	Linear						63 (73)	103 (120)	163 (191)	232 (268)	550 (636)
Reduction 4	Equal percentage									163 (188)	232 (268)
	Linear									163 (188)	232 (268)
Reduction 5	Equal percentage										163 (188)
	Linear										163 (188)
Fast opening		28 (32)	50 (50)	85 (88)	117 (136)	180 (210)	260 (300)	390 (456)	640 (749)	780 (902)	1 100 (1 272)

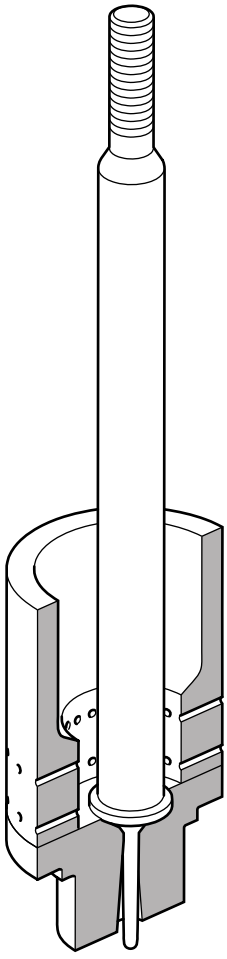
1 Stage Perforated Trim

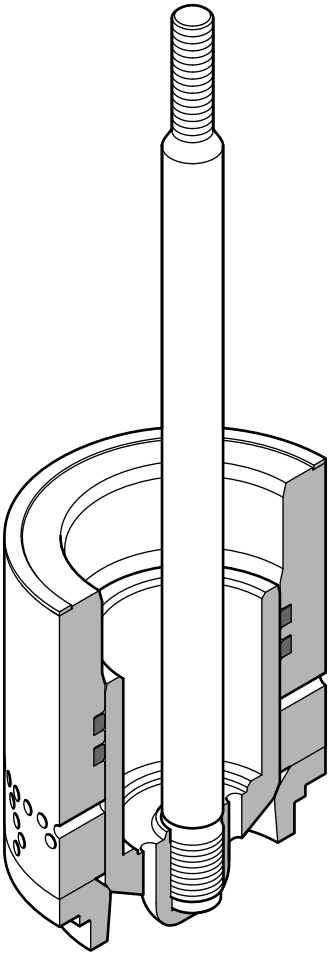
Model availability

Balanced DN40 to DN50 (Diameter 1½" to 2") option only available for Spira-trol™ J Series.

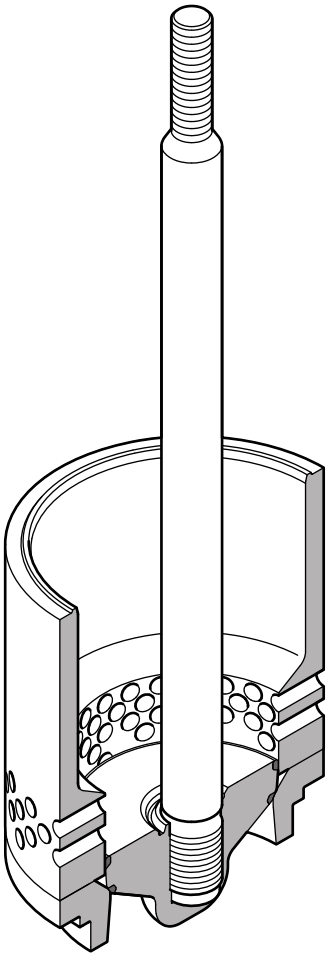
Technical data

Trim design			Perforated
Leakage	Metal-to-metal		Class IV
	Soft seal	Unbalanced	Class VI
		Balanced	Class IV
Rangeability			50:1
Travel	DN40 to DN50 (1½" to 2")		20mm (0.8")
	DN65 to DN100 (2½" to 4")		30 mm (1.2")
	DN125 to DN300 (5" to 12")		70 mm (2.8")





1 stage low noise (P1) balanced trim



1 stage low noise (P1) unbalanced trim

1 Stage Perforated Trim (continued)

Kv (Cv US) values

For conversion: Cv (UK) = Kv x 0.963

Trim	DN15 (½")	DN20 (¾")	DN25 (1")	DN32 (1¼")	DN40 (1½")	DN50 (2")	DN65 (2½")	DN80 (3")	DN100 (4")	DN125 (5")	DN150 (6")	DN200 (8")	DN250 (10")	DN300 (12")
Full port Equal percentage	4 (4.6)	6.3 (7.3)	10 (11.6)	16 (18.5)	25 (29)	25 (29)	50 (58)		80 (92)				551 (637)	787 (909)
Full port Linear	4 (4.6)	6.3 (7.3)	10 (11.6)	16 (18.5)	25 (29)	36 (42)	63 (73)	70 (81)	90 (104)	245 (283)	300 (347)	516 (596)	622 (719)	890 (1 028)
Reduction 1 Equal percentage	2.5 (2.9)	4 (4.6)	6.3 (7.3)	10 (11.6)	16 (18.5)	25 (29)	36 (42)	50 (58)	63 (73)	219 (253)	255 (295)	457 (528)		551 (637)
Reduction 1 Linear	2.5 (2.9)	4 (4.6)	6.3 (7.3)	10 (11.6)	16 (18.5)	25 (29)	36 (42)	63 (73)	63 (73)	219 (253)	255 (295)	457 (528)	516 (596)	622 (719)
Reduction 2 Equal percentage and Linear	1.6 (1.8)	2.5 (2.9)	4 (4.6)	6.3 (7.3)	10 (11.6)	16 (18.5)	25 (29)	36 (42)	50 (58)	115 (133)	200 (231)	350 (405)	457 (528)	
Reduction 2 Linear	1.6 (1.8)	2.5 (2.9)	4 (4.6)	6.3 (7.3)	10 (11.6)	16 (18.5)	25 (29)	36 (42)	50 (58)	115 (133)	200 (231)	350 (405)	457 (528)	
Reduction 3 Equal percentage and Linear	1.0 (1.2)*	1.6 (1.8)	2.5 (2.9)	4 (4.6)	6.3 (7.3)	10 (11.6)	16 (18.5)	25 (29)	36 (42)	75 (87)	152 (176)	265 (306)	350 (405)	457 (528)
Reduction 4 Equal percentage and Linear	0.5** (0.6)*	1.0 (1.2)*	1.6 (1.8)		4 (4.6)	6.3 (7.3)		16 (18.5)	16 (18.5)				265 (306)	457 (528)
Reduction 5 Equal percentage and Linear	0.2** (0.2)*	0.5** (0.6)*	1.0 (1.2)*			4 (4.6)							175 (203)	350 (405)
Reduction 6 Equal percentage and Linear	0.1** (0.1)*	0.2** (0.2)*	0.5** (0.6)*										100 (116)	265 (306)
Reduction 7 Equal percentage and Linear		0.1** (0.1)*	0.2** (0.2)*											175 (203)
Reduction 8 Equal percentage and Linear			0.1** (0.1)*											100 (116)

* Only available in Anti-cavitation

** Linear characteristic only

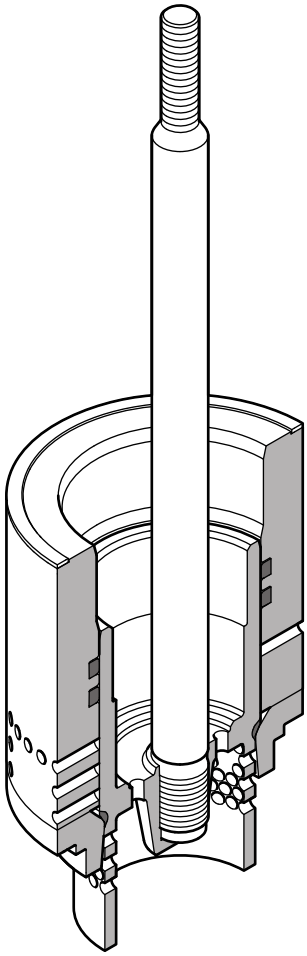
2 Stage Perforated Trim

Model availability

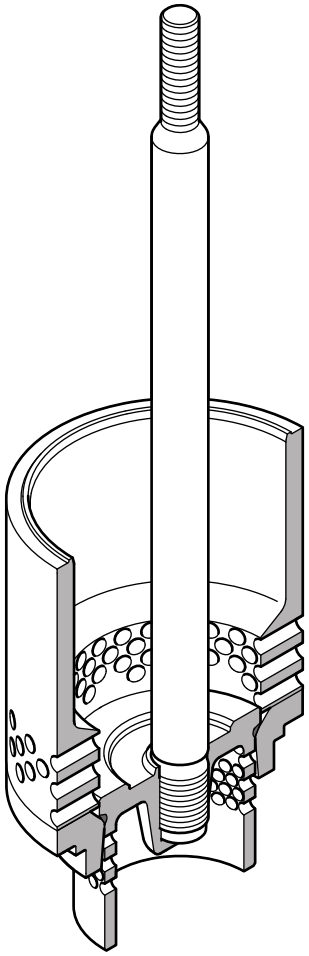
Balanced DN40 to DN50 (Diameter 1½" to 2") option only available for Spira-trol™ J Series

Technical data

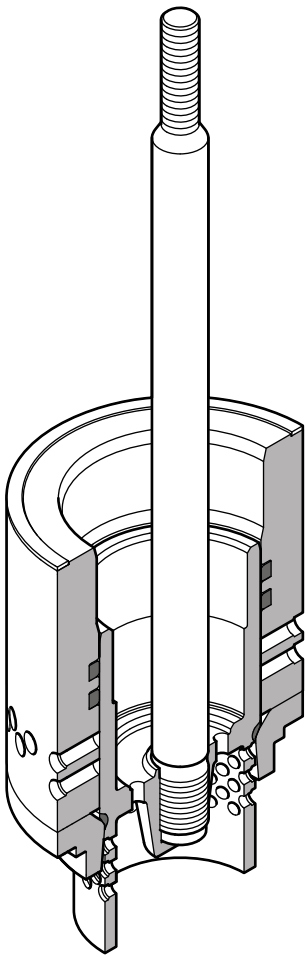
Trim design		Perforated
Leakage	Hard facing	Class IV
Rangeability		50:1
Travel	DN40 to DN50 (1½" to 2")	20mm (0.8")
	DN65 to DN100 (2½" to 4")	30 mm (1.2")
	DN125 to DN300 (5" to 12")	70 mm (2.8")



2 stage low noise (P2) balanced trim



2 stage low noise (P2) unbalanced trim



2 stage anti-cavitation (A2) balanced trim

2 Stage Perforated Trim (continued)

Kv (Cv US) values

For conversion: Cv (UK) = Kv x 0.963

Trim	DN32 (1¼")	DN40 (1½")	DN50 (2")	DN65 (2½")	DN80 (3")	DN100 (4")	DN125 (5")	DN150 (6")	DN200 (8")	DN250 (10")	DN300 (12")
Full port Equal percentage	16 (18.5)	16 (18.5)	16 (18.5)	44 (51)	44 (51)	63 (73)	125 (145)	160 (185)	280 (324)	305 (353)	386 (446)
Full port Linear	16 (18.5)	16 (18.5)	16 (18.5)	50 (58)	50 (58)	63 (73)	125 (145)	160 (185)	280 (324)	305 (353)	436 (504)
Reduction 1 Equal percentage and Linear	10 (11.6)	10 (11.6)	10 (11.6)	36 (42)	36 (42)	36 (42)	100 (116)	100 (116)	160 (185)	280 (324)	305 (353)
Reduction 2 Equal percentage and Linear	6.3 (7.3)	6.3 (7.3)	6.3 (7.3)	25 (29)	25 (29)	25 (29)	63 (73)	63 (73)	100 (116)	160 (185)	280 (324)
Reduction 3 Equal percentage and Linear	4 (4.6)	4 (4.6)	4 (4.6)	16 (18.5)	16 (18.5)	16 (18.5)	36 (42)	36 (42)	63 (73)	100 (116)	160 (185)
Reduction 4 Equal percentage and Linear				10 (11.6)	10 (11.6)	10 (11.6)	25 (29)		36 (42)	63 (73)	100 (116)
Reduction 5 Equal percentage and Linear				6.3 (7.3)	6.3 (7.3)					36 (42)	63 (73)
Reduction 6 Equal percentage and Linear											36 (42)

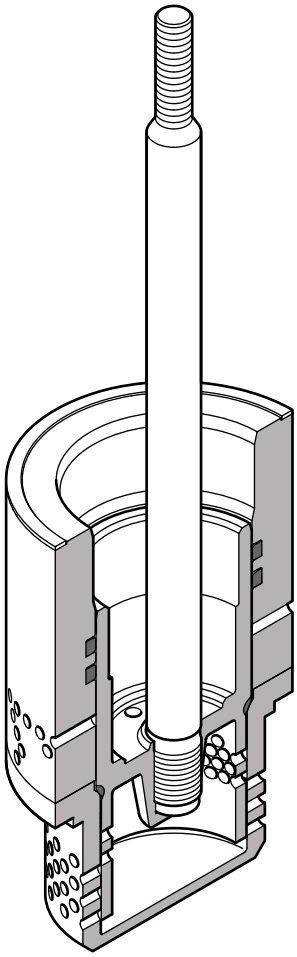
3 Stage Low Noise Trim

Model availability

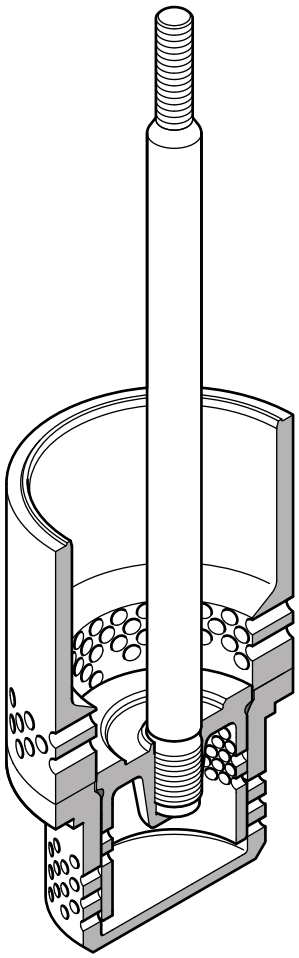
Balanced DN40 to DN50 (Diameter 1½" to 2") option only available for Spira-trol™ J Series

Technical data

Trim design		Perforated
Leakage	Hard facing	Class IV
Rangeability		50:1
Travel	DN40 to DN50 (1½" to 2")	20mm (0.8")
	DN65 to DN100 (2½" to 4")	30 mm (1.2")
	DN125 to DN300 (5" to 12")	70 mm (2.8")



3 stage low noise (P3) balanced trim



3 stage low noise (P3) unbalanced trim

3 Stage Low Noise Trim (continued)

Kv (Cv US) values

For conversion: Cv (UK) = Kv x 0.963

Trim	DN32 (1¼")	DN40 (1½")	DN50 (2")	DN65 (2½")	DN80 (3")	DN100 (4")	DN125 (5")	DN150 (6")	DN200 (8")	DN250 (10")	DN300 (12")
Full port Equal percentage	13 (15)	13 (15)	13 (15)	25 (29)	25 (29)	36 (42)	78 (90)	100 (116)	180 (208)	223 (258)	282 (326)
Full port Linear	13 (15)	13 (15)	13 (15)	25 (29)	25 (29)	36 (42)	78 (90)	100 (116)	180 (208)	282 (326)	319 (369)
Reduction 1 Equal percentage and Linear	10 (11.6)	10 (11.6)	10 (11.6)	16 (18.5)	16 (18.5)	25 (29)	63 (73)	63 (73)	160 (185)	180 (208)	223 (258)
Reduction 2 Equal percentage and Linear	6.3 (7.3)	6.3 (7.3)	6.3 (7.3)	10 (11.6)	10 (11.6)	16 (18.5)	36 (42)	36 (42)	100 (116)	160 (185)	180 (208)
Reduction 3 Equal percentage and Linear	4 (4.6)	4 (4.6)	4 (4.6)	6.3 (7.3)	6.3 (7.3)	10 (11.6)	25 (29)	25 (29)	36 (42)	100 (116)	160 (185)
Reduction 4 Equal percentage and Linear				4 (4.6)	4 (4.6)	6.3 (7.3)	16 (18.5)			36 (42)	100 (116)
Reduction 5 Equal percentage and Linear							10 (11.6)				36 (42)

Spira-trol™ selection guide

Valve size	DN15 to DN300	**DN80**
Valve series	J = J series 2-port control valve K = K series 2-port control valve L = L series 2-port control valve	**K**
Valve characteristic	E = Equal percentage F = Fast opening L = Linear	**E**
Type of flange	Blank = EN A = ASME (ANSI)	**A**
Flow	Blank = Flow under T = Flow over	
Body material	3 = Cast iron 4 = Carbon steel 6 = Stainless steel 7 = SG iron 8 = Alloy steel	**4**
Connections	1 = Screwed 2 = Socket Welded 3 = Flanged 4 = Butt Welded	**3**
Stem sealing	N = PTFE / Nitronic bush P = PTFE H = Graphite D = Bellows / Graphite secondary seals	**D**
Seating	T = 431 stainless steel P = Full PEEK seat G = PTFE soft seat S = 316L stainless steel W = 316L with stellite 6 facing C = Steam-Tight reversible PEEK seat	**T**
Type of trim	S = Standard trim P1 = Low noise cage 1 stage P2 = Low noise cage 2 stage P3 = Low noise cage 3 stage A1 = Anti-cavitation cage 1 stage A2 = Anti-cavitation cage 2 stage	**P1**
Trim balancing	U = Unbalanced B = Balanced	**B**
Bonnet type	S = Standard E = Extended high temperature	**S**
Bolting	S = Standard H = High temperature	**S**
Finish	Blank = Standard N = ENP coating	
Series	.2 = .2	**.2**
Kvs (Cv)	To be specified	**Cv 58**
Connection type	To be specified	**Flanged ASME 300**

Selection example:

DN80	-	**K**	**E**	**A**		**4**	**3**	**D**	**T**	**P1**	**B**	**S**	**S**		**.2**	-	**Cv 58**	-	**Flanged ASME 300**

Available spares

Balanced gasket set	**Parts 1, 2**

TI-P415-01-US
Issue 2

1000 and 1000A Series 2 Way Control Valves

Description

The Spirax Sarco Hiter 1000/1000A Series is a 2-way control valve built to provide fine control and easy adjustment in a compact design. Available in a wide variety of body ratings, sizes and materials, it is designed to efficiently control a wide range of fluids in numerous types of processes and industrial facilities.
Spirax Sarco Hiter 1000/1000A Series are available in diameters from ½" to 24" and pressure classes up to ASME 16.34 CL 2500 in both globe and angle body patterns.



Applications

Oil and Gas Processes; Offshore Platforms; Refineries; Gas Storage and Transportation; Chemical Industry; Sugar and Ethanol; Power Generation, Pulp and Paper and any applications which requires a good control in large diameters and medium or high pressures,

Designed and manufactured in accordance to the requirements of the European Pressure Equipment Directive 2014/68/EU and carries the CE mark when so required and applicable.

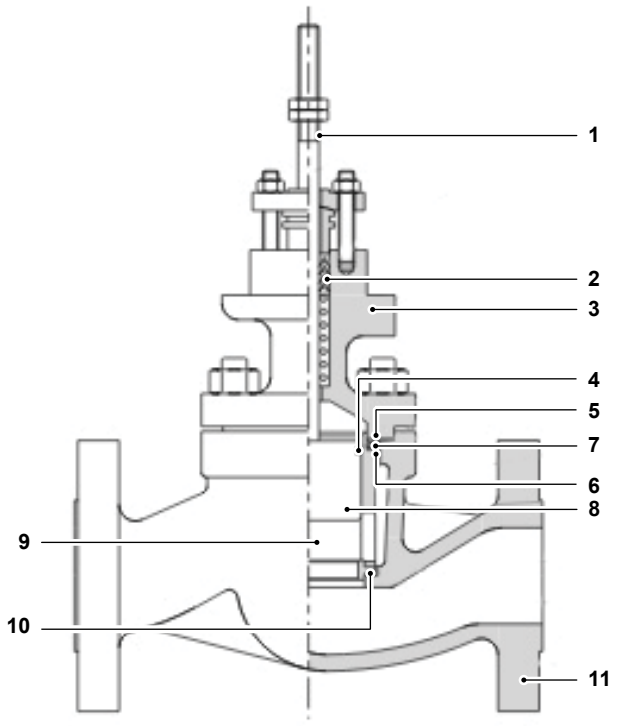
Series 1000 available versions

ASME B16.34 150, 300 or 600 Classes Sizes 6" to 24"		
Model type	1010	Globe body. Balanced plug, cage guided trim suitable for medium and large pressure drops. Standard seat leakage in accordance with ANSI FCI 70.2 Class IV. Classes V and VI are available upon request.
	1110	Globe body. Balanced plug, cage guided trim with resilient seat. Suitable for applications that require low seat leakage. Standard seat leakage in accordance with ANSI FCI 70.2 Class VI. Pressure drop limited to 300 psi g (21 bar g).
	1210	Globe body. Balanced plug, cage guided trim, with double metal seat, suitable for high temperatures and large pressure drops. Standard seat leakage in accordance with ANSI FCI 70-2 Class IV.
	1040	Angle body with balanced plug, cage guided trim. Suitable for medium and large pressure drops. Standard seat leakage in accordance with ANSI FCI 70.2 Class IV.
	1140	Angular body with balanced plug and cage guided trim with soft (PTFE) seat for use when low leakage is necessary. Standard seat leakage in accordance with ANSI FCI 70.2 is Class VI

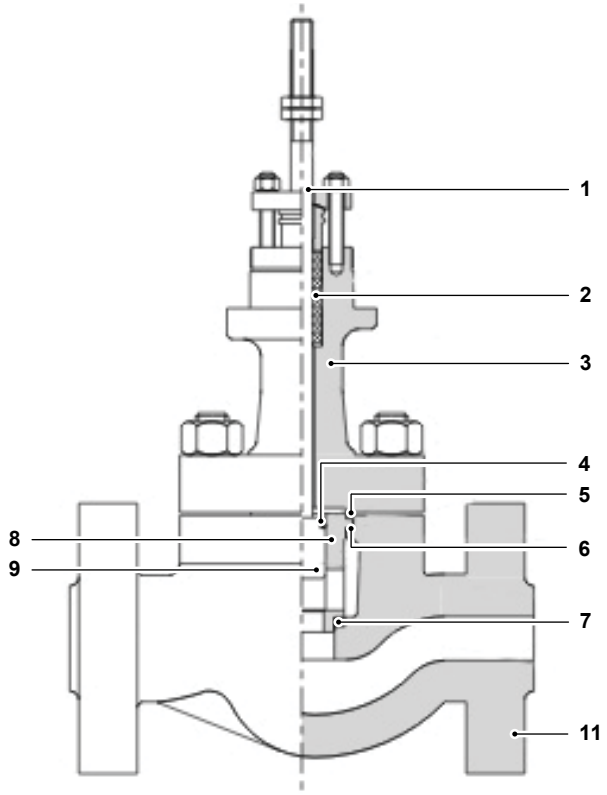
Series 1000A available versions

ASME B16.34 900, 1500 or 2500 Classes Sizes ½" to 24"		
Model type	1010	Globe body. Balanced plug, cage guided trim suitable for medium and large pressure drops. Standard seat leakage in accordance with ANSI FCI 70.2 Class IV. Classes V and VI are available upon request.
	1070	Globe body. Micro flow plug and cage guided. Suitable for applications with low flow in medium or high pressure drops. Suitable also to high temperatures due to the metal seat. Standard seat leakage in accordance with ANSI FCI 70.2 Class IV. Class V is available upon request.
	1210	Globe body. Balanced plug, cage guided trim, with double metal seat, suitable for high temperatures and large pressure drops. Standard seat leakage in accordance with ANSI FCI 70-2 Class IV.

Main components



1000 Series
Class 150 to 600



1000A Series
Class 900 to 2500

12.1
52

No.	Part
1	Stem
2	Packing set
3	Bonnet

No.	Part
4	Seal ring
5	Bonnet gasket
6	Cage gasket

No.	Part
7	Spiral wound gasket
8	Cage
9	Plug

No.	Part
10	Seat gasket
11	Body

Technical specifications

	Type		Pressure class	Standard	Available size
End connections	**RF**	Flanged	ASME 150 to 600 ASME 900 to 2500	ASME 16.34	10" to 24" ½" to 24"
	RTJ	(Ring Type Joint)	ASME 150 to 600 ASME 900 to 2500	ASME 16.20	10" to 24" ½" to 24"
	SW	(Socket Weld)	ASME 900 to 2500	ASME B16.11	½" to 2"
	BW	(Butt Weld)	ASME 600 ASME 900 to 2500	ASME B16.25	10" to 24" 3" to 24"

Face to Face	**RF/RTJ**	ISA S75.08.01
	SW	ISA S75.08.03
	BW	ISA S75.08.05

	Material [1]	Range temperature [2]
Body material	Carbon Steel ASTM A216 WCB	-20 °F to 800 °F (-29 °C to 427 °C)
	Alloy steel Cr-Mo-V ASTM A217 WC9	-20 °F to 1100 °F [1] (-29 °C to 595 °C) [1]
	Stainless steel ASTM A351 CF8M	-20 °F to 1000 °F [1] (-29 °C to 538 °C) [1]

[1] At temperatures of 1000 °F (538 °C), only valves with welded connections should be used Different materials are available upon request

	Braided PTFE		Graphite	
Stem seal materials (Packing)	CE1 bonnet	CE3 bonnet	CE1 bonnet	CE3 bonnet
	-22 °F to 450 °F (-30 °C to 232 °C)	-150 °F to 572 °F (-101 °C to 300 °C)	-22 °F to 700 °F (-30 °C to 371 °C)	-94 °F to 1202 °F (-70 °C to 650 °C)

	Seat, bonnet and cage gasket	Spiral wound gasket	Temperature limit
Gasket material combinations	Carbon and graphite fibers with NBR rubber (non-asbestos)	304 stainless steel and carbon and graphite fibers with NBR rubber (non- asbestos)	450 °F (232 °C)
	PTFE	304 stainless steel and PTFE	450 °F (232 °C)
	Expanded graphite laminate with stainless steel insert	Inconel and expanded graphite	1099 °F (593 °C)

Technical specifications

	Material	Temperature limit
Seal ring materials	BUNA	248 °F (120 °C)
	EPDM	
	Neoprene	302 °F (150 °C)
	PTFE	392 °F (200 °C)
	Viton	399 °F (204 °C)
	PTFE Graf.	446 °F (230 °C)
	SHT	482 °F (250 °C)
	CHEMRAZ	500 °F (260 °C)
	KALREZ	527 °F (275 °C)
	Graphite	1202 °F (650 °C)
Body to bonnet bolting		
Stud material	ASTM A193 Gr. B7	-20 °F to 801 °F (-29 °C to 427 °C)
	ASTM A193 Gr. B8M	-425 °F to 801 °F (-254 °C to 427 °C)
	ASTM A193 Gr. B16	802 °F to 1099 °F (428 °C to 593 °C)
Nut material	ASTM A194 Gr. 2H	-20 °F to 801 °F (-29 °C to 427 °C)
	ASTM A194 Gr. 8M	-425 °F to 801 °F (-254 °C to 427 °C)
	ASTM A194 Gr. 7	802 °F to 1099 °F (428 °C to 593 °C)
Pressure and temperature limits	By ASME B16.34	

Trim materials

	Plug	Cage	Seal ring	Max. ΔP.	Temperature range
Type 1010 1040 ASME 150 to 600	316 stainless steel	410 stainless steel hardened	See seal ring table opposite	305 psi (21 bar)	-20 °F to 527 °F (-29 °C to 275 °C)
	316 stainless steel	17.4 PH stainless steel hardened			-150 °F to 600 °F (-101 °C to 316 °C)
	410 stainless steel hardened			1500 psi (103.4 bar)	-20 °F to 788 °F (-29 °C to 420 °C)
	316 stainless steel with Stellite coating	316 stainless steel with Stellite face			790 °F to 1051 °F (421 °C to 566 °C)
Type 1110 1140 ASME 150 to 600	316 stainless steel with PTFE	410 stainless steel hardened	See seal ring table opposite	305 psi (21 bar)	-20 °F to 248 °F (-29 °C to 120 °C)
					-20 °F to 248 °F (-29 °C to 120 °C)
		17.4 PH stainless steel hardened		305 psi (21 bar)	-20 °F to 248 °F (-29 °C to 120 °C)
					-20 °F to 392 °F (-29 °C to 120 °C)

	Plug	Cage	Max. ΔP.	Temperature range
Type 1210 ASME 150 to 600	316 stainless steel	410 stainless steel hardened	305 psi (21 bar)	-20 °F to 600 °F (-29 °C to 316 °C)
		17.4 PH stainless steel hardened		-150 °F to 600 °F (-101 °C to 316 °C)
	316 stainless steel with Stellite coating	17.4 PH stainless steel hardened	1450 psi (100 bar)	102 °F to 199 °F (39 °C to 93 °C)
	316 stainless steel with Stellite coating	316 stainless steel with Stellite face	1500 psi (103.4 bar)	-20 °F to 788 °F (-29 °C to 420 °C)

	Plug	Cage	Seal ring	Max. ΔP.	Temperature range
Type 1010 ASME 900 to 2500	316 stainless steel		See seal ring table opposite	305 psi (21 bar)	-20 °F to 248 °F (-29 °C to 120 °C)
					-20 °F to 248 °F (-29 °C to 120 °C)
	316 stainless steel with Stellite coating	410 stainless steel hardened		6237 psi (430 bar)	-20 °F to 248 °F (-29 °C to 120 °C)
	316 stainless steel with Stellite coating	17.4 PH stainless steel hardened			-13 °F to 392 °F (-29 °C to 120 °C)
	410 stainless steel hardened			609 psi (42 bar)	-20 °F to 1099 °F (-29 °C to 593 °C)
	316 stainless steel with Stellite coating	316 stainless steel with Stellite face			
Type 1070 1210 ASME 900 to 2500	316 stainless steel with Stellite coating	17.4 PH stainless steel hardened	N/A	1088 psi (75 bar)	-20 °F to 248 °F (-29 °C to 120 °C)
	17.4 PH stainless steel hardened			6237 psi (430 bar)	-20 °F to 1099 °F (- 29 °C to 593 °C)
	410 stainless steel hardened				
	410 stainless steel hardened			5990 psi (413 bar)	-20 °F to 1099 °F (-29 °C to 593 °C)
	316 stainless steel with Stellite coating	Nitrided Cr-Mo Alloy-Steel with Stellite Coating			

Flow coefficients

Flow coefficient range

LV-Linear
PV-Equal percentage
MV-Modified parabolic
1R, 2R, 3R, 4R-Low noise 1, 2, 3 and 4 stages respectively
1K, 2K, 3K – Anti-cavitation 1,2 and 3 stages respectively

Flow coefficient-C_v

Types 1010 1110 1210

ASME CL 150 to 600

Body size (inch)	Flow characteristic									
	LV	PV	MV	1R	2R	3R	4R	1K	2K	3K
10	450-1350	400-1170	180-1200	218-760	315-500	212-617	80-208	184-515	168-393	120-330
12	650-1640	490	400-1062	587-1050	533-693	360-468	270-350	289-610	210-490	150-360
14	1050-1830	1700	950-1800	846-1400	693-900	468-608	270-380	338-900	251-586	186-434
16	1900-2720	2230	1500-2000	1217-1700	693-2100	468-1300	380-430	581-2350		
18	3800-5000	3300	3450		1500			2800		
20	4700	4270	4100	3200				2700-3500		
24	7300	6350	6650							

Flow coefficient-C_v

Types 85-51 85-61 85-71

Body size (inch)	Flow characteristic									
	LV	PV	MV	1R	2R	3R	4R	1K	2K	3K
10	527-1580	468-1369	1034-1404	255-889	369-585	248-722	94-243	216-603	197-460	140-386
12	761-1919	573	468-1243	687-1229	624-811	421-548	316-410	338-715	246-573	176-421
14	1229-2141	1989	1112-2106	990-1638	811-1053	548-711	316-445	396-1053	294-686	218-508
16	2223-3182	2609	1755-2340	1424-1989	811-2457	548-1521	445-503	680-2750		
18	4446-5850	3861	4037		1755			3276		
20	5499	4996	4797	3744				3159-4095		
24	8541	7430	7781							

Flow coefficient-C_v

Types 1010 1020 1210

ASME CL 900

Body size (inch)	Flow characteristic									
	LV	PV	MV	1R	2R	3R	4R	1K	2K	3K
1	12	10	11	2,7				8		
1½	13-22	11-18	12-20	18-26				9 – 13	4-8	3-6
2	25-41	21-36	20-36	30-48				15 – 27	8-18	5-15
3	45-131	39-115	39-120	100	12-74	43		17 – 67	24-37	14-33
4	22-180	125-155	89-170	80-178	74-155	56-95	56	77 – 121	50-70	22-81
6	195-290	168-250	180-270	180-286	125-212	73-155	73-96	140 – 180	76-152	72-145
8	310-520	280-448	283-470	350-380	163-275	125-200	96-150	207 – 235	100-250	96-241
10	525-950	450-820	485-884	520-710	212-464	125-340	150-212	270 – 441	189-441	145
12	635-1150	530-960	570-1030	1000						
14	930-1690	780-1410	840-1520							
16	1060-2050	890-1610	960-1740							

Flow coefficients

	Body size (inch)	Flow characteristic									
		LV	PV	MV	1R	2R	3R	4R	1K	2K	3K
Flow coefficient-C_v	1	12	10	11					8		
	1½	13-22	11-18	12-20	18-26				9 – 13	4-8	3-6
Types 1010 1020 1210	2	25-41	21-36	20-42	30-48				15 – 27	8-18	5-15
	3	45-96	39-82	39-85	35-93	44-74	38		17 – 64	23-39	10-35
	4	40-170	86-145	89-150	154	74-155	50-120	56	74 – 113	46-81	27-75
ASME CL 1500	6	120-265	155-228	160-235	200-280	163-212	65-143	73	130-168	70-141	35-134
	8	276-480	240-405	250-390	360	163-275	85-200	125-150	194-220	96-242	96-241
	10	508-1030	428-760	405-770	678	212-440	100-310	150-350	253-412	176-411	171-399
	12	615-1110	500-900	500-900					474-489	209-490	204- 477
	14	870-1570	725-1310	820-1480							
	16	995-1800	830-1500	885-1600							

	Body size (inch)	Flow characteristic									
		LV	PV	MV	1R	2R	3R	4R	1K	2K	3K
Flow coefficient-C_v	1	11	9	10					8		
	1½	11-16	9-13	10-14					9-10		
Types 1010 1020 1210	2	17-30	14-26	15-26	15-42				11-23	8-15	7 – 12
	3	32-70	27-60	30-63	77	28-61	22		26-53	18-31	16-27
	4	74-104	63-90	70-95	141	47-80	29-48	45	60-90	36-63	46-81
ASME CL 2500	6	110-177	95-150	105-157	217	61-205	38-150	56-73	103-137	57-114	51-103
	8	187-360	158-330	166-350	290	135-615	110-175	73-130	158-180	76-190	75-181
	10	380-750	350-628	370-800	542	175-390	186-280	130-180	207-341	145-338	140-326
	12	1090		920							

	Body size (inch)			Orifice code	Linear	Equal percentage	Modified parabolic
Flow coefficient-C_v	1"	¾"	½"	M1			0.25
				M2			0.4
Types 1070				M3	0.85	0.85	0.85
				M4	2	2	2
ASME CL 900 to 2500				M5	3.4	3.4	3.4
				M6	5.5	5.5	5.5
				M7	7.5	7.5	7.5
				M8	10.6	10.6	10.6
				M9	13	13	13

Seat leakage class

	Valve type	Leakage class	Note
Leakage Class – FCi 70.2	1010	IV or V	With balance seal ring in elastomer
	1040		
	1210	IV	Metal seat
	1110	VI	With PTFE seat
	1140		
	1070	IV or V	Metal seat
	1090		

Special trims



1R-1 Stage



2R-2 Stage



3R-3 Stage



1K – 1 Stage

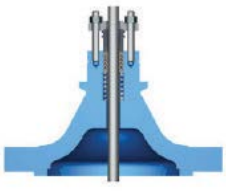


2K – 2 Stage



3 Stage

Bonnet types



CE-1 standard bonnet



CE-3 extended bonnet

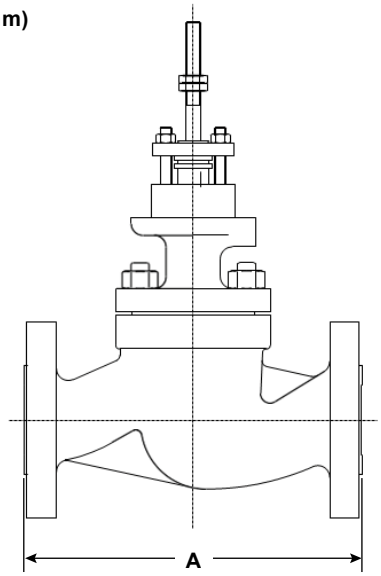


CE- 4 bellows sealed bonnet

Sizes and Weights (approximate) in kg (lbs)

Valve size	S1000				S1000A					
	ASME CL 150 and 300		ASME CL 600		ASME CL 900		ASME CL 1500		ASME CL 2500	
	FLG	BW/SW/ THRD	FLG	BW/SW/ THRD	FLG	BW/SW/ THRD	FLG	BW/SW/ THRD	FLG	BW/SW/ THRD
½"	14 (31)	12 (26)	18 (40)	16 (35)	40 (88)	35 (77)	44 (97)	40 (88)		
¾"	14 (31)	12 (26)	18 (40)	16 (35)	40 (88)	35 (77)	44 (97)	40 (88)	60 (132)	50 (110)
1"	14 (31)	12 (26)	18 (40)	16 (35)	40 (88)	35 (77)	44 (97)	40 (88)	60 (132)	50 (110)
1½"	26 (57)	24 (53)	28 (62)	26 (57)	50 (110)	35 (77)	55 (121)	40 (88)		
2"	40 (88)	36 (79)	46 (101)	40 (88)	60 (132)	45 (99)	60 (132)	45 (99)		
3"	75 (165)	68 (150)	85 (187)	75 (165)	120 (265)	100 (220)	130 (287)	100 (220)	240 (529)	200 (441)
4"	110 (242)	90 (198)	120 (264)	95 (209)	205 (452)	170 (375)	220 (485)	180 (397)	400 (882)	350 (772)
6"	192 (423)	165 (364)	240 (529)	190 (419)	420 (926)	350 (772)	480 (1058)	380 (838)		
8"	370 (816)	322 (710)	440 (970)	364 (802)	630 (1389)	520 (1146)	760 (1675)	600 (1323)		
10"	550 (1212)	460 (1014)	620 (1367)	522 (1151)	1050 (2315)	860 (1896)	1200 (2646)	940 (2072)	2200 (4850)	1900 (4189)
12"	752 (1658)	700 (1543)	960 (2116)	810 (1786)	1300 (2866)	1120 (2469)				
14"	1242 (2738)	1180 (2601)	1388 (3060)	1230 (2712)			1700 (3748)	1500 (3307)		
16"	1548 (3413)	1480 (3263)	1725 (3803)	1515 (3340)						
18"	1720 (3792)	1640 (3616)								
20“	3280 (7231)	3000 (6614)	4180 (9215)	3800 (8378)						
24"	5200 (11464)	4900 (10803)	6200 (13669)	5960 (13140)						

Dimensions (approximate) in inches (mm)



Body Size (in)	A Flanged Body inch (mm)											
	Series 1000						Series 1000A					
	ASME CL 150		ASME CL 300		ASME CL 600		ASME CL 900		ASME CL 1500		ASME CL 2500	
	FR	RTJ	FR	RTJ	FR	RTJ	FR	RTJ	FR	RTJ	FR	RTJ
½"	See Series 85						10.7" (272)					
¾"							10.25" (260)**				12.5" (318)	
1"							10.25" (260)**				12.5" (318)	
1½"							13.1" (333)					
2"							14.8" (376)					
3"							15.5" (394)**	17.5" (445)	16.3" (413)**	164" (417)	19.6" (498)	199.9" (505)**
4"							20.1" (511)	20.2" (513)**	20.9" (531)	20.9" (531)**	28.9" (734)	29.3" (744)**
6"							28.1" (714)	28.3" (719)**	30.2" (767)	30.4" (772)		
8"							36" (914)	31.6" (803)**	38.2" (970)	38.7" (983)		
10"	26.5" (673)	27" (686)	279" (709)	28.5" (724)	296" (752)	29.8" (756)	39" (991)	39.1" (993)	42" (1067)	42.4" (1077)	54.1" (1374)	54.8" (1392)**
12"	29" (737)	29.5" (749)	30.5" (775)	31.1" (790)	32.25" (819)	32.4" (823)	44.5" (1130)	44.6" (1133)				
14"	35" (889)	35.5" (902)	36.5" (927)	37.1" (943)	38.25" (972)	38.4" (975)			49.5" (1257)	50.2" (1275)		
16"	40" (1016)	40.5" (1029)	41.6" (1057)	42.25" (1073)	43.6" (1108)	43.8" (1113)						
18"	45" (1143)		46.7" (1186)									
20	49.9" (1267)				54" (1372)							
24	60" (1524)				65.9" (1674)							

** Face to face as per Manufacturer Standard

Actuators

The Spirax Sarco Hiter 1000/1000A Series control is normally actuated by a Hiter DC spring and diaphragm actuator or Hiter PP piston actuator.
Series 1000 / 1000A valves can also be supplied with electric or hydraulic actuators.
Please contact Spirax Sarco for your specific requirements.



DC Series
Spring and Diaphragm Actuator



PP Series
Piston Actuator

Positioners

The Spirax Sarco Hiter 1000/1000A Series control valves are available with the complete range of Spirax Sarco positioners. Alternative positioners are also available. Please contact Spirax Sarco for your specific requirements.

Series 85 selection guide

Series	1000 and 1000A	1000A
Types	1010, 1110, 1210, 1040, 1140, 1090	1010
Valve size	½", 1", ¾" 1½", 2", 3", 4", 6", 8" 10" 12" 14", 16", 18", 20", 24"	4"
Class	150, 300, 600, 900, 1500, 2500	1500
Body material	WCB-Carbon Steel ASTM A216 WCB WC9-Alloy Steel Cr-Mo-V ASTM A217 WC9' CF8M-Stainless Steel ASTM A351 CF8M	WCB
Trim materials	316 stainless steel 17/4PH stainless steel hardened 410 stainless steel hardened 316 stainless steel with Stellite coating	410
Bonnet type	CE1 CE3 CE4	CE1
Stem seal material	Braided PTFE Graphite	Graphite

Order Example

1000A	1010	4"	1500#	WCB	410	CE1	Graphite

TI-P414-03-US
Issue 2

85 Series
2 Way Control Valves

Description

The 85 Series is a 2-way control valve, with globe body built to provide fine control and easy adjustment in a compact design. Available in a wide variety of body ratings, sizes and materials, it is designed to efficiently control a wide range of fluids in numerous types of processes and industrial facilities. 85 Series are available in diameters from ½" to 8" and pressure classes up to ASME 16.34 CL 600, adaptable to many applications due to the clamp in place seat technology.

Applications

Oil & Gas Processes; Offshore Platforms; Refineries; Gas Storage and Transportation; Chemical Industry; Sugar and Ethanol; Power Generation, Pulp & Paper and any applications which requires a good control in low to medium pressure ranges.

Designed and manufactured in accordance to the requirements of the European Pressure Equipment Directive 2014/68/EU and carries the CE mark when so required and applicable.



Series 85 Available Versions

ASME B16.34 150, 300 or 600 Classes Sizes 1" to 8"		
Model Type	**85-51**	Balanced plug, cage guided trim suitable for medium and large pressure drops. Standard seat leakage in accordance with ANSI FCI 70.2 is Class IV. Class V available upon request.
	85-61	Balanced plug, cage guided trim with resilient seat. Suitable for applications that require low seat leakage. Standard seat leakage in accordance with ANSI FCI 70.2 is Class VI.
	85-70	Unbalanced plug, cage guided trim suitable for low and medium pressure drops. Standard seat leakage in accordance with ANSI FCI 70 is Class IV. Class V available upon request.
	85-71	Balanced plug, cage guided trim, with double metal seat, suitable for high temperatures and large pressure drops. Standard seat leakage in accordance with ANSI FCI 70-2 is Class IV. Class V available upon request.
ASME B16.34 150, 300 or 600 Classes Sizes 1½" to 4"		
Model Type	**85-58**	Unbalanced top-guided plug, metal seat suitable for low and medium pressure drops. Standard seat leakage in accordance with ANSI FCI 70.2 is Class IV. Class V is available upon request.
	85-68	Unbalanced top-guided plug with resilient seat. Suitable for applications that require low seat leakage. Standard seat leakage in accordance with ANSI FCI 70.2 is Class VI.
ASME B16.34 150, 300 or 600 Classes Sizes ½" to 2"		
Model Type	**85-52**	Unbalanced top-guided micro-flow plug, metal seat suitable for low flow rates. Standard seat leakage in accordance with ANSI FCI 70.2 is Class IV. Class V available upon request.
	85-62	Unbalanced top-guided micro-flow plug with resilient seat. Suitable for applications that require low seat leakage Standard seat leakage in accordance with ANSI FCI 70.2 is Class VI

Technical Specifications

		Type	Presssure Class	Design Standards	Face to Face Standards	Available Size
Connections	RF	Raised Faced	1500 to 600	ASME B16.5	ISA S75.08.01	½" to 8"
	RC	NPT Threaded	1500 to 600	ASME B1.20.1	ISA S75.08.03	½" to 2"
	SW	Socket-Welding	1500 to 600	ASME B16.11	ISA S75.08.03	½" to 2"
	BW	Butt welding	1500 to 600	ASME B16.25	ISA S75.08.05	3" to 8"

	Material	Range Temperature[2]
Body Material	Carbon Steel ASTM A216 WCB	-20 °F to 800 °F (-29 °C to 427 °C)
	Cr-Mo Alloy Steel ASTM A217 WC9	-20 °F to 1100 °F (-29 °C to 595 °C) [2]
	Stainless Steel ASTM A351 CF8M	-20 °F to 1000°F (-29 °C to 538 °C) [2]

[1] Different materials are available upon request including; Duplex SST, Nickel Alloys, Titanium Alloys
[2] Class 150 flanged end valve limited to 1000 °F (538 °C)

Technical Specifications

		Model Reference	Temperature Range
Bonnet Types	CE1	Standard Bonnet	Standard bonnet for use with temperatures up to 662 °F (350 °C)
	CE3	Extended Bonnet	Extended bonnet for use with temperatures up to 1100 °F (595 °C)
	CE4	Bellows Seal Bonnet	Extended with bellows for use with corrosive or dangerous fluids. For use with temperatures up to 662 °F (350 °C)

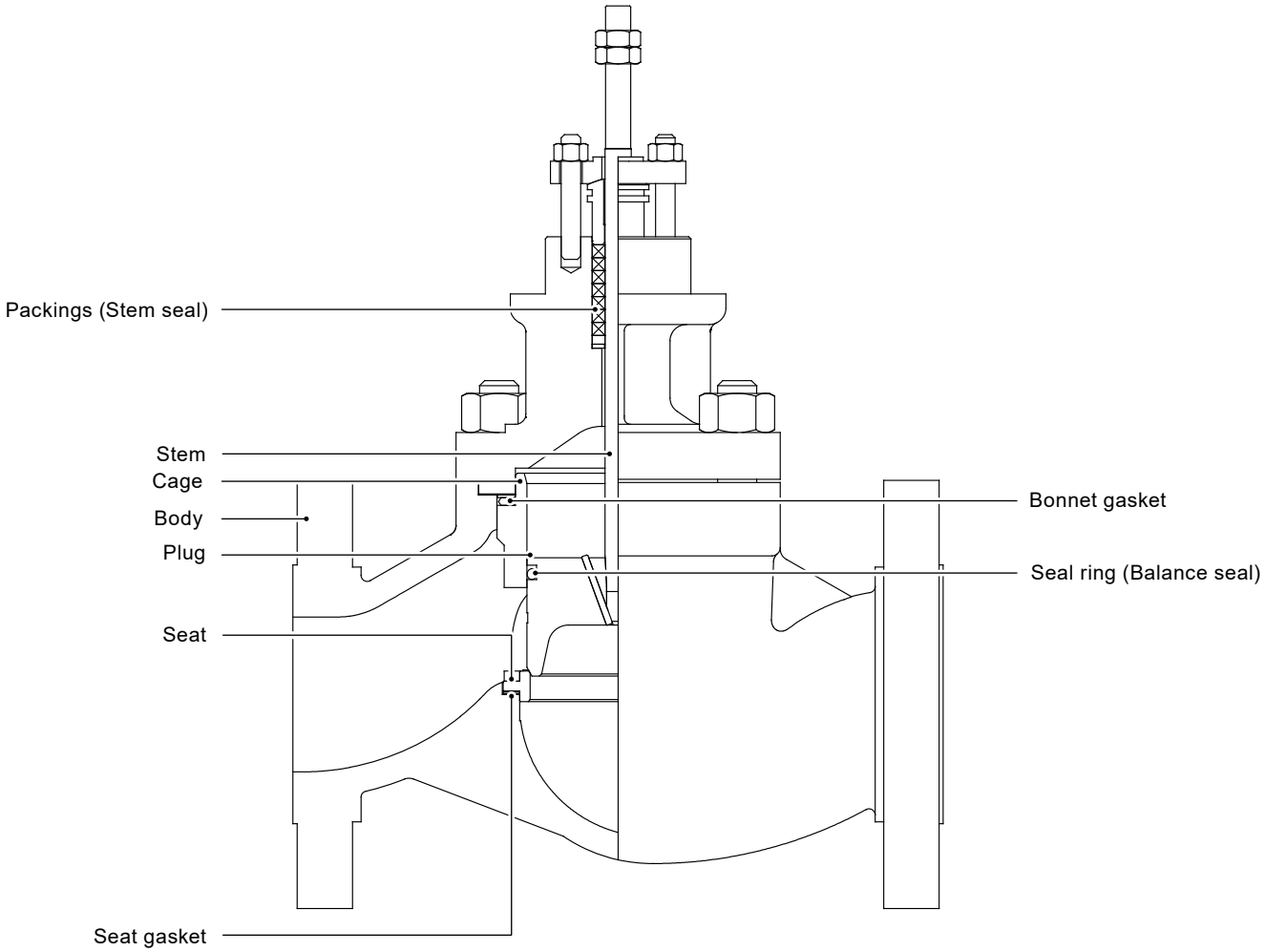
	Braided PTFE		Graphite	
Stem Seal Materials (Packing)	**CE1 Bonnet** -22 °F to 450 °F (-30 °C to 232 °C)	**CE3 / CE4 Bonnet** -150 °F to 572 °F (-101 °C to 300 °C)	**CE1 Bonnet** -22 °F to 662 °F (-30 °C to 350 °C)	**CE3 / CE4 Bonnet** -94 °F to 1100 °F (-70 °C to 595 °C)

	Gasket Material Options	Minimum Temperature	Maximum Temperature
Gasket Material Combinations	PTFE + 316L SST filled with PTFE	-328 °F (-200 °C)	450 °F (232 °C)
	316L SST with Graphite + 316 SST	-4 °F (-20 °C)	1100 °F (593 °C)

	Material	Temperature Limit
Seal Ring Materials	Nitrile Rubber	248 °F (120 °C)
	EPDM Rubber	248 °F (120 °C)
	Neoprene	302 °F (150 °C)
	PTFE	392 °F (200 °C)
	Viton Rubber	399 °F (204 °C)
	PTFE w/ Graphite	446 °F (230 °C)
	SHT	482 °F (250 °C)
	CHEMRAZ	500 °F (260 °C)
	KALREZ	527 °F (275 °C)
	Graphite	1202 °F (650 °C)

Body to Bonnet Bolting	Material	Temperature Limit
Stud material	ASTM A193 Gr. B7	-20 °F to 800 °F (-29 °C to 427 °C)
	ASTM A193 Gr. B8M	-425 °F to 800 °F (-254 °C to 427 °C)
	ASTM A193 Gr. B16	802 °F to 1100 °F (428 °C to 593 °C)
Nut material	ASTM A194 Gr. 2H	-20 °F to 800 °F (-29 °C to 427 °C)
	ASTM A194 Gr. 8M	-425 °F to 800 °F (-254 °C to 427 °C)
	ASTM A194 Gr. 7	800 °F to 1100 °F (428 °C to 593 °C)

Series 85 Main Components



Trim Materials

	Plug/seat		**Cage**	**Seal ring**	**Max. ΔP.**	**Temperature range**
Type 85-51 ASME CL 150 to 600	316SST		17-4PH SST Hardened	See Seal Ring Table on previous page	300 psi (20 bar)	-150 °F to 600 °F (-101 °C to 316 °C)
	410SST Hardened		410SST Hardened		1500 psi (103 bar)	-20 °F to 788 °F (-29 °C to 420 °C)
	316SST Stellite Coated		Nitrided Cr-Mo Alloy steel		1500 psi (103 bar)	790 °F to 1050 °F (421 °C to 566 °C)
Type 85-61 ASME CL 150 to 600	**Plug/seat**	**Seat**	**Cage**	**Seal ring**	**Max. ΔP.**	**Temperature range**
	316SST	316SST w/PTFE	17-4PH SST Hardened	See Seal Ring Table on previous page	300 psi (20 bar)	-128 °F to 392 °F (-89 °C to 200 °C)
	Plug/seat		**Cage**	**Seal ring**	**Max. ΔP.**	**Temperature range**
Type 85-70 ASME CL 150 to 600	316SST		17-4PH SST Hardened		300 psi (20 bar)	-150 °F to 600 °F (-101 °C to 316 °C)
	410SST Hardened		410SST Hardened		1500 psi (103 bar)	-20 °F to 788 °F (-29 °C to 420 °C)
	316SST Stellite Coated		Nitrided Cr-Mo Alloy steel		1500 psi (103 bar)	-20 °F to 788 °F (-29 °C to 420 °C)
	Plug/seat		**Cage**	**Seal ring**	**Max. ΔP.**	**Temperature range**
Type 85-71 ASME CL 150 to 600	17-4PH SST Hardened		17-4PH SST Hardened		1500 psi (103 bar)	-20 °F to 788 °F (-29 °C to 420 °C)
	410SST Hardened		410SST Hardened		1500 psi (103 bar)	-20 °F to 788 °F (-29 °C to 420 °C)
	316SST Stellite Coated		Nitrided Cr-Mo Alloy Steel Stellite Coated		1500 psi (103 bar)	790 °F to 1050 °F (421 °C to 566 °C)
	Plug/seat		**Cage**	**Seal ring**	**Max. ΔP.**	**Temperature range**
Type 85-52 and 85-58 ASME CL 150 to 600	316SST		17-4PH SST Hardened		300 psi (20 bar)	-150 °F to 600 °F (-101 °C to 316 °C)
	316SST Stellite Coated		316SST Stellite Coated		1500 psi (103 bar)	99°F to 1100°F (-73°C to 593°C)
	410SST Hardened		410SST Hardened		1500 psi (103 bar)	20 °F to 788 °F (-29 °C to 420 °C)
Type 85-62 and 85-68 ASME CL 150 to 600	**Plug/seat**	**Seat**	**Cage**	**Seal ring**	**Max. ΔP.**	**Temperature range**
	316SST	316SST w/ PTFE	17-4PH SST Hardened		300 psi (20 bar)	-128 °F to 392 °F (-89 °C to 200 °C)

Flow Coefficients

Flow Capacity (Cv)

	Size	LV	PV	MV	1R	2R	3R	4R	1K	2K	3K
Model Types 85-51 85-61 85-70 85-71	**1"**	19	17	11	4,5 - 18				12,2	2 - 6	
	1½"	23 - 38	22 - 34	12 - 20	4,5 - 33	5 - 25			12,4 - 19,4	2 - 10	3,7 - 7
	2"	30 - 63	26 - 52	12 - 40	4,5 - 63	13 - 50	10 - 26		14 - 36,1	2 - 23,5	2 - 16
	3"	88 - 130	57 - 118	32 - 120	30 - 125	50 - 85	8 - 57	10 - 32	15 - 78	17 - 45,1	1 - 35
	4"	87 - 215	95 - 200	20 - 220	25 - 190	65 - 143	40 - 125	14 - 72	53 - 146,3	53,5 - 80	37,4 - 56
	6"	155 - 410	140 - 390	64 - 400	104 - 380	85 - 330	96 - 290	72 - 165	51 - 310	69,1 - 138,2	48 - 71
	8"	100 - 870	210 - 820	118 - 820	190 - 665	186 - 415	125 - 365	94 - 212	104,7 - 315	105 - 210	68 - 130

Subtitle: LV - Linear PV - Equal percentage MV - Modified parabolic
1R, 2R, 3R, 4R - Low noise 1, 2, 3 and 4 stages respectively
1K, 2K, 3K – Anti-cavitation 1,2 and 3 stages respectively.

Flow Capacity (Cv)

		Size		Orifice Code	LC	PC	MV
Model Types 85-52 85-62	½"	¾"	1" 1½" 2'	**M09**		0,16	
				M10		0,25	
				M11	0.5	0,5	
				M2			0,4
				M3	0,85	0,85	0,85
				M4	2	2	2
				M5	3.4	3.4	3.4
				M6	5.5	5.5	5.5
				M7	7.5	7.5	7.5
				M8	10.6	10.6	10.6
				M9	13	13	13

Subtitle: LC - Linear
PC – Equal Percentage
MV – Modified Parabolic

Flow Capacity (Cv)

	Size	LC	PC
Model Types 85-58 85-68	**1½"**	17 - 23	17 - 23
	2"	16 - 41	15 - 41
	3"	44 - 115	20 - 115
	4"	44 - 195	73 - 195

Subtitle: LC - Linear
PC – Equal Percentage

Seat Leakage Class

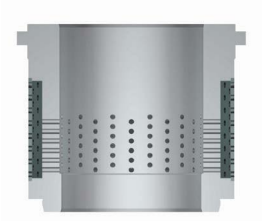
	Leakage Class	Valve Type	Note
Leakage Class ANSI FCI 70-2	IV or V	85-51	With elastomer seal ring
		85-52	Metal seat
		85-71	
		85-58	Metal seat
	VI	85-61	PTFE seat
		85-62	
		85-68	

Special Trims

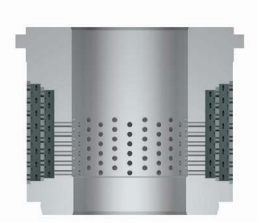
Noise Control (R)



R - 1 STAGE

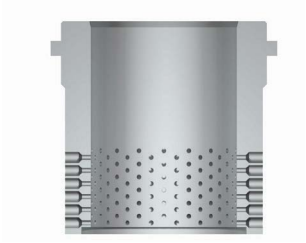


2R - 2 STAGES



3R - 3 STAGES

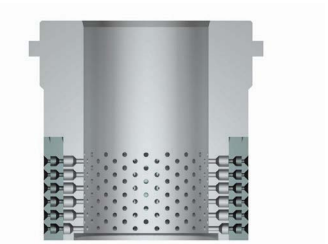
Cavitation Control (K)



1K – 1 STAGE

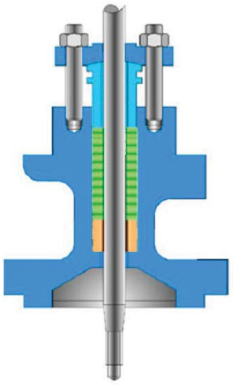


2K – 2 STAGE

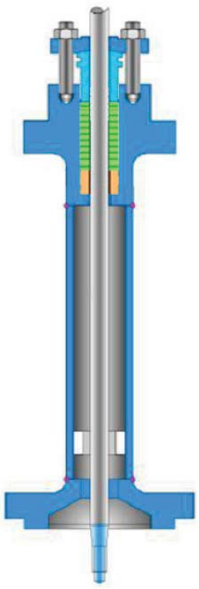


3K – 3 STAGE

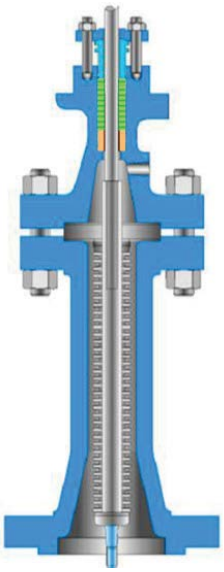
Bonnet Types



CE1 STANDARD



CE3 EXTENDED

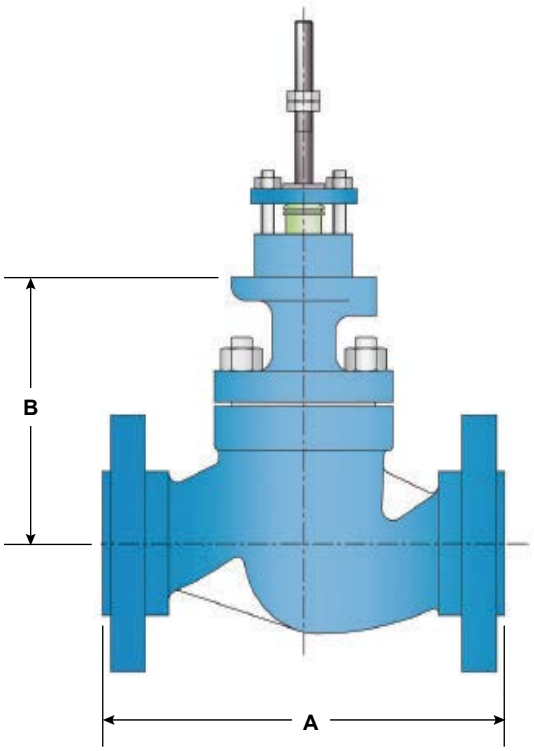


CE4 EXTENDED WITH BELLOWS

Sizes and Weights (approximate) in pounds and (kg)

Valve Size	ASME CL 150 & 300		ASME CL 600	
	Standard Bonnet CE1*		Standard Bonnet CE1*	
	FLG	BW/SW/THD	FLG	BW/SW/THD
½"	26 (12)	22 (10)	36 (16)	31 (14)
¾"	36 (16)	26 (12)	37 (17)	31 (14)
1"	36 (16)	26 (12)	37 (17)	31 (14)
1½"	49 (22)	36 (16)	53 (24)	36 (16)
2"	66 (30)	49 (22)	66 (30)	49 (22)
3"	132 (60)	84 (38)	132 (60)	99 (45)
4"	209 (95)	132 (60)	220 (100)	143 (65)
6"	375 (170)	242 (110)	463 (210)	265 (120)
8"	661 (300)	617 (280)	772 (350)	727 (330)

Dimensions (approximate) in inches and (mm)



Valve Size	A - FLANGED BODY			B		
	ANSI/ISA-75.08.01			BONNET TYPE		
	Class 150	Class 300	Class 600	CE1	CE3	CE4
½"	7.25 (184)	7.5 (190)	8 (203)	5.35 (136)	9.13 (232)	14.17 (360)
¾"		7.62 (194)	8.12 (206)			
1"		7.75 (197)	8.25 (210)			12.13 (308)
1½"	8.75 (222)	9.25 (235)	9.88 (251)	5.87 (149)	11.89 (302)	12.2 (310)
2"	10 (254)	10.5 (267)	11.25 (286)	6.73 (171)	18.86 (479)	17.72 (450)
3"	11.75 (298)	12.5 (318)	13.25 (337)	7.8 (198)	19.92 (506)	21.46 (545)
4"	13.88 (352)	14.5 (368)	15.5 (394)	8.58 (218)	20.67 (525)	28 (712)
6"	17.75 (451)	18.62 (473)	20 (508)	13.15 (334)	23.27 (591)	32.87 (835)
8"	21.38 (543)	22.38 (568)	24 (610)	16.54 (420)	28.54 (725)	36.18 (919)

85 Series Pneumatic Actuators

The 85 Series control valves are normally actuated by DC Series spring and diaphragm actuator or PP Series piston actuator, both manufactured by Hiter.

85 series valves can also be supplied with electric or hydraulic actuators.

Please contact Hiter for your specific requirements.



DC Series
Spring Diaphragm Actuator



PP Series
Piston Actuator

Positioners

The 85 Series control valves are available with the complete range of Spirax Sarco positioners. Alternative positioners are also available. Please contact Hiter or Spirax Sarco for your specific requirements.

85 Series Selection Guide

Series	85	85
Types	51, 52, 61, 62, 58, 68, 70, 71	51
Valve Size	½", ¾", 1", 1½", 2", 3", 4", 6", 8"	4"
Class	150, 300 and 600	150
Body Material	WCB - Carbon Steel ASTM A216 WCB	WCB
	WC9 - Alloy Steel Cr-Mo-V ASTM A217 WC9	
	CF8M - Stainless Steel ASTM A351 CF8M	
Trim Materials	316 stainless steel	316
	17-4PH stainless steel hardened 410 stainless steel hardened	
	316 stainless steel with Stellite coating	
Bonnet Type	CE1	CE1
	CE3	
	CE4	
Stem Seal Material	Braided PTFE	Graphite
	Graphite	

Order Example

85	51	4"	150#	WCB	316	CE1	Graphite

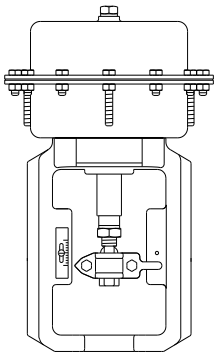
TI-P357-30
CTLS Issue 18

PN9000 Series
Pneumatic Actuators
for use with Spira-trol™ Control Valves

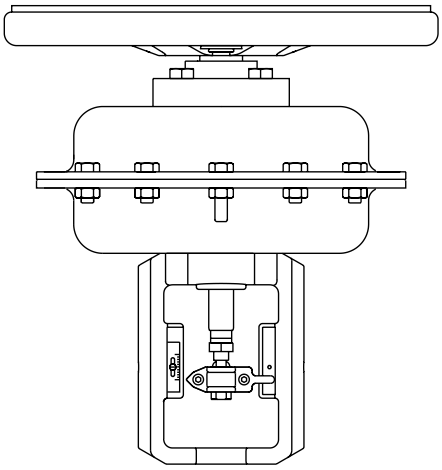
Description

The PN9000 series actuators are a compact range of linear actuators that are available in 3 diaphragm sizes for matching the requirements of valves at various differential pressures.
Each actuator is fitted with a mechanical travel indicator and incorporates a fully-rolling diaphragm, which provides good linearity over the operating stroke.

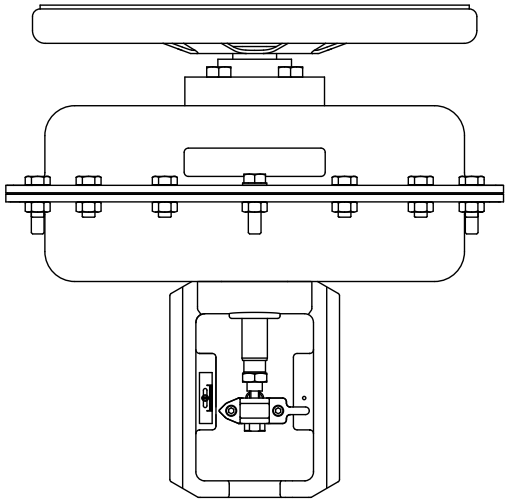
Available types	**PN** = Standard	**Suffix E** = Spring-extend	**Important note:** Throughout this document, reference has been made to the PN actuator.
		Suffix R = Spring-retract	
Optional extra	**Manual handwheel**	**Suffix H**	
	Anti-corrosive bolting	**Suffix S**	
Fast speed		**Suffix F**	



PN9100



PN9200EH



PN9336EH

Actuator force available in relation to motive air pressure

Actuator	Area of diaphragm cm² (in²)	Spring rating bar (psi)		Spring force E = Closed / R = Opened N (lbf)	Actuator force available in relation to motive air pressure N (lbf)					
					1	2	3	4	5	6
PN91_0 _	100 (15.5)	0.2 (2.9)	1.0 (14.5)	200 (45)		1000 (224.8)	2000 (449.6)	3000 (674.4)	4000 (899.2)	5000 (1124)
PN91_0 _		0.4 (5.8)	1.2 (17.4)	400 (89.9)		800 (179.8)	1800 (404.6)	2800 (629.4)	3800 (854.2)	4800 (1079)
PN91_6 _		1.0 (14.5)	2.0 (29)	1000 (224.8)			1000 (224.8)	2000 (449.6)	3000 (674.4)	4000 (899.2)
PN91_3 _		2.0 (29)	4.0 (58)	2000 (449.6)					1000 (224.8)	2000 (449.6)
PN92_0 _	340 (52.7)	0.2 (2.9)	1.0 (14.5)	680 (152.8)		3400 (764.3)	6800 (1528.7)	10200 (2293)		
PN92_0 _		0.4 (5.8)	1.2 (17.4)	1360 (305.7)		2720 (611.4)	6120 (1375.8)	9520 (2140.1)		
PN92_6 _		1.0 (14.5)	2.0 (29)	3400 (764.3)			3400 (764.3)	6800 (1375.8)	10200 (2293)	13600 (3057.4)
PN92_3 _		2.0 (29)	4.0 (58)	6800 (1528.7)					3400 (3012.4)	6800 (1528.7)
PN93_0 _	670 (103.9)	0.2 (2.9)	1.0 (14.5)	1340 (301.2)		6700 (1506.2)	13400 (3012.4)			
PN93_0 _		0.4 (5.8)	1.2 (17.4)	2680 (602.4)		5360 (1205)	12060 (2711.2)			
PN93_6 _		1.0 (14.5)	2.0 (29)	6700 (1506.2)			6700 (1506.2)	13400 (3012.4)		
PN93_7 _		2.5 (36.2)	3.5 (50.7)	16750 (3765.5)				3350 (753.1)		

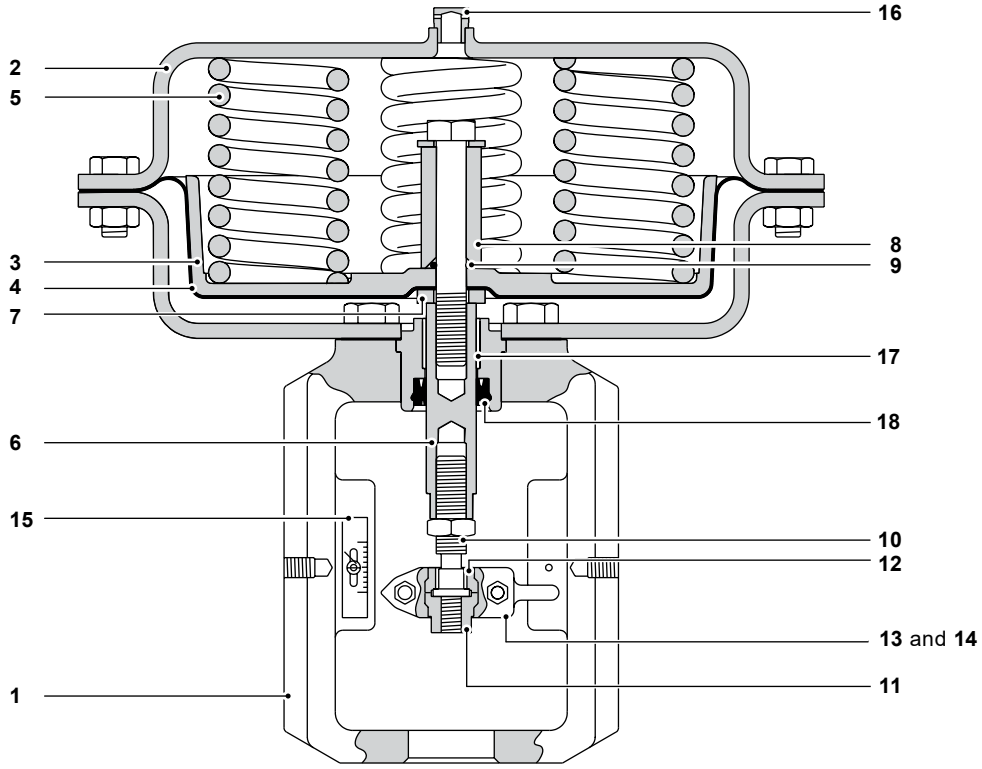
Technical data

Temperature range	**Reinforced NBR Diaphragm**	- 20 °C to +110 °C (- 4 °F to 230 °F)
	EPDM (T version)	-20 °C to +130 °C (- 4 °F to 266 °F)
Maximum operating inlet pressure	**PN9100**	6 bar g (87 psi g)
	PN9220E	3 bar g (43.4 psi g)
	PN9226E/PN9230E	4 bar g (58 psi g)
	PN9223E/PN9236E/PN9233E and PN9200R	6 bar g (87 psi g)
	PN9320E	2 bar g (29 psi g)
	PN9330E	3 bar g (43.4 psi g)
	PN9336E-PN9337E	4 bar g (58 psi g)
	PN9300R	2.7 bar g (39.1 psi g)
Air supply connection		¼" NPT
Actuator travel	**PN9100**	20 mm (0.79")
	PN922_ and PN932_	20 mm (0.79")
	PN923_ and PN933_	30 mm (1.18")
Reinforced NBR diaphragm		

Compliance

The PN9000 series actuator, when coupled to the Spira-trol™ control valve (as defined in the Technical Information sheets TI-S24-71 and TI-S24-72), complies with the requirements of Machinery Directive 2006/42EC. Please refer to the Installation and Maintenance Instructions for the PN9000 series (IM-P357-29) and the Spira-trol™ valve (IM-S24-42) for potential hazards and safety information relating to the installation, commissioning, maintenance and disposal of the product assembly and its component parts.

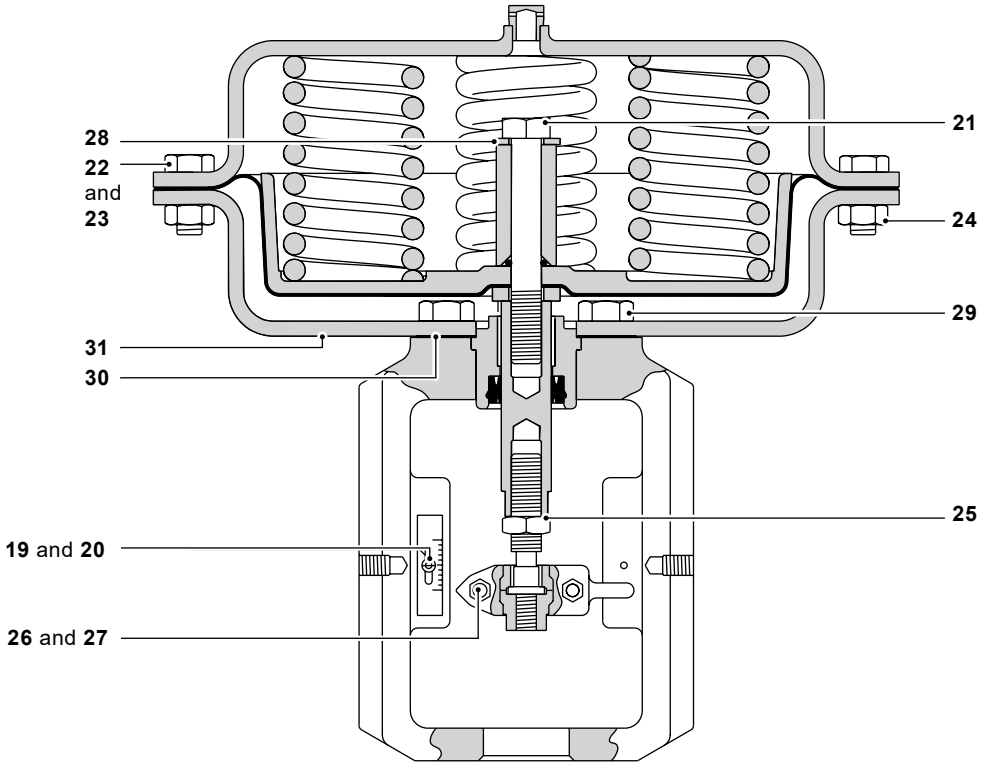
Materials



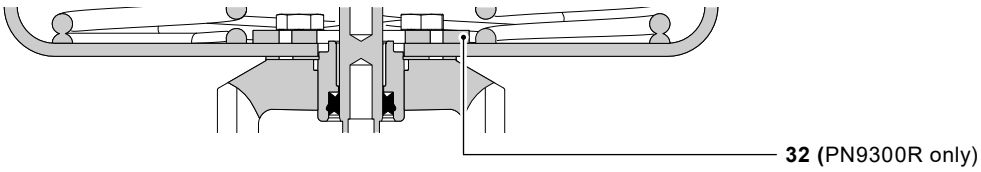
No.	Part	Material	
1	Yoke	SG iron	
2	Upper diaphragm housing	Carbon steel (Zn. plated)	
3	Diaphragm plate	Aluminium	
4	Diaphragm (optional EPDM for T version)	Reinforced NBR	
5	Spring	Spring steel	
6	Spindle	Stainless steel	
7	Washer	Carbon steel (Zn. plated)	
8	Spacer	Carbon steel (Zn. plated)	
9	'O' ring	Viton	
10	Connector	Stainless steel	BS 970 431 S29
11	Adaptor	Stainless steel	BS 970 431 S29
12	Collar	Stainless steel	1.4057
13	Clamp front	Stainless steel	BS 3100 Pt 2 304 C15
14	Clamp rear	Stainless steel	BS 3100 Pt 2 304 C15
15	Scale	Stainless steel	BS 1449 304 S16
16	Vent plug	Brass	
17	Bearing	PTFE/steel composite	
18	Seal	Polyurethane (FKM for T version)	

Materials continued on next page

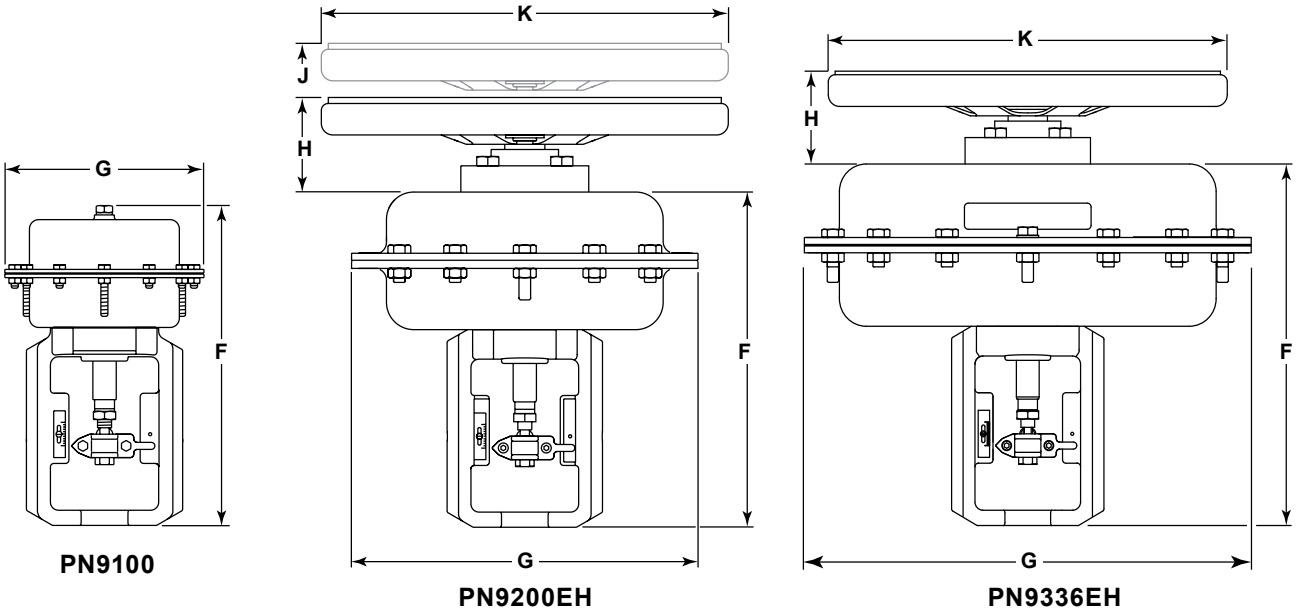
Materials
(continued)



No.	Part		Material	
19 20	Pan head screw Nyloc nut	PN9000	Carbon steel (Zn. plated)	
		PN9000S	Stainless steel	A2 - 70
21	Bolt		Carbon steel (Zn. plated)	Gr. 8.8
22 23 24	Hex. head screw (short) Hex. head screw (long) Nut	PN9000	Carbon steel (Zn. plated)	Gr. 8.8
		PN9000S	Carbon steel (Zn. and AL. plated)	Gr. 8.8
25	Lock-nut		Stainless steel	A2 - 70
26 27	Socket head screw Nut	PN9000	Carbon steel (Zn. plated)	Gr. 8.8
		PN9000S	Stainless steel	A2 - 70
28	Washer		Carbon steel (Zn. plated)	
29	Hex. head screw		Carbon steel (Zn. plated)	Gr. 8.8 (Gr. 10.9 for PN9300R)
30	Gasket		Reinforced Graphite	
31	Lower diaphragm housing		Carbon steel (Zn. plated)	
32	Thrust plate	PN9300R only	Carbon steel	



Dimensions and weights (approximate) in mm (inches) and kg (lbs)



PN9100 PN9200EH PN9336EH

Actuator range	F		G		H		J (Handwheel lifted)		K		Weight			
											Actuator		With handwheel	
	mm	(inches)	mm	(inches)	mm	(inches)	mm	(inches)	mm	(inches)	kg	(lbs)	kg	(lbs)
PN9100E and variants	275	10.8	170	6.7	55	2.1	75	2.9	225	8.9	6	13.2	+ 5.86	12.9
PN9100R and variants	275	10.8	170	6.7	120	4.7	140	5.5	225	8.9	6	13.2	+ 2.50	5.5
PN9200E and variants	300	11.8	300	11.8	65	2.5	85	3.3	350	13.8	17	37.5	+ 7.20	15.9
PN9200R and variants	300	11.8	300	11.8	132	5.1	152	6.0	350	13.8	17	37.5	+ 3.77	8.3
PN9230E and variants	335	13.2	300	11.8	65	2.5	95	3.7	350	13.8	17	37.5	+ 3.77	8.3
PN9230R and variants	335	13.2	300	11.8	122	4.8	152	6.0	350	13.8	17	37.5	+ 3.77	8.3
PN9320E and variants	325	12.8	390	15.4	65	2.5	85	3.3	350	13.8	27	59.5	+ 7.20	15.9
PN9320R and variants	325	12.8	390	15.4	132	5.1	152	6.0	350	13.8	27	59.5	+ 3.77	8.3
PN9330E and variants	335	13.2	390	15.4	65	2.5	95	3.7	350	13.8	27	59.5	+ 7.20	15.9
PN9330R and variants	335	13.2	390	15.4	122	4.8	152	6.0	350	13.8	27	59.5	+ 3.70	8.3
PN9336E and variants	335	13.2	390	15.4	65	2.5	95	3.7	350	13.8	27	59.5	+ 7.20	15.9
PN9336R and variants	335	13.2	390	15.4	122	4.8	152	6.0	350	13.8	27	59.5	+ 3.77	8.3
PN9337E and variants	335	13.2	390	15.4	410	16.1	410	16.1	350	13.8	27	59.5		

How to use the sizing data on the following pages:

The following tables supply guidance as to the sizing of the PN9000 when it is used on a Spira-trol™ control valve.

Two conditions are illustrated in tabular form:
Class IV shut-off - Providing shut-off of the valve to the requirements of BS 5793-4 (IEC 60534-4) class IV.
Class VI shut-off - Providing shut-off of the valve to the requirements of BS 5793-4 (IEC 60534-4) class VI.

To select a suitable actuator:

- Identify the column containing the valve and gland material selected.
- Identify the maximum operating pressure condition, including any transient pressures likely to occur, within the selected column.
- Read back to the left hand side of the table to identify the suitable actuator for the application.

For conditions outside of those illustrated please contact Spirax Sarco.

PN9000E
- Maximum differential pressures for Class IV shut-off
- Metal Seated (T & S)
- Spira-trol
- DN15 - 25 (½" - 1")
- Flow under

Actuator	Spring range bar (psi)	Standard Cage (S)																							
		Cage Type		DN15-25 (½"-1")																					
		Valve size		0.01-0.07 (0.012-0.081)			0.1-0.2 (0.12-0.23)			0.5 (0.58)			1.0 (1.2)			1.6 (1.8)			2.5 (2.9)					
		Kvs (Cv)		N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D			
		Maximum pressure bar g (psi g)																							
PN9120E	0.2-1.0	6.0		103.4			50.2																		
	(3-15)	(87)		(1500)			(728)																		
	0.4-1.2	6.0		103.4			103.4		25.0	96.6		25.0	67.6		17.6	26.5		0.6	12.2					
	(6-17)	(87)		(1500)			(1500)		(363)	(1401)		(363)	(980)		(255)	(384)		(9)	(177)					
PN9126E	1.0-2.0	6.0		103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	81.4	25.0	85.5	47.3	25.0			
	(15-29)	(87)		(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1180)	(363)	(1240)	(686)	(363)			
PN9123E	2.0-4.0	6.0		103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(29-58)	(87)		(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			
PN9220E	0.2-1.0	6.0		103.4	103.4	25.0	103.4	103.4	25.0	103.4	94.6	25.0	103.4	66.1	25.0	85.4	25.7	25.0	49.8	11.7	25.0			
	(3-15)	(87)		(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1372)	(363)	(1500)	(959)	(363)	(1239)	(373)	(363)	(722)	(170)	(363)			
	0.4-1.2	6.0		103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	98.2	25.0			
	(6-17)	(87)		(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1424	(363)			
PN9226E	1.0-2.0	6.0		103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(15-29)	(87)		(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			
PN9223E	2.0-4.0	6.0		103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(29-58)	(87)		(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			
PN9320E	0.2-1.0	4.0		103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	95.7	25.0			
	(3-15)	(58)		(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1388)	(363)			
	0.4-1.2	4.0		103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(6-17)	(58)		(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			

Table continued on next page

Table continued from previous page

PN9000E
- Maximum differential pressures for Class IV shut-off
- Metal Seated (T & S)
- Spira-trol
- DN15 - 25 (½" - 1")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)														Low noise cage - P1			
		Valve size	DN15-25 (½"-1")																	
		Kvs (Cv)	4.0 (4.6)			4.9-6.3 (5.7-7.3)			7.2 (8.3)			10 (12)			11 (12.7)			2.5-4-6.3-10 (2.9-4.6-7.3-12)		
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D
PN9120E	0.2-1.0	6.0																		
	(3-15)	(87)																		
	0.4-1.2	6.0	5.1																	
	(6-17)	(87)	(74)																	
PN9126E	1.0-2.0	6.0	56.0	29.5	25.0	27.8	12.9	21.3	20.5	8.7	15.4	15.4	5.8	11.2	11.4	3.7	8.0	11.4	3.7	8.0
	(15-29)	(87)	(812)	(428)	(363)	(403)	(187)	(309)	(297)	(126)	(223)	(223)	(84)	(162)	(165)	(54)	(116)	(165)	(54)	(116)
PN9123E	2.0-4.0	6.0	103.4	103.4	25.0	75.5	60.6	25.0	58.2	46.4	25.0	45.9	36.4	25.0	36.2	28.5	25.0	36.2	28.5	25.0
	(29-58)	(87)	(1500)	(1500)	(363)	(1095)	(879)	(363)	(844)	(673)	(363)	(666)	(528)	(525)	(252)	(413)	(363)	(525)	(413)	(363)
PN9220E	0.2-1.0	6.0	31.3	4.8	19.8	13.8		7.4	9.5		4.4	6.5		2.3	4.2		0.8	4.2		0.8
	(3-15)	(87)	(454)	(70)	(287)	(200)		(107)	(138)		(64)	(94)		(33)	(61)		(12)	(61)		(12)
	0.4-1.2	6.0	91.4	64.9	25.0	47.7	32.7	25.0	36.2	24.4	25.0	28.1	18.6	24.0	21.7	14.0	18.4	21.7	14.0	18.4
	(6-17)	(87)	(1326)	(941)	(363)	(691)	(474)	(363)	(525)	(356)	(363)	(408)	(270)	(348)	(314)	(203)	(267)	(315)	(203)	(267)
PN9226E	1.0-2.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	93.0	83.5	25.0	74.4	66.7	25.0	74.4	66.7	25.0
	(15-29)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1349)	(1211)	(363)	(1079)	(967)	(363)	(1079)	(967)	(363)
PN9223E	2.0-4.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0
	(29-58)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)
PN9320E	0.2-1.0	4.0	89.6	63.1	25.0	46.7	31.8	25.0	35.4	23.6	25.0	27.5	17.9	23.3	21.2	13.5	17.9	21.2	13.5	17.9
	(3-15)	(58)	(1300)	(915)	(363)	(677)	(461)	(363)	(513)	(342)	(363)	(399)	(260)	(338)	(307)	(196)	(260)	(308)	(196)	(260)
	0.4-1.2	4.0	103.4	103.4	25.0	103.4	98.4	25.0	88.1	76.3	25.0	70.1	60.6	25.0	55.8	48.1	25.0	55.8	48.1	25.0
	(6-17)	(58)	(1500)	(1500)	(363)	(1500)	(1427)	(363)	(1278)	(1107)	(363)	(1017)	(879)	(363)	(809)	(698)	(363)	(809)	(698)	(363)

PN9000R
- Maximum differential pressures for Class IV shut-off
- Metal Seated (T & S)
- Spira-trol
- DN15 - 25 (½" - 1")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																					
		Valve size	DN15-25 (½"-1")																					
		Kvs (Cv)	0.01-0.07 (0.012-0.081)			0.1-0.2 (0.12-0.23)			0.5 (0.58)			1.0 (1.2)			1.6 (1.8)			2.5 (2.9)					
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D			
PN9120R	0.2-1.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(3-15)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			
	0.4-1.2	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(6-17)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			
PN9126R	1.0-2.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(15-29)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			
PN9123R	2.0-4.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(29-58)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			
PN9220R	0.2-1.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(3-15)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			
	0.4-1.2	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(6-17)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			
PN9226R	1.0-2.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(15-29)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			
PN9223R	2.0-4.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(29-58)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			
PN9320R	0.2-1.0	2.7	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(3-15)	(0.18)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			
	0.4-1.2	2.7	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(6-17)	(39.1)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			

Table continued on next page

Table continued from previous page

PN9000R
- Maximum differential pressures for Class IV shut-off
- Metal Seated (T & S)
- Spira-trol
- DN15 - 25 (½" - 1")
- Flow under

Actuator	Spring range bar (psi)	Standard Cage (S)																Low noise cage - P1			
		Cage Type	DN15-25 (½"-1")															2.5-4-6.3-10 (2.9-4.6-7.3-12)			
		Valve size		4.0 (4.6)			4.9-6.3 (5.7-7.3)			7.2 (8.3)			10 (12)			11 (12.7)				
		Kvs (Cv)		N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D
		Maximum pressure bar g (psi g)																			
PN9120R	0.2-1.0	6.0		103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	102.9	25.0	103.4	102.9	25.0
	(3-15)	(87)		(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1492)	(363)	(1500)	(1492)	(363)
	0.4-1.2	6.0		103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	97.9	25.0	103.4	97.9	25.0
	(6-17)	(87)		(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1133)	(363)	(1500)	(1420)	(363)
PN9126R	1.0-2.0	6.0		103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	97.5	25.0	85.8	78.1	25.0	85.8	78.1	25.0
	(15-29)	(87)		(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1414)	(363)	(1244)	(413)	(363)	(1239)	(1133)	(363)
PN9123R	2.0-4.0	6.0		103.4	103.4	25.0	75.5	60.6	25.0	58.2	46.4	25.0	45.9	36.4	25.0	36.2	28.5	25.0	36.2	28.5	25.0
	(29-58)	(87)		(1500)	(1500)	(363)	(1095)	(879)	(363)	(844)	(673)	(363)	(666)	(528)	(363)	(525)	(1500)	(363)	(525)	(413)	(363)
PN9220R	0.2-1.0	6.0		103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0
	(3-15)	(87)		(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)
	0.4-1.2	6.0		103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0
	(6-17)	(87)		(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)
PN9226R	1.0-2.0	6.0		103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0
	(15-29)	(87)		(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)
PN9223R	2.0-4.0	6.0		103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0
	(29-58)	(87)		(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)
PN9320R	0.2-1.0	2.7		103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0
	(3-15)	(39.1)		(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)
	0.4-1.2	2.7		103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0
	(6-17)	(39.1)		(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)

PN9000E
- Maximum differential pressures for Class IV shut-off
- Metal Seated (T & S)
- Spira-trol
- DN32 - 50 (1¼" - 2")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																							
		Valve size	DN32-50 (1¼"-2")																							
		Kvs (Cv)	4.0 (4.6)			6.3 (7.3)			10 (12)			16 (18)			17.5 - 18 (20.2-21)			25 (29)							
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D
PN9120E	0.4-1.2	6.0	7.9																							
	(6-17)	(87)	(115)																							
PN9126E	1.0-2.0	6.0	57.2	31.5	25.0	30.3	15.4	23.8	17.4	7.8	13.2	13.5	5.6	10.1	9.5	3.4	6.9	3.6	0.3	2.2						
	(15-29)	(87)	(830)	(457)	(363)	(439)	(223)	(345)	(252)	(113)	(191)	(196)	(81)	(146)	(138)	(49)	(100)	(52)	(4)	(32)						
PN9123E	2.0-4.0	6.0	103.4	103.4	25.0	78.0	63.1	25.0	47.9	38.4	25.0	38.8	30.9	25.0	29.1	23.0	25.0	14.2	10.9	12.7						
	(29-58)	(87)	(1500)	(1500)	(363)	(1131)	(915)	(363)	(695)	(560)	(363)	(563)	(448)	(363)	(422)	(334)	(363)	(206)	(158)	(184)						
PN9220E	0.2-1.0	6.0	33.2	7.6	22.1	16.3	1.4	9.9	8.5		4.3	6.2		2.7	3.8		1.2	0.5								
	(3-15)	(87)	(482)	(110)	(320)	(236)	(20)	(144)	(123)		(62)	(90)		(39)	(55)		(17)	(7)								
	0.4-1.2	6.0	91.4	65.7	25.0	50.2	35.2	25.0	30.1	20.6	25.0	24.1	16.2	20.6	17.7	11.6	15.0	8.0	4.7	6.6						
	(6-17)	(87)	(1326)	(953)	(363)	(728)	(510)	(363)	(437)	(299)	(363)	(350)	(235)	(299)	(257)	(168)	(218)	(116)	(68)	(96)						
PN9226E	1.0-2.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	95.0	85.5	25.0	77.7	69.8	25.0	59.2	53.1	25.0	30.5	27.2	25.0						
	(15-29)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1378)	(1240)	-363	(1127)	(1012)	(363)	(859)	(770)	(363)	(442)	(395)	(363)						
PN9223E	2.0-4.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	67.9	64.6	25.0						
	(29-58)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	-363	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(985)	(937)	(363)						
PN9320E	0.2-1.0	4.0	89.7	64.0	25.0	49.2	34.3	25.0	29.5	19.9	25.0	23.5	15.6	20.1	17.3	11.1	14.6	7.8	4.5	6.3						
	(3-15)	(58)	(1300)	(928)	(363)	(713)	(497)	(363)	(428)	(289)	-363	(341)	(226)	(292)	(251)	(161)	(212)	(113)	(65)	(91)						
	0.4-1.2	4.0	103.4	103.4	25.0	103.4	100.9	25.0	72.1	62.6	25.0	58.8	50.9	25.0	44.6	38.4	25.0	22.5	19.2	21.7						
	(6-17)	(58)	(1500)	(1500)	(363)	(1500)	(1463)	(363)	(1046)	(908)	-363	(853)	(738)	(363)	(647)	(557)	(363)	(326)	(276)	(315)						

Table continued on next page

Table continued from previous page

PN9000E
- Maximum differential pressures for Class IV shut-off
- Metal Seated (T & S)
- Spira-trol
- DN32 - 50 (1¼" - 2")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)								Low Noise Cage (P1)		
		Valve size	DN32-50 (1¼"-2")										
		Kvs (Cv)	31-36 (36-42)			46-50 (53-58)			All Kvs				
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D		
PN9126E	1.0-2.0	6.0	2.3		1.2	1.0			1.0				
	(15-29)	(87)	(33)		(17)	(15)			(15)				
PN9123E	2.0-4.0	6.0	10.8	8.1	9.6	7.0	5.1	6.2	7.0	5.1	6.2		
	(29-58)	(87)	(157)	(90)	(139)	(247)	(74)	(90)	(247)	(90)	(247)		
PN9220E	0.4-1.2	6.0	5.8	3.2	4.7	3.5	1.6	2.7	3.5	1.6	2.7		
	(6-17)	(87)	(84)	(39)	(68)	(51)	(23)	(39)	(51)	(39)	(51)		
PN9226E	1.0-2.0	6.0	23.8	21.2	22.7	16.3	14.4	15.5	16.3	14.4	15.5		
	(15-29)	(87)	(345)	(225)	(329)	(236)	(209)	(225)	(236)	(225)	(236)		
PN9223E	2.0-4.0	6.0	53.8	51.2	25.0	37.7	35.8	16.0	37.7	35.8	25.0		
	(29-58)	(87)	(780)	(363)	(363)	(547)	(519)	(232)	(547)	(232)	(547)		
PN9320E	0.2-1.0	4.0	5.7	3.0	4.5	3.4	1.5	2.5	3.4	1.5	2.5		
	(3-15)	(58)	(83)	(36)	(65)	(49)	(74)	(36)	(49)	(36)	(49)		
	0.4-1.2	4.0	17.5	14.8	16.3	11.8	9.9	11.0	11.8	9.9	11.0		
	(6-17)	(58)	(254)	(160)	(236)	(171)	(144)	(160)	(171)	(160)	(171)		

PN9000R
- Maximum differential pressures for Class IV shut-off
- Metal Seated (T & S)
- Spira-trol
- DN32 - 50 (1¼" - 2")
- Flow under

Actuator	Spring range bar (psi)	Standard Cage (S)																					
		Cage Type		DN32-50 (1¼"-2")																			
		Valve size			4.0 (4.6)			6.3 (7.3)			10 (12)			16 (18)			17.5 - 18 (20.2-21)			25 (29)		
		Kvs (Cv)	Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D
PN9120R	0.2-1.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	87.7	81.6	25.0	45.9	42.6	25.0
	(3-15)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1272)	(1184)	(363)	(666)	(618)	(363)
	0.4-1.2	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	101.6	25.0	83.8	77.7	25.0	43.8	40.5	25.0
	(6-17)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1474)	(363)	(1215)	(1127)	(363)	(635)	(587)	(363)
PN9126R	1.0-2.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	99.5	25.0	89.3	81.4	25.0	68.2	62.1	25.0	35.3	32.0	25.0
	(15-29)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1443)	(363)	(1295)	(1181)	(363)	(989)	(901)	(363)	(515)	(464)	(363)
PN9123R	2.0-4.0	6.0	103.4	103.4	25.0	78.0	63.1	25.0	47.9	38.4	25.0	38.8	30.9	25.0	29.1	23.0	25.0	14.2	10.9	12.7
	(29-58)	(87)	(1500)	(1500)	(363)	(1131)	(915)	(363)	(695)	(560)	(363)	(563)	(448)	(363)	(422)	(334)	(363)	(206)	(158)	(184)
PN9220R	0.2-1.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0
	(3-15)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(363)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)
	0.4-1.2	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0
	(6-17)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(363)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)
PN9226R	1.0-2.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0
	(15-29)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(363)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)
PN9223R	2.0-4.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	67.9	64.6	25.0
	(29-58)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(363)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(985)	(937)	(363)
PN9320R	0.2-1.0	2.7	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0
	(3-15)	(39.1)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(363)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)
	0.4-1.2	2.7	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	100.4	25.0
	(6-17)	(39.1)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(363)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1456)	(363)

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PN9000R
- Maximum differential pressures for Class IV shut-off
- Metal Seated (T & S)
- Spira-trol
- DN32 - 50 (1¼" - 2")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)								Low noise cage (P1)		
		Valve size	DN32-50 (1¼"-2")										
		Kvs (Cv)	31-36 (36-42)			46-50 (53-58)			All Kvs				
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D		
PN9120R	0.2-1.0	6.0	36.2	33.5	25.0	25.1	23.2	24.3	25.1	23.2	24.3		
	(3-15)	(87)	(525)	(486)	(363)	(364)	(336)	(352)	(364)	(364)	(352)		
	0.4-1.2	6.0	34.5	31.8	25.0	23.9	22.0	23.1	23.9	22.0	23.1		
	(6-17)	(87)	(500)	(461)	(363)	(346)	(319)	(335)	(346)	(346)	(335)		
PN9126R	1.0-2.0	6.0	27.7	25.1	25.0	19.1	17.2	18.3	19.1	17.2	18.3		
	(15-29)	(87)	(402)	(364)	(363)	(277)	(249)	(265)	(277)	(277)	(265)		
PN9123R	2.0-4.0	6.0	10.8	8.1	9.6	7.0	5.1	6.2	7.0	5.1	6.2		
	(29-58)	(87)	(157)	(117)	(139)	(102)	(74)	(90)	(102)	(102)	(90)		
PN9220R	0.2-1.0	6.0	103.4	103.4	25.0	101.8	99.9	25.0	101.8	99.9	25.0		
	(3-15)	(87)	(1500)	(1500)	(363)	(1476)	(1449)	(363)	(1476)	(1476)	(363)		
	0.4-1.2	6.0	103.4	103.4	25.0	97.5	95.7	25.0	97.5	95.7	25.0		
	(6-17)	(87)	(1500)	(1500)	(363)	(1414)	(1388)	(363)	(1414)	(1414)	(363)		
PN9226R	1.0-2.0	6.0	103.4	103.4	25.0	80.4	78.6	25.0	80.4	78.6	25.0		
	(15-29)	(87)	(1500)	(1500)	(363)	(1166)	(1140)	(363)	(1166)	(1166)	(363)		
PN9223R	2.0-4.0	6.0	53.8	51.2	25.0	37.7	35.8	25.0	37.7	35.8	25.0		
	(29-58)	(87)	(780)	(743)	(363)	(547)	(519)	(363)	(547)	(547)	(363)		
PN9320R	0.2-1.0	2.7	94.3	91.6	25.0	66.5	64.7	25.0	66.5	64.7	25.0		
	(3-15)	(39.1)	(1368)	(1329)	(363)	(965)	(938)	(363)	(965)	(965)	(363)		
	0.4-1.2	2.7	82.5	79.8	25.0	58.1	56.2	25.0	58.1	56.2	25.0		
	(6-17)	(39.1)	(1196)	(1157)	(363)	(843)	(815)	(363)	(843)	(843)	(363)		

PN9000E
- Maximum differential pressures for Class IV shut-off
- Metal Seated (T & S)
- Spira-trol
- DN65 - 100 (2½" - 4")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																											
		Valve size	DN65-100 (2½"-4")																						DN100 (4")					
		Kvs (Cv)	16 (18)			25 (29)			36 (42)			63-73-90 (73-85-104)			100-117 (116-135)			160-180 (185-208)												
		Maximum pressure bar g (psi g)	P	H	D	N-P	H	D	P	H	D	P	H	D	P	H	D													
PN9230E	0.2-1.0	6.0	2.8		1.2																									
	(3-15)	(87)	(41)		(17)																									
	0.4-1.2	6.0	16.6	6.3	15.0	5.4	0.9	4.7	3.2		2.7	0.9		0.7																
	(6-17)	(87)	(241)	(91)	(218)	(78)	(13)	(68)	(46)		(39)	(13)		(10)																
PN9236E	1.0-2.0	6.0	58.2	47.8	25.0	23.4	18.9	22.7	16.0	12.8	15.5	8.2	6.4	7.9	4.7	3.5	4.5	2.5	1.8	2.4										
	(15-29)	(87)	(844)	(693)	(363)	(339)	(274)	(329)	(232)	(186)	(225)	(119)	(93)	(115)	(68)	(51)	(22)	(36)	(26)	(35)										
PN9233E	2.0-4.0	6.0	103.4	103.4	16.0	53.4	48.9	25.0	37.4	34.2	25.0	20.2	18.4	19.9	12.4	11.2	6.5	7.3	6.6	7.2										
	(29-58)	(87)	(1500)	(1500)	(232)	(775)	(709)	(363)	(542)	(496)	(363)	(293)	(267)	(289)	(180)	(162)	(94)	(106)	(96)	(104)										
PN9330E	0.2-1.0	4.0	16.2	5.9	14.6	5.2	0.7	4.5	3.0		2.5	0.9		0.6																
	(3-15)	(58)	(235)	(86)	(212)	(75)	(10)	(65)	(44)		(36)	(13)		(9)																
	0.4-1.2	4.0	43.5	33.2	25.0	17.0	12.5	16.3	11.5	8.3	11.0	5.6	3.8	5.3	31.0	1.9	2.9	1.5	0.7	1.4										
	(6-17)	(58)	(631)	(482)	(363)	(247)	(181)	(236)	(167)	(120)	(160)	(81)	(55)	(77)	(450)	(28)	(42)	(22)	(10)	(20)										
PN9336E	1.0-2.0	4.0	103.4	103.4	25.0	52.5	48.0	25.0	36.7	33.5	25.0	19.8	18.0	19.5	12.2	11.0	12.2	7.1	6.4	7.0										
	(15-29)	(58)	(1500)	(1500)	(363)	(1197)	(696)	(363)	(532)	(486)	(363)	(287)	(261)	(283)	(177)	(160)	(180)	(103)	(93)	(102)										
PN9337E	2.5-3.5	4.0	103.4	103.4	25.0	103.4	103.4	25.0	99.9	96.7	25.0	55.4	53.6	25.0	34.9	33.8	25.0	21.3	20.6	21.2										
	(36)-3.5	(58)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1149)	(1403)	(363)	(804)	(777)	(363)	(506)	(490)	(363)	(309)	(299)	(307)										

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PN9000E
- Maximum differential pressures for Class IV shut-off
- Metal Seated (T & S)
- Spira-trol
- DN65 - 100 (2½" - 4")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Low Noise Cage (P1)									
		Valve size	DN65-100 (2½"-4")						DN100 (4")			
		Kvs (Cv)	All Kvs						All Kvs			
		Maximum pressure bar g (psi g)	P		H		D		P		H	D
PN9230E	0.2-1.0	6.0										
	(3-15)	(87)										
	0.4-1.2	6.0										
	(6-17)	(87)										
PN9236E	1.0-2.0	6.0	4.7		3.5		4.5		2.5		1.8	2.4
	(15-29)	(87)	(51)		(65)		(36)		(26)		(35)	(35)
PN9233E	2.0-4.0	6.0	12.4		11.2		12.2		7.3		6.6	7.2
	(29-58)	(87)	(162)		(177)		(106)		(96)		(104)	(104)
PN9330E	0.2-1.0	4.0										
	(3-15)	(58)										
	0.4-1.2	4.0	3.1		1.9		2.9		1.5		0.7	1.4
	(6-17)	(58)	(28)		(42)		(22)		(10)		(20)	(20)
PN9336E	1.0-2.0	4.0	12.2		11.0		12.0		7.1		6.4	7
	(15-29)	(58)	(160)		(174)		(103)		(93)		(102)	(102)
PN9337E	2.5-3.5	4.0	34.9		33.8		25.0		21.3		20.6	21.2
	(36)-3.5	(58)	(490)		(363)		(309)		(299)		(307)	(307)

PN9000R
- Maximum differential pressures for Class IV shut-off
- Metal Seated (T & S)
- Spira-trol
- DN65 - 100 (2½" - 4")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																							
		Valve size	DN65-100 (2½"-4")																							
		Kvs (Cv)	16 (18)			25 (29)			36 (42)			63-73-90 (73-85-104)			100-117 (116-135)			160-180 (185-208)							
		Maximum pressure bar g (psi g)	P	H	D	N-P	H	D	P	H	D	P	H	D	P	H	D	P	H	D	P	H	D	P	H	D
PN9230R	0.2-1.0	6.0	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	103.4 (1500)	25.0 (363)	101.5 (440)	98.3 (1426)	25.0 (363)	56.3 (817)	54.5 (790)	25.0 (363)	35.5 (515)	34.3 (497)	25.0 (363)	21.7 (314)	20.9 (303)	21.6 (313)						
	(3-15)	(87)																								
	0.4-1.2	6.0	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	103.4 (1500)	25.0 (363)	97.2 (1363)	94.0 (1363)	25.0 (363)	53.9 (782)	52.1 (756)	25.0 (363)	33.9 (492)	32.8 (476)	25.0 (363)	20.7 (300)	20.0 (290)	20.6 (299)						
	(6-17)	(87)																								
PN9236R	1.0-2.0	6.0	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	103.4 (1500)	25.0 (363)	80.1 (1162)	76.9 (1115)	25.0 (363)	44.2 (641)	42.4 (613)	25.0 (363)	27.8 (403)	26.6 (386)	25.0 (363)	16.9 (245)	16.2 (235)	16.8 (244)						
	(15-29)	(87)																								
PN9233R	2.0-4.0	6.0	103.4 (1500)	103.4 (1500)	25.0 (363)	53.4 (775)	48.9 (702)	25.0 (363)	37.4 (542)	34.2 (914)	25.0 (363)	20.2 (293)	18.4 (267)	19.9 (363)	12.4 (180)	11.2 (162)	12.2 (177)	7.3 (106)	6.6 (96)	7.2 (104)						
	(29-58)	(87)																								
PN9330R	0.2-1.0	2.7	103.4 (1500)	103.4 (1500)	25.0 (363)	93.8 (1360)	89.3 (1295)	25.0 (363)	66.2 (960)	63.0 (792)	25.0 (363)	36.4 (528)	34.6 (502)	25.0 (363)	22.8 (331)	21.6 (313)	22.6 (328)	13.8 (200)	13.0 (189)	13.6 (202)						
	(3-15)	(39.1)																								
	0.4-1.2	2.7	103.4 (1500)	103.4 (1500)	25.0 (363)	82.0 (1189)	77.5 (1124)	25.0 (363)	57.8 (838)	54.6 (303)	25.0 (363)	31.7 (460)	29.8 (432)	25.0 (363)	19.7 (286)	18.6 (270)	19.6 (284)	11.9 (173)	11.1 (160)	11.7 (170)						
	(6-17)	(39.1)																								
PN9336R	1.0-2.0	2.7	84.5 (1226)	74.1 (1075)	25.0 (363)	34.8 (505)	30.3 (439)	25.0 (363)	24.1 (350)	20.9 (303)	23.6 (342)	12.7 (184)	10.9 (158)	12.4 (180)	7.6 (110)	6.5 (94)	7.4 (107)	4.3 (62)	3.6 (52)	4.2 (61)						
	(15-29)	(39.1)																								

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PN9000R
- Maximum differential pressures for Class IV shut-off
- Metal Seated (T & S)
- Spira-trol
- DN65 - 100 (2½" - 4")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Low Noise Cage (P1)								
		Valve size	DN65-80 (2½"-3")				DN100				
		Kvs (Cv)	All Kvs				All Kvs				
		Maximum pressure bar g (psi g)	P		H	D	P		H	D	
PN9230R	0.2-1.0	6.0	35.5	(515)	34.3	(497)	25.0	(55)	21.7	(315)	20.9	(303)	21.6	(313)
	(3-15)	(87)	33.9	(492)	32.8	(476)	25.0	(55)	20.7	(300)	20.0	(290)	20.6	(299)
	0.4-1.2	6.0	27.8	(403)	26.6	(386)	25.0	(55)	16.9	(235)	16.2	(235)	16.8	(244)
	(6-17)	(87)	12.4	(180)	11.2	(162)	12.2	(27)	7.3	(106)	6.6	(96)	7.2	(104)
PN9236R	1.0-2.0	6.0	22.8	(331)	21.6	(313)	22.6	(59)	13.8	(200)	13.0	(189)	13.6	(197)
	(15-29)	(87)	19.7	(286)	18.6	(270)	19.6	(43)	11.9	(173)	11.1	(161)	11.7	(170)
PN9233R	2.0-4.0	6.0	7.6	(110)	6.5	(94)	7.4	(16)	4.3	(52)	3.6	(52)	4.2	(61)
	(29-58)	(87)												
PN9330R	0.2-1.0	2.7												
	(3-15)	(39.1)												
	0.4-1.2	2.7												
	(6-17)	(39.1)												
PN9336R	1.0-2.0	2.7												
	(15-29)	(39.1)												

PN9000E
- Maximum differential pressures for Class VI shut-off
- Resilient Seated (P & Steam-Tight)
- Spira-trol
- DN15 - 25 (½" - 1")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																					
		Valve size	DN15-25 (½"-1")																					
		Kvs (Cv)	0.01-0.07 (0.012-0.081)			0.1-0.2 (0.12-0.23)			0.5 (0.58)			1.0 (1.2)			1.6 (1.8)			2.5 (2.9)					
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D
PN9126E	1.0-2.0	6.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
	(15-29)	(87)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)
PN9123E	1.0-2.0	6.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
	(15-29)	(87)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)
PN9220E	0.2-1.0	6.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
	(3-15)	(87)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)
	0.4-1.2	6.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
	(6-17)	(87)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)
PN9320E	0.2-1.0	4.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
	(3-15)	(58)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)

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PN9000E
- Maximum differential pressures for Class VI shut-off
- Resilient Seated (P & Steam-Tight)
- Spira-trol
- DN15 - 25 (½" - 1")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)															Low noise cage (P1-A1)			
		Valve size	DN15-25 (½"-1")																		
		Kvs (Cv)	4.0 (4.6)			4.9-6.3 (5.7-7.3)			7.2 (8.3)			10 (12)			11 (12.7)			2.5-4-6.3-10 (2.9-4.6-7.3-12)			
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	B	D
PN9126E	1.0-2.0	6.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	17.6	19.0	19.0	13.8	19.0	18.6	10.9	15.3	18.6	10.9		15.3
	(15-29)	(87)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(255)	(276)	(276)	(200)	(276)	(270)	(158)	(222)	(270)	(158)		(222)
PN9123E	1.0-2.0	6.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	16.0	19.0	19.0	19.0	19.0	19.0	4.7	19.0
	(15-29)	(87)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(232)	(276)	(276)	(276)	(276)	(276)	(68)	(276)
PN9220E	0.2-1.0	6.0	19.0	18.1	19.0	19.0	8.9	17.4	18.3	6.6	13.2	14.5	4.9	10.3	11.4	3.6	8.0	11.4	3.6		8.0
	(3-15)	(87)	(276)	(263)	(276)	(276)	(129)	(252)	(263)	(96)	(191)	(210)	(71)	(149)	(165)	(52)	(116)	(165)	(52)		(116)
	0.4-1.2	6.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0		19.0
	(6-17)	(87)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)		(276)
PN9320E	0.2-1.0	4.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0		19.0
	(3-15)	(58)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)		(276)

PN9000E
- Maximum differential pressures for Class VI shut-off
- Resilient Seated (P & Steam-Tight)
- Spira-trol
- DN32 - 50 (1¼" - 2")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																							
		Valve size	DN32-50 (1¼"-2")																							
		Kvs (Cv)	4.0 (4.6)			6.3 (7.3)			10 (12)			16 (18)			17.5 - 18 (20.2-21)			25 (29)								
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D						
PN9126E	1.0-2.0	6.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	13.8	19.0	19.0	11.1	15.6	14.0	8.2	11.7	7.1	3.8							
	(15-29)	(87)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(200)	(276)	(200)	(161)	(226	(203)	(119)	(170)	(103)	(55)							
PN9123E	2.0-4.0	6.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	17.7	14.4	16.3						
	(29-58)	(87)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(257)	(209)	(236)						
PN9220E	0.2-1.0	6.0	19.0	17.4	19.0	19.0	8.9	19.0	14.5	4.9	10.3	11.6	3.7	8.2	8.6	2.5	6.0	4.0	0.7	2.6						
	(3-15)	(87)	(276)	(129)	(276)	(276)	(129)	(276)	(210)	(71)	(149)	(168)	(54)	(119)	(125)	(36)	(87)	(58)	(10)	(38)						
	0.4-1.2	6.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	16.4	19.0	11.5	8.2	10.0						
	(6-17)	(87)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(238)	(87)	(167)	(119)	(145)						
PN9226E	1.0-2.0	6.0																								
	(15-29)	(87)																								
PN9320E	0.2-1.0	4.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	15.9	19.0	11.3	8.0	9.9						
	(3-15)	(58)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(276)	(231)	(87)	(164)	(116)	(144)						
	0.4-1.2	4.0																								
	(6-17)	(58)																								

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PN9000E
- Maximum differential pressures for Class VI shut-off
- Resilient Seated (P & Steam-Tight)
- Spira-trol
- DN32 - 50 (1¼" - 2")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)								Low Noise Cage (P1-A1-P2-A2)	
		Valve size	DN32-50 (1¼"-2")									
		Kvs (Cv)	31-36 (36-42)			46-50 (53-58)			All Kvs			
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	
PN9126E	1.0-2.0	6.0	5.5	2.8	4.3	3.6	1.7	2.8	3.6	1.7	2.8	
	(15-29)	(87)	(80)	(41)	(62)	(52)	(25)	(41)	(25)	(25)	(41)	
PN9123E	2.0-4.0	6.0	13.9	11.3	12.8	9.7	7.8	8.8	9.7	7.8	8.8	
	(29-58)	(87)	(202)	(164)	(186)	(141)	(113)	(128)	(113)	(113)	(128)	
PN9220E	0.2-1.0	6.0	3.0	0.4	1.9	1.9		1.1	1.9		1.1	
	(3-15)	(87)	(44)	(6)	(28)	(28)		(16)	(28)		(16)	
	0.4-1.2	6.0	9.0	6.4	7.9	6.1	4.3	5.3	6.1	4.3	5.3	
	(6-17)	(87)	(131)	(93)	(115)	(88)	(62)	(77)	(62)	(62)	(77)	
PN9226E	1.0-2.0	6.0	19.0	19.0	19.0	19.0	17.1	18.2	19.0	17.1	18.2	
	(15-29)	(87)	(276)	(276)	(276)	(276)	(248)	(264)	(248)	(248)	(264)	
PN9320E	0.2-1.0	4.0	8.8	6.2	7.7	6.0	4.1	5.2	6.0	4.1	5.2	
	(3-15)	(58)	(128)	(90)	(112)	(87)	(59)	(75)	(59)	(59)	(75)	
	0.4-1.2	4.0	8.8	6.2	7.7	6.0	4.1	5.2	6.0	4.1	5.2	
	(6-17)	(58)	(128)	(90)	(112)	(87)	(59)	(75)	(59)	(59)	(75)	

PN9000E
- Maximum differential pressures for Class VI shut-off
- Resilient Seated (P & Steam-Tight)
- Spira-trol
- DN65 - 100 (2½" - 4")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																					
		Valve size	DN65-100 (2½-4")																					
		Kvs (Cv)	16 (18)			25 (29)			36 (42)			63-73-90 (73-85-104)			100-117 (116-135)			160-180 (185-208)					
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D			
PN9230E	0.2-1.0	6.0	7.6		6.3	2.6		1.9	1.6		1.1	0.5		0.3									
	(3-15)	(87)	(110)		(91)	(38)		(58)	(23)		(16)	(7)		(4)									
	0.4-1.2	6.0	19.0	11.1	19.0	8.6	4.1	7.9	5.8	2.6	5.3	2.9	1.1	2.7	1.7	0.5	1.5	0.9		0.8			
	(6-17)	(87)	(276)	(276)	(276)	(125)	(59)	(115)	(84)	(38)	(77)	(42)	(16)	(39)	(25)	(7)	(22)	(13)		(12)			
PN9236E	1.0-2.0	6.0				19.0	19.0	19.0	18.7	15.5	18.2	10.2	8.4	9.9	6.3	5.1	6.1	3.7	3.0	3.6			
	(15-29)	(87)				(276)	(276)	(176)	(271)	(225)	(264)	(148)	(122)	(144)	(91)	(74)	(88)	(54)	(44)	(52)			
PN9233E	2.0-4.0	6.0							19.0	19.0	19.0	14.0	12.8	5.0	8.5	7.8	8.4						
	(29-58)	(87)							(276)	(276)	(276)	(203)	(186)	(73)	(123)	(113)	(122)						
PN9330E	0.2-1.0	4.0	19.0	10.7	19.0	8.4	3.9	7.7	5.7	2.5	5.2	2.9	1.1	2.6	1.6	0.5	1.4	0.8		0.7			
	(3-15)	(58)	(276)	(276)	(276)	(122)	(57)	(112)	(112)	(36)	(75)	(42)	(16)	(38)	(23)	(7)	(15)	(12)		(10)			
	0.4-1.2	4.0				19.0	15.7	19.0	14.1	10.0	13.6	7.6	5.8	7.3	4.7	3.5	4.5	2.7	2.0	2.6			
	(6-17)	(58)				(276)	(228)	(276)	(276)	(145)	(197)	(110)	(84)	(106)	(68)	(51)	(65)	(39)	(29)	(38)			
PN9336E	1.0-2.0	4.0										19.0	19.0	19.0	13.8	12.6	13.6	8.4	7.7	8.3			
	(15-29)	(58)										(276)	(276)	(276)	(200)	(183)	(197)	(122)	(112)	(120)			
PN9337E	2.5-3.5	4.0																19.0	19.0	19.0			
	(36)-3.5	(58)																(276)	(276)	(276)			

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PN9000E
- Maximum differential pressures for Class VI shut-off
- Resilient Seated (P & Steam-Tight)
- Spira-trol
- DN65 - 100 (2½" - 4")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Low Noise Cage (P1-A1-P2-A2)									
		Valve size	DN65-80 (2½"-3")						DN100 (4")			
		Kvs (Cv)	All Kvs						All Kvs			
		Maximum pressure bar g (psi g)	N-P		H		D		N-P		H	D
PN9230E	0.2-1.0	6.0										
	(3-15)	(87)										
PN9230E	0.4-1.2	6.0	1.7		0.5		1.5		0.9			0.8
	(6-17)	(87)	(25)		(7)		(22)		(13)			(12)
PN9236E	1.0-2.0	6.0	6.3		5.1		6.1		3.7		3.0	3.6
	(15-29)	(87)	(91)		(74)		(88)		(54)		(44)	(52)
PN9233E	2.0-4.0	6.0	14.0		12.8		5.0		8.5		7.8	8.4
	(29-58)	(87)	(203)		(186)		(73)		(123)		(113)	(122)
PN9330E	0.2-1.0	4.0	1.6		0.5		1.4		0.8			0.7
	(3-15)	(58)	(23)		(7)		(20)		(12)			(10)
	0.4-1.2	4.0	4.7		3.5		4.5		2.7		2.0	2.6
	(6-17)	(58)	(68)		(51)		(65)		(39)		(29)	(38)
PN9336E	1.0-2.0	4.0	13.8		12.6		13.6		8.4		7.7	8.3
	(15-29)	(58)	(200)		(183)		(197)		(122)		(112)	(120)
PN9337E	2.5-3.5	4.0							19.0		19.0	19.0
	(36)-3.5	(58)							(276)		(276)	(276)

PN9000E
- Maximum differential pressures for Class VI shut-off
- PTFE Seated (G)
Spira-trol
- DN15 - 25 (½" - 1")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																					
		Valve size	DN15-25 (½"-1")																					
		Kvs (Cv)	0.01-0.07 (0.012-0.081)			0.1-0.2 (0.12-0.23)			0.5 (0.58)			1.0 (1.2)			1.6 (1.8)			2.5 (2.9)					
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D			
PN9120E	0.2-1.0	6.0	4.0			4.0			4.0			4.0			4.0			4.0					
	(3-15)	(87)	(58)			(58)			(58)			(58)			(58)			(58)					
	0.4-1.2	6.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0		4.0			4.0
	(6-17)	(87)	(58)		(58)	(58)		(58)	(58)		(58)	(58)		(58)	(58)		(58)	(58)		(58)			(58)
PN9126E	1.0-2.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			4.0
	(15-29)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)			(58)
PN9123E	2.0-4.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			4.0
	(29-58)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)			(58)
PN9220E	0.2-1.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			4.0
	(3-15)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)			(58)
	0.4-1.2	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			4.0
	(6-17)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)			(58)

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PN9000E
- Maximum differential pressures for Class VI shut-off
- PTFE Seated (G)
Spira-trol
- DN15 - 25 (½" - 1")
- Flow under

Actuator	Spring range bar (psi)	Standard Cage (S)																Low Noise Cage (P1)			
		Cage Type	DN15-25 (½"-1")																		
		Valve size		4.0 (4.6)			4.9-6.3 (5.7-7.3)			7.2 (8.3)			10 (12)			11 (12.7)			2.5-4-6.3-10 (2.9-4.6-7.3-12)		
		Kvs (Cv)		N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D
		Maximum pressure bar g (psi g)																			
PN9120E	0.2-1.0	6.0		4.0			3.3			2.5			1.9			1.5			1.5		
	(3-15)	(87)		(58)			(48)			(36)			(28)			(22)			(22)		
	0.4-1.2	6.0		4.0		4.0	4.0		4.0	4.0		4.0	4.0		3.9	4.0		3.1	4.0		3.1
	(6-17)	(87)		(58)		(58)	(58)		(58)	(58)		(58)	(58)		(57)	(58)		(45)	(58)		(45)
PN9126E	1.0-2.0	6.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	(15-29)	(87)		(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)
PN9123E	2.0-4.0	6.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	(29-58)	(87)		(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)
PN9220E	0.2-1.0	6.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	(3-15)	(87)		(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)
	0.4-1.2	6.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	(6-17)	(87)		(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)

PN9000R
- Maximum differential pressures for Class VI shut-off
- PTFE Seated (G)
- Spira-trol
- DN15 - 25 (½" - 1")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																					
		Valve size	DN15-25 (½"-1")																					
		Kvs (Cv)	0.01-0.07 (0.012-0.081)			0.1-0.2 (0.12-0.23)			0.5 (0.58)			1.0 (1.2)			1.6 (1.8)			2.5 (2.9)					
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D			
PN9120R	0.2-1.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
	(3-15)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)				
	0.4-1.2	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
	(6-17)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)				
PN9126R	1.0-2.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
	(15-29)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)				

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PN9000R
- Maximum differential pressures for Class VI shut-off
- PTFE Seated (G)
- Spira-trol
- DN15 - 25 (½" - 1")
- Flow under

Actuator	Spring range bar (psi)	Standard Cage (S)																		Low Noise Cage (P1)	
		Cage Type	DN15-25 (½"-1")																		
		Valve size																			
		Kvs (Cv)	4.0 (4.6)			4.9-6.3 (5.7-7.3)			7.2 (8.3)			10 (12)			11 (12.7)			2.5-4-6.3-10 (2.9-4.6-7.3-12)		
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D
PN9120R	0.2-1.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	(3-15)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)
	0.4-1.2	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	(6-17)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)
PN9126R	1.0-2.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	(15-29)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)

PN9000E
- Maximum differential pressures for Class VI shut-off
- PTFE Seated (G)
- Spira-trol
- DN32 - 50 (1¼" - 2")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																					
		Valve size	DN32-50 (1¼"-2")																					
		Kvs (Cv)	4.0 (4.6)			6.3 (7.3)			10 (12)			16 (18)			17.5 - 18 (20.2-21)			25 (29)					
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D			
PN9120E	0.2-1.0	6.0	4.0			3.3			1.9			1.5			1.1			0.4					
	(3-15)	(87)	(58)			(48)			(28)			(22)			(22)			(6)					
	0.4-1.2	6.0	4.0		4.0	4.0		4.0	4.0		3.9	4.0		4.0	4.0		2.3	2.5			1.1		
	(6-17)	(87)	(58)		(58)	(58)		(58)	(58)		(57)	(58)		(47)	(58)		(33)	(36)			(16)		
PN9126E	1.0-2.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	(15-29)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)
PN9123E	2.0-4.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	(29-58)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)
PN9220E	0.2-1.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.5	4.0
	(3-15)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(36)	(58)
	0.4-1.2	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	(6-17)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)
PN9226E	1.0-2.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	(15-29)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)
PN9223E	2.0-4.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	(29-58)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)

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PN9000E
- Maximum differential pressures for Class VI shut-off
- PTFE Seated (G)
- Spira-trol
- DN32 - 50 (1¼" - 2")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)								Low noise cage (P1)			
		Valve size	DN32-50 (1¼"-2")											
		Kvs (Cv)	31-36 (36-42)			46-50 (53-58)			All Kvs					
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D			
PN9120E	0.2-1.0	6.0	0.3											
	(3-15)	(87)	(4)											
	0.4-1.2	6.0	2.0		0.8	1.3		0.5	1.3		0.5			
	(6-17)	(87)	(29)		(12)	(19)		(7)	(19)		(7)			
PN9126E	1.0-2.0	6.0	4.0	4.0	4.0	4.0	3.1	4.0	4.0	3.1	4.0			
	(15-29)	(87)	(58)	(58)	(58)	(58)	(45)	(58)	(58)	(45)	(58)			
PN9123E	2.0-4.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			
	(29-58)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)			
PN9220E	0.2-1.0	6.0	4.0	1.9	3.4	3.2	1.3	2.4	3.2	1.3	2.4			
	(3-15)	(87)	(58)	(28)	(28)	(46)	(19)	(35)	(46)	(19)	(35)			
	0.4-1.2	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			
	(6-17)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)			
PN9226E	1.0-2.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			
	(15-29)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)			
PN9223E	2.0-4.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			
	(29-58)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)			

PN9000R
- Maximum differential pressures for Class VI shut-off
- PTFE Seated (G)
- Spira-trol
- DN32 - 50 (1¼" - 2")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																					
		Valve size	DN32-50 (1¼"-2")																					
		Kvs (Cv)	4.0 (4.6)			6.3 (7.3)			10 (12)			16 (18)			17.5 - 18 (20.2-21)			25 (29)					
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D			
PN9120R	0.2-1.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
	(3-15)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)				
	0.4-1.2	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
	(6-17)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)				
PN9126R	1.0-2.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
	(15-29)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)				
PN9123R	2.0-4.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
	(29-58)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)				
PN9220R	0.2-1.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
	(3-15)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)				
	0.4-1.2	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
	(6-17)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)				

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PN9000R
- Maximum differential pressures for Class VI shut-off
- PTFE Seated (G)
- Spira-trol
- DN32 - 50 (1¼" - 2")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)								Low Noise Cage (P1)			
		Valve size	DN32-50 (1¼"-2")											
		Kvs (Cv)	31-36 (36-42)			46-50 (53-58)			All Kvs					
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D
PN9120R	0.2-1.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	(3-15)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)
	0.4-1.2	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	(6-17)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)
PN9126R	1.0-2.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	(15-29)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)
PN9123R	2.0-4.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	(29-58)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)
PN9220R	0.2-1.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	(3-15)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)
	0.4-1.2	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	(6-17)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)

PN9000E
- Maximum differential pressures for Class VI shut-off
- PTFE Seated (G)
- Spira-trol
- DN65 - 100 (2½" - 4")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																							
		Valve size	DN65-100 (2½-4")																							
		Kvs (Cv)	16 (18)			25 (29)			36 (42)			63-73-90 (73-85-104)			100-117 (116-135)			160-180 (185-208)								
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D
PN9230E	0.2-1.0	6.0	4.0		4.0	4.0		3.4	2.9		2.4	1.5		1.3	0.9		0.8	0.5		0.4						
	(3-15)	(87)	(58)		(58)	(58)		(49)	(42)		(35)	(22)		(19)	(13)		(12)	(7)		(6)						
	0.4-1.2	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.9	2.1	3.7	2.5	1.3	2.3	1.5	0.8	1.4						
	(6-17)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(57)	(30)	(54)	(36)	(19)	(33)	(22)	(12)	(20)						
PN9236E	1.0-2.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.7	4.3						
	(15-29)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(54)	(62)						
PN9233E	2.0-4.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0						
	(29-58)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)						
PN9330E	0.2-1.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.8	4.0	3.9	2.1	3.6	2.4	1.3	3.6	1.5	0.7	1.4						
	(3-15)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(55)	(58)	(57)	(30)	(52)	(35)	(19)	(52)	(22)	(10)	(20)						
	0.4-1.2	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.4	2.6	3.2						
	(6-17)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(49)	(38)	(46)						
PN9336E	1.0-2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0						
	(15-29)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)						
PN9337E	2.5-3.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0						
	(36)-3.5	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)						

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PN9000E
- Maximum differential pressures for Class VI shut-off
- PTFE Seated (G)
- Spira-trol
- DN65 - 100 (2½" - 4")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Low Noise Cage (P1)								
		Valve size	DN65-80 (2½-3")						DN100 (4")		
		Kvs (Cv)	All Kvs						All Kvs		
		Maximum pressure bar g (psi g)	N-P		H		D		N-P	H	D
PN9230E	0.2-1.0	6.0	0.9				0.8		0.5		0.4
	(3-15)	(87)	(13)				(12)		(7)		(6)
	0.4-1.2	6.0	2.5		1.3		2.3		1.5	0.8	1.4
	(6-17)	(87)	(36)		(19)		(33)		(22)	(12)	(20)
PN9236E	1.0-2.0	6.0	4.0		4.0		4.0		4.0	3.7	4.0
	(15-29)	(87)	(58)		(58)		(58)		(58)	(54)	(58)
PN9233E	2.0-4.0	6.0	4.0		4.0		4.0		4.0	4.0	4.0
	(29-58)	(87)	(58)		(58)		(58)		(58)	(58)	(58)
PN9330E	0.2-1.0	4.0	2.4		1.3		3.6		1.5	0.7	1.4
	(3-15)	(58)	(35)		(19)		(52)		(22)	(10)	(20)
	0.4-1.2	4.0	4.0		4.3		4.0		3.4	2.6	3.2
	(6-17)	(58)	(58)		(62)		(58)		(49)	(38)	(46)
PN9336E	1.0-2.0	4.0	4.0		4.0		4.0		4.0	4.0	4.0
	(15-29)	(58)	(58)		(58)		(58)		(58)	(58)	(58)
PN9337E	2.5-3.5	4.0	4.0		4.0		4.0		4.0	4.0	4.0
	(36)-3.5	(58)	(58)		(58)		(58)		(58)	(58)	(58)

PN9000R
- Maximum differential pressures for Class VI shut-off
- PTFE Seated (G)
- Spira-trol
- DN65 - 100 (2½" - 4")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																					
		Valve size	DN65-100 (2½-4")																					
		Kvs (Cv)	16 (18)			25 (29)			36 (42)			63-73-90 (73-85-104)			100-117 (116-135)			160-180 (185-208)					
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D			
PN9230R	0.2-1.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
	(3-15)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)				
	0.4-1.2	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
	(6-17)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)				
PN9236R	1.0-2.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
	(15-29)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)				
PN9233R	2.0-4.0	6.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
	(29-58)	(87)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)				
PN9330R	0.2-1.0	2.7	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
	(3-15)	(39.1)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)				
	0.4-1.2	2.7	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
	(6-17)	(39.1)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)				
PN9336R	1.0-2.0	2.7	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
	(15-29)	(39.1)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)				

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PN9000R
- Maximum differential pressures for Class VI shut-off
- PTFE Seated (G)
- Spira-trol
- DN65 - 100 (2½" - 4'')
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Low Noise Cage (P1)									
		Valve size	DN65-80 (2½-3")				DN100 (4")					
		Kvs (Cv)	All Kvs				All Kvs					
		Maximum pressure bar g (psi g)	N-P		H	D	N-P		H	D		
PN9230R	0.2-1.0	6.0	4.0		4.0	4.0	4.0		4.0	4.0		
	(3-15)	(87)	(58)		(58)	(58)	(58)		(58)	(58)		
	0.4-1.2	6.0	4.0		4.0	4.0	4.0		4.0	4.0		
	(6-17)	(87)	(58)		(58)	(58)	(58)		(58)	(58)		
PN9236R	1.0-2.0	6.0	4.0		4.0	4.0	4.0		4.0	4.0		
	(15-29)	(87)	(58)		(58)	(58)	(58)		(58)	(58)		
PN9233R	2.0-4.0	6.0	4.0		4.0	4.0	4.0		4.0	4.0		
	(29-58)	(87)	(58)		(58)	(58)	(58)		(58)	(58)		
PN9330R	0.2-1.0	2.7	4.0		4.0	4.0	4.0		4.0	4.0		
	(3-15)	(39.1)	(58)		(58)	(58)	(58)		(58)	(58)		
	0.4-1.2	2.7	4.0		4.0	4.0	4.0		4.0	4.0		
	(6-17)	(39.1)	(58)		(58)	(58)	(58)		(58)	(58)		
PN9336R	1.0-2.0	2.7	4.0		4.0	4.0	4.0		4.0	4.0		
	(15-29)	(39.1)	(58)		(58)	(58)	(58)		(58)	(58)		

PN9000E
- Maximum differential pressures for Class IV shut-off
- Hard Facing (W)
- Spira-trol
- DN15 - 25 (½" - 1")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																					
		Valve size	DN15-25 (½"-1")																					
		Kvs (Cv)	0.01-0.07 (0.012-0.081)			0.1-0.2 (0.12-0.23)			0.5 (0.58)			1.0 (1.2)			1.6 (1.8)			2.5 (2.9)					
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D			
PN9120E	0.2-1.0	6.0	92.8																					
	(3-15)	(87)	(1346)																					
	0.4-1.2	6.0	103.4		25.0	103.4		25.0	64.6			39.8			6.5									
	(6-17)	(87)	(1500)		(363)	(1500)		(363)	(940)			(577)			(94)									
PN9126E	1.0-2.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	61.4	25.0	69.5	31.3	25.0				
	(15-29)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(891)	(363)	(1008)	(454)	(363)				
PN9123E	2.0-4.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0				
	(29-58)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)				
PN9220E	0.2-1.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	62.6	25.0	103.4	38.0	25.0	65.4	5.7	25.0	33.8		25.0				
	(3-15)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	6(38)	(363)	(1500)	(1500)	(363)	(1500)	(83)	(363)	(490)		(363)				
	0.4-1.2	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	82.2	17.3				
	(6-17)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1192)	(251)				
PN9226E	1.0-2.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0				
	(15-29)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)				
PN9223E	2.0-4.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0				
	(29-58)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)				
PN9320E	0.2-1.0	4.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	79.7	25.0				
	(3-15)	(58)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1156)	(363)				
	0.4-1.2	4.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0				
	(6-17)	(58)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)				

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PN9000E
- Maximum differential pressures for Class IV shut-off
- Hard Facing (W)
- Spira-trol
- DN15 - 25 (½" - 1")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																Low Noise Cage (P1-A1)		
		Valve size	DN15-25 (½"-1")																		
		Kvs (Cv)	4.0 (4.6)			4.9-6.3 (5.7-7.3)			7.2 (8.3)			10 (12)			11 (12.7)			2.5-4-6.3-10 (2.9-4.6-7.3-12)		
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D
PN9126E	1.0-2.0	6.0	42.7	16.2	25.0	17.8	2.9	11.3	11.6		6.5	7.4		3.2	4.2		0.8	4.2		0.8
	(15-29)	(87)	(619)	(235)	(363)	(258)	(42)	(164)	(168)		(94)	(107)		(46)	(61)		(12)	(61)		(12)
PN9123E	2.0-4.0	6.0	103.4	101.1	25.0	65.5	50.6	25.0	49.3	37.5	25.0	37.9	28.4	25.0	29.0	21.3	25.0	29.0	21.3	25.0
	(29-58)	(87)	(1500)	(1466)	(363)	(950)	(734)	(363)	(715)	(544)	(363)	(550)	(412)	(363)	(421)	(309)	(363)	(421)	(309)	(363)
PN9220E	0.2-1.0	6.0	17.9		6.5	3.8			0.6											
	(3-15)	(87)	(260)		(94)	(55)			(9)											
	0.4-1.2	6.0	78.1	51.5	25.0	37.7	22.7	25.0	27.3	15.5	25.0	20.1	10.6	16.0	14.5	6.8	11.2	14.5	6.8	11.2
	(6-17)	(87)	(1133)	(747)	(363)	(547)	(329)	(363)	(396)	(225)	(363)	(292)	(154)	(232)	(210)	(99)	(162)	(210)	(99)	(162)
PN9226E	1.0-2.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	95.7	25.0	85.0	75.5	25.0	67.2	59.5	25.0	67.2	59.5	25.0
	(15-29)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1388)	(363)	(1233)	(1095)	(363)	(975)	(863)	(363)	(975)	(863)	(363)
PN9223E	2.0-4.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0
	(29-58)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)
PN9320E	0.2-1.0	4.0	76.3	49.8	25.0	36.7	21.8	25.0	26.5	14.7	25.0	19.5	9.9	15.3	14.0	6.3	10.7	14.0	6.3	10.7
	(3-15)	(58)	(1107)	(722)	(363)	(532)	-316	(363)	(384)	(213)	(363)	(283)	(144)	(222)	(203)	(91)	(155)	(203)	(91)	(155)
	0.4-1.2	4.0	103.4	103.4	25.0	103.3	88.4	25.0	79.2	67.4	25.0	62.1	52.6	25.0	48.6	40.9	25.0	48.6	40.9	25.0
	(6-17)	(58)	(1500)	(1500)	(363)	(1500)	(1282)	(363)	(1149)	(978)	(363)	(901)	(763)	(363)	(705)	(593)	(363)	(705)	(593)	(363)

PN9000R
- Maximum differential pressures for Class IV shut-off
- Hard Facing (W)
- Spira-trol
- DN15 - 25 (½" - 1")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																					
		Valve size	DN15-25 (½"-1")																					
		Kvs (Cv)	0.01-0.07 (0.012-0.081)			0.1-0.2 (0.12-0.23)			0.5 (0.58)			1.0 (1.2)			1.6 (1.8)			2.5 (2.9)					
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D			
PN9120R	0.2-1.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(3-15)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			
	0.4-1.2	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(6-17)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			
PN9126R	1.0-2.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(15-29)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			
PN9123R	2.0-4.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(29-58)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			
PN9220R	0.2-1.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(3-15)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			
	0.4-1.2	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(6-17)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			
PN9226R	1.0-2.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0			
	(15-29)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)			

Table continued on next page

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PN9000R
- Maximum differential pressures for Class IV shut-off
- Hard Facing (W)
- Spira-trol
- DN15 - 25 (½" - 1")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																Low Noise Cage (P1-A1)		
		Valve size	DN15-25 (½"-1")																		
		Kvs (Cv)	4.0 (4.6)			4.9-6.3 (5.7-7.3)			7.2 (8.3)			10 (12)			11 (12.7)			2.5-4-6.3-10 (2.9-4.6-7.3-12)		
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D
PN9120R	0.2-1.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	95.7	25.0	103.4	95.7	25.0
	(3-15)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1388)	(363)	(1500)	(1388)	(363)
	0.4-1.2	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	98.4	90.7	25.0	98.4	90.7	25.0
	(6-17)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1427)	(1315)	(363)	(1427)	(1315)	(363)
PN9126R	1.0-2.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	99.0	89.5	25.0	78.6	70.9	25.0	78.6	70.9	25.0
	(15-29)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1436)	(1298)	(363)	(1140)	(1028)	(363)	(1140)	(1028)	(363)
PN9123R	2.0-4.0	6.0	103.4	101.1	25.0	65.5	50.6	25.0	49.3	37.5	25.0	37.9	28.4	25.0	29.0	21.3	25.0	29.0	21.3	25.0
	(29-58)	(87)	(1500)	(363)	(363)	(950)	(734)	(363)	(715)	(544)	(363)	(550)	(412)	(363)	(421)	(309)	(363)	(421)	(309)	(363)
PN9220R	0.2-1.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0
	(3-15)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)
	0.4-1.2	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0
	(6-17)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)
PN9226R	1.0-2.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0
	(15-29)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)

PN9000E
- Maximum differential pressures for Class IV shut-off
- Hard Facing (W)
- Spira-trol
- DN32 - 50 (1¼" - 2")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																							
		Valve size	DN32-50 (1¼"-2")																							
		Kvs (Cv)	4.0 (4.6)			6.3 (7.3)			10 (12)			16 (18)			17.5 - 18 (20.2-21)			25 (29)							
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D
PN9126E	1.0-2.0	6.0	40.8	15.1	25.0	17.8	2.9	11.3	7.4		3.2	4.4		1.0	1.5											
	(15-29)	(87)	(592)	(219)	(363)	(258)	(42)	(164)	(107)		(46)	(64)		(15)	(22)											
PN9123E	2.0-4.0	6.0	103.4	97.2	25.0	65.5	50.6	25.0	37.9	28.4	25.0	29.7	21.8	16.0	21.1	15.0	18.4	8.3	5.0	6.8						
	(29-58)	(87)	(1500)	(1410)	(363)	(950)	(734)	(363)	(550)	(412)	(431)	(431)	(316)	(232)	(306)	(218)	(267)	(120)	(73)	(99)						
PN9220E	0.2-1.0	6.0	16.8		5.7	3.8																				
	(3-15)	(87)	(244)		(83)	(55)																				
	0.4-1.2	6.0	75.0	49.3	25.0	37.7	22.7	25.0	20.1	10.6	16.0	15.0	7.1	11.5	9.7	3.6	7.0	2.1		0.7						
	(6-17)	(87)	(1088)	(715)	(363)	(547)	(329)		(292)	(154)	(218)	(218)	(103)	(167)	(141)	(52)	(102)	(30)		(10)						
PN9226E	1.0-2.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	85.0	75.5	25.0	68.6	60.7	16.0	51.2	45.1	25.0	24.6	21.3	23.2						
	(15-29)	(87)	(1500)	(1500)		(1500)	(1500)		(1233)	(1095)	(363)	(995)	-880	(232)	(743)	(654)	(363)	(357)	(309)	(336)						
PN9223E	2.0-4.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	16.0	103.4	103.4	25.0	62.0	58.7	25.0						
	(29-58)	(87)	(1500)	(1500)		(1500)	(1500)		(1500)	(1500)	(363)	(1500)	(1500)	(232)	(1500)	-1500	(363)	(899)	(851)	(363)						
PN9320E	0.2-1.0	4.0	73.3	47.6	25.0	36.7	21.8	25.0	19.5	9.9	15.3	14.4	6.5	11.0	9.3	3.1	6.6	1.9		0.5						
	(3-15)	(58)	(1063)	(690)		(532)	(316)		(283)	(144)	(222)	(209)	(94)	(160)	(135)	(45)	(96)	(28)		(7)						
	0.4-1.2	4.0	103.4	103.4	25.0	103.3	88.4	25.0	62.1	52.6	25.0	49.7	41.8	16.0	36.6	30.4	25.0	16.7	13.3	15.2						
	(6-17)	(58)	(1500)	(1500)		(1500)	(1282)		(901)	(763)	(363)	(721)	(606)	(232)	(531)	(441)	(363)	(242)	(193)	(220)						

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PN9000E
- Maximum differential pressures for Class IV shut-off
- Hard Facing (W)
- Spira-trol
- DN32 - 50 (1¼" - 2")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)								Low Noise Cage (P1-P2-P3-A1-A2)	
		Valve size	DN32-50 (1¼"-2")									
		Kvs (Cv)	31-36 (36-42)			46-50 (53-58)			All Kvs			
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	
PN9123E	2.0-4.0	6.0	5.5	2.9	4.4	2.6	0.7	1.7	2.6	0.7	1.7	
	(29-58)	(87)	(80)	(42)	(64)	(38)	(10)	(25)	(38)	(10)	(25)	
PN9220E	0.2-1.0	6.0										
	(3-15)	(87)										
	0.4-1.2	6.0	0.6									
	(6-17)	(87)	(9)									
PN9226E	1.0-2.0	6.0	18.6	15.9	17.4	11.9	10.0	11.0	11.9	10.0	11.0	
	(15-29)	(87)	(270)	(231)	(252)	(173)	(145)	(160)	(173)	(145)	(160)	
PN9223E	2.0-4.0	6.0	48.6	45.9	25.0	33.2	31.4	25.0	33.2	31.4	25.0	
	(29-58)	(87)	(705)	(666)	(363)	(482)	(455)	(363)	(482)	(455)	(363)	
PN9320E	0.2-1.0	4.0	0.4									
	(3-15)	(58)	(6)									
	0.4-1.2	4.0	12.2	9.6	11.1	7.3	5.4	6.5	7.3	5.4	6.5	
	(6-17)	(58)	(177)	(139)	(161)	(106)	(78)	(94)	(106)	(78)	(94)	

PN9000R
- Maximum differential pressures for Class IV shut-off
- Hard Facing (W)
- Spira-trol
- DN32 - 50 (1¼" - 2")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																					
		Valve size	DN32-50 (1¼"-2")																					
		Kvs (Cv)	4.0 (4.6)			6.3 (7.3)			10 (12)			16 (18)			17.5 - 18 (20.2-21)			25 (29)					
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D			
PN9120R	0.2-1.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	97.6	25.0	79.7	73.6	25.0	40.0	36.7	25.0				
	(3-15)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1416)	(363)	(1156)	(1067)	(363)	(580)	(532)	(363)				
	0.4-1.2	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	100.4	92.5	25.0	75.8	69.7	25.0	37.9	34.6	25.0				
	(6-17)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1456)	(1342)	(363)	(1099)	(1011)	(363)	(550)	(502)	(363)				
PN9126R	1.0-2.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	99.0	89.5	25.0	80.2	72.3	25.0	60.2	54.1	25.0	29.4	26.1	25.0				
	(15-29)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1436)	(1298)	(363)	(1163)	(1049)	(363)	(873)	(785)	(363)	(426)	(379)	(363)				
PN9123R	2.0-4.0	6.0	103.4	97.2	25.0	65.5	50.6	25.0	37.9	28.4	25.0	29.7	21.8	25.0	21.1	15.0	18.4	8.3	5.0	6.8				
	(29-58)	(87)	(1500)	(1410)	(363)	(950)	(734)	(363)	(55)	(412)	(363)	(431)	(316)	(363)	(306)	(218)	(267)	(120)	(73)	(99)				
PN9220R	0.2-1.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0				
	(3-15)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)				
	0.4-1.2	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0				
	(6-17)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)				
PN9226R	1.0-2.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0				
	(15-29)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)				
PN9223R	2.0-4.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	62.0	58.7	25.0				
	(29-58)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(899)	(851)	(363)				
PN9320R	0.2-1.0	2.7	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0				
	(3-15)	(39.1)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)				
	0.4-1.2	2.7	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	103.4	103.4	25.0	97.8	94.5	25.0				
	(6-17)	(39.1)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1418)	(1371)	(363)				

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PN9000R
- Maximum differential pressures for Class IV shut-off
- Hard Facing (W)
- Spira-trol
- DN32 - 50 (1¼" - 2")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)								Low Noise Cage (P1-P2-P3-A1-A2)	
		Valve size	DN32-50 (1¼"-2")									
		Kvs (Cv)	31-36 (36-42)			46-50 (53-58)			All Kvs			
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	
PN9120R	0.2-1.0	6.0	30.9	28.3	25.0	20.7	18.8	19.8	20.7	18.8	19.8	
	(3-15)	(87)	(448)	(410)	(363)	(300)	(273)	(287)	(300)	(273)	(287)	
	0.4-1.2	6.0	29.2	26.6	25.0	19.5	17.6	18.6	19.5	17.6	18.6	
	(6-17)	(87)	(424)	(386)	(309)	(283)	(270)	(270)	(283)	(270)	(270)	
PN9126R	1.0-2.0	6.0	22.5	19.8	21.3	14.6	12.7	13.8	14.6	12.7	13.8	
	(15-29)	(87)	(326)	(287)	(64)	(212)	(184)	(200)	(212)	(184)	(200)	
PN9123R	2.0-4.0	6.0	5.5	2.9	4.4	2.6	0.7	1.7	2.6	0.7	1.7	
	(29-58)	(87)	(80)	(42)	(363)	(38)	(10)	(25)	(38)	(10)	(25)	
PN9220R	0.2-1.0	6.0	103.4	103.4	25.0	97.4	95.5	25.0	97.4	95.5	25.0	
	(3-15)	(87)	(1500)	(1500)	(363)	(1413)	(1385)	(363)	(1413)	(1385)	(363)	
	0.4-1.2	6.0	103.4	103.4	25.0	93.1	91.2	25.0	93.1	91.2	25.0	
	(6-17)	(87)	(1500)	(1500)	(363)	(1350)	(1323)	(363)	(1350)	(1323)	(363)	
PN9226R	1.0-2.0	6.0	103.4	103.4	25	76.0	74.1	25.0	76.0	74.1	25.0	
	(15-29)	(87)	(1500)	(1500)	(363)	(1102)	(1075)	(363)	(1102)	(1075)	(363)	
PN9223R	2.0-4.0	6.0	48.6	45.9	25	33.2	31.4	25.0	33.2	31.4	25.0	
	(29-58)	(87)	(705)	(666)	(363)	(482)	(455)	(363)	(482)	(455)	(363)	
PN9320R	0.2-1.0	2.7	89	86.4	25	62.1	60.2	25.0	62.1	60.2	25.0	
	(3-15)	(39.1)	(1291)	(1253)	(363)	(901)	(751)	(363)	(901)	(751)	(363)	
	0.4-1.2	2.7	77.2	74.6	25	53.7	51.8	25.0	53.7	51.8	25.0	
	(6-17)	(39.1)	(1120)	(1082)	(363)	(779)	51.8	(363)	(779)	51.8	(363)	

PN9000E
- Maximum differential pressures for Class IV shut-off
- Hard Facing (W)
- Spira-trol
- DN65 - 100 (2½" - 4")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																							
		Valve size	DN65-100 (2½-4")																							
		Kvs (Cv)	16 (18)			25 (29)			36 (42)			63-73-90 (73-85-104)			100-117 (116-135)			160-180 (185-208)								
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D
PN9230E	0.4-1.2	6.0	8.6		7.0																					
	(6-17)	(87)	(125)		(102)																					
PN9236E	1.0-2.0	6.0	50.2	39.8	25.0	18.1	13.6	17.4	11.5	8.3	11.0	4.8	3.0	4.5	2.0	0.9	1.8	0.4		0.3						
	(15-29)	(87)	(728)	(577)	(363)	(263)	(197)	(252)	(167)	(120)	(160)	(70)	(44)	(65)	(29)	(13)	(26)	(6)		(4)						
PN9233E	2.0-4.0	6.0	103.4	103.4	25.0	48.1	43.6	25.0	32.9	29.7	25.0	16.9	15.0	16.6	9.7	8.6	9.5	5.2	4.5	5.1						
	(29-58)	(87)	(1500)	(1500)	(363)	(698)	(632)	(363)	(477)	(431)	(363)	(245)	(218)	(241)	(141)	(125)	(138)	(75)	(65)	(74)						
PN9330E	0.2-1.0	4.0	8.2		6.6																					
	(3-15)	(58)	(119)		(96)																					
	0.4-1.2	4.0	35.5	25.2	25.0	11.8	7.3	11.1	7.0	3.8	6.5	2.3	0.5	2.0	0.4		0.2									
	(6-17)	(58)	(515)	(370)	(363)	(171)	(171)	(161)	(102)	(55)	(94)	(33)	(7)	(29)	(6)		(3)									
PN9336E	1.0-2.0	4.0	103.4	103.4	25.0	47.2	42.7	25.0	32.3	29.1	15.9	16.5	14.7	16.2	9.5	8.3	9.3	5.0	4.3	4.9						
	(15-29)	(58)	(1500)	(1500)	(363)	(685)	(685)	(363)	(468)	(422)	(231)	(239)	(213)	(235)	(138)	(120)	(135)	(73)	(62)	(71)						
PN9337E	2.5-3.5	4.0	103.4	103.4	25.0	103.4	103.4	25.0	95.5	92.3	25.0	52.0	50.2	25.0	32.2	31.1	25.0	19.2	18.5	19.1						
	(36)-3.5	(58)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1385)	(1339)	(363)	(754)	(728)	(363)	(467)	(451)	(363)	(278)	(268)	(277)						

Table continued on next page

Table continued from previous page

PN9000E
- Maximum differential pressures for Class IV shut-off
- Hard Facing (W)
- Spira-trol
- DN65 - 100 (2½" - 4")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Low Noise Cage (P1-A1-P2-A2-P3)									
		Valve size	DN65-80 (2½-3")						DN100 (4")			
		Kvs (Cv)	All Kvs						All Kvs			
		Maximum pressure bar g (psi g)	N-P		H		D		N-P	H	D	
PN9236E	1.0-2.0	6.0	2.0		0.9		1.8		0.4		0.3	
	(15-29)	(87)	(29)		(13)		(26)		(6)		(4)	
PN9233E	2.0-4.0	6.0	9.7		8.6		9.5		5.2	4.5	5.1	
	(29-58)	(87)	(141)		(125)		(138)		(75)	(65)	(74)	
PN9330E	0.2-1.0	4.0										
	(3-15)	(58)										
	0.4-1.2	4.0	0.4				0.2					
	(6-17)	(58)	(6)				(3)					
PN9336E	1.0-2.0	4.0	9.5		8.3		9.3		5.0	4.3	4.9	
	(15-29)	(58)	(138)		(120)		(135)		(73)	(62)	(71)	
PN9337E	2.5-3.5	4.0	32.2		31.1		25.0		19.2	18.5	19.1	
	(36)-3.5	(58)	(467)		(451)		(363)		(278)	(268)	(277)	

PN9000R
- Maximum differential pressures for Class IV shut-off
- Hard Facing (W)
- Spira-trol
- DN65 - 100 (2½" - 4")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Standard Cage (S)																					
		Valve size	DN65-100 (2½-4")																					
		Kvs (Cv)	16 (18)			25 (29)			36 (42)			63-73-90 (73-85-104)			100-117 (116-135)			160-180 (185-208)					
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D	N-P	H	D
PN9230R	0.2-1.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	97.1	93.9	25.0	52.9	51.1	25.0	32.8	31.7	25.0	19.6	18.8	19.4				
	(3-15)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1408)	(1362)	(363)	(767)	(741)	(363)	(476)	(460)	(363)	(284)	(273)	(281)				
	0.4-1.2	6.0	103.4	103.4	25.0	103.4	103.4	25.0	92.8	89.6	25.0	50.5	48.7	25.0	31.3	30.1	25.0	18.6	17.9	18.5				
	(6-17)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1346)	(1300)	(363)	(732)	(706)	(363)	(454)	(437)	(363)	(270)	(260)	(268)				
PN9236R	1.0-2.0	6.0	103.4	103.4	25.0	103.4	103.4	25.0	75.7	72.5	25.0	40.9	39.1	25.0	25.1	24.0	24.9	14.8	14.0	14.7				
	(15-29)	(87)	(1500)	(1500)	(363)	(1500)	(1500)	(363)	(1098)	(1052)	(363)	(593)	(567)	(363)	(364)	(348)	(361)	(215)	(203)	(213)				
PN9233R	2.0-4.0	6.0	103.4	103.4	25.0	48.1	43.6	25.0	32.9	29.7	25.0	16.9	15.0	16.6	9.7	8.6	9.5	5.2	4.5	5.1				
	(29-58)	(87)	(1500)	(1500)	(363)	(698)	(632)	(363)	(477)	(431)	(363)	(245)	(218)	(241)	(141)	(125)	(138)	(75)	(65)	(74)				
PN9330R	0.2-1.0	4.0	103.4	103.4	25.0	88.6	84.1	25.0	61.8	58.6	25.0	33.1	31.3	25.0	20.1	19.0	19.9	11.6	10.9	11.5				
	(3-15)	(58)	(1500)	(1500)	(363)	(1285)	(1220)	(363)	(896)	(850)	(363)	(480)	(454)	(363)	(292)	(276)	(289)	(168)	(158)	(167)				
	0.4-1.2	4.0	103.4	103.4	25.0	76.8	72.3	25.0	53.4	50.2	25.0	28.3	26.5	25.0	17.1	15.9	16.9	9.8	9.0	9.6				
	(6-17)	(58)	(1500)	(1500)	(363)	(1114)	(1049)	(363)	(775)	(728)	(363)	(410)	(384)	(363)	(248)	(231)	(245)	(142)	(131)	(139)				
PN9336R	1.0-2.0	4.0	76.5	66.1	25.0	29.5	25.0	25.0	19.7	16.5	19.2	9.4	7.6	9.1	4.9	3.8	4.8	2.1	1.5	2.1				
	(15-29)	(58)	(1110)	(959)	(363)	(428)	(363)	(363)	(286)	(239)	(278)	(136)	(110)	(132)	(71)	(55)	(70)	(30)	(22)	(30)				

Table continued on next page

Table continued from previous page

PN9000R
- Maximum differential pressures for Class IV shut-off
- Hard Facing (W)
- Spira-trol
- DN65 - 100 (2½" - 4")
- Flow under

Actuator	Spring range bar (psi)	Cage Type	Low Noise Cage (P1-A1-P2-A2-P3)							
		Valve size	DN65-80 (2½-3")			DN100 (4")				
		Kvs (Cv)	All Kvs			All Kvs				
		Maximum pressure bar g (psi g)	N-P	H	D	N-P	H	D		
PN9230R	0.2-1.0	6.0	32.8	31.7	25.0	19.6	18.8	19.4		
	(3-15)	(87)	(476)	(460)	(363)	(284)	(284)	(284)		
	0.4-1.2	6.0	31.3	30.1	25.0	18.6	17.9	18.5		
	(6-17)	(87)	(454)	(437)	(363)	(270)	(270)	(270)		
PN9236R	1.0-2.0	6.0	25.1	24.0	24.9	14.8	14.0	14.7		
	(15-29)	(87)	(364)	(348)	(361)	(215)	(215)	(215)		
PN9233R	2.0-4.0	6.0	9.7	8.6	9.5	5.2	4.5	5.1		
	(29-58)	(87)	(141)	(125)	(138)	(75)	(75)	(75)		
PN9330R	0.2-1.0	4.0	20.1	19.0	19.9	11.6	10.9	11.5		
	(3-15)	(58)	(292)	(276)	(289)	(168)	(168)	(168)		
	0.4-1.2	4.0	17.1	15.9	16.9	9.8	9.0	9.6		
	(6-17)	(58)	(248)	(231)	(245)	(142)	(142)	(142)		
PN9336R	1.0-2.0	4.0	4.9	3.8	4.8	2.1	1.5	2.1		
	(15-29)	(58)	(71)	(55)	(70)	(30)	(30)	(30)		

PN9000 series selection guide:

Before making your PN9000 series selection please reference pages 6 to 26 - Sizing data

How to use the sizing data:
The tables supply guidance as to the sizing of the PN9000 when it is used on a SPIRA-TROL control valve.

Two conditions are illustrated in tabular form:
Class IV shut-off - Providing shut-off of the valve to the requirements of BS 5793-4 (IEC 60534-4) class IV.
Class VI shut-off - Providing shut-off of the valve to the requirements of BS 5793-4 (IEC 60534-4) class VI.

To select a suitable actuator:

- Identify the column containing the valve and gland material selected.
- Identify the maximum operating pressure condition, including any transient pressures likely to occur, within the selected column.
- Read back to the left hand side of the table to identify the suitable actuator for the application.

For conditions outside of those illustrated please contact Spirax Sarco.

					PN
Type	**PN**	=	Polyester powder coated (standard)		**PN**
Series	**9**	=	9000 series		**9**
Actuator size	**1**	=	100 cm²	(39.3"²)	**3**
	2	=	340 cm²	(133"²)	
	3	=	670 cm²	(263"²)	
Valve travel	**2**	=	20 mm	(0.78")	**3**
	3	=	30 mm	(1.18")	
Spring rating	**0**	=	0.2 to 1.0 bar (option for 0.4 to 1.2 bar)	(2.9 to 14 psi (option for 2.8 to 17.4 bar))	**7**
	3	=	2.0 to 4.0 bar	(29 to 58 psi)	
	6	=	1.0 to 2.0 bar	(14.5 to 19 psi)	
	7	=	2.5 to 3.5 bar (PN933_ series only	(36.2 to 50.7 psi (PN933_ series only)	
Spring action	**E**	=	Spring-extend		**E**
	R	=	Spring-retract		
Yoke type (DN15 - DN50)	**Blank**	=	Spira-trol™ K and L Series (M34)		
	B	=	Spira-trol™ J Series (M50)		
Manual override	**H**	=	Handwheel (optional)		
Anti-corrosive bolting	**S**	=	Anti-corrosive bolting (optional)		
Fast Speed	**F**	=	version with the higher capacity of speed (possible only PN92_ and PN93_)		
Diaphragm	**Blank**	=	Standard		
	T	=	High Temperature EPDM diaphragm		

How to order / selection example:

1 off Spirax Sarco PN9337E pneumatic actuator.

Spare parts

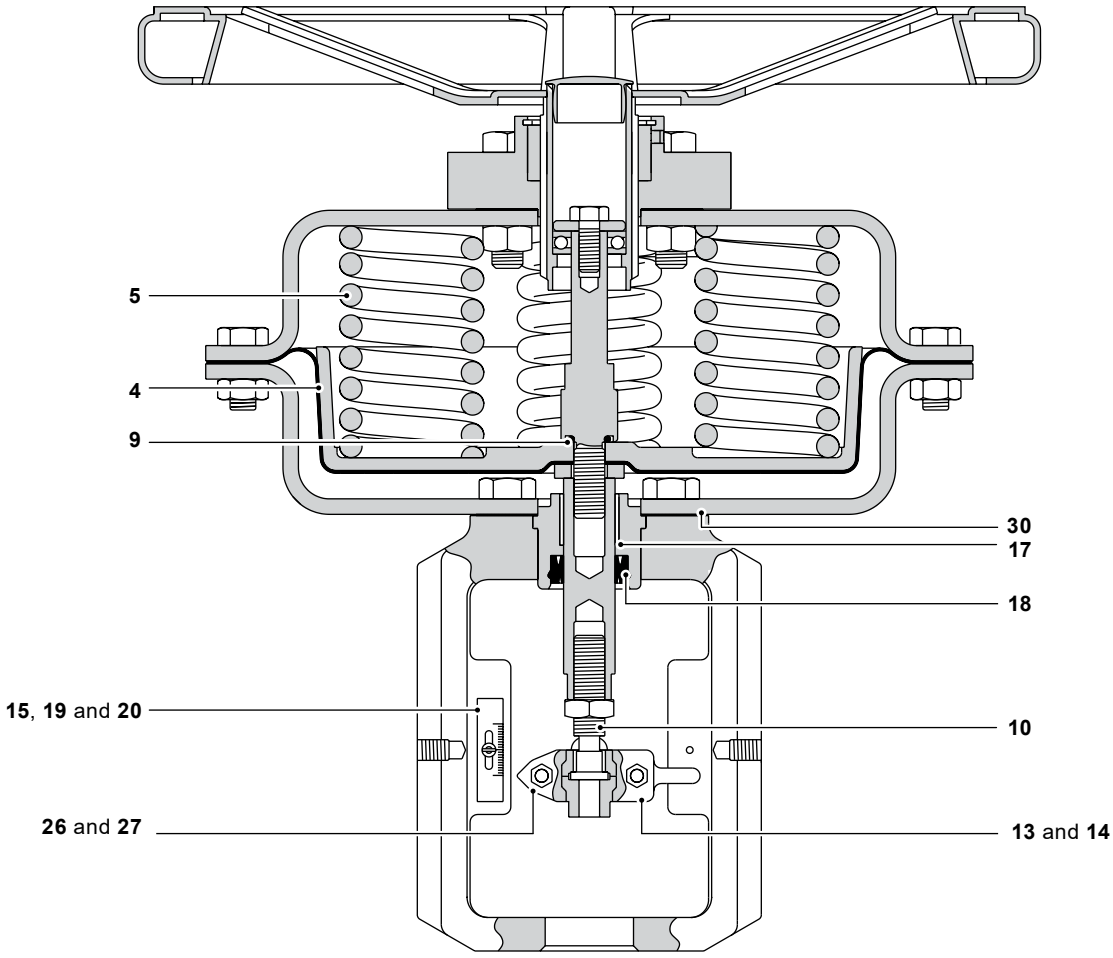
The only spares available are clearly indicated below and are common for both spring-extend and spring-retract versions.

Available spares

Stem seal kit	**17, 18, 30**
Diaphragm kit	**4, 9**
Travel indicator kit	**15, 19, 20**
Spring kit	**5**
Linkage kit (Spira-trol™ valves)	**10, 13, 14, 26, 27**

How to order spares

Always order spares by using the description given in the column headed 'Available spares' and state the actuator model.
Example: 1 - Stem seal kit for a PN9123E pneumatic actuator.



TI-P327-01
CTLS Issue 6

TN2000 Series
Pneumatic Piston Actuators for DN125 to DN300 (5" to 12") Spira-trol™ Series Control Valves

Description

The TN2000 series pneumatic piston actuators are designed for use with DN125 to DN300 (5" to 12") Spira-trol™ control valves. There are three versions available: Single-acting (with spring), Double-acting (with spring) and Double-acting (no spring) for matching the requirements of valves at various differential pressures and in a variety of applications.

Available types

SE	=	Single-acting, spring-extend
SR	=	Single-acting, spring-retract
DE	=	Double-acting, spring assisted (extend)
DR	=	Double-acting, spring assisted (retract)
DA	=	Double-acting, no spring

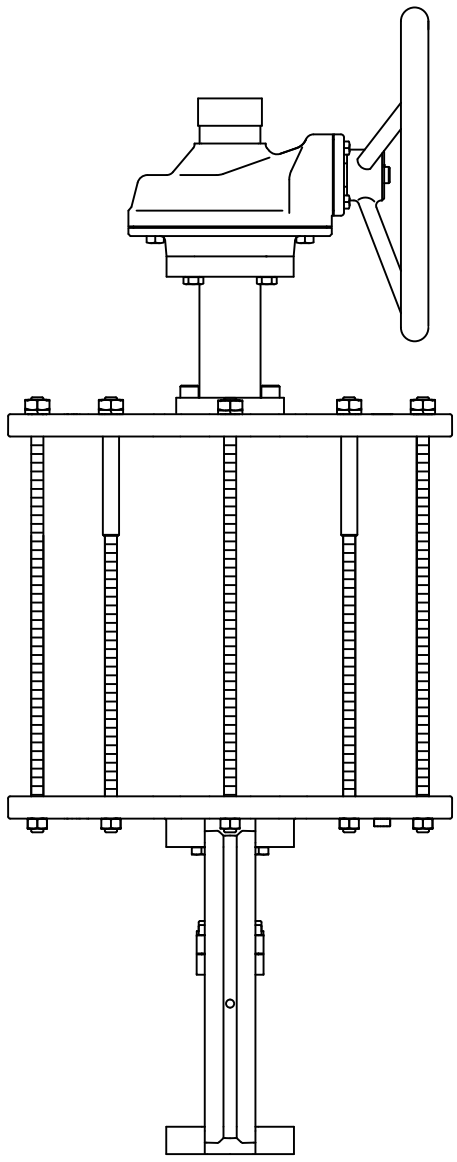
Optional extra

Manual handwheel

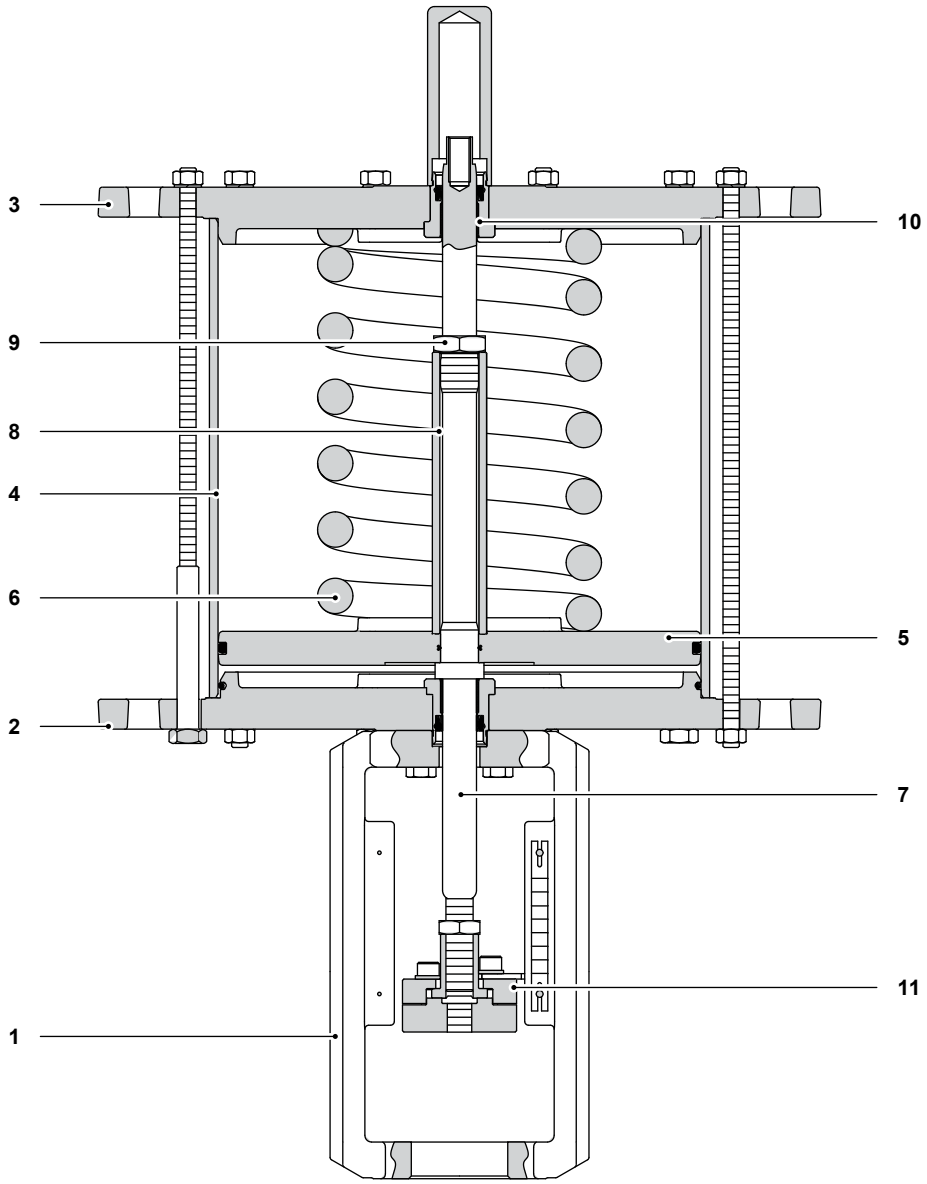
Technical data

Temperature range	- 15 °C to +110 °C (5 °F to 230 °F)
Maximum operating inlet temperature	10 bar g (150 psi g)
Air supply connection	⅜" screwed NPT
Actuator level	70 mm (2¾")

Note: Volume booster is recommended for use with this type of actuator.



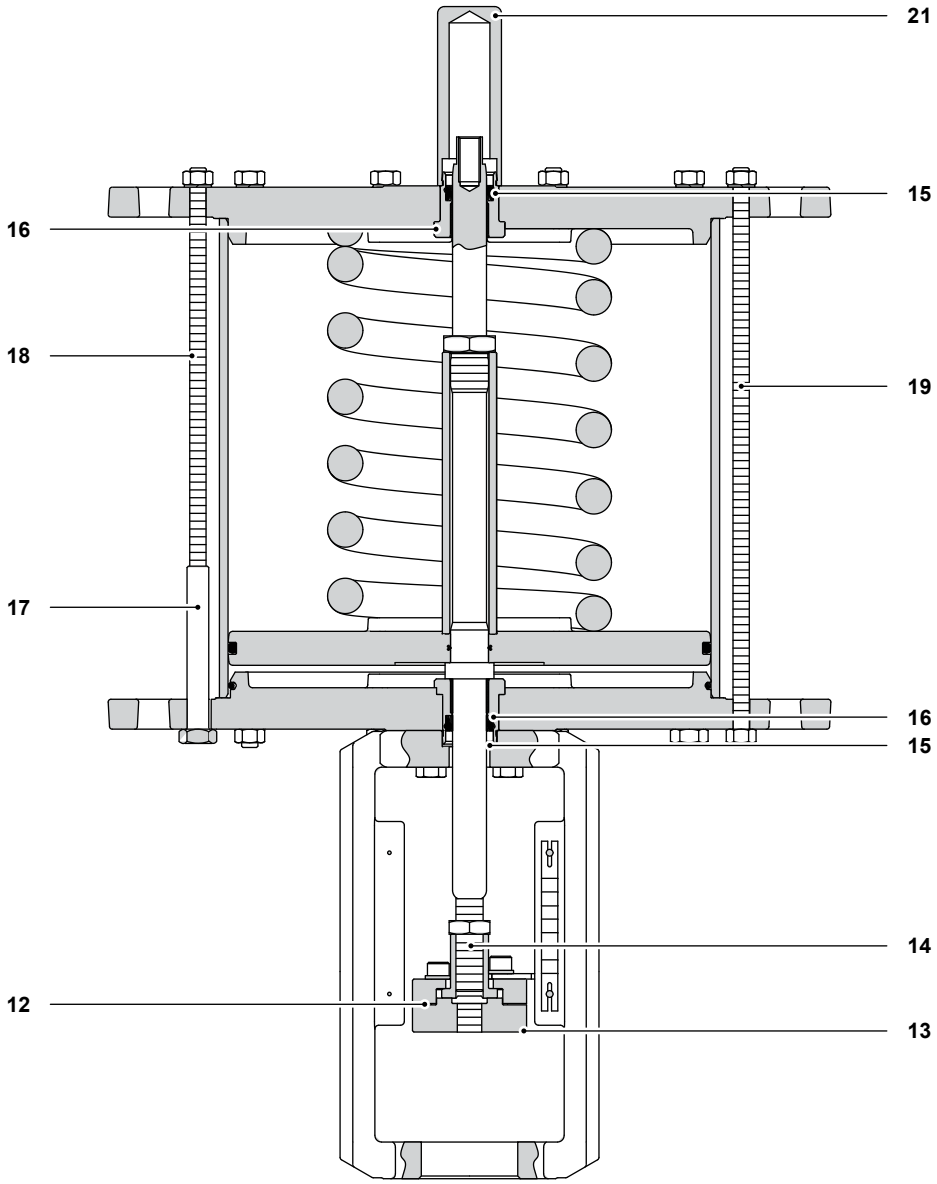
Materials



No.	Part		Material
1	Yoke		SG iron
2	Lower cylinder end cap		SG iron BS EN 1563 GJS 400 18U-LT
3	Upper cylinder end cap		SG iron BS EN 1563 GJS 400 18U-LT
4	Cylinder		Composite tube
5	Piston		SG iron
6	Spring		Chrome vanadium steel
7	Spindle		Stainless steel
8	Spindle sleeve		Carbon steel (plated)
9	Lock-nut	M27	Carbon steel (plated)
10	Bearing and seal insert		Carbon steel (plated)
11	Indicator plate		Stainless steel

Materials continued on next page

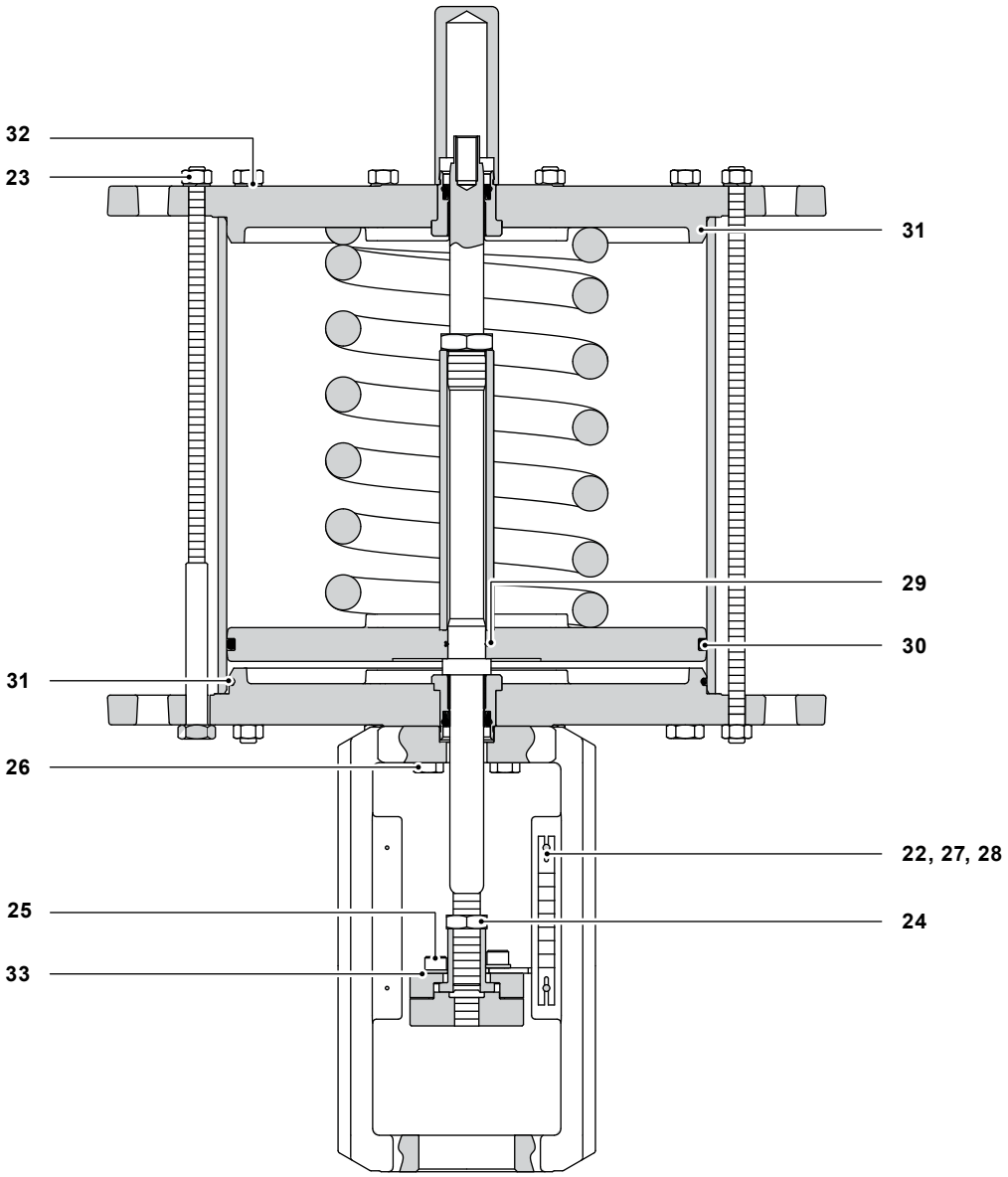
Materials (continued)



No.	Part		Material
12	Top connector		Carbon steel (plated)
13	Bottom connector		Carbon steel (plated)
14	Connector		Stainless steel
15	Rod seal wiper		Polyurethane
16	DU plain bearing		PTFE/steel composite
17	Long nut		Carbon steel (plated)
18	Nut and threaded bar		Carbon steel (plated)
19	Threaded bar	M12	Carbon steel (plated)
20	⅜" NPT vent plug (not shown)		LD Polyethylene
21	Cover		PVC

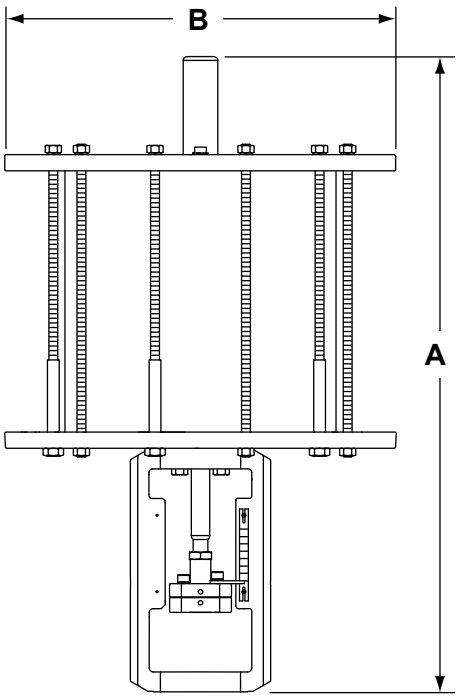
Materials continued on next page

Materials (continued)

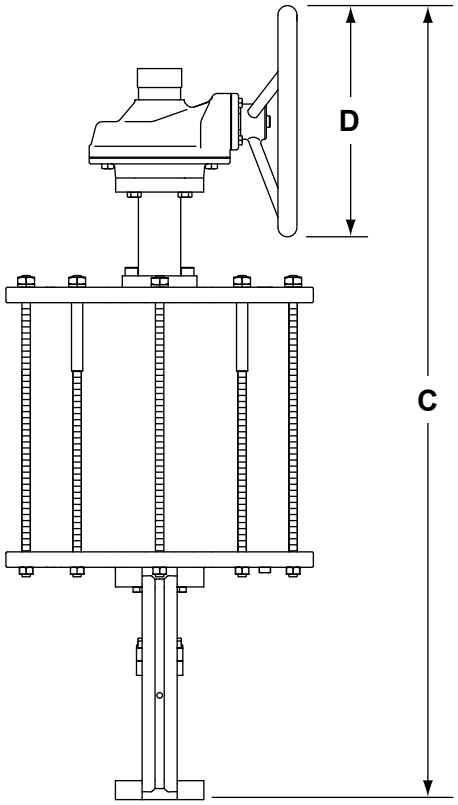


No.	Part		Material
22	Scale		Stainless steel
23	Nut	M12	Carbon steel (plated)
24	Lock-nut	M20	Stainless steel
25	Cap screw		Carbon steel (plated)
26	Bolt	M12	Stainless steel
27	Pan head screw		Carbon steel (plated)
28	Nut	M2.5	Carbon steel (plated)
29	'O' ring		Fluorocarbon rubber (Viton)
30	'O' ring		Fluorocarbon rubber (Viton)
31	'O' ring		Fluorocarbon rubber (Viton)
32	Spring washer	M12	Carbon steel (plated)
33	Spring washer	M10	Carbon steel (plated)

Dimensions/weights (approximate) in mm (inches) and kg (lbs)



TN2277SE



TN2277SRH

Actuator range	A	B	C	D	Weight	
					Actuator	With handwheel
TN2277SE and variants	863 (34)	532 (21)	1197 (47)	330 (13)	116 (255)	+21 (+46)
TN2277DE and variants						
TN2277SR and variants			1132 (44.5)			+19 (+42)
TN2277DR and variants						
TN227NDA and variants					98 (216)	

How to use the sizing data:

The following tables supply guidance as to the sizing of the TN2000 when it is used on the SPIRA-TROL series control valves.

There are three applications:

Unbalanced flow under applications	Unbalanced on/off flow over applications	Balanced flow under applications



Two conditions are illustrated in tabular form in each of the applications:
Class IV shut-off - Providing shut-off of the valve to the requirements of EN 60534-4 (IEC 60534-4) Class IV.
Class VI shut-off - Providing shut-off of the valve to the requirements of EN 60534-4 (IEC 60534-4) Class VI.
Class V shut-off - Providing shut-off of the valve to the requirements of EN 60534-4 (IEC 60534-4) Class V.

To select a suitable actuator:

- Identify the column containing the valve and gland material selected.
- Identify and compare the maximum operating pressure condition, including any transient pressures likely to occur, within the selected column.

Note: Flow over the plug for modulating control is not recommended. Flow over is only suitable for on/off applications.

For conditions outside of those illustrated, including double acting versions, please contact Spirax Sarco.

Note: For TN2277SR, the values in the following tables are based on the air pressure indicated below the product nomenclature of the specific unit. For double acting actuators in the event of air failure you will require an air pressurised tank to position the valve.
For fluctuating pressure control applications, or applications requiring rapid response (e.g. accumulator control)a pneumatic volume booster is recommended.

TN2277SE			Valve maximum differential pressure							
			DN125 (5")		DN150 (6")		DN200 (8") DN250 (10") DN300 (12") reduced		DN300 full (12")	
Flow			PTFE	Graphite	PTFE	Graphite	PTFE	Graphite	PTFE	Graphite
			bar g (psi g)	bar g (psi g)	bar g (psi g)	bar g (psi g)	bar g (psi g)	bar g (psi g)	bar g (psi g)	bar g (psi g)
Unbalanced	Under	Metal seated (T, W) Class IV	7.8 (113.1)	7 (101.5)	4.8 (69.6)	4.2 (60.9)	2.2 (31.9)	1.9 (27.6)		
		Metal seated (T, W) Class V**	3.0 (43.5)	2.2 (31.9)	0.8 (11.6)	0.3 (4.35)				
		Soft seated (G, K) Class VI	10.9 (158.1)	10.0 (145.0)	7.3 (105.9)	6.7 (97.2)	4.1 (59.5)	3.7 (53.7)	1.4 (20.3)	1.3 (18.9)
		Soft seated (P) Class VI	10.4 (150.8)	9.6 (139.2)	6.9 (100.1)	6.3 (91.4)	3.8 (55.1)	3.4 (49.3)	1.3 (18.9)	1.1 (16.0)
Balanced		All seated (T, W, P, K, G) Class IV	103.4 (1,500)	96.2 (1395.3)	71.6 (1038.5)	64.8 (939.8)	32.5 (471.4)	29.3 (425)	11.8 (171.1)	10.4 (150.8)
Unbalanced	Over	All seated (T, W, P, K, G) Class IV, V, VI	29.8 (432.2)	29.0 (420.1)	19.6 (284.3)	19 (275.6)	10.8 (156.6)	10.5 (152.3)	3.9 (56.6)	3.8 (55.1)

Flow over : on/off application only with unbalanced trim only.
For flow over maximum differential pressure, 6 bar g (87 psi g) air supply is considered for others air pressure please consult Spirax Sarco.

TN2277SR with 6 bar air supply*			Valve maximum differential pressure							
			DN125 (5")		DN150 (6")		DN200 (8") DN250 (10") DN300 (12") reduced		DN300 full (12")	
Flow			PTFE	Graphite	PTFE	Graphite	PTFE	Graphite	PTFE	Graphite
Unbalanced	Under	Metal seated (T, W) Class IV	24.7 (358.2)	23.8 (345.2)	16.1 (233.5)	15.5 (224.8)	8.6 (124.7)	8.3 (120.4)	2.6 (37.7)	2.5 (36.3)
		Metal seated (T, W) Class V**	19.9 (288.6)	19.0 (275.6)	12.1 (175.5)	11.6 (168.2)	5.6 (81.2)	5.3 (76.9)	0.7 (10.2)	0.9 (13.1)
		Soft seated (G, K) Class VI	27.7 (401.8)	26.9 (390.2)	18.6 (269.8)	18.0 (261.1)	10.4 (150.8)	10.1 (146.5)	3.8 (55.1)	3.7 (53.7)
		Soft seated (P) Class VI	27.2 (394.5)	26.4 (382.9)	18.2 (264.0)	17.6 (255.3)	10.1 (146.5)	9.8 (142.1)	3.6 (52.2)	3.5 (50.8)
Balanced		All seated (T, W, P, K, G) Class IV	103.4 (1,500)	96.2 (1395.3)	71.6 (1038.5)	64.8 (939.8)	32.5 (471.4)	29.3 (425)	11.8 (171.1)	10.4 (150.8)
Unbalanced	Over	All seated (T, W, P, K, G) Class IV, V, VI	11.8 (171.1)	10.9 (158.1)	7.7 (111.7)	7.2 (104.4)	4.3 (62.4)	3.9 (56.6)	1.5 (21.8)	1.4 (20.3)

*For other air supply pressures please consult Spirax Sarco.
Flow over are for on/off application only and unbalanced trim only.

** Class V has an additional cost impact on the valve. Please contatct Spirax Sarco for details.

Note: The differential pressures stated are at 100% of actuator thrust. It is recommended that valve assemblies are not selected to operate at the absolute maximum differential pressure, especially for steam applications where the downstream pressure can operate in vacuum. Please contact Spirax Sarco for further information.

How to order

Ordering a TN2000 Series Actuator

Type	TN			TN
Series	**2**	=	2000 series	**2**
Actuator size	**2**	=	993 cm^2	**2**
Valve travel	**7**	=	70 mm	**7**
Spring rating	**7**	=	with spring	**7**
	N	=	double-acting (no spring)	
Action	**SE**	=	Single-acting, spring-extend	**SE**
	SR	=	Single-acting, spring-retract	
	DE	=	Double-acting, spring assisted (extend)	
	DR	=	Double-acting, spring assisted (retract)	
	DA	=	Double-acting, no spring	
Manual override	**H**	=	Handwheel (optional) not available for the NDA version	

Ordering example:

1 off Spirax Sarco TN2277SE pneumatic piston actuator.

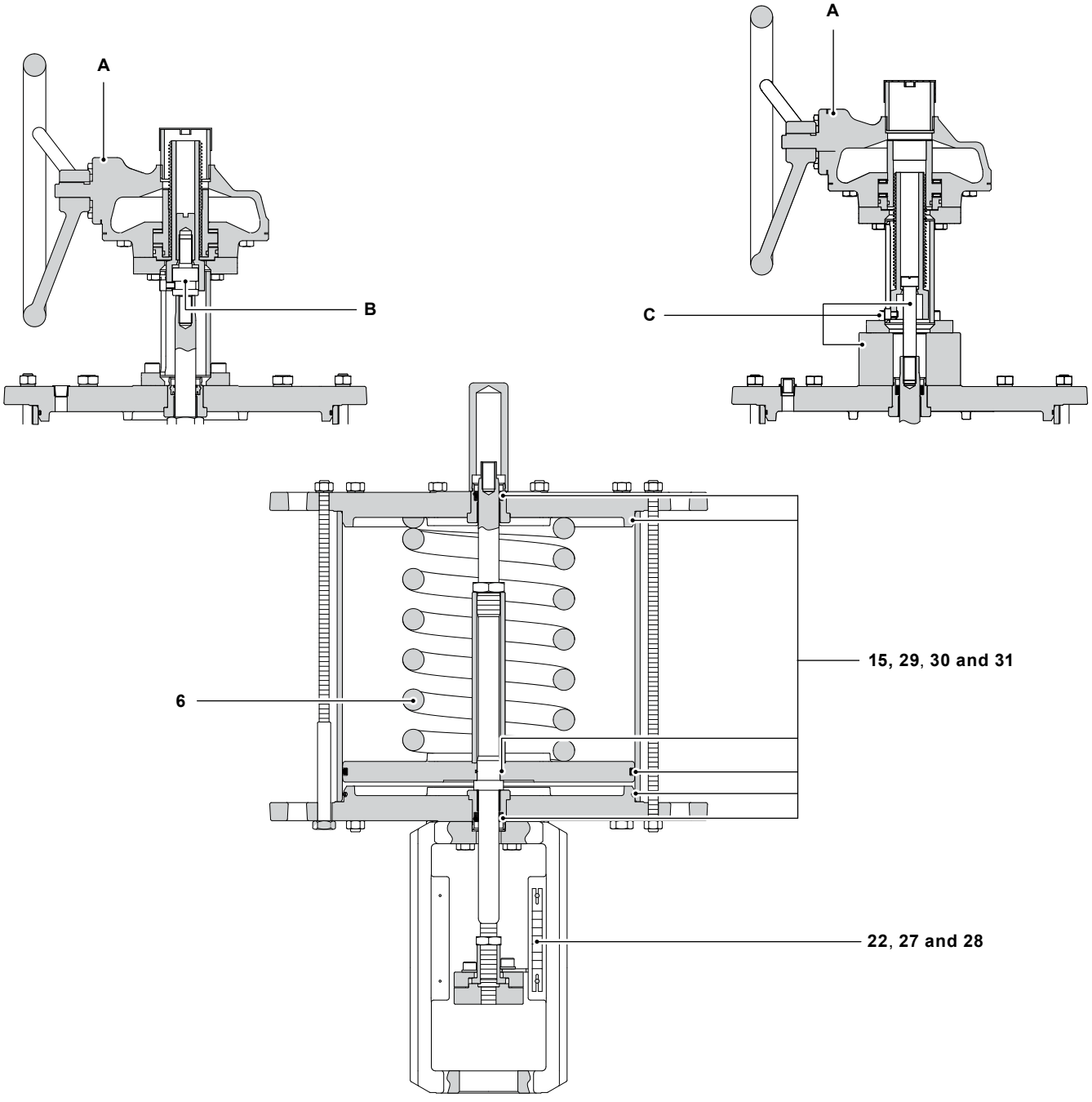
Spare parts

The spare parts available are common across the range of actuators detailed in this document. No other parts are available as spares.

Available spares	
'O' ring kit	**15, 29, 30, 31**
Travel indicator kit	**22, 27, 28**
Spring	**6**
Handwheel	**A**
EH kit	**B**
RH kit	**C**

How to order spares

Always order spares by using the description given in the column headed 'Available spares' and state the actuator model.
Example: 1 - 'O' ring kit for a Spirax Sarco TN2277SE pneumatic piston actuator.



TI-P713-02
CTLS Issue 8

AEL7 Series
Electric Linear Actuator

Description

The AEL7 Series linear electric actuators are a cost effective heavy duty range of linear electric actuators only suitable for the modulation of Spirax Sarco Group valves. The AEL7 Series actuators must not be used for any other purpose. Actuators available with a spring extend failure function are referred to as AEL7T. Full nomenclature details can be found on page 27 of this document.

Simple to commission and especially suited to the steam generation and distribution areas of the steam ecosystem where robustness and reliability are key requirements, the AEL7 Series is compatible with the complete Spira-trol™ 2-port and 3-port ranges. It is also suitable for the Hiter Series 85 and Series 1000 ranges for more arduous applications.

Typical applications for the heavy duty AEL7 Series actuator include:

- Level control including boiler feed water
- Desuperheater TCV
- Thermal oil applications

The AEL7 Series actuator can be used as a problem solver* where:

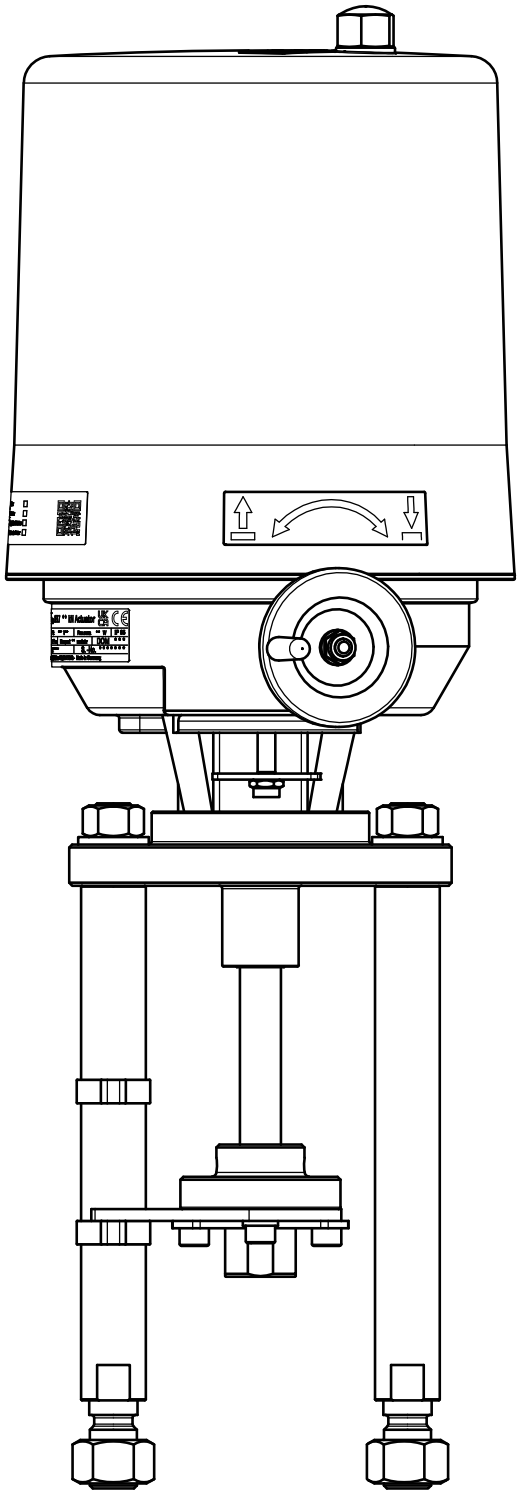
- Vibration levels can be problematic – e.g. vent valves
- Steam systems where water hammer can be experienced

* The source of the problem should always be targeted in parallel with the use of the AEL7 to mitigate the risk of failure

The AEL7 electric linear actuators (with the exclusion of AEL7T) use two physical force dependent (torque) switches to determine the end position of the actuator stroke in both directions and stop the actuator motor i.e. uses the end stops within the valve in order to determine stroke. The force dependent switches do not require any adjustment to correspond to valves with different lengths of stroke thereby minimising the risk of damage due to incorrect set up or in-service wear and tear.

The AEL7T versions require the setting of end position with travel dependent switches due to the spring extend function.

Actuators will normally be supplied fitted to the control valve. When supplied separately, ensure the actuator selected is capable of providing the force necessary to close the two-port or three-port control valve against the expected differential pressure.



Available types

These electric linear actuators are available on 4 different supply variants: 230 Vac, 115 Vac, 24 Vac, and 24 Vdc. The standard version is suitable for VMD (Valve Motor Drive) input power signal. If required the actuator can be fitted with a positioner input card that can accept (4 - 20 mA or 2 - 10 Vdc) control signals.
This can either be used in conjunction with the positioner for 2 - 10 V or 4 - 20 mA input signals, or as feedback for VMD. Also available are auxiliary limit switches and anti - condense heater.

These actuators can be used with the following valves, in conjunction with an appropriate valve adaptor and mounting flange.

2 - Port	DN15 - DN300 (½" - 12")	Spira-trol™ L, K, and J series control valves
		Hiter series 85 and 1000
3 - Port	DN15 - DN200 (½" - 8")	Spira-trol™ Q series control valves



WARNING

Mains connection is required for the installation of the AEL7T Series actuator and therefore requires specialist knowledge of electrical circuits and systems, and the inherent dangers. A working knowledge of linear actuators is also required. Only suitably qualified personnel can operate the actuator under these conditions.

Standards and approvals:

This equipment is CE marked and conforms to the following:

Electrical safety	2014/35/EU (Low Voltage Directive)
Operational safety	EN 60204-1:2018 (Machinery Directive)
	EN14597 (AEL7T only; Temperature control devices and temperature limiters for heat generating systems)
Operational requirements	EN15714-2 (Electric actuators for industrial valves - Basic requirements)
	Modulating actuator Class C acc. to DIN EN ISO 22153
Installation requirements	EN 61000-6-4:2007/A1:2011 (Electromagnetic compatibility)
	EN 60529:92 + A1:00 + A2:13 (Ingress Protection)
Material requirements	REACH and UK REACH

Certification options:

The DN15-100 Spira-trol™ 'L' and 'K' series valves are available with EN14597 certification for the complete assembly when used with the AEL7T spring extend actuator for high limit applications (Temperature control devices and temperature limiters for heat generating systems). Certification must be specified at time or order.

The EN14597 certification is only valid for DN15-100 (½" to 4") standard trim type valves with seat options:

- **T** - 431 stainless steel
- **P** - Full PEEK

All other size, trim and seat option types are out of scope of this safety standard.

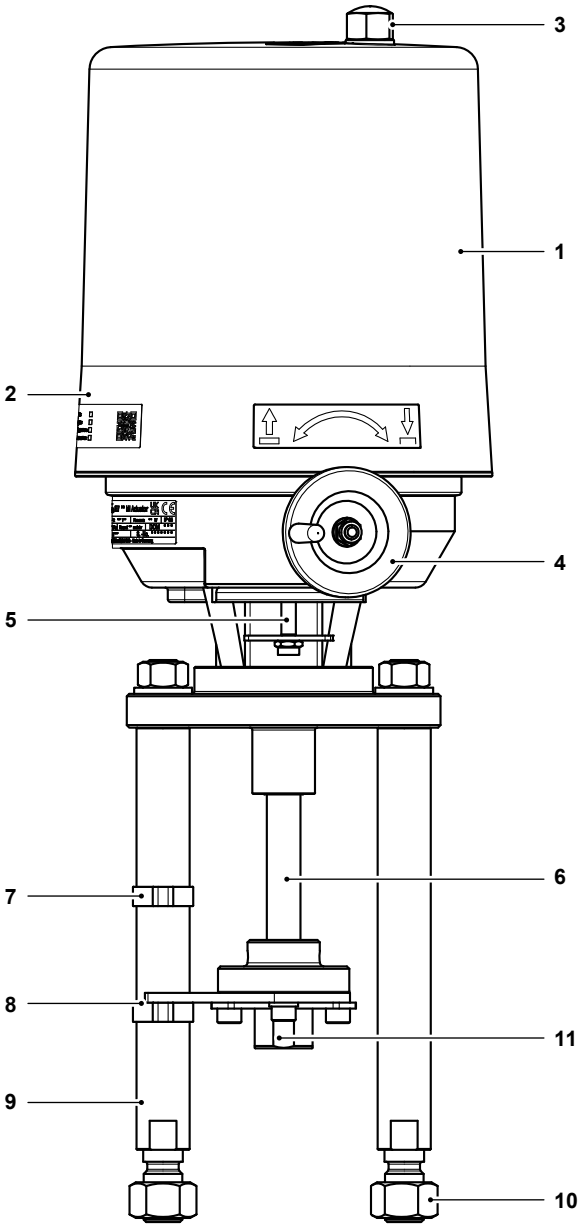
AEL7 Technical specification

Actuator Model	AEL71	AEL71T [1]	AEL72	AEL72T [1]	AEL73	AEL74	AEL75	AEL76	AEL77	AEL78
Thrust kN (lbf)	1.2 (270)	0.9 (202)	2 (450)	2.1 (472)	4 (900)	6 (1349)	8 (1798)	12 (2698)	15 (3372)	20 (4496)
Full Load Speed mm/s (in/sec) @ 24 Vac – 240 Vac (50/60Hz)										
Low	0.2 (0.008)	0.29 (0.011)	0.4 (0.016)	0.29 (0.011)	0.4 (0.016)	0.6 (0.024)	0.7 (0.028)	0.4 (0.016)	0.4 (0.016)	
Medium					0.8 (0.031)		1.4 (0.055)			0.8 (0.031)
High			1.7 (0.067)							
Full load Speed mm/s (in/sec) @ 24 Vdc										
Low	0.5 (0.019)						0.7 (0.028)	0.4 (0.016)	0.4 (0.016)	
Medium			0.8 (0.031)		0.8 (0.031)	0.8 (0.031)	1.4 (0.055)			1 (0.039)
High			1.7 (0.067)							
Set Stroke, mm (in)[3]	20 (0.79)	30 (1.18)								70 (2.76)
Maximum stroke, mm (in)		35 (1.38)	40 (1.57)	35 (1.38)	40 (1.57)	50 (1.97)	60 (2.36)			100 (3.94)
Motor Brake										Vac Only
Ambient temperature	-20 °C … 60 °C (-4 °F … 140 °F)									
Media temperature	-20 °C … 300 °C (425 °C with extended valve bonnet [6]) -4 °F … 572 °F (797 °F with extended valve bonnet [6])									
Enclosure rating	IP54		IP 65	IP54	IP 65					
Enclosure material	Thermoplastic						Steel			
Manual override	Crank handle						Hand wheel			
Conduit entries	2 x M20 x 1.5, 1 x M16 x 1.5						3 x M20 x 1.5			
Electrical connection	Terminal board									
Thread Adapter[4]	M8	M8 and M12					M12			M30 x 1.5
AEL7 Actuator Options										
2WE	2 auxiliary limit switches 5 A - 230 Vac									
POT[2]	Potentiometer 1000 Ω for all strokes									
Positioner card	Input 0/2…10 V, 0 (4)…20 mA, output 0/2…10 V, 0 (4)…20 mA									
Heater	100-230 Vac / 24 Vac/dc									
Shutdown module[5]			FSC20		FSC20		FSC40			FSC60

1 Not available 24 Vdc.
2 Required for Positioner Card.
3 Actuator supplied with stroke at this setting. Actuator travel can be adjusted up to the maximum stroke. See IM-P713-01.
4 Supplied as Standard. Other options available as a cost option. Refer to Mounting Tables for configuration requirements.
5 Factory fitment only. Not available 24 Vac.
6 Bonnet must not be insulated.

Materials

No.	Description	Materials	Surface finish
1	Cover	Polycarbonate 1 - 6 kN (225 - 1349 lbf)	None
		Carbon steel 8 kN+ (1798 lbf)	Painted
2	Housing	Machined Aluminium	None
		Cast Aluminium	Painted
3	Cover Nut [1]	Polycarbonate 1 - 6 kN (225 - 1349 lbf)	None
		Carbon steel 8 kN+ (1798 lbf)	Galvanic zinc plated
4	Hand wheel [2]	Polycarbonate 8 kN+ (1798 lbf)	None
5	Clutch	Carbon steel	Painted
6	Actuator Spindle	Carbon steel	None
7	Stroke Indicator	Carbon steel	None
8	Anti-Rotation Plate and Indicator	Carbon steel	None
9	Actuator Pillar	Carbon steel	Galvanic zinc plated
10	Pillar Nut	Carbon steel	None
11	Actuator Adaptor	Carbon steel	None
12	Boot (1.2 kN (270 lbf) only)	EPDM	None



[1] Internal O - seal in place of gasket for 1 - 6 kN (225 - 1349 lbf) actuators

[2] 1 - 4 kN (225 - 900 lbf) actuators use a hand with crank (See IM-P713-01 for details)

AEL7 Valve Adapter and Mounting Flange Selection - Spira-trol™ K & L

Actuator	Thrust kN (lbf)	DN15 - DN50 (½" - 2")			DN65 - DN100 (2½" - 4")			DN125 - DN300 (5" - 12")		
		Flange	Thread	Adapter	Flange	Thread	Adapter	Flange	Thread	Adapter
AEL71	1.2 (270)	EL5970	M8	Integral						
AEL71T	0.9 (202)			AEL7XM8[1]	EL5971	M12	Integral			
AEL72	2.0 (450)									
AEL72T	2.1 (472)									
AEL73	4.0 (900)									
AEL74	6.0 (1349)									
AEL75	8.0 (1798)									
AEL76	12.0 (2698)									
AEL77	15.0 (3372)									
AEL78	20.0 (4496)				EL5972		AEL7XM12[2]	EL5974	M30 x 1.5	Integral

[1] Included in the standard scope of supply AEL71 to AEL75
[2] Adapter must be ordered separately

AEL7 Valve Adapter and Mounting Flange Selection - Spira-trol™ J

Actuator	Thrust kN (lbf)	DN15 - DN50 (½" - 2")			DN65 - DN100 (2½" - 4")			DN125 - DN300 (5" - 12")		
		Flange	Thread	Adapter	Flange	Thread	Adapter	Flange	Thread	Adapter
AEL71	1.2 (270)	EL5971J	M8	AEL7XJ01[1]	EL5972J					
AEL71T	0.9 (202)					M12	AEL7XJ02[1]			
AEL72	2.0 (450)									
AEL72T	2.1 (472)									
AEL73	4.0 (900)									
AEL74	6.0 (1349)									
AEL75	8.0 (1798)									
AEL76	12.0 (2698)									
AEL77	15.0 (3372)									
AEL78	20.0 (4496)				EL5972J		AEL7XM12[1]	EL5974	M30 x 1.5	Integral

[1] Adapter must be ordered separately

AEL7 Valve Adapter and Mounting Flange Selection - Spira-trol™ Q

Actuator	Thrust kN (lbf)	DN15 - DN50 (½" - 2")			DN65 - DN100 (2½" - 4")			DN125 - DN300 (5" - 12")		
		Flange	Thread	Adapter	Flange	Thread	Adapter	Flange	Thread	Adapter
AEL71	1.2 (270)	EL5970[3]	M8	Integral						
AEL71T	0.9 (202)			AEL7XM8[1]	EL5971	M12	Integral			
AEL72	2.0 (450)									
AEL72T	2.1 (472)									
AEL73	4.0 (900)									
AEL74	6.0 (1349)									
AEL75	8.0 (1798)									
AEL76	12.0 (2698)									
AEL77	15.0 (3372)									
AEL78	20.0 (4496)				EL5972		AEL7XM12[2]	EL5974	M30 x 1.5	Integral

[1] Included in the standard scope of supply AEL71 to AEL75
[2] Adapter must be ordered separately
[3] Spacer 3570003 also required

AEL7 Valve Adapter and Mounting Kit Selection - Hiter S85 and S1000

Valve Model	Ø (")	AEL74		Qty Required	AEL78	
		Mounting Kit	Bolts		Mounting Kit	Bolts
08-18-58-68-02-12-52-62	½	AEL7Y1	012XA125111Z Ø5⁄16"-18UNC x 1½" Hex Head. ASTM A307 gr.A Zinc Plated"	4		
	¾					
	1					
	1½					
01-11-51-61-21-71 Full Bore	1					
	1½					
01-11-51-61-21-71 Red. Bore	1½					
08-18-58-68	2	AEL7Y3		8		
01-11-51-61-21-71 Full Bore						
01-11-51-61-21-71 Red. Bore						
02-12-52-62		AEL7Y4				
08-18-58-68-02-12-52-62	3					
01-11-51-61-21-71 Full Bore						
01-11-51-61-21-71 Red.		AEL7Y3				
08-18-58-68-02-12-52-62	4					
01-11-51-61-21-71 Full Bore						
01-11-51-61-21-71 Red. Bore						
51-61-71 - Stroke 2"	6				Y6	n/a
51-61-71 - Stroke 3"	6					
51-61-71 - Stroke 4"	6					
51-61-71 - Stroke 2"	8					
51-61-71 - Stroke 4"	8					

AEL7 VMD Upgrade Requirements

Use the table to identify the components required to customise a basic VMD actuator or convert to modulating control (positioner card).

Actuator type	Thrust kN (lbf)	Voltage	Switch upgrade	Potentiometer upgrade[1]	Positioner upgrade Kit[2]	Positioner[3]	Heater
AEL7 VMD	1 (225)	230 Vac	AEL7X016	AEL7X001*	AEL71PEL1	AEL7X241	AEL7X181
		110 Vac					
		24 Vac				AEL7X233	AEL7X183
		24 Vdc			n/a[4]		
	2 - 4 (450 - 900)	230 Vac	AEL7X010	AEL7X002*	AEL73PEL1	AEL7X241	AEL7X191
		110 Vac					
		24 Vac				AEL7X233	AEL7X193
		24 Vdc			n/a[4]		
	6 (1349)	230 Vac	AEL7X011	AEL7X003*	AEL74PEL1	AEL7X241	AEL7X201
		110 Vac					
		24 Vac				AEL7X233	AEL7X203
		24 Vdc			n/a[4]		
	8 - 15 (1798 - 3372)	230 Vac	AEL7X012	AEL7X004	AEL77PEL1	AEL7X241	AEL7X211
		110 Vac					
		24 Vac				AEL7X233	AEL7X213
		24 Vdc			AEL78PEL4	AEL7X224	
	20 (4496)	230 Vac			AEL78PEL1	AEL7X241	AEL7X211
		110 Vac					
		24 Vac				AEL7X233	AEL7X213
		24 Vdc			AEL78PEL4	AEL7X224	

[1] Requires switch upgrade to be fitted

[2] Requires potentiometer to be fitted (contains wiring loom, positioner guard and location piece)

[3] Requires positioner upgrade kit to be fitted

[4] 24 Vdc positioner upgrade is a factory only option

AEL7 Spares and accessories

Use the table to identify spare parts for AEL7 (VMD and Positioner)

Actuator Type	Thrust kN (lbf)	Voltage	Switch Replacement	Potentiometer Replacement	Positioner Replacement	Heater Replacement
AEL7	1 (225)	230 Vac	AEL7X017	AEL7X001*	AEL7X241	AEL7X181
		110 Vac				
		24 Vac			AEL7X233	AEL7X183
		24 Vdc			AEL7X224	
	2 - 4 (450 - 900)	230 Vac	AEL7X014	AEL7X002*	AEL7X241	AEL7X191
		110 Vac				
		24 Vac			AEL7X233	AEL7X193
		24 Vdc			AEL7X224	
	6 (1349)	230 Vac	AEL7X015	AEL7X003*	AEL7X241	AEL7X201
		110 Vac				
		24 Vac			AEL7X233	AEL7X203
		24 Vdc			AEL7X224	
	8 - 20 (1798 - 4496)	230 Vac	AEL7X012	AEL7X004	AEL7X241	AEL7X211
		110 Vac				
		24 Vac			AEL7X233	AEL7X213
		24 Vdc			AEL7X224	

AEL7 Switch kit contents

Switch Kit	AEL7X016/010/011	AEL7X017/014/015
Transmitter Plate	●	
Auxiliary switch cams (incl. lock nut and knurled nut)	●	
Potentiometer cam	●	
Feedback bar	●	
End position Switch PCB	●	●

AEL7T accessories

Actuator Type	Thrust kN (lbf)	Voltage	Aux. Switch	Potentiometer	Positioner
AEL7T	1 (225)	230 Vac	AEL7T010	AEL7T001	AEL7X241
		110 Vac			
		24 Vac			AEL7X233
	2 (450)	230 Vac			AEL7X241
		110 Vac			
		24 Vac			AEL7X233

Maximum differential pressures in bar (psi) for Class IV shut - off - Metal Seated (T&S) Spira - trol - DN15 - DN25 (½" - 1") - FLOW UNDER

Actuator Type	Cage Type	Standard Cage (S)														
	Valve size	DN15 - DN25 (½" - 1")														
	Kvs	0.01 - 0.5			1			1.6			2.5			4		
	Cv	0.012 - 0.58			1.2			1.8			2.9			4.6		
	Actuator thrust kN (lbf)	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D
AEL71	1.2 (270)	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	77.9 (1130)	25.0 (363)	77.3 (1121)	50.7 (735)	25.0 (363)
AEL72	2.0 (450)											103.4 (1500)		103.4 (1500)	103.4 (1500)	
AEL73	4.0 (900)															

Actuator Type	Cage Type	Standard Cage (S)												Low Noice Cage (P1)		
	Valve size	DN15 - DN25 (½" - 1")														
	Kvs	4.9 - 6.3			7.2			10			11			2.5 - 4 - 6.3 - 10		
	Cv	5.7 - 7.3			8.3			12			12.7			2.9 - 4.6 - 7.3 - 12		
	Actuator thrust kN (lbf)	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D
AEL71	1.2 (270)	39.7 (576)	24.8 (360)	25.0 (363)	29.9 (434)	18.1 (263)	24.8 (360)	23.0 (334)	13.5 (196)	18.9 (274)	17.6 (255)	9.9 (144)	14.2 (206)	17.6 (255)	9.9 (144)	14.2 (206)
AEL72	2.0 (450)	79.5 (1153)	64.6 (937)		61.3 (889)	49.5 (718)	25.0 (363)	48.5 (703)	38.9 (564)	25.0 (363)	38.3 (555)	30.5 (422)	25.0 (363)	38.3 (555)	30.5 (422)	25.0 (363)
AEL73	4.0 (900)	103.4 (1500)	103.4 (1500)		103.4 (1500)	103.4 (1500)		103.4 (1500)	102.6 (1488)		89.9 (1304)	82.2 (1192)		89.9 (1304)	82.2 (1192)	

Maximum differential pressures in bar (psi) for Class IV shut - off - Metal Seated (T&S) Spira - trol - DN32 - DN50 (1¼" - 2") - FLOW UNDER

Actuator Type	Cage Type	Standard Cage (S)													
	Valve size	DN32 - DN50 (1¼" - 2")													
	Kvs	4			6.3			10			16			17.5 - 18		
	Cv	4.6			7.3			12			18			20.2 - 21		
	Actuator thrust kN (lbf)	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D
AEL71	1.2 (270)	77.7 (1127)	52.0 (754)	25.0 (363)	42.2 (612)	27.3 (396)	25.0 (363)	25.0 (363)	15.5 (225)	20.9 (303)	19.8 (287)	12.0 (174)	16.4 (238)	14.4 (209)	8.3 (120)	11.8 (171)
AEL72	2.0 (450)	103.4 (1500)	103.4 (1500)		82.0 (1189)	67.1 (973)		50.5 (732)	40.9 (593)	25.0 (363)	40.9 (593)	33.0 (479)	25.0 (363)	30.7 (445)	24.6 (357)	25.0 (363)
AEL73	4.0 (900)				103.4 (1500)	103.4 (1500)		103.4 (1500)	103.4 (1500)		93.5 (1356)	85.6 (1242)		71.5 (1037)	65.3 (947)	
AEL74	6.0 (1349)										103.4 (1500)	103.4 (1500)		103.4 (1500)	103.4 (1500)	
AEL75*	8.0 (1798)															

Actuator Type	Cage Type	Standard Cage (S)									Low Noise Cage (P1 - P2 - P3 - A1 - A2)		
	Valve size	DN32 - DN50 (1¼" - 2")											
	Kvs	25			31 - 36			46 - 50			All Kvs		
	Cv	29			36 - 42			53 - 58			All Cv		
	Actuator thrust kN (lbf)	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D
AEL71	1.2 (270)	6.2 (90)	2.9 (42)	4.8 (70)	4.4 (64)	1.8 (26)	3.3 (48)	2.5 (36)	0.6 (9)	1.7 (25)	2.5 (36)	0.6 (9)	1.7 (25)
AEL72	2.0 (450)	15.0 (218)	11.7 (170)	13.6 (197)	11.5 (167)	8.8 (128)	10.3 (149	7.5 (109)	5.6 (81)	6.7 (97)	7.5 (109)	5.6 (81)	6.7 (97)
AEL73	4.0 (900)	37.1 (538)	33.8 (490)	25.0 (363)	29.1 (422)	26.5 (384)	25.0 (363)	20.1 (292)	18.2 (264)	19.3 (280)	20.1 (292)	18.2 (264)	19.3 (280)
AEL74	6.0 (1349)	59.1 (857)	55.8 (809)		46.8 (679)	44.1 (640)		32.7 (474)	30.8 (447)	25.0 (363)	32.7 (474)	30.8 (447)	25.0 (363)
AEL75*	8.0 (1798)	81.1 (1176)	77.8 (1128)		64.3 (933)	61.7 (895)		45.2 (656)	43.3 (62)		45.2 (656)	43.3 (628)	

*** Not - be used with 316L plug and stem**

Maximum differential pressures in bar (psi) for Class IV shut - off - Metal Seated (T&S) Spira - trol - DN65 - DN100 (2½" - 4") - FLOW UNDER

Actuator Type	Cage Type	Standard Cage (S)														
	Valve size	DN65 - DN100 (2½" - 4")														
	Kvs	16			25			36			73 - 90			100 - 117		
	Cv	18			29			42			85 - 104			116 - 135		
	Actuator thrust kN (lbf)	P	H	D	N - P	H	D	P	H	D	P	H	D	P	H	D
AEL71	1.2 (270)	13.4 (194)	3.0 (44)	11.8 (171)	4.0 (58)		3.3 (48)	2.2 (32)		1.7 (25)	0.4 (6)					
AEL72	2.0 (450)	29.7 (431)	19.3 (280)		11.0 (160)	6.6 (96)	10.3 (149)	7.2 (104)	3.3 (48)	6.7 (97)	3.2 (46)	3.3 (48)	2.9 (42)	1.5 (22)	0.4 (6)	1.3 (19)
AEL73	4.0 (900)	70.4 (1021)	60.0 (870)		28.7 (416)	24.2 (351)		19.8 (287)	16.6 (241)	19.3 (280)	10.3 (149)	8.5 (123)	10.0 (145)	6.0 (87)	4.9 (71)	5.9 (86)
AEL74	6.0 (1349)		100.8 (1462)		46.3 (672)	41.8 (606)		32.3 (468)	29.1 (422)		17.4 (252)	15.6 (226)	17.1 (248)	10.6 (154)	9.4 (136)	10.4 (151)
AEL75	8.0 (1798)			25.0 (363)	64.0 (928)	59.5 (863)		44.9 (651)	41.7 (605)		24.4 (354)	22.6 (328)	24.1 (350)	15.1 (219)	13.9 (202)	14.9 (216)
AEL76	12.0 (2698)	103.4 (1500)			99.2 (1439)	94.7 (1374)	25.0 (363)	70.1 (1017)	66.9 (970)	25.0 (363)	38.6 (560)	36.8 (560)		24.2 (351)	23.0 (334)	24.0 (348)
AEL77*	15.0 (3372)		103.4 (1500)		103.4 (1500)	103.4 (1500)		88.9 (1289)	85.7 (1243)		49.2 (714)	47.3 (686)	25.0 (363)	31.0 (450)	29.8 (432)	25.0 (363)
AEL78*	20.0 (4496)							103.4 (1500)	103.4 (1500)		66.9 (970)	65.1 (944)		42.3 (614)	41.1 (596)	

Actuator Type	Cage Type	Standard Cage (S)			Low Noise Cage (P1 - A1 - P2 - A2 - P3)					
	Valve size	DN65 - DN100 (2½" - 4")			DN65 - DN80 (2½" - 3")			DN100 (4")		
	Kvs	160 - 180			All Kvs					
	Cv	185 - 208			All Cv					
	Actuator thrust kN (lbf)	P	H	D	P	H	D	P	H	D
AEL72	2.0 (450)	0.5 (7)		0.4 (6)	1.5 (22)	0.4 (6)	1.3 (19)	0.5 (7)		0.4 (6)
AEL73	4.0 (900)	3.3 (48)	2.6 (38)	3.2 (46)	6.0 (87)	4.9 (71)	5.9 (86)	3.3 (48)	2.6 (38)	3.2 (46)
AEL74	6.0 (1349)	6.1 (88)	5.4 (78)	6.0 (87)	10.6 (154)	9.4 (136)	10.4 (151)	6.1 (88)	5.4 (78)	6.0 (87)
AEL75	8.0 (1798)	9.0 (131)	8.2 (119)	8.9 (129)	15.1 (219)	13.9 (202)	14.9 (216)	9.0 (131)	8.2 (119)	8.9 (129)
AEL76	12.0 (2698)	14.6 (212)	13.9 (202)	14.5 (210)	24.2 (351)	23.0 (334)	24.0 (348)	14.6 (212)	13.9 (202)	14.5 (210)
AEL77*	15.0 (3372)	18.9 (274)	18.1 (263)	18.8 (273)	31.0 (450)	29.8 (432)	25.0 (363)	18.9 (274)	18.1 (263)	18.8 (273)
AEL78*	20.0 (4496)	25.9 (376)	25.2 (365)	25.0 (363)	42.3 (614)	41.1 (596)		25.9 (376)	25.2 (365)	25.0 (363)

*** Not - be used with 316L plug and stem**

Maximum differential pressures in bar (psi) for Class VI shut - off - Resilient Seated (P&C) Spira - trol - DN15 - DN25 (½" - 1") - FLOW UNDER

	Cage Type	Standard Cage (S)														
	Valve size	DN15 - DN25 (½" - 1")														
Actuator Type	Kvs	0.01 - 0.5			1			1.6			2.5			4		
	Cv	0.012 - 0.58			1.2			1.8			2.9			4.6		
	Actuator thrust kN (lbf)	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D
AEL71	1.2 (270)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)
AEL72	20.0 (4496)															

	Cage Type	Standard Cage (S)												Low Noise Cage (P1 - A1)		
	Valve size	DN15 - DN25 (½" - 1")														
Actuator Type	Kvs	4.9 - 6.3			7.2			10			11			2.5 - 4 - 6.3 - 10		
	Cv	5.7 - 7.3			8.3			12			12.7			2.9 - 4.6 - 7.3 - 12		
	Actuator thrust kN (lbf)	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D
AEL71	1.2 (270)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)
AEL72	20.0 (4496)															

Note: Maximum differential pressure for saturated steam. Refer to Spirax Sarco for other liquids and gases.

Maximum differential pressures in bar (psi) for Class VI shut - off - Resilient Seated (P&C) Spira - trol - DN32 - DN50 (1¼" - 1") - FLOW UNDER

	Cage Type	Standard Cage (S)													
	Valve size	DN32 - DN50 (1¼" - 2")													
Actuator Type	Kvs	4			6.3			10			16			17.5 - 18		
	Cv	4.6			7.3			12			18			20.2 - 21		
	Actuator thrust kN (lbf)	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D
AEL71	1.2 (270)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	13.1 (190)	16.6 (241)
AEL72	20.0 (4496)														19.0 (276)	19.0 (276)

	Cage Type	Standard Cage (S)									Low Noise Cage (P1 - P2 - P3 - A1 - A2)		
	Valve size	DN32 - DN50 (1¼" - 2")											
Actuator Type	Kvs	25			31 - 36			46 - 50			All Kvs		
	Cv	29			36 - 42			53 - 58			All Cv		
	Actuator thrust kN (lbf)	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D
AEL71	1.2 (270)	9.8 (142)	6.5 (94)	8.3 (120)	7.6 (110)	4.9 (71)	6.4 (93)	5.1 (74)	3.3 (48)	4.3 (62)	5.1 (74)	3.3 (48)	4.3 (62)
AEL72	20.0 (4496)	18.6 (270)	15.3 (222)	17.1 (248)	14.6 (212)	12.0 (174)	13.5 (196)	10.2 (148)	8.3 (120)	9.4 (136)	10.2 (148)	8.3 (120)	9.4 (136)

Note: Maximum differential pressure for saturated steam. Refer to Spirax Sarco for other liquids and gases.

Maximum differential pressures in bar (psi) for Class VI shut - off - Resilient Seated (P&C) Spira - trol - DN65 - DN100 (2½" - 4") - FLOW UNDER

Actuator Type	Cage Type	Standard Cage (S)														
	Valve size	DN65 - DN100 (2½" - 4")														
	Kvs	16			25			36			73 - 90			100 - 117		
	Cv	18			29			42			85 - 104			116 - 135		
	Actuator thrust kN (lbf)	P	H	D	P	H	D	P	H	D	P	H	D	P	H	D
AEL71	1.2 (270)	18.2 (264)	7.8 (113)	16.6 (241)	7.2 (104)	2.7 (39)	6.4 (93)	4.8 (70)	1.6 (23)	4.3 (62)	2.4 (35)	0.6 (9)	2.1 (30)	1.3 (19)	0.2 (3)	1.1 (16)
AEL72	2.0 (450)	19.0 (276)	19.0 (276)	19.0 (276)	14.2 (206)	9.7 (141)	13.5 (196)	9.9 (144)	6.6 (96)	9.4 (136)	5.2 (75)	3.4 (49)	4.9 (71)	3.1 (45)	2.0 (29)	2.9 (42)
AEL73	4.0 (900)				19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	12.3 (178)	10.5 (152)	12.0 (174)	7.6 (110)	6.5 (94)	7.5 (109)
AEL74	6.0 (1349)										19.0 (276)	17.6 (255)	19.0 (276)	12.2 (177)	11.0 (160)	12.0 (174)
AEL75	8.0 (1798)											19.0 (276)		16.7 (242)	15.5 (225)	16.5 (239)
AEL76	12.0 (2698)													19.0 (276)	19.0 (276)	19.0 (276)

Actuator Type	Cage Type	Standard Cage (S)			Low Noise Cage (P1 - A1 - P2 - A2 - P3)					
	Valve size	DN65 - DN100 (2½" - 4")			DN65 - DN80 (2½" - 3")			DN100 (4")		
	Kvs	160 - 180			All Kvs					
	Cv	185 - 208			All Cv					
	Actuator thrust kN (lbf)	P	H	D	P	H	D	P	H	D
AEL71	1.2 (270)	0.6 (9)		0.5 (7)	1.3 (19)	0.2 (3)	1.1 (16)	0.6 (9)		0.5 (7)
AEL72	2.0 (450)	1.8 (26)	1.0 (15)	1.7 (25)	3.1 (45)	2.0 (29)	2.9 (42)	1.8 (26)	1.0 (15)	1.7 (25)
AEL73	4.0 (900)	4.6 (67)	3.9 (57)	4.5 (65)	7.6 (110)	6.5 (94)	7.5 (109)	4.6 (67)	3.9 (57)	4.5 (65)
AEL74	6.0 (1349)	7.4 (107)	6.7 (97)	7.3 (106)	12.2 (177)	11.0 (160)	12.0 (174)	7.4 (107)	6.7 (97)	7.3 (106)
AEL75	8.0 (1798)	10.2 (148)	9.5 (138)	10.1 (146)	16.7 (242)	15.5 (225)	16.5 (239)	10.2 (148)	9.5 (138)	10.1 (146)
AEL76	12.0 (2698)	15.9 (231)	15.2 (220)	15.8 (229)	19.0 (276)	19.0 (276)	19.0 (276)	15.9 (231)	15.2 (220)	15.8 (229)

Note: Maximum differential pressure for saturated steam. Refer to Spirax Sarco for other liquids and gases.

Maximum differential pressures in bar (psi) for Class VI shut - off - PTFE Seat (G) Spira - trol - DN15 - DN25 (½" - 1") - FLOW UNDER

	Cage Type	Standard Cage (S)														
	Valve size	DN15 - DN25 (½" - 1")														
Actuator Type	Kvs	0.01 - 0.5			1			1.6			2.5			4		
	Cv	0.012 - 0.58			1.2			1.8			2.9			4.6		
	Actuator thrust kN (lbf)	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D
AEL71	1.2 (270)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)
AEL72	2.0 (450)															
AEL73	4.0 (900)															

	Cage Type	Standard Cage (S)												Low Noise Cage (P1)		
	Valve size	DN15 - DN25 (½" - 1")														
Actuator Type	Kvs	4.9 - 6.3			7.2			10			11			2.5 - 4 - 6.3 - 10		
	Cv	5.7 - 7.3			8.3			12			12.7			2.9 - 4.6 - 7.3 - 12		
	Actuator thrust kN (lbf)	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D
AEL71	1.2 (270)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)
AEL72	2.0 (450)															
AEL73	4.0 (900)															

Note: Maximum differential pressure for saturated steam. Refer to Spirax Sarco for other liquids and gases.

Maximum differential pressures in bar (psi) for Class VI shut - off - PTFE Seated (G) Spira - trol - DN32 - DN50 (1¼" - 2") - FLOW UNDER

	Cage Type	Standard Cage (S)														
	Valve size	DN32 - DN50 (1¼" - 2")														
Actuator Type	Kvs	4			6.3			10			16			17.5 - 18		
	Cv	4.6			7.3			12			18			20.2 - 21		
	Actuator thrust kN (lbf)	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D
AEL71	1.2 (270)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)
AEL72	2.0 (450)															
AEL73	4.0 (900)															

	Cage Type	Standard Cage (S)									Low Noise Cage (P1)		
	Valve size	DN32 - DN50 (1¼" - 2")											
Actuator Type	Kvs	25			31 - 36			46 - 50			All Kvs		
	Cv	29			36 - 42			53 - 58			All Cv		
	Actuator thrust kN (lbf)	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D
AEL71	1.2 (270)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)
AEL72	2.0 (450)												
AEL73	4.0 (900)												

Note: Maximum differential pressure for saturated steam. Refer to Spirax Sarco for other liquids and gases.

Maximum differential pressures in bar (lbf) for Class VI shut - off - PTFE Seated (G) Spira - trol - DN65 - DN100 (2½" - 4") - FLOW UNDER

Actuator Type	Cage Type	Standard Cage (S)													
	Valve size	DN65 - DN100 (2½" - 4")													
	Kvs	16			25			36			73 - 90			100 - 117		
	Cv	18			29			42			85 - 104			116 - 135		
	Actuator thrust kN (lbf)	P	H	D	N - P	H	D	P	H	D	P	H	D	P	H	D
AEL71	1.2 (270)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	3.0 (44)	4.0 (58)	3.4 (49)	1.6 (23)	3.1 (45)	2.1 (30)	1.0 (15)	1.9 (28)
AEL72	2.0 (450)								4.0 (58)		4.0 (58)	4.0 (58)	4.0 (58)	3.9 (57)	2.8 (41)	3.7 (54)
AEL73	4.0 (900)													4.0 (58)	4.0 (58)	4.0 (58)
AEL74	6.0 (1349)															

Actuator Type	Cage Type	Standard Cage (S)			Low Noise Cage (P1)					
	Valve size	DN65 - DN100 (2½" - 4")			DN65 - DN80 (2½" - 3")			DN100 (4")		
	Kvs	160 - 180			All Kvs					
	Cv	185 - 208			All Cv					
	Actuator thrust kN (lbf)	P	H	D	P	H	D	P	H	D
AEL71	1.2 (270)	1.3 (19)	0.6 (9)	1.2 (17)	2.1 (30)	1.0 (15)	1.9 (28)	1.3 (19)	0.6 (9)	1.2 (17)
AEL72	2.0 (450)	2.4 (35)	1.7 (25)	2.3 (33)	3.9 (57)	2.8 (41)	3.7 (54)	2.4 (35)	1.7 (25)	2.3 (33)
AEL73	4.0 (900)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)	4.0 (58)
AEL74	6.0 (1349)									

Note: Maximum differential pressure for saturated steam. Refer to Spirax Sarco for other liquids and gases.

Maximum differential pressures in bar (psi) for Class IV shut - off - Hard Facing (W) Spira - trol - DN15 - DN25 (½" - 1") - FLOW UNDER

Actuator Type	Cage Type	Standard Cage (S)														
	Valve size	DN15 - DN25 (½" - 1")														
	Kvs	0.01 - 0.5			1			1.6			2.5			4		
	Cv	0.012 - 0.58			1.2			1.8			2.9			4.6		
	Actuator thrust kN (lbf)	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D
AEL71	1.2 (270)	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	103.4 (1500)	25.0 (363)	100.1 (1452)	61.9 (898)	25.0 (363)	63.9 (927)	37.4 (542)	25.0 (363)
AEL72	2.0 (450)										103.4 (1500)	103.4 (1500)		103.4 (1500)	103.4 (1500)	
AEL73	4.0 (900)															
AEL74	6.0 (1349)															

Actuator Type	Cage Type	Standard Cage (S)												Low Noise Cage (P1)		
	Valve size	DN15 - DN25 (½" - 1")														
	Kvs	4.9 - 6.3			7.2			10			11			2.5 - 4 - 6.3 - 10		
	Cv	5.7 - 7.3			8.3			12			12.7			2.9 - 4.6 - 7.3 - 12		
	Actuator thrust kN (lbf)	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D
AEL71	1.2 (270)	29.7 (431)	14.8 (215)	23.2 (336)	21.0 (305)	9.2 (133)	15.9 (231)	15.0 (216)	5.5 (80)	10.9 (158)	10.4 (151)	2.6 (38)	7.0 (102)	10.4 (151)	2.6 (38)	7.0 (102)
AEL72	2.0 (450)	69.5 (1008)	54.6 (792)	25.0 (363)	52.4 (760)	40.7 (590)	25.0 (363)	40.5 (587)	30.9 (448)	25.0 (363)	31.1 (451)	23.3 (338)	25.0 (363)	31.1 (451)	23.3 (338)	25.0 (363)
AEL73	4.0 (900)	103.4 (1500)	103.4 (1500)		103.4 (1500)	103.4 (1500)		103.4 (1500)	94.6 (1372)		82.7 (1199)	75.0 (1088)		82.7 (1199)	75.0 (1088)	
AEL74	6.0 (1349)								103.4 (1500)		103.4 (1500)	103.4 (1500)		103.4 (1500)	103.4 (1500)	

Maximum differential pressures in bar(psi) for Class IV shut - off - Hard Facing (W) Spira - trol - DN32 - DN50 (1¼" - 2") - FLOW UNDER

Actuator Type	Cage Type	Standard Cage (S)														
	Valve size	DN32 - DN50 (1¼" - 2")														
	Kvs	4			6.3			10			16			17.5 - 18		
	Cv	4.6			7.3			12			18			20.2 - 21		
	Actuator thrust kN (lbf)	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D
AEL71	1.2 (270)	61.3 (889)	35.6 (516)	25.0 (363)	29.7 (431)	14.8 (215)	23.2 (336)	15.0 (218)	5.5 (80)	10.9 (158)	10.8 (157)	2.9 (42)	7.3 (106)	6.4 (93)	0.3 (4)	3.8 (55)
AEL72	2.0 (450)	103.4 (1500)	103.4 (1500)		69.5 (1008)	54.6 (792)	25.0 (363)	40.5 (587)	30.9 (448)	25.0 (363)	31.8 (461)	23.9 (347)	25.0 (363)	22.7 (329)	16.6 (241)	20.1 (292)
AEL73	4.0 (900)				103.4 (1500)	103.4 (1500)		103.4 (1500)	103.4 (1500)		103.4 (1500)	76.5 (1110)		63.5 (921)	57.3 (831)	25.0 (363)
AEL74	6.0 (1349)											103.4 (1500)		103.4 (1500)	98.1 (1423)	

Actuator Type	Cage Type	Standard Cage (S)									Low Noise Cage (P1 - P2 - P3 - A1 - A2)		
	Valve size	DN32 - DN50 (1¼" - 2")											
	Kvs	25			31 - 36			46 - 50			All Kvs		
	Cv	29			36 - 42			53 - 58			All Cv		
	Actuator thrust kN (lbf)	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D
AEL72	2.0 (450)	9.2 (133)	5.9 (86)	7.7 (112)	6.2 (90)	3.6 (52)	5.1 (74)	3.1 (45)	1.2 (17)	2.2 (32)	3.1 (45)	1.2 (17)	2.2 (32)
AEL73	4.0 (900)	31.2 (453)	27.9 (405)	25.0 (363)	23.9 (347)	21.2 (307)	22.7 (329)	15.6 (226)	13.7 (199)	14.8 (215)	15.6 (226)	13.7 (199)	14.8 (215)
AEL74	6.0 (1349)	53.2 (772)	49.9 (724)		41.5 (602)	38.9 (564)	25.0 (363)	28.2 (409)	26.3 (381)	25.0 (363)	28.2 (409)	26.3 (381)	25.0 (363)
AEL75	8.0 (1798)										40.8 (592)	38.9 (564)	
AEL76	12.0 (2698)										65.9 (956)	64.0 (928)	
AEL77	15.0 (3372)										84.8 (1230)	82.9 (1202)	

Maximum differential pressures in bar (psi) for Class IV shut - off - Hard Facing (W) Spira - trol - DN65 - DN100 (2½" - 4") - FLOW UNDER

Actuator Type	Cage Type	Standard Cage (S)														
	Valve size	DN65 - DN100 (2½" - 4")														
	Kvs	16			25			36			73 - 90			100 - 117		
	Cv	18			29			42			85 - 104			116 - 135		
	Actuator thrust kN (lbf)	P	H	D	N - P	H	D	P	H	D	P	H	D	P	H	D
AEL72	2.0 (450)	21.7 (315)	11.3 (164)	20.1 (292)	5.8 (84)	1.3 (19)	5.1 (74)	2.7 (39)		2.2 (32)						
AEL73	4.0 (900)	62.4 (905)	52.0 (754)	25.0 (363)	23.4 (339)	18.9 (274)	22.7 (329)	15.3 (222)	12.1 (175)	14.8 (215)	6.9 (100)	5.1 (74)	6.7 (97)	3.4 (49)	2.2 (32)	3.2 (46)
AEL74	6.0 (1349)	103.4 (1500)	92.8 (1346)		41.1 (596)	36.6 (531)	25.0 (363)	27.9 (392)	24.7 (358)	25.0 (363)	14.0 (203)	12.2 (177)	13.7 (199)	7.9 (115)	6.8 (99)	7.7 (112)
AEL75	8.0 (1798)		103.4 (1500)		58.7 (851)	54.2 (786)		40.5 (587)	37.3 (541)		21.1 (306)	19.3 (280)	20.8 (302)	12.4 (180)	11.3 (164)	12.3 (178)
AEL76	12.0 (2698)				94.0 (1363)	89.5 (1298)		65.6 (943)	62.4 (905)		35.1 (509)	33.4 (484)	25.0 (363)	21.5 (312)	20.3 (294)	21.3 (309)

Actuator Type	Cage Type	Standard Cage (S)			Low Noise Cage (P1 - A1 - P2 - A2 - P3)					
	Valve size	DN65 - DN100 (2½" - 4")			DN65 - DN80 (2½" - 3")			DN100 (4")		
	Kvs	160 - 180			All Kvs					
	Cv	185 - 208			All Cv					
	Actuator thrust kN (lbf)	P	H	D	P	H	D	P	H	D
AEL73	4.0 (900)	1.2 (17)	0.5 (7)	1.1 (16)	3.4 (49)	2.2 (32)	3.2 (46)	1.2 (17)	0.5 (7)	1.1 (16)
AEL74	6.0 (1349)	4.0 (58)	3.3 (48)	3.9 (57)	7.9 (115)	6.8 (99)	7.7 (112)	4.0 (58)	3.3 (48)	3.9 (57)
AEL75	8.0 (1798)	6.9 (100)	6.1 (88)	6.8 (99)	12.4 (180)	11.3 (164)	12.3 (178)	6.9 (100)	6.1 (88)	6.8 (99)
AEL76	12.0 (2698)	12.5 (181)	11.8 (171)	12.4 (180)	21.5 (312)	20.3 (294)	21.3 (309)	12.5 (181)	11.8 (171)	12.4 (180)
AEL77	15.0 (3372)				28.3 (410)	27.1 (393)	25.0 (363)	16.7 (242)	16.0 (232)	16.6 (241)
AEL78	20.0 (4496)				39.6 (574)	38.4 (557)		23.8 (345)	23.1 (335)	23.7 (344)

Maximum differential pressures in bar (psi) for Class IV shut - off - Metal Seated (T&S) Spira - trol - DN15 - DN25 (½" - 1") - FLOW OVER

Actuator Type	Cage Type		Standard Cage (S)													
	Valve size		DN15 - DN25 (½" - 1")													
	Kvs		0.01 - 0.5			1			1.6			2.5			4	
	Cv		0.012 - 0.58			1.2			1.8			2.9			4.6	
	Thrust kN (lbf)	Pressure	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H
AEL71T	0.9 (202)	Max.	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	103.4 (1500)
		Min.	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

Actuator Type	Cage Type		Standard Cage (S)											
	Valve size		DN15 - DN25 (½" - 1")											
	Kvs		4.9 - 6.3			7.2			10			11		
	Cv		5.7 - 7.3			8.3			12			12.7		
	Thrust kN (lbf)	Pressure	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D
AEL71T	0.9 (202)	Max.	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	103.4 (1500)	25.0 (363)
		Min.	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

Maximum differential pressures in bar (psi) for Class IV shut - off - Metal Seated (T&S) Spira - trol - DN32 - DN50 (1¼" - 2'') - FLOW OVER

Actuator Type	Cage Type		Standard Cage (S)													
	Valve size		DN32 - DN50 (1¼" - 2'')													
	Kvs		4			6.3			10			16			17.5 - 18	
	Cv		4.6			7.3			12			18			20.2 - 21	
	Thrust kN (lbf)	Pressure	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H
AEL71T	0.9 (202)	Max.	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	103.4 (1500)	25.0 (363)	103.4 (1500)	103.4 (1500)
		Min.	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

Actuator Type	Cage Type		Standard Cage (S)								
	Valve size		DN32 - DN50 (1¼" - 2")								
	Kvs		25			31 - 36			46 - 50		
	Cv		29			36 - 42			53 - 58		
	Thrust kN (lbf)	Pressure	N - P	H	D	N - P	H	D	N - P	H	D
AEL71T	0.9 (202)	Max.	60.4 (876)	56.6 (821)	25.0 (363)	47.0 (682)	44.1 (640)	25.0 (363)	32.5 (471)	30.5 (442)	25.0 (363)
		Min.	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.2 (3)

Maximum differential pressures in bar (psi) for Class IV shut - off - Metal Seated (T&S) Spira - trol - DN65 - DN100 (2½" - 4'') - FLOW OVER

Actuator Type	Cage Type		Standard Cage (S)													
	Valve size		DN65 - DN100 (2½" - 4")													
	Kvs		16			25			36			73 - 90			100 - 117	
	Cv		18			29			42			85 - 104			116 - 135	
	Thrust kN (lbf)	Pressure	P	H	D	P	H	D	P	H	D	P	H	D	P	H
AEL71T	0.9 (202)	Max.	103.4 (1500)	103.4 (1500)	25.0 (363)	50.9 (738)	45.4 (660)	25.0 (363)	34.2 (496)	30.5 (442)	25.0 (363)	18.1 (263)	16.1 (234)	17.8 (258)	11.3 (164)	10.1 (146)
		Min.	0.0 (0.0)	3.1 (45)	0.0 (0.0)	0.0 (0.0)	3.1 (45)	0.0 (0.0)	0.0 (0.0)	2.9 (42)	0.2 (3)	0.7 (10)	2.5 (36)	1.0 (15)	1.0 (15)	2.1 (30)
AEL72T	2.1 (472)	Max.	31.7 (460)	21.3 (309)	25.0 (363)	11.9 (173)	7.4 (107)	11.2 (162)	7.8 (113)	4.6 (67)	7.3 (106)	3.6 (52)	1.8 (26)	3.3 (48)	1.7 (25)	0.6 (9)
		Min.	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

Actuator Type	Cage Type		Standard Cage (S)		
	Valve size		DN65 - DN100 (2½" - 4")		
	Kvs		160 - 180		
	Cv		185 - 208		
	Thrust kN (lbf)	Pressure	P	H	D
AEL71T	0.9 (202)	Max.	6.9 (100)	6.2 (90)	6.8 (99)
		Min.	1.0 (15)	1.8 (26)	1.2 (17)
AEL72T	2.1 (472)	Max.	5.2 (75)	4.4 (64)	5.0 (73)
		Min.	0.0 (0.0)	0.1 (2)	0.0 (0.0)

Maximum differential pressures in bar (psi) for Class VI shut - off - Resilient Seated (P) Spira - trol - DN15 - DN25 (½" - 1") - FLOW OVER

Actuator Type	Cage Type		Standard Cage (S)													
	Valve size		DN15 - DN25 (½" - 1")													
	Kvs		0.01 - 0.5			1			1.6			2.5			4	
	Cv		0.012 - 0.58			1.2			1.8			2.9			4.6	
	Thrust kN (lbf)	Pressure	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H
AEL71T	0.9 (202)	Max.	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)
		Min.	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

Actuator Type	Cage Type		Standard Cage (S)											
	Valve size		DN15 - DN25 (½" - 1")											
	Kvs		4.9 - 6.3			7.2			10			11		
	Cv		5.7 - 7.3			8.3			12			12.7		
	Thrust kN (lbf)	Pressure	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D
AEL71T	0.9 (202)	Max.	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)
		Min.	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

* Not suitable for use with Spira - trol Steam - Tight (Seat Option C)

Maximum differential pressures in bar (psi) for Class VI shut - off - Resilient Seated (P) Spira - trol - DN32 - DN50 (1¼" - 2") - FLOW OVER

Actuator Type	Cage Type		Standard Cage (S)													
	Valve size		DN32 - DN50 (1¼" - 2")													
	Kvs		4			6.3			10			16			17.5 - 18	
	Cv		4.6			7.3			12			18			20.2 - 21	
	Thrust kN (lbf)	Pressure	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H
AEL71T	0.9 (202)	Max.	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)
		Min.	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

Actuator Type	Cage Type		Standard Cage (S)								
	Valve size		DN32 - DN50 (1¼" - 2")								
	Kvs		25			31 - 36			46 - 50		
	Cv		29			36 - 42			53 - 58		
	Thrust kN (lbf)	Pressure	N - P	H	D	N - P	H	D	N - P	H	D
AEL71T	0.9 (202)	Max.	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)
		Min.	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

* Steam - Tight (option C) NOT suitable for Flow Over applications

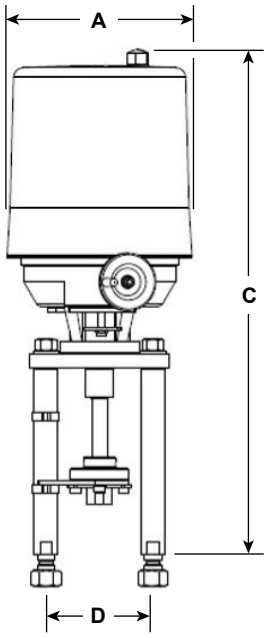
Note: Maximum differential pressure for saturated steam. Refer to Spirax Sarco for other liquids and gases.

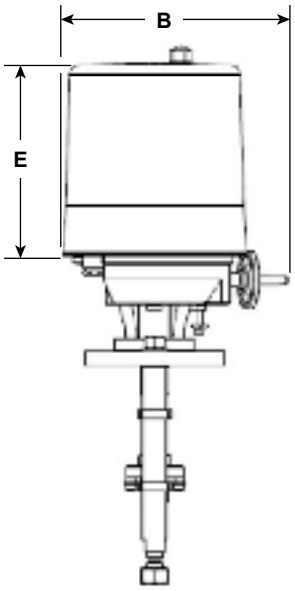
Maximum differential pressures in bar (psi) for Class VI shut - off - Resilient Seated (P) Spira - trol - DN65 - DN100 (2½" - 4'') - FLOW OVER

Actuator Type	Cage Type		Standard Cage (S)													
	Valve size		DN65 - DN100 (2½" - 4")													
	Kvs		16			25			36			73 - 90			100 - 117	
	Cv		18			29			42			85 - 104			116 - 135	
	Thrust kN (lbf)	Pressure	N - P	H	D	N - P	H	D	N - P	H	D	N - P	H	D	P	H
AEL71T	0.9 (202)	Max.	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	19.0 (276)	18.1 (263)	16.1 (234)	17.8 (258)	11.3 (164)	10.1 (146)
		Min.	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.3 (4)	0.0 (0.0)	0.0 (0.0)	0.5 (7)	0.0 (0.0)	0.0 (0.0)	0.5 (7)
AEL72T	2.1 (472)	Max.										13.5 (196)	1.8 (26)	3.3 (48)	1.7 (25)	0.6 (9)
		Min.										0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

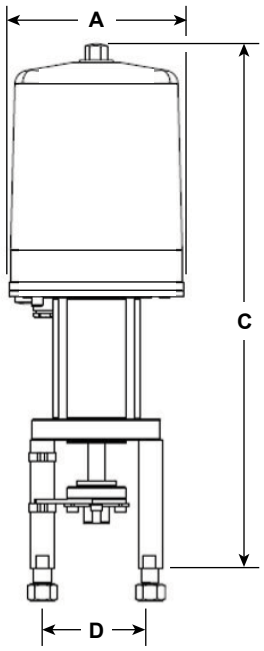
Actuator Type	Cage Type		Standard Cage (S)		
	Valve size		DN65 - DN100 (2½" - 4")		
	Kvs		160 - 180		
	Cv		185 - 208		
	Thrust kN (lbf)	Pressure	P	H	D
AEL71T	0.9 (202)	Max.	6.9 (100)	6.2 (90)	6.8 (99)
		Min.	0.0 (0.0)	0.5 (7)	0.0 (0.0)
AEL72T	2.1 (472)	Max.	5.2 (75)	4.4 (64)	5.0 (73)
		Min.	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

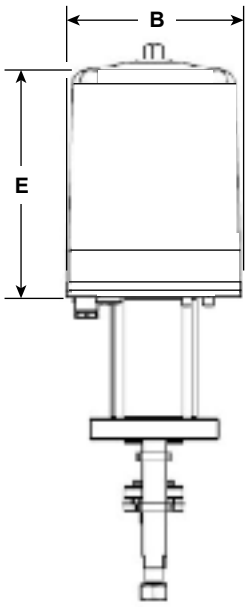
Dimensions / Weights (approximate) in mm (in) and kg (lb)





AEL7
(AEL74 used for reference)





AEL7T

Actuator	Thrust kN (lbf)	Dimensions (mm) A	B	C	D	E	Weight
AEL71	1.2 (270)	129 (5)	129 (5)	272 (10.7)		138 (5.4)	2.1 (4.6)
AEL71T	0.9 (202)	162 (6.4)	162 (6.4)	490 (19.3)		213 (8.4)	8.7 (19.1)
AEL72	2.0 (450)	173 (6.8)	173 (6.8)	374 (14.7)		189 (7.4)	8 (17.6) (8.65 (19) for Super-Capacitor versions)
AEL72T	2.1 (472)	162 (6.4)	162 (6.4)	508 (20)		213 (8.4)	9.3 (20.5)
AEL73	4.0 (900)	173 (6.8)	173 (6.8)	374 (14.7)	100 (3.9)	189 (7.4)	8 (17.6) (8.65 (19) for Super-Capacitor versions)
AEL74	6.0 (1349)	173 (6.8)	211 (8.3)	474 (18.7)		180 (7.1)	8 (17.6)
AEL75	8.0 (1798)					198 (7.8)	15 (33) (15.65 (34.5) for Super-Capacitor versions)
AEL76	12.0 (2698)	188 (7.4)	259 (10.2)	527 (20.7)			
AEL77	15.0 (3372)						
AEL78	20.0 (4496)	216 (8.5)	282 (11.1)	657 (25.9)	155 (6.1)	228 (9)	19 (41.9) (19.65 (43.3) for Super-Capacitor versions)

Safety information, installation and maintenance

Full details for the safe installation, commissioning and removal of the AEL7 Series actuator can be found in:
IM-P713-01 for AEL7 versions and **IM-P713-02 for AEL7T** versions

Installation and wiring note

The valve should be installed in the horizontal line. The position of the actuator will depend on the type of valve to which it is fitted and the temperature of the media. However, it is not recommended that the actuators be fitted directly below the valve or in a wet environment.

Disposal

This product is recyclable. No ecological hazard is anticipated with the disposal of this product, providing due care is taken.

Selection example

Control Valve	DN20 JE43 HTSUSS Kv10
Kvs	6.3
Connection	PN63
Operating ΔP	30 bar
Electrical Supply	24 Vdc
Control Input Signal	4-20mA
Position Feedback	4-20mA
End-position Feedback	VFC

		Information Source
Maximum ΔP	103.4 bar	Differential Pressure Tables (Class IV) Metal Seated (T & S)
Mounting Flange	EL5971J	AEL7 Valve Adapter and Mounting Flange Selection - Spira-trol™ J
Stem Adapter	AEL7XJ01	
Positioner	AEL7X224 (Supplied with actuator)	Nomenclature and How to Order
Position Feedback	Positioner function	AEL7 Technical Specification
End-position Feedback	AEL7X014	AEL7 Assessories (Positioner)

Nomenclature and How to order

Product	**A**	Actuator		**A**
Type	**E**	Electric		**E**
Action	**L**	Linear		**L**
Series	**7**	-		**7**
Thrust	**1**	1.2 kN (270 lbf)	0.9 kN (202 lbf) for AEL71T	**3**
	2	2.0 kN (450 lbf)	2.1 kN (472 lbf) for AEL72T	
	3	4.0 kN (900 lbf)		
	4	6.0 kN (1349 lbf)		
	5	8.0 kN (1798 lbf)		
	6	12.0 kN (2698 lbf)		
	7	15.0 kN (3372 lbf)		
	8	20.0 kN (4496 lbf)		
Nominal Stroke	**1**	20 mm (0.79")	Stroke Setting from factory. For full stroke information and adjustment, refer to IM-P713-01.	**2**
	2	30 mm (1.18")		
	3	50 mm (1.97")		
	4	70 mm (2.76")		
Speed	**1**	Low	≤0.7 mm/s (0.027 in/s)	**2**
	2	Medium	0.8 - 1.5 mm/s (0.031 - 0.05 in/s)	
	3	High	1.6+ mm/s (0.06 in/s)	
Supply Voltage	**1**	230 Vac		**4**
	2	115 Vac		
	3	24 Vac		
	4	24 Vdc		
Control Signal	**F**	VMD	24 Vac	**P**
	G	VMD	110 Vac	
	J	VMD	230 Vac	
	K	VMD	24 Vdc	
	P	Modulating	(0)4-20 mA / 0(2)-10V Positioner	
Failure Mode	**X**	None		**X**
	S	Super-Capacitor	Non-retrofit option. Not suitable for 24 Vac	
	T	Spring Extend	Non-retrofit option. Not suitable for 24 Vdc	
Potentiometer	**X**	None		**A**
	A	Potentiometer	1 x 1000Ω [1]	

[1] Required for any actuator with positioner card

12.2
90

How to order example

1-off AEL73242PXA plus Auxiliary travel switch (AEL7X014)
1-off AEL7XJ08 DN15-50 J Series adapter

TI-P714-01
CTLS Issue 8

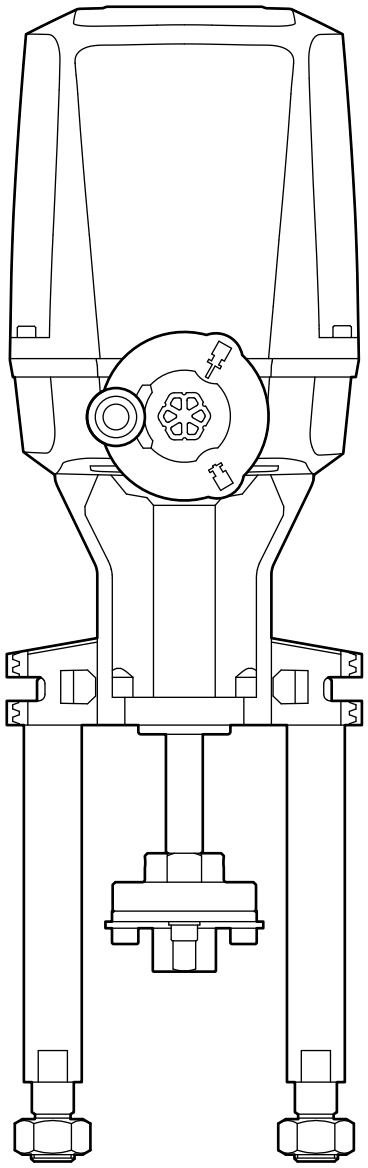
AEL8 Series
Electric Linear Actuator

Description

The AEL8 Series linear electric actuators are a cost effective range of linear electric process actuators, with diagnostics, only suitable for the modulation of Spirax Group valves. The AEL8 Series actuators must not be used for any other purpose. Full nomenclature details can be found on page 7 of this document.

Simple to select and commission, the AEL8 series is especially suited to process point of use applications within the steam ecosystem where robustness and reliability are key requirements. The AEL8 Series is compatible with the complete Spira-trol™ 2-port and 3-port ranges.

The AEL8 Series linear electric actuators utilise a fully electronic set up and operation of the actuator with no mechanical switches or manual intervention required. The direct measurement of valve position, stroke and force guarantee optimised process control, and all actuators have internal anti-rotation for improved actuator rigidity.



Diagnostics

The AEL8 series actuator provides actuator diagnostics through 3 functions:

- Non-intrusive health check hand wheel
- Self-diagnostic LED
- (Optional) Fault relay

Typical applications

The AEL8 series actuators are used for the modulation of Spirax Group valves in closed-loop and open-loop control systems.

Typical applications for the AEL8 Series actuator include:

- Temperature control
- Pressure control
- Flow control
- Level control

For boiler feed water applications please refer to the AEL7 (TI-P713-02)

Available types

The AEL8 electric linear actuators are simple to select with only 2 different power supply variants:

- 90…264 Vac wide range input
- 24 Vac/24 Vdc Dual voltage

The standard version is configurable for modulated input signal (4-20mA or 0(2)-10V). The actuator has a position override function. A 24V input can be used to drive the actuator to either end stop (e.g. as a result of independent high-limit)

All actuators offer 0(2) - 10 V or 4 - 20 mA position feedback. Also available are auxiliary limit switches and anti-condensation heater.

These actuators can be used with the following valves, in conjunction with an appropriate valve adaptor and mounting flange.

2 - Port	DN15 - DN100 (½" - 4")	Spira-trol™ L, K series control valves
3 - Port	DN15 - DN200 (½" - 8")	Spira-trol™ Q series control valves

Standards and approvals

This equipment is CE marked and conforms to the following:

Electrical safety 2014/35/EU (Low Voltage Directive)	2006/42/EC (Machinery Directive) The Supply of Machinery (Safety) Regulations 2008 2014/35/EU (Low Voltage Directive) The Electrical Equipment (Safety) Regulations 2016 2014/30/EU (Electromagnetic compatibility Directive) The Electromagnetic Compatibility Regulations 2016
Operational safety	EN 61010-1:2010+A1:2019 EN IEC 61010-2-202:2021 EN ISO 12100:2010
Operational requirements	EN15714-2 (Electric actuators for industrial valves - Basic requirements) Modulating actuator Class C acc. to DIN EN ISO 22153
Electromagnetic compatibility	EN 61800-3:2004/A1:2012

Please visit the Spirax Sarco product compliance web pages for up to date information on any substances of concern that may be contained within this product. Where no additional information is provided on the Spirax Sarco product compliance web page, this product may be safely recycled and/or disposed providing due care is taken. Always check your local recycling and disposal regulations.

Visit - https://www.spiraxsarco.com/product-compliance

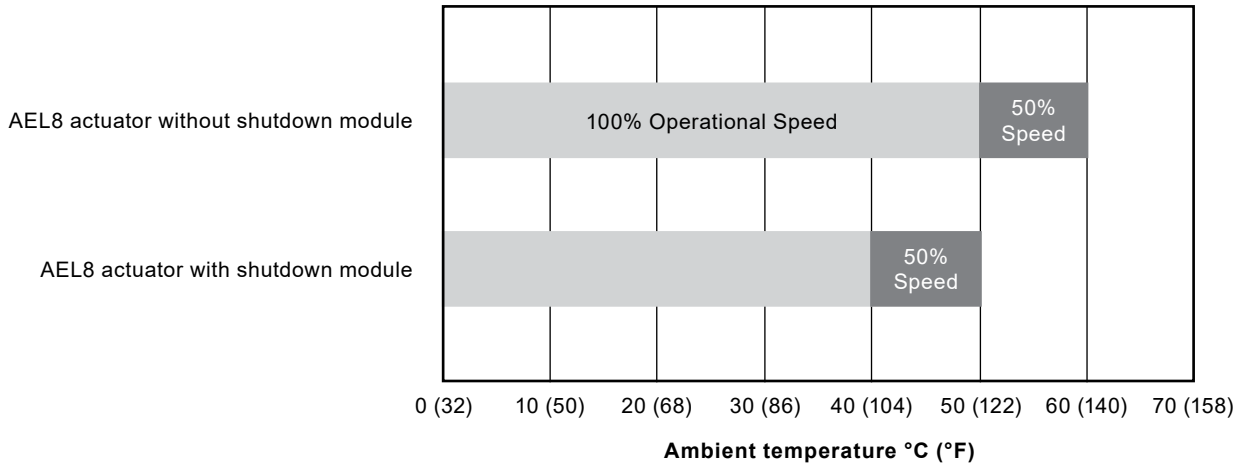
AEL8 Technical specification

Actuator model	**AEL82**	**AEL83**	**AEL84**	**AEL85**	**AEL86**	**AEL87**
Thrust	2 kN (450 lbf)	4.5 kN (1000 lbf)	6 kN (1500 lbf)	8 kN (1800 lbf)	12 kN (2700 lbf)	15 kN (3300 lbf)
	30% load					
Medium Speed	1.6 mm/s (0.07 in/s)	1.6 mm/s (0.07 in/s)	1.2 mm/s (0.05 in/s)	2.4 mm/s (0.09 in/s)	1.2 mm/s (0.04 in/s)	1.2 mm/s (0.04 in/s)
High Speed	n/a	4.5 mm/s (0.18 in/s)	3.6 mm/s (0.141 in/s)	3.8 mm/s (0.149 in/s)	3.5 mm/s (0.13 in/s)	3.1 mm/s (0.12 in/s)
	Full load speed					
Medium Speed	1.3 mm/s (0.05 in/s)	1.3 mm/s (0.05 in/s)	1.0 mm/s (0.04 in/s)	2.0 mm/s (0.08 in/s)	1.0 mm/s (0.04 in/s)	0.9 mm/s (0.03 in/s)
High Speed	n/a	3.6 mm/s (0.141 in/s)	2.8 mm/s (0.11 in/s)	3.0 mm/s (0.11 in/s)	2.6 mm/s (0.10 in/s)	2.1 mm/s (0.08 in/s)

AEL8 Technical specification (continued)

Max. Stroke	2⅜"			3"		
Actuator model	**AEL82**	**AEL83**	**AEL84**	**AEL85**	**AEL86**	**AEL87**
Mains Voltage/frequency	AC 100...240 Vac, 50...60 Hz or 24 Vac/dc					
	Permissible fluctuation of mains voltage ±10 % Permissible fluctuation of mains frequency ± 5 % (further voltages on request) 24 Vdc and Shutdown module: permissible fluctuation of mains voltage –6 %/+10 %					
Operating mode according to IEC 34-1	S2 – 15 min, S4 – 30 % ED 1200 c/h, S1 – 100 %					
Motor Protection	Electronic shutdown in case of over temperature					
Electrical connection Cross section	Power supply: Spring terminal max 2.5 mm² (12 AWG), Signal: Spring terminal max. 2.5 mm² (12 AWG)					
End position switch-off	Electronically selectable torque or travel for both directions					
Control input	Analog: 0/2 – 10 V: input impedance >100 kOhm, 0/4 – 20 mA: input impedance 50 Ohm Control inputs 24 Vdc: galvanically isolated Ri = 3300 Ohm (I < 10 mA) OPEN, CLOSE					
Position feedback	Analog 0 – 10 V, 0/4 – 20 mA, load max. 500 Ohm Position measurement via non-contact displacement sensor					
Message signals	Collective fault 24 Vdc, I max. 50 mA, galvanically isolated Option: I/O module with 4x 24 Vdc, Imax 50 mA, galvanically isolated from mains supply, OPEN, CLOSE, intermediate positions, UNI-OUT (collective fault)					
Configuration	Setting via remote input Initialization/Reset zero point Setting via DIP switch Input signal/Output signal Rising signal/Falling signal Operating mode Programming keys Speed, thrust Shutdown mode, operating parameters					
Positioning accuracy	< 0,5 % of total stroke					
Mounting position	Any orientation except vertically below the pipe					
Installation height	≤ 2000 m above sea level					
Lubricant	Gear grease: Klüber Microlube GL261					
Humidity	Up to 95 % relative humidity (Anti-condensation heater required)					
Lifetime	Spirax-Sarco linear actuators meet or exceed the lifetime requirements of EN 15714-2 (C).					
Ambient temperature	See graph on next page					
Media temperature	-20 °C … +300 °C (-4 °F ... +572 °F)					
Enclosure rating	IP 65					
Enclosure Matl.	Thermoplastic					
Manual override	Hand Wheel					
Conduit entries	3 x blanking plugs (M20x1.5)					
Thread Adaptor	M8			M12		
	AEL8 Actuator options					
I/O Module	4 x 24 V-230 Vac/dc output relays @ 0.5A Max.					
Heater	90-264 Vac/24 Vac/dc					
Shutdown Module	Super capacitor (Factory fit only)					

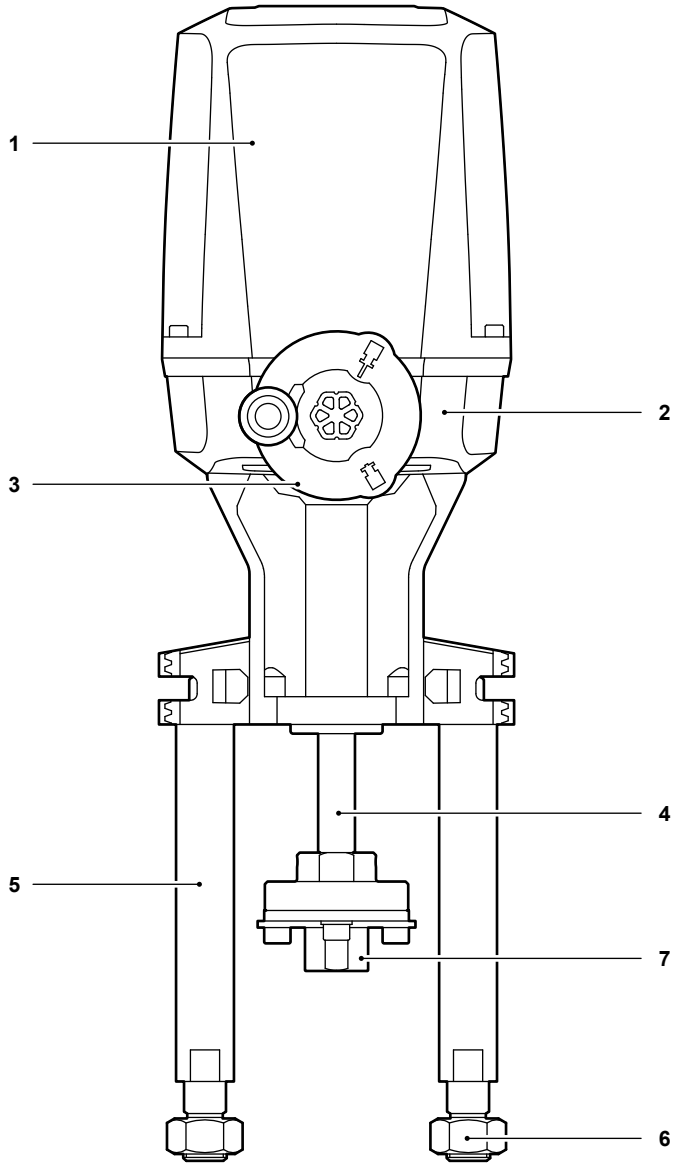
Maximum ambient temperature of installation



Note:
AEL8 actuator without shutdown module: Ambient temperatures between 50 °C - 60 °C will cause the actuator to operate at 50% specified speed (yellow hand wheel light will be shown) to help prolong the life of the actuator.

AEL8 actuator with shutdown module: Maximum ambient temperature must not exceed 50 °C.

Materials



No.	Part	Materials	Surface Finish
1	Cover	Polycarbonate	None
2	Housing	AlSi7Mg0.3 (LM25), seawater resistant	Anodised
3	Hand wheel [1]	Aluminium	None
		Polycarbonate	None
4	Actuator spindle	Carbon steel	None
5	Actuator pillar	Stainless steel	None
6	Pillar nut	Carbon steel	Galvanic zinc plated
7	Thread adaptor	Carbon steel	None

[1] Clear polycarbonate for Health check LED.

AEL8 valve adapter and mounting flange selection - Spira-trol™ K & L

Actuator	Thrust	DN15-50 (½" - 2")			DN65-100 (2½" - 4")		
		Flange	Thread	Adapter	Flange	Thread	Adaptor
AEL82	2.0 kN (450 lbf)	EL5970	M8	AEL8 x M8 [1]	EL5971	M12	Integral
AEL83	4.5 kN (1000 lbf)						
AEL84	6.0 kN (1500 lbf)						
AEL85	8.0 kN (1800 lbf)						
AEL86	12.0 kN (2700 lbf)						
AEL87	15.0 kN (3300 lbf)						

[1] Included in the standard scope of supply AEL82 to AEL85

AEL8 valve adapter and mounting flange selection - Spira-trol™ QL

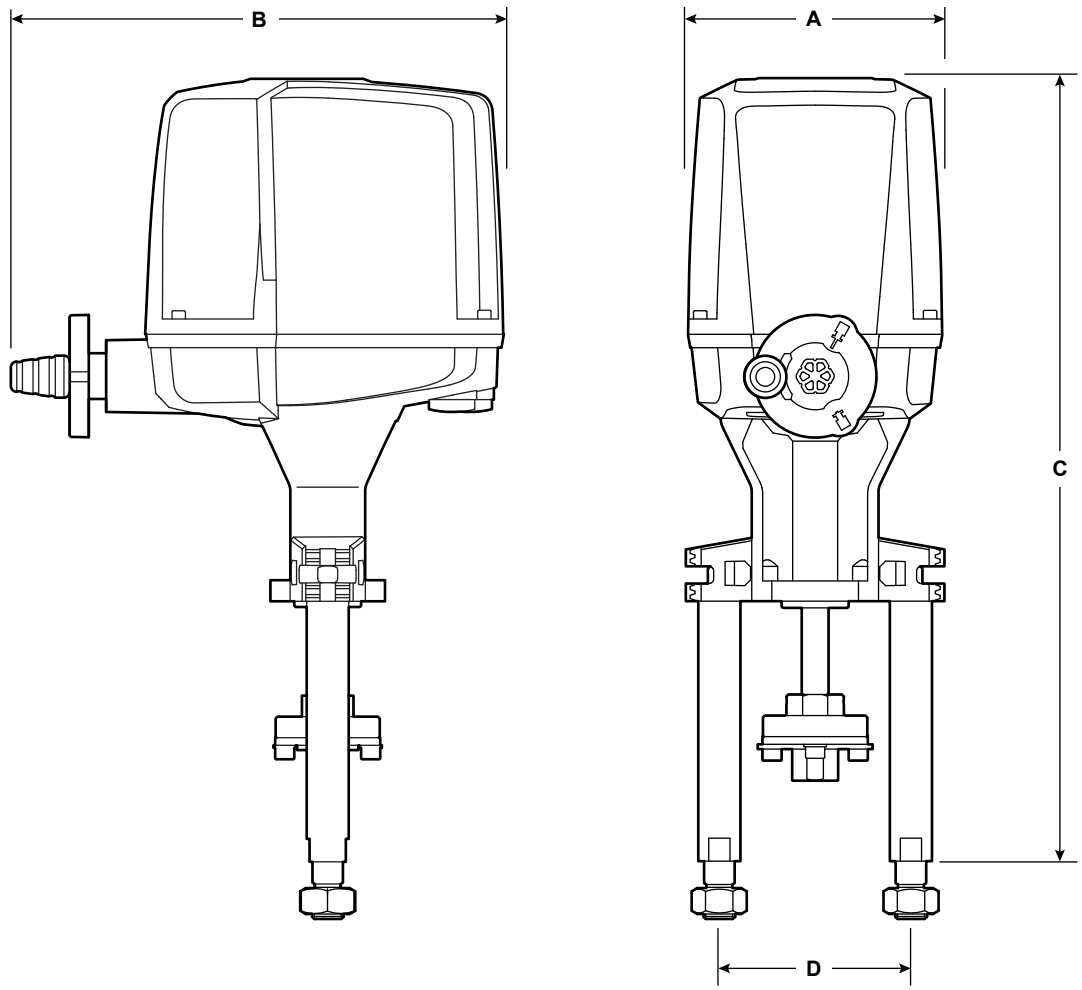
Actuator	Thrust	DN15-50 (½" - 2")			DN65-100 (2½" - 4")			DN125-200 (5" to 8")		
		Flange	Thread	Adapter	Flange	Thread	Adaptor	Flange	Thread	Adaptor
AEL82	2.0 kN (450 lbf)	EL5970	M8	AEL8 x M8 [1]	EL5971	M12	Integral			
AEL83	4.5 kN (1000 lbf)									
AEL84	6.0 kN (1500 lbf)									
AEL85	8.0 kN (1800 lbf)							EL5974	M18 x 1.5	AEL8XQ18 + AEL8Q125
AEL86	12.0 kN (2700 lbf)									
AEL87	15.0 kN (3300 lbf)									

[1] Included in the standard scope of supply AEL82 to AEL85

AEL8 accessories

Actuator Type	Thrust	Voltage	I/O Module	Positioner	Heater
AEL8	2 - 6 kN (450 - 1500 lbf)	230 Vac	AEL8981	AEL8961	AEL8954
		110 Vac			
		24 Vac			AEL8596
		24 Vdc			
	8 - 15 kN (1800 - 3300 lbf)	230 Vac			AEL8954
		110 Vac			
		24 Vac			AEL8965
		24 Vdc			

Dimensions/weights (approximate) in inches (mm) and lbs (kg)



Actuator	Thrust	Dimensions (mm) A	B	C	D Pillar Centre	E Cover removal space	Weight (kg)
AEL82	2.0 kN	133	259	410	100	140	6.0
AEL83	4.5 kN						
AEL84	6.0 kN						
AEL85	8.0 kN	161	345	523		205	11.0
AEL86	12.0 kN						
AEL87	15.0 kN						

Actuator	Thrust	Dimensions (inches) A	B	C	D Pillar Centre	E Cover removal space	Weight (lb)
AEL82	450 lbf	5.25	10.2	16.15	3.94	5.5	13.25
AEL83	1000 lbf						
AEL84	1500 lbf						
AEL85	1800 lbf	6.35	13.6	20.6		8.1	24.25
AEL86	2700 lbf						
AEL87	3300 lbf						

Safety information, installation and maintenance

Full details for the safe installation, commissioning and removal of the AEL8 Series actuator can be found in IM-P714-02 for AEL8 versions

Installation and wiring note

The valve should be installed in the horizontal line. The position of the actuator will depend on the type of valve to which it is fitted and the temperature of the media. However, it is not recommended that the actuators be fitted directly below the valve or in a wet environment.

Disposal

This product is recyclable. No ecological hazard is anticipated with the disposal of this product, providing due care is taken.

Please visit the Spirax Sarco product compliance web pages https://www.spiraxsarco.com/product-compliance for up to date information on any substances of concern that may be contained within this product. Where no additional information is provided on the Spirax Sarco product compliance web page, this product may be safely recycled and/or disposed providing due care is taken. Always check your local recycling and disposal regulations.

AEL8 Series nomenclature

Product Name	A	= Actuator		**A**
	E	= Electric		**E**
	L	= Linear		**L**
	8	= Model		**8**
Thrust (kN)	2	= 2.0 kN (450 lbf)		**2**
	3	= 4.5 kN (1000 lbf)		
	4	= 6.0 kN (1500 lbf)		
	5	= 8.0 kN (1800 lbf)		
	6	= 12.0 kN (2700 lbf)		
	7	= 15.0 kN (3300 lbf)		
Stroke (mm)	2	= 60 mm (2⅜")		**2**
	3	= 80 mm (3")		
Speed @ 30%	2	= Medium	1.2 - 3.8 mm/s (0.05-0.14 in/s)	**2**
	3	= High	2.1+ mm/s (0.08 in/s)	
Supply Voltage	1	= 100...240 Vac wide range input		**3**
	3	= 24 Vac/24 Vdc		
Control signal	P	= Modulating	(0)4-20 mA / 0(2)-10 V Positioner	**P**
Failure Mode	X	= None		**S**
	S	= Super-Capacitor	Non-retrofit option	
Options	X	= None		**X**
	O	= I/O Module		
	E	= EasiHeat M12		

Ordering example

A	E	L	8	2	2	2	3	P	S	X

Selection example

Control Valve	DN20 KE43 HTSUSS
Kvs	6.3
Connection	PN40
Operating ΔP	30 bar
Electrical Supply	24 Vdc
Control Input Signal	4-20 mA
Position Feedback	4-20 mA
End-position Feedback	VFC

		Information source
Minimum Thrust required	2 kN	Differential Pressure Tables (Class IV) Metal Seated (T & S)
Maximum ΔP	64.6 bar g	
Mounting Flange	EL5970	AEL8 Valve Adapter and Mounting Flange Selection - Spira-trol™ K & L
Stem Adapter	AEL8XM8	
Positioner	Integral	AEL8 Technical Specification
Position Feedback	Positioner function	AEL8 Technical Specification
End-position Feedback	I/O module	AEL8 Assessories (Positioner)

TI-P353-01-US
Issue 1

Rotork CVL Electric Actuators for Spira-trol Control Valves

Description

The Rotork CVL range of electric actuators offers a highly accurate and responsive method of automating our Spira-trol and C Series control valves. They can interface with a number of control signals and communication protocols and are suitable for use in most industrial environments with available hazardous areas enclosures.

They are full duty rated capable of continuous, un-restricted modulation. Super-capacitors provide power to drive the valve to a safe position in the event of a loss of the power supply.

Set-up is achieved through an auto-calibration routine with further configuration completed via software through a Bluetooth® link.

Features

Fast travel speed

The actuator can open or close a valve between 3 seconds for ¾" travel valve and 20 seconds for a 2" travel valve.



Multiple control signal options

The standard actuator operates on a 4-20mA signal and provides 4-20mA position feedback (an auxiliary 24V d/c supply is required to drive this loop). Options are available to allow interfacing with HART®, Profibus or Foundation Fieldbus network control.

Status indication relay

A user configurable relay is available for status and availability indication. This can be configured to indicate a number of parameters.

Valve diagnostics

A data-logger is provided which helps detect potential valve problems before they occur. It stores operational data relating to the valve position and load which can be monitored over time.

Dual Sensor™ technology

Two independent position sensors minimize backlash and positional errors.

Brushless DC motor

Highly reliable, maintenance free and provides full, continuous, unrestricted modulation duty (S9).

Double sealing

Provides ingress protection to IP68.

Power supply flexibility

Incorporated within each AC actuator is a switch mode power supply, which can accept a range of input voltages from 100-240 VAC 50/60 Hz. An optional 24 VDC supply can be catered for.

Reserve power

For fail-to-position action on loss of supply, the actuator can be fitted with an optional reserve power-pack, which consists of 'super capacitors'. The reserve power-pack will allow the actuator to move to a predetermined position on power failure.

Drive-train

simple yet durable spur gear drive, lubricated for life with proven durability.

Anti-back drive mechanism

the actuator is capable of resisting any back drive from the valve up to 125% of the rated force. For applications where loss of power requires increased "fail-in-position" capability, an optional solenoid locking mechanism is available.

Technical information

Linearity (4-20mA signal)	≥0.5% full scale	
Resolution (4-20mA signal)	≥0.1% of signal	
Signal voltage drop		7 V @ 20 mA
Duty rating		S9 (continuous modulation)
Ambient temperature	Standard	-22 °F to 158 °F (-30 °C to 70 °C)
	Low temperature (option)	-40 °F to 140 °F (-40 °C to 60 °C)
Enclosure	Standard	NEMA 4&6, IP68
	Hazardous area (option)	Class I, Div 1, Groups B,C,D
		Class II, Div 1, Groups E,F,G
Finish		Polyester powder coated
Manual override		optional
Status relay	Single pole, normally open, 8A/120VAC/30VDC	
Power consumption	Stationary	4.7W @ 110 VAC
	Full load	32.1W @ 110 VAC
	Peak	58.2W @ 110 VAC

Model	Minimum thrust lb.f (N)	Rated thrust lb.f (N)	Maximum stroke in (mm)	Spindle speed in/sec (mm/sec)	Full stroke time* sec
CVL500	200 (890)	500 (2224)	1.5 (38.1)	0.25 (6.35)	6
CVL1000	400 (1779)	1000 (4448)	2 (50.8)	0.1 (2.54)	20
CVL1500	600 (2669)	1500 (6672)	2 (50.8)	0.1 (2.54)	20

* Time shown is for the maximum actuator stroke. This time is reduced further for valves with a shorter stroke e.g. A ½" Spira-trol has a stroke of ¾", when fitted with a CVL500 it will open or close in 3 seconds.

Differential Pressures for Spira-trol Control Valves with Rotork CVL Electric Actuators

Class IV Shut-off
PTFE and Graphite Stem Seals

Actuator	Maximum Differential Pressure psi (bar)																			
	½"		¾"		1"		1 ¼"		1 ½"		2"		2 ½"		3"		4"	
	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph
CVL500	740 (51.0)	740 (51.0)	740 (51.0)	740 (51.0)	652 (45.0)	538 (37)	511 (32.5)	423 (29.1)	195 (13.4)	157 (10.8)	129 (8.8)	102 (7.0)	58 (3.9)	32 (2.2)	29 (1.9)	13 (0.9)	12 (0.8)	
CVL1000					740 (51.0)	740 (51.0)	740 (51.0)	740 (51.0)	480 (33.0)	441 (30.4)	332 (22.9)	305 (21.0)	172 (11.8)	146 (10.0)	102 (7.0)	86 (5.9)	57 (3.9)	47 (3.2)
CVL1500							740 (51.0)	740 (51.0)	740 (51.0)	726 (50.0)	535 36.9)	507 (34.9)	286 (19.7)	260 (17.9)	175 (12.0)	159 (10.9)	103 (7.1)	92 (6.3)

Class VI Shut-off
PTFE and Graphite Stem Seals

Actuator	Maximum Differential Pressure psi (bar)																	
	½"		¾"		1"		1 ¼"		1 ½"		2"		2 ½"		3"		4"	
	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph
CVL500	740 (51.0)	740 (51.0)	740 (51.0)	740 (51.0)	740 (51.0)	692 (47.7)	624 (43.0)	535 (36.9)	269 (18.5)	231 (15.9)	192 (13.2)	164 (11.3)	105 (7.2)	79 (5.4)	67 (4.6)	50 (3.4)	42 (2.9)	31 (2.1)
CVL1000					740 (51.0)	740 (51.0)	740 (51.0)	740 (51.0)	554 (38.2)	515 (35.5)	394 (27.2)	367 (25.3)	219 (15.1)	193 (13.3)	140 (9.7)	123 (8.5)	87 (6.0)	77 (5.3)
CVL1500							740 (51.0)	740 (51.0)	740 (51.0)	740 (51.0)	597 (41.2)	570 (39.3)	333 (23.0)	307 (21.2)	213 (14.7)	196 (13.5)	133 (9.2)	122 (8.4)

Differential Pressures for Spira-trol Control Valves with Rotork CVL Electric Actuators

Class VI Shut-off

Bellows Stem Seals with PTFE and Graphite Secondary Packing

Maximum Differential Pressure psi (bar)

Actuator	½"		¾"		1"		1 ¼"		1 ½"		2"		2 ½"		3"		4"	
	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph
CVL500	223 (15.4)	16 (1.1)	162 (11.2)		80 (5.5)		45 (3.1)											
CVL1000	740 (51.0)	740 (51.0)	740 (51.0)	740 (51.0)	740 (51.0)	740 (51.0)	702 (48.4)	613 (42.3)	273 (18.8)	234 (16.1)	182 (12.5)	155 (10.7)	55 (3.8)	29 (2.0)	26 (1.8)			
CVL1500					740 (51.0)	740 (51.0)	740 (51.0)	740 (51.0)	557 (38.4)	519 (35.8)	385 (26.5)	358 (24.7)	169 (11.7)	143 (9.9)	99 (6.8)	82 (5.7)	54 (3.7)	43 (3.0)

Class VI Shut-off

Bellows Stem Seals with PTFE and Graphite Secondary Packing

Maximum Differential Pressure psi (bar)

Actuator	½"		¾"		1"		1 ¼"		1 ½"		2"		2 ½"		3"		4"	
	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph
CVL500	445 (30.7)	228 (15.7)	351 (24.2)	180 (12.4)	234 (16.1)	120 (8.3)	181 (12.5)	92 (6.3)	77 (5.3)	39 (2.7)	55 (3.8)	28 (1.9)						
CVL1000	740 (51.0)				740 (51.0)	740 (51.0)	740 (51.0)	740 (51.0)	362 (25.0)	323 (22.3)	258 (17.8)	230 (15.9)	111 (7.7)	85 (5.86)	71 (4.9)	54 (3.7)	44 (3.0)	34 (2.3)
CVL1500					740 (51.0)	740 (51.0)	740 (51.0)	740 (51.0)	646 (44.5)	608 (41.9)	460 (31.7)	433 (29.9)	225 (15.5)	199 (13.7)	144 (9.9)	127 (8.8)	90 (6.2)	79 (5.4)

Options and nomenclature

Actuator model range	CV – Control valve actuator	CV
Transmission	L - Linear	L
Size	500 – 500 lb.f (2,224 N)	500
	1000 – 1,000 lb.f (4,448 N)	
	1500 – 1,500 lb.f (6,672 N)	
Power Supply	Blank – 110/230 VAC	
	D – 24 VDC	
Control Signal	Blank – 4-20 mA	H
	H – 4-20 mA + HART	
	F – Foundation Fieldbus	
	P – Profibus-PA	
Back-up power	Blank – Programmable fail-safe	
	S – Stay-put	
Manual over-ride	Blank – None	M
	M – Manual Override (hand wheel)	
Enclosure	Blank – NEMA 4&6/IP68	X
	X – FM Explosion proof	
Temperature rating	Blank: -22 °F to 158 °F (-30 °C to 70 °C)	
	L – -40 °F to 140 °F (-40 °C to 60 °C)	

Example: CVL500HCM Electric actuator

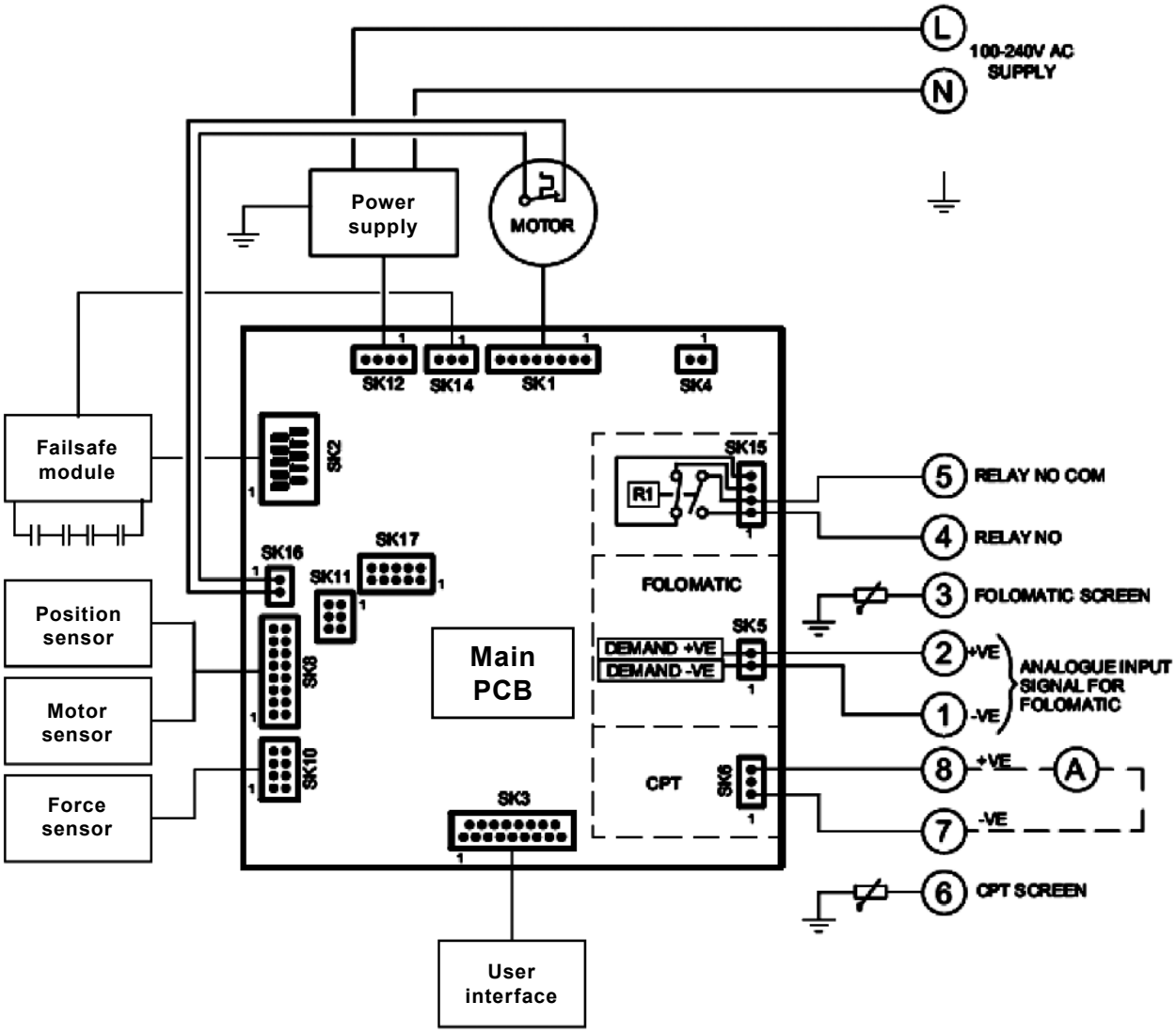
Commissioning

For actuators controlled by a 4-20mA analog signal, they will arrive from the factory fully set-up (according to our standard configuration) and ready to install. If a special configuration is required, we will set-up the actuator provided we are given the requirements at the time of the order.

Local configuration can be done using a Bluetooth enabled PDA/Smartphone running a windows O/S or a Bluetooth enabled PC. The Rotork Enlight software must be installed and is available for free download from the Rotork website at www.rotork.com.

Alternatively, if the HART option card is installed, a HART communicator or PC with HART interface and software can be used.

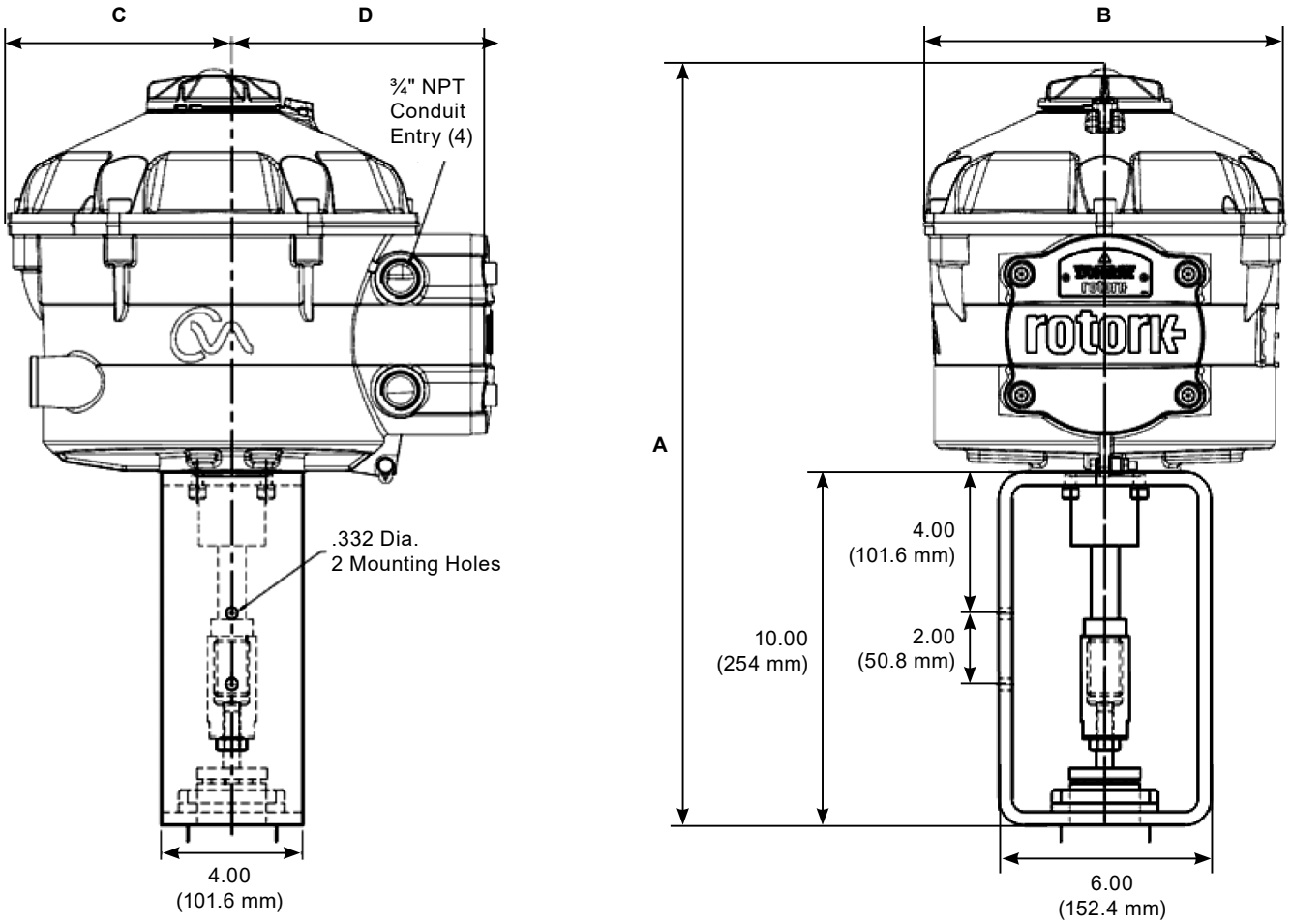
Circuit drawn with power supply off



Relay R1 can be configured to indicate anyone of the following

0 Disabled
1 Remote control available
2 Fault
3 Fully open
4 Fully closed
5 Force trip opening
6 Force trip closing
7 Force trip any position
8 Failsafe operation

Dimensions/weights (approximate) in inches (mm) and lbs (kg)



Actuator	Valve size	A	B	C	D	Weight
CVL500	½" to 4"	19.82 (503.4)	8.95 (227.3)	6.2 (157.5)	6.13 (155.7)	40 (18.1)
CVL1000	½" to 4"	21.4 (543.6)	10.14 (257.6)	6.3 (160)	7.51 (190.8)	53 (24)
CVL1500	½" to 4"	21.4 (543.6)	10.14 (257.6)	6.3 (160)	7.51 (190.8)	53 (24)

TI-P350-02-US
Issue 1

Belimo AFB Series Electric Actuators for ½" to 2" B Series and Spira-trol L & K Series Control Valves

Description

The Belimo AFB Series actuators are suitable for either two position or modulating control. These actuators can be used with B Series or Spira-trol L and K Series control valves.

Multi-function technology (MFT)

An integrated microprocessor allows for a variety of parameters, including control signal type, to be configured in the factory or the field with a PC and Belimo software.

Manual operation

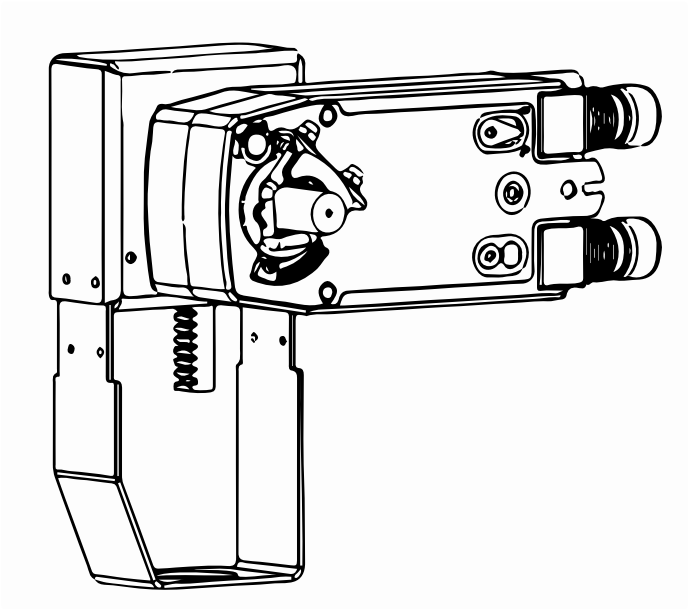
A 5mm Allen wrench can be used to manually operate the actuator. Turning the wrench clockwise will extend the spindle. Spindle position will be retained until power is applied to the actuator.

Overload protection

The actuator is protected against short circuiting and reverse polarity. The spindle stroke is adapted automatically and is overload protected.

Operational display

The stroke is physically shown by a travel indicator on the actuator yoke.



Available types

Actuator Model	Valve action in event of power failure	
	B Series	Spira-trol
AFB24-MFT-US	Optional*	Optional*
2 x AFB24-MFT-US	Optional*	Optional*

*Power failure action should be specified at the time of order and will determine the actuator to yoke mounting orientation.

Ambient limits

Storage temperature	-40 °F to 176 °F (-40 °C to 80 °C) at 5 to 95% RH
Ambient temperature	-22 °F to 122 °F (-30 °C to 50 °C) at 5 to 95% RH
Maximum valve media temperature	338 °F (170 °C)*

* Equivalent to a saturated steam pressure of 100 psi g (6.9 bar g)

Agency listings

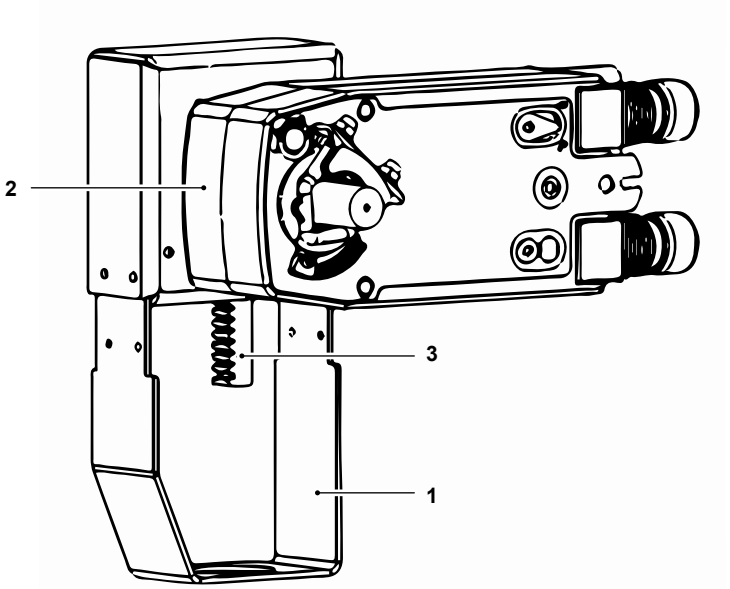
General	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Housing	NEMA 2, IP54, Enclosure Type 2

Specifications

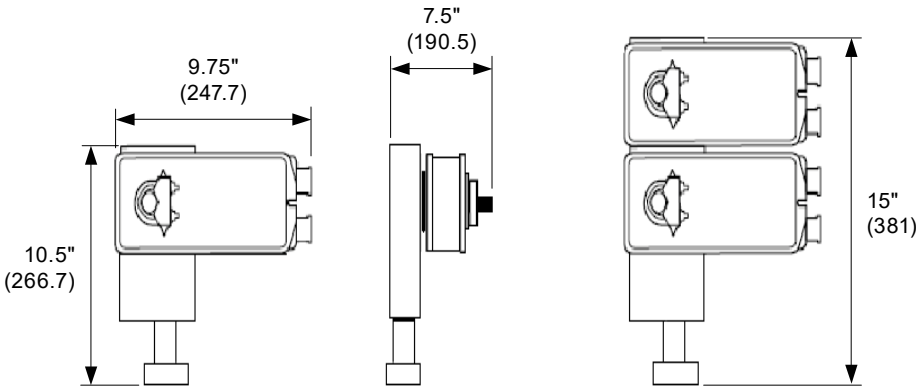
Supply voltage		24 VAC 50/60 Hz or 24 VDC
Transformer sizing		10 VA (Class 2 power supply)
Power consumption		7.5W running, 3W holding
Electrical connection		3 ft., 18 GA appliance cable, ½" conduit fitting
Runnning time motor		70 - 220 sec
Runnning time spring		<20 sec
Overload protection		Electronic throughout stroke
Control signal (to be specified at time of order)		2 to 10 VDC, 0.5 mA max
		4 to 20 mA w/ 500Ω resistor
		Pulse Width Modulation (pulse
		width to be specified by customer)
		Floating Point
		On/Off
Input impedance		100 KΩ for 2 to 10 VDC,
		500 Ω for 4 to 20 mA,
		1500Ω for Pulse Width Modulation (PWM)
Feedback		2 to 10 VDC, 0.5mA max
Maximum stroke		¾" (20mm)
Spindle force	AFB24-MFT US	230lbf (1023N)
	2 x AFB24-MFT US	343lbf (1525N)
Position indication		Visual indicator
Manual override		3/16 Allen (supplied) 5mm hex

Materials

No.	Component	Material
1	Yoke	Steel
2	Base	Aluminum die casting
3	Cover	Steel



Dimensions/weights (approximate) in inches (mm)



Weights (approximate) lbs (kg)

AFB24-MFT-US	12.8 lb (5.8 kg)
2 x AFB24-MFT-US	20.6 lb (9.3 kg)

Installation and wiring

The valves should be installed in the horizontal line.

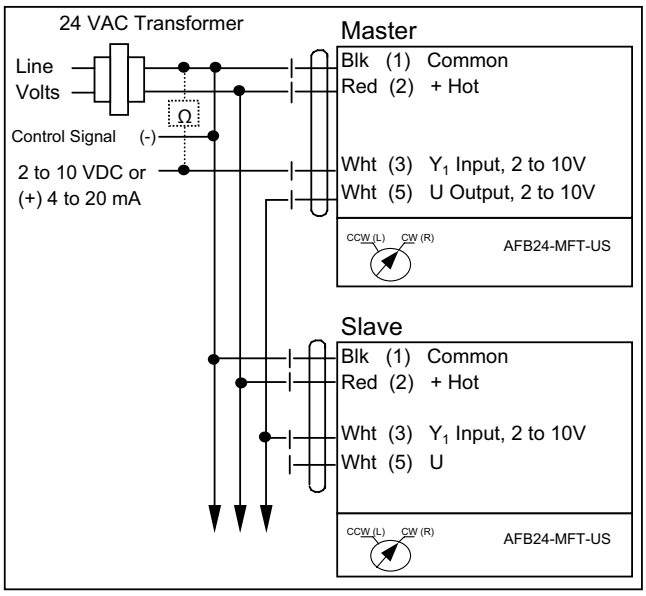
Allow 6" for the cover removal and 12" for complete actuator removal.

These actuators should never be mounted underneath the valve as condensation can build up and result in a failure of the actuator.

Full instructions are supplied with the product. The diagram below shows the wiring schematic.

For AFB-MFT-US actuators, connect as shown in the 'Master' schematic.

For 2 x AFB-MFT-US actuators, one actuator motor should be connected as a 'Master' and the other as a 'Slave' unit, as shown in the schematic.



Note: Please contact Belimo for other wiring information.

Differential pressures in psi g (bar g)

Note: Due to temperature capability limitations, maximum saturated steam inlet pressure is 100 psi g (6.9 bar g). For reduced capacity valves, use the differential pressures for the next valve size down.

B Series 2-Way and 3-Way control valves

ANSI/FCI 70-2 Class IV Shut-off (metal seated trimbar g) for 2-way valves and Class III for 3-way (mixingbar g) valves

Model	Thrust lbf (N)	½"		¾"		1"		1¼"		1½"		2"	
		FB	RB	FB	RB	FB	RB	FB	RB	FB	RB	FB	RB
Class IV													
AFB24-MFT	311 (1383)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	118 (8.1)	150 (10.3)	73 (5.0)	115 (7.9)
2xAFB24-MFT	464 (2064)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	119 (8.2)	150 (10.3)
Class VI													
AFB24-MFT	311 (1383)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	122 (8.4)	150 (10.3)
2xAFB24-MFT	464 (2064)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)

Spira-trol Series control valves in psi g (bar g)

Class IV Shut-Off

Model	Thrust lbf (N)	Theoretical Maximum Differential Pressure (psi bar)											
		½"		¾"		1"		1 - ¼"		1 - ½"		2"	
		PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph
AFB24-MFT	311 (1383)	708 (48.8)	491 (33.9)	538 (37.1)	367 (25.3)	331 (22.8)	217 (15.0)	263 (18.1)	174 (12.0)	88 (6.1)	49 (3.4)	53 (3.7)	25 (1.7)
2xAFB24-MFT	464 (2064)	725 (50)	725 (50)	725 (50)	725 (50)	591 (40.7)	476 (32.8)	464 (32.0)	375 (25.9)	175 (12.1)	136 (9.4)	115 (7.9)	87 (6.0)

AFB24	½"		¾"		1"		1 - ¼"		1 - ½"		2"	
Cv	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph
Full	708 (48.8)	491 (33.9)	538 (37.1)	367 (25.3)	331 (22.8)	217 (15.0)	263 (18.1)	174 (12.0)	88 (6.1)	49 (3.4)	53 (3.7)	25 (1.7)
Red 1	725 (50)	725 (50)	681 (47.0)	464 (32.0)	495 (34.1)	324 (22.3)	340 (23.4)	225 (15.5)	203 (14.0)	114 (7.9)	74 (5.1)	35 (2.4)
Red 2	725 (50)	725 (50)	725 (50)	725 (50)	626 (43.2)	410 (28.3)	507 (35.0)	336 (23.2)	262 (18.1)	147 (10.1)	170 (11.7)	82 (5.7)
Red 3	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	642 (44.3)	426 (29.4)	391 (27.0)	220 (15.2)	220 (15.2)	105 (7.2)

2 X AFB24	½"		¾"		1"		1 - ¼"		1 - ½"		2"	
Cv	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph
Full	725 (50)	725 (50)	725 (50)	725 (50)	591 (40.7)	476 (32.8)	464 (32.0)	375 (25.9)	175 (12.1)	136 (9.4)	115 (7.9)	87 (6.0)
Red 1	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	711 (49.0)	599 (41.3)	485 (33.4)	404 (27.9)	315 (21.7)	161 (11.1)	122 (8.4)
Red 2	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	521 (35.9)	(28.1)	371 (25.6)	282 (19.4)
Red 3	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	607 (41.9)	479 (33.0)	365 (25.2)

Spira-trol Series control valves (continued) in psi g (bar g)

Class VI Shut-Off

Model	Thrust lbf (N)	Theoretical Maximum Differential Pressure (psibar)											
		½"		¾"		1"		1 - ¼"		1 - ½"		2"	
		PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph
AFB24-MFT	311 (1383)	725 (50)	703 (48.5)	725 (50)	555 (38.3)	485 (33.4)	371 (25.6)	376 (25.9)	287 (19.8)	162 (11.2)	123 (8.5)	115 (7.9)	88 (6.1)
2xAFB24-MFT	464 (2064)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	630 (43.4)	576 (39.7)	488 (33.6)	249 (17.2)	210 (14.5)	177 (12.2)	150 (10.3)

AFB24	½"		¾"		1"		1 - ¼"		1 - ½"		2"	
Cv	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph
Full	725 (50)	703 (48.5)	725 (50)	555 (38.3)	485 (33.4)	371 (25.6)	376 (25.9)	287 (19.8)	162 (11.2)	123 (8.5)	115 (7.9)	88 (6.1)
Red 1	725 (50)	725 (50)	725 (50)	703 (48.5)	725 (50)	554 (38.2)	485 (33.4)	370 (25.5)	374 (25.8)	285 (19.7)	161 (11.1)	123 (8.5)
Red 2	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	701 (48.3)	724 (49.9)	553 (38.1)	483 (33.3)	368 (25.4)	373 (25.7)	284 (19.6)
Red 3	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	700 (48.3)	721 (49.7)	550 (37.9)	481 (33.2)	367 (25.3)

2X AFB24	½"		¾"		1"		1 - ¼"		1 - ½"		2"	
Cv	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph	PTFE	Graph
Full	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	630 (43.4)	576 (39.7)	488 (33.6)	249 (17.2)	210 (14.5)	177 (12.2)	150 (10.3)
Red 1	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	630 (43.4)	575 (39.6)	486 (33.5)	248 (17.1)	210 (14.5)
Red 2	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	726 (50.1)	725 (50)	628 (43.3)	574 (39.6)	485 (33.4)
Red 3	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	725 (50)	626 (43.2)

Spares
No spare parts are available for this actuator range.

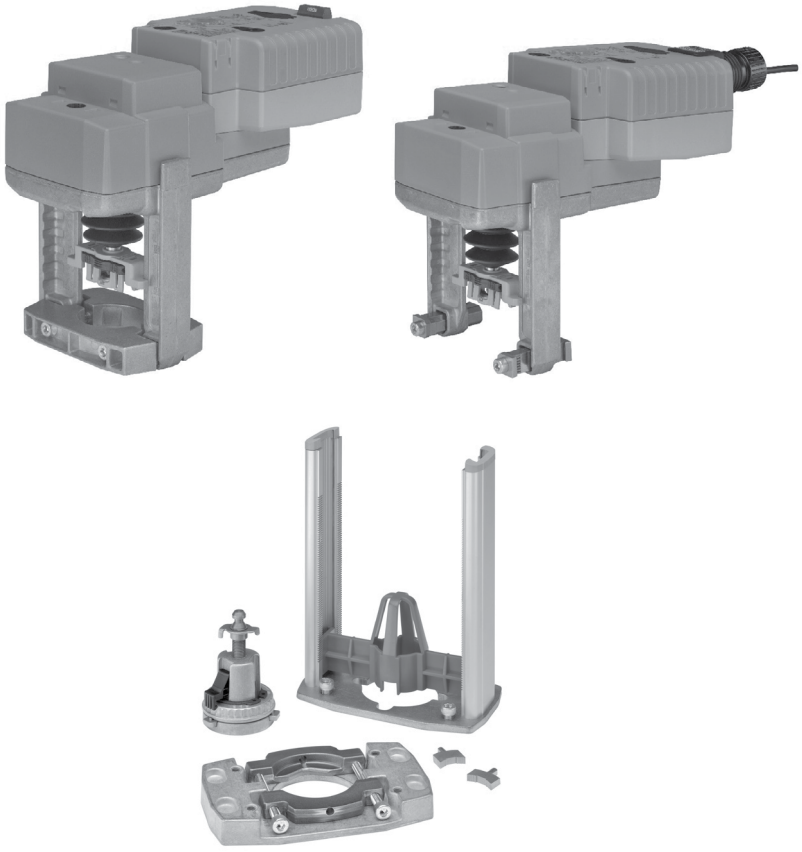
TI-P350-03-US
Issue 1

Belimo SVK Series Electric Actuator with UGVL Linkage Kit for ½" to 2" B Series and Spira-trol Control Valves

Description

The Belimo SVK series actuator is suitable for either On/Off or modulating/proportional globe valve control. It provides control in response to an input from an electronic controller with an adjustable reversing switch and manual override located on the cover. This 24 VDC/AC actuator can be used with B Series or Spira-trol Series control valves up to 2 inch line sizes. Its fail-safe control action is determined by the switch setting and can be set for fail-close, fail-open, or a predetermined position.

The SVK does not contain a spring with fail-safe positioning accomplished through supercapacitor technology.



Multi-Function Technology (MFT)

An integrated microprocessor allows for a variety of parameters including control signal type, to be configured in the factory or the field with a PC and Belimo software.

Operation

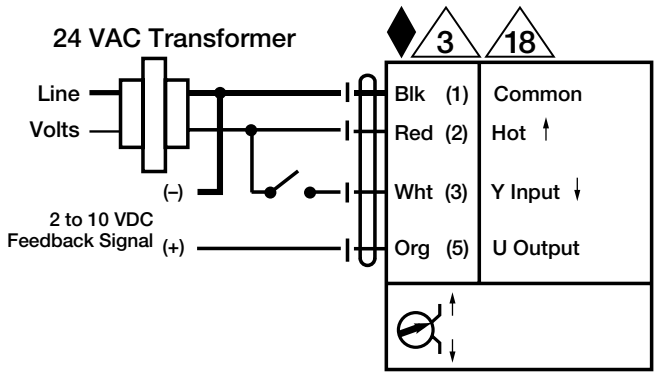
The actuator is electronically protected against overload and reverse polarity protected. The SVK series use a sensorless brushless DC motor. It has an illuminated green Adaptation/Power button to reset and relearn the valve stroke and indicate that the actuator is powered.

Specifications

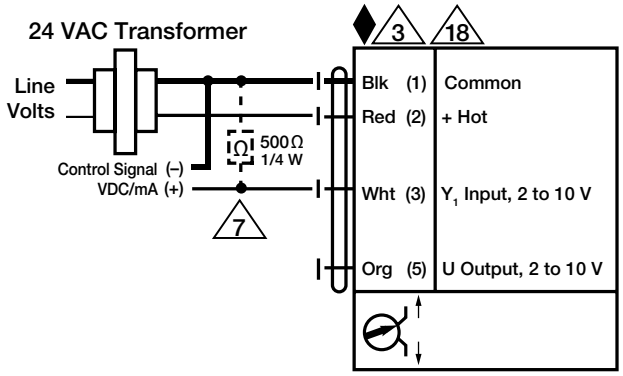
Actuator	SVKX24-MFT
Fail-safe	Electronic Fail-Safe
Control input	Proportional 2 to 10 VDC, 4 to 20 mA (with 500 Ω), PWM, Floating Point, On/Off
Input impedance	100 k Ω for 2 to 10 VDC (0.1 mA), 500 Ω for 4 to 20 mA, 1500 Ω for PWM, floating point and On/Off
Position feedback	2 to 10 VDC
Running time (motor)	90 seconds (default), variable (90 to 150 seconds)
Running time (fail-safe)	35 seconds
Auxiliary switch	Not available
Power supply	24 VAC ± 20%, 50/60 Hz, 24 VDC ± 10%
Power consumption	8.5 W
Transformer sizing	21 VA (class 2 power source)
Electrical connection	3 ft, 18 GA plenum rated cable with ½" conduit connector protected NEMA 2 (IP54)
Overload protection	electronic throughout full stroke
Direction of rotation (motor)	reversible with built-in switch
Direction of rotation (fail-safe)	reversible with switch
Position indication	stroke indicator on bracket
Manual override	4 mm hex crank (shipped w/actuator)
Humidity	5 to 95% RH non-condensing
Ambient temperature	-22 °F to +122 °F (-30 °C to +50 °C)
Storage temperature	-40 °F to +176 °F (-40 °C to +50 °C)
Noise level	<45 dB (A)
Housing material	Aluminum die cast and plastic casing
Housing	NEMA 2, IP42, UL enclosure type 2
Agency listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EEC and 2006/95/EC
Quality standards	ISO 9001
Weight	3.6 lbs (1.6 kg)
Linear force/Torque	337 lbf (1500 N)
Maximum stroke	¾" (20 mm)

Installation and wiring

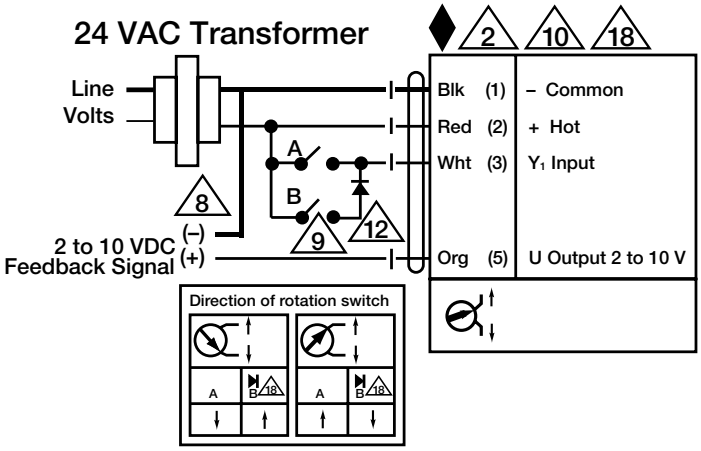
The valve and SVK actuator should be installed horizontally. Allow for 6" for the cover removal and 16" for the complete actuator removal. The actuator should not be mounted below the valve because of possible condensation build-up.



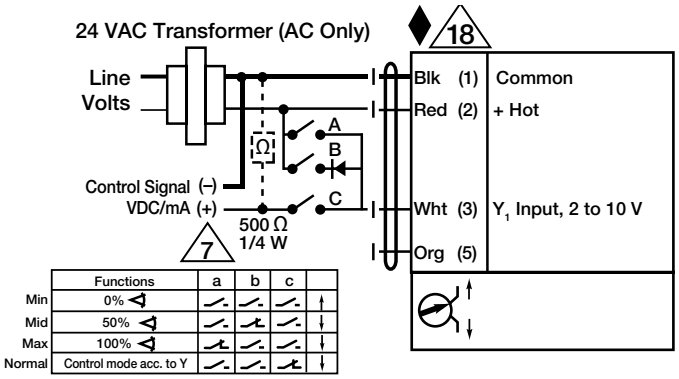
On/Off



VDC/4-20 mA

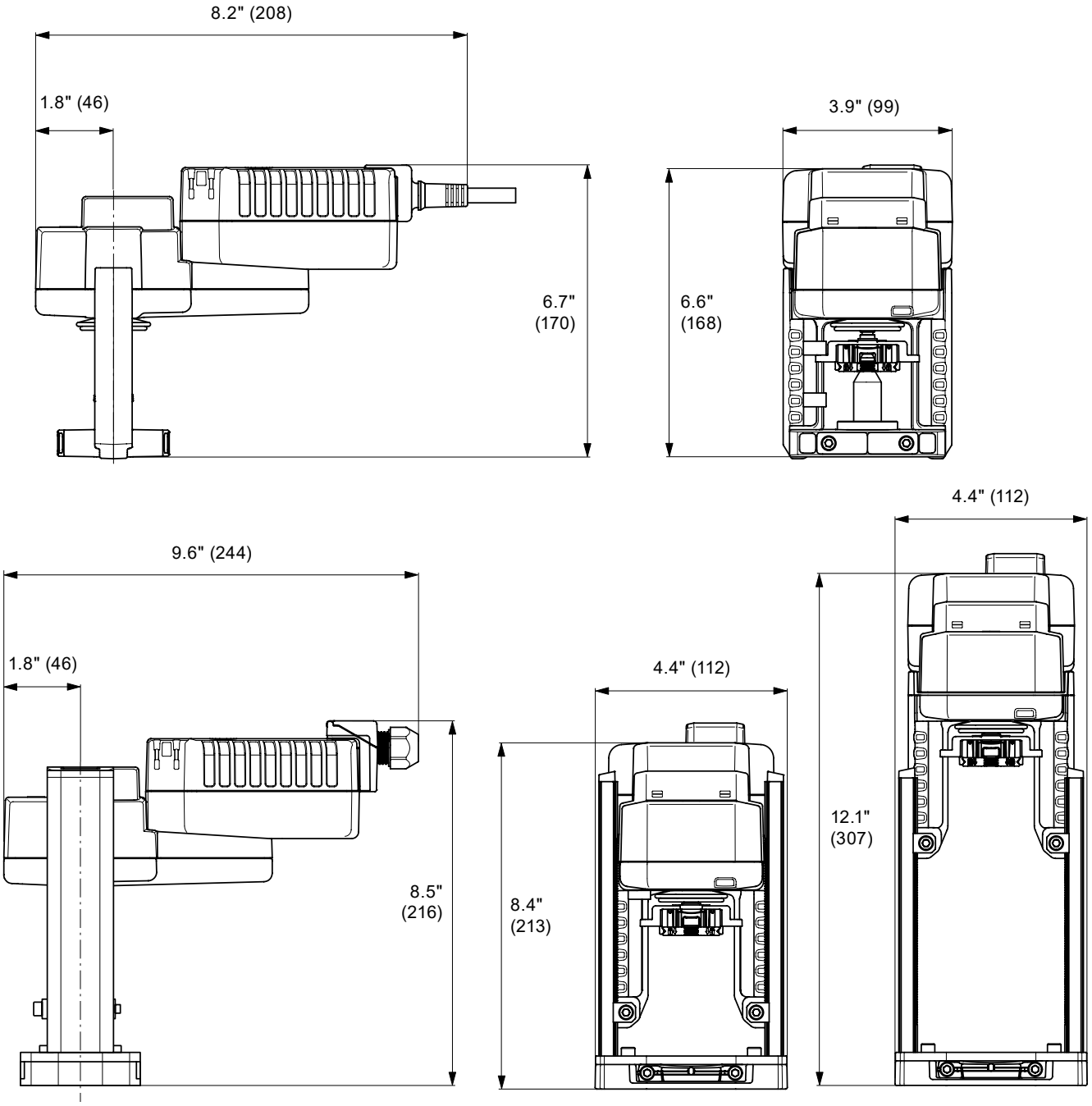


Floating point



Override

Dimensions **(approximate) in inches (mm)**



Differential pressures in psi g (bar g)

Note: Due to temperature capability limitations, maximum saturated steam pressure is 50 psi with Actuator/Valve assembly mounted in horizontal position. Below differential pressures apply to condensate and water.

B Series 2-Way and 3-Way Control Valves

ANSI/FCI 70-2 Class IV Shut-off (metal seated trim) for 2-way valves and Class III for 3-way valves

Model	½"	¾"	1"	1¼"	1½"	2"
SVKX24-MFT	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	130 (9.0)	80 (5.5)

ANSI/FCI 70-2 Class VI Shut-off (PTFE soft-seated trim)

Model	½"	¾"	1"	1¼"	1½"	2"
SVKX24-MFT	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	150 (10.3)	125 (8.6)

Spira-trol L and K Series Control Valves

ANSI/FCI 70-2 Class IV Shut-off (metal seated trim)

Model	½"	¾"	1"	1¼"	1½"	2"
SVKX24-MFT	725 (50)	600 (41.4)	375 (25.9)	300 (20.7)	100 (6.9)	60 (4.1)

Spira-trol L and K Series Control Valves

ANSI/FCI 70-2 Class VI Shut-off (PTFE soft-seated trim)

Model	½"	¾"	1"	1¼"	1½"	2"
SVKX24-MFT	725 (50)	725 (50)	525 (36.2)	410 (28.3)	175 (12.1)	125 (8.6)

Spares

No spare parts are available for the Belimo SVK acutator.

spirax sarco
by HITER

TI-P368-01-US
Issue 2

DC Series diaphragm actuator

Description

The DC Series are type diaphragm pneumatic actuators used to operate linear displacement valves in modular or block control system.

It is a versatile equipment which makes possible the change of direct acting for inverse acting, with no need of additional parts.

Due to the component responsibility for an adequate valve performance, for maintenance purposes, use only original parts supplied by HITER.

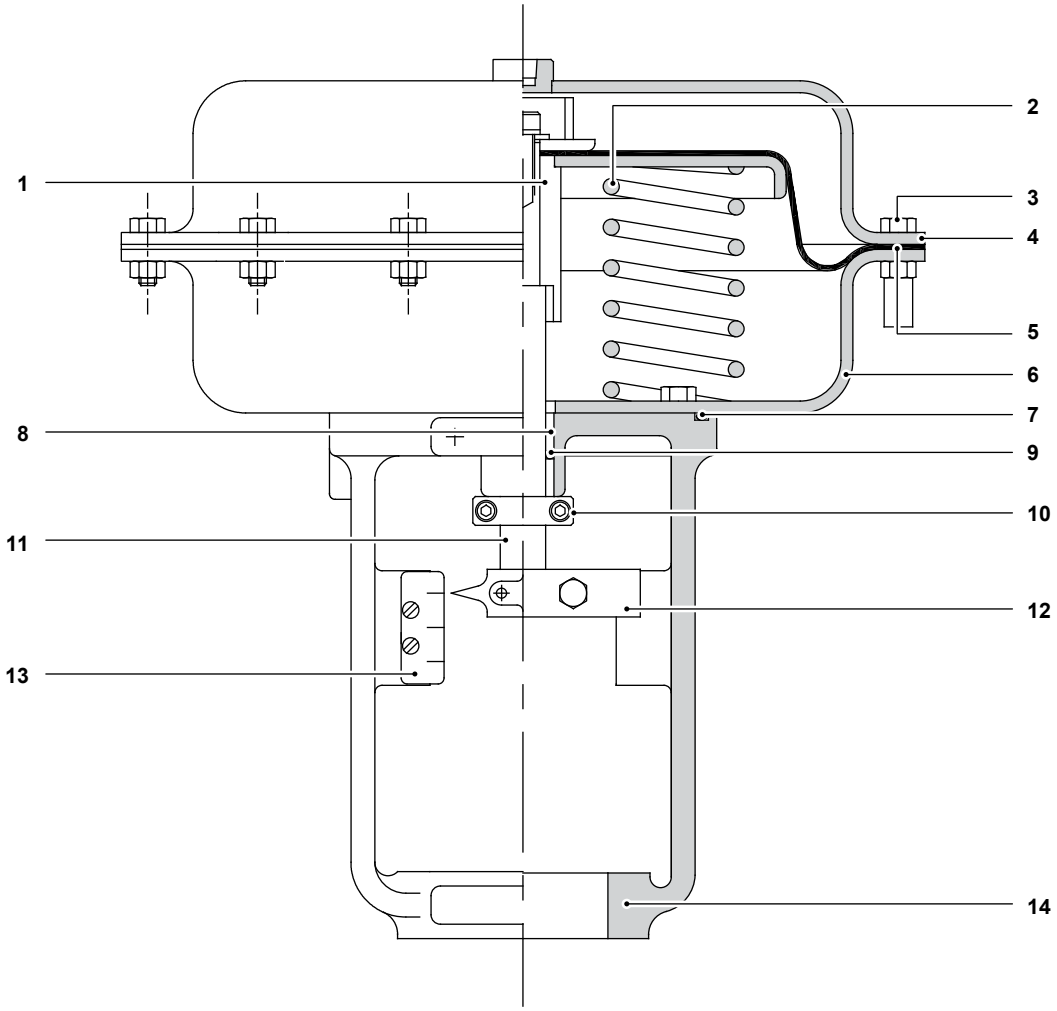
Generally actuators and diaphragm are supplied assembled in valves, although they can also be supplied in separate.



Technical specifications

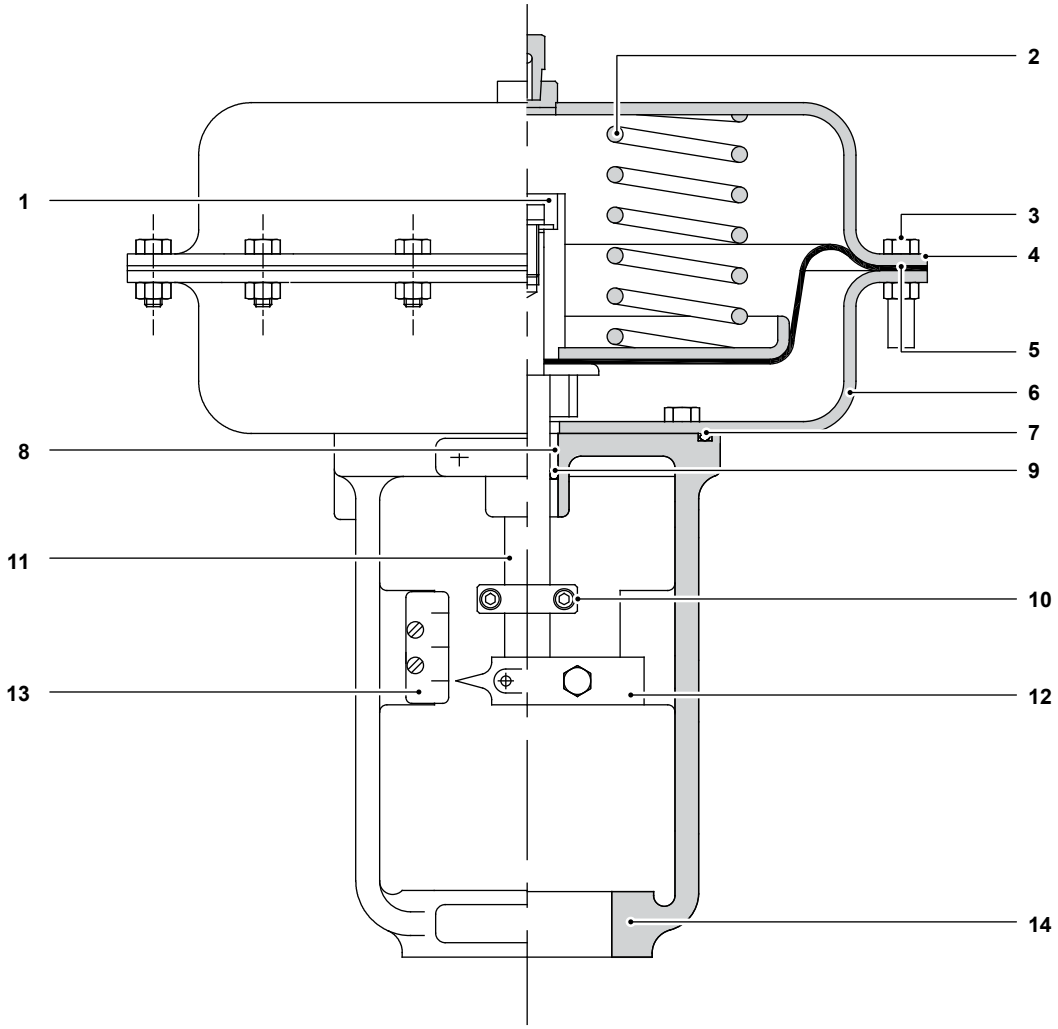
Characteristics	Linear pneumatic diaphragm/spring actuator Units without handwheel are completely field reversible		
Manual operator (optional)	Top handwheel for manual operation or stroke limiting can be supplied		
Air pressure supply	50 psi g (3.4 bar g) maximum		
Actuator specifications	**Size**	**Diaphragm effective area (in²)**	**Maximum stroke (in)**
	02	16.00 (103.2 cm²)	7/16 (1.11 cm)
	03	47.40 (305.8 cm²)	
	06		¾ (1.90 cm)
	07	70.58 (455.4 cm²)	
	08		1⅛ (2.86 cm)
	09	106.62 (687.9 cm²)	2 (5.08 cm)
	10	154.38 (996 cm²)	
Spring range	3 to 15, 12 to 30 or 16 to 40 psi g (0.21 to 1.03, 0.83 to 2.07 or 1.10 to 2.76 bar g)		

Materials - Direct actuator



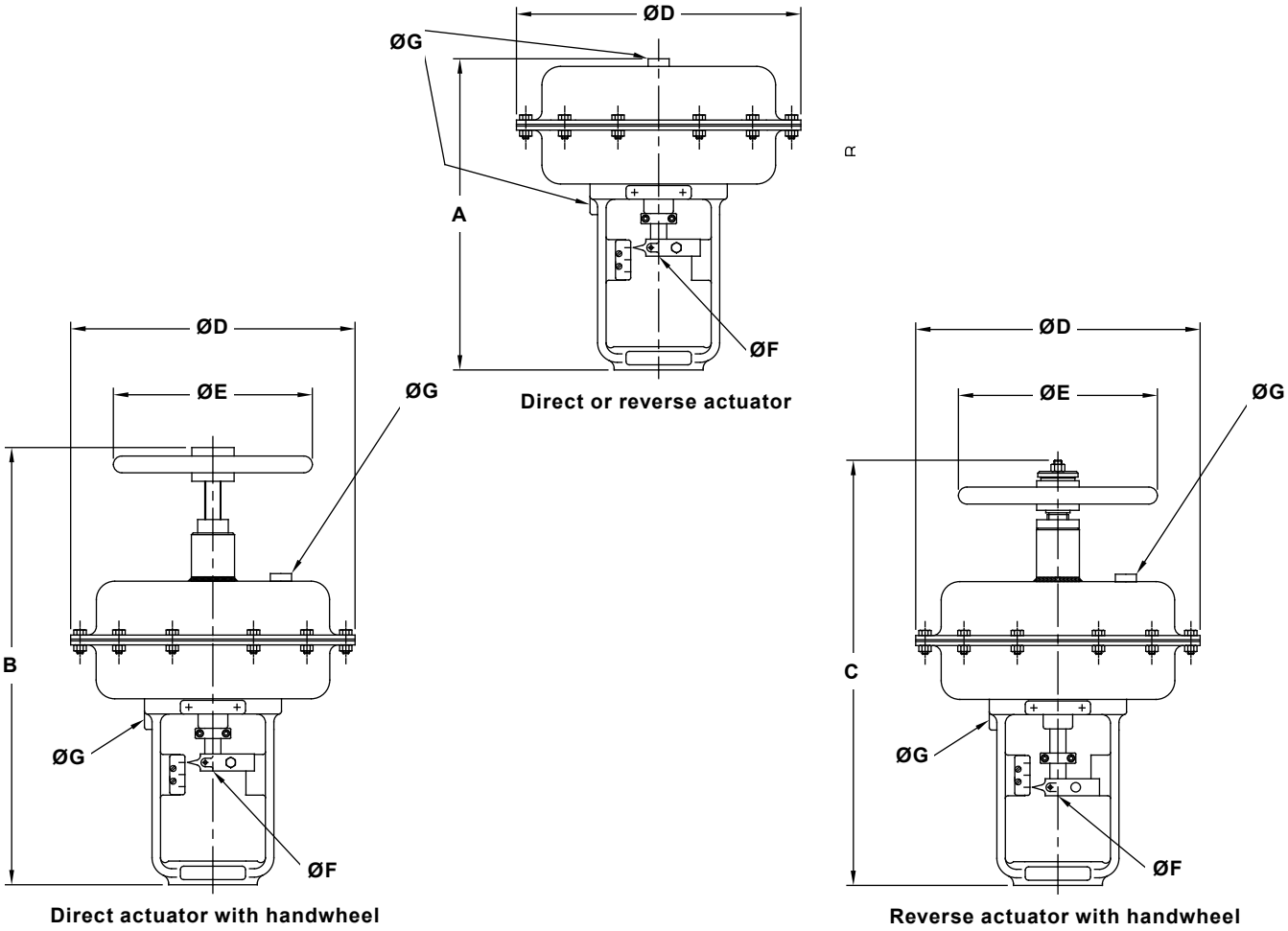
No.	Part	Material
1	Stroke limiter	Carbon steel
2	Spring	Carbon steel
3	Compression bolt	Carbon steel with Z coated
4	Upper case	Carbon steel
5	Diaphragm	NBR elastomer
6	Lower case	Carbon steel
7	'O' ring	NBR elastomer
8	Guide sleeve	Brass
9	'O' ring	NBR elastomer
10	Spring regulator	Stainless steel
11	Stem	Stainless steel
12	Connector	Carbon steel
13	Stroke indicator	Stainless steel
14	Yoke	Casting iron

Materials - Reverse actuator



No.	Part	Material
1	Stroke limiter	Carbon steel
2	Spring	Carbon steel
3	Compression bolt	Carbon steel with Z coated
4	Upper case	Carbon steel
5	Diaphragm	NBR elastomer
6	Lower case	Carbon steel
7	'O' ring	NBR elastomer
8	Guide sleeve	Brass
9	'O' ring	NBR elastomer
10	Spring regulator	Stainless steel
11	Stem	Stainless steel
12	Connector	Carbon steel
13	Stroke indicator	Stainless steel
14	Yoke	Casting iron

Sizes and dimensions (approximate) in inches (mm)



Size	A	B	C	ØD	ØE	ØF (THREADED CON.)	ØG
02	8.35" (212.09 mm)	11.8" (299.72 mm)	12.2" (309.88 mm)	7.48" (189.99 mm)	6.50" (165.1 mm)	¼"-28UNF	⅛"-27NPT
03	9.22" (234.19 mm)	15.3" (388.62 mm)	15.7" (398.78 mm)	11.3" (287.02 mm)	9.26" (235.20 mm)	¼"-22UNF	¼"-18NPT
06	12.3" (312.42 mm)	18.4" (467.36 mm)	18.7" (474.98 mm)			⅜"-24UNF	¼"-18NPT
07	13.4" (340.36 mm)	19.4" (492.76 mm)	19.8" (502.92 mm)	13.3" (337.82 mm)		⅜"-24UNF	¼"-18NPT
08	13.8" (350.52 mm)	19.9" (505.46 mm)	20.3" (515.62 mm)			½"-20UNF	¼"-18NPT
09	17.5" (444.5 mm)	24.9" (632.46 mm)	25.9" (657.86 mm)	16.2" (411.48 mm)	13.4" (340.36 mm)	½"-20UNF	¼"-18NPT
10	19.5" (495.3 mm)	28.0" (711.2 mm)	26.8" (680.72 mm)	18.8" (477.52 mm)	18.9" (472.44 mm)	¾"-16UNF	¼"-18NPT

Accessories

Pneumatic positioner, electro-pneumatic positioner, smart positioner, air filter/regulator, limit switch, electro-pneumatic transducer,solenoid valve, and others.

TI-P368-07-US
Issue 1

PP Series
Pneumatic Series Actuator

Description

PP Series is a linear pneumatic piston type actuator that provides positive throttling or on-off operation for automatic control valves.

The cylinders are designed for instrument air supply pressures of up to 100 psi (6.9 bar).

This actuator can be single or double-acting and spring-return.

This actuator is fully field reversible for air-to-open or air-to-close action. Can be supplied with handwheel for manual operation.

Maximum supply pressure	100 psi g (6.9 bar g)
Sping range	Standard: 25 - 50 psi g (1.7 - 3.4 bar g)

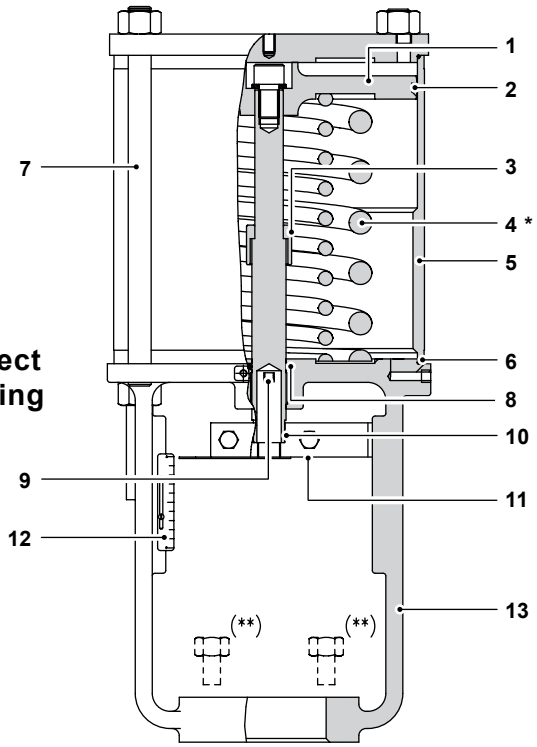


Actuator specifications

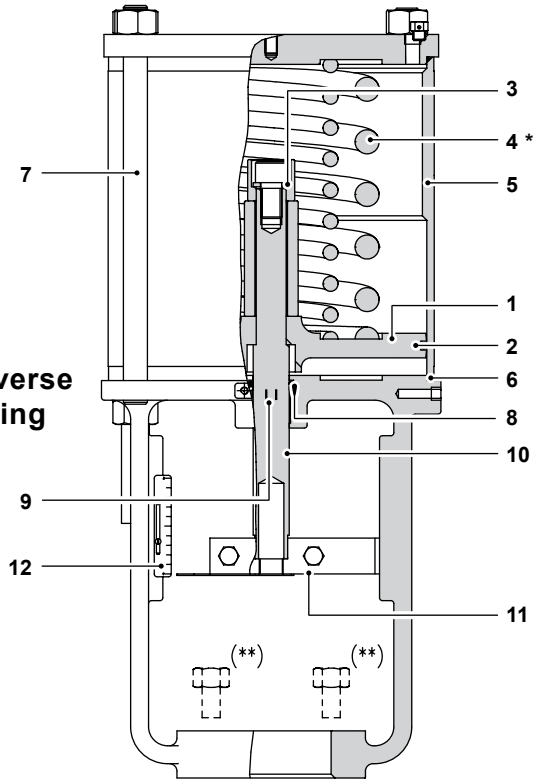
Size	Piston area, in² (cm²)	Available stroke, in (mm)
02	10.64 (69)	7/16 (11)
03	28 (181)	¼ and ⅜ (6 and 10)
04	50 (323)	¾ to 2 (19 to 51)
05	81 (523)	1½ to 4 (38 to 102)
06	133 (858)	2 to 7 (51 to 178)
07	227 (1465)	2 to 7 (51 to 178)

Materials

Direct acting



Reverse acting

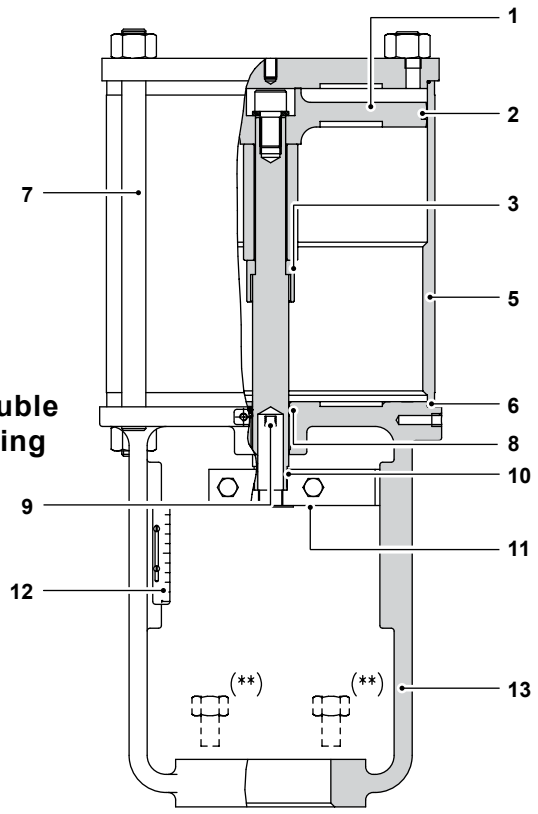


(*) Quantity of springs depends on spring range

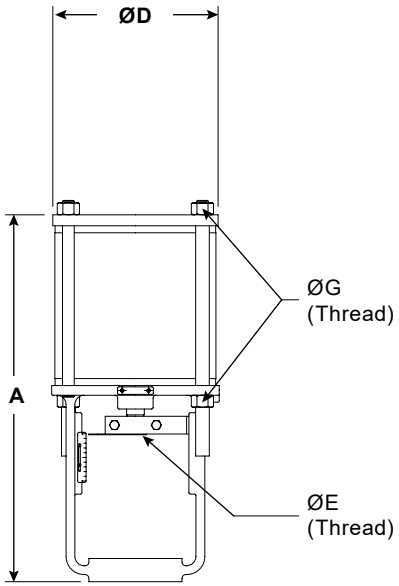
(**) These screws are available up to 04 Actuator's size

No.	Part	Material
1	Piston	Casting Iron
2	'O' ring	Elastomer
3	Stroke limiter	Carbon Steel
4	Spring	Carbon Steel
5	Cylinder	Carbon Steel
6	'O' ring	Elastomer
7	Tension screw	Carbon Steel
8	'O' ring	Elastomer
9	Guide bush	PTFE
10	Stem	Stainless Steel
11	Conector	Carbon Steel
12	Stoke plate	Stainless Steel
13	Yoke	Casting Iron

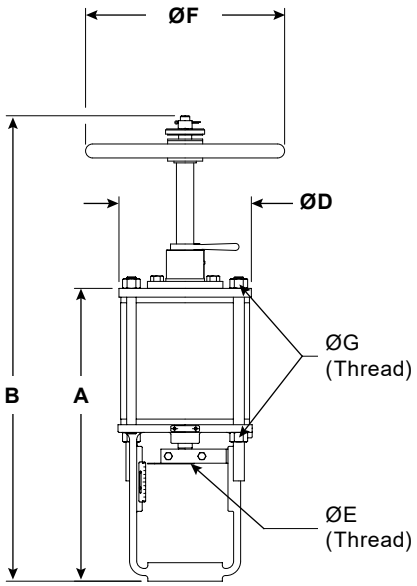
Double acting



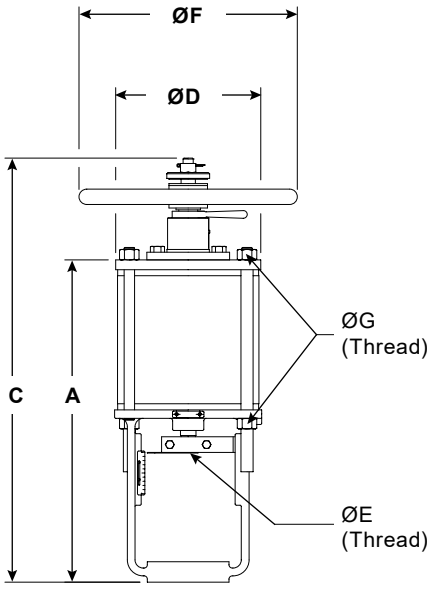
Size and dimensions (approximate) in inches and (mm)



Direct or Reverse Actuator



Direct Actuator with Handwheel (up to 05 size)



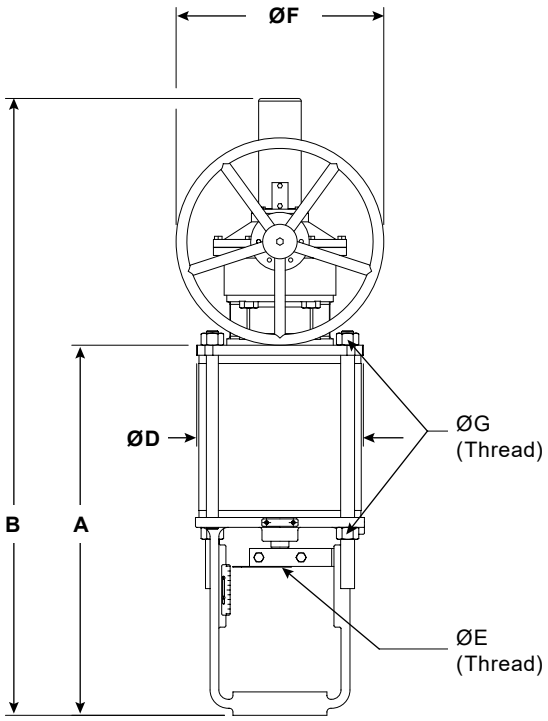
Direct Actuator with Handwheel (up to 05 size)

Size (inch)	A*	B*	C*	ØD	ØE	ØF	ØG
02	7.7 (195)	11.9 (301)	12.5 (317)	4.3 (108)	¼"-28UNF-2B	6.5 (165)	⅛"-NPT
03	12.4 (315)	18.6 (472)	18.1 (460)	6.9 (175)	⅜"-24UNF-2B	9.3 (235)	¼"-18NPT
04	28.3 (720)	25.9 (657)	23.9 (608)	8.9 (226)	½"-20UNF-2B	13.4 (340)	¼"-18NPT
05	34.5 (877)	44 (1118)	41.9 (1065)	11.4 (290)	¾"-16UNF-2B	18.9 (480)	¼"-18NPT

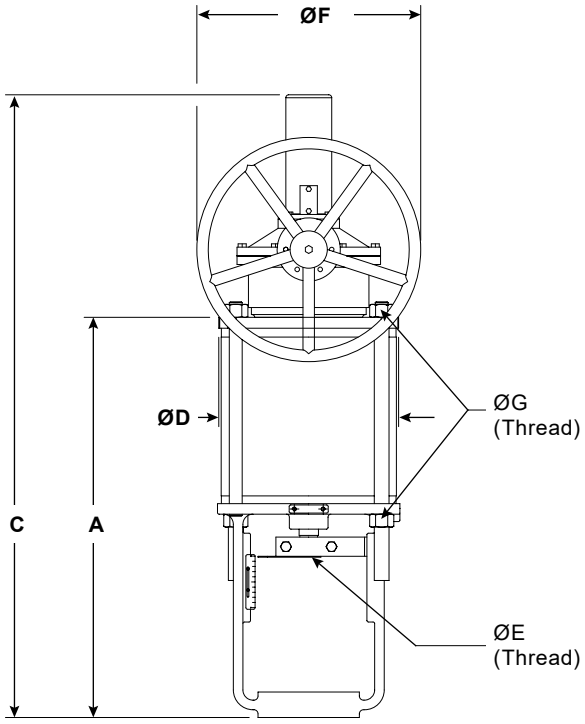
(*) These dimensions are maximum. Could be less depending on stroke options.

06 and 07 sizes are shown on the next page

Size and Dimensions (approximate) in inches and (mm) (continued)



Direct Actuator with Handwheel (06 and 07 sizes)



Reverse Actuator with Handwheel (06 and 07 sizes)

Size (inch)	A*	B*	C*	ØD	ØE	ØF	ØG
06	57.8 (1469)	60.4 (1533)	53.1 (1350)	14.1 (360)	1"-12UNF-2B	13.4 (340)	⅜"-18NPT
07	62.9 (1598)		83.7 (2127)	18.9 (480)	1½"-16UN-2B	18.9 (480)	⅜"-18NPT

(*) These dimensions are maximum. Could be less depending on stroke options.

Accessories

Pneumatic positioners, electro-pneumatic positioners, smart positioners, air regulators, Limit switch, electro-pneumatic transducer, solenoid valves and others.

TI-P705-01
CTLS Issue 5

IPC6 and IPC6 ATEX Convertor



Description

The IPC6 convertor is a two wire, Wall, DIN rail or 2" pipe mount (option), pneumatic convertor requiring a 4 - 20 mA (0-10 Vdc only on Safe version) input signal to provide a pneumatic air output signal.

Features

- Field Reversible to provide output which is directly or inversely proportional to the input signal.
- 3 output pressure ranges to meet final control element requirements.

Materials

Part	Material
Body and housing	Aluminium
Trim	Zinc plated steel
Diaphragm	Nitrile
Orifice	Nickle plated brass
Wall bracket	Steel zinc plated
Din rail bracket	Plastic

Technical data

Input signal range (See Table 1 below)	
Output signal range	Dependant on version selected
Supply air pressure	Minimum 1.5 bar g (21.8 psi g)
	Maximum 8.0 bar g (116 psi g)
Flow rate	18.7 m³/h (11.0 SCFM)
Enclosure rating	IP65
Air consumption	0.17 Nm³/h (0.10 SCFM) (average)
Pneumatic connections	¼" NPT
Electrical connections	EN 175301-803
Working temperature	-40 °C to +70 °C (-40 °F to 158 °F)
Input impedance (See Table 1 below)	
Maximum current	93 mA
Linearity	+0.5% FS
Hysteresis	0.25% FS

The IPC6-ATEX convertor is certified as intrinsically safe to:

- ATEX/IECEx II 1 G D Ex ia IIC T4 Ga/Ex ia IIIC T135 °C Da (Ta = -40 °C to +70 °C) (-40 °F to 158 °F).
- CCC/NEPSI Ex ia IIC T4 Ga/Ex ia IIIC T135 °C Da (Ta = -40 °C to +70 °C) (-40 °F to 158 °F).
- UKEX II 1 G D Ex ia IIC T4 Ga/Ex ia IIIC T135 °C Da (Ta = -40 °C to +70 °C) (-40 °F to 158 °F).

Table 1

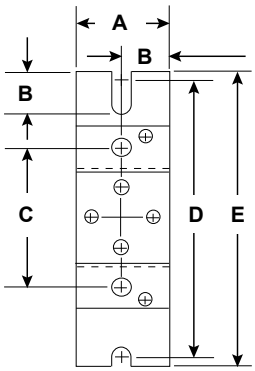
Output range	psi g	3 - 15	3 - 27	6 - 30
	bar	0.2 - 1.0	0.2 - 1.9	0.4 - 2.1
	kPa	21 - 103	21 - 186	41 - 207
Supply pressure	psi g	21 - 120	32 - 120	35 - 120
	bar	1.4 - 8.3	2.2 - 8.3	2.4 - 8.3
	kPa	138 - 827	221 - 827	241 - 827
Minimum span	psi g	5	10	10
	bar	0.3	0.7	0.7
	kPa	34	69	69
Impedance (OHMS)	4-20 mA	197	204	204
	0-10 Vdc	1100	1064	1064

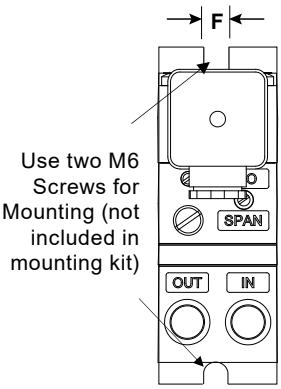
Note: 0-10 Vdc not available for hazardous area use.

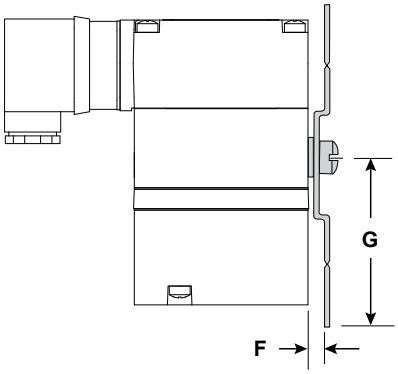
Dimensions (approximate) in mm (inches)

The IPC6 is supplied with a wall mounting kit and a DIN Rail Mounting Kit.
Mounting Kit PMK is available when installing the unit on a 2" pipe

Mounting kit (Included with unit)



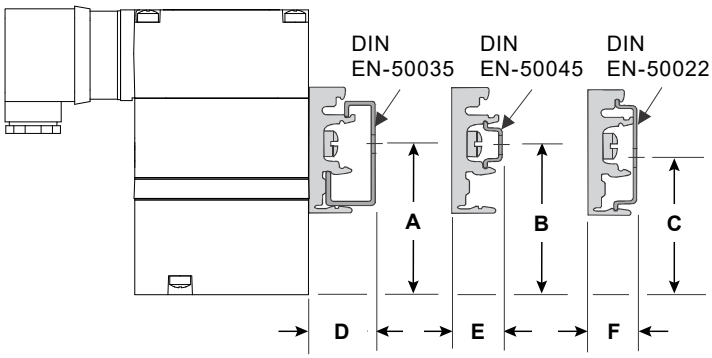


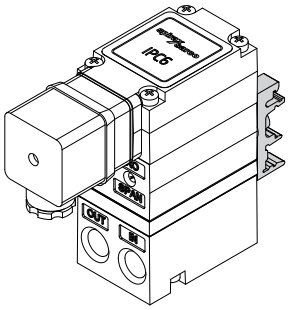


Mounting Kit
Includes the following:
Two 10-32 x 5⁄16" Screws
Mounting Bracket Two ¼" NPT Pipe Plugs
Two 5 mm thick washers

A	B	C	D	E	F	G
38 (1.50)	19 (0.75)	57 (2.24)	114 (4.49)	123 (4.84)	7 (0.28)	62 (2.44)

DIN Rail mounting kit (Included with unit)



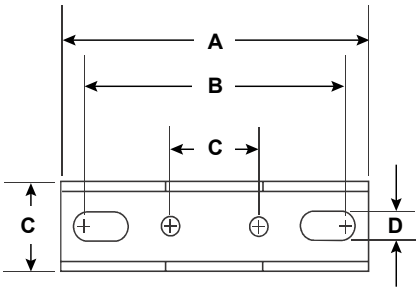


Din Rail Mounting Configuration
shown with Model IPC6 and DIN EN-50045

A	B	C	D	E	F
34.5 (1.36)	35 (1.38)	32 (1.26)	21 (0.83)	15 (0.60)	16 (0.63)

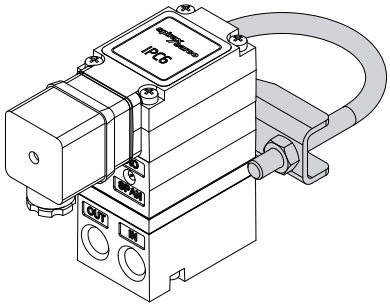
Dimensions (approximate) in mm (inches)

Mounting kit
(Sold separately)



Mounting Kit PMK
includes the following:
Mounting Bracket 2" Pipe Clamp
Two 10-32 x 5⁄16" Screws

2" Pipe Mounting Configuration
shown with Model IPC6



A	B	C	D
89 (3.50)	68 (2.68)	25 (0.98)	9 (0.35)

Weight (approximate) in kg (lbs)

IPC6 including all mountings apart from PMK - 0.79 kg (1.74 lb)
Mounting Kit PMK- 0.2 kg (0.44 lb)

Safety information, installation and maintenance

Full details are contained in the appropriate Installation and Maintenance Instructions.

Electro-pneumatic convertor options

		IPC6
Basic model	Aluminium enclosure EN 17 5301-803 electrical connection, IP65 Operating temperature -40 °C to +70 °C (-40 °F to 158 °F) Wall & DIN rail mounts included	
Hazardous area protection	Instrinsically safe (UKEX, ATEX, IECEx)	**A**
	Intrinsically safe (CCC, NEPSI, UKEX, ATEX, IECEx)	**C**
	Safe area only	**S**
Electrical input	0-10 Vdc (Safe area only)	**0**
	4-20 mA	**1**
Air output range	0.2 - 1.0 bar g (3 - 15 psi g)	**0**
	0.2 - 1.8 bar g (3 - 26 psi g)	**1**
	0.4 - 2.0 bar g (6 - 29 psi g)	**2**
Non standard features	Standard model	**A**

Ordering code example: IPC6 | A | 1 | 0 - A

12.3
4

Electro-pneumatic convertor mount option

2" Pipe mounting kit	PMK

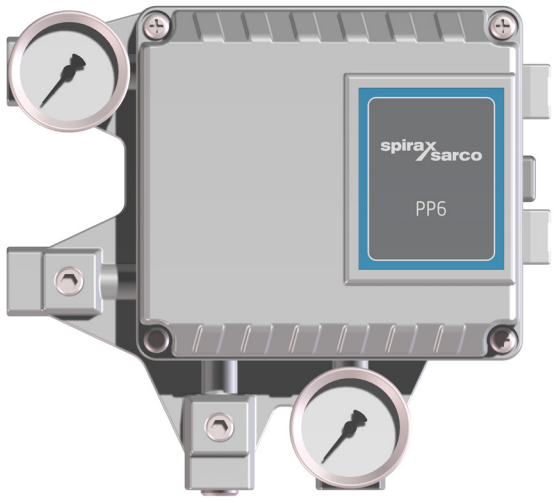
Customer requirement example:

1 off Electro-pneumatic convertor, ATEX intrinsically safe protection, having 0.2 - 1.0 bar g (3 - 15 psi g) output range.

How to order example: 1 off Spirax Sarco IPC6A10-A Electro-pneumatic convertor.

TI-P704-01
CTLS Issue 3

PP6
Pneumatic Positioner



Description

The PP6 positioner can control any valve that is actuated by a linear or rotary pneumatic actuator that conforms with NAMUR. It guarantees an exact proportionality between the stroke of the valve and the value of the pneumatic input signal into the positioner.
The PP6 has a cast aluminium housing that is also treated for outdoor installation. The unit can be mounted onto pneumatic actuators either rotary 55-90° or linear 20 to 150 mm (0.79 to 5.9 inches).
The positioner can be supplied without a mounting kit or with a kit for rotary or linear actuators, the type must be specified when ordering.
As standard the PP6 is equipped with two pressure gauges to indicate air pressure command sent to the pneumatic actuator and the air pressure supplied to the positioner.
The PP6 is supplied for a pneumatic control signal 0.2 to 1.0 bar (3 to 15 psi g) and for an air supply pressure up to 7 bar (100 psi g).
The positioners can be arranged for sequential operation of two or more pneumatic valves in such a way that the stroke of each valve is obtained by a split-range control signal.
For example: 0.2 to 0.6 bar and 0.6 to 1.0 bar (3 to 9 psi g and 9 to 15 psi g) in the case of two valves.
The PP6 can also be used to reverse the action of the control signal.

Air supply

The PP6 positioner must be provided with a high quality air supply to ISO 8573-1:2010 Class 3:3:2.

ATEX rating	II 2G Ex h IIC T6 Gb EX h IIIC T85°C Db	

Applications

The PP6 can be used with any actuator that conforms to NAMUR, this includes all of the following Spirax Sarco pneumatic actuators:

- **BVA300 rotary**
- **PN1600**
- **PNS3000** and **PNS4000 series**
- **PN9000 series**
- **TN2000 series**

Materials

Part	Material	Finish
Case and cover	Die cast aluminium	Anti-corrosive paint to RAL9016
Mounting bracket	Steel	EP protected
Feedback pin	Stainless steel	
Feedback lever	Stainless steel	
Feedback pin locator	Stainless steel	
Screws	Stainless steel	

Technical data

Input signal range	0.2 - 1.0 bar (3 - 15 psi)
Air supply	1.4 to 7.0 bar (20 to 100 psi g) (regulate 0.4 to 0.7 bar (5 to 10 psi) above actuator spring range)
Air quality	ISO 8573-1:2010 Class 3:3:2.
Output pressure	0 to 100% supply pressure
Actuator stroke	20 mm to 150 mm (0.79 to 5.91 inches) or 55° to 90°
Action	Single acting/fail vent/Double acting
Operating temperature	-20 °C to +70 °C (-4 °F to +158 °F)
Air flow	80 LPM @ 1.4 bar (2.83 SCFM @ 20 psi g)
Steady state air consumption	2.5 LPM @ 1.4 bar supply (0.09 SCFM @ 20 psi g)
Air connections	¼" NPT female
Sensitivity	Single acting is +/- 0.2%
	Double Acting and Rotary are +/- 0.5%
Hysterisis	+/-1% F.S.
Linearity	Single acting is +/- 1%
	Double Acting and Rotary are +/- 2%
Repeatability	+/- 0.5% F.S
Degree of protection	IP66
Characteristic	Linear
Shipping weight	Linear 2.1 kg (4.63 lbs) (positioner only)
	Mounting Kits for Linear PY3 and PY4 - 1.3 kg (2.87 lbs,), UY1,2,3 - 0.9 kg (2.0 lbs,), UBC - 0.2 kg (0.45 lbs)
	Rotary 3.3 kg (7.28 lbs) (Positioner and mounting kit)

Positioner options

Basic model	Aluminium enclosure Safe Area or Explosion proof protection method	**PP6**
Acting type	Single acting	**S**
	Double acting	**D**
Mounting type	Linear - See page 4 for Mounting Kit selection	**L**
	Rotary - Mounting Kit included	**R**
Air connection	¼" NPT	**1**
Non standard features	Standard model	**A**

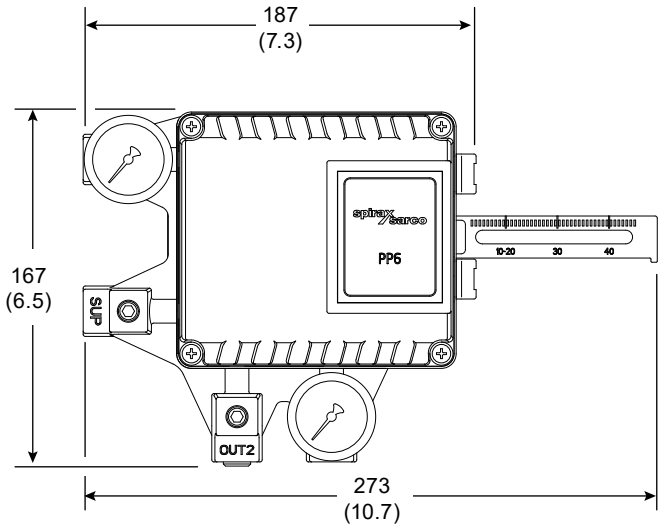
Ordering code example: **PP6** **S** **L** **1** - **A**

12.3
6

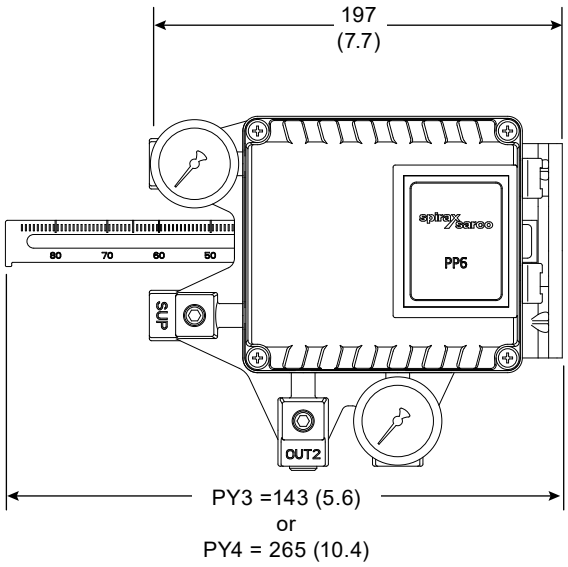
Safety information, installation and maintenance

Full details are contained in the PP6 pneumatic positioner Installation and Maintenance Instructions.

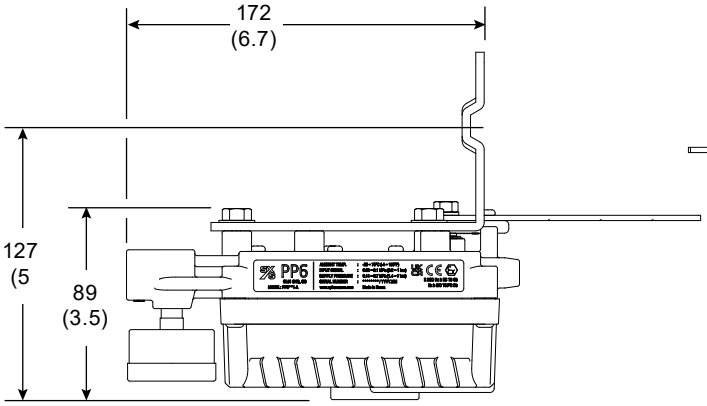
Dimensions (approximate) in mm (inches)

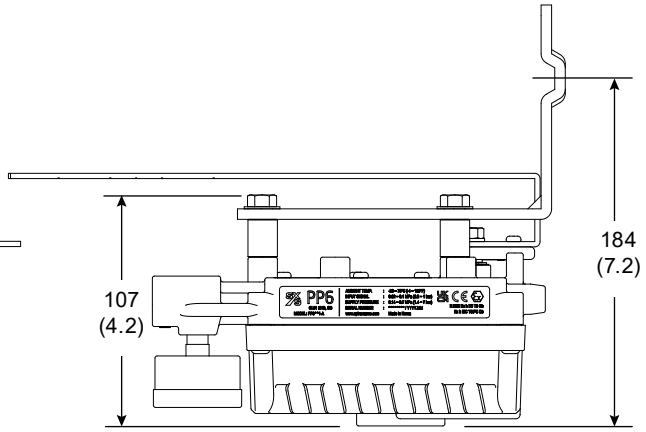


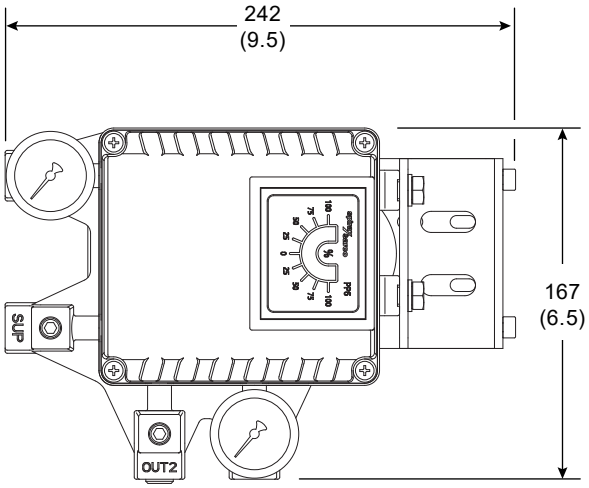
Linear left mounted

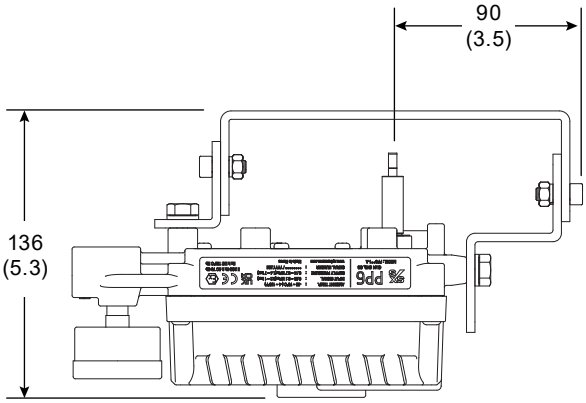


Linear centrally mounted









Rotary mounted

Mounting/linkage kit : Positioner mounting kits will be supplied for central mounting as standard.

Mounting Position	Actuator Model	Valve Models	Valve Sizes	Spirax kit Nomenclature
Central	PN9100	Spira-trol™ two port and QL three port	DN15 to DN50	PY3
	PN9200		DN15 to DN100	
	PN9300			
	PN9400		DN125 to DN300	PY4
	TN2150	Spira-trol™ two port and QL three port	DN15 to DN100	PY3
	TN2300		DN125 to DN300	PY4
	TN2400			Not compatible
	TN2270			PY4
	PN3000 Sprg Ext	LE, LEA and Steri-trol	DN15 to DN100	PY3
	PN4000 Sprg Ret			
	PN5000	KE, KEA, LE and LEA	DN15 to DN100	PY3 + UBC
	PN6000			
	PN5000	Spira-trol™ QL three port	DN125 to DN200	PY4 + UBC
	PN6000			
Left side	PN9100	Spira-trol™ two port and QL three port	DN15 to DN50	UY3
	PN9200		DN15 to DN100	
	PN9300			
	PN9400		DN125 to DN300	UY1
	TN2150	Spira-trol™ two port and QL three port	DN15 to DN100	Not compatible
	TN2300		DN125 to DN300	UY1
	TN2400			Not compatible
	TN2270			UY1
	PN3000 Sprg Ext	LE, LEA and Steri-trol	DN15 to DN100	UY3
	PN4000 Sprg Ret			
	PN5000	KE, KEA, LE and LEA	DN15 to DN100	UY3 + UBC
	PN6000			
	PN5000	Spira-trol™ QL three port	DN125 to DN200	UY1 + UBC
	PN6000			
	PN1600	'C' series	DN65 to DN100	UY1
	PN1600	'C' series	DN125 to DN200	UY2
	PN1600	Spira-trol™	DN125 to DN300	

Customer requirement example:

1 off Pneumatic positioner for use with single acting PN9300 actuator, having 30 mm (1.18 inches) stroke.

How to order

Example: 1 off Spirax Sarco PP6SL1-A Pneumatic-Pneumatic Positioner + PY3 mounting kit.
Caution: The PP6 positioner must have a high quality air supply to ISO 8573-1:2010 Class 3:3:2

TI-P706-01
CTLS Issue 10

SP7-10, SP7-11 and SP7-12
Smart Positioners

Description

The SP7-1* smart positioner can control any valve that is actuated by a linear or rotary pneumatic actuator that conforms with NAMUR. It guarantees an exact proportionality between the stroke of the valve and the value of the electrical input signal (mA) into the positioner.

The SP7-1* has a cast aluminium housing that is also treated for outdoor installation. The unit can be mounted onto pneumatic actuators either rotary -57 to 57° or linear -28 to 28°.
The positioner can be supplied without a mounting kit or with a kit for rotary or linear actuators, the type must be specified when ordering.

The positioner can be supplied without a pressure gauge block or with a pressure gauge block, the type must be specified when ordering. The positioner is supplied for a control signal in mA and for an air supply pressure from 1.4 to 6 bar (20 to 87 psi).
The SP7-1* positioner can also be used to reverse the action of the control signal.

The positioner has a local communication interface (LCI) as standard in the SP7-10. Additionally, a 'HART® communication' option for communication via the 20 mA signal is available. Both communications are based on the HART® Protocol. Alternatively, HART®5 or HART®7 are available.

Other available options are the SP7-11 with a PROFIBUS PA module or the SP7-12 with FOUNDATION Fieldbus module.
In addition to its input for the analog position set point, the positioner is equipped with a digital input which can be used to activate control system functions in the device. A digital output allows you to output collective messages (alarms/faults).



Throughout the document SP7-1* is written where the information is relevant to all versions; the SP7-10, SP7-11 and SP7-12. Where the information is specific it will be referenced as the version appropriate.

Approvals

	ATEX rating	II 2 G Ex ib IIC T6, T4...T1 Gb
	CCC (China)	Ex ib IIC T4/T6 Gb
	NEPSI rating	Ex ib IIC T4/T6 Gb
Segurança OCP 0004 INMETRO	**INMETRO rating**	INMETRO Ex Ib IIC T6, T4 ....T1 Gb

Air supply
The SP7-10 positioner must be provided with a high quality air supply to ISO 8573-1:2010 Class 3:3:3

Applications
The SP7-1* can be used with any actuator that conforms to NAMUR, this includes all of the following Spirax Sarco pneumatic actuators:

BVA300 rotary	**PN9000 series**
PN1600 series	**TN2000 series**
PNS3000 and **PNS4000 series**	

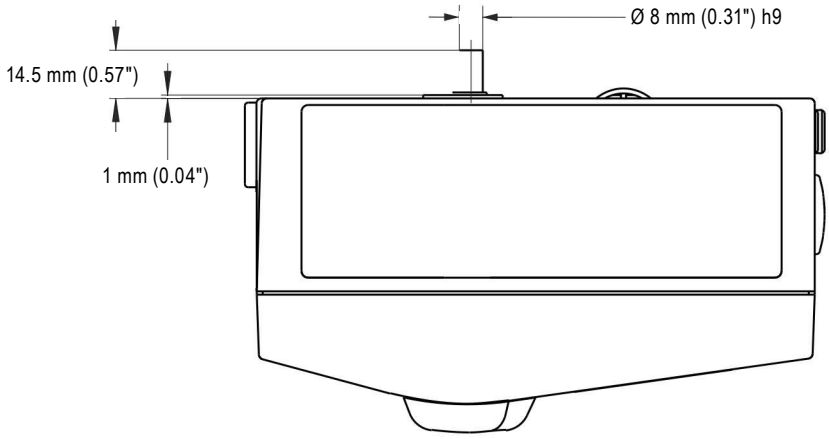
Materials

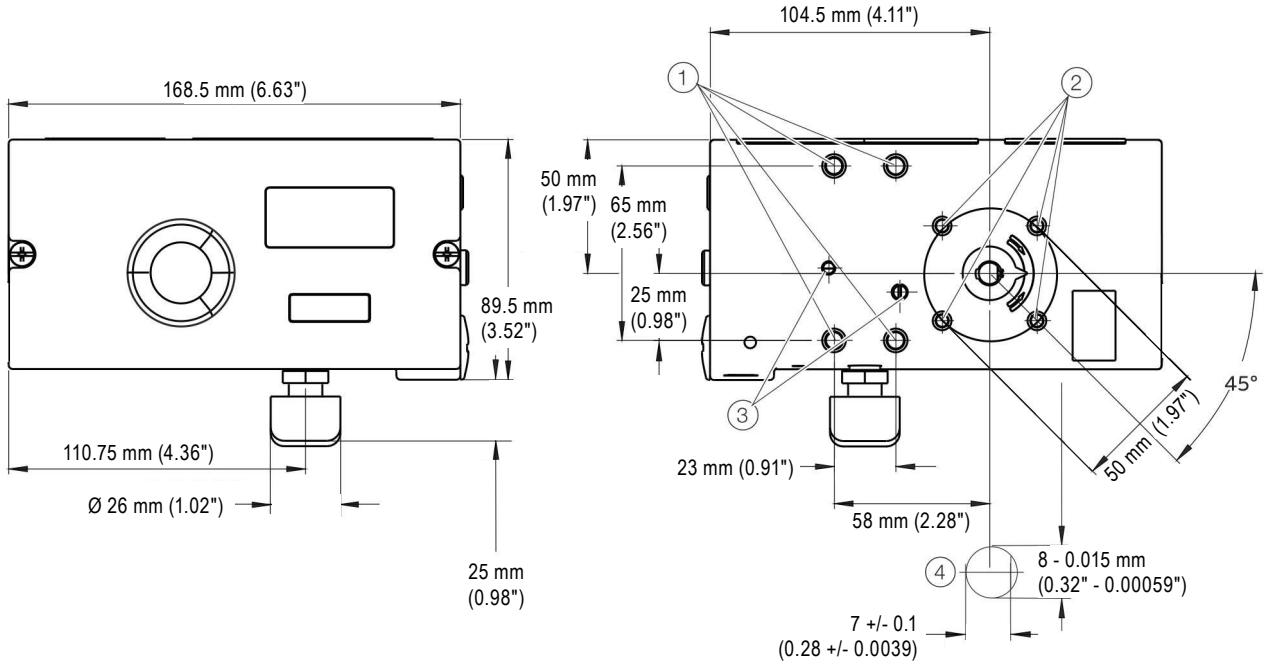
Part	Material	Finish
Case and cover	Die cast aluminium	Case - Anti-corrosive paint, Black
		Cover - Anti-corrosive paint to RAL9016
Mouting kits	Stainless steel	-
Follower pin cone	Nylon	-

Technical data

Input signal	4-20 mA (split range minimum amplitude 8 mA) or PROFIBUS PA or FOUNDATION Fieldbus
Impedance	Max 485 +/- 15 Ω (for 4-20mA input signal only)
Air supply	1.4 to 6.0 bar (20 to 87 psi)
Air quality	ISO 8573-1:2010 Class 3:3:3
Output pressure	0 to 100% supply pressure
Actuator stroke	20 mm to 150 mm (0.8" to 5.9") or 55 ° to 90 °
Action	Single acting/fail vent/Double acting
Operating temperature	−40 to 85 °C (-40 °F to 185 °F)
Air connections	¼" NPT female
Deviation	≤ 0.5 %
Tolerance band	0.3 to 10 %, adjustable
Configurable dead zone	0.1 to 10 %, adjustable for 4-20 mA, HART and PROFIBUS PA, 0.1 to 5 % for FOUNDATION Fieldbus
Resolution (AD-conversion)	> 16,000 steps
Sampling frequency	20 ms (for 4-20 mA, HART and PROFIBUS PA only)
Ambient temperature effect	≤ 0.5 % per 10 K
Reference temperature	20 °C (68 °F)
Influence of vibration	≤ 1 % to 10 g and 80 Hz
Degree of protection	IP65
Weight	Linear mounting kit - 0.78 kg (1.7 lb)
	Rotary mounting kit - 0.4 kg (0.9 lb)
	Positioner (without mounting kits or gauge blocks) - 1.7 kg (3.7 lb)
Basic positioner options	SP7-10 - 4-20 mA or 4-20 mA with HART
	SP7-11 - Profibus PA
	SP7-12 - Foundation fieldbus

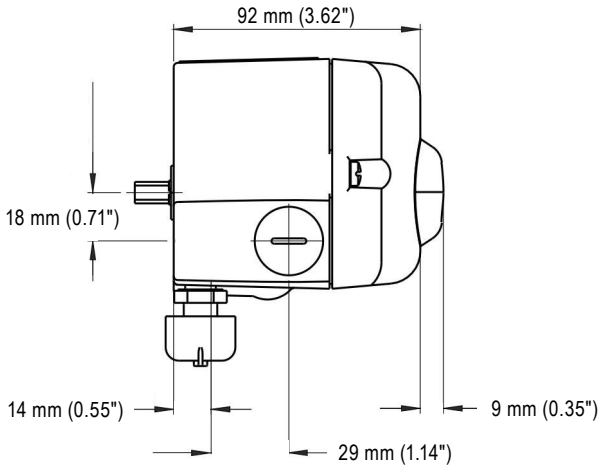
Dimensions (approximate) in mm (and inches)

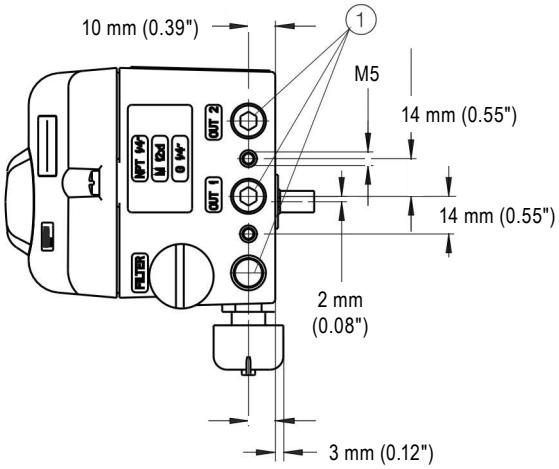




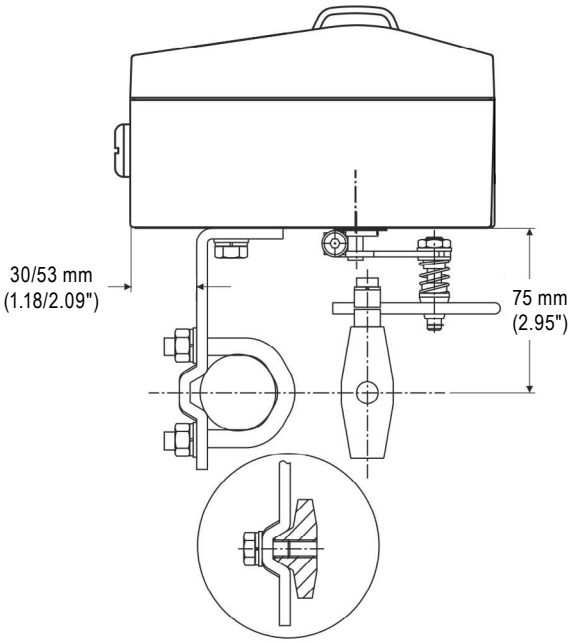
1. Threaded hole M8 (10 mm [0.39"] deep)
2. Threaded hole M6 (8 mm deep [0.31"])
3. Threaded hole M5 x 0.5 (air outputs for direct mount)
4. Sensor shaft (shown larger than scale)

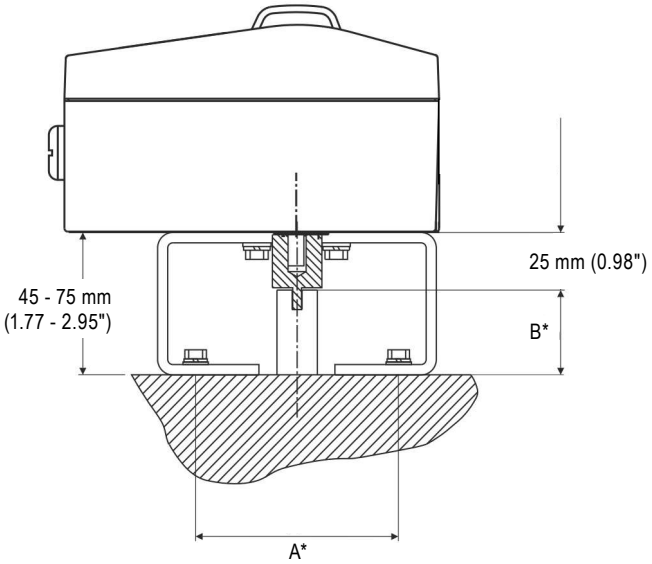
Dimensions (approximate) in mm (and inches)





1 Pneumatic connections, NPT ¼ in-18





* Dimensions A and B depend on the rotary actuator

Rotary positioner mounting kits

Actuator mounting dimensions	Spirax kit nomenclature
80/20 mm (3.1/0.8")	AKR13
80/30 mm (3.1/1.2")	AKR14
130/30 mm (5.1/1.2")	AKR15
130/50 mm (5.1/1.9")	AKR16

For BVA actuators the AKR14 mounting kit is required.

Positioner options for SP7-10 - 4-20 mA or 4-20mA with HART

Standard	**Case/Mounting**	Case made of aluminium, varnished, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845	**10**
		Case made of aluminium, varnished, with mechanical position indicator, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845	**20**
		Remote sensor control unit (Note 1)	**70**
	Input/Communication Port	Input 4 ... 20 mA, two-wire, with connector plug for LKS adapter	**1**
		Input 4 ... 20 mA, two-wire, with connector plug for LKS adapter and FSK module for HART communication	**2**
	Explosion Protection	Without	**0**
		ATEX II 2 G Ex ib IIC T6, T4...T1 Gb	**1**
		IECEx Ex ib IIC T6, T4...T1 Gb	**5**
		NEPSI Ex ib IIC T4/T6 Gb	**V**
		INMETRO Ex Ib IIC T6, T4 ....T1 Gb	**P**
	Output/Safe Position (in case of an electrical power failure)	Single acting, fail safe	**1**
		Single acting, fail freeze	**2**
		Double acting, fail safe (Note 2)	**4**
		Double acting, fail freeze (Note 2)	**5**
	Connections	Cable: Thread ½-14 NPT, air pipe: Thread ¼-18 NPT	**2**
		Cable: Thread M20 x 1.5, air pipe: Thread ¼-18 NPT	**5**
	Option Modules for Analog or Digital Position Feedback	Without	**0**
		Plug-in module for analog position feedback, signal range 4 ... 20 mA, two-wire	**1**
		Plug-in module for digital position feedback	**3**
		Plug-in module for analog position feedback, signal range 4 ... 20 mA, two-wire, and digital position feedback	**5**
	Optional Mechanical Kit for Digital Position Feedback	Without	**00**
		Mechanical kit for digital position feedback with proximity switches SJ2-SN (NC or logical 1) (Note 3)	**10**
		Mechanical kit for digital position feedback with 24 V AC/DC microswitches (change-over contacts) (Note 4)	**50**
	Design (Varnish/Coding)	Standard	**1**
		Higher Stiffness + Lower Air Capacity	**H**
		Protection Class IP 66/NEMA 4X	**P**
		Increased Corrosion Protection incl. Protection Class IP66	**S**

Positioner options continued on next page

Positioner options for SP7-10 - 4-20 mA or 4-20mA with HART (continued)

Optional	Device Identification Label	Stainless steel 18.5 x 65 mm (0.73 x 2.56") (Note 5)	MK1
	Remote Sensor	Basic unit (Note 6)	RS
		Basic unit with position indicator (Note 6)	RD
	Remote Sensor Temperature Range	Extended ambient temperature range -40 ... 100 °C (-40 ... 212 °F) (Note 6)	RT
	Remote Sensor Vibration Resistance	Advanced vibration range 2 g @ 300 Hz (Note 6)	RV
	Remote Sensor Protection Class	Protection class IP 67 (Note 6)	RP
	Remote Sensor Cable	5 m cable enclosed (Note 6)	R5
		10 m cable enclosed (Note 6)	R6

SP7-10

Note 1: With standard characteristic curve, if delivered without remote sensor
Note 2: Not for for integral mounting
Note 3: Only for model with mechanical position indicator
Note 4: Not for explosion protected version and only for model with mechanical position indicator
Note 5: Plain text, max. 16 letters
Note 6: Only with remote sensor control unit

Ordering Code Example:

SP7-10	-	20	1	0	1	5	0	00	1

Positioner options for SP7-11 - PROFIBUS PA

Standard	**Case/Mounting**	Case made of aluminium, varnished, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845	**10**
		Case made of aluminium, varnished, with mechanical position indicator, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845	**20**
	Input/Communication Port	PROFIBUS PA	**3**
	Explosion Protection	Without	**0**
		ATEX II 2 G Ex ib IIC T6, T4...T1 Gb	**3**
		IECEx Ex ib IIC T6, T4...T1 Gb	**M**
		NEPSI Ex ib IIC T4/T6 Gb	**V**
		INMETRO Ex Ib IIC T6, T4 ....T1 Gb	**P**
	Output/Safe Position (in case of an electrical power failure)	Single acting, fail safe	**1**
		Single acting, fail freeze	**2**
		Double acting, fail safe	**4**
		Double acting, fail freeze	**5**
	Connections	Cable: Thread ½-14 NPT, air pipe: Thread ¼-18 NPT	**2**
		Cable: Thread M20 x 1.5, air pipe: Thread ¼-18 NPT	**5**
	Option Module for Shutdown Function	Without	**0**
	Optional Mechanical Kit for Digital Position Feedback	Without	**00**
		Mechanical kit for digital position feedback with proximity switches SJ2-SN (NC or logical 1) (Note: 1)	**10**
		Mechanical kit for digital position feedback with 24 V AC/DC microswitches (change-over contacts) (Note: 2)	**50**
	Design (Varnish/Coding)	Standard	**1**
		Higher Stiffness + Lower Air Capacity	**H**
		Increased Corrosion Protection incl. Protection Class IP66	**S**
Optional	**Device Identification Label**	Stainless steel 18.5 x 65 mm (0.73 x 2.56") (Note: 4)	**MK1**

SP7-11

Note 1: Only for model with mechanical position indicator
Note 2: Not for explosion protected version and only for model with mechanical position indicator
Note 3: (Details on request)
Note 4: Plain text, max. 16 letters

Ordering Code Example: | SP7-11 | - | 20 | 1 | 0 | 1 | 5 | 0 | 00 | 1 |

Positioner options for SP7-12- FOUNDATION Fieldbus

Standard	Case/Mounting	Case made of aluminium, varnished, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845	10
		Case made of aluminium, varnished, with mechanical position indicator, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845	20
	Input/Communication Port	FOUNDATION Fieldbus	4
	Explosion Protection	Without	0
		ATEX II 2 G Ex ib IIC T6, T4...T1 Gb	3
		IECEx Ex ib IIC T6, T4...T1 Gb	M
		NEPSI Ex ib IIC T4/T6 Gb	V
		INMETRO Ex Ib IIC T6, T4 ....T1 Gb	P
	Output/Safe Position (in case of an electrical power failure)	Single acting, fail safe	1
		Single acting, fail freeze	2
		Double acting, fail safe	4
		Double acting, fail freeze	5
	Connections	Cable: Thread ½-14 NPT, air pipe: Thread ¼-18 NPT	2
		Cable: Thread M20 x 1.5, air pipe: Thread ¼-18 NPT	5
	Option Module for Shutdown Function	Without	0
	Optional Mechanical Kit for Digital Position Feedback	Without	00
		Mechanical kit for digital position feedback with proximity switches SJ2-SN (NC or logical 1) (Note: 1)	10
		Mechanical kit for digital position feedback with 24 V AC/DC microswitches (change-over contacts) (Note: 2)	50
	Design (Varnish/ Coding)	Standard	1
		Higher Stiffness + Lower Air Capacity	H
		Increased Corrosion Protection incl. Protection Class IP66	S
	CCC Certification	CCC for Ex ib	CCC
Optional	Device Identification Label	Stainless steel 18.5 x 65 mm (0.73 x 2.56") (Note: 4)	MK1

SP7-12

Note 1: Only for model with mechanical position indicator
Note 2: Not for explosion protected version and only for model with mechanical position indicator
Note 3: (Details on request)
Note 4: Plain text, max. 16 letters

Ordering Code Example: SP7-12 - 20 1 0 1 5 0 00 1

Safety information, installation and maintenance

Full details are contained in the SP7-1* digital positioner Installation and Maintenance Instructions.

Mounting/linkage kit : Positioner mounting kits will be supplied for central mounting as standard.

Actuator Model	Valve Models	Valve Sizes	Spirax kit Nomenclature
PN9100	Spira-trol two port and QL three port	DN15 to DN50 (½" to 2")	AKL10
PN9200		DN15 to DN100 (½" to 4")	AKL10
PN9300		DN15 to DN100 (½" to 4")	AKL10
PN9400		DN125 to DN300 (5" to 12")	AKL17
TN2150	Spira-trol two port and QL three port	DN15 to DN100 (½" to 4")	AKL10
TN2300		DN125 to DN300 (5" to 12")	AKL17
		DN125 to DN300 (5" to 12")	AKL17
TN2400	Spira-trol two port and QL three port	DN125 to DN300 (5" to 12")	AKL17
		DN125 to DN300 (5" to 12")	AKL17
TN2270		DN125 to DN300 (5" to 12")	AKL17
		DN125 to DN300 (5" to 12")	AKL17
PN3000 Sprg Ext	LE, LEA and Steri-trol	DN15 to DN100 (½" to 4")	AKL10
PN4000 Sprg Ret		DN15 to DN100 (½" to 4")	AKL10
PN5000	KE, KEA, LE and LEA	DN15 to DN100 (½" to 4")	AKL10 +UBC
PN6000		DN15 to DN100 (½" to 4")	AKL10 + UBC
PN5000	QL three port	DN125 to DN200 (5" to 8")	AKL11 + UBC
PN6000		DN125 to DN200 (5" to 8")	AKL11 + UBC
PN1600	'C' series	DN65 to DN100 (2½" to 4")	AKL11
PN1600		DN125 to DN200 (5" to 8")	AKL11
PN1600	Spira-trol	DN125 to DN300 (5" to 12")	AKL11

Gauge blocks

		Spirax Nomenclature	Weight
6 bar/87 psi NPT ¼"	Single acting	GBS6A	0.28 kg (0.6 lb)
	Double acting	GBD6A	0.32 kg (0.7 lb)
0.6 MPa/87 psi NPT ¼"	Single acting	GBS06A	0.28 kg (0.6 lb)
	Double acting	GBD06A	0.32 kg (0.7 lb)

How to order

Example: 1 off Spirax Sarco SP7-10-2010150001 Smart positioner with AKL10 mounting kit and GBS6A gauge block..
Caution: The SP7-1* positioner must have a high quality air supply to ISO 8573-1:2010 Class 3:3:3.

TI-P706-04
CTLS Issue 7

SP7-20, SP7-21 and SP7-22
Smart Positioner

Description

The SP7-2* is an electronically configurable positioner with communication capabilities designed for mounting on pneumatic linear or rotary actuators. It features a small and compact design, a modular construction, and an excellent cost-performance ratio. Fully automatic determination of the control parameters and adaptation to the positioner allow for considerable time savings as well as optimum control behaviour.

The positioner has a local communication interface (LCI) as standard in the SP7-20. Additionally, a 'HART® communication' option for communication via the 20 mA signal is available. Both communications are based on the HART® Protocol. Alternatively, HART®5 or HART®7 are available.

Other available options are the SP7-21 with a PROFIBUS PA module or the SP7-22 with FOUNDATION Fieldbus module.
In addition to its input for the analog position set point, the positioner is equipped with a digital input which can be used to activate control system functions in the device. A digital output allows you to output collective messages (alarms/faults).



Throughout the document SP7-2* is written where the information is relevant to all versions; the SP7-20, SP7-21 and SP7-22. Where the information is specific it will be referenced as the version appropriate.

Air supply

The SP7-2* positioner must be provided with a high quality air supply to ISO 8573-1:2010 Class 3:3:3

Approvals

ATEX rating	II 2 G Ex db IIC T4/T5/T6 Gb
IECEx rating	Ex db IIC T4/T5/T6 Gb
CCC (China)	Ex db IIC T4/T5/T6 Gb
NEPSI rating	Ex db IIC T4/T5/T6 Gb
INMETRO rating	Ex db IIC T6 ....T4 Gb

Applications

The SP7-2* can be used with any actuator that conforms to NAMUR, this includes all of the following Spirax Sarco pneumatic actuators:

BVA300 rotary
PN1600 series
PNS3000 and **PNS4000 series**
PN9000 series
TN2000 series

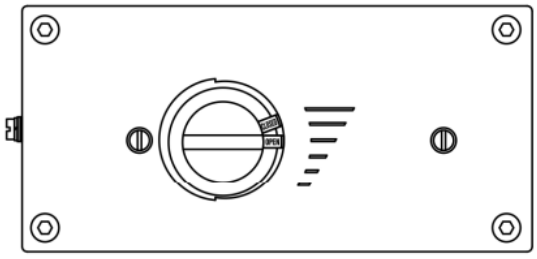
Materials

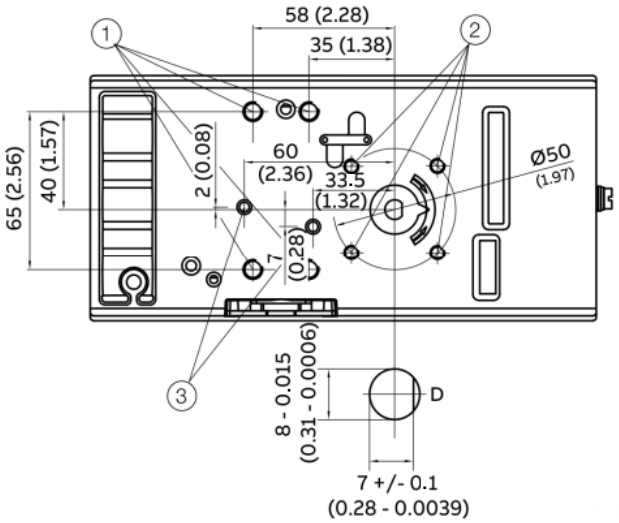
Part	Material	Finish
Case and cover	Die cast aluminium	Case - Anti-corrosive paint, Black
		Cover - Anti-corrosive paint to RAL9016
Mounting kits	Stainless steel	-
Follower pin cone	Nylon	-

Technical data

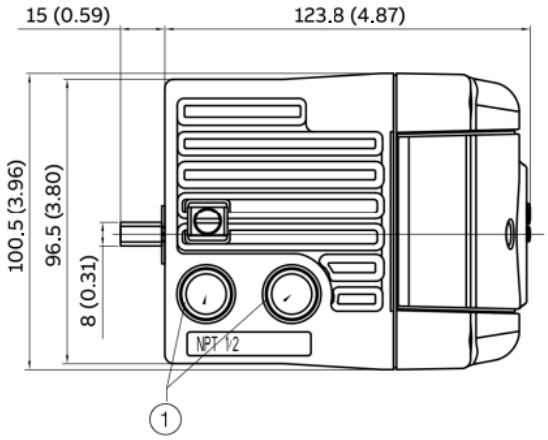
Input signal	4-20 mA (split range minimum amplitude 8 mA) or PROFIBUS PA or FOUNDATION Fieldbus	
Impedance	Max 485 +/- 15 Ω (for 4-20mA input signal only)	
Air supply	1.4 to 6.0 bar (20.3 to 87 psi g)	
Air quality	ISO 8573-1:2010 Class 3:3:3	
Output pressure	0 to 100% supply pressure	
Actuator stroke	20 mm to 150 mm or 55 ° to 90 ° (0.78 to 5.91 inches)	
Action	Single acting/fail vent/Double acting	
Operating temperature	−40 to 85 °C (0.78 to 5.91 inches)	
Air connections	¼" NPT female	
Deviation	≤ 0.5 %	
Tolerance band	0.3 to 10 %, adjustable	
Configurable dead zone	0.1 to 10 %, adjustable for 4-20 mA, HART and PROFIBUS PA, 0.1 to 5 % for FOUNDATION Fieldbus	
Resolution (AD-conversion)	> 16,000 steps	
Sampling frequency	20 ms (for 4-20mA input signal only).	
Ambient temperature effect	≤ 0.5 % per 10 K	
Reference temperature	20 °C (68 °F)	
Influence of vibration	≤ 1 % to 10 g and 80 Hz	
Degree of protection	IP65	
Weight	Linear mounting kit - 0.78 kg (1.72 lb)	
	Rotary mounting kit - 0.4 kg (0.88 lb)	
	Positioner (without mounting kits or gauge blocks) - 3.0 kg (6.61 lb)	
Basic positioner options	SP7-20	4-20 mA or 4-20 mA with HART
	SP7-21	PROFIBUS PA
	SP7-22	FOUNDATION Fieldbus

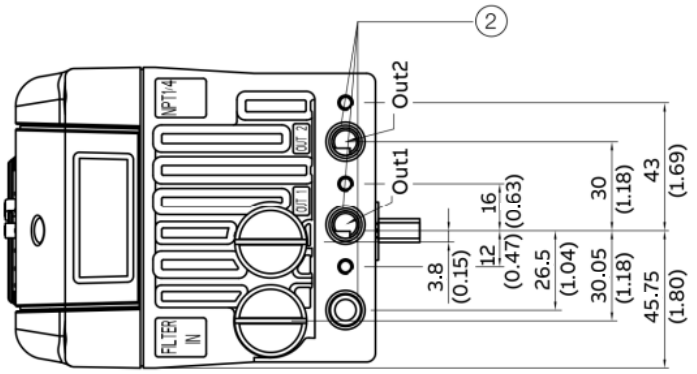
Dimensions (approximate) in mm (and inches)





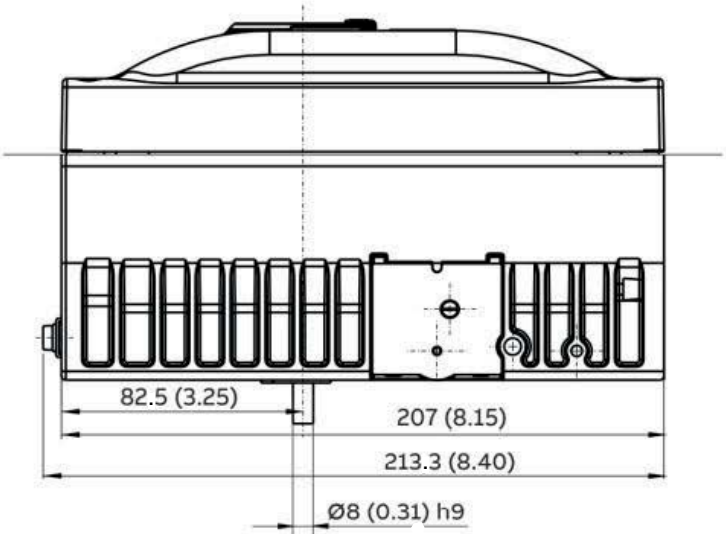
① Threaded hole M8 (10 mm (0.39") deep)
② Threaded hole M6 (8 mm (0.31") deep)
③ Threaded hole M5 x 0.5 (air outputs for integral mount)

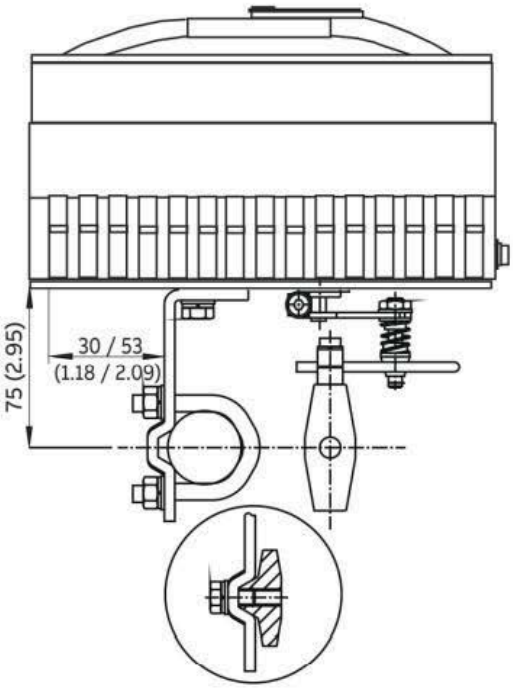


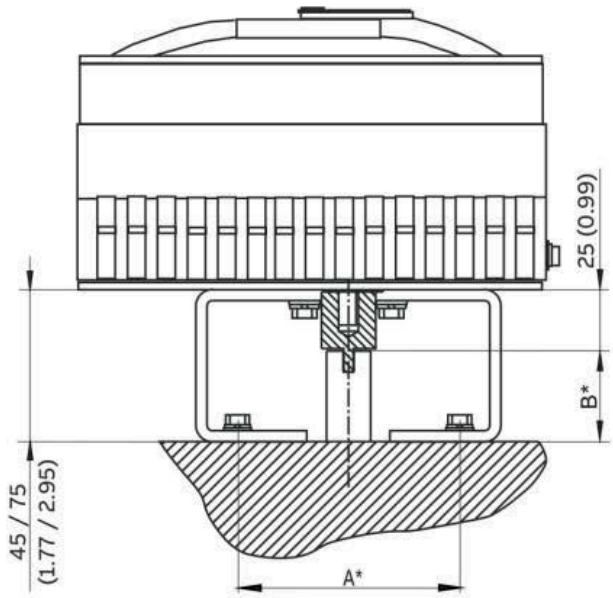


① NPT ½" or M20 x 1.5
② Pneumatic connections, NPT ¼" - 18 oder G¼"

Dimensions (approximate) in mm (and inches)







* Dimensions A and B depend on the rotary actuator

Rotary positioner mounting kits

Actuator mounting dimensions	Spirax kit nomenclature
80/20 mm (3.15/0.79 inches)	AKR13
80/30 mm (3.15/1.18 inches)	AKR14
130/30 mm (5.12/1.18 inches)	AKR15
130/50 mm (5.12/1.97 inches)	AKR16

For BVA actuators the AKR14 mounting kit is required.

Positioner options - SP7-20 - 4-20mA or 4-20 mA with HART

Standard	**Case/Mounting**	Case made of aluminium, varnished, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845	**10**
		Case made of aluminium, varnished, with mechanical position indicator, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845	**20**
	Operation	With operator panel and display integrated in the enclosure cover	**1**
	Explosion Protection	ATEX II 2G Ex db II C T4/T5/T6 Gb	**1**
		IECEx Ex db II C T4/T5/T6 Gb	**6**
		INMETRO Ex db IIC T6 .....T4 Gb	**S**
		NEPSI Ex db IIC T4/T5/T6 Gb	**X**
	Output/Safe Position (in case of an electrical power failure)	Single acting, fail safe	**1**
		Single acting, fail freeze	**2**
		Double acting, fail safe	**3**
		Double acting, fail freeze	**4**
	Connections	Cable: Thread M20 x 1.5, air pipe: Thread 1/4-18 NPT	**2**
		Cable: Thread 1/2-14 NPT, air pipe: Thread 1/4-18 NPT	**3**
	Option Modules for Analog or Digital Position Feedback	Without	**0**
		Plug-in module for analog position feedback, signal range 4 ... 20 mA, two-wire	**1**
		Plug-in module for digital position feedback	**3**
		Plug-in module for analog position feedback, signal range 4 ... 20 mA, two-wire, and digital position feedback	**4**
	Optional Mechanical Kit for Digital Position Feedback	Without	**0**
		Mechanical kit for digital position feedback with proximity switches SJ2-SN (NC or logical 1)	**1**
		Mechanical kit for digital position feedback with 24 V AC/DC microswitches (change-over contacts) (Note 2)	**3**
	Parameter Setting/Bus Address	Factory setting for HART devices	**1**
	Design (Varnish/Coding)	Standard	**1**
		Higher Stiffness + Lower Air Capacity	**H**
		Protection Class IP 66	**P**
	Device Identification Label	Without	**0**
		Stainless steel 18.5 x 65 mm (0.73 x 2.56 in.) (Note 3)	**2**
Optional	**SIL2 - Declaration of Conformity**	SIL2 - Declaration of Conformity (Note 4)	**CS2**
	CCC Certification	CCC for Ex db	**CCC**

SP7-20

Note 1: Only with cable connection NPT thread
Note 2: Only for Ex d version
Note 3: Plain text, max. 16 letters
Note 4: With single acting, fail safe pneumatic only

Ordering Code Example: | SP7-20 | 10 | 1 | 1 | 3 | 2 | 0 | 1 | 1 | 1 | 2 |

Positioner options - SP7-21 - PROFIBUS PA

Standard	Case/Mounting	Case made of aluminium, varnished, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845	10
		Case made of aluminium, varnished, with mechanical position indicator, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845	20
	Operation	With operator panel and display integrated in the enclosure cover	1
	Explosion Protection	ATEX II 2G Ex db II C T4/T5/T6 Gb	1
		IECEx Ex db II C T4/T5/T6 Gb	6
		INMETRO Ex db IIC T6 .....T4 Gb	S
		NEPSI Ex db IIC T4/T5/T6 Gb	X
	Output/Safe Position (in case of an electrical power failure)	Single acting, fail safe	1
		Single acting, fail freeze	2
		Double acting, fail safe	3
		Double acting, fail freeze	4
	Connections	Cable: Thread M20 x 1.5, air pipe: Thread 1/4-18 NPT	2
		Cable: Thread 1/2-14 NPT, air pipe: Thread 1/4-18 NPT	3
	Option Module for Shutdown Function	Without	0
	Optional Mechanical Kit for Digital Position Feedback	Without	03
		Mechanical kit for digital position feedback with proximity switches SJ2-SN (NC or logical 1)	13
		Mechanical kit for digital position feedback with 24 V AC/DC microswitches (change-over contacts) (Note 2)	33
	Design (Varnish/Coding)	Standard	1
		Higher Stiffness + Lower Air Capacity	H
		Protection Class IP 66	P
	Device Identification Label	Without	0
		Stainless steel 18.5 x 65 mm (0.73 x 2.56 in.) (Note 3)	2
Optional	CCC Certification	CCC for Ex db	CCC

SP7-21

Note 1: Only with cable connection NPT thread
Note 2: Only for Ex d version
Note 3: Plain text, max. 16 letters

Ordering Code Example: SP7-21 | 20 | 1 | 1 | 2 | 2 | 0 | 0 | 3 | 1 | 0

Positioner options - SP7-22 - FOUNDATION Fieldbus

Standard	Case/Mounting	Case made of aluminium, varnished, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845	10
		Case made of aluminium, varnished, with mechanical position indicator, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845	20
	Operation	With operator panel and display integrated in the enclosure cover	1
	Explosion Protection	ATEX II 2G Ex db II C T4/T5/T6 Gb	1
		IECEx Ex db II C T4/T5/T6 Gb	6
		INMETRO Ex db IIC T6 .....T4 Gb	S
		NEPSI Ex db IIC T4/T5/T6 Gb	X
	Output/Safe Position (in case of an electrical power failure)	Single acting, fail safe	1
		Single acting, fail freeze	2
		Double acting, fail safe	3
		Double acting, fail freeze	4
	Connections	Cable: Thread M20 x 1.5, air pipe: Thread 1/4-18 NPT	2
		Cable: Thread 1/2-14 NPT, air pipe: Thread 1/4-18 NPT	3
	Option Modules for Shutdown Function	Without	0
	Optional Mechanical Kit for Digital Position Feedback	Without	04
		Mechanical kit for digital position feedback with proximity switches SJ2-SN (NC or logical 1)	14
		Mechanical kit for digital position feedback with 24 V AC/DC microswitches (change-over contacts) (Note 2)	34
	Design (Varnish/Coding)	Standard	1
		Higher Stiffness + Lower Air Capacity	H
		Protection Class IP 66	P
	Device Identification Label	Without	0
		Stainless steel 18.5 x 65 mm (0.73 x 2.56 in.) (Note 3)	2
Optional	CCC Certification	CCC for Ex db	CCC

SP7-22

Note 1: Only with cable connection NPT thread
Note 2: Only for Ex d version
Note 3: Plain text, max. 16 letters

Ordering Code Example: SP7-22 | 10 | 1 | 1 | 3 | 2 | 0 | 34 | P | 2

Mounting/linkage kit : Positioner mounting kits for central mounting

Actuator model	Valve models	Valve sizes		Spirax kit nomenclature
PN9100	Spira-trol two port and QL three port	DN15 to DN50	(½" to 2")	AKL10
PN9200		DN15 to DN100	(½" to 4")	AKL10
PN9300				
PN9400		DN125 to DN300	(5" to 12")	AKL17
TN2150	Spira-trol two port and QL three port	DN15 to DN100	(½" to 4")	AKL10
TN2300		DN125 to DN300	(5" to 12")	AKL17
TN2400	Spira-trol two port and QL three port	DN125 to DN300	(5" to 12")	AKL17
TN2270				
PN3000 Sprg Ext	LE, LEA and Steri-trol	DN15 to DN100	(½" to 4")	AKL10
PN4000 Sprg Ret				
PN5000	KE, KEA, LE and QL three port	DN15 to DN100	(½" to 4")	AKL10 +UBC
PN6000				
PN5000	QL three port	DN125 to DN200	(5" to 8")	AKL11 + UBC
PN6000				
PN1600	''C' series	DN65 to DN100	(2½" to 4")	AKL11
PN1600		DN125 to DN200	(5" to 8")	AKL11
PN1600	Spira-trol	DN125 to DN300	(5" to 12")	AKL11

BVA actuators

For BVA actuators the AKR14 mounting kit is required.

Gauge blocks

		Spirax Nomenclature	Weight	
6 bar/87 psi NPT¼"	Single acting	GBS6A	0.28 kg	(0.62 lb)
	Double acting	GBD6A	0.32 kg	(0.71 lb)
0.6 Mpa/87 psi NPT¼"	Single acting	GBS06A	0.28 kg	(0.62 lb)
	Double acting	GBD06A	0.32 kg	(0.71 lb)

How to order

Example: 1 off Spirax Sarco SP7-20-10113201112 Smart positioner with AKL10 mounting kit and GBS6A gauge block.
Caution: The SP7-20 positioner must have a high quality air supply to ISO 8573-1:2010 Class 3:3:3.

TI-P707-02
CTLS Issue 3

SP8-10
Smart Positioner

Description

The SP8-10 is an electronically configurable positioner with communication capabilities designed for mounting on pneumatic linear or rotary actuators. It features a small and compact design, a modular construction, and an excellent cost-performance ratio. Fully automatic determination of the control parameters and adaptation to the positioner allow for considerable time savings as well as optimum control behaviour.

An I/P module with subsequent pneumatic amplifier is used to control the pneumatic actuator. The well-proven I/P module proportionally converts the permanent electrical set point signal from the CPU into a pneumatic signal used to adjust a 3/3-way valve. Dosing of the air flow for pressurizing or depressurizing the actuator is continuously adjusted. As a result, excellent control results are achieved. When reaching the set point, the 3/3-way valve is closed in centre position to minimize the air consumption. The pneumatic system can be supplied in four versions: for single acting and double acting actuators and each with the 'fail-safe' / 'fail-freeze' safety function.

In addition to its input for the analogue position set point, the positioner is equipped with a digital input which can be used to activate control system functions in the device. A digital output allows you to output collective messages (alarms / faults).



Applications

The SP8-10 can be used with any actuator that conforms to NAMUR, this includes all of the following Spirax Sarco pneumatic actuators:

BVA300 rotary	**PN9000 series**
PN1600 series	**TN2000 series**
PNS3000 and **PNS4000 series**	

Materials

Part	Material	Finish
Case and cover	Die cast aluminium	Case - Anti-corrosive paint, Black
		Cover - Anti-corrosive paint to RAL9016
Mouting kits	Stainless steel	-
Follower pin cone	Nylon	-

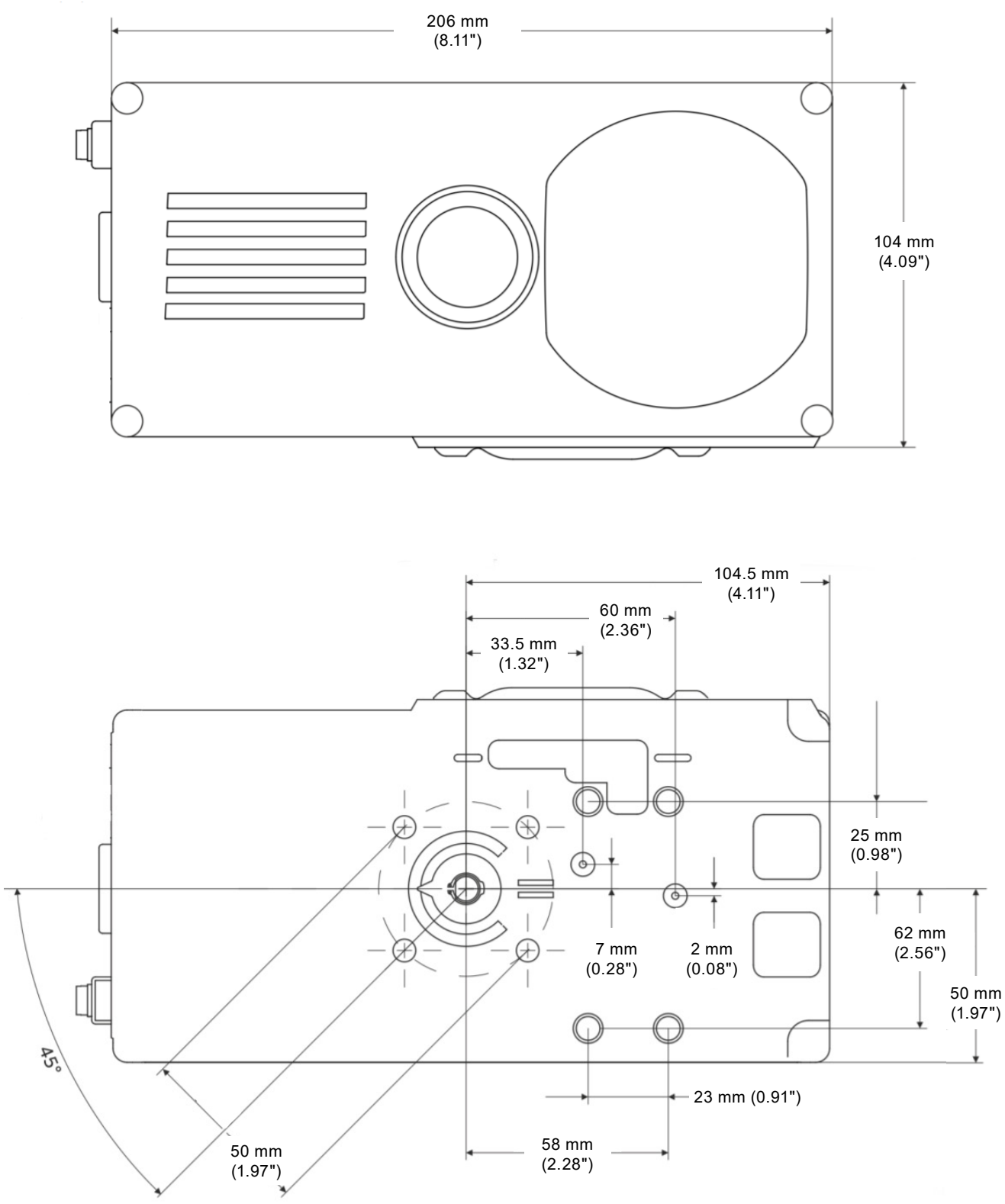
Technical data

Input signal range	4-20 mA (split range minimum amplitude 8 mA)
Impedance	485 ohms at 20mA
Output pressure	0 to 10 bar (0 to 145 psi)
Actuator stroke	Min. and max. limits, freely configurable in range 0 to 100 %
Action	Single acting/fail vent/Double acting
Operating temperature	−40 to 85 °C (-40 to 185 °F)
Air connections	¼" NPT female
Deviation	≤ 0.5 %
Tolerance band	0.3 to 10 %, adjustable
Configurable dead zone	0.1 to 10 %, adjustable
Resolution (AD-conversion)	> 16,000 steps
Sampling frequency	20 ms
Ambient temperature effect	≤ 0.5 % per 10 K
Reference temperature	20 °C (68 °F)
Influence of vibration	≤ 1 % to 10 g and 80 Hz
Degree of protection	IEC 60529 IP65 (Ex versions IEC 60079-0 IP64)
Weight	Linear mounting kit - 0.78 kg (1.7 lb)
	Rotary mounting kit - 0.4 kg (0.8 lb)

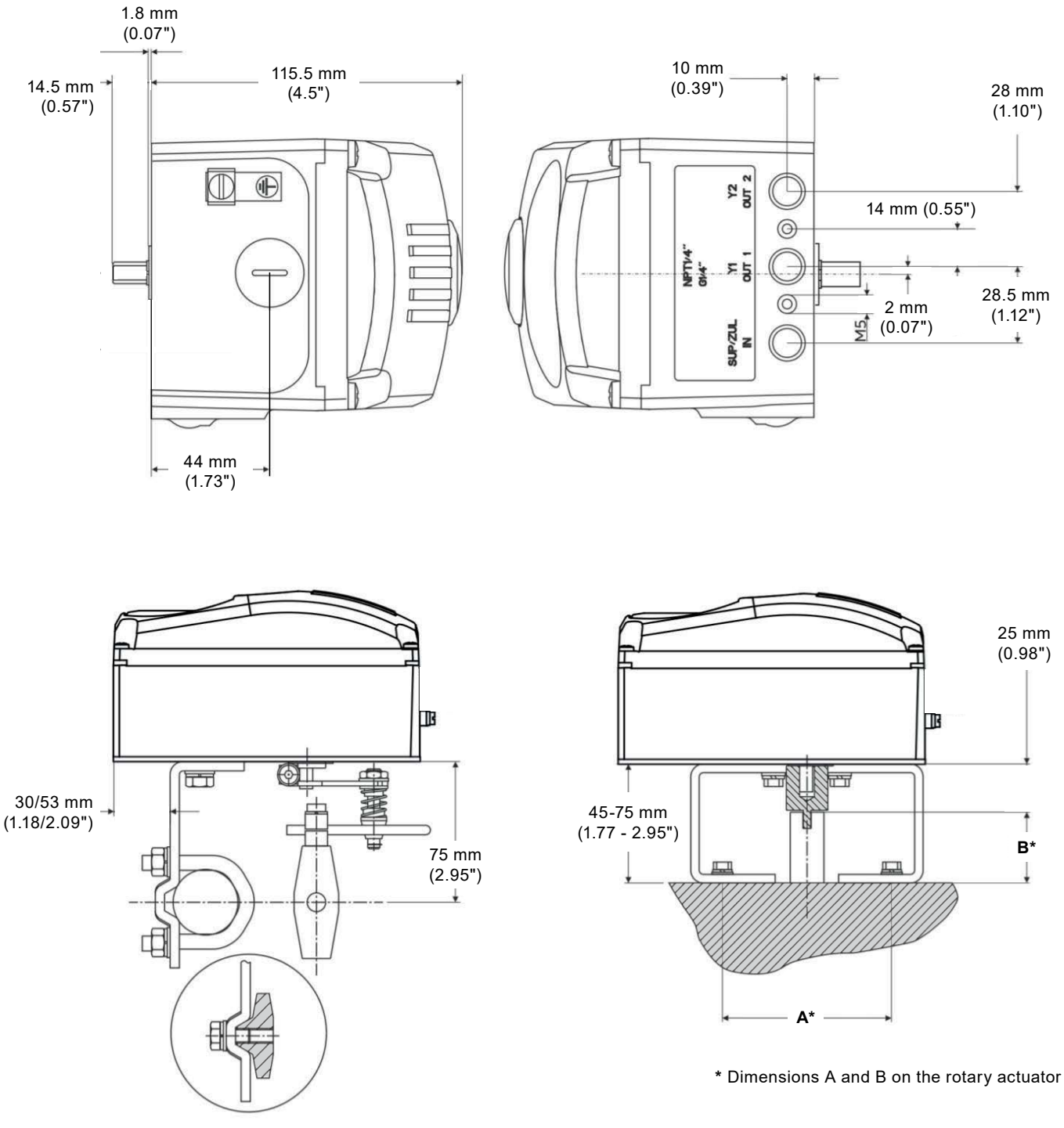
SP8-10 Approvals

ATEX II 1G Ex ia IIC T6 Ga	IECEx Ex ia IIC T6 Ga
ATEX II 1D Ex ia IIIC T_{200} 70 °C Da	IECEx Ex ia IIIC T_{200} 70 °C Da
ATEX II 1G Ex ia IIC T4 Ga	IECEx Ex ia IIC T4 Ga
ATEX II 1D Ex ia IIIC T_{200} 115 °C Da	IECEx Ex ia IIIC T_{200} 115 °C Da
ATEX II 3G Ex ec IIC T6 Gc	IECEx Ex ec IIC T6 Ga ; Ex nA IIC T6 Gc
ATEX II 2D Ex tb IIIC T_{200} 70 °C Db	IECEx Ex tb IIIC T_{200} 70 °C Da
ATEX II 3G Ex ec IIC T4 Gc	IECEx Ex ec IIC T4 Ga ; Ex nA IIC T4 Gc
ATEX II 2D Ex tb IIIC T_{200} 115 °C Db	IECEx Ex tb IIIC T_{200} 115 °C Da

Dimensions (approximate) in mm (and inches)



Dimensions (approximate) in mm (and inches)



* Dimensions A and B on the rotary actuator

Rotary positioner mounting kits

Actuator mounting dimensions	Spirax kit nomenclature
80/20 mm	AKR13
80/30 mm	AKR14
130/30 mm	AKR15
130/50 mm	AKR16

For BVA actuators the AKR14 mounting kit is required.

Positioner Options for SP8-10

Standard		Without	**Y0**
	Explosion Protection Certification	ATEX II 1G Ex ia IIC T6 Ga ATEX II 1D Ex ia IIIC T200 70 °C Da Ta = -40 °C to 40 °C (-40 °F to 104 °F) ATEX II 1G Ex ia IIC T4 Ga ATEX II 1D Ex ia IIIC T200 115 °C Da Ta = -40 °C to 85 °C (-40 °F to 185 °F) IP64 Connection values : see manual	**A1**
		ATEX II 3G Ex ec IIC T6 Gc ATEX II 2D Ex tb IIIC T200 70 °C Db Ta = -40 °C to 40 °C (-40 °F to 104 °F) ATEX II 3G Ex ec IIC T4 Gc Ta = -40 °C to 80 °C (-40 °F to 176 °F) ATEX II 2D Ex tb IIIC T200 115 °C Db Ta = -40 °C to 85 °C (-40 °F to 185 °F) IP64 Connection values : see manual	**B1**
		IECEx Ex ia IIC T6 Ga IECEx Ex ia IIIC T200 70 °C Da Ta = -40 °C to 40 °C (-40 °F to 104 °F) IECEx Ex ia IIC T4 Ga IECEx Ex ia IIIC T200 115 °C Da Ta = -40 °C to 85 °C (-40 °F to 185 °F) IP64 Connection values : see manual	**M1**
		IECEx Ex ec IIC T6 Ga ; Ex nA IIC T6 Gc IECEx Ex tb IIIC T200 70 °C Da Ta = -40 °C to 40 °C (-40 °F to 104 °F) IECEx Ex ec IIC T4 Ga ; Ex nA IIC T4 Gc Ta = -40 °C to 80 °C (-40 °F to 176 °F) IECEx Ex tb IIIC T200 115 °C Da Ta = -40 °C to 85 °C (-40 °F to 185 °F) IP64 Connection values : see manual	**N1**
	Input Signal / Communication Port	4 ... 20 mA	**A**
		HART digital communication and 4 ... 20 mA	**H**
	Pneumatic Output Type	Single acting	**1**
		Double acting	**2**
	Safe Position	Fail-safe	**S**
		Fail-freeze	**F**
	Air Pipe Connection Thread	Air Pipe Connection Thread ¼-18 NPT female	**2**
	Cable Conduits	Thread M20 x 1.5 female	**C**
		Thread NPT ½" female	**D**

12.3
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When the stainless steel housing material is selected, gauge blocks will automatically be S/S

Positioner options for SP8-10 continued on next page

Positioner options for SP8-10 (continued)

Optional	Option Module Slot 1	Analogue feedback output	A1
		Digital feedback output	A2
		Analogue universal input	A3
	Option Module Slot 2	Analogue feedback output B1	B1
		Digital feedback output B2	B2
		Analogue universal input B3	B3
		Emergency shutdown module B4	B4
	Option, Air Power	50 kg/h	L5
	Position Indicator	Visual Indicator, integrated into cover	D1
	Limit Switches	Microswitches (Not suitable for Ex versions)	F1
		Proximity switches (NC) SJ2-SN	F2
	Housing Material	Stainless steel	H1
	Position Sensor Type	With integrated (contactless) position sensor	K1
		Control Unit for remote position sensor (Not suitable for Ex versions)	K2
	Special Applications	Option with natural gas (Aluminium or Stainless housing. Only for Ex versions1)	P8
		With Noise reduction	P9
	Pressure Gauge Bl °Ck Type	0 ... 1 MPa (0 ... 10 bar, 0 ... 145 psi)	R3
		Matl. Stainless Steel if option H1 selected	
	Pressure Diagnosis Module	Pressure Sensors	S3
	Additional TAG plate	Stainless steel 18.5 mm x 65 mm (0.73" x 2.5")	T1
		Sticker 11 mm x 25 mm (0.44" x 1") (Not suitable for Ex versions)	T3
	Mounting Options	Prepared for integral mounting	
	Remote Sensor	Basic unit (Not suitable for Ex versions)	RS
		Matl. Stainless Steel if option H1 selected (Not suitable for Ex versions)	
	Remote Sensor Temperature Range	Extended ambient temperature range -40 ... 100 °C (-40 ... 212 °F) (Not suitable for Ex versions)	RT
	Remote Sensor Vibration Resistance	Advanced vibration range 2 g @ 300 Hz (Not suitable for Ex versions)	RV
	Remote Sensor Protection Class	Protection class IP 66 (Not suitable for Ex versions)	RP
	Remote Sensor Cable	5 m cable enclosed (Not suitable for Ex versions)	R5
		10 m cable enclosed (Not suitable for Ex versions)	R16

Note: Option M1 is not suitable for use with natural gas medium

Ordering Code Example: SP8-10 | Y0 | H | 2 | F | 2 | C

SP8, Without Explosion Protection Certification, HART, Double Acting, Fail-Freeze, ¼ NPT Air Pipe Connection, M20 x 1.5 Cable Conduits.

Safety information, installation and maintenance

Full details are contained in the SP8-10 digital positioner Installation and Maintenance Instructions.

Mounting/linkage kit : Positioner mounting kits will be supplied for central mounting as standard.

Actuator Model	Valve Models	Valve Sizes	Spirax kit Nomenclature
PN9100	Spira-trol two port and QL three port	DN15 to DN50 (½" to 2")	AKL10
PN9200		DN15 to DN100 (½" to 4")	AKL10
PN9300		DN15 to DN100 (½" to 4")	AKL10
PN9400		DN125 to DN300 (5" to 12")	AKL17
TN2150	Spira-trol two port and QL three port	DN15 to DN100 (½" to 4")	AKL10
TN2300		DN125 to DN300 (5" to 12")	AKL17
TN2400	Spira-trol two port and QL three port		AKL17
			AKL17
TN2270			AKL17
			AKL17
PN3000 Sprg Ext	LE, LEA and Steri-trol	DN15 to DN100 (½" to 4")	AKL10
PN4000 Sprg Ret			
PN5000	KE, KEA, LE and LEA	DN15 to DN100 (½" to 4")	AKL10 +UBC
PN6000			
PN5000	QL three port	DN125 to DN200 (5" to 8")	AKL11 + UBC
PN6000			
PN1600	'C' series	DN65 to DN100 (2½" to 4")	AKL11
PN1600		DN125 to DN200 (5" to 8")	AKL11
PN1600	Spira-trol	DN125 to DN300 (5" to 12")	AKL11

Gauge blocks

	Material	Spirax Nomenclature	Weight
1,0 MPa/145 psi NPT¼"	Aluminium	GBS1A	0.28 kg (0.6 lb)
		GBD1A	0.32 kg (0.7 lb)
		GBS1S	0.50 kg (1.1 lb)
		GBD1S	0.52 kg (1.1 lb)

	Material	Spirax Nomenclature	Weight
10 bar/145 psi NPT¼"	Stainless steel	GBS10A	0.28 kg (0.6 lb)
		GBD10A	0.32 kg (0.7 lb)
		GBS10S	0.50 kg (1.1 lb)
		GBD10S	0.52 kg (1.1 lb)

How to order

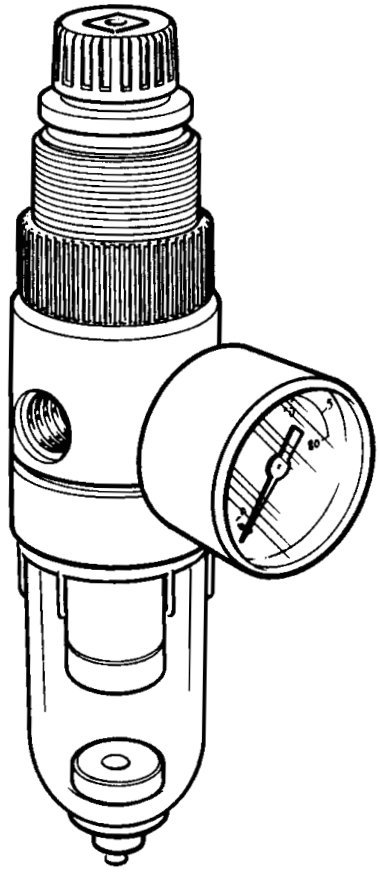
Example: 1 off Spirax Sarco SP8-10-Y0H2F2C Smart positioner with AKL10 mounting kit and GBS6A gauge block.
Caution: The SP8-10 positioner must have a high quality air supply to ISO 8573-1:2010 Class 3:3:3.

TI-P436-04-US
Issue 1

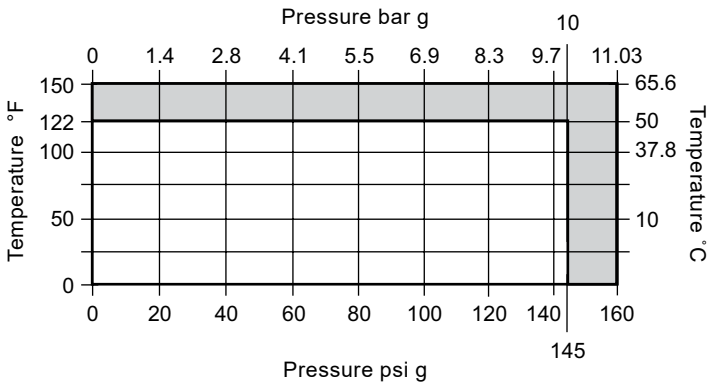
MPC2
High Efficiency Compressed Air Filter/Regulator

Description
Spirax Sarco high efficiency oil removing filter/regulator. To provide very high quality compressed air, with accurate pressure control, for pneumatic actuators and general purpose systems.

Model	MPC2
Sizes	¼"
Connections	¼" O.D. Tube
Construction	Aluminum/Polycarbonate
Pressure range	0 to 100 psi g (0 to 6.8 bar g)



Pressure/temperature limits



The product **must not** be used in this region.

Pressure gauge
1½" gauge with face in psi and bar is supplied with each MPC2.

Pressure Range:	0 to 100 psi g (0 - 6.9 bar g)

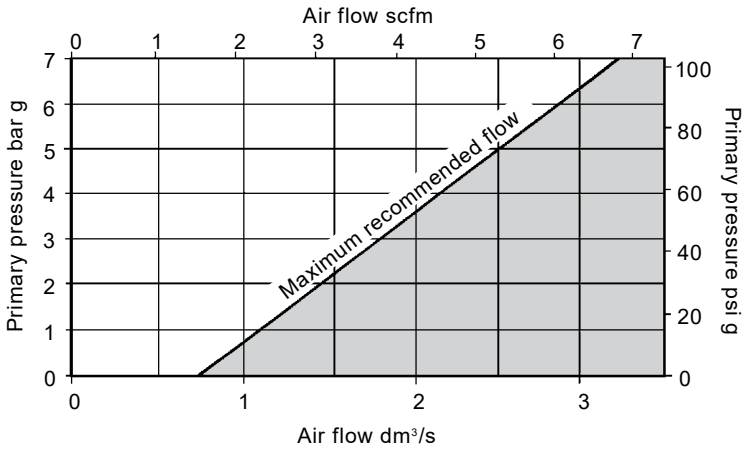
FK21 Fixing Kit
All MPC2's come complete with FK21 Fixing Kits to allow direct mounting onto the Spirax Sarco range of PN Pneumatic Actuators.

Materials

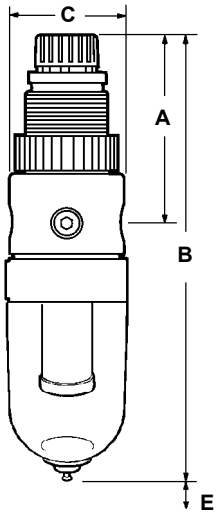
No.	Part	Material
1	Body	Aluminum
2	Body finish	Electrophoretic epoxy
		Internal and external
3	Bowl	Polycarbonate
4	Bonnet assembly	Polycarbonate
5	Filter element	MicroFibre/Stainless Steel
6	Valve	Nitrile

Performance Selection

For any specified primary filtration pressure, there is a maximum recommended air flow rate. Keeping within this, will ensure that the element performance maintains the stated high efficiency levels, particularly for the removal of oil and water contaminants.

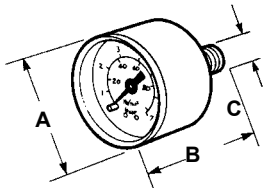


Dimensions/weights (approximate) in inches (mm) and lbs (kg)

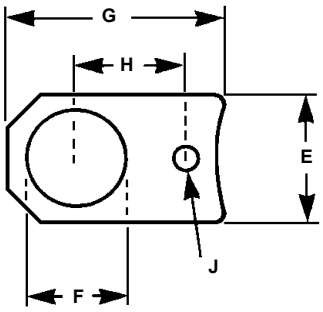


Withdrawal Distance

Size	A	B	C	E	Weight
¼"	2.5	6.1	1.6	1	1 lb
	(64)	(155)	(41)	(25)	(0.45 kg)

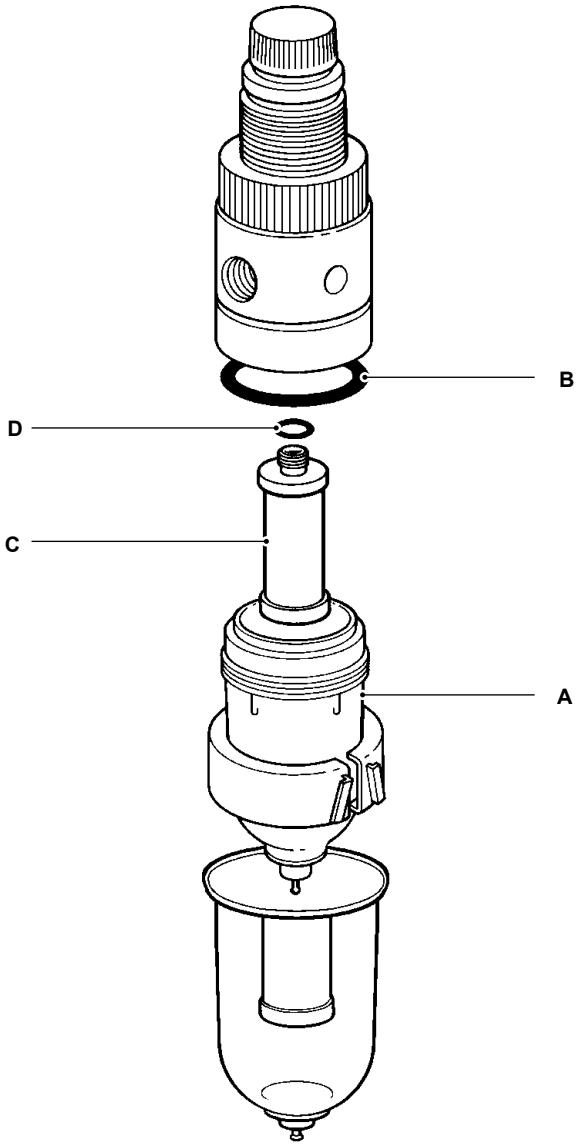


Size	A	B	C
1½"	1.5	1.8	R⅛"
	(38)	(46)	



E	F	G	H	J
1.5	1.2	2.4	1.26	0.31
(38.1)	(30.5)	(61.0)	(32.0)	(7.9)

Spare parts



Bowl Assembly (specify with or without Drain)	**A,B**
Element and O Ring Set	**B, C, D**

How to order

Example: 1 Element and 'O' ring set for ¼" Spirax-Monnier Filter/Regulator Type MPC2

TI-P703-01
CTLS Issue 3

EP6
Electro-pneumatic Positioner



Description

The EP6 Electro-pneumatic positioner can control any valve that is actuated by a linear or rotary pneumatic actuator that conforms with NAMUR. It guarantees an exact proportionality between the stroke of the valve and the value of the electrical input signal (mA) into the positioner.
The EP6 has a cast aluminium housing that is also treated for outdoor installation. The unit can be mounted onto pneumatic actuators either rotary 55-90° or linear 20 to 150 mm.
The positioner can be supplied without a mounting kit or with a kit for rotary or linear actuators, the type must be specified when ordering.
As standard the EP6 is equipped with a pressure gauge to indicate the air pressure command sent to the pneumatic actuator.
The positioner is supplied for a control signal in mA and for an air supply pressure up to 7 bar.
The EP6 positioner can also be used to reverse the action of the control signal.

Air supply

The EP6 positioner must be provided with a high quality air supply to ISO 8573-1:2010 Class 3:3:2

Applications

The EP6 can be used with any actuator that conforms to NAMUR, this includes all of the following Spirax Sarco pneumatic actuators:

BVA300 rotary
PN1600 series
PNS3000 and **PNS4000 series**
PN9000 series
TN2000 series

Materials

Part	Material	Finish
Case and cover	Die cast aluminium	Anti-corrosive paint to RAL9016
Mounting bracket	Steel	EP protected
Feedback pin	Stainless steel	
Feedback lever	Stainless steel	
Feedback pin locator	Stainless steel	
Screws	Stainless steel	

Technical data

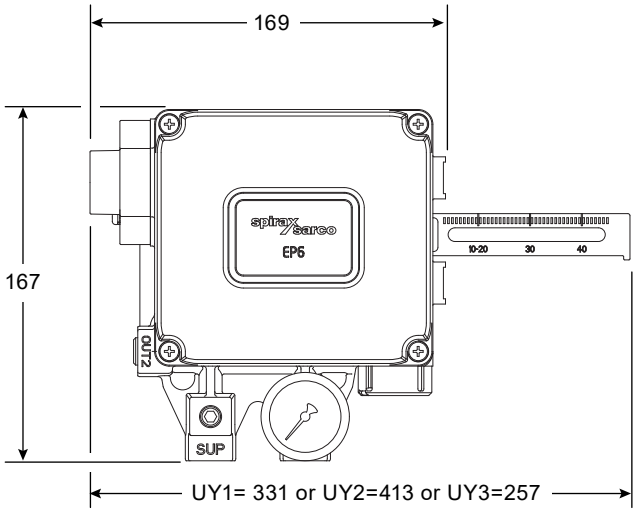
Input signal range	4-20 mA (split range minimum amplitude 8 mA)	
Impedance	Max 250 +/- 15 Ω	
Air supply	1.4 to 7.0 bar (regulate 5 to 10 psi above actuator spring range)	
Air quality	ISO 8573-1:2010 Class 3:3:2	
Output pressure	0 to 100% supply pressure	
Actuator stroke	20 mm to 150 mm or 0° to 90°	
Action	Single acting/fail vent/Double acting	
Operating temperature	Standard temperature	-20 °C to +70 °C
	High temperature	-20 °C to +120 °C
Air flow	80 LPM @ 1.4 bar	
Steady state air consumption	2.4 LPM @ 1.4 bar	
Air connections	¼" NPT female	
Sensitivity	Single : +/- 0.2% F.S. (Full Scale)	
	Double : +/- 0.5% F.S	
Hysteresis	+/- 1% F.S.	
Linearity	Single +/- 1% F.S.	
	Double +/- 2% F.S.	
Repeatability	+/- 0.5% F.S	
Electrical connections	Cable gland M20 internal, terminals for conductors from 0.5 to 2.5 mm² wire	
Degree of protection	IP66	
Characteristic	Linear	
Shipping weight	Linear 2.8 kg (positioner only)	
	Mounting Kits for Linear EY3 and EY4 - 1.3 kg, UY1,2,3 - 0.9 kg, UBC - 0.2 kg	
	Rotary 4.1 kg (Positioner and mounting kit)	

Positioner options

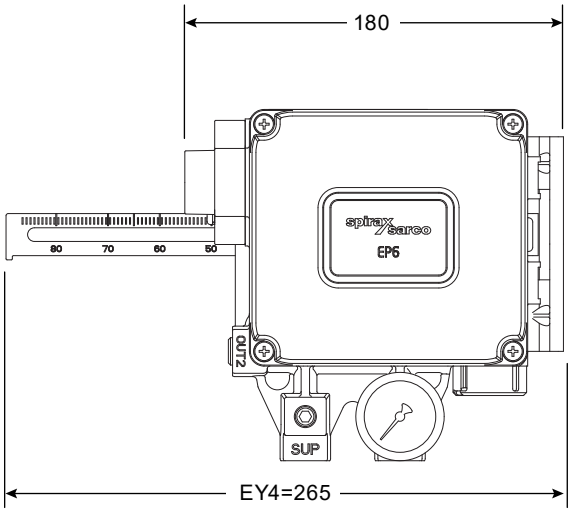
Basic model	Aluminium enclosure	**EP6**
Acting type	Single acting	**S**
	Single Acting + Reduced Orifice Ø 1	**A**
	Double acting	**D**
Mounting type	Linear - See page 4 for Mounting Kit selection	**L**
	Rotary - Mounting Kit included	**R**
Hazardous area protection	Safe area	**S**
Electrical and Air connection	M20 -¼" NPT	**1**
Non standard features	Standard model	**A**
	Standard Model + Supply Pressure Gauge	**B**
	High Temp Model (-20 °C to +120 °C)	**H**
	High Temp Model (-20 °C to +120 °C) + Supply Pressure Gauge	**K**

Ordering Code Example: EP6 | S | L | S | 1 - A

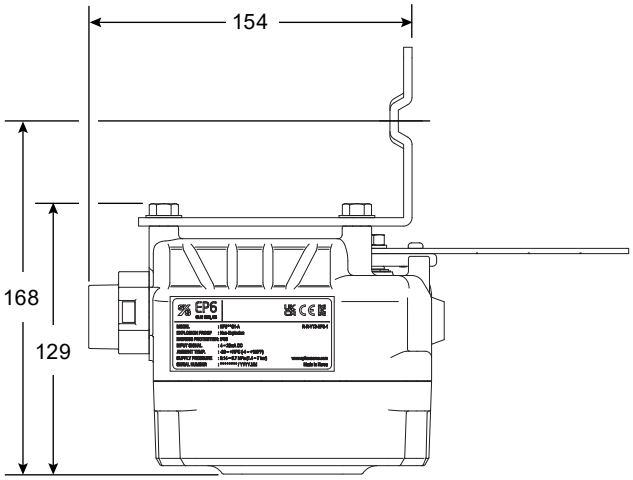
Dimensions (approximate) in mm

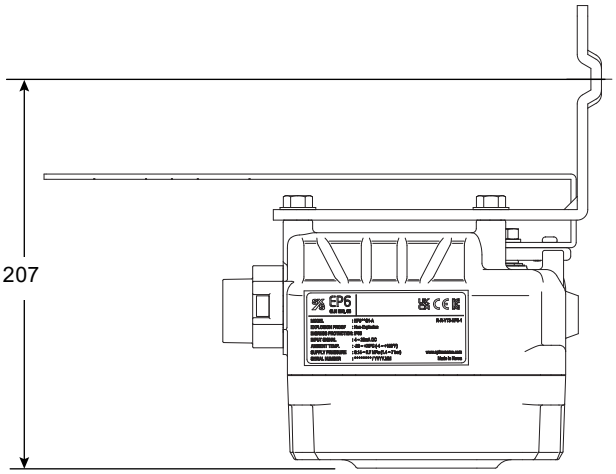


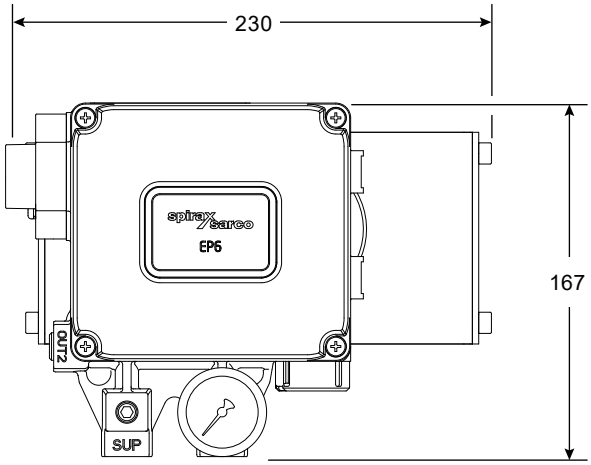
Linear left mounted

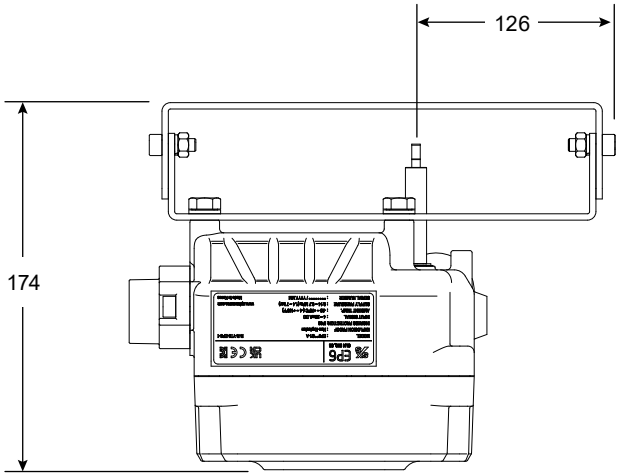


Linear centrally mounted









Rotary mounted

Mounting/linkage kit : Positioner mounting kits will be supplied for central mounting as standard.

Mounting Position	Actuator Model	Valve Models	Valve Sizes	Spirax kit Nomenclature
Central	PN9100	Spira-trol™ two port and QL three port	DN15 to DN50	EY3
	PN9200		DN15 to DN100	
	PN9300			
	PN9400		DN125 to DN300	EY4
	TN2150	Spira-trol™ two port and QL three port	DN15 to DN100	EY3
	TN2300		DN125 to DN300	EY4
	TN2400			
	TN2270			
	PN3000 Sprg Ext	LE, LEA and Steri-trol	DN15 to DN100	EY3
	PN4000 Sprg Ret			
	PN5000	KE, KEA, LE and LEA	DN15 to DN100	EY3 + UBC
	PN6000			
	PN5000	Spira-trol™ QL three port	DN125 to DN200	EY4 + UBC
	PN6000			
Left side	PN9100	Spira-trol™ two port and QL three port	DN15 to DN50	UY3
	PN9200		DN15 to DN100	
	PN9300			
	PN9400		DN125 to DN300	UY1
	TN2150	Spira-trol™ two port and QL three port	DN15 to DN100	Not Compatible
	TN2300		DN125 to DN300	UY1
	TN2400			
	TN2270			
	PN3000 Sprg Ext	LE, LEA and Steri-trol	DN15 to DN100	UY3
	PN4000 Sprg Ret			
	PN5000	KE, KEA, LE and LEA	DN15 to DN100	UY3 + UBC
	PN6000			
	PN5000	Spira-trol™ QL three port	DN125 to DN200	UY1 + UBC
	PN6000			
	PN1600	'C' series	DN65 to DN100	UY1
	PN1600	'C' series	DN125 to DN200	UY2
	PN1600	Spira-trol™	DN125 to DN300	

Customer requirement example:

1 off Electro-pneumatic positioner for use with single acting PN9300 actuator, having 30 mm stroke.

12.3
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How to order

Example: 1 off Spirax Sarco EP6SLS1-A Electro-pneumatic Positioner + EY3 mounting kit.
Caution: The EP6 positioner must have a high quality air supply to ISO 8573-1:2010 Class 3:3:2.

TI-P703-03
CTLS Issue 5

EP6
ATEX Electro-pneumatic Positioner

Description

The EP6 Electro-pneumatic positioner can control any valve that is actuated by a linear pneumatic actuator that conforms with NAMUR. It guarantees an exact proportionality between the stroke of the valve and the value of the electrical input signal (mA) into the positioner.

The EP6 has a cast aluminium housing that is also treated for outdoor installation. The unit can be mounted onto pneumatic actuators either rotary 55-90° or linear 20 to 150 mm.
The positioner can be supplied without a mounting kit or with a kit for rotary or linear actuators, the type must be specified when ordering.

As standard the EP6 is equipped with a pressure gauge to indicate air pressure command sent to the pneumatic actuator.
The positioner is supplied for a control signal in mA and for an air supply pressure up to 7 bar.

The EP6 positioner can also be used to reverse the action of the control signal.



Air supply

The EP6 positioner must be provided with a high quality air supply to ISO 8573-1:2010 Class 3:3:3.

Applications

The EP6 can be used with any actuator that conforms to NAMUR, this includes all of the following Spirax Sarco pneumatic actuators:

BVA300 rotary
PN1600
PNS3000 and **PNS4000 series**
PN9000 series
TN2000 series

ATEX rating Flameproof. Not intrinsically safe.		II 2G Ex db mb IIB T5 Gb
INMETRO (Brazil)		Ex db mb IIB T5 Gb
CCC (China)		Ex d mb IIB T5 Gb
UKEX rating Flameproof. Not intrinsically safe.		II 2G Ex db mb IIB T5 Gb

Materials

Part	Material	Finish
Case and cover	Die cast aluminium	Anti-corrosive paint to RAL9016
Mounting bracket	Steel	EP protected
Feedback pin	Stainless steel	
Feedback lever	Stainless steel	
Feedback pin locator	Stainless steel	
Screws	Stainless steel	

Technical data

Input signal range	4-20 mA
Impedance	Max 250 +/- 15 Ω
Air supply	1.4 to 7.0 bar (regulate 0.4 to 0.7 bar above actuator spring range)
Air quality	ISO 8573-1:2010 Class 3:3:2
Output pressure	0 to 100% supply pressure
Actuator stroke	20 mm to 150 mm or 55° to 90°
Action	Single acting/fail vent/Double acting
Operating temperature	-20 °C to +60 °C
Air flow	80 LPM @ 1.4 bar
Steady state air consumption	2.5 LPM @ 1.4 bar
Air connections	¼" NPT female
Sensitivity	Single +/- 0.2% F.S. (Full Scale)
	Double +/- 0.5%
Hysteresis	+/- 1% F.S.
Linearity	Single +/- 1%F.S.
	Double +/- 2% F.S.
Repeatability	+/- 0.5% F.S
Electrical connections	Cable gland M20 internal, terminals for conductors from 0.5 to 2.5 mm² wire
Degree of protection	IP66
Characteristic	Linear
Shipping weight	Linear 3.0 kg (positioner only)
	Mounting Kits for Linear EY3 and EY4 - 1.3 kg, UY1,2,3 - 0.9 kg, UBC - 0.2 kg
	Rotary 4.4 kg (Positioner and mounting kit)

Positioner options

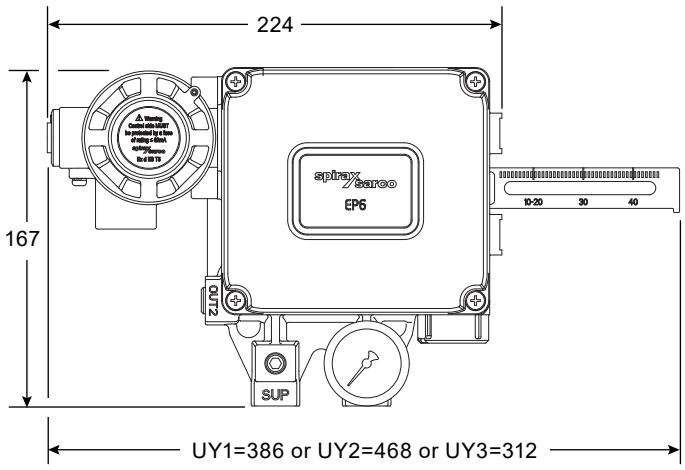
Basic model	Aluminium enclosure	**EP6**
Acting type	Single acting	**S**
	Double acting	**D**
	Single Acting + Reduced Orifice Ø 1	**A**
Mounting type	Linear - See page 4 for Mounting Kit selection	**L**
	Rotary - Mounting Kit included	**R**
Hazardous area protection	Safe Area	**S**
	Flameproof Ex d (UKEX, ATEX, IECEx, KCs)	**A**
	Flameproof Ex d (CCC, NEPSI, UKEX, ATEX, IECEx)	**C**
	Flameproof Ex d (INMETRO)	**M**
Electrical and Air connection	M20 -¼" NPT	**1**
Non standard features	Standard model	**A**
	Standard Model + Supply Pressure Gauge	**B**

Ordering Code Example: | **EP6** | **S** | **L** | **A** | **1** | - | **A** |

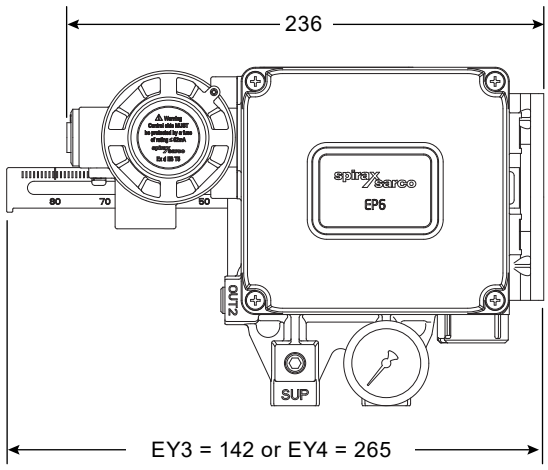
Safety information, installation and maintenance

Full details are contained in the EP6 Electro-pneumatic positioner Installation and Maintenance Instructions.

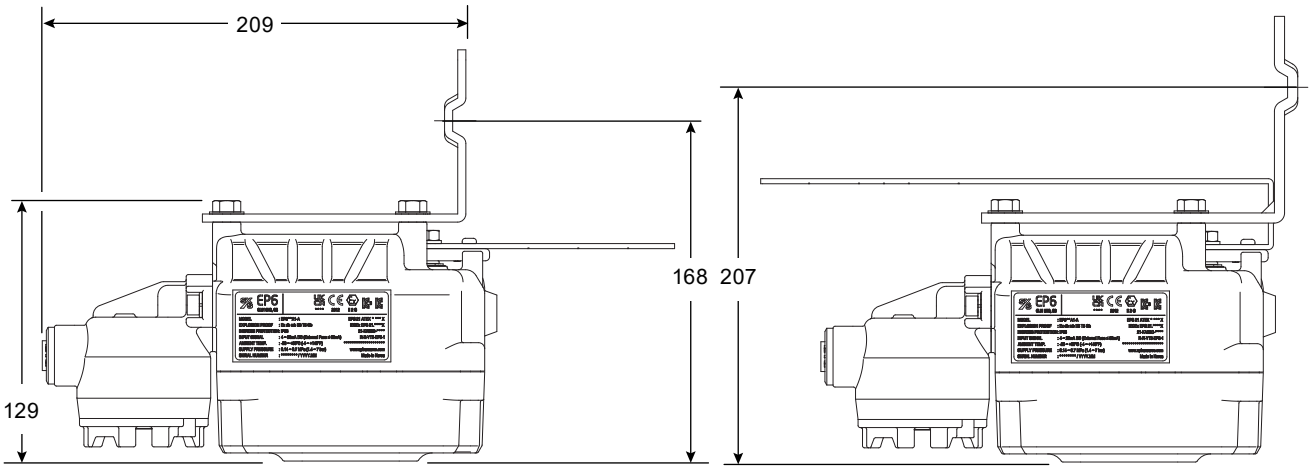
Dimensions (approximate) in mm

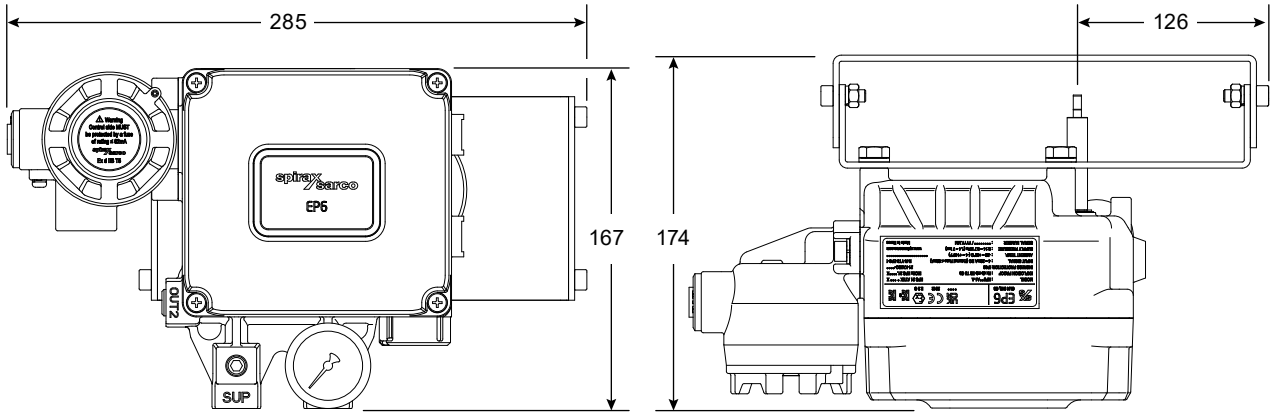


Linear left mounted



Linear centrally mounted





Rotary mounted

Mounting/linkage kit : Positioners mounting kits will be supplied for central mounting as standard.

Mounting Position	Actuator Model	Valve Models	Valve Sizes	Spirax kit Nomenclature
Central	PN9100	Spira-trol™ two port and QL three port	DN15 to DN50	EY3
	PN9200		DN15 to DN100	
	PN9300			
	PN9400		DN125 to DN300	EY4
	TN2150	Spira-trol™ two port and QL three port	DN15 to DN100	EY3
	TN2300		DN125 to DN300	EY4
	TN2400			
	TN2270			
	PN3000 Sprg Ext	LE, LEA and Steri-trol	DN15 to DN100	EY3
	PN4000 Sprg Ret			
	PN5000	KE, KEA, LE and LEA	DN15 to DN100	EY3 + UBC
	PN6000			
	PN5000	QL three port	DN125-DN200	EY4 + UBC
	PN6000			
Left side	PN9100	Spira-trol™ two port and QL three port	DN15 to DN50	UY3
	PN9200		DN15 to DN100	
	PN9300			
	PN9400		DN125 to DN300	UY1
	TN2150	Spira-trol™ two port and QL three port	DN15 to DN100	Not compatible
	TN2300		DN125 to DN300	UY1
	TN2400			
	TN2270			
	PN3000 Sprg Ext	LE, LEA and Steri-trol	DN15 to DN100	UY3
	PN4000 Sprg Ret			
	PN5000	KE, KEA, LE and LEA	DN15 to DN100	UY3 + UBC
	PN6000			
	PN5000	QL three port	DN125-DN200	EY4 + UBC
	PN6000			
	PN1600	'C' series	DN65 to DN100	UY1
	PN1600	'C' series	DN125 to DN200	UY2
	PN1600	Spira-trol™	DN125 to DN300	

Customer requirement example:

1 off Electro-pneumatic positioner for use with single acting PN9300 actuator, having 30 mm stroke and ATEX approved.

How to order

Example: 1 off Spirax Sarco EP6SLA1-A Electro-pneumatic Positioner + EY3 mounting kit.
Caution: The EP6 positioner must have a high quality air supply to ISO 8573-1:2010 Class 3:3:2.

TI-P320-47
CTLS Issue 7

PN600 Series
Pneumatic Controllers

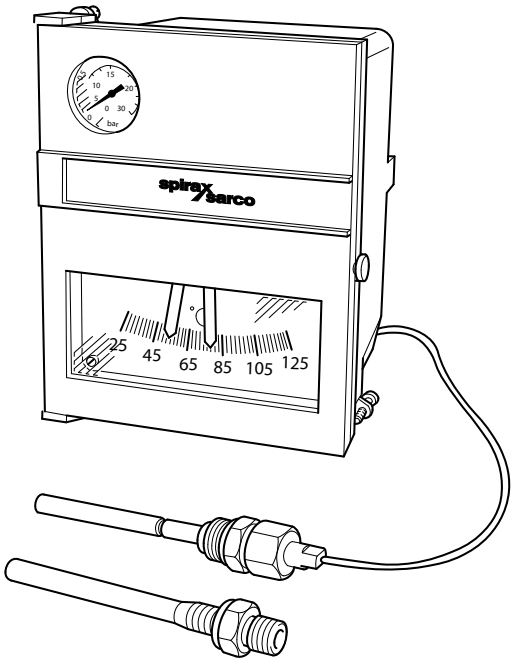
Description

The PN600 series pneumatic controllers provide temperature or pressure control providing a 0.2 bar to 1 bar output signal with proportional (plus manual reset) or proportional plus integral control action. An optional stainless steel pocket type W30S is available for use with tempertature sensors.
The range of pneumatic controllers can be used in conjunction with PN9000 series linear actuators and PP6 pneumatic positioners.

Available types

Temperature control

Model	Control function	Scale range	
662-T5-M5*	Proportional (+ Manual reset)	0 - 100 °C	212 °F
662-T5-M5	Proportional (+ Manual reset)	50 - 150 °C	122 - 302 °F
662-T5-M5*	Proportional (+ Manual reset)	25 - 125 °C	77 - 257 °F
662-T5SY-M5	Proportional (+ Manual reset)	25 - 125 °C	77 - 257 °F
663-T5-M5*	Proportional + Integral	0 - 100 °C	212 °F
663-T5-M5	Proportional + Integral	50 - 150 °C	122 - 302 °F
663-T5-M5*	Proportional + Integral	25 - 125 °C	77 - 257 °F
663-T5SY-M5	Proportional + Integral	25 - 125 °C	77 - 257 °F



T5 = Nitrogen filled sensing bulb and capillary

SY = Sensing bulb for sterile applications

M5 = 5 metres capillary tube (*Option of 10 metres - Suffix 'M10')

Pressure control

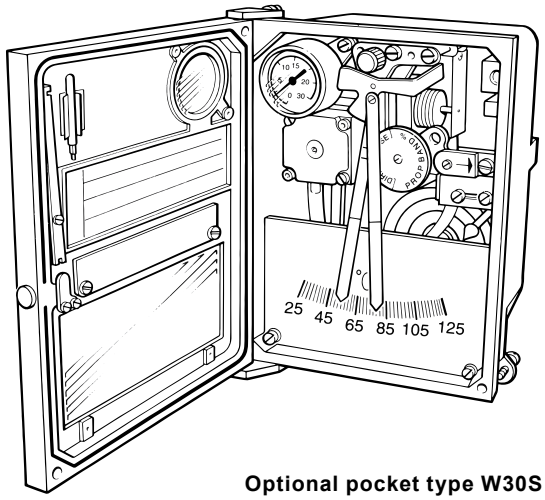
622	Proportional (+ Manual reset)	0 - 7 bar	0 - 102 psi
622	Proportional (+ Manual reset)	0 - 20 bar	0 - 290 psi
623	Proportional + Integral	0 - 7 bar	0 - 102 psi
623	Proportional + Integral	0 - 20 bar	0 - 290 psi

Other options available include:-

Pneumatic receiver for 0.2 to 1 bar (3 to 15 psi g) input signal.
Electromechanical receiver for 4-20 mA, 0-10 Vdc, RTD Pt100 or thermocouple input signal.

Other scale ranges available:-

Pressure (bar and psi)	Scale span options up to:- 0 to 500 bar (0 to 7251 psi)
Temperature (°C and °F)	Scale span options for:- 50, 75, 100, 150, 200, 300 and 400 °C (122, 167, 212, 302, 392, 482, 572 and 752 °F)



Optional pocket type W30S

Measuring elements

Pressure

Bourdon tube	AISI 316L stainless steel
Connection	¼" BSP
Maximum pressure	+25% of scale range

Temperature

Bulb and capillary	AISI 316L stainless steel	
	- Cylindrical bulb for liquids	
	- Sanitary bulb for sterile applications	
	(Option available with spiral bulb for air/gas)	
Bulb connection	¾" BSP	
Capillary length	5 metres	
	10 metres (in some ranges)	
	(Other options available)	
Max. measured temperature		+25% of scale range

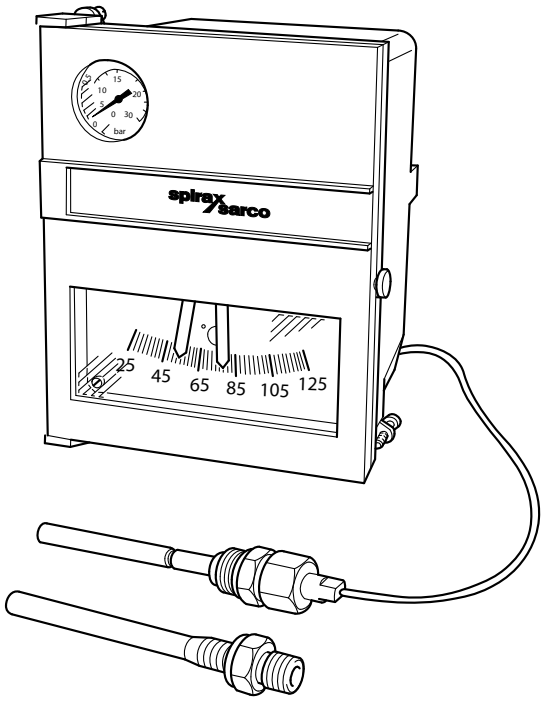
Pocket - Type W30S (optional)

Material	AISI 316L	Stainless steel
Connection	½" BSP	
Maximum pressure	PN40	

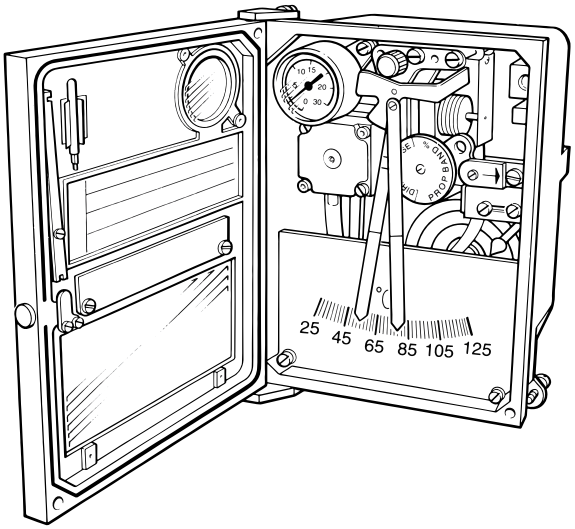
Technical data

Controller

Enclosure rating	IP54 (Standard) IP55 (Optional)	
Scale length	100 mm (3.94 inches)	
Pointers	Measured value Set point	- black - red
Gauges	Output signal pressure (bar/psi g)	
Control mode	Proportional (5-200% of scale range) Integral (0.1 to 20 repeats per minute)	
Output signal	0.2 - 1 bar (2.9 - 14.5 psi)	
Control action	Direct or reverse action - Field reversable	
Set point adjustment	Manual adjustment	
Accuracy	1% of range span	
Sensitivity	0.2% of range span	
Repeatability	0.5% of range span	
Linearity	0.5% of range span	
Air supply	1.4 bar (20.3 psi)	
Air consumption	0.2 Nm³/h (.4 scfm) (average)	
Air connections	¼" NPT	
Ambient temperature limits	-15 °C to 65 °C (5 °F to 149 °F)	
Mounting	Wall or flush panel mounted	
Weight	3.5 kg (7.7 lbs)	



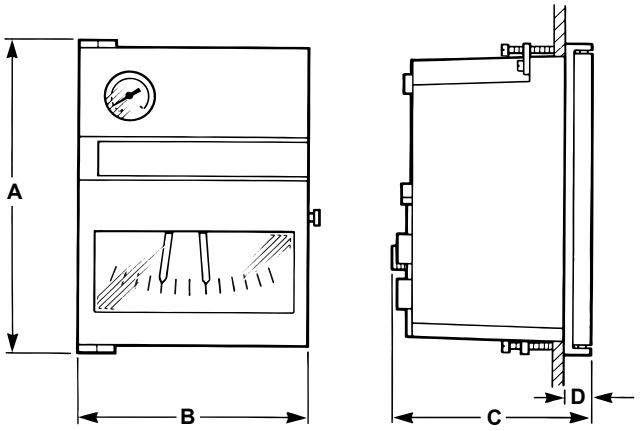
Optional pocket type W30S



Dimensions in mm (inches)

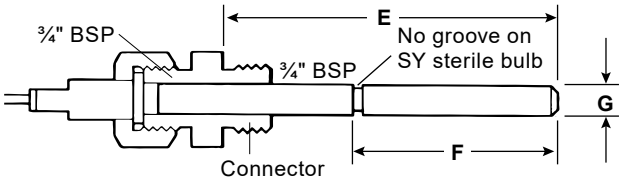
Controller

A	B	C	D
7.8 (202)	5.7 (144)	5.3 (136)	.67 (17)



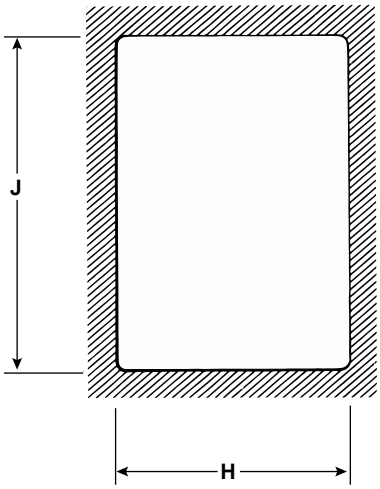
Temperature sensing bulb

E	F	G
4.7 (200)	4.7 (120)	.5 (13)



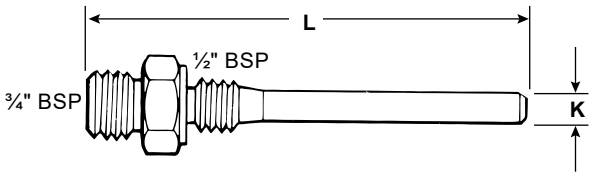
Panel mounting cut-out

H	J
5.5 (138)	7.4 (188)



Pocket

K	L
0.6 (16)	8.2 (210)



TI-P794-01
CTLS Issue 1

Programmable Controllers
GS-X1, GS-X2, GS-X3

Description

The GS-Xx range of panel mounted programmable single loop PID controllers aids optimization of production yield for thermal and other forms of processing.

Designed with native high speed Ethernet the GS-Xx range is an ideal component for digitized Industry 4.0 and "Industrial Internet of Things" applications.

Highly configurable, with precise, repeatable control and measurement performance, meeting accuracy specifications up to and including stringent aerospace regulatory requirements, the GS-Xx range remains simple to use and deploy.

The GS-X1 and GS-X2 are suitable replacements for the SX80 and SX90 respectively, example nomeclature has been prepared (see examples) to aid the ordering process and further documentation will be available to show the requirments for the physical change over.

Key features and options:

- Enhanced PID control with cutback function for fast response and minimal overshoot
- Precision 0.1% Inputs meeting accuracy requirements of AMS2750F and CQI-9
- Wireable function blocks including math, logic, and advanced control
- Fast Ethernet with RJ45 connector for IIoT and Industry 4.0.
- Modbus, Ethernet/IP and BACnet protocol support
- Up to 20 ramp/soak program profiles.



Associated equipment

- USB Backup cable available for convenient desktop configuration and back up; powers the instrument with or without a sleeve.
- iTools software for backup and configuration.

General

Controller Function	Single loop panel mount PID controller range with autotune, on/off and valve positioning (no slidewire required).
	Zirconia probe atmosphere control.
	Single loop profile/program.
	AC Mains voltage and 24Vdc power options.
Measurement Inputs	1 or 2 inputs. Accuracy ±0.1% of reading (refer to Universal Inputs table).
PID Control	2 PID sets are available as standard, with 8 as an optional extension (Each PID set offers a separate proportional band for heat and cool operation).
	Enhanced Autotuning control with cutback function to minimize overshoot and oscillation. Fast reacting precision control to setpoint changes or after process disturbances.
	Enhanced valve positioning (unbounded) algorithm.
	Gain scheduling allows PID selection for a wide range of operating situations, including deviation from setpoint, absolute temperature, output level and others.
	AC supply voltage monitoring for feedforward function. Process Variable (PV) and Setpoint (SP) feedforward functions.
Setpoint Programmer/Profiler	Options include 20 profiles of 8 steps (20 x 8), 10 x 24, 1 x 24 and 1 x 8.
	Holdback ("guaranteed soak"), event outputs, time to target, ramp rate, dwell, step and call segment types.
	Communication addresses are compatible with industry leading Programmable Controller.
	Additional timer functions are available.
User Function Block Wiring	Optional totalizer
	Math
	Logic and multiplexing
	BCD conversion
	Counter/timer and many other special function blocks available including 16 point linearization, zirconia and dual input switchover.
Limit Functions	EN ISO 13849-1: Performance Level (PL) "C" for PV input to Alarm function
	EN 14597 TR approved
Additional Functions	Digital and analog retransmission functions.
	CT Input – Monitor partial load failure, load short and open circuit; Dual input functions including switchover, redundant sensor, average, min, max, zirconia.
	6 freely configurable alarms with manual, automatic, non-latching and event types plus alarm delay function and blocking.
	Alarms may be inhibited in standby.
	5 Recipes with 40 freely selectable parameters switchable from the front panel or digital input.
	Scrolling parameter help and user messages displayed on event.
Backup and Configuration Tools	Free iTools software for backup and configuration.
	USB Backup cable available for convenient desktop configuration and back up; powers the instrument with or without a sleeve.
	iTools also connects using Modbus/TCP and serial Modbus RTU.
"OEM Security"	Helps protect instrument configurations from unauthorized viewing, cloning or backwards engineering.

Function Blocks	Function	Standard	Standard Toolkit Blocks	Enhanced Toolkit Blocks
Instrument	Interface to Instrument wide settings	1	-	-
Loop	Enhanced Eurotherm PID Loop	1	-	-
Programmer	Ramp/Dwell Programmer	1	-	-
BCD	BCD Conversion	1	-	-
Alarm	General purpose analog alarm monitoring	6	-	-
Recipe	General purpose recipe function	1	-	-
Comms*	General purpose recipe function	2	-	-
AI	Interface to serial and Ethernet communications	2	-	-
IP Monitor	Interface to main analog input	2	-	-
IO*	Interface to Inputs and Outputs	6	-	-
Option DIO*	Digital I/O options	8	-	-
Remote Input	Interface to remote (communications) input	1	-	-
OR	Eight input logical "OR" operation	8	-	-
CT*	Current transformer	1	-	-
Zirconia*	Zirconia Probe input	1	-	-
Wires*	User wiring	50	200	200
Math2	Two input math functions	-	4	8
Lgc2	Two input logical operations	-	4	8
Lgc8	Eight input logical operations	-	2	4
Timer	Timer based functions	-	1	2
SwitchOver	Input switchover	-	1	1
Mux8	Eight Input multiplexer	-	3	4
Total	Totalizer	-	1	1
Counter	Counter block (32–bit)	-	1	2
UsrVal	User values (freely assignable)	-	4	12
Lin16	16 point linearization	-	2	2

*Dependent on instrument/options ordered

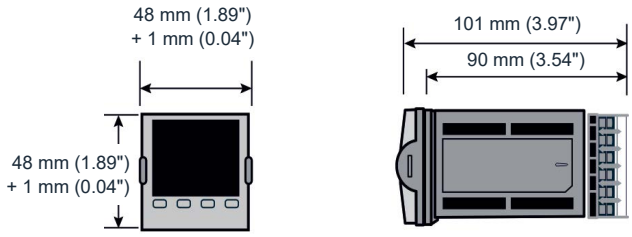
Environmental Specifications, Standards Approvals and Certifications

Operating Temperature	0 to 55°C (32 to 131°F)	
Storage Temperature	-20 to +70°C (-4 to 158°F)	
Operating/Storage Humidity	5% to 90% RH non-condensing	
Atmosphere	Non-corrosive, non-explosive	
Altitude	<2000 meters (6562 feet)	
Installation	Indoor Use Only	
Vibration and Shock	EN 61131-2 (5 to 11.9Hz @ 7mm peak to peak displacement, 11.9-150Hz @ 2g, 0.5 octave min.) EN 60068-2-6 Test FC, Vibration. EN 60068-2-27 Test Ea and guidance, Shock.	
Front of Panel Sealing Protection	Bezel (Washdown): EN 60529 IP66, UL50E Type 4X (indoor use) (equivalent to NEMA 4X)	
Rear of Panel Protection	EN 60529 IP10	
Electromagnetic Compatibility (EMC)	Emissions	HV Power Supply units to EN 61326-1 Class B – Light industrial LV Power Supply units to EN 61326-1 Class A – Heavy industrial
	Immunity	EN 61326-1 Industrial
Approvals and Certification	Europe	CE, REACH, EN 14597 TR Type Approval
	USA, Canada	UL, cUL.
	China	China RoHS, CCC: Exempt (Product not listed in catalog of products subject to China Compulsory Certification)
	General	When subject to the necessary field calibration, GS-Xx series controllers supplied by Spirax Sarco are suitable for use in Nadcap applications in all furnace classes, as defined in AMS2750F clause 3.3.1.
		Meets accuracy requirements of CQI-9
		Spirax Sarco environmental and sustainability lifecycle standards
		EN ISO 13849-1 Performance Level "C"
Electrical Safety		EN 61010-1 (installation category II, pollution degree 2)

Dimensions/panel cut-out/weights

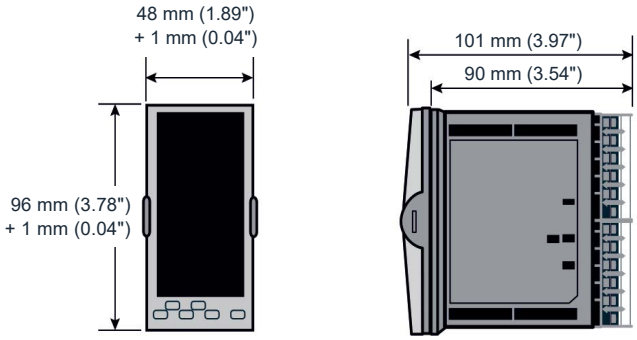
GS-X1

Cut Out Dimension	45 mm (-0.0 +0.6) x 45 mm (-0.0 +0.6)
	1.77" (-0.0 +0.02) x 1.77" (-0.0 +0.02)
Product Weight	250 g
	8.81 oz



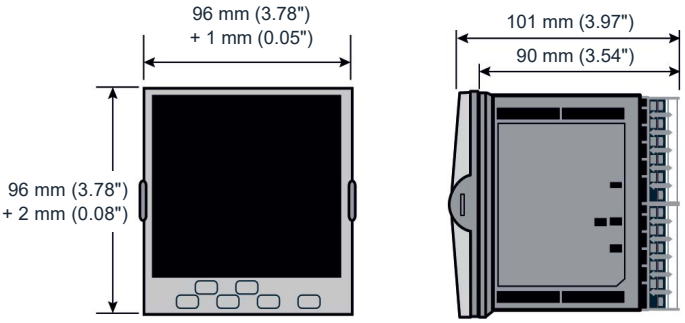
GS-X2

Cut Out Dimension	92 mm (-0.0 +0.8) x 45 mm (-0.0 +0.6)
	3.62" (-0.0 +0.03) x 1.77" (-0.0 +0.02)
Product Weight	350 g
	12.34 oz



GS-X3

Cut Out Dimension	92 mm (-0.0 +0.8) x 92 mm (-0.0 +0.8)
	3.62" (-0.0 +0.03) x 3.62" (-0.0 +0.03)
Product Weight	420 g
	14.81 oz



Specifications - Inputs and Outputs

I/O and communication types

I/O and Comms	GS-X1	GS-X2/GS-X3
Analog Inputs	1 universal input 20Hz	1 or 2 (option) universal input 20Hz
	1 auxiliary input 4-20mA, 0-10V 4Hz (option)	
Optional I/O Modules:	Up to 2, freely selectable:	Up to 3, freely selectable:
	Form A Relay Output	Form A Relay Output
	Logic I/O	Logic I/O
	DC Analog Output	DC Analog Output
	TRIAC Output	TRIAC Output
Form C Relay Output	1	1
Contact Closure Logic Input	1 (option)	2
Logic I/O (Open Collector)	-	4 or 8 (option)
Current Transformer	1 (option)	1
Transmitter Power Supply	1 (option-18V)	1 (24V)
(On GS-X1 you cannot select both Transmitter Power Supply and Communications, only one or the other)		
Communications	1 of the following options:	2 of the following options:
	EIA-485	EIA-485
	EIA-422	Modbus (or EI Bisynch) and Modbus TCP
	EIA-232	Modbus TCP Slave + EtherNet/IP Server, or Modbus TCP Slave + BACnet Slave
	Modbus RTU slave (EI Bisynch available with serial comms)	Modbus TCP Master and Slave
	Modbus TCP slave	
	Modbus TCP Slave + EtherNet/IP Server, or Modbus TCP Slave + BACnet Slave	
	Modbus TCP Master and Slave	

I/O Specifications

Universal Process Inputs	
Input Types	Thermocouples, Pt100/Pt1000 RTD, 4-20mA, 0-20mA, 10V, 2V, 0.8V, 80mV, 40mV, zirconia (oxygen probe), pyrometers. For other input types, contact your Spirax Sarco supplier for advice.
	Accuracy ±0.1% of reading. When subject to the necessary field calibration, GS-X series controllers supplied by Spirax Sarco are suitable for use in Nadcap applications in all furnace classes as defined in AMS2750F clause 3.3.1. For further information contact Spirax Sarco
Sample Time	Process Inputs 50ms (20Hz)
	Thermocouple 62.5ms (16Hz)
	RTD 100ms (10Hz)
	Automatic cycle time selection
Mains Rejection (48-62Hz)	Series mode rejection >80dB.
	Common mode rejection >150dB
Sensor Break	AC sensor break. Break detected within 3 seconds worst case.
Input Filtering	OFF to 60 seconds filter time constant.
User Calibration	User 2 point input adjust (offset/gradient), transmitter output scaling.
Thermocouple	K, J, N, R, S, B, L, T as standard, plus 2 downloadable custom curves
	Linearization accuracy: refer to IM-Pxxx-xx
	Cold Junction (CJ) calibration accuracy: ±1.0ºC at 25ºC (±1.8ºF at 77ºF) ambient
	CJ ambient rejection ratio: better than 40:1 from 25ºC ambient
	External CJ selectable as 0, 45, 50ºC or measurable for GS-X3/GS-X2

Specifications - Inputs and Outputs

I/O and communication types

Input Ranges	40mV	80mV	0.8V	2V	10V	RTD (Pt100/Pt1000)	mA
Range Min	-40mV	-80mV	-800mV	-2V	-10V	0Ω (-200°C; -328°F)	-32mA
Range Max	+40mV	+80mV	+800mV	+2V	+10V	400Ω /4000Ω (850°C; 1562°F)	+32mA
Thermal Stability from 25°C (77°F) Ambient	±0.4µV/°C ±13ppm/°C	±0.4µV/°C ±13ppm/°C	±0.4µV/°C ±13ppm/°C	±0.4µV/°C ±13ppm/°C	±0.8µV/°C ±70ppm/°C	±0.01°C/°C ±25ppm/°C	±0.16µA/°C ±113ppm/°C
Resolution	1.0µV unfiltered	1.6µV	16µV	41µV	250µV	0.05 °C (0.09 °F)	0.6µA
Electrical Noise (peak to peak with 1.6s input filter)	0.8µV	3.2µV	32µV	82µV	250µV	0.05 °C (0.09 °F)	1.3µA
Linearity Accuracy (best fit straight line)	0.003%	0.003%	0.003%	0.003%	0.007%	0.033%	0.003%
Calibration Accuracy @25°C (77°F) ambient	±4.6µV ±0.053%	±7.5µV ±0.052%	±75µV ±0.052%	±420µV ±0.044%	±1.5mV ±0.063%	±0.31°C (0.56°F) ±0.023%	±3µA ±1.052%
Input Resistance	100MΩ	100MΩ	100MΩ	100MΩ	57kΩ	-	2.49Ω (1% Shunt)
Bulb Current	-	-	-	-	-	190µA/ 180µA	-

Remote Setpoint Auxiliary Analog Input (GS-X1 Only)

Range	0 to 10V and 4 to 20mA. Max ranges -1V to 11V and 3.36mA to 20.96mA
Accuracy	<±0.25% of reading ± 1LSD, 14 Bits
Sample Rate	4Hz (250ms)
Functions	Remote setpoint input
	Auxiliary analog input
Thermal Stability	100ppm (typical) < 150ppm (worst case)
Mains Rejection	Common Mode 48-62Hz > 120dB, Series Mode > 90dB
Input Impedance	Voltage 223kΩ. Current 2.49Ω

Current Transformer Input

Input Range	0-50mA RMS, 48-62Hz
	10Ω burden resistor fitted inside module
Measurement Scaling	10, 25, 50 or 100 Amps
Calibration Accuracy	<1% of reading (typical) <4% of reading (worst case)
Input Functions	Partial load failure. SSR open or short circuit.
	Other functions including power usage totalization available using soft wiring.

Contact Closure Logic Inputs

Thresholds	Open > 400Ω, Closed < 100Ω		
Input functions	- Auto/Manual select	- Program run functions	- BCD bit
	- SP2 select	- Recipe select	- Autotune enable
	- Integral hold	- Keylock	- Standby
	- Control inhibit	- PID select	
	- PV select plus other functions available using soft wiring.		

Specifications - Inputs and Outputs

Logic I/O Modules

Output Rating	ON 12Vdc 44mA max. Minimum control cycle time 50ms (auto)		
Output Functions	Time proportioned heat, time proportioned cool. SSR drive alarm and event outputs, interlock outputs, other functions available using soft wiring.		
Contact Closure (input)	Open 500Ω, Closed 150Ω		
Input Functions	- Auto/Manual select	- Program run functions	- BCD bit
	- SP2 select	- Keylock	- Autotune enable
	- Integral hold	- Recipe select	- Standby
	- Control inhibit	- PID select	
	- PV select plus other functions available using soft wiring.		

Logic I/O Open Collector Type (GS-X3/GS-X2 only)

External DC Power Supply	15V to 35Vdc		
Output Limit	Maximum current sinking 40mA		
Output Functions	Alarm and event outputs, interlock outputs, other functions available using soft wiring. Cannot be used as a control output.		
Voltage Sensing Input	OFF < 1V, ON > 4V. Max 35V, Min -1V		
Contact Closure Input	OFF > 28KΩ, ON < 100Ω		
Input Functions	- Auto/Manual select	- Program run functions	- BCD bit
	- SP2 select	- Keylock	- Autotune enable
	- Integral hold	- Recipe select	- Standby
	- Control inhibit	- PID select	
	- PV select plus other functions available using soft wiring.		

TRIAC Module

Rating	Min 40mA, 30V RMS, Max 0.75A @ 264V AC resistive.
Output Functions	Time proportioned heat, time proportioned cool. SSR drive alarm and event outputs, interlock outputs, other functions available using soft wiring.
Surge Rating	Max current surge 30A (<10ms) Max continuous operating voltage 540V peak, 385V RMS. Max surge voltage 800V peak, 565V RMS (< 10ms).

Isolated DC Analog Output Module

	Current Output	**Voltage Output**
Range	0-20mA	0-10V
Load Resistance	<550Ω	<450Ω
Calibration Accuracy	±(0.5% of reading + 100µA offset)	±(0.5% of reading + 50mV offset)
Output Functions	- SCR/Power control drive - Proportional valve - Retransmission to chart recorder or other instrumentation - Other functions using soft wiring	
Digital Input (DI), where configured	The DC output module can be configured as contact closure input see "I/O List (io)" in Installation Manual (IM-P794-03). In this case: - Retransmission to chart recorder or other instrumentation - Other functions using soft wiring	

Specifications - Power, communications and operator interface

Power and transmitter power supply

Power Supply, AC Supply Measurement and Transmitter Power Supply	
Controller Supply Voltage	100-230Vac +/- 15%, 48 to 62Hz or 24Vac +10%/-15%, 48 to 62Hz or 24Vdc +20%/-15%, max 5% ripple voltage.
Power Supply Rating	GS-X1 Controller 6W GS-X2/GS-X3 Controller 9W
Power Measurement	Only available in 100-230Vac powered instruments. Measures direct from power supply (no additional connections). Uncalibrated. Electrical noise 0.5V filtered, used by the PID function for power feedforward.
Transmitter Power Supply (GS-X2/GS-X3 only)	24Vdc. 2 to 28mA load. Isolated from system (300V AC double insulation)
Transmitter Power Supply (GS-X1 Option)	18Vdc. +/- 15% 30mA maximum. Load Regulation < 1 V over 25mA. Isolated from system (300V AC double insulation)
Over voltage category	CAT II

Communications

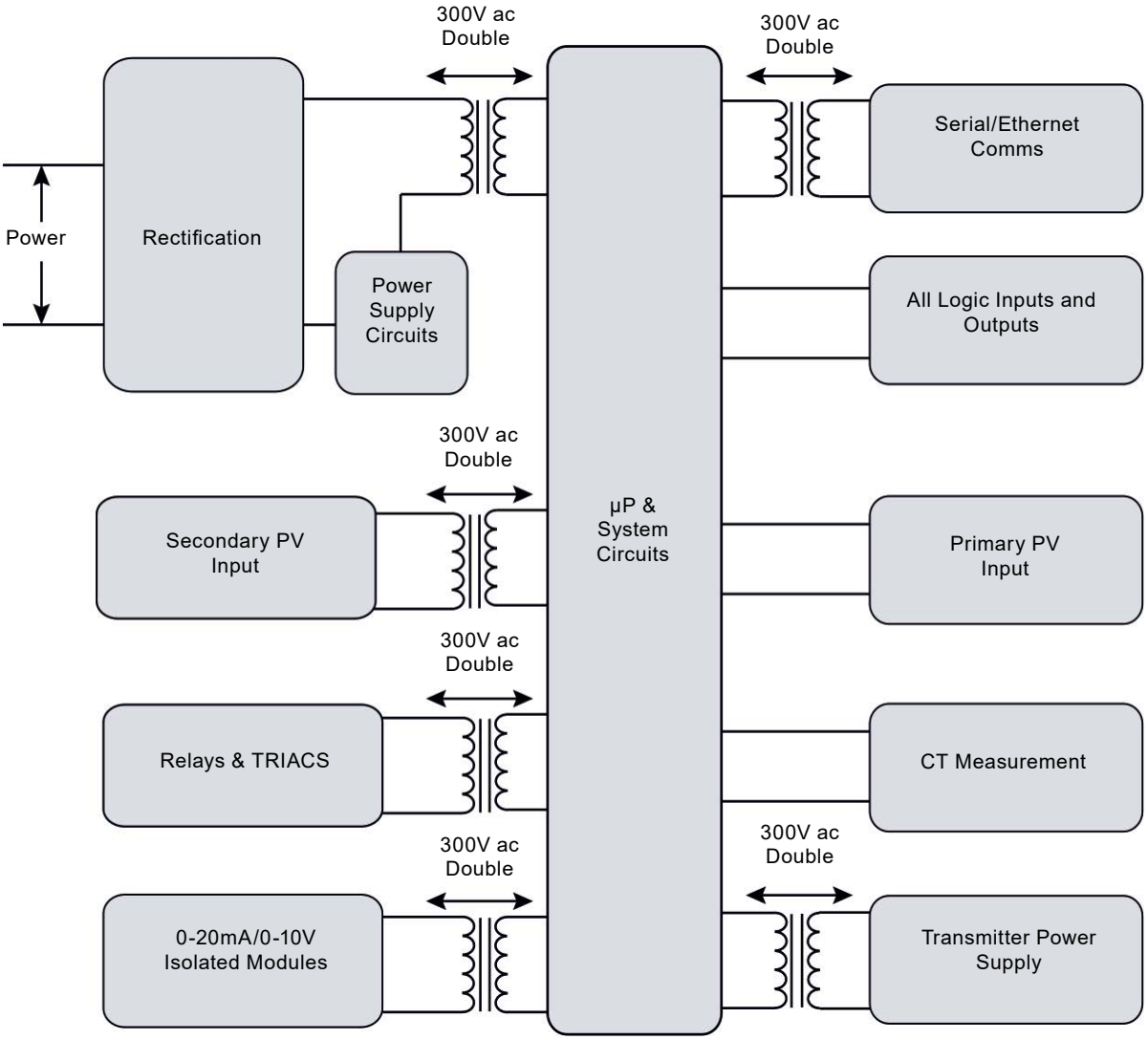
Ethernet	Shielded grounded RJ45 connection supporting 10/100BASE-T auto-sensing
	vModbus/TCP, BACnet and EtherNet/IP Protocols
	Fixed IP address or DHCP
	Bonjour Auto-Discovery
Serial	EIA-485 Half duplex
	EIA-422/EIA-232 Full duplex
	Baud Rates 4800 (EI-Bisynch only), 9600, 19200
	Modbus RTU 8 data bits, odd/even/no parity selectable
	EI-Bisynch 7 data bits even parity fixed

Operator Interface - Display and Operation

Type	High visibility LCD with backlight. Flat "washdown" membrane bezel with superior panel sealing, or sculpted bezel with fully tactile keys.
Keyboard	100,000 operations typical
Main PV	GS-X1 4 digits, 3 decimal places
	GS-X2 4.5 digits, 4 decimal places
	GS-X3 5 digits, 4 decimal places; green/red bicolor (red in alarm)
Second Line (GS-X3/GS-X2 only)	5 character 16 segment text or numeric
Third Line	16 segment scrolling text or numeric display
Text Character sets	Roman, Simplified Cyrillic
Additional Display Functions	Program status indicator (ramp up, ramp down or dwell)
	Output indicators
	Alarm indication
	Units
	Bar graph (GS-X3, GS-X2 Controllers only)
	Communications activity indicator
HMI Functions	Configurable display contents
	Configurable scroll lists for operator/supervisor
	Configurable scrolling event messages
	Passcode level protection with lockout period
	2 Programmable function keys (GS-X3, GS-X2 Controllers only)

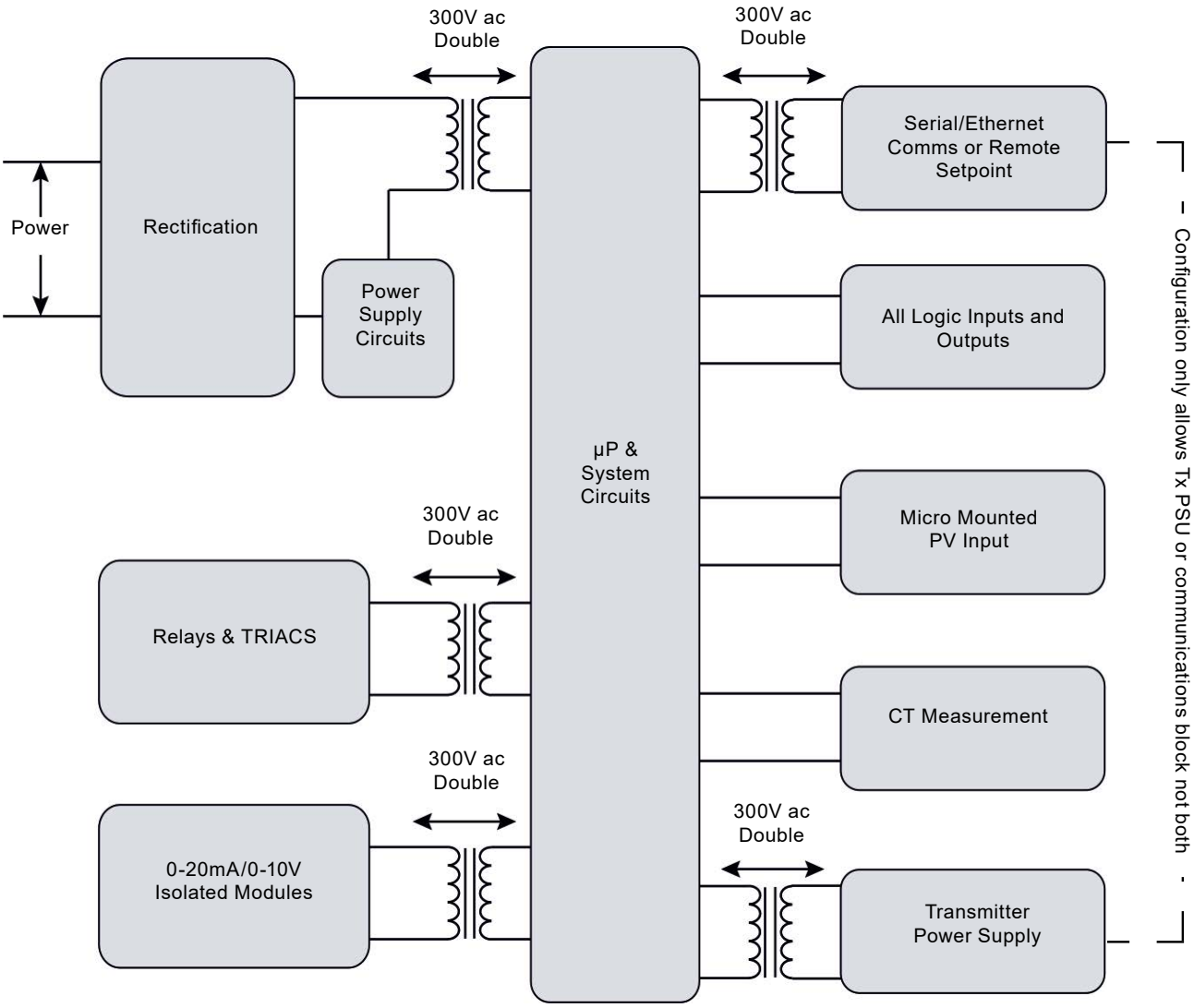
Specifications

GS-X2/GS-X3 isolation



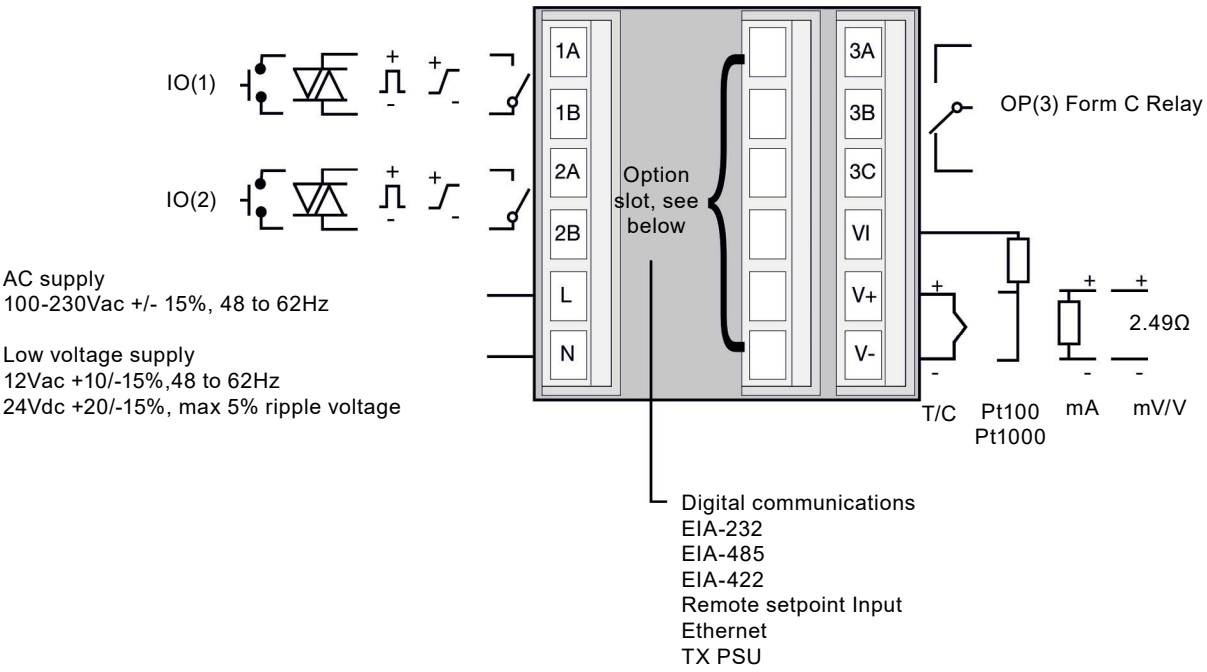
Specifications (continued)

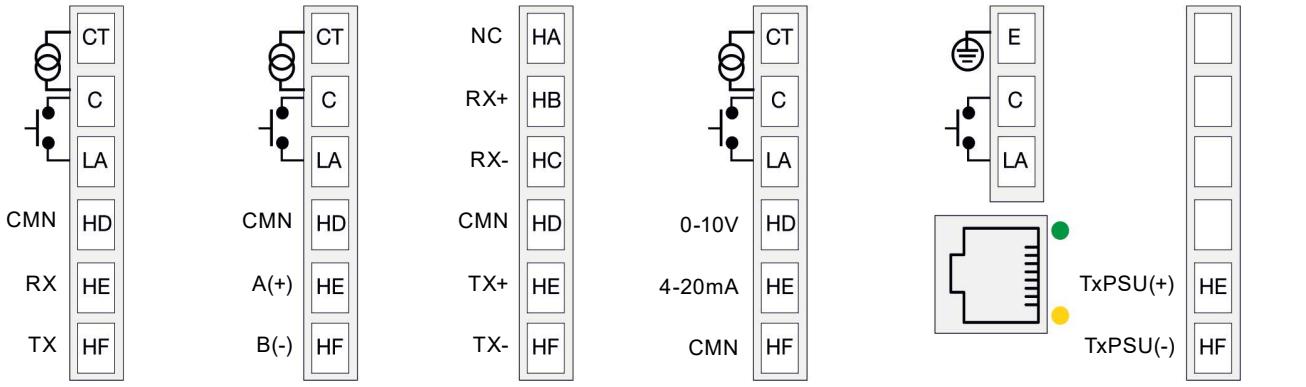
GS-X1 isolation



Specifications (continued)

Rear terminals GS-X1



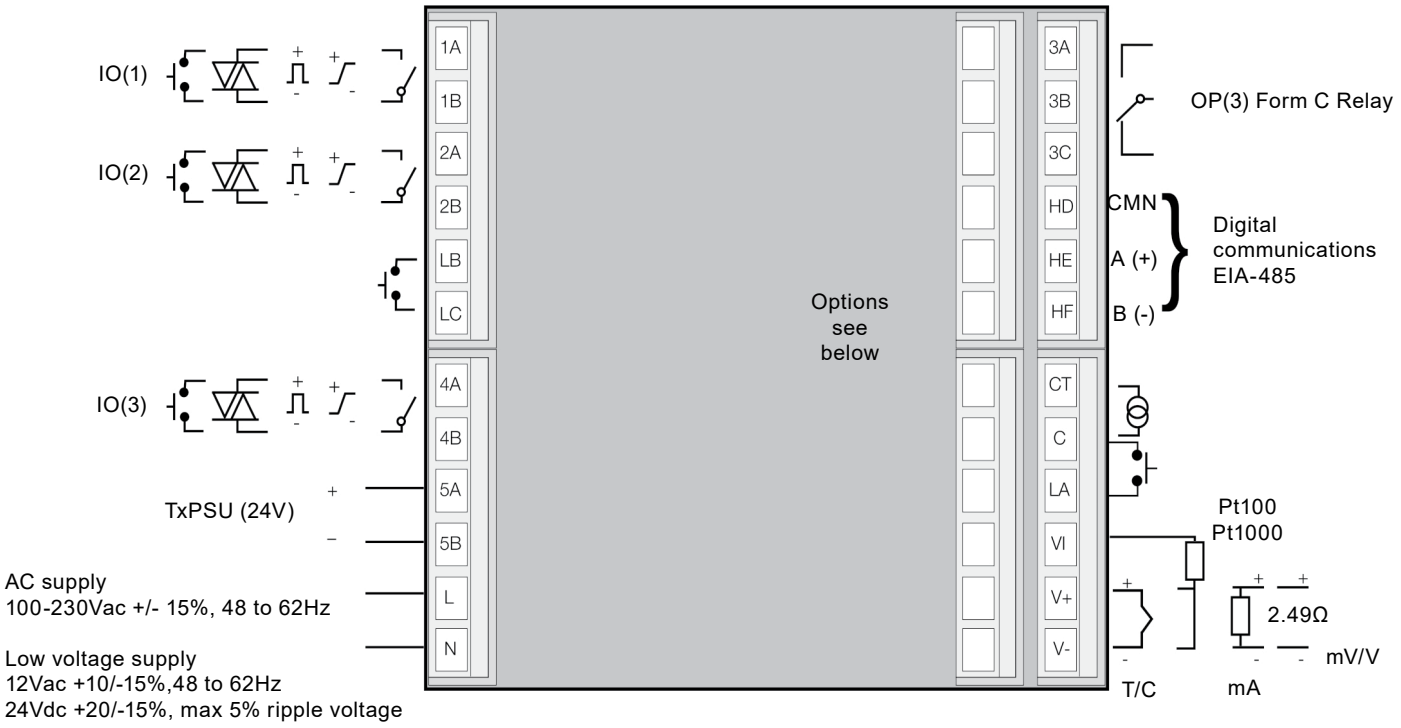


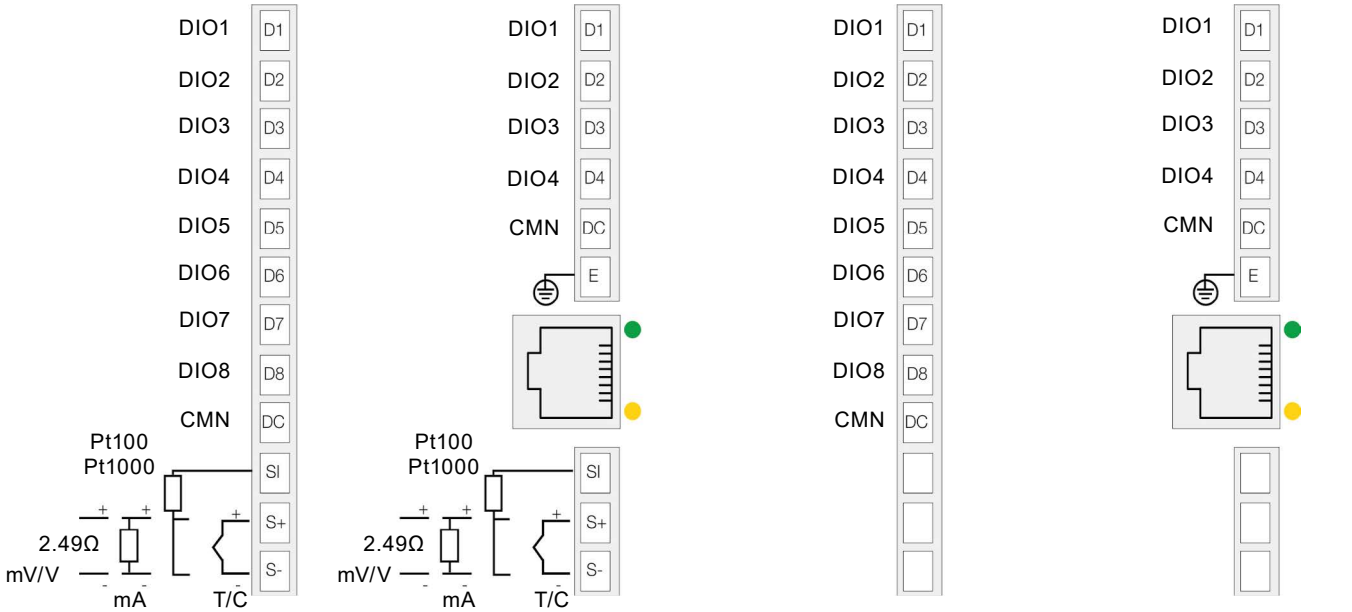
Key to Symbols Used in Wiring Diagrams

+ −	**Logic Output (SSR drive)**		Relay Output		Contact Input
+ −	**0-10V/0-20mA Analog Output**		TRIAC Output		Current Transformer Input

Specifications (continued)

Rear terminals GS-X2, GS-X3





PV INPUT
8 x DIGITAL IN/OUT

PV INPUT
ETHERNET
4 x DIGITAL IN/OUT

8 x DIGITAL IN/OUT

ETHERNET
4 x DIGITAL IN/OUT

Key to Symbols Used in Wiring Diagrams

+ –	**Logic Output (SSR drive)**		Relay Output		Contact Input
+ –	**0-10V/0-20mA Analog Output**		TRIAC Output		Current Transformer Input

Order Codes GS-X1

GS-X1	1/16 DIN Controller (Includes one Universal PV Input and one Form C Relay)			GS-X1
1	Type	CC	= Controller Only	CC
		CP	= 1 x 8 Segment Basic Programmer	
		P1	= 1 x 24 Segment Advanced Programmer	
		P10	= 10 x 24 Segment Advanced Programmer	
		P20	= 20 x 8 Segment Advanced Programmer	
2	Supply Voltage	VH	= 100 - 230Vac +/-15% (48 to 62Hz)	VH
		VL	= 24Vac +10%, -15% (48 to 62 Hz); 24Vdc +20, -15%; 5% Ripple	
3	I/O 1	XX	= Not Fitted	R2
		L2	= Logic	
		R1	= Relay Output (Without Snubber)	
		R2	= Relay (Supplied With External Snubber)	
		D1	= DC Output	
		T1	= TRIAC (Without Snubber)	
		T2	= TRIAC (Supplied With External Snubber)	
4	I/O 2	XX	= Not Fitted	D1
		L2	= Logic	
		R1	= Relay Output (Without Snubber)	
		R2	= Relay (Supplied With External Snubber)	
		D1	= DC Output	
		T1	= TRIAC (Without Snubber)	
		T2	= TRIAC (Supplied With External Snubber)	
5	Future	X	= Not Fitted	X
6	Output 3	XX	= Form C (Default)	XX
7	Serial Communications Protocol [7]	XX	= Modbus Slave (Default) Or None	XX
		EI	= EI-Bisynch Comms	
		SM	= Modbus Master and Slave	
8	Ethernet, Communications & Remote SP [8]	XX	= None (Default)	TX
		C1	= CT Input, Contact Closure Digital Input, and EIA-232	
		C2	= CT Input, Contact Closure Digital Input, and EIA-485 (3 Wire)	
		C3	= EIA-422 Only (5 Wire)	
		CR	= CT Input, Contact Closure Digital Input, RSP Input	
		CE	= Contact Closure Digital Input, Ethernet	
		TX	= Transmitter PSU	
9	Ethernet (TCP) Communications Protocol [9]	XX	= Modbus TCP Slave (Default) Or None	XX
		ES	= EtherNet/IP Server and Modbus TCP Slave	
		BS	= BACnet Slave and Modbus TCP Slave	
		TM	= Modbus TCP Master and Slave	

Order Codes continued on next page

10	Tool Kit Blocks	XX	= None (Default 50 Wires)	XX
		TK	= Standard (Includes 200 Wires)	
		ETK	= Enhanced (Includes 200 Wires)	
11	OEM Security	XXX	= None (Default)	XXX
		OEM	= OEM Security	
12	Bezel	WD	= Washdown	WD
13	Labels	XXXXX	= None (Default)	XXXXX
		Fnnnn	= Custom Label	
14	Specials [14]	XXXXXX	= None (Default)	XXXXXX
15	Gain scheduling Sets	XX	= Two Gain Scheduling Sets (Default)	XX
		08	= Eight Gain Scheduling Sets	

[7] Use of a serial communications protocol requires purchase of "C1", "C2" or "C3" option in field 8, cannot be selected if TX in field 8 required.

[8] Not available if field 7 set to EI or SM

[9] Use of an ethernet communications protocol requires purchase of "CE" in field 8.

[14] Regional and Application specific codes are entered here which can be found in additional release documentation

Example

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
GS-X1	**CC**	**VH**	**R2**	**D1**	**X**	**XX**	**XX**	**TX**	**XX**	**XX**	**XXX**	**WD**	**XXXXX**	**XXXXXX**	**XX**

Quick start codes GS-X1

				Example
16	Application	X	= None	X
		1	= Heat Only	
		2	= Heat/Cool	
		V	= VPU	
17	Input 1 Sensor Type	X	= Not Required	X
		M	= Linear 0 to 80mVdc	
		V	= Linear 0 to 10Vdc	
		2	= Linear 0 to 20mA	
		4	= Linear 4 to 20mA	
		B	= Type B Thermocouple	
		C	= Type C Thermocouple	
		J	= Type J Thermocouple	
		K	= Type K Thermocouple	
		L	= Type L Thermocouple	
		N	= Type N Thermocouple	
		R	= Type R Thermocouple	
		S	= Type S Thermocouple	
		T	= Type T Thermocouple	
		P	= Pt100	
		W	= Pt100	
18	Input 1 Range	X	= Not Required	X
		F	= Full Range	
		1	= 0 to 100°C or 32 to 212°F or 273 to 373K	
		2	= 0 to 200°C or 32 to 392°F or 273 to 473K	
		3	= 0 to 400°C or 32 to 752°F or 273 to 673K	
		4	= 0 to 600°C or 32 to 1112°F or 273 to 873K	
		5	= 0 to 800°C or 32 to 1472°F or 273 to 1073K	
		6	= 0 to 1000°C or 32 to 1832°F or 273 to 1273K	
		7	= 0 to 1200°C or 32 to 2192°F or 273 to 1473K	
		8	= 0 to 1300°C or 32 to 2552°F or 273 to 1573K	
		9	= 0 to 1600°C or 32 to 2912°F or 273 to 1873K	
		A	= 0 to 1800°C or 32 to 3272°F or 273 to 2073K	
19	Future	X	= Future	X
20	Future	XX	= Future	X

12.4
20

Quick start codes continued on next page

21	CT Input Range	X	= Not Used	X
		1	= 10A	
		2	= 25A	
		5	= 50A	
		6	= 100A	
		7	= 1000A	
22	Digital Input A Function [22]	X	= Not Used	X
		W	= Alarm Acknowledge	
		M	= Auto/Manual	
		R	= Programmer Run/Hold	
		L	= Keylock	
		K	= Loop Track	
		P	= Local Setpoint Select	
		T	= Programmer Reset	
		U	= Remote Setpoint Select	
		V	= Recipe Select	
23	Future	X	= Future	X
24	Future	X	= Future	X
25	Units	X	= Use Default (Degrees Celsius)	X
		C	= Degrees Celsius	
		F	= Degrees Fahrenheit	
		K	= Kelvin	
26	Future	XX	= Future	XX
27	Warranty	XX	= Standard Warranty	XX
			= Future - WL005 Extended warranty	
28	Certificate of Conformity	XX	= None Required	XX
		CERT1	= Supplied With Certificate of Conformity	
		CERT2	= Supplied With Certificate of Conformity	

[22] Requires purchase of Communications Option (Field 8) with "Digital Input".

Example (cont)

16	17	18	19	20	21	22	23	24	25	26	27	28
X	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**XX**	**XX**	**XX**

Order Codes GS-X2, GS-X3

				Example
GS-X2 1/8 DIN Controller **GS-X3** 1/4 DIN Controller		I/O supplied as standard includes one Universal PV Input, EIA-485 Modbus RTU Slave Communications, 1 Form C Relay, 2x Contact Closure Digital Inputs, 1 Current Transformer Input, and 24Vdc Transmitter Power Supply.		**GS-X2**
1	Type	CC	= Controller Only	CC
		CP	= 1 x 8 Segment Basic Programmer	
		P1	= 1 x 24 Segment Advanced Programmer	
		P10	= 10 x 24 Segment Advanced Programmer	
		P20	= 20 x 8 Segment Advanced Programmer	
2	Supply Voltage	VH	= 100 - 230Vac +/-15% (48 to 62Hz)	VH
		VL	= 24Vac +10%, -15% (48 to 62 Hz); 24Vdc +20, -15%; 5% Ripple	
3	I/O 1	XX	= Not Fitted	R2
		L2	= Logic	
		R1	= Relay Output (Without Snubber)	
		R2	= Relay (Supplied With External Snubber)	
		D1	= DC Output	
		T1	= TRIAC (Without Snubber)	
		T2	= TRIAC (Supplied With External Snubber)	
4	I/O 2	XX	= Not Fitted	D1
		L2	= Logic	
		R1	= Relay Output (Without Snubber)	
		R2	= Relay (Supplied With External Snubber)	
		D1	= DC Output	
		T1	= TRIAC (Without Snubber)	
		T2	= TRIAC (Supplied With External Snubber)	
5	I/O 4	XX	= Not Fitted	D1
		L2	= Logic	
		R1	= Relay Output (Without Snubber)	
		R2	= Relay (Supplied With External Snubber)	
		D1	= DC Output	
		T1	= TRIAC (Without Snubber)	
		T2	= TRIAC (Supplied With External Snubber)	
6	Output 3	XX	= Form C (Default)	XX
7	Serial Communications Protocol [7]	XX	= Modbus Slave (Default) Or None	XX
		EI	= EI-Bisynch Comms	
		SM	= Modbus Master and Slave	

Order Codes continued on next page

Order Codes GS-X2, GS-X3 (continued)

				Example
8	Ethernet, Communications & Remote SP [8]	XX	= None (Default)	D8
		I8	= Second PV Input; 8 Digital Input/Outputs	
		D8	= 8 Digital Input/Outputs Only	
		E4	= Ethernet (Modbus TCP Slave) 4 x Digital I/O Only	
		IE	= Second PV Input;Ethernet (Modbus TCP Slave) + 4 x Digital I/O	
9	Ethernet (TCP) Communications Protocol [9]	XX	= Modbus TCP Slave (Default) Or None	XX
		ES	= EtherNet/IP Server and Modbus TCP Slave	
		BS	= BACnet Slave and Modbus TCP Slave	
		TM	= Modbus TCP Master and Slave	
10	Tool Kit Blocks	XX	= None (Default 50 Wires)	XX
		TK	= Standard (Includes 200 Wires)	
		ETK	= Enhanced (Includes 200 Wires)	
11	OEM Security	XXX	= None (Default)	XXX
		OEM	= OEM Security	
12	Bezel	WD	= Washdown	WD
13	Labels	XXXXX	= None (Default)	XXXXX
		Fnnnn	= Custom Label	
14	Specials [14]	XXXXXX	= None (Default)	XXXXXX
15	Gain scheduling Sets	XX	= Two Gain Scheduling Sets (Default)	XX
		08	= Eight Gain Scheduling Sets	

[7] EIA-485 serial communications is provided as standard for GS-X2 and GS-X3. No additional option purchase is required to use serial communications protocols.

[8] Digital I/O on Ethernet, 2nd Input & Option I/O cannot be used for PID control output.

[9] Use of Ethernet communications protocols requires purchase of Ethernet Communications (field 8) options "E4" or "IE".

[14] Regional and Application specific codes are entered here which can be found in additional release documentation

Example

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
GS-X2	**CC**	**VH**	**R2**	**D1**	**D1**	**XX**	**XX**	**D8**	**XX**	**XX**	**XXX**	**WD**	**XXXX**	**XXXXXX**	**XX**

Quick start codes GS-X2, GS-X3

				Example
16	Application	X	= None (Exit Quick Code)	X
		1	= Heat Only (Default) 1,2,V,C,D all add (note 5)	
		2	= Heat/Cool	
		V	= VPU	
		C	= Carbon Potential Controller (Requires PV2 and Zirconia)	
		D	= Dew Point Controller (Requires PV2 and Zirconia)	
17	Input 1 Sensor Type	X	= Not Required	X
		M	= Linear 0 to 80mVdc	
		V	= Linear 0 to 10Vdc	
		2	= Linear 0 to 20mA	
		4	= Linear 4 to 20mA	
		B	= Type B Thermocouple	
		C	= Type C Thermocouple	
		J	= Type J Thermocouple	
		K	= Type K Thermocouple	
		L	= Type L Thermocouple	
		N	= Type N Thermocouple	
		R	= Type R Thermocouple	
		S	= Type S Thermocouple	
		T	= Type T Thermocouple	
		P	= Pt100	
		W	= Pt100	
18	Input 1 Range	X	= Not Required	X
		F	= Full Sensor range	
		1	= 0 to 100°C or 32 to 212°F or 273 to 373K	
		2	= 0 to 200°C or 32 to 392°F or 273 to 473K	
		3	= 0 to 400°C or 32 to 752°F or 273 to 673K	
		4	= 0 to 600°C or 32 to 1112°F or 273 to 873K	
		5	= 0 to 800°C or 32 to 1472°F or 273 to 1073K	
		6	= 0 to 1000°C or 32 to 1832°F or 273 to 1273K	
		7	= 0 to 1200°C or 32 to 2192°F or 273 to 1473K	
		8	= 0 to 1300°C or 32 to 2552°F or 273 to 1573K	
		9	= 0 to 1600°C or 32 to 2912°F or 273 to 1873K	
		A	= 0 to 1800°C or 32 to 3272°F or 273 to 2073K	

Quick start codes continued on next page

Quick start codes GS-X2, GS-X3 (continued)

				Example
19	Input 2 Sensor Type [19]	X	= Not Required	X
		M	= Linear 0 to 80mVdc	
		V	= Linear 0 to 10Vdc	
		2	= Linear 0 to 20mA	
		4	= Linear 4 to 20mA	
		B	= Type B Thermocouple	
		C	= Type C Thermocouple	
		J	= Type J Thermocouple	
		K	= Type K Thermocouple	
		L	= Type L Thermocouple	
		N	= Type N Thermocouple	
		R	= Type R Thermocouple	
		S	= Type S Thermocouple	
		T	= Type T Thermocouple	
		P	= Pt100	
		W	= Pt100	
		Z	= Zirconia (HiZ)	
20	Input 2 Range [7] [20]	X	= Not Required	X
		F	= Full Sensor range	
		1	= 0 to 100°C or 32 to 212°F or 273 to 373K	
		2	= 0 to 200°C or 32 to 392°F or 273 to 473K	
		3	= 0 to 400°C or 32 to 752°F or 273 to 673K	
		4	= 0 to 600°C or 32 to 1112°F or 273 to 873K	
		5	= 0 to 800°C or 32 to 1472°F or 273 to 1073K	
		6	= 0 to 1000°C or 32 to 1832°F or 273 to 1273K	
		7	= 0 to 1200°C or 32 to 2192°F or 273 to 1473K	
		8	= 0 to 1300°C or 32 to 2552°F or 273 to 1573K	
		9	= 0 to 1600°C or 32 to 2912°F or 273 to 1873K	
		A	= 0 to 1800°C or 32 to 3272°F or 273 to 2073K	
21	CT Input Range	X	= Not Used	X
		1	= 10A	
		2	= 25A	
		5	= 50A	
		6	= 100A	
		7	= 1000A	

Quick start codes continued on next page

Quick start codes GS-X2, GS-X3 (continued)

				Example
22	Digital Input A Function [22]	X	= Not Used	X
		W	= Alarm Acknowledge	
		M	= Auto/Manual	
		R	= Programmer Run/Hold	
		L	= Keylock	
		K	= Loop Track	
		P	= Local Setpoint Select	
		T	= Programmer Reset	
		U	= Remote Setpoint Select	
		V	= Recipe Select	
23	Digital Input B Function	X	= Not Used	X
		W	= Alarm Acknowledge	
		M	= Auto/Manual	
		R	= Programmer Run/Hold	
		L	= Keylock	
		K	= Loop Track	
		P	= Local Setpoint Select	
		T	= Programmer Reset	
		U	= Remote Setpoint Select	
		V	= Recipe Select	
24	Programmer I/O Configuration [24]	X	= Not Used/Fitted	X
		1	= D1 to D8 Programmer Event Outputs 1 to 8	
		2	= D1 to D4 = Programmer Event Outputs 1 to 4, D5 to D7 = BCD Inputs 1 to 3, D8 = Programmer Run/Hold. BCD Output to Program Number	
		3	= D1 to D4 = Programmer Event outputs 1 to 4, D5 to D8 Programmer Run, Hold, Reset, Advance Respectively	
		4	= D1 to D4 = Programmer Event inputs 1 to 4, D5 to D7 Programmer Run/Hold, Reset, Advance Respectively, D8 Not Used. BCD Output to Program Number	
		5	= D1 to D8 = BCD Inputs 1 to 8. BCD Output to Recipe Recall	
		6	= D1 to D4 = BCD Inputs 1 to 4, D5 - D8 = Not used. BCD Output to Recipe Recall	
		7	= D1 to D4 Programmer Run, Hold, Reset, Advance Respectively, D5 - D8 = Not used	
		8	= D1 to D3 Programmer Run, Hold, Reset Respectively, D4 - D8 = Not Used	
		9	= D1 to D4 = Programmer Event Outputs, D5 to D8 = Not Used	

Quick start codes continued on next page

Quick start codes GS-X2, GS-X3 (continued)

					Example
25	Units	X	=	Use Default (Degrees Celsius)	X
		C	=	Degrees Celsius	
		F	=	Degrees Fahrenheit	
		K	=	Kelvin	
26	Future	XX	=	Future	XX
27	Warranty	XX	=	Standard Warranty	XX
			=	Future - WL005 Extended warranty	
28	Certificate of Conformity	XX	=	None Required	XX
		CERT1	=	Supplied With Certificate of Conformity	
		CERT2	=	Supplied With Certificate of Conformity	

[19] Requires purchase of second input (field 8). either "I8" or "IE".
[20] Requires purchase of second input (field 8),either "I8" or "IE".
[22] Requires purchase of Communications Option (Field 8) with "Digital Input".
[24] Requires purchase of option I/O (field 8). either "I8", "D8", "E4" or "IE".

Example (cont)

16	17	18	19	20	21	22	23	24	25	26	27	28
X	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**XX**	**XX**	**XX**

Further Examples

SX80 Example - to order an equivelent of the SX80 the following Nomenclature is required

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
GS-X1	CC	VH	R2	D1	X	XX	XX	TX	XX	XX	XXX	WD	XXXXX	XXXXXX

15	16	17	18	19	20	21	22	23	24	25	26	27	28
XX	X	X	X	X	X	X	X	X	X	X	XX	XX	XX

Resulting in order code:
GS-X1 CC/VH/R2/D1/X/XX/XX/TX/XX/XX/XXX/WD/XXXXX/XXXXXX/XX

SX90 Example - to order an equivelent of the SX90 the following Nomenclature is required

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
GS-X2	CC	VH	R2	D1	D1	XX	XX	D8	XX	XX	XXX	WD	XXXXX	XXXXXX

15	16	17	18	19	20	21	22	23	24	25	26	27	28
XX	X	X	X	X	X	X	X	X	X	X	XX	XX	XX

Resulting in order code:
GS-X2 CC/VH/R2/D1/D1/XX/XX/D8/XX/XX/XXX/WD/XXXX/XXXXXX/XX

GS-X1 Example - as SX80 example above but with Modbus RTU (no TX PSU)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
GS-X1	CC	VH	R2	D1	X	XX	XX	C2	XX	XX	XXX	WD	XXXXX	XXXXXX

15	16	17	18	19	20	21	22	23	24	25	26	27	28
XX	X	X	X	X	X	X	X	X	X	X	XX	XX	XX

Resulting in order code:
GS-X1 CC/VH/R2/D1/X/XX/XX/C2/XX/XX/XXX/WD/XXXXX/XXXXXX/XX

GS-X2 Example - Communications with BACnet and Modbus TCP

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
GS-X2	CC	VH	R2	D1	D1	XX	XX	CE	BS	XX	XXX	WD	XXXXX	XXXXXX

15	16	17	18	19	20	21	22	23	24	25	26	27	28
XX	X	X	X	X	X	X	X	X	X	X	XX	XX	XX

Resulting in order code:
GS-X2 CC/VH/R2/D1/D1/XX/XX/CE/BS/XX/XXX/WD/XXXXX/XXXXXX/XX

How to order example:

GS-X1 CC/VH/R2/D1/X/XX/XX/TX/XX/XX/XXX/WD/XXXXX/XXXXXX/XX
1 off Spirax Sarco Panel Mounted programmable controller to replace SX80

Spare parts and accessories

The controllers contain no user servicable parts.
The following accessories are available.

Accessory order codes

GS-X	GS-Xx Accessories	Example
		GS-X
1	RES2R9 = 2.49 Resistor	USBCONF
	RES250 = 250 Resistor	
	RES500 = 500 Resistor	
	SNUBBER = RC Snubber	
	USBCONF = USB Backup Lead	
	CTR10A = Current Transformer 10A Primary	
	CTR25A = Current Transformer 25A Primary	
	CTR50A = Current Transformer 50A Primary	
	CTR100A = Current Transformer 100A Primary	
	ITOOLS = i Tools configuration software	

Example

	1
GS-X	USBCONF

How to order spares and accessories

Always order accessories by using the nomenclature and description given in the table above.

Example: GS-X USBCONF - 1 off USB Backup Lead - This accessory is for a GS-Xx Controller.

TI-P373-13
CMGT Issue 17

PF6
Stainless Steel
Piston Actuated On/Off Valves

Description

A 2-port pneumatically actuated on/off stainless steel valve for use on steam, water, air, oil and gases. A pneumatic signal acts on the actuator piston to open or close the valve with a spring return action. A valve position indicator is included on standard and flow regulator models.
Standard versions have PTFE stem seals for operation up to 180 °C (356 °F).
Optionally, high temperature stem seals (**H**) can be provided for operation up to 200 °C (392 °F).

Valves are available with one of three sizes of actuator:

Type 1 (45 mm (1.77")), **Type 2** (63 mm (2.48")) and **Type 3** (90 mm (3.54")) with the following action options:

- **NC (Normally Closed) -** Designed for flow over the seat (port 1 to 2).
  Caution: Not recommended for waterhammer prevention.
- **NO (Normally Open) -** Designed for flow under the seat (port 2 to 1). Can be used to prevent waterhammer on valve closure in liquid applications.
- **BD (Bi-Directional normally closed) -** Designed for special applications that require flow in both directions and incorporates an anti-waterhammer design for liquid applications flowing under the seat (port 2 to 1).
  Note: To help prevent the possibility of waterhammer on liquid applications flowing over the seat (port 1 to 2) the pressure should not exceed 1 bar g (15 psi g).

Optional extras (see 'Valve selection guide'):

Travel switch	Flow regulator	Position module



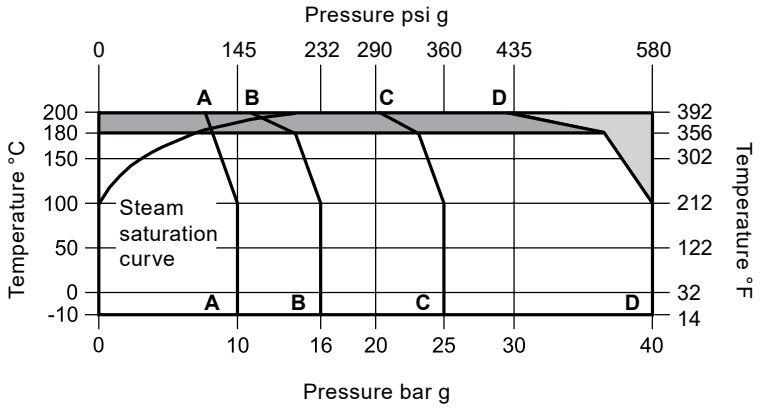
Sizes, pipe connections and actuator combinations

Valve type and pipe connections	Actuator type and version		DN15 ½"	DN20 ¾"	DN25 1"	DN32 1¼"	DN40 1½"	DN50 2"
PF61G Screwed to BSP or NPT **PF62G** Butt weld to DIN 11850 pipe, ASME B 36.10/ISO 65 pipe	**1**	PTFE version	•	•				
	2	PTFE version	•	•	•	•	•	•
		H version	•	•	•			
	3	PTFE version			•	•	•	•
		H version				•	•	•
PF63G Flanged to EN 1092 or ASME Class 150 (welded on flanges)	**2**	PTFE version	•	•	•	•	•	•
		H version	•	•	•			
	3	PTFE version			•	•	•	•
		H version				•	•	•

Available range

Valve action	Screwed (BSP or NPT)	Butt weld	Flanged (EN 1092 or ASME)
NC - Normally Closed (flow over seat)	PF61G-1NC	PF62G-1NC	
	PF61G-2NC	PF62G-2NC	PF63G-2NC
	PF61G-3NC	PF62G-3NC	PF63G-3NC
NO - Normally Open (flow under seat)	PF61G-1NO	PF62G-1NO	
	PF61G-2NO	PF62G-2NO	PF63G-2NO
	PF61G-3NO	PF62G-3NO	PF63G-3NO
BD - Bi-Directional normally closed (flow over or under seat)	PF61G-1BD	PF62G-1BD	
	PF61G-2BD	PF62G-2BD	PF63G-2BD
	PF61G-3BD	PF62G-3BD	PF63G-3BD

Pressure/temperature limits



A - A PN10

B - B PN16 and ASME 150

C - C PN25

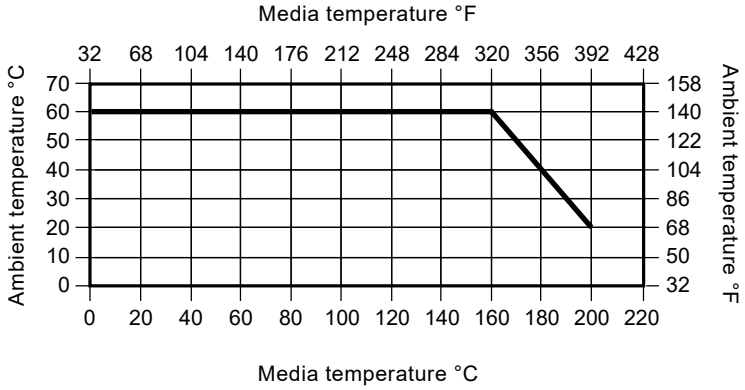
D - D PN40

The product **must not** be used in this region or beyond the body design conditions quoted in the table below as damage to the internals will occur.

High temperature stem seals (Option **H**) are required for use in this region.

Body design conditions	Screwed, butt weld and flanged EN 1092	DN15 - DN25 (½" - 1")	PN40
		DN32 and DN40 (1¼" - 1½")	PN25
		DN50 (2")	PN16
	Flanged ASME	DN15 - DN50 (½" - 2")	Class 150
Maximum design pressure			Refer to the graph above
Maximum design temperature		200 °C	392 °F
Minimum design temperature		-10 °C	14 °F
Maximum operating pressure for saturated steam service	Standard seals	9 bar g @ 180 °C	130 psi g @ 356 °F
	High temperature seals - Option **H**	14.5 bar g @ 200 °C	210 psi g @ 392 °F
Maximum operating temperature	Standard seals	180 °C @ 9 bar g	356 °F @ 130 psi g
	High temperature seals - Option **H**	200 °C @ 14.5 bar g	392 °F @ 210 psi g
Minimum operating temperature	(**Note:** For lower operating temperatures consult Spirax Sarco)	-10 °C	14 °F
Ambient temperature limits	Maximum	60 °C	140 °F
	Minimum	-10 °C	14 °F
Note: Protection from environmental influences (e.g. UV radiation, humidity, chemicals) is required. Ensure that adequate shelter is provided for outdoor installations			
Maximum differential pressure			(see page 6)
Designed for a maximum cold hydraulic test pressure of:			1.5 x PMA (PN rating)
Maximum test pressure is equal to the maximum differential pressure			

Temperature degredation



Technical details

Leakage		TFM 1600 soft seal	ASME Class VI
Flow characteristic		Fast opening	On/off
Flow direction	**PF6_G-NC**	Flow over seat	Port 1 to 2
	PF6_G-NO	Flow under seat	Port 2 to 1
	PF6_G-BD	Flow over seat	Port 1 to 2
		Flow under seat	Port 2 to 1
Pilot media Instrument air or inert gases - For use with other flow media contact Spirax Sarco			60 °C (140 °F)maximum
Actuator rotation		360°	

Actuator type and size		**Pilot connection**	**Maximum pilot pressure**	
			NC & BO	NO
	Type 1 = 45 mm (1.77")diameter	⅛" BSP	10 bar g (145 psi g)	10 bar g (145 psi g)
	Type 2 = 63 mm (2.48") diameter	¼" BSP	10 bar g (145 psi g)	8 bar g (116 psi g)
	Type 3 = 90 mm (3.54") diameter	¼"BSP	8 bar g (116 psi g)	8 bar g (116 psi g)

Kvs values

Size	**DN15 ½"**	**DN20 ¾"**	**DN25 1"**	**DN32 1¼"**	**DN40 1½"**	**DN50 2"**
Kvs	4.5	8.0	15.6	24.6	42.0	57.0

For conversion:
Cv (UK) = Kv x 0.963
Cv (US) = Kv x 1.156

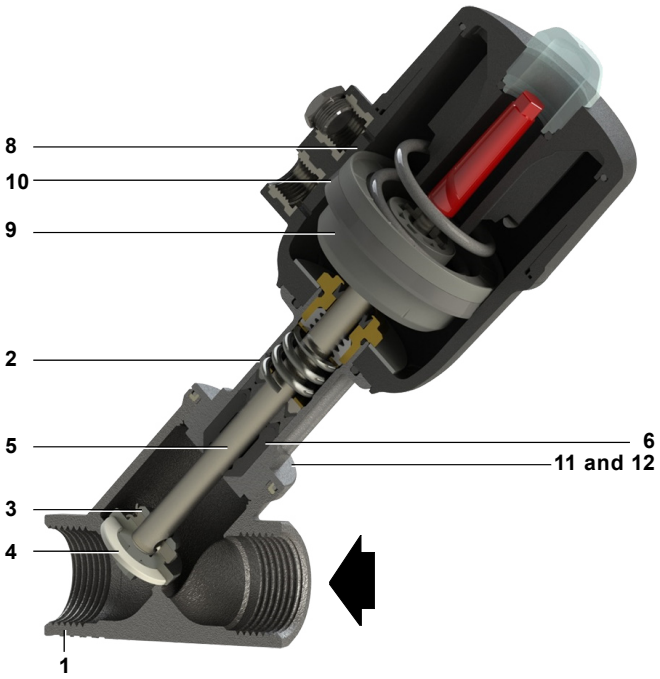
Materials

No.	Part		Material	
1	Body		Stainless steel	AISI 316L
2	Bonnet		Stainless steel	AISI 316L
3	Plug		Stainless steel	AISI 316L
4	Valve plug seal		Modified PTFE G500	
5	Valve stem		Stainless steel	AISI 316L
6	Stem seals	Standard	PTFE + 25% carbon graphite filled PTFE	
			+ FKM chevron	
		Option **H**	25% carbon graphite filled PTFE + FKM chevron	
7*	Stem 'O' ring		FKM	
8**	Actuator housing		30% glass filled polyamide (for **H** version PA66)	
9	Piston		50% glass filled polyamide	
10	Piston lip seal		NBR	
11	Gasket		PTFE	
12	'O' ring		FKM	

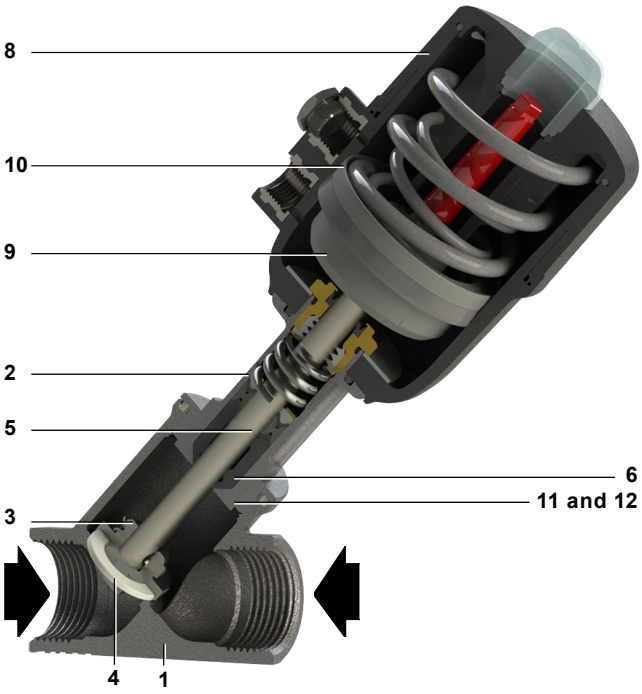
* **Note** Item 7 is not shown.

** **Note** Optional stainless steel actuator available on request.

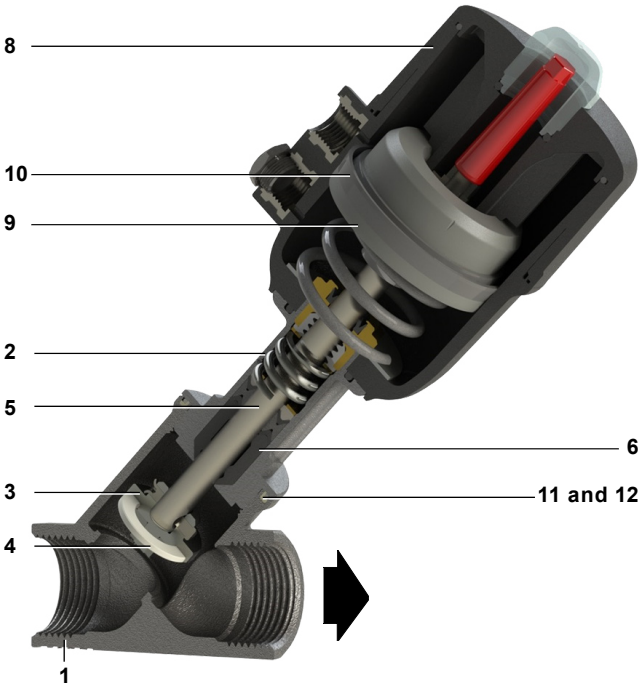
NC (Normally Closed)



BD (Bi-Directional normally closed)



NO (Normally Open)



ΔPMX - Maximum differential pressures for PF6 piston actuated valves

*** Notes:**

1. Maximum differential pressure for saturated steam service is 11.5 bar g (167 psi g) and 14.5 bar g (210 psi g) for high temperature valve versions.

2. ASME flange connections are limited to ASME 150 pressure rating.

PF6_G-NC (Normally closed)

Model	Valve size	Actuator diameter (mm)		Flow direction (port 1 to 2)	Maximum differential pressure (see Notes at the top of this page)		Pilot Pressure			
							Minimum		Maximum	
		mm	inches		bar	psi g	bar	psi g	bar	psi g
PF6_G-1NC	DN15 - (½")	45	1.77	over seat	16	230	1.8	26	10	150
	DN20 - (¾")									
PF6_G-2NC	DN15 - (½")	63	2.48	over seat	20	290	3.9	57	10	150
	DN20 - (¾")						4.6	67	10	150
	DN25 - (1")						5.2	75	10	150
	DN32 - (1¼")				16	230	5.7	83	10	150
	DN40 - (1½")						8.8	128	10	150
	DN50 - (2")				11	160	7.8	113	10	150
PF6_G-3NC	DN25 - (1")	90	3.54	over seat	20	290	3.0	44	8	115
	DN32 - (1¼")				16	230	3.0	44	8	115
	DN40 - (1½")						4.0	58	8	115
	DN50 - (2")						5.8	84	8	115

PF6_G-NO (Normally open)

Model	Valve size	Actuator diameter (mm)		Flow direction (port 1 to 2)	Maximum differential pressure (see Notes at the top of this page)		Pilot Pressure			
							Minimum		Maximum	
		mm	inches		bar	psi g	bar	psi g	bar	psi g
PF6_G-1NO	DN15 - (½")	45	1.77	under seat	16	230	1.8	26	10	150
	DN20 - (¾")									
PF6_G-2NO	DN15 - (½")	63	2.48	under seat	16	230	2.8	41	10	145
	DN20 - (¾")						4.5	65	10	145
	DN25 - (1")						5.7	83	10	145
	DN32 - (1¼")						6.7	97	10	145
	DN40 - (1½")						8.8	127	10	145
	DN50 - (2")				8	175	9.6	139	10	145
PF6_G-3NO	DN25 - (1")	90	3.54	under seat	16	230	4.5	65	8	116
	DN32 - (1¼")						4.0	58	8	116
	DN40 - (1½")						5.4	78	8	116
	DN50 - (2")						7.0	101	8	116

PF6_G-BD (Bi-Directional normally closed)

Model	Valve size	Actuator diameter (mm)		Flow direction (port 1 to 2)	* Maximum differential pressure (port 1 to 2)		Flow direction (port 2 to 1)	* Maximum differential pressure (port 2 to 1)		Pilot pressure			
										Minimum		Maximum	
		mm	inches		bar	psi g		bar	psi g	bar	psi g	bar	psi g
PF6_G-1BD	**DN15 -** (½")	45	1.77	over seat	16	230	under seat	16.0	230	5.0	60	10	150
	DN20 - (¾")						under seat	7.0	100				
PF6_G-2BD	**DN15 -** (½")	63	2.48	over seat	16	230	under seat	16.0	230	4.2	61	10	150
	DN20 - (¾")						under seat	16.0	230				
	DN25 - (1")						under seat	11.0	160				
	DN32 - (1¼")						under seat	6.0	87				
	DN40 - (1½")				12	175	under seat	4.0	60				
	DN50 - (2")				8	115	under seat	2.5	36				
PF6_G-3BD	**DN25 -** (1")	90	3.54	over seat	16	230	under seat	14.0	205	3.8	55	8	115
	DN32 - (1¼")						under seat	12.0	175				
	DN40 - (1½")						under seat	8.0	115				
	DN50 - (2")				14	205	under seat	6.0	73				

*** Notes:**

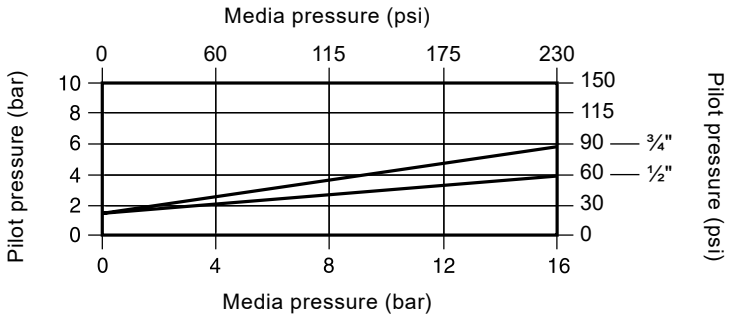
1. Maximum differential pressure for saturated steam service is 11.5 bar g (167 psi g) and 14.5 bar g (210 psi g) for high temperature valve versions.

2. ASME flange connections are limited to ASME 150 pressure rating.

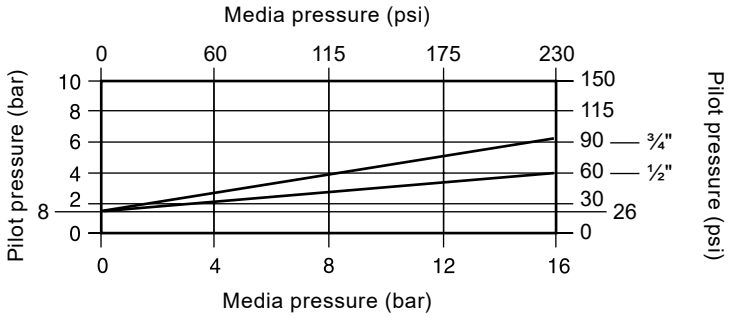
Pilot/media pressure relationship

PF6_G-NC (Normally Closed)

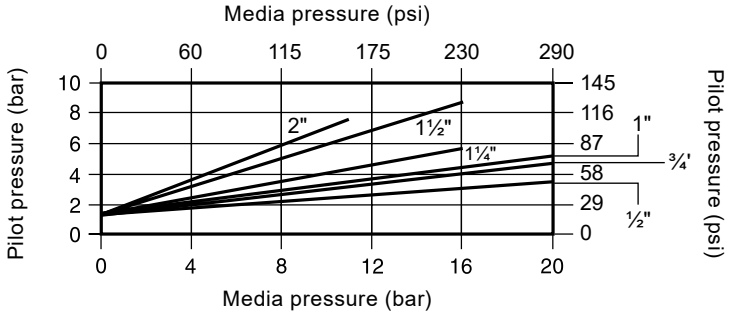
PF6_G-1NC flow over seat (1 to 2)



PF6_G-2NC flow over seat (1 to 2)



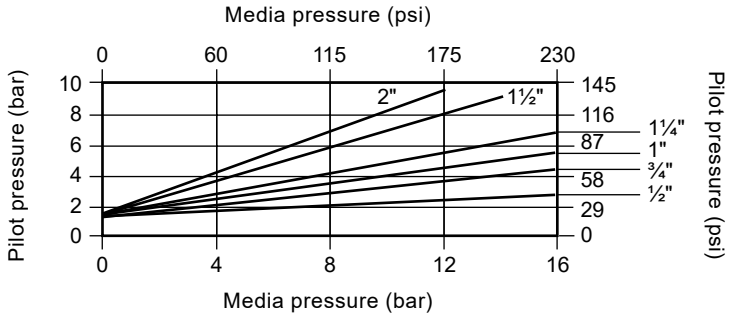
PF6_G-3NC flow over seat (1 to 2)



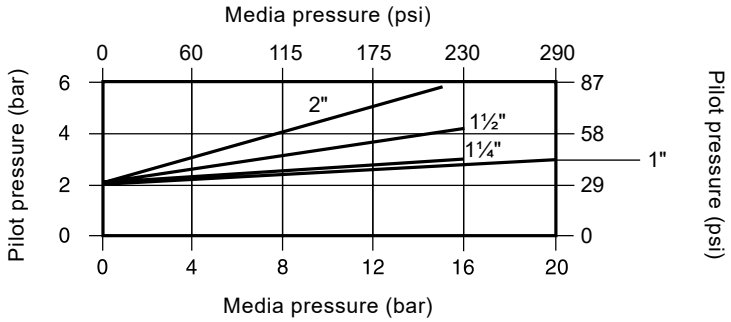
Pilot/media pressure relationship (continued)

PF6_G-NO (Normally Open)

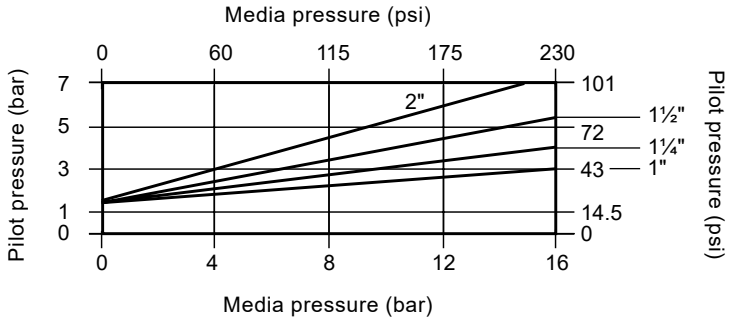
PF6_G-1NO flow under seat (2 to 1)



PF6_G-2NO flow under seat (2 to 1)



PF6_G-3NO flow under seat (2 to 1)

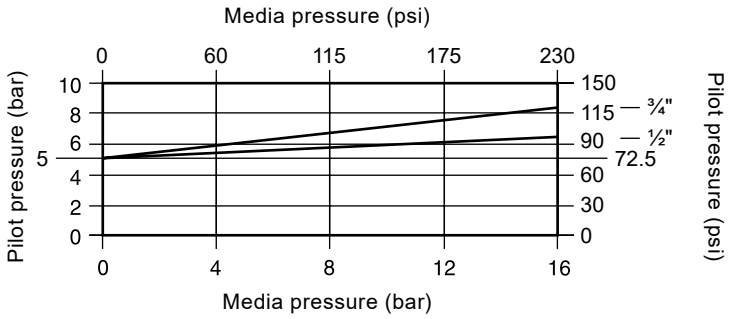


Pilot/media pressure relationship continued on next page

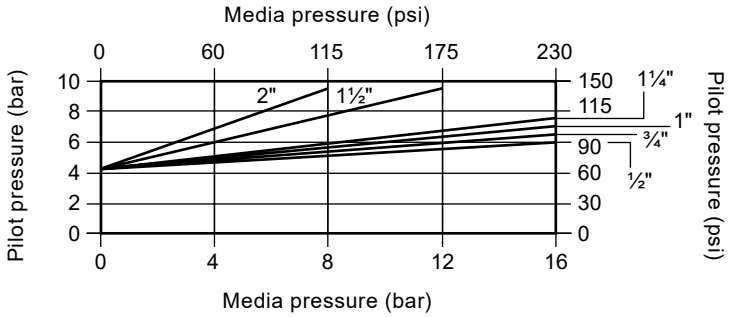
Pilot/media pressure relationship

PF6_G-BD (Bi-Directional normally closed)

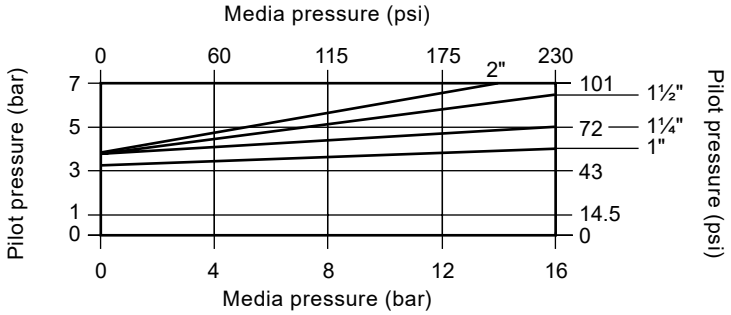
PF6_G-1BD flow over seat (1 to 2)



PF6_G-2BD flow over seat (1 to 2)



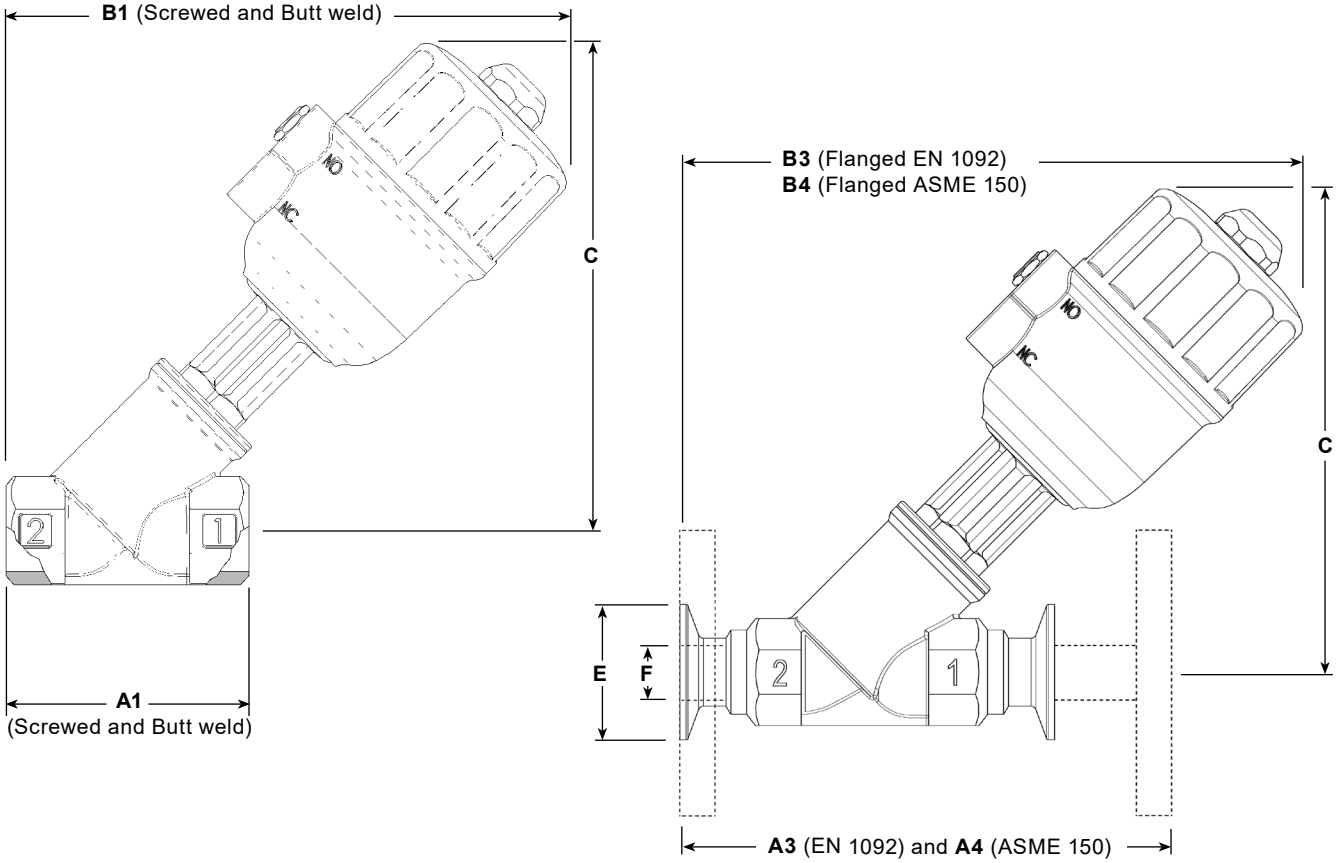
PF6_G-3BD flow over seat (1 to 2)



Dimensions and weights (approximate) in mm (inches) and kg (lb)

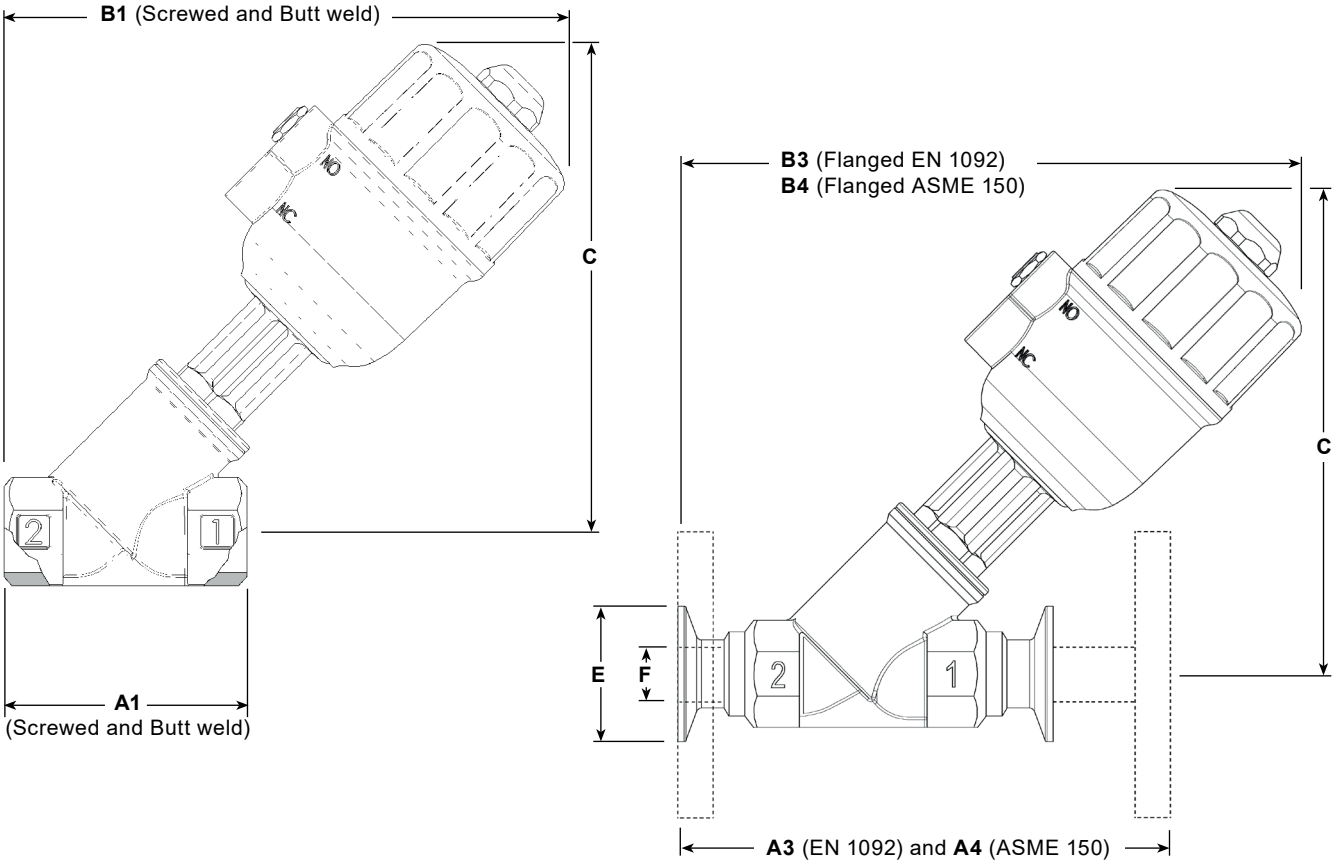
Notes:

* **Add** 0.2 kg (0.4 lb) for travel switch or flow regulator options (not available for use with the Type 1 actuator).
  Add 0.45 kg (1 lb) for the position module.



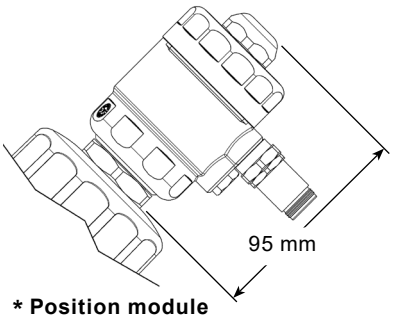
Valve size	Actuator type and size		Screwed and Butt weld							
			A1		B1		C		Weight *	
			mm	inches	mm	inches	mm	inches	kg	lbs
DN15 - ½"	1	(45 mm)	65	2.56	144	5.67	123	4.85	0.8	1.8
	2	(63 mm)	65	2.56	192	7.56	171	6.74	1.2	2.7
DN20 - ¾"	1	(45 mm)	75	2.96	155	6.11	126	4.97	0.9	2.0
	2	(63 mm)	75	2.96	198	7.80	176	6.93	1.3	2.9
DN25 - 1"	2	(63 mm)	90	3.55	212	8.35	185	7.29	1.5	3.3
	3	(90 mm)	90	3.55	223	8.79	196	7.72	2.0	4.9
DN32 - 1¼"	2	(63 mm)	110	4.33	225	8.87	193	7.60	1.9	4.2
	3	(90 mm)	110	4.33	234	9.22	202	7.96	2.4	5.3
DN40 - 1½"	2	(63 mm)	120	4.73	230	9.06	198	7.80	2.1	5.3
	3	(90 mm)	120	4.73	239	9.42	207	8.16	2.6	5.8
DN50 - 2"	2	(63 mm)	150	5.91	248	9.77	207	8.16	2.9	6.4
	3	(90 mm)	150	5.91	257	10.13	216	8.51	3.3	7.3

Dimensions and weights (approximate) in mm (inches) and kg (lb) (continued)

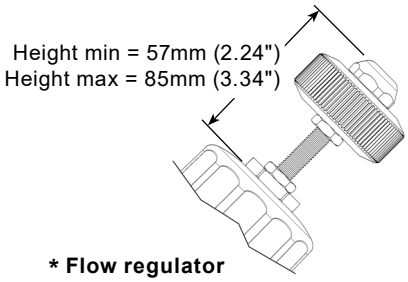


Valve size	Actuator type and size		Flanged											
			EN 1092 A3		ASME 150 A4		EN 1092 B3		ASME 150 B4		C		Weight *	
			mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	kg	lbs
DN15 - ½"	1	(45 mm)	-	-	-	-	-	-	-	-	-	-	-	-
	2	(63 mm)	130	5.12	139.7	5.51	229.0	8.59	226.2	7.65	202.1	7.65	2.6	5.5
DN20 - ¾"	1	(45 mm)	-	-	-	-	-	-	-	-	-	-	-	-
	2	(63 mm)	150	5.91	152.4	6.00	235.9	9.30	232.7	8.28	207.4	8.28	3.0	6.4
DN25 - 1"	2	(63 mm)	160	6.31	165.1	6.50	249.2	9.42	247.6	8.20	216.2	8.20	3.8	8.2
	3	(90 mm)	160	6.31	165.1	6.50	260.2	9.85	258.6	8.63	227.2	8.63	4.4	9.5
DN32 - 1¼"	2	(63 mm)	180	7.09	184.2	7.26	262.0	9.93	259.9	8.51	224.0	8.51	5.6	12.2
	3	(90 mm)	180	7.09	184.2	7.26	273.0	10.37	270.9	8.95	235.0	8.95	6.0	13.0
DN40 - 1½"	2	(63 mm)	200	7.88	203.2	8.00	267.0	10.13	266.5	8.67	229.0	8.67	6.5	14.2
	3	(90 mm)	200	7.88	203.2	8.00	278.0	10.56	277.5	9.14	240.0	9.14	7.0	15.2
DN50 - 2"	2	(63 mm)	230	9.06	228.6	9.00	288.2	10.84	237.3	9.06	237.8	9.06	8.7	19.0
	3	(90 mm)	230	9.06	228.6	9.00	299.2	11.27	298.3	9.46	248.8	9.46	9.1	20.0

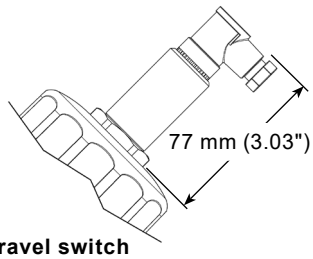
Dimensions (approximate) in mm (inches) (continued)



* Position module



* Flow regulator



* Travel switch

PF6 piston actuated valves - opening/closing times (seconds)

Notes:
1. Pilot pressure is 6 bar (87 psi)
2. Pressure in the body 0 bar (0 psi)

Valve size	Actuator Ø45 mm				Actuator Ø63 mm				Actuator Ø90 mm			
	NC valves		NO valves		NC valves		NO valves		NC valves		NO valves	
	opening	closing	opening	closing	opening	closing	opening	closing	opening	closing	opening	closing
DN15 - ½"	0.09	0.22	0.22	0.09	0.14	0.30	0.30	0.14	-	-	-	-
DN20 - ¾"	0.09	0.22	0.22	0.09	0.20	0.30	0.30	0.20	-	-	-	-
DN25 - 1"	-	-	-	-	0.32	0.34	0.34	0.32	0.32	0.34	0.34	0.32
DN32 - 1¼"	-	-	-	-	0.34	0.38	0.38	0.34	0.36	0.40	0.40	0.36
DN40 - 1½"	-	-	-	-	0.34	0.38	0.38	0.34	0.40	0.46	0.46	0.40
DN50 - 2"	-	-	-	-	0.36	0.38	0.38	0.36	0.40	0.46	0.46	0.40

Associated equipment

Pilot solenoid

Type DM 3-port two way electropneumatic pilot solenoid valve that can be directly mounted (banjo connection) to the PF61G-NC, NO and BD series piston actuated valves to provide actuator pilot pressure to open normally closed or close normally open valves. Suitable for air or water operating media. The valve is supplied with a DIN connector. For full details refer to the relevant Technical Information Sheet.

Please refer to TI-P373-04 or IM-P373-12 for more information.

Available types

Model	Type	Actuator	Voltage/Frequency	Connection
DM11	1	45 mm (1.77")	230/50 or 240/60 Vac	⅛" BSP
DM12			110/50 or 120/60 Vac	⅛" BSP
DM13			24/50 or 24/60 Vac	⅛" BSP
DM14			24 Vdc	⅛" BSP
DM21	2	63 mm (2.48")	230/50 or 240/60 Vac	¼" BSP
DM22			110/50 or 120/60 Vac	¼" BSP
DM23			24/50 or 24/60 Vac	¼" BSP
DM24			24 Vdc	¼" BSP
DM31	3	90 mm (3.54")	230/50 or 240/60 Vac	¼" BSP
DM32			110/50 or 120/60 Vac	¼" BSP
DM33			24/50 or 24/60 Vac	¼" BSP
DM34			24 Vdc	¼" BSP



Valve selection guide

						DN25
Valve size	DN15 (½"), DN20 (¾"), DN25 (1"), DN32 (1¼"), DN40 (1½") and DN50 (2")					
Valve type	**P**	=	Piston valve			**P**
Valve characteristic	**F**	=	Fast opening			**F**
Body material	**6**	=	Stainless steel			**6**
Connections	**1**	=	Screwed	BSP or NPT		**3**
	2	=	Butt weld	**Note**: state pipeline connection when ordering:	- DIN 11850 pipe - ASME B 36.10/ISO 65 pipe	
	3	=	Flanged	EN 1092 or ASME Class 150 (welded on flanges)		
	4	=				
Valve plug seal	**G**	=	Modified PTFE G500 soft seat			**G**
Stem seal	**Blank**	=	PTFE + 25% carbon graphite filled PTFE + FKM chevron (standard)			
	H	=	25% carbon graphite filled PTFE + FKM chevron **Note:** Option **H** is not available for valves fitted with Type 1 actuators.			
Actuator type	**1**	=	45 mm diameter	(1.77 inches)		**2**
	2	=	63 mm diameter	(2.48 inches)		
	3	=	90 mm diameter	(3.54 inches)		
Valve position	**NC**	=	Normally Closed			**NC**
	NO	=	Normally Open			
	BD	=	Bi-Directional			
Optional	**Blank**	=	No options required			
	A	=	Position module with mechanical switch	Change-over contacts, max. tension 230 Vac, Max. current 6 A	**Provides indication of open and closed valve position through an inductive or mechanical switch. Available on all actuators types.**	
	B	=	Position module with inductive switch	PNP, supply 14 - 12 Vdc power 13 mA max.		
	I	=	Travel switch	Provides indication of open or closed valve position through a magnetic reed switch with volt free contacts.		
				Maximum rating:	Voltage (V) = 500 V, Current (I) = 0.5 A, Power (P) = 30 VA.	
				Available on Type 2 and Type 3 actuators with suffix 'I' if this option is required.		
	R	=	Flow regulator	Provides manual control of maximum flow through the valve. Can also provide manual shut-off on normally open valves. Available on Type 2 and Type 3 actuators with suffix 'R' if this option is required.		

Note: Shaded areas represent fixed parameters

Valve selection guide example

DN25	-	P	-	F	-	6	-	3	-	G	-		-	2	-	NC	-		-	Flanged EN 1092 PN40

How to order

Example: 1 off Spirax Sarco DN25 PF63G-2NC stainless steel piston actuated on/off valve having flanged EN 1092 PN40 connections.

Spare parts

A seal kit is available for all valve and actuator sizes comprising: Piston lip seal, stem 'O' ring, valve head seal (Modified PTFE G500), body seal and 'O' ring.

How to order spare seal kits

Always order spares by specifying the valve size, type and date code (given on the actuator label i.e. 02/14 = Month 02, Year 2014).
Example: 1 off Seal kit for a 1" PF61G-2NC, date code 05/22.

Safety information, installation and maintenance

For full details, see the Installation and Maintenance Instructions supplied with the product.

Installation note: These valves can be mounted in any orientation. The actuator can be rotated 360° in the direction indicated on the product label to facilitate easy pilot mounting connection.

TI-P373-14
CMGT Issue 7

PF51G
Bronze Piston Actuated On/Off Valves

Description

A 2-port pneumatically actuated on/off bronze valve for use on water, air, oil and gases. It can also be used on lower specification steam applications.
A pneumatic signal acts on the actuator piston to open or close the valve with a spring return action. The valve plugs have a PTFE soft seal (**G**) to provide a tight shut-off. A valve position indicator is included on standard and flow regulator models.

Valves are available with one of three sizes of actuator:

Type 1 (45 mm), **Type 2** (63 mm) and **Type 3** (90 mm) with the following action options:

- **NC (Normally Closed) -** These valves are designed for flow over the seat (port 1 to 2).
  Caution: Not recommended for waterhammer prevention.
- **NO (Normally Open) -** These valves are designed for flow under the seat (port 2 to 1). Can be used to prevent waterhammer on valve closure in liquid applications.
- **BD (Bi-Directional normally closed) -** These valves are designed for special applications that require flow in both directions and incorporates an anti-waterhammer design for liquid applications flowing under the seat (port 2 to 1).
  Note: To help prevent the possibility of waterhammer on liquid applications flowing over the seat (port 1 to 2) the pressure should not exceed 1 bar g (15 psi g).

Optional extras (see 'Valve selection guide'):

- Travel switch
- Flow regulator



12.5
17

Sizes, pipe connections and actuator combinations

Valve type	Pipe connections	Valve action		Type	Actuator model	DN15 ½"	DN20 ¾"	DN25 1"	DN32 1¼"	DN40 1½"	DN50 2"
PF51G	Screwed to BSP or NPT	NC	Normally Closed (flow over seat)	1	PF51G - 1NC	•	•	•			
				2	PF51G - 2NC	•	•	•	•	•	•
				3	PF51G - 3NC			•	•	•	•
		NO	Normally Open (flow under seat)	1	PF51G - 1NO	•	•	•			
				2	PF51G - 2NO	•	•	•	•	•	•
				3	PF51G - 3NO			•	•	•	•
		BD	Bi-Directional normally closed (flow over or flow under seat)	1	PF51G - 1BD	•	•	•			
				2	PF51G - 2BD	•	•	•	•	•	•
				3	PF51G - 3BD			•	•	•	•

Technical details

Leakage		PTFE soft seal	ASME Class VI
Flow characteristic		Fast opening	On/off
Flow direction	**PF51G-NC**	Flow over seat	Port 1 to 2
	PF51G-NO	Flow under seat	Port 2 to 1
	PF51GG-BD	Flow over seat	Port 1 to 2
		Flow under seat	Port 2 to 1
Pilot media		Air or water	60 °C maximum
Actuator rotation		360°	

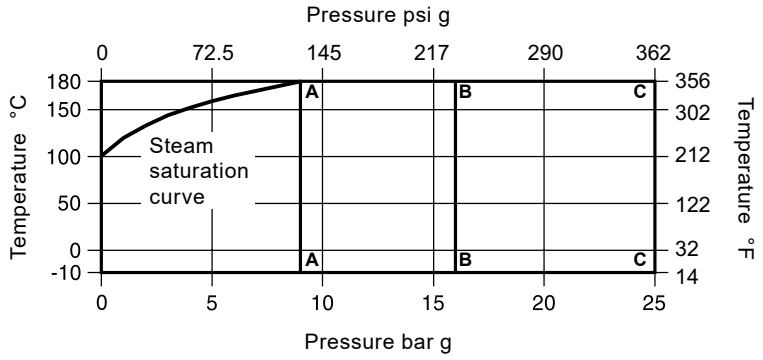
Actuator type and size	**Pilot connection**	**Maximum pilot pressure**	
	Type 1 = 45 mm diameter	⅛" BSP	10 bar g (145 psi g)
	Type 2 = 63 mm diameter	¼" BSP	10 bar g (145 psi g)
	Type 3 = 90 mm diameter	¼" BSP	8 bar g (116 psi g)

Kvs values

Size	DN15 ½"	DN20 ¾"	DN25 1"	DN32 1¼"	DN40 1½"	DN50 2"
Kvs	4.5	8.0	15.6	24.6	42.0	57.0

For conversion:
Cv (UK) = Kv x 0.963
Cv (US) = Kv x 1.156

Pressure/temperature limits

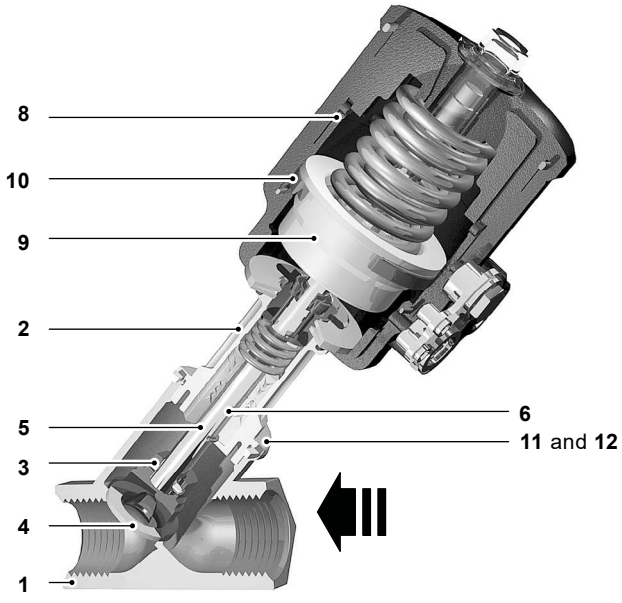


A - A	Maximum operating pressure on saturated steam	9 bar g	(130 psi g)
B - B	Maximum operating pressure on size 2"	16 bar g	(230 psi g)
C - C	Maximum operating pressure on sizes ¼" to 1½"	25 bar g	(360 psi g)

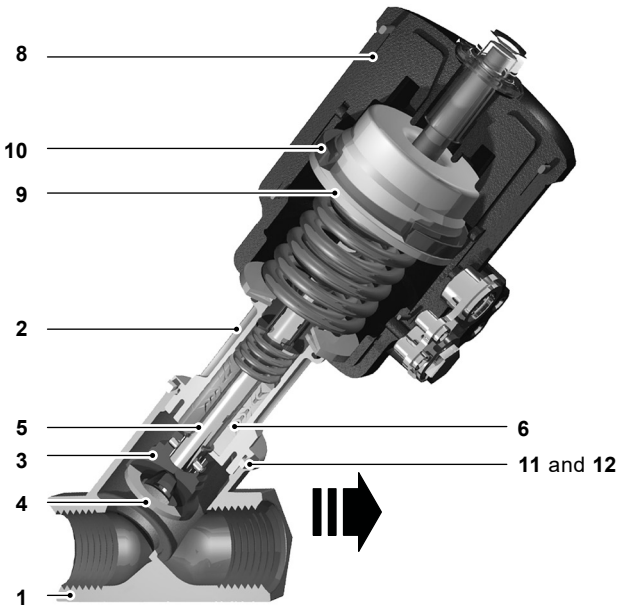
Body design conditions		Screwed BSP or NPT	DN15 - DN40 (½" - 1½")	PN25
			DN50 (2")	PN16
PMA	Maximum allowable pressure		25 bar g	360 psi g
TMA	Maximum allowable temperature		180 °C	356 °F
Minimum allowable temperature			-10 °C	14 °F
PMO	Maximum operating pressure for saturated steam service		9 bar g @ 180 °C	130 psi g @ 356 °F
TMO	Maximum operating temperature		180 °C	356 °F
Minimum operating temperature (**Note:** For lower operating temperatures consult Spirax Sarco)			-10 °C	14 °F
Ambient temperature limits		Maximum	60 °C	140 °F
		Minimum	-10 °C	14 °F
Note: Protection from environmental influences (e.g. UV radiation, humidity, chemicals) is required. Ensure that adequate shelter is provided for outdoor installations.				
ΔPMX	Maximum differential pressure			(see page 5)
Designed for a maximum cold hydraulic test pressure of: **Note:** With internals fitted, test pressure must not exceed ΔPMX				1.5 x PMA (PN rating)

Materials

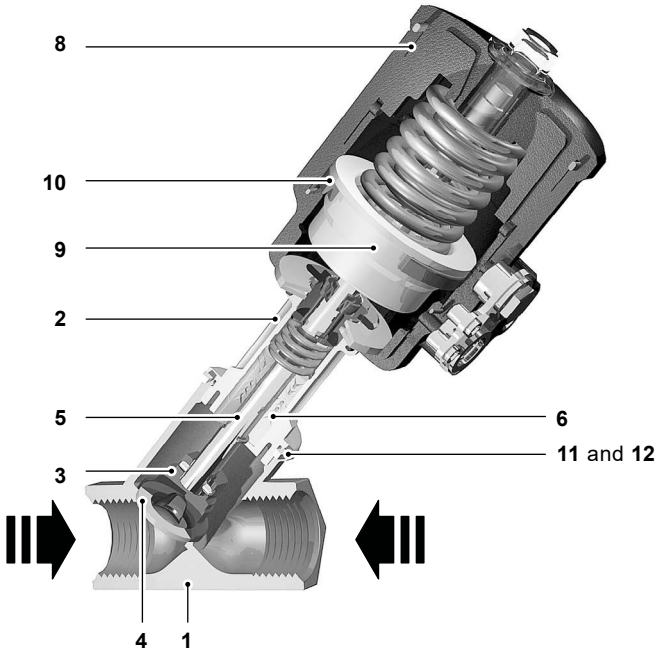
NC (Normally Closed)



NO (Normally Open)



BD (Bi-Directional normally closed)



No.	Part	Material	
1	Body	Bronze	EN 1982 CC491K
2	Bonnet	Bronze ½" and 1"	EN 1982 CC491K
3	Plug	Stainless steel	AISI 316L
4	Valve plug seal	PTFE	
5	Valve stem	Stainless steel	AISI 316
6	Stem seals	PTFE chevrons	

No.	Part	Material
7*	Stem 'O' ring (not shown)	Viton
8	Actuator housing	Glass filled polyamide
9	Piston	Glass filled polyamide
10	Piston lip seal	Viton
11	Gasket	PTFE

ΔPMX - Maximum differential pressures for PF51G piston actuated valves

PF51G-NC (Normally closed)

Model	Valve size	Actuator diameter mm (in)	Flow direction (port 1 to 2)	Maximum differential pressure bar (psi g)	Pilot Pressure	
					Minimum bar (psi g)	Maximum bar (psi g)
PF51G-1NC	DN15 - (½")	45 (1.8)	over seat	16 (232)	1.8 (26)	10 (145)
	DN20 - (¾")		over seat			
	DN25 - (1")		over seat			
PF51G-2NC	DN15 - (½")	63 (2.5)	over seat	20 (290)	1.5 (22)	
	DN20 - (¾")		over seat			
	DN25 - (1")		over seat			
	DN32 - (1¼")		over seat	16 (232)	3 (44)	
	DN40 - (1½")		over seat			
	DN50 - (2")		over seat	11 (160)		
PF51G-3NC	DN25 - (1")	90 (3.5)	over seat	20 (290)	1 (15)	8 (116)
	DN32 - (1¼")		over seat	16 (232)	2.5 (36)	
	DN40 - (1½")		over seat			
	DN50 - (2")		over seat	15 (218)		

PF51G-NO (Normally open)

Model	Valve size	Actuator diameter mm (in)	Flow direction (port 2 to 1)	Maximum differential pressure bar (psi g)	Pilot Pressure	
					Minimum bar (psi g)	Maximum bar (psi g)
PF51G-1NO	DN15 - (½")	45 (1.8)	under seat	16 (232)	1.8 (26)	10 (145)
	DN20 - (¾")		under seat			
	DN25 - (1")		under seat			
PF51G-2NO	DN15 - (½")	63 (2.5)	under seat		1.5 (22)	
	DN20 - (¾")		under seat			
	DN25 - (1")		under seat			
	DN32 - (1¼")		under seat			
	DN40 - (1½")		under seat			
	DN50 - (2")		under seat	12 (174)		
PF51G-3NO	DN25 - (1")	90 (3.5)	under seat	16 (232)	1 (15)	8 (116)
	DN32 - (1¼")		under seat			
	DN40 - (1½")		under seat			
	DN50 - (2")		under seat			

Maximum differential pressures continued on next page

ΔPMX - Maximum differential pressures for PF51G piston actuated valves (continued)

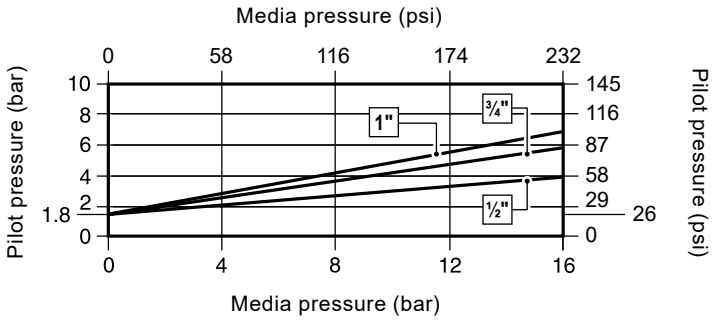
PF51G-BD (Bi-Directional normally closed)

Model	Valve size	Actuator diameter mm (in)	Flow direction (port 1 to 2)	* Maximum differential pressure (port 1 to 2) bar (psi)	Flow direction (port 2 to 1)	* Maximum differential pressure (port 2 to 1) bar (psi)	Pilot pressure	
							Minimum bar (psi)	Maximum bar (psi)
PF51G-1BD	DN15 - (½")	45 (1.8)	over seat	16 (232)	under seat	16 (232)	5 (73)	10 (145)
	DN20 - (¾")		over seat		under seat	7 (102)		
	DN25 - (1")		over seat		under seat	5 (73)		
PF51G-2BD	DN15 - (½")	63 (2.5)	over seat		under seat	16 (232)	3.8 (55)	
	DN20 - (¾")		over seat		under seat			
	DN25 - (1")		over seat		under seat	11 (160)		
	DN32 - (1¼")		over seat		under seat	6 (87)	3.3 (48)	
	DN40 - (1½")		over seat	12 (174)	under seat	4 (58)		
	DN50 - (2")		over seat	8 (116)	under seat	2.5 (36)	3.8 (55)	
PF51G-3BD	DN25 - (1")	90 (3.5)	over seat	16 (232)	under seat	14 (203)	3.3 (48)	8 (116)
	DN32 - (1¼")		over seat		under seat	12 (174)		
	DN40 - (1½")		over seat		under seat	8 (116)		
	DN50 - (2")		over seat	14 (203)	under seat	5 (73)		

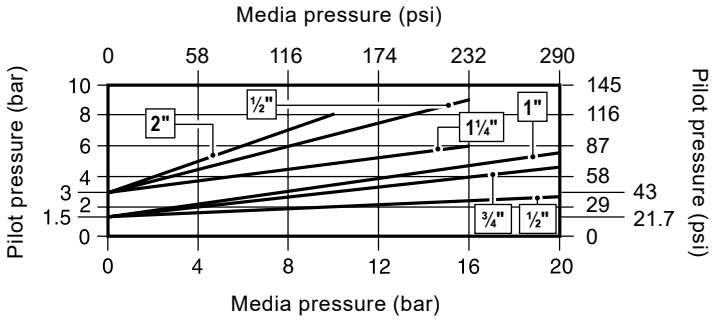
Pilot/media pressure relationship

PF51G-NC (Normally Closed)

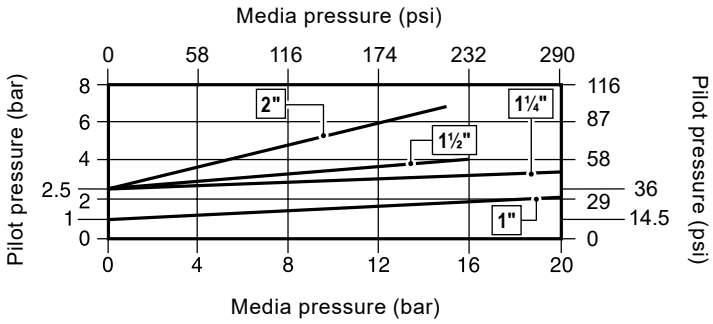
PF51G-1NC flow over seat (1 to 2)



PF51G-2NC flow over seat (1 to 2)



PF51G-3NC flow over seat (1 to 2)

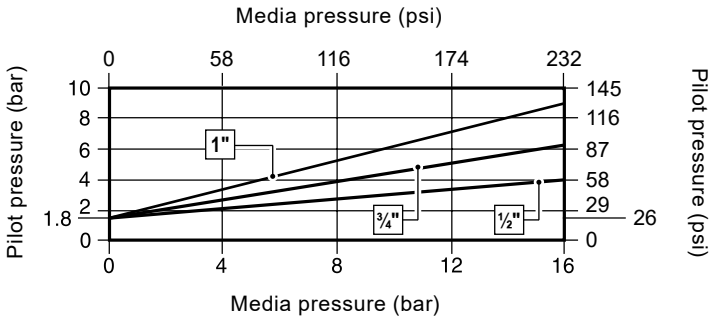


Pilot/media pressure relationship continued on next page

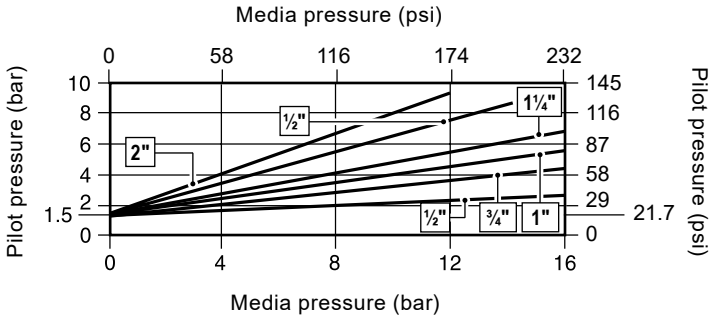
Pilot/media pressure relationship (continued)

PF51G-NO (Normally Open)

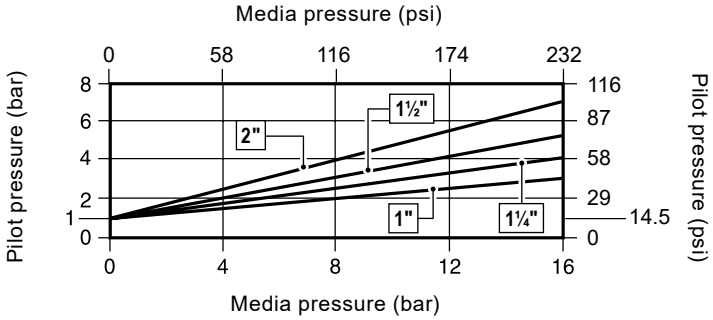
PF51G-1NO flow under seat (2 to 1)



PF51G-2NO flow under seat (2 to 1)



PF51G-3NO flow under seat (2 to 1)

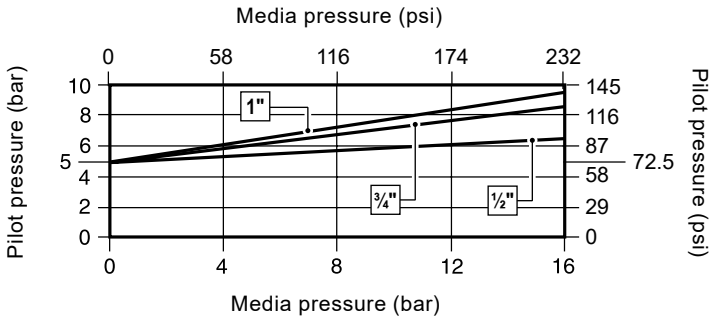


Pilot/media pressure relationship continued on next page

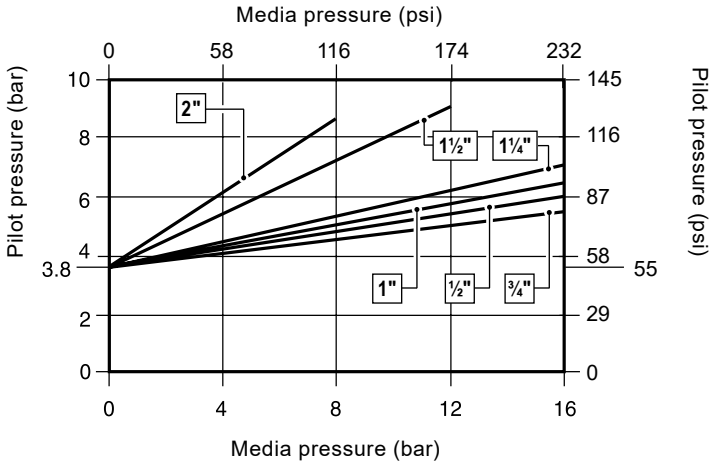
Pilot/media pressure relationship (continued)

PF51G-BD (Bi-Directional normally closed)

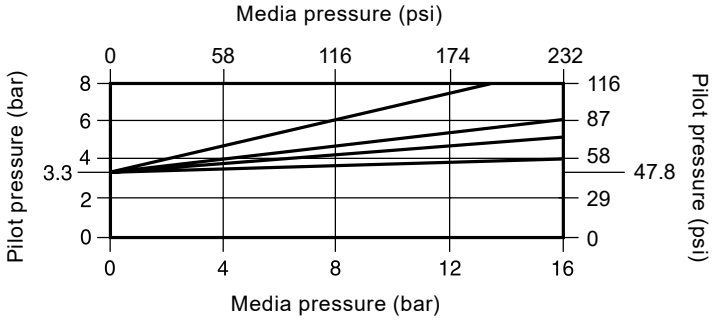
PF51G-1BD flow over seat (1 to 2)



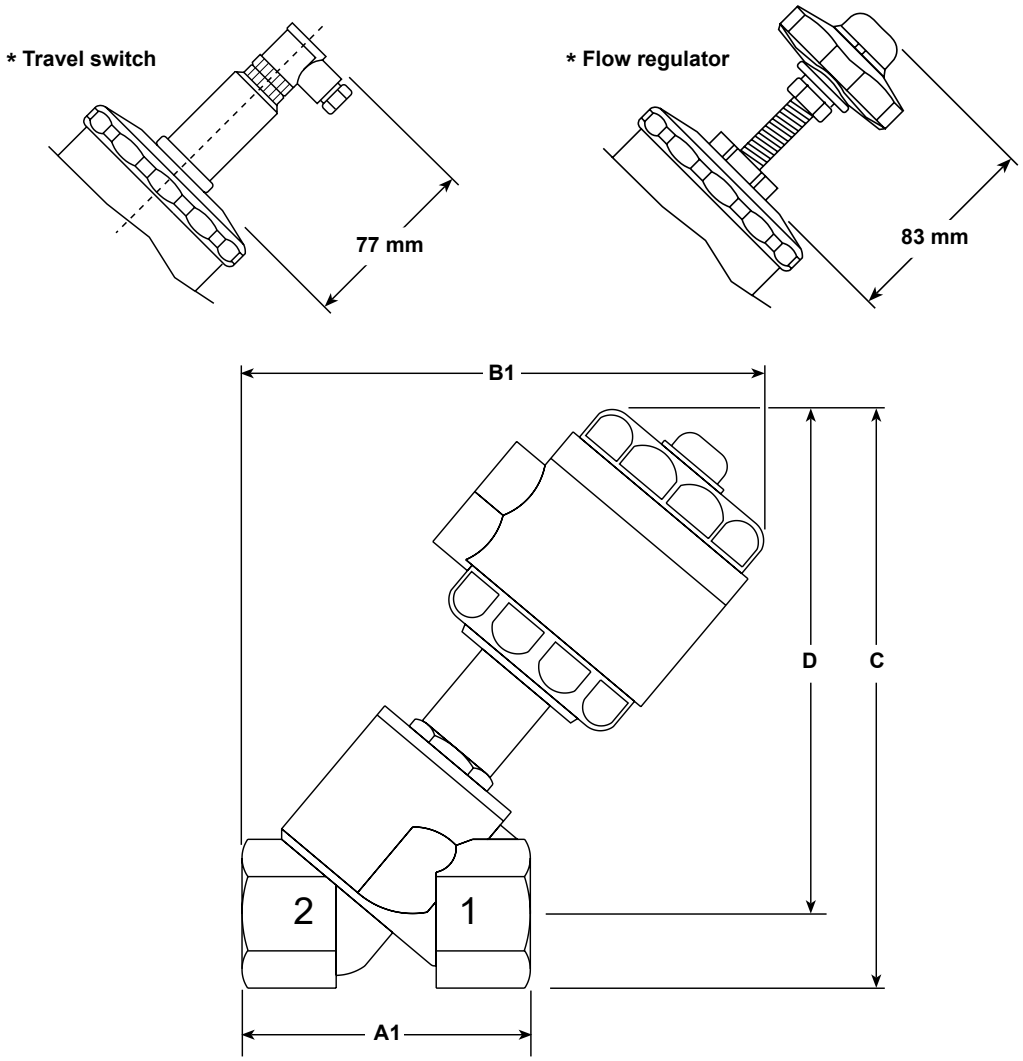
PF51G-2BD flow over seat (1 to 2)



PF51G-3BD flow over seat (1 to 2)



Dimensions/weights (approximate) in mm (inches) and kg (lbs)



Valve size	Actuator type and size	A1		B1		C		D		Weight*	
		mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	kg	lbs
DN15 - ½"	1	45 mm	1.8	65	2.56	144	5.67	136	5.36	123	4.85	0.8	1.8
	2	63 mm	2.5			192	7.56	184	7.25	171	6.74	1.2	2.7
DN20 - ¾"	1	45 mm	1.8	75	2.96	49	5.87	142	5.60	126	4.97	0.9	2.0
	2	63 mm	2.5			198	7.80	192	7.57	176	6.94	1.3	2.9
DN25 - 1"	1	45 mm	1.8	90	3.55	168	5.87	161	6.35	141	5.56	1.1	2.5
	2	63 mm	2.5			212	8.35	205	8.08	185	7.29	1.5	3.3
	3	90 mm	3.5			223	8.79	216	8.51	196	7.73	2.2	4.9
DN32 - 1¼"	2	63 mm	2.5	110	4.33	225	8.87	217	8.55	193	7.61	1.9	4.2
	3	90 mm	3.5			234	9.22	227	8.94	202	7.96	2.4	5.3
DN40 - 1½"	2	63 mm	2.5	120	4.73	230	9.06	25	8.87	198	7.80		
	3	90 mm	3.5			239	9.42	235	9.26	207	8.16	2.6	5.8
DN50 - 2"	2	63 mm	2.5	150	5.91	248	9.77	241	9.50	207	8.16	2.9	6.4
	3	90 mm	3.5			257	10.13	250	9.85	216	8.51	3.3	7.3

***Note:** Add 0.2 kg (0.4 lbs) for travel switch or flow regulator options (not available for use with the Type 1 actuator).

Valve selection guide

				DN25
Valve size	DN15 (½"), DN20 (¾"), DN25 (1"), DN32 (1¼"), DN40 (1½") and DN50 (2")			
Valve type	**P**	= Piston valve		**P**
Valve characteristic	**F**	= Fast opening		**F**
Body material	**5**	= Bronze		**5**
	1	= Screwed	BSP or NPT	**1**
Valve plug seal	**G**	= PTFE		**G**
Actuator type	**1**	= 45 mm (1.8") diameter	(for valve sizes ½" to 1")	**2**
	2	= 63 mm (2.5") diameter	(for valve sizes ½" to 2")	
	3	= 90 mm (3.5") diameter	(for valve sizes 1" to 2")	
Valve position	**NC**	= Normally Closed		**NC**
	NO	= Normally Open		
	BD	= Bi-Directional		
Optional	**Blank**	= No options required		
	I	= Travel switch	Provides indication of open or closed valve position through a magnetic reed switch with volt free contacts.	
			Maximum rating: Voltage (V) = 500 V, Current (I) = 0.5 A, Power (P) = 30 VA.	
			Available on Type 2 and Type 3 actuators with suffix 'I' if this option is required.	
	R	= Flow regulator	Provides manual control of maximum flow through the valve. Can also provide manual shut-off on normally open valves. Available on Type 2 and Type 3 actuators with suffix 'R' if this option is required.	

Note: Shaded areas represent fixed parameters

Valve selection guide example

DN25	-	P	-	F	-	5	-	1	-	G	-	2	-	NC	-		-	Screwed BSP

How to order

Example: 1 off Spirax Sarco 1" PF51G-2NC bronze piston actuated on/off valve having screwed BSP connections.

Spare parts

A seal kit is available for all valve and actuator sizes comprising: Piston lip seal, stem 'O' ring, valve head seal (PTFE), body seal.

How to order spare seal kits

Always order spares by specifying the valve size, type and date code (given on the actuator label i.e. 120 = week 12, year 2000).

Example: 1 off Seal kit for a 1" PF51G-2NC, date code 120.

Safety information, installation and maintenance

For full details, see the Installation and Maintenance Instructions supplied with the product.

Installation note: These valves can be mounted in any orientation. The actuator can be rotated 360° in the direction indicated on the product label to facilitate easy pilot mounting connection.

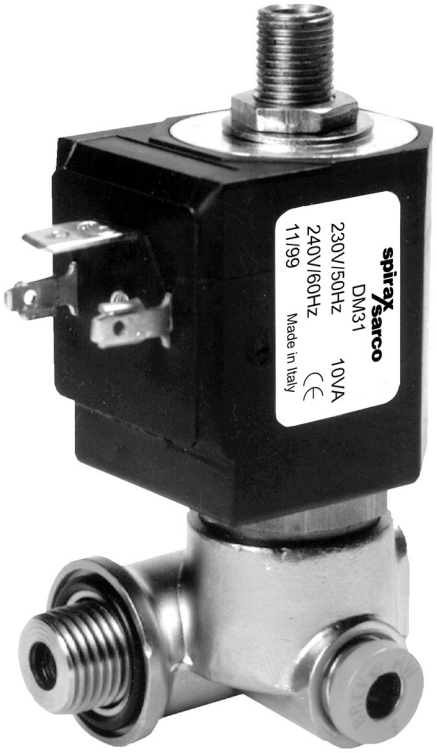
Associated equipment

Pilot solenoid

Type DM 3-port two way electropneumatic pilot solenoid valve that can be directly mounted (banjo connection) to the PF51G-NC, NO and BD series piston actuated valves to provide actuator pilot pressure to open normally closed or close normally open valves. Suitable for air or water operating media. The valve is supplied with a DIN connector. For full details refer to the relevant Technical Information Sheet.

Available types

Model	Type	Actuator	Voltage/ Frequency	Actuator connection	Line connection
DM11	1	45 mm (1.8")	230/50 or 240/60 Vac	⅛" BSP	⅛" BSP
DM12			110/50 or 120/60 Vac		
DM13			24/50 or 24/60 Vac		
DM14			24 Vdc		
DM21	2	63 mm (2.5")	230/50 or 240/60 Vac	¼" BSP	
DM22			110/50 or 120/60 Vac		
DM23			24/50 or 24/60 Vac		
DM24			24 Vdc		
DM31	3	90 mm (3.5")	230/50 or 240/60 Vac		
DM32			110/50 or 120/60 Vac		
DM33			24/50 or 24/60 Vac		
DM34			24 Vdc		



How to order

Example: 1 off Spirax Sarco DN25 PF63G-2NC stainless steel piston actuated on/off valve having flanged EN 1092 PN40 connections.

Spare parts

A seal kit is available for all valve and actuator sizes comprising: Piston lip seal, stem 'O' ring, valve head seal (Modified PTFE G500), body seal and 'O' ring.

How to order spare seal kits

Always order spares by specifying the valve size, type and date code (given on the actuator label i.e. 02/14 = Month 02, Year 2014).
Example: 1 off Seal kit for a 1" PF61G-2NC, date code 02/14.

Safety information, installation and maintenance

For full details, see the Installation and Maintenance Instructions supplied with the product.

Installation note: These valves can be mounted in any orientation. The actuator can be rotated 360° in the direction indicated on the product label to facilitate easy pilot mounting connection.

TI-P373-04
CTLS Issue 6

DM Type Solenoid Valves for use with Piston Actuated Valves

Description

A 3-port two way electropneumatic pilot solenoid valve that can be directly mounted (banjo connection) to the PF51G and PF61G-NC, NO and BD series piston actuated valves.
Suitable for air or water operating media. The valve is supplied with a DIN connector and fitted with manual override as standard.

Available types

Model	Actuator	Voltage/Frequency	Connection
DM11	45 mm (1.8")	230/50 or 240/60 Vac	⅛" BSP
DM12		110/50 or 120/60 Vac	
DM13		24/50 or 24/60 Vac	
DM14		24 Vdc	
DM21	63 mm (2.5")	230/50 or 240/60 Vac	¼" BSP
DM22		110/50 or 120/60 Vac	
DM23		24/50 or 24/60 Vac	
DM24		24 Vdc	
DM31	90 mm (3.5")	230/50 or 240/60 Vac	
DM32		110/50 or 120/60 Vac	
DM33		24/50 or 24/60 Vac	
DM34		24 Vdc	



Technical details

Mounting		**Banjo connection**
Manual override		Fitted as standard
DIN connector	Type B	DM11, DM12, DM13 and DM14
	Type B	DM21, DM22, DM23 and DM24
	Type A	DM31, DM32, DM33 and DM34
Pilot media connection	DM11 to DM14 DM21 to DM24 DM31 to DM34	Push in type to suit 6 mm dia. nylon or copper tube
Coil consumption	DM11, DM12, DM13 and DM14	ac 10 VA (holding)
		ac 16 VA (maximum)
		dc 7 Watts
	DM21, DM22, DM23, and DM24	ac 10 VA (holding)
		ac 16 VA (maximum)
		dc 7 Watts
	DM31, DM32, DM33 and DM34	ac 18 VA (holding)
		ac 36 VA (maximum)
		dc 14 Watts

First for Steam Solutions
EXPERTISE | SOLUTIONS | SUSTAINABILITY

Limiting conditions

Maximum media temperature	60 °C (140 °F)
Minimum media temperature	-10 °C (14 °F)
Protection class	IP65 (with connector)
Operating pressure	0 bar g (0 psi g) min. to 10 bar g (145 psi g) max.

Materials

Part	Material
Body	ELNP Niploy coated brass
Seal	FKM

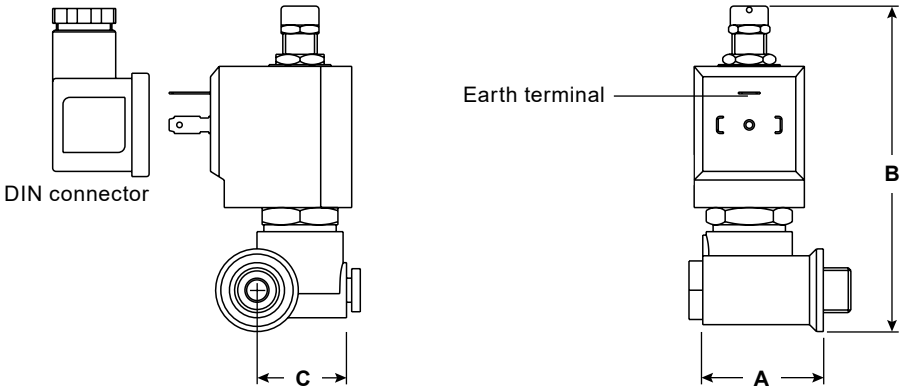
Spares parts

No spares are available for this product.

Installation

The valve can be directly mounted (banjo connection) onto the actuator.

Dimensions/weights (approximate) in mm (in) and kg (lb)



Type	A	B	C	Weight
DM11, DM12, DM13 and DM14	31 (1.2)	77 (3)	27 (1.1)	0.27 (0.12)
DM21, DM22, DM23 and DM24	35 (1.4)	78 (3.1)		
DM31, DM32, DM33 and DM34		95 (3.7)		0.38 (0.17)

How to order

Example: 1 off Spirax Sarco DM21 solenoid valve 240 Vac.

TI-P433-01-US
Issue 1

MDM Manifold Pilot Solenoid Valves for use with Piston Actuated Valves

Description

A series of 3 way normally closed, solenoid operated, manifold pilot valves that are joined together and supply pressure to operate a corresponding number of Piston Actuated Valves. This manifold assembly may be mounted in any position. They are suitable for air or water media.

Standard for each manifold valve is a manual override button, FKM seals, a strain relief electrical connector with IP65 protection.

Technical details

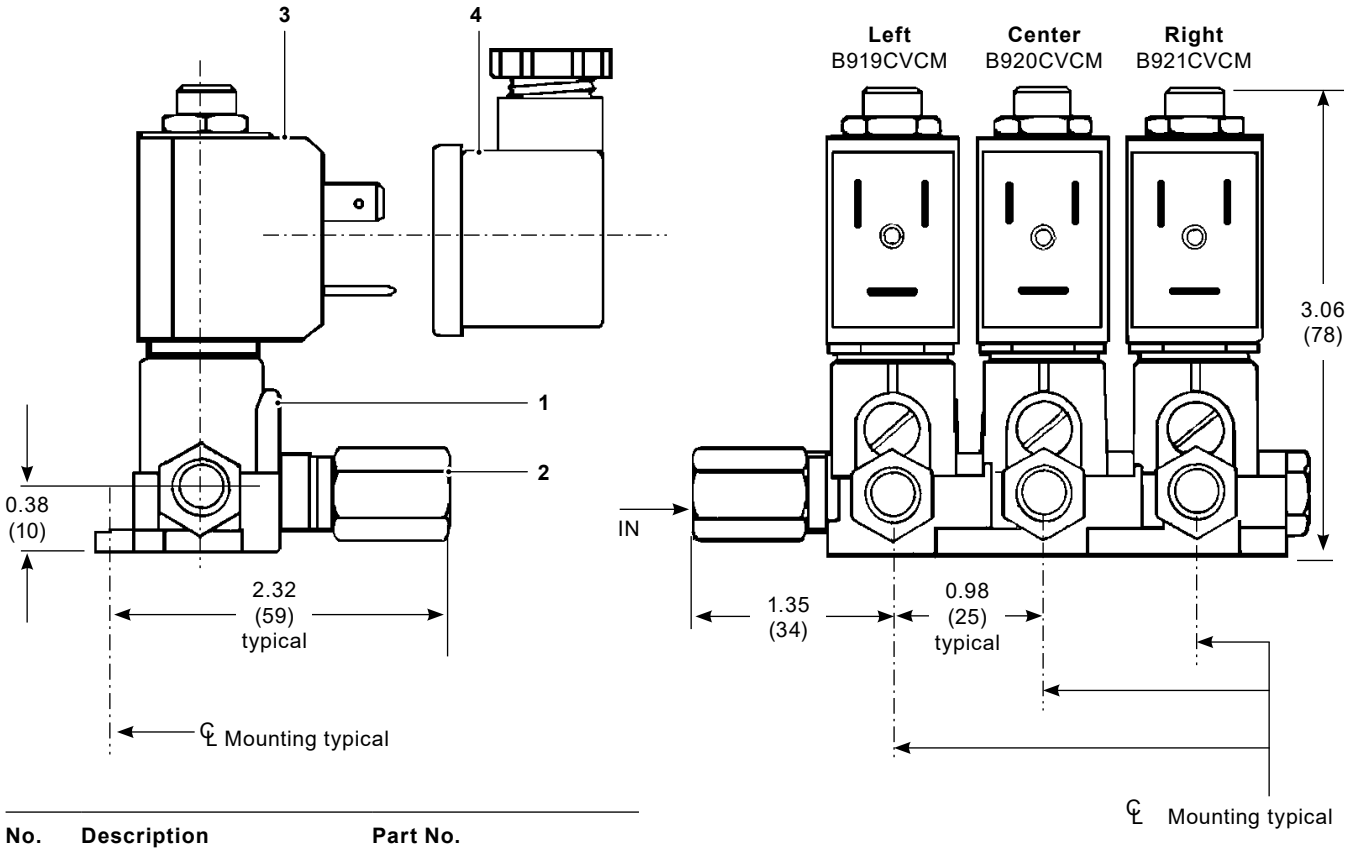
Construction material:	Body — Brass Seals — Viton
Mounting:	Universal, any position Accepts #6 machine screws
Manual Override:	Slotted 180° turn-button
Pilot Valve Connections:	⅛" NPT common “IN" ⅛" NPT individual “OUT"
Electrical Connection:	DIN 43650 Form B
Coil Consumption:	AC: 9 VA (holding) 14 VA (inrush) DC: 7 W



Limiting conditions

Maximum media temperature:	140 °F (60 °C)
Minimum media temperature:	14 °F (-10 °C)
Protection class:	IP65 (with DIN connector)
Operating pressure:	0 - 150 psi g (0 - 10.3 bar g)

Materials, dimensions and weights (approximate) in inches (mm) and lb (kg)



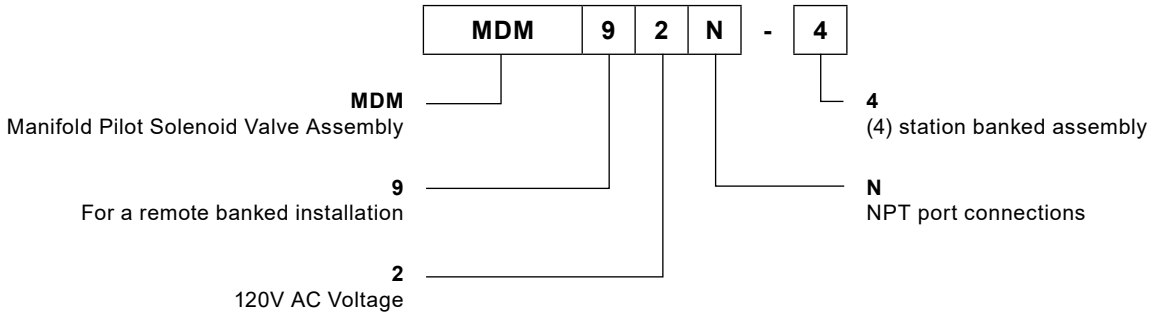
No.	Description	Part No.
1	Valve - Left	B919CVCM
	Valve - Center	B920CVCM
	Valve - Right	B921CVCM
2	Adaptor	72415
3	Coil	270R - 240 Vac
		240R - 120 Vac
		220R - 24 Vac
		225R - 24 Vdc
4	Connector DIN 43650	001

Station	C	Weight
2	3 (76)	1.3 (0.6)
3	4 (102)	1.9 (0.9)
4	5 (127)	2.5 (1.1)
5	6 (152)	3.1 (1.4)
6	7 (178)	3.7 (1.7)
7	8 (203)	4.3 (1.9)
8	9 (229)	4.9 (2.2)

Installation

The manifold pilot solenoid valve assembly can be directly mounted to a system plate in any position. Incoming pilot pressure to connect with the common “IN" port (end). Outgoing pilot pressure to connect from the individual “OUT" ports (sides).
Each “Out" port line to connect to a corresponding Piston Actuated Valve actuator.
Note: When attaching to the PAV’s with 2.5" (63 mm) or 3.5" (90 mm) actuator heads, it will be necessary to bush up from ⅛" NPT to ¼" NPT.

Order information



Example: **MDM92N-4**

A (4) station manifold Pilot Solenoid Valve assembly, 120 Vac,

⅛" NPT for a 2.5" (63 mm) or 3.5" (90 mm) Piston Actuated Valve.

Available types

Model Number	Pav actuator	Voltage/Frequency	Port connections
MDM91N-X*	1.8, 2.5" (45, 63 mm)**	240 Vac	⅛" NPT
MDM92N-X*		120 Vac	
MDM93N-X*		24 Vac	
MDM93N-X*			

* X denotes number of manifold stations. Number may be from (2) to (8) depending on amount of PAV’s requiring service. For information on additional stations, consult Spirax Sarco, Inc.

** 90 mm Actuators, consult Spirax Sarco, Inc.

TI-P475-01
TES Issue 5

Direct Contact Desuperheaters

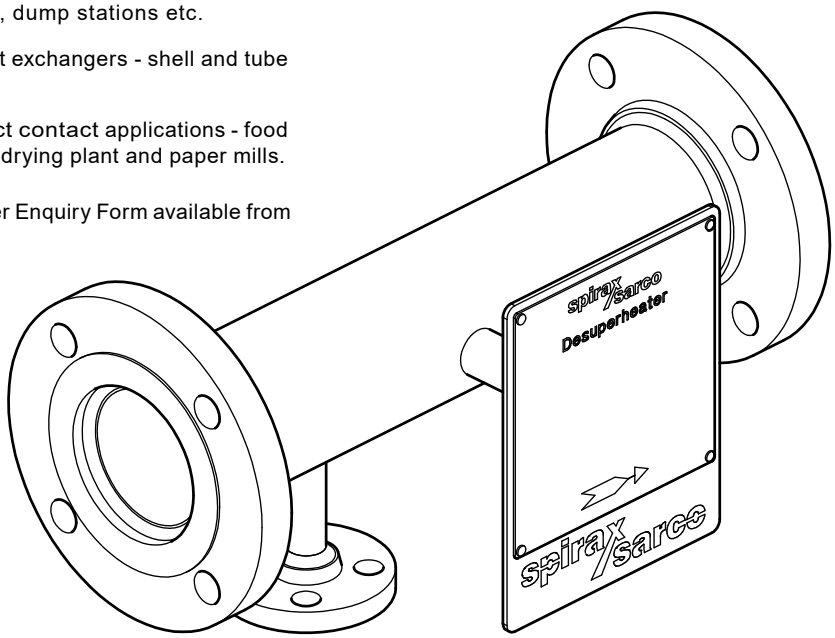
Description

Spirax Sarco direct contact desuperheaters reduce the temperature of superheated steam to produce steam temperatures approaching saturation temperature. To cool the superheated steam, water is entrained and flashed into vapour by absorbing heat from the steam.

Typical applications:

- To reduce the temperature of steam discharged from turbine by-pass systems on power plants for heat exchangers, dump stations etc.
- To improve heat transfer of indirect contact heat exchangers - shell and tube , plate type, reactor heating jackets etc.
- To reduce the temperature of steam on direct contact applications - food cooking kettles, in-line steam heaters, tobacco drying plant and paper mills.

Send us your requirements using our Desuperheater Enquiry Form available from our website.



Features:

- Low cost simple, robust design.
- No moving parts to wear.
- Minimal steam pressure drop.
- Flexible design options.

Standards and approvals

Spirax Sarco desuperheaters are available built to ASME B 31.3 design code. Also available are ASME Division 1.

This product fully complies with the requirements of the Pressure Equipment Directive 2014/68/EU and carries the CE mark when so required.

Welding is in accordance with ASME IX.
Connections (EN 1092 or ASME B16.5) are sized to suit the process conditions.
Standard ASTM materials of construction include: Carbon steel, Stainless steel, Chrome molybdenum steel etc.,

Certification (included as standard):

1. Desuperheater general arrangement drawing.
2. Installation, operation and maintenance instructions.
3. Hydrostatic test certificate.
4. Letter of conformity.

The following certificates / documents can be supplied at an additional cost.

5. Material certificates to EN 10204 3.1 with a corresponding material location diagram.
6. NDT reports.

Pressure / temperature limits

Spirax Sarco desuperheaters are bespoke products, individually designed to meet user defined process conditions.
Mechanical design pressure and mechanical design temperature limitations are stated on the desuperheater data sheet available from our online sizing software. These limits are also stated on the product nameplate.
Pressure / temperature ratings for these products will be in accordance with ASME B16.5-1996 or EN 1092-1:2013 as appropriate.

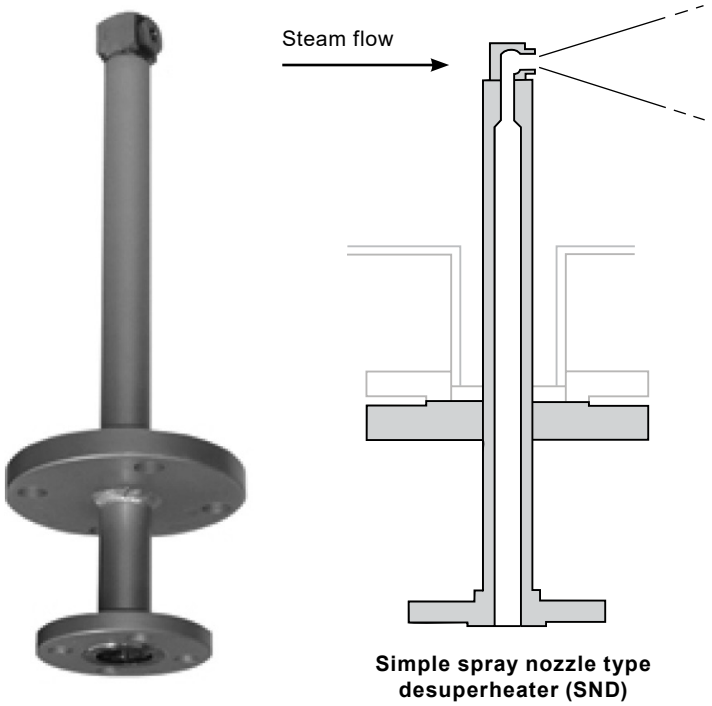
Available types

Spray type desuperheaters

A simple type of in-line desuperheater with cooling water injected into the centre of the unit via an atomizing nozzle sprayed in the direction of the steam flow. **Spirax Sarco spray type desuperheaters are available in two options:-**

1. Spray nozzle desuperheater (SND)

The assembly is designed for mounting on a suitable flanged branch on the steam pipework. A thermal sleeve installed downstream of the unit is recommended.



Simple spray nozzle type desuperheater (SND)

Applications:

- Relatively constant load handling duties.
- Retrofitting a desuperheater to an existing steam line (steam line and thermal sleeve by others).
- Large steam lines where an STD could be cost prohibitive.

Mechanical design temperature and flange rating

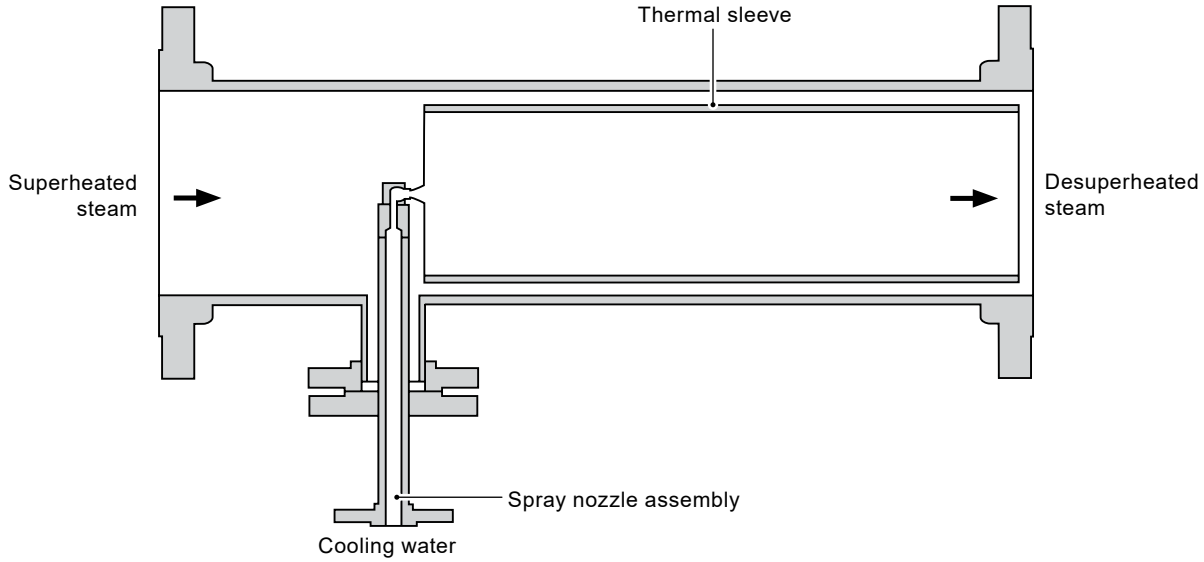
<371 °C (<700 °F)	ASME 150, ASME 300, ASME 600, ASME 900, ASME 1500 + PN16, PN25, PN40, PN63 and PN100 Slip-on
371 - 427 °C (700 - 800 °F)	ASME 150, ASME 300, ASME 600, ASME 900, ASME 1500 + PN16, PN25, PN40, PN63 and PN100 Weld neck
424 - 570 °C (795 - 1058 °F)	ASME 150, ASME 300, ASME 600, ASME 900, ASME 1500 Weld neck (Slip-on N/A)

Materials

Component	Mechanical design temperature up to and including 427 °C (800 °F)	Mechanical design temperature above 427 °C (800 °F) up to and including 570 °C (1058 °F)
Pipe	ASTM A106 Grade B	ASTM A335 P11
Flanges	ASTM A105N	ASTM A182 F11
Spray nozzle	ASTM A182 F316L	ASTM A182 F11
Nozzle holder	ASTM A350 LF2N	ASTM A182 F11

2. Spray type desuperheater (STD)

A complete Desuperheater ready for installation, including spray nozzle, nozzle housing, thermal sleeve and flanged shell.



Standard STD has welded spray nozzle assembly. Item shown above is STD with removable spray nozzle.

Applications:

- Relatively constant load handling duties.
- Dumping steam application.
- Control of downstream temperature not critical.

Mechanical design temperature and flange rating

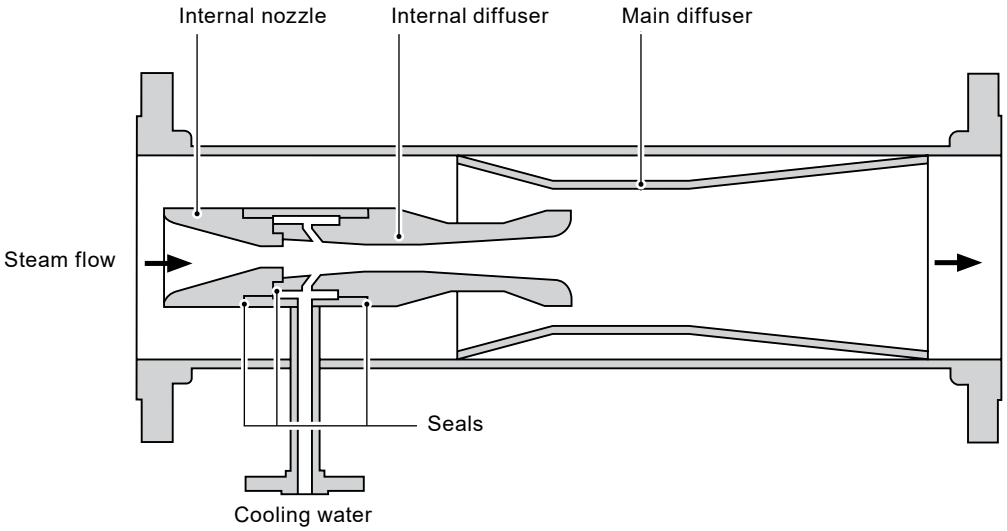
<371 °C (<700 °F)	ASME 150, ASME 300, ASME 600 + PN16, PN25, PN40 Slip-on (Weld neck optional)
371 - 427 °C (700 - 800 °F)	ASME 150, ASME 300, ASME 600 + PN16, PN25, PN40 Weld neck (Slip-on N/A)
424 - 570 °C (795 - 1058 °F)	ASME 150, ASME 300, ASME 600, ASME 900, ASME 1500 Weld neck (Slip-on N/A)

Materials

Component	Mechanical design temperature up to and including 427 °C (800 °F)	Mechanical design temperature above 427 °C (800 °F) up to and including 570 °C (1058 °F)
Shell	ASTM A106 Grade B	ASTM A335 P11
Water branch	ASTM A106 Grade B	ASTM A335 P11
Flanges	ASTM A105N	ASTM A182 F11
Spray nozzle	ASTM A182 F316L	ASTM A182 F11
Nozzle holder	ASTM A350 LF2N	ASTM A182 F11
Thermal sleeve	ASTM A312 TP316L	ASTM A335 P11

Venturi type desuperheaters (VTD)

The venturi principle is used to create regions of high velocity and turbulence which produces intimate contact between the steam and cooling water.



Application

- Suitable for most general plant applications, except where high turndowns on cooling water are required.
- Flow turndowns between 3:1 and 10:1 depending on conditions.

Mechanical design temperature and flange rating

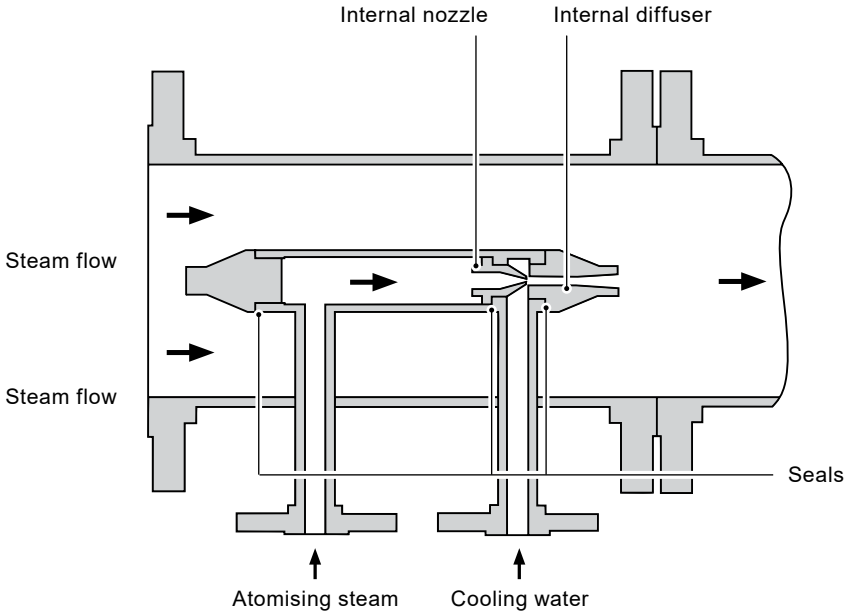
<371 °C (<700 °F)	ASME 150, ASME 300, ASME 600 + PN16, PN25, PN40 Slip-on (Weld neck optional)
371 - 427 °C (700 - 800 °F)	ASME 150, ASME 300, ASME 600 + PN16, PN25, PN40 Weld neck (Slip-on N/A)
424 - 570 °C (795 - 1058 °F)	ASME 300, ASME 600, ASME 900, ASME 1500 + PN10, PN16, PN25, PN40, PN63 and PN100 Weld neck (Slip-on N/A)

Materials

Component	Mechanical design temperature up to and including 427 °C (800 °F)	Mechanical design temperature above 427 °C (800 °F) up to and including 570 °C (1058 °F)
Shell	Sizes 1 to 2: ASTM A350 LF2N Size 3 and above: ASTM A106 Grade B	Sizes 1 to 2: ASTM A182 F11 Size 3 and above: ASTM A335 P11
Water branch	Sizes 1 to 2: ASTM A350 LF2N Size 3 and above: ASTM A106 Grade B	Sizes 1 to 2: ASTM A182 F11 Size 3 and above: ASTM A335 P11
Flanges	Sizes 1 to 2: ASTM A350 LF2N Size 3 and above: ASTM A105N	ASTM A182 F11
Nozzle	ASTM A182 F316L	ASTM A182 F11
Internal diffuser	Sizes 1 to 2: Not applicable Size 3 and above: ASTM A182 F316L	Sizes 1 to 2: Not applicable Size 3 and above: ASTM A182 F11
Internal housing	Sizes 1 to 2: Not applicable Size 3 and above: ASTM A350 LF2N	Sizes 1 to 2: Not applicable Size 3 and above: ASTM A182 F11
Main diffuser	Sizes 1 to 4: ASTM A350 LF2N Sizes 6 and 8: ASTM A240 / ASTM A312 316L Size 10: BS EN 10130:2006 DC01 Size 12 and above: ASTM A516 Gr70	Sizes 1 to 4: ASTM A182 F11 Sizes 6 and above: ASTM A387 Gr11
Internal seals	Soft copper	Soft copper

Steam atomizing desuperheaters (SAD)

A high pressure auxiliary steam supply is used to atomize the incoming water within the diffuser of the unit.
The auxiliary steam pressure needs to be at least 1.5 times the desuperheater inlet pressure with a minimum pressure of 3 bar g.



Application

- High turndown applications where auxiliary steam is available, eg ;combined pressure reducing/desuperheating stations.

Mechanical design temperature and flange rating

<371 °C (<700 °F)	ASME 150, ASME 300, ASME 600 + PN16, PN25, PN40 Slip-on (Weld neck optional)
374 - 525 °C (700 - 977 °F)	ASME 150, ASME 300, ASME 600 + PN16, PN25, PN40 Weld neck (Slip-on N/A)

Materials

Component	Mechanical design temperature up to and including 427 °C (800 °F)	Mechanical design temperature above 427 °C (800 °F) up to and including 570 °C (1058 °F)
Shell	ASTM A106 Grade B	ASTM A335 P11
Atomising steam branch	ASTM A106 Grade B	ASTM A335 P11
Water branch	ASTM A106 Grade B	ASTM A335 P11
Flanges	ASTM A105N	ASTM A182 F11
Nozzle	ASTM A182 F316L	ASTM A182 F11
Diffuser	ASTM A182 F316L	ASTM A182 F11
Internal housing	ASTM A350 LF2N	ASTM A182 F11
Internal seals	Soft copper	Soft copper

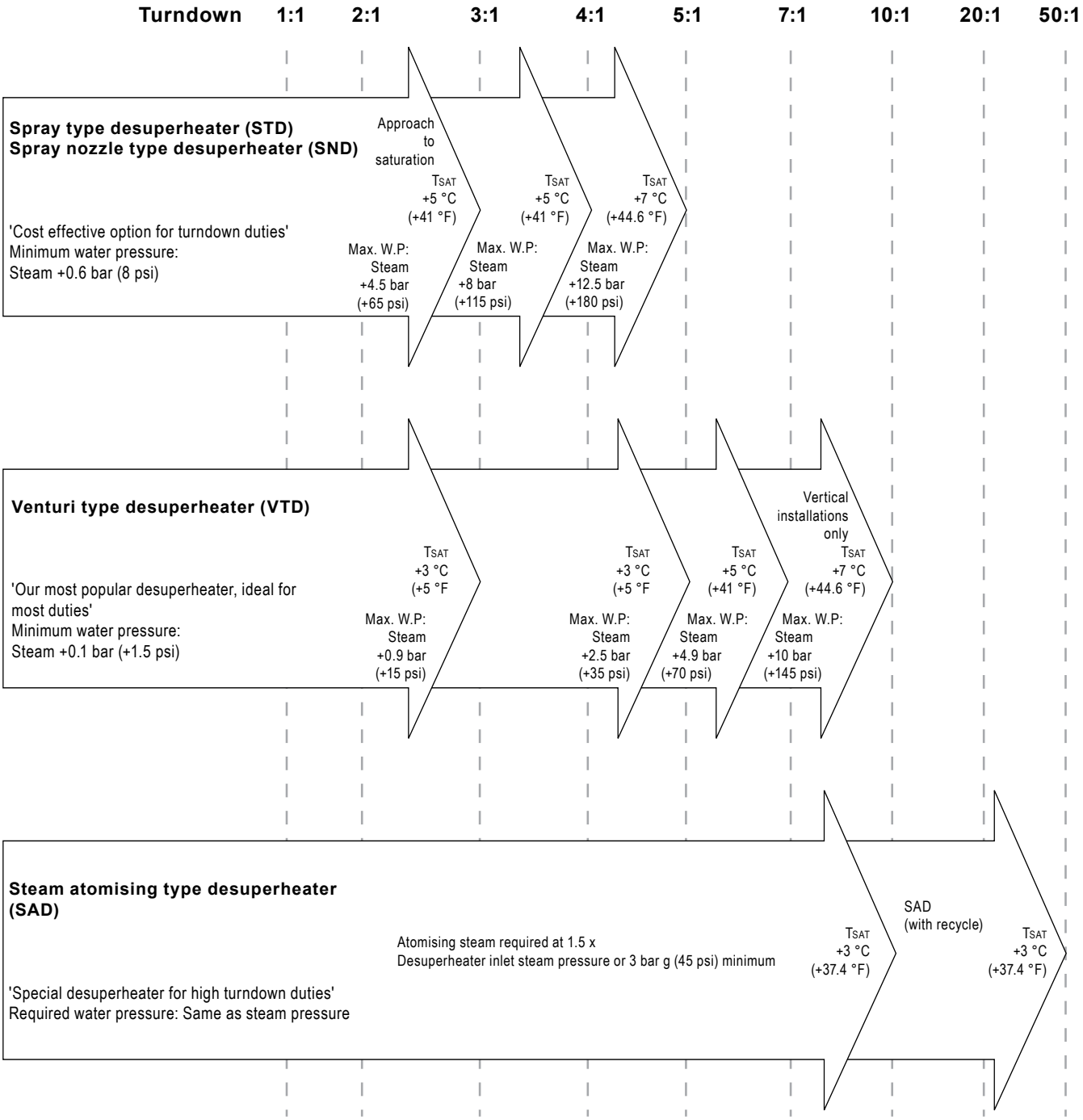
Sizing and selection

There are a number of factors which must be considered in determining the best type of desuperheater for each application. Such factors are:-

1. Residual superheat.
2. Turndown.
3. Accuracy of final temperature.
4. Available pressure drop.
5. Cooling water pressure.
6. Auxiliary higher pressure steam available for atomising.
7. Cost.

With so many factors, it is not an easy task to develop a decision tree to aid selection, but the charts below have been developed to assist engineers in desuperheater selection. Please read this first chart in conjunction with the note at the bottom of the page.

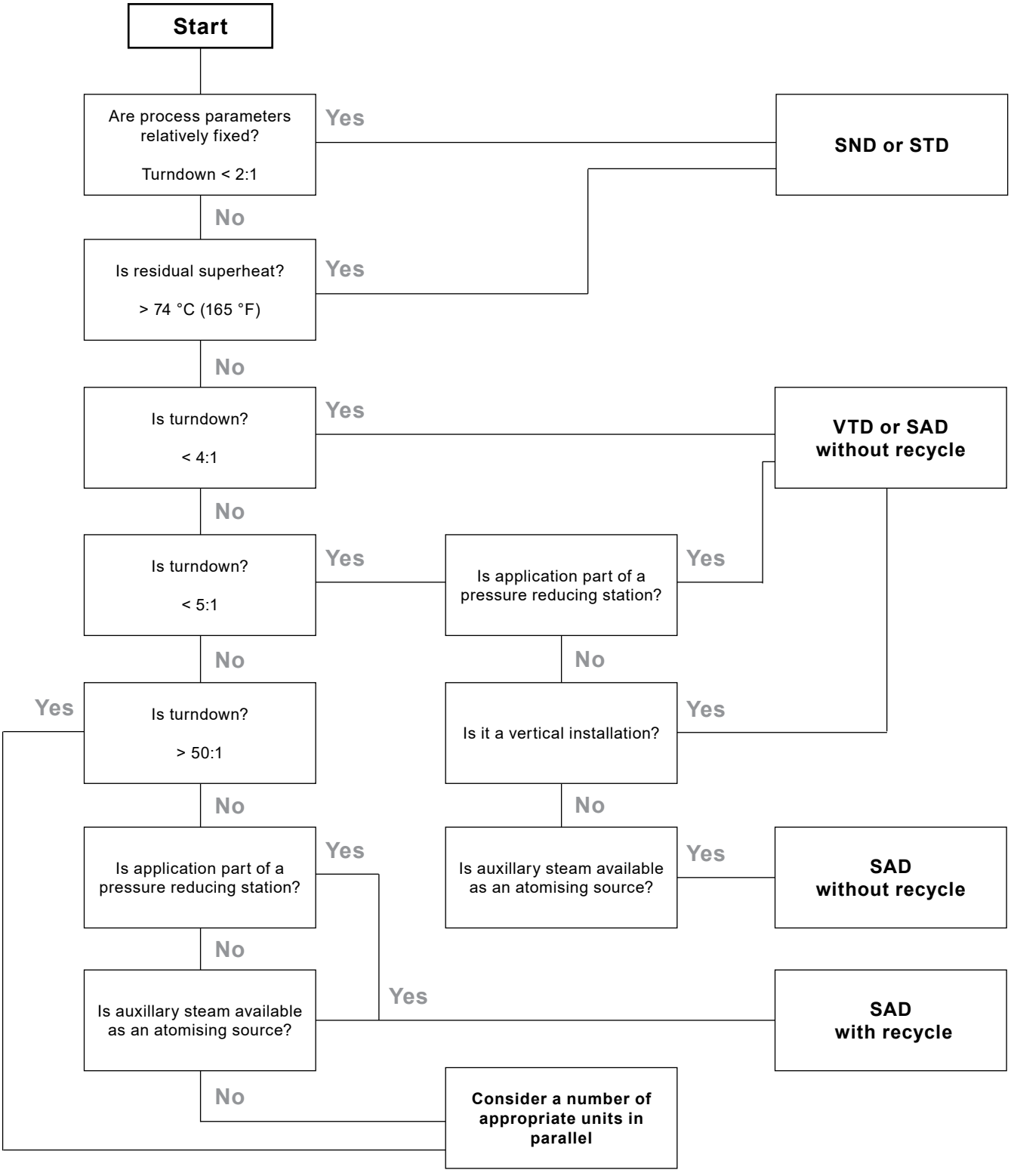
Desuperheater selection chart



Note: For VTD's, turndowns above 7:1 must not be offered until design checks have been made by Spirax Sarco.

Which desuperheater is right for my application?

This is a general guide and does not represent every option available.
Please contact us if you have any queries regarding selection for your specific application.



Sizing and selection software

It is necessary to use our online sizing and selection software so that the desuperheater can be correctly specified and ordered. The software will generate a desuperheater data sheet and general assembly detail drawing of the resulting product. Please refer to TI-P475-06 'Desuperheater Online Programme Sizing Guidance' for further information.

Safety information, installation and maintenance

For full details see the Installation and Maintenance Instruction that are supplied with the product.

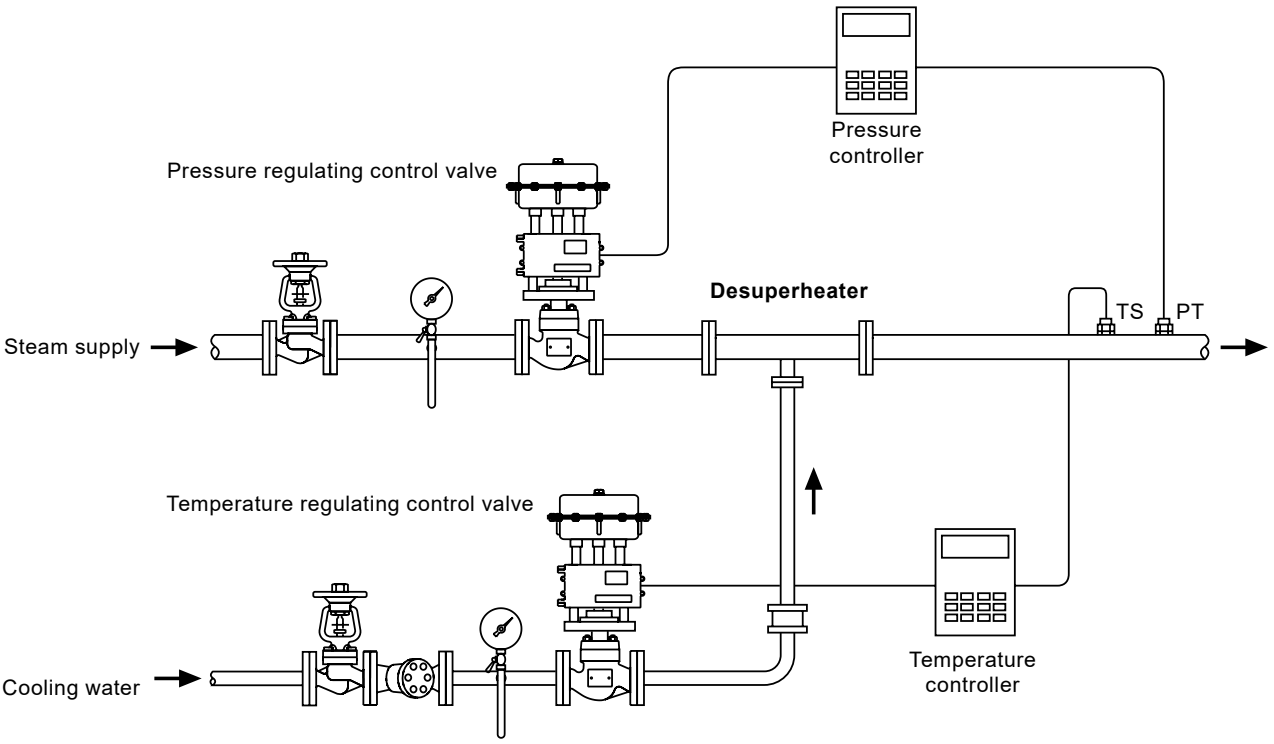
Installation note
Desuperheaters may be installed either horizontally or vertically with the steam flowing upwards.
Spirax Sarco strongly advises against installations in which the steam flow is vertically downwards.

In the case of a horizontal installation the cooling water connection (and the atomising steam connection on a steam atomising desuperheater) should ideally point downwards, as this gives the best orientation for drainage of fluids in a shutdown situation. Other orientations are acceptable for satisfactory operation, but drainage is not as effective.

In a vertical installation we recommend that, the cooling water pipework (and atomising steam pipework, if applicable) should be brought to the Desuperheater from below the corresponding connections on the desuperheater. This will provide the best layout for drainage of fluids on shutdown.

Desuperheating and pressure reducing stations

Spirax Sarco can provide complete desuperheating and pressure reducing stations including control valves, temperature sensors, pressure transmitters, instrumentation and pipework, all mounted on a support skid.



Combined desuperheating and pressure reducing station for venturi and spray type desuperheaters

Sizes

Spirax Sarco desuperheaters are specified by their nominal inlet and outlet size in inches. For example an 80 mm (3.14") connection is referred to as Size 3, a 250 mm (9.84") would be Size 10.

Dimensions and weights

Please refer to the general assembly detail drawing generated by the sizing and selection software for details of specific desuperheaters.

Selection guide

		Example
Desuperheater type	STD, SND, VTD and SAD	**VTD**
Steam inlet / outlet size, mm (inches)	20 mm - 450 mm (0.78" - 17.7")	**080**
Shell / pipe material	CS - Carbon steel A106 Grade B. For VTD sizes 1 to 2, CS = A350 LF2N material CM - Chrome molybdenum A182 F11	**CS**
Steam end connections	ASME 150, ASME 300, ASME 600, ASME 900, ASME 1500 PN16, PN25, PN40, PN63 and PN100	**A600**
Flange style	Weld neck or slip-on	**WN**

How to order

1 off Spirax Sarco Size 3 desuperheater model VTD080CS having ASME 600 RF weld neck flanged connections. (Attach the desuperheater Data Sheet with your order).

Spare parts

For units with fixed internals, spare parts are not available.
Spare parts and internal diffuser removal tools are available for units fitted with removable internals.
For guidance ;
SAD of 6" and larger and VTD of 10" and larger are of a fully welded construction, hence spare parts are not available. There are no spares available for SND or STD with fixed nozzle assembly.

Please quote the equipment model number and serial number from the nameplate when requesting parts.

TI-P475-06
CTLS Issue 4

Desuperheater
Online Program Sizing Guidance

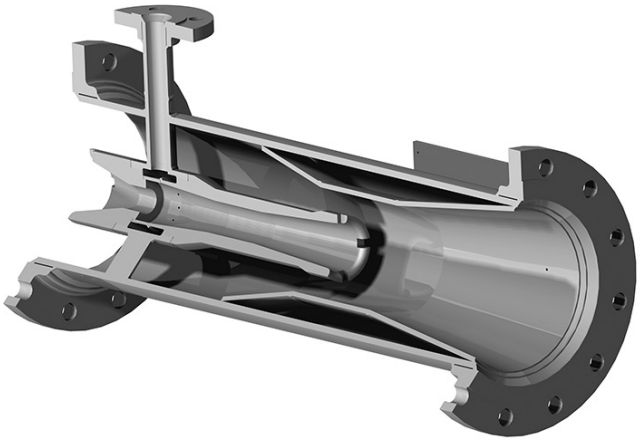
Description

In typical process plants, process steam is usually superheated, or heated to a temperature above saturation. The difference between the saturation temperature and the actual temperature of the steam is called 'superheat'.

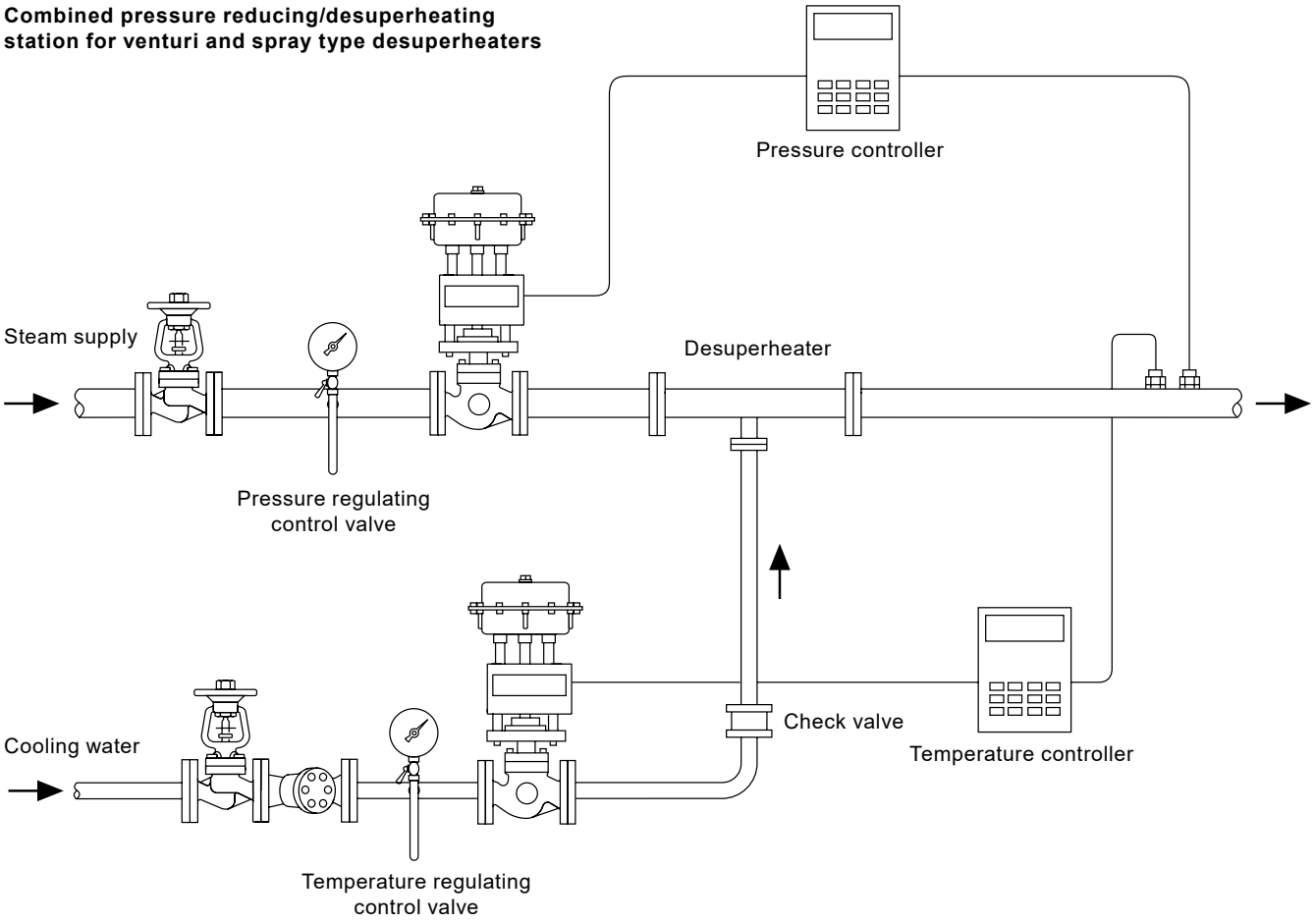
Desuperheated steam is more efficient in the transfer of thermal energy, consequently desuperheaters are used to bring the outlet degree of superheat closer to that of saturation.

Desuperheaters reduce the temperature of superheated process steam by introducing finely atomized cooling water droplets into the steam flow. As the droplets evaporate, sensible heat from the superheated steam is converted into latent heat of vaporization.

A typical desuperheater installation is shown below:



Combined pressure reducing/desuperheating station for venturi and spray type desuperheaters



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Desuperheater selection

There are various types of desuperheater available so evaluation of the process duty is crucial to ensure selection of the right equipment. Turndown capability, pressure drop and outlet superheat play lead roles in desuperheater design and selection:

Turndown: (Maximum steam flowrate ÷ Minimum steam flowrate)
Turndown represents the variability of the steam flowrate. For many processes, turndown is very small or fixed. Generally, the higher the turndown, the more complicated the Desuperheater design.

Outlet superheat:
Although desuperheaters are capable of desuperheating to the saturation temperature of the steam, typically, desuperheaters are designed to produce steam temperatures at 5 °F to 9 °F (3 °C to 5 °C) above saturation. This is because it becomes increasingly difficult to control the process (and there is very little advantage) at lower temperatures.

Steam pressure drop (for venturi type desuperheaters):
For most pressure systems, a 6 to 10 psi g (0.4 to 0.7 bar g) drop is considered reasonable. It should be noted that as the required turndown increases, so does the pressure drop. This is because there is a minimum acceptable pressure drop at the minimum flowrate case that ensures sufficient velocity to atomize the water droplets. Therefore, as the maximum steam flowrate increases, so does the velocity and hence the maximum pressure drop.

Water pressure drop (for spray type desuperheaters):
It should be noted that as the required turndown increases, the required cooling water pressure also increases.

General 'Rule-of-thumb':
Over-specifying the thermal load or process requirements is detrimental to efficient operation and will increase the cost of the desuperheater (and its controls). Under specifying the operating range can result in a unit that cannot handle all operating cases.

Each type of Spirax Sarco desuperheater, employs a different method to create water droplets. The process by which the water droplets are created is usually referred to as 'atomization'.

It must be remembered that the evaporation of the water droplets (and hence cooling of the steam) is a time dependent process and does not occur instantaneously. Consequently, most of the desuperheating does not occur in the desuperheater itself, but in the pipework immediately downstream. Therefore, the design of the downstream pipework is a crucial factor in a successful desuperheater installation.

It is important that the water droplets remain suspended in the downstream pipework for as long as possible. To ensure this, it is necessary to maintain sufficient turbulence in the downstream piping by keeping the velocity relatively high – higher than is usually encountered in steam distribution systems up to 200 ft/sec (61 m/s). This is the reason why desuperheaters and their associated pipework are often (not always) smaller than the distribution system in which they are being installed.

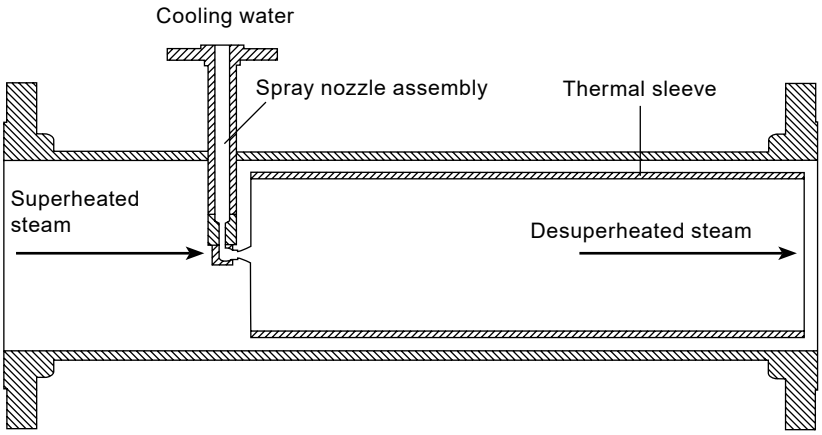
Types of desuperheater

From the preceding paragraphs, it is easy to understand why there has to be a period of good contact between the droplets of cooling water the superheated steam. If good contact is lost, the water can no longer absorb heat effectively from the steam, evaporation stops and the desuperheating process comes to a halt.

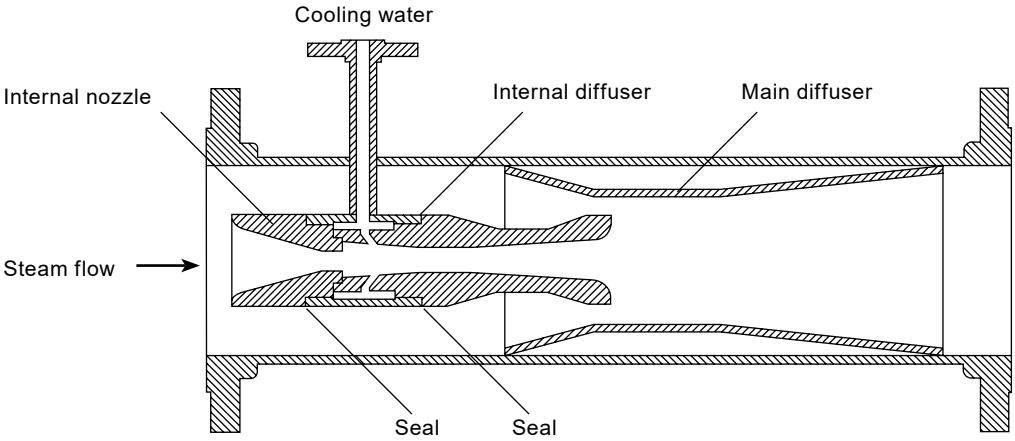
When the steam velocity is too low, 'water droplet fall-out' occurs and a pool of water is formed which runs along the bottom of pipe. At this point good contact between cooling water and the steam is lost and effective desuperheating will not occur. By following the guidelines presented in this document or using the Spirax Sarco online sizing software, problems due to droplet fall-out can be avoided.

There are three basic types of Spirax Sarco desuperheater (shown below) which all use a different method to atomize the cooling water droplets. Each one has its own merits and the desuperheater selection chart shown on the following page determines which type should be selected.

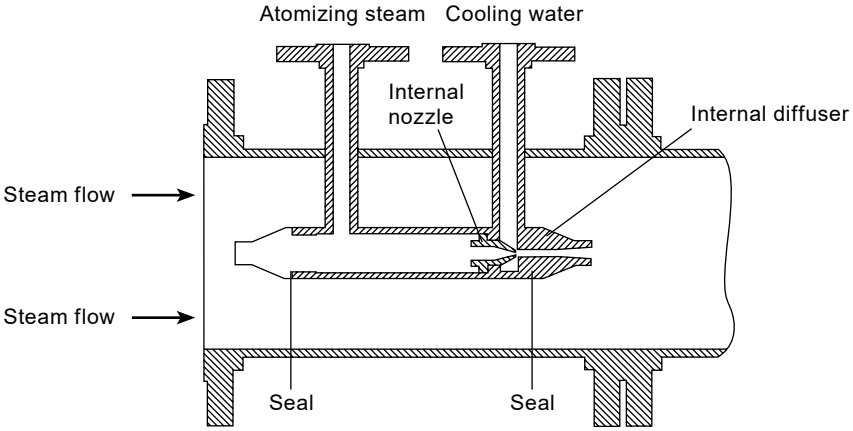
Complete spray type desuperheater



Venturi type desuperheater



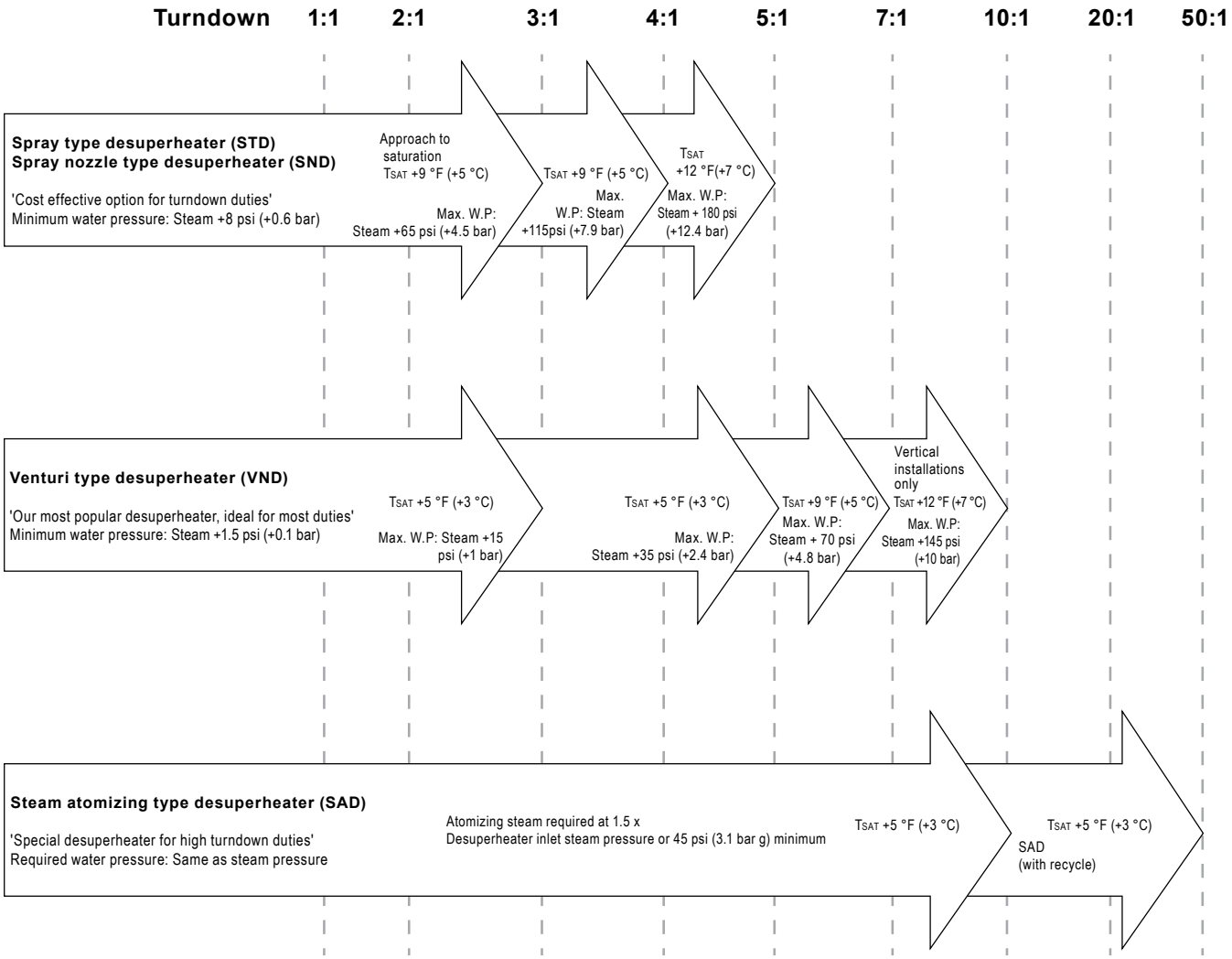
Steam atomizing desuperheater



Finer droplets, therefore smaller absorbtion length and/or better turndown and approach to saturation

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Desuperheater selection chart



Other considerations

Desuperheater orientation

Desuperheaters may be installed either horizontally or vertically (with the steam flowing upwards). In a vertical installation, increased turndown can be achieved; as the steam and water are countered by gravity, the water is less likely to fall out of suspension. Spirax Sarco strongly advizes against installations in which the steam flow is vertically downwards, as the opposite would occur.

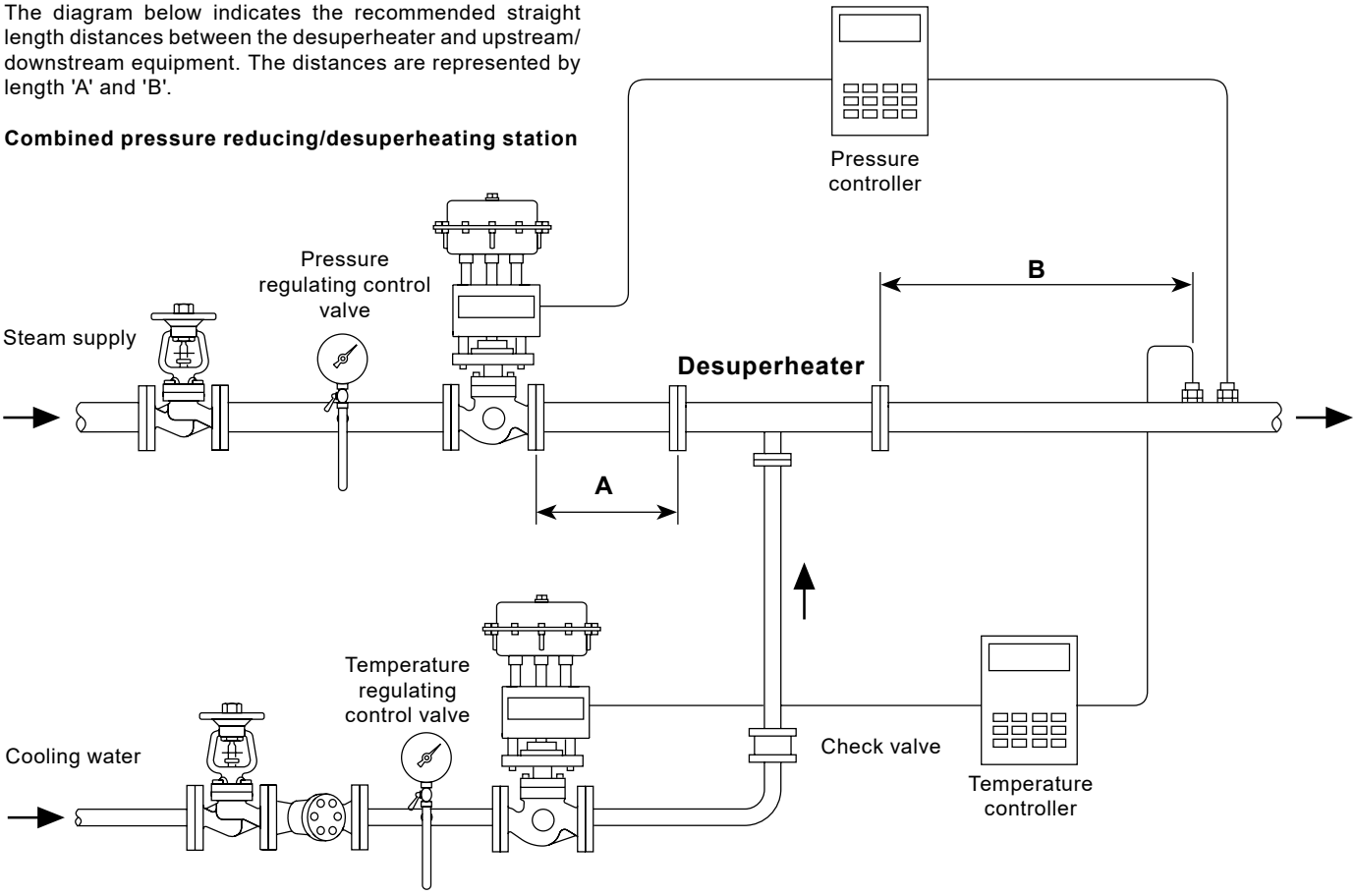
In the case of a horizontal installation, the cooling water connection and the atomizing steam connection on a SAD (steam atomizing desuperheater) should ideally point downwards, as this gives the best orientation for drainage of fluids in a shutdown situation. Other orientations are acceptable for satisfactory operation, but drainage is not as effective.

In a vertical installation we recommend that, the cooling water pipework (and atomizing steam pipework, if applicable) should be brought to the desuperheater from below the corresponding connections on the desuperheater. This will provide the best layout for drainage of fluids on shutdown.

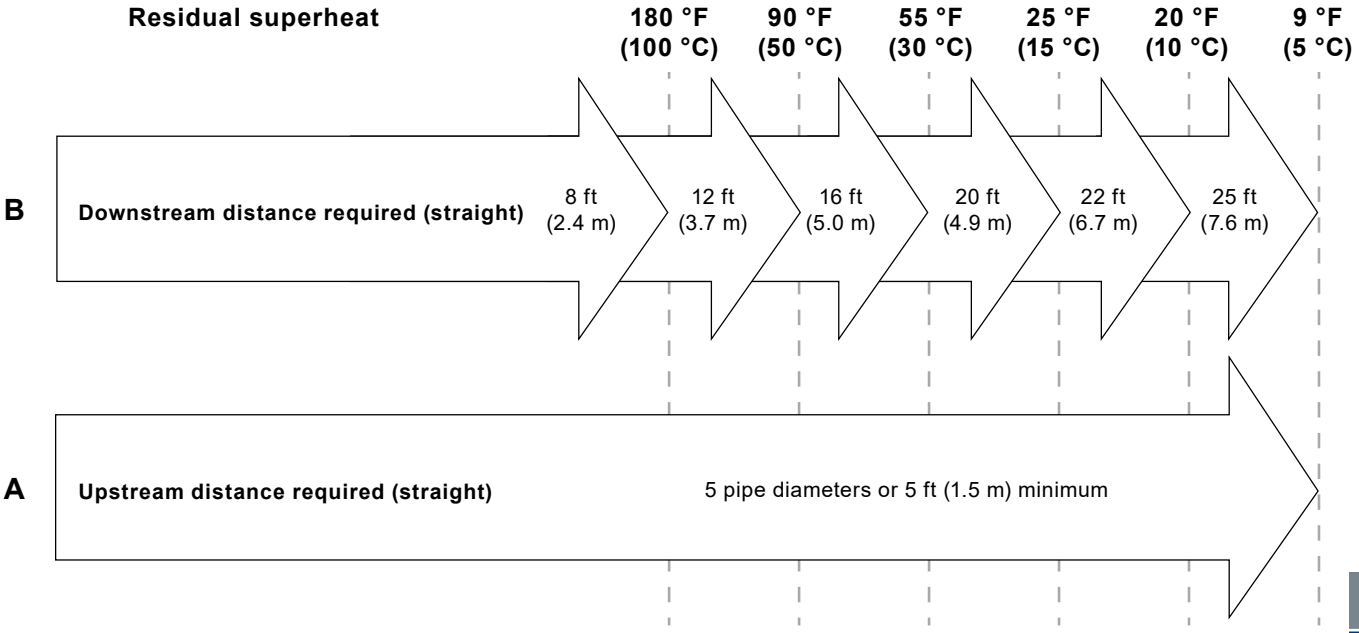
Distances

The diagram below indicates the recommended straight length distances between the desuperheater and upstream/ downstream equipment. The distances are represented by length 'A' and 'B'.

Combined pressure reducing/desuperheating station



Recommended distances for location of pressure and temperature sensors and equipment:



'The greater the residual superheat, the faster the water droplets are absorbed'

Other considerations (continued)

Cooling water supply

Typical cooling water supply options are as follows:

- Boiler feedwater (BFW) (taken from the pressure side of the boiler feedpump).
- Demineralized water.
- De-ionized water.
- Condensate.

Town's water or process water may also be used, but depending on hardness, salts may be deposited on the inside of downstream pipework and the face of valve seats and plugs.

Cooling water quality

The quality of the injected water is important. The TDS (Total Dissolved Solids) of the injection water should be as low as possible since all these solids will come out of solution and be deposited on the faces of valves and could block up the small orifices in the desuperheater nozzles.

Cooling water temperature

Generally, the hotter the better. This is because hot droplets need to absorb less heat to reach their flash temperature than cold ones. Hence, hot droplets will evaporate more quickly, producing a more efficient desuperheating process. Using hot water also has the additional advantage that smaller amounts of water will fall onto the inside walls of the pipework.
Because of the benefits of using hot water, it is logical to insulate the water supply pipes to minimize heat loss.

Cooling water pressure and flowrate

In order to inject the cooling water, its pressure at the desuperheater nozzle must be equal to or greater than the operating steam pressure in the pipe. The requirement varies from one type of desuperheater to another, but typical minimum values are:

- Spray type desuperheater — steam pressure +8 psi (+ 0.55 bar)
- Venturi type desuperheater — steam pressure +1.5 psi (+ 0.1 bar)
- Steam atomizing type desuperheaterequal to steam pressure

For the spray and Venturi type desuperheaters, the highest water inlet pressure required will be at the highest cooling water flowrate.

It should be noted that the water flowrate is a function of the square of the pressure difference between cooling water and the steam. So if the water flowrate is to be increased by a factor of 4 for example, then the pressure difference must increase by a factor of 42 = 16. This is the reason why it is important not to over-specify the turndown as high cooling water pressures are quickly reached (especially with spray type desuperheaters).

If an independent or booster pump is used, a recirculation loop will be required to ensure that there is always flow through the pump.

Cooling water control valve

A pressure drop will be required over the water control valve. We have already said that ideally the water should be as hot as possible so care is needed to ensure that flashing conditions do not exist across the control valve.

Superheated steam pressure control

It is desirable that a constant steam supply pressure be maintained.

The temperature of the steam after the desuperheater controls the amount of water added. The higher the temperature, the more the control valve will open and the greater the amount of water that is added. Usually the target is to reduce the steam temperature to within a small margin of saturation temperature. In virtually all applications the upstream pressure will be controlled and constant, however, if the superheated steam supply pressure is increased, the saturation temperature will also increase. The set value on the Controller will not change, and an excessive amount of water will be added as the control system tries to achieve the set temperature. This would result in very wet saturated steam with its resulting problems.

Control

In this document we have frequently used the term 'turndown' to describe the performance of the different types of desuperheater. However, as far as an installation is concerned, it should be remembered that the desuperheater is only one element of a desuperheating station. Obviously, if the controls that are fitted have lower turndown than the desuperheater, then the turndown of the desuperheater station will be reduced.

For example, in a particular pressure reducing/desuperheating station, the rangability of the cooling water valve may not be as high as the desuperheater. In this case it will be the rangability of the water control valve that limits the turndown of the desuperheating station.

Separator station

In applications where there must be no moisture present in the resulting steam (such as prior to a turbine for example) it is recommended that a separator is installed downstream of the desuperheater. This will protect downstream pipework and equipment from the effects of moisture in the event of a control system failure or abnormal operating conditions, for example at start-up.

The separator must be located after the temperature sensor thereby giving the water droplets as much time as possible to evaporate.

Strainer
Spirax Sarco recommends that a strainer is incorporated in the cooling water supply line to protect both the cooling water control valve and the small bores within the desuperheater from becoming blocked.

Isolation valves
To allow maintenance to be safely carried out, isolation valves are recommended upstream of:

- The superheated steam pressure control valve.
- The cooling water control valve.

Safety valve
In applications involving simultaneous pressure reduction, a safety relief valve may be needed to protect both the desuperheater and downstream equipment from the effects of:

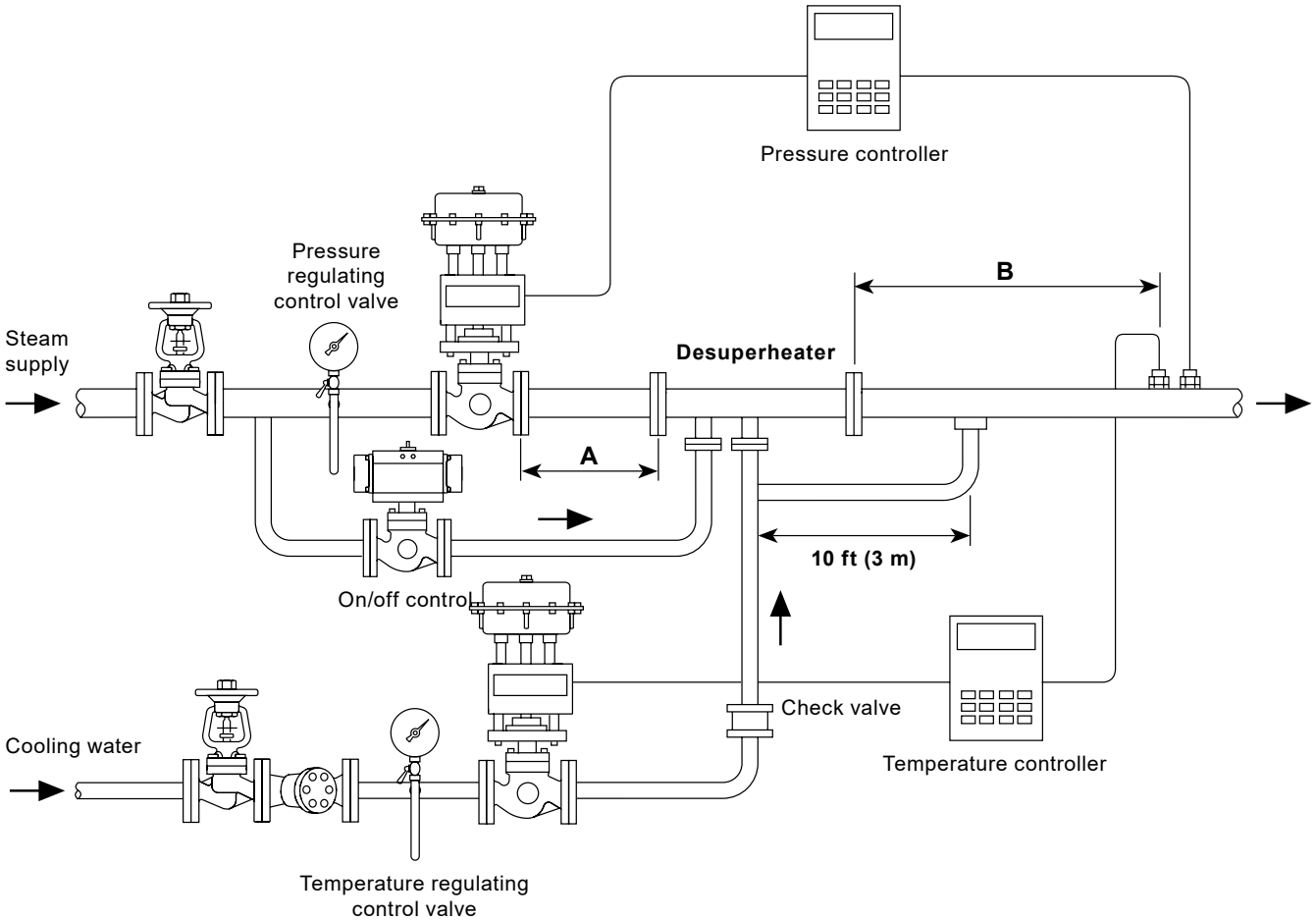
- Excess pressure in the event of pressure control system failure.
- Excess temperature in the event of temperature control system failure.

It is essential that the desuperheater and downstream equipment are suitable for the maximum temperature of the superheated steam. This is to protect these items in the event of a failure of both the pressure and temperature control systems.

Recycle loop
For SAD steam atomizing desuperheaters with a very high turndown a 'catchpot and recycle loop' are often installed as shown on the diagram below. The recycled condensate is hot which leads to faster absorption.

The desuperheater generates a small suction effect to draw the recycle water back to the desuperheater ensuring that the water doesn't 'by-pass' the desuperheater.

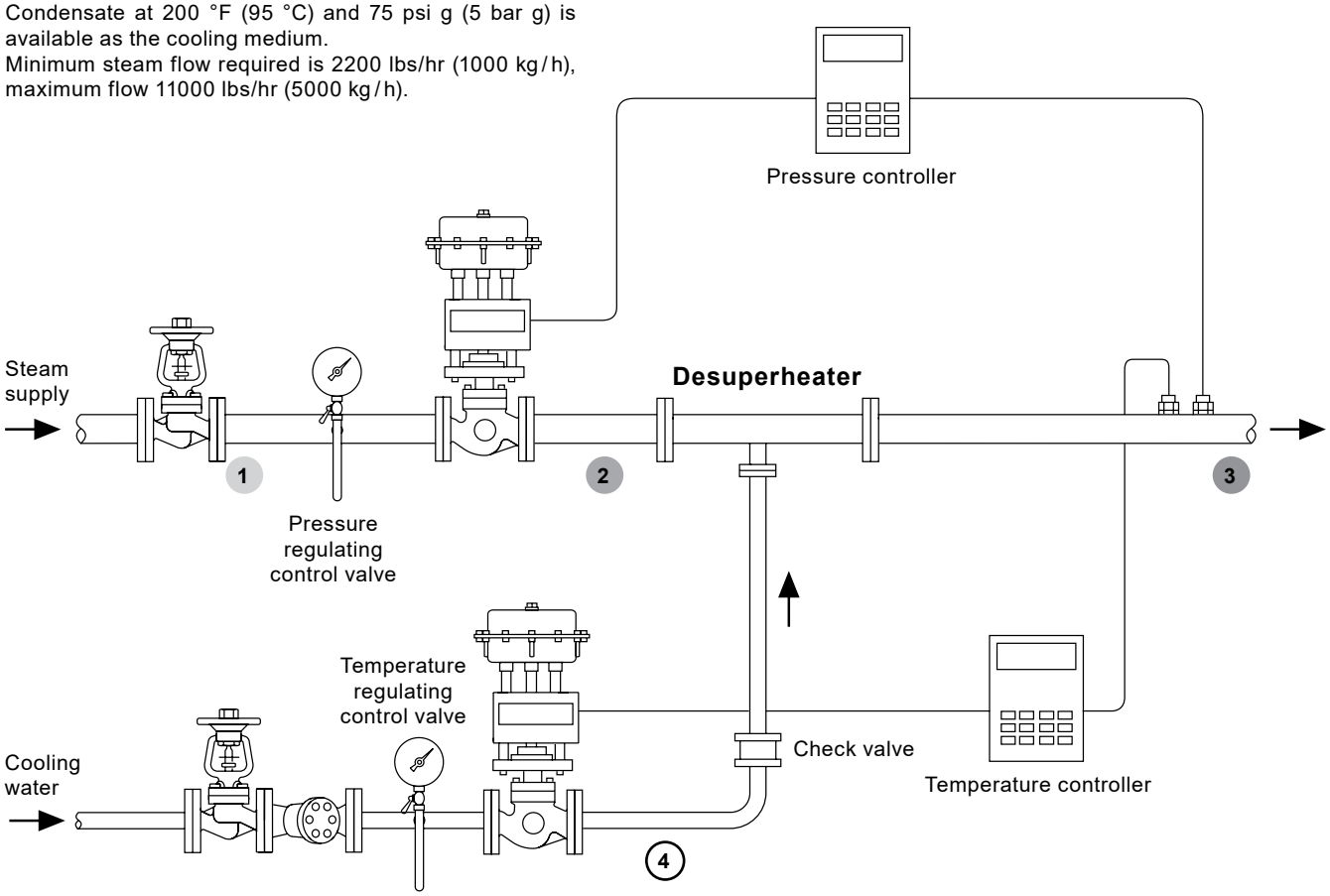
Combined pressure reducing/desuperheating station for steam atomizing type desuperheaters



Detailed example

Steam is required to heat a vessel jacket at 30 psi g (2 bar g) and 275 °F (133.7 °C). A low pressure steam supply is available at 145 psi g (10 bar g) and 390 °F (200 °C) for this purpose.

Condensate at 200 °F (95 °C) and 75 psi g (5 bar g) is available as the cooling medium.
Minimum steam flow required is 2200 lbs/hr (1000 kg/h), maximum flow 11000 lbs/hr (5000 kg/h).



Method

As the turndown required equals 5:1 and the application involves simultaneous pressure reduction, this would seem to be a good application for a venturi type desuperheater (VTD). Please note that a steam atomizing desuperheater (SAD) could also be used for this duty, but the overall installation cost would be higher due to the greater complexity of the installation.

As already stated, it is not possible to control at the saturated temperature of the steam so any associated temperature controller should have a set point of 5 °F (3 °C) above the saturation temperature (which is 275 °F (136.7 °C) in this example).

We can use the Spirax Sarco Online Sizing Program to calculate the unit size (available at www.spiraxsarco.com/uk with password). The form would be completed as follows:

The steam temperature at the inlet to the desuperheater is calculated by the program automatically and is shown on the datasheet.

Once the calculation button is pressed the software will calculate the required cooling water pressure and flowrate. It will also calculate the pressure drop across the unit. The user will see a summary screen, at which point the desired flange rating can be selected and then the 'Save & Email' button can be pressed. You will then receive an e-mail with a drawing and datasheet to your chosen e-mail address.

Venturi Type Desuperheater Quote

Welcome to the Transvac Online Quote system. Please complete the details below.

Client Reference			
Is there a pressure reducing valve upstream?	◉ Yes ○ No		
Turndown	○ Fixed ◉ Not Fixed		
1 Upstream of Let-down Valve	Design	Case 1	Case 2
Pressure bar(g)	10	10	10
Temperature °C	200	200	200
2 Desuperheater Inlet Conditions	Design	Case 1	Case 2
Pressure bar(g)	2	2	2
Temp In °C			
Design Flowrate	5000	3000	1000
CW Temp	95	95	95
3 Desuperheater Outlet Conditions	Design	Case 1	Case 2
	◉ Tsat+3°C ○ Other	◉ Tsat+3°C ○ Other	◉ Tsat+3°C ○ Other
Temperature °C			
Mechanical Design Conditions	Steam Side	Water Side	
Pressure bar(g)	15	15	
Temperature °C	220		

Calculate > (it may take a few minutes to calculate)

Detailed example (continued) The datasheet generated by the program for this example is as follows:

Spirax Sarco Venturi Type Desuperheater Data Sheet

v 1.4

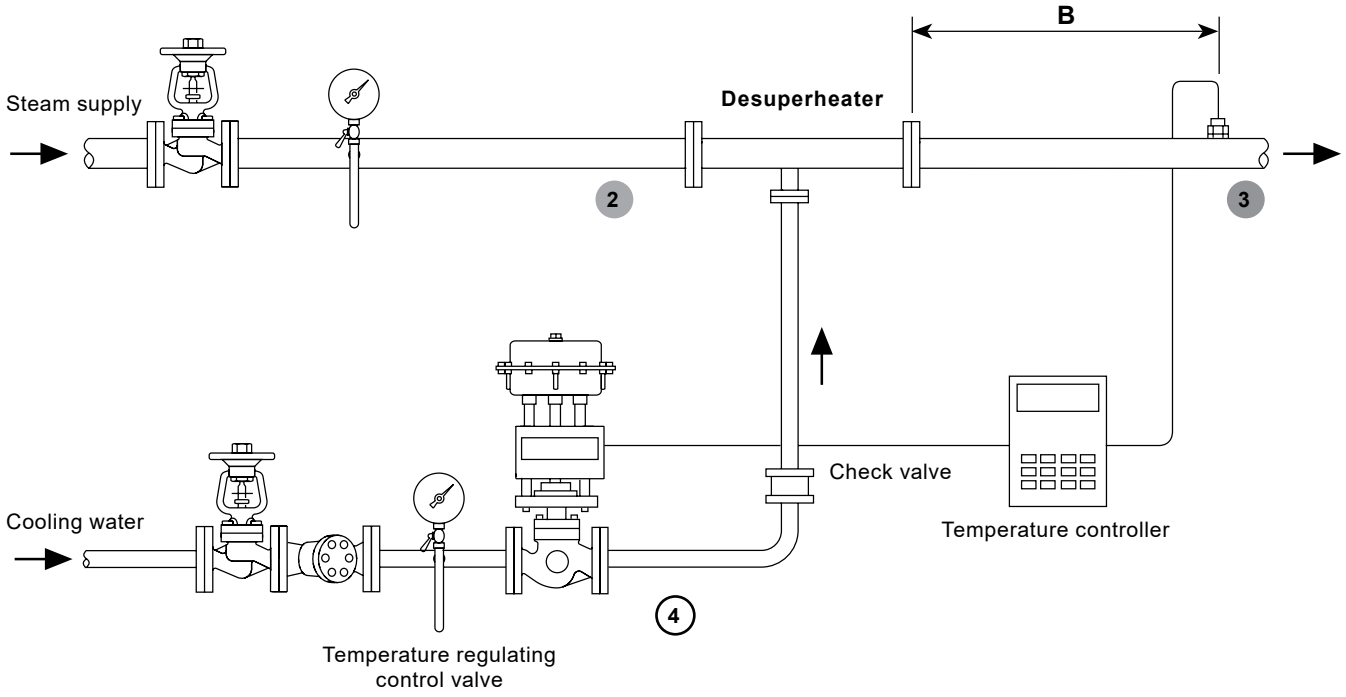
1	Client :	Spirax-Sarco Limited			Client Project Ref :			
2	Client's Ref :	EXAMPLE CALCULATION			Plant Location :			
3	Spirax Sarco Ref :	VTD01582			Equip. Item No. :			
4	Description :	Size 6 Venturi Type Desuperheater			No. OFF :	1		
5	Unit Ref :	VTD150 °CS6F0			Operation :			
6	Drawing No. :	DE-VTDSDSO			Serial No. :			
7	Unit Size :	6						
8	**INLET CONDITIONS**	Case 1	Case 2	Case 3	**CONDITIONS UPSTREAM OF LET-DOWN VALVE**			
9	Flowrate (kg/hr)	5000	3000	1000	Case 1	Case 2	Case 3	
10	Pressure (bar g)	2.302	2.108	2.012	10	10	10	
11	Temperature (°C)	179.7	179.2	178.9	200	200	200	
12								
13	**COOLING MEDIUM**	Case 1	Case 2	Case 3				
14	Flowrate (kg/hr)	193.5	116.1	38.7				
15	Pressure (bar g)	5.34	3.2	2.13				
16	Temperature (°C)	95	95	95				
17	Medium -	Water						
18								
19	**DISCHARGE CONDITIONS**	Case 1	Case 2	Case 3				
20	Pressure (bar g)	2	2	2				
21	Temperature (°C)	136.7	136.7	136.7				
22	Flowrate (kg/hr)	5193.5	3116.1	1038.7				
23								
24	**MATERIALS OF CONSTRUCTION**				Flanges	Carbon Steel ASTM A 105		
25	Main Body	Carbon Steel ASTM A 106 Grade B			Gaskets	Soft Copper		
26	Inner Nozzle	Stainless Steel BS 970 S11/13			Inner Body	Carbon Steel ASTM A350 LF2		
27	Inner Venturi	Stainless Steel BS 970 S11/13			Main Venturi	C.Steel BS 1501-151/161-430A/B		
28								
29	**MECHANICAL DESIGN**	Steam	Water		CONNECTION DETAILS			
30		Side	Side			Size	Rating	
31	Max.Design Pressure (bar g)	15	15		Inlet Steam	6	300 LB	
32	Max. Design Temperature (°C)	220	220		Discharge Steam	6	300 LB	
33	Internal Corrosion Allowance (mm)	1.5	1.5		Cooling Medium	1	300 LB	
34	Mechanical Design Code	ASME B31.3			Flange Type	ASME B16.5 Slip-On		
35	Welding Standard	To Code						
36	External Surface Finish	High Temp. Silicone Aluminium						
37	Weight (kg)	68						
38								
39	**DIMENSIONS**							
40	A (" NB) 6							
41	B (mm) 178							
42	C (mm) 127							
43	D (mm) 533							
44	E (mm) 660	Note: Letters refer to Drawing						
0	Issued for sizing only			PDA	08/01/2010			
Rev	Description			By	Date	Checked	Date	

A Spirax Sarco Size 6 venturi type desuperheater has been selected. It can be seen from the 'Cooling Medium' section that the maximum cooling water pressure required is 35 psi g (2.41 bar g) consequently a water booster pump should also be installed (as the cooling water is only available at 75 psi g (5.17 bar g).

The program has calculated a steam pressure drop across the desuperheater of 4.4 psi g (0.303 bar g) (maximum). As there is a pressure reducing valve installed, the program has automatically added this pressure drop to the desuperheater inlet pressure to 'compensate' for the pressure drop. This will ensure that the outlet pressure from the desuperheater is 30 psi g (2.07 bar g). The datasheet therefore shows the correct pressures and flowrates for sizing both the pressure reducing valve and the water control valve.

Detailed example 2

Steam is required at 75 psi g (5 bar g) (saturated) for use in a Shell & Tube Heat Exchanger. The Client has steam available at 75 psi g (5 bar g), 660 °F (349 °C). Minimum steam flow is 18,750 lbs/hr (8 505 kg / h), maximum is 55,000 lbs/hr (24,948 kg/h). Boiler feedwater at 70 °F (21 °C) is available as the cooling medium.



Method

As the turndown is approximately 3:1 we can select any type of Desuperheater. There are 3 options:

SAD - Steam atomising desuperheater
This would require atomizing steam at 110 psi g (7.5 bar g) min.

VTD - Venturi type desuperheater
This could be selected, however, this desuperheater is not part of a pressure reducing station, consequently if we select a VTD venturi type desuperheater, the discharge steam pressure will be reduced by the pressure drop across the unit. The steam could be desuperheated to Tsat +5 °F (+3 °C).

STD - Spray type desuperheater
The unit is capable of handling the turndown with no steam-side pressure drop and can desuperheat to Tsat +9 °F (+5 °C).

In this case the client states that Tsat +9 °F (+5 °C) is acceptable so we will select an STD.

The Spirax Sarco Online Spray Type Desuperheater Sizing Program would be completed as shown opposite:

Spray Type Desuperheater Quote

Welcome to the Transvac Online Quote system. Please complete the details below.

Client Reference	DETAILED EXAMPLE 2
Is there a pressure reducing valve upstream?	○ Yes ◉ No
Turndown	○ Fixed ◉ Not Fixed

Upstream of Let-down Valve

	Design	Case 1	Case 2
Pressure bar(g)			
Temperature °C			

Desuperheater Inlet Conditions

	Design	Case 1	Case 2
Pressure bar(g)	5	5	5
Temp In °C	350	350	350
Flowrate kg/h	25000	18000	8500
CW Temp °C	25	25	25

Desuperheater Outlet Conditions

	Design	Case 1	Case 2
	◉ Tsat+5°C ○ Other	◉ Tsat+5°C ○ Other	◉ Tsat+5°C ○ Other
Temperature °C			

Mechanical Design Conditions

	Steam Side	Water Side
Pressure bar(g)	10	30
Temperature °C	374	

Calculate > (it may take a few minutes to calculate)

This section does not need to be completed

Detailed example 2 (continued) A Spirax Sarco Size 10 spray type desuperheater has been selected. The maximum cooling water pressure required is 140 psi g (9.65 bar g) and there is a negligible steam-side pressure drop.

Spirax Sarco Spray Type Desuperheater Data Sheet

v2.0

1	Client :	Spirax-Sarco Limited			Client Project Ref :		
2	Client's Ref :	DETAILED EXAMPLE 2			Plant Location :		
3	Spirax Sarco Ref :	STD00519			Equip. Item No. :		
4	Description :	Size 10 Spray Type Desuperheater			No. OFF :	1	
5	Unit Ref :	Size STD250CS6F0			Operation :		
6	Drawing No. :	DESTD00519-1			Serial No. :		
7	Unit Size :	10					
8	**INLET CONDITIONS**	Case 1	Case 2	Case 3	**CONDITIONS UPSTREAM OF LET-DOWN VALVE**		
9	Flowrate (kg/hr)	25000	18000	8500	Case 1	Case 2	Case 3
10	Pressure (bar g)	5	5	5			
11	Temperature (°C)	350	350	350			
12							
13	**COOLING MEDIUM**	Case 1	Case 2	Case 3			
14	Flowrate (kg/hr)	3733	2678.8	1269.2			
15	Pressure (bar g)	9.79	7.48	5.55			
16	Temperature (°C)	25	25	25			
17	Medium -	Water					
18							
19	**DISCHARGE CONDITIONS**	Case 1	Case 2	Case 3			
20	Pressure (bar g)	5	5	5			
21	Temperature (°C)	163.9	163.9	163.9			
22	Flowrate (kg/hr)	28733	20687.8	9769.2			
23							
24	**MATERIALS OF CONSTRUCTION**				Nozzle Housing	Carbon Steel ASTM A 350 LF2	
25	Main Body	Carbon Steel ASTM A 106 Grade B			Flanges	Carbon Steel ASTM A 105	
26	Water Branch	Carbon Steel ASTM A 106 Grade B			Gaskets	Soft Copper	
27	Thermal Sleeve	Stainless Steel ASTM A312 TP316L			Spray Nozzle	Stainless Steel	
28							
29	**MECHANICAL DESIGN**	Steam	Water		**CONNECTION DETAILS**		
30		Side	Side			Size	Rating
31	Max.Design Pressure (bar g)	10	30		Inlet Steam	10	300 LB
32	Max. Design Temperature (°C)	374	374		Discharge Steam	10	300 LB
33	Internal Corrosion Allowance (mm)	1.5	1.5		Cooling Medium	2	300 LB
34	Mechanical Design Code -	ASME B31.3			Flange Type	ASME B16.5 Slip-On	
35	Welding Standard -	To Code					
36	External Surface Finish -	High Temp. Silicone Aluminium					
37	Weight (kg)	180					
38							
39	**DIMENSIONS**						
40	A (" NB)	10					
41	B (mm)	430					
42	C (mm)	250					
43	D (mm)	800					
44	E (mm)	1050	Note: Letters refer to Drawing				
0	Issued for sizing only			PDA	22/01/2010		
Rev	Description			By	Date	Checked	Date

Typical applications

The following is a list of applications where desuperheaters have been supplied:

Power generation

To reduce the temperature of steam discharged from turbine bypass systems to that required for other parts of the plant.

- Turbine washing

Process industries

In process industries, desuperheaters are used as part of a system for reducing the temperature and pressure of steam from boilers to economic levels of operation.

Paper and board industry

- Paper drying machines

Food industry

- Steam cooking kettles
- Evaporator heat exchanger
- Product conditioning

Textile industry

- Fabric finishing autoclaves

Tobacco industry

- Tobacco leaf drying plants

Chemical and pharmaceutical industry

- Reactor heater jackets and coils
- Steam supply to process heaters

Oil and petrochemical industry

- Vacuum distillation start-up heaters
- Steam supply to process heaters
- Let-down station and turbine bypass
- Thermocompressor discharge
- Mechanical vapour re-compression

Brewing and distilling industry

- Steam heating system

Boiler and turbine installations

- Power generation
- Ship building
- Coffee
- Chemical

TI-P605-10
TES Issue 5

DA Series
Variable Area Desuperheaters

Desuperheater overview

Hiter direct contact desuperheaters reduce the temperature of superheated steam to produce steam temperatures approaching saturation temperature. Spray water is injected directly into the steam, flashing into vapour by absorbing heat from the steam.
The DA series desuperheater is designed to precisely and economically control the downstream steam temperature by injecting cooling water directly into the superheated steam flow. It consists of a single actuator and a spray control valve integrated into a single unit.

Typical applications:

- High turndown applications that are beyond the scope of fixed area desuperheaters.
- To safely reduce the steam temperature to allow the operation of downstream process equipment designed for lower temperatures, maintaining a constant temperature for processes precise temperature control
- To reduce the temperature of steam discharge from turbine by-pass systems on power plants for heat exchangers, dump stations etc.
- To improve heat transfer of indirect contact heat exchangers- shell and tube, plate type, reactor heating jackets, etc.

Features:

- Easy installation
- Low maintenance
- Robust design
- Wide Cv range
- Minimal steam pressure drop
- Rapid evaporation to minimise over spray
- Flexible design options



Standard and approvals

- Pressure rating and connections according to ASME B16.34 and ASME B16.5, EN12516-1 and EN1092-1.
- The products listed comply with the requirements of The EU Pressure Equipment Directive/UK Pressure Equipment (Safety) Regulations and carry the CE/UKCA mark when so required.
- Welding is in accordance with ASME IX.
- Connections are sized to suit the process conditions.
- Standard ASTM materials of construction include: carbon steel, stainless steel and chrome molybdenum steel. Special materials are available on request.

Documentation and certification:

Each Spirax Sarco DA will be supplied with the following documentation & certification pack:

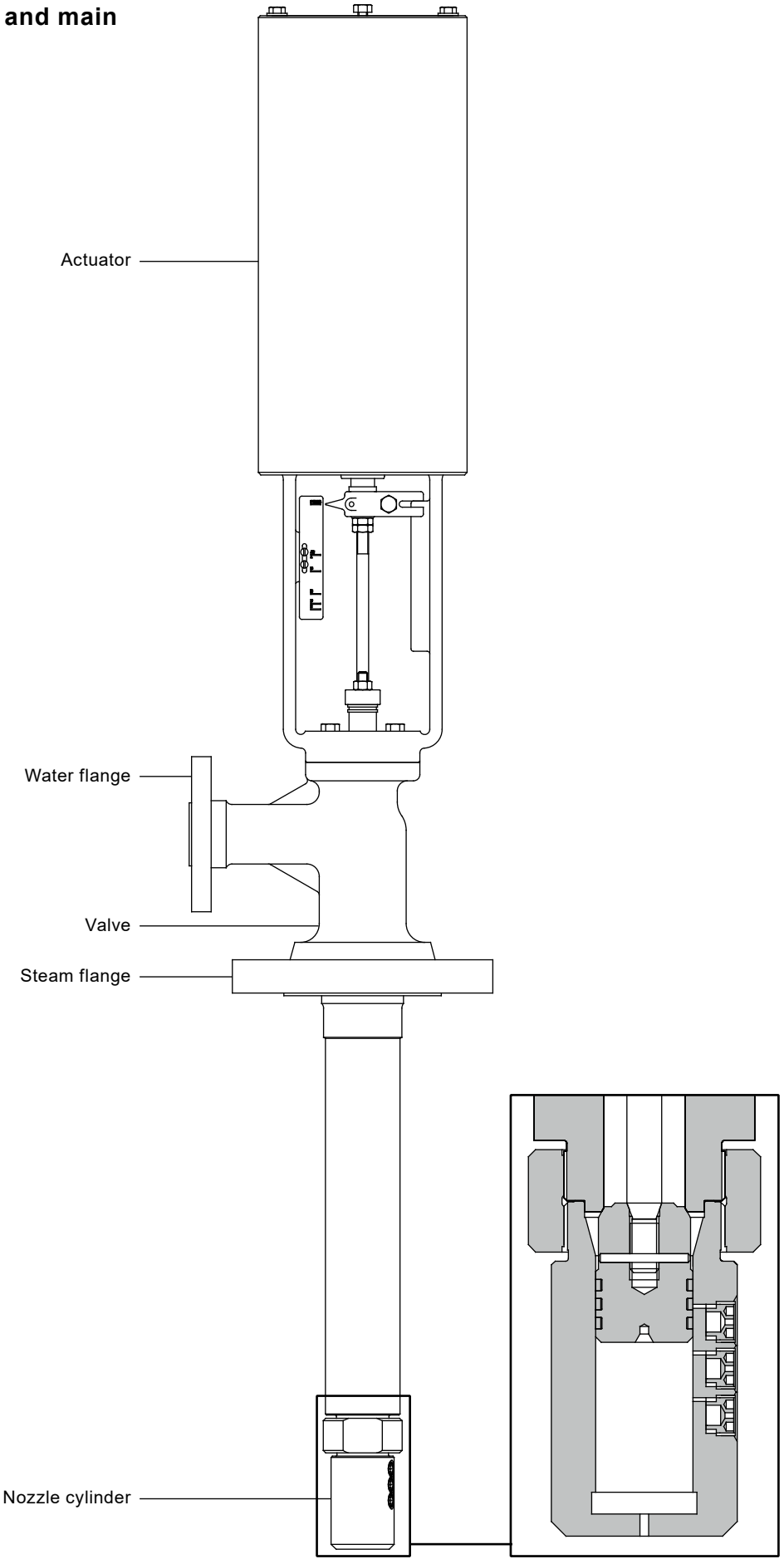
- Material traceability certificates to EN 10204 3.1 for body assembly, plug, stem, and nozzles
- Quality certificate indicating hydrostatic test and seat leakage (Class IV) test results
- Warranty terms & conditions

NDT reports are available on request

Class V leakage certification available upon request.

For up to date information on product compliance please visit: **www.spiraxsarco.com/product-compliance**

Standard scope of supply and main component identification



Technical specifications

Diameters	1" (DN25)	Water Connection	
	3" (DN80)	Steam Connection	
End Connections	FR	Raised Face	
	RTJ	Ring Type Seal ASME600 and ASME900 only	
Pressure Rating/Materials	ASME B16.34	Class 150 - 900	ASME A216 WCB, ASME A217 WC9 and ASME A351 CF8M
	EN1092-1	PN40	ASME A216 WCB and ASME A351 CF8M
	EN 12516-1	PN40	ASME A217 WC9
	EN1092-1	PN63 - 100	EN 10213 GP240GH (1.0619) and EN 10213 GX5CrNiMo19-11-2 (1.4408)
	EN 12516-1	PN63 - 100	PN63 - PN100 - EN 10213 G17CrMo9-10 (1.7379)
Steam Pipe Diameter	6" (DN150) to 24" (DN600)		
Steam Velocity	6 - 90m/s[1]		
Rangibility	Up to 50:1		
Leakage Class	Class IV standard		
	Class V optional - maximum ΔP 30 bar (435.1 psi)		
Minimum approach temperature	6 °C (10.8 °F)		
Differential pressure between water and steam	Minimum 3.5 bar (50.76 psi)		
	Maximum 75 bar (1087.78 psi)		
Maximum allow water pressure	95 bar (1377.86 psi)		
Minimum recommended water temperature	50 °C (122 °F)		
Maximum recommended water temperature	180 °C (356 °F)		
Differential Temperature between water and steam	Up to 232 °C (449.6 °F) without the need of steam thermal sleeve		
	Above 232 °C (449.6 °F) we recommend the use of steam thermal sleeve[1]		

[1] Optional, upon request. A thermal sleeve is recommended for operational velocities below 10m/s (33ft/s) or low spray water temperatures. See IM-P605-11 for details.

Technical specifications continued on next page

Technical Specifications (continued)

	Material	Maximum temperature	Pressure Rating	Maximum allowable pressure
Body materials²	ASME A216 WCB	425 °C (797.0 °F)	ASME 150	19.6 bar g (284.2 psi g)
			ASME 300	51.1 bar g (741.1 psi g)
			ASME 600	102.1 bar g (1480.8 psi g)
			ASME 900	153.2 bar g (2222 psi g)
		400 °C (752 °F)	PN40	40.0 bar g (580.1 psi g)
	EN 10213 GP240GH (1.0619)	400 °C (752 °F)	PN63	63.0 bar g (913.7 psi g)
			PN100	100.0 bar g (1450.3 psi g)
	ASME A217 WC9	538 °C (1000.4 °F)	ASME 150	19.8 bar g (287.1 psi g)
			ASME 300	51.7 bar g (749.8 psi g)
			ASME 600	103.4 bar g (1499.6 psi g)
			ASME 900	155.1 bar g (2249.5 psi g)
			PN40	40.0 bar g (580.1 psi g)
	EN 10213 G17CrMo9-10 (1.7379)	538 °C (1000.4 °F)	PN63	63.0 bar g (913.7 psi g)
			PN100	100.0 bar g (1450.3 psi g)
	ASME A351 CF8M	538 °C (1000.4 °F)	ASME 150	19 bar g (275.5 psi g)
			ASME 300	49.6 bar g (719.3 psi g)
			ASME 600	99.3 bar g (1440.2 psi g)
			ASME 900	148.9 bar g (2159.6 psi g)
			PN40	40.0 bar g (580.1 psi g)
	EN 10213 GX5CrNiMo19-11-2 (1.4408)	538 °C (1000.4 °F)	PN63	63.0 bar g (913.7 psi g)
			PN100	100.0 bar g (1450.3 psi g)

	Plug	Seat	Gasket	Cylinder (Nozzles)	Nozzles	Temperature
Trim materials	SS 410	Stellite	Inconel	SS 410	SS 416	538 °C (1000.4 °F)

	Nozzle	6A	6A1	9A1	6B	9B	6C	6D	3C6D	6E	3C6E	9E
Flow Coefficient - Cv	Cv	0.19	0.30	0.45	0.80	1.20	2.10	3.18	4.00	5.40	6.20	8.10
	Kv	0.16	0.26	0.39	0.69	1.04	1.81	2.75	3.46	4.67	5.36	7.00

Actuator	Supplied as standard with a pneumatic spring return actuator that closes the water supply in the event of pneumatic of control signal failure. An optional hand wheel (mechanical override) actuator is available upon request. Electric actuators can also be supplied upon request.
Actuator temperature range	-10 °C to +80 °C (14 °F to 176 °F)
Actuator maximum pressure	6.21 bar (90 psi)
Actuator spring range	2.07 bar to 3.45 bar (30 psi to 50 psi)

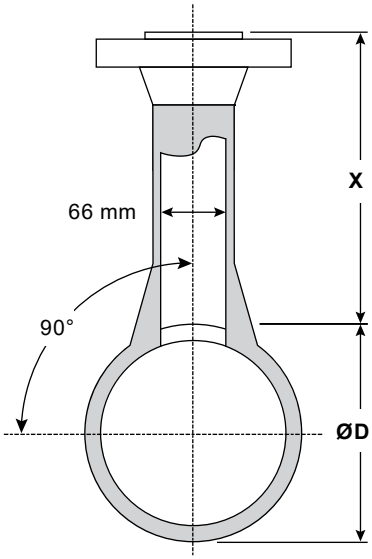
² Special materials available on request.

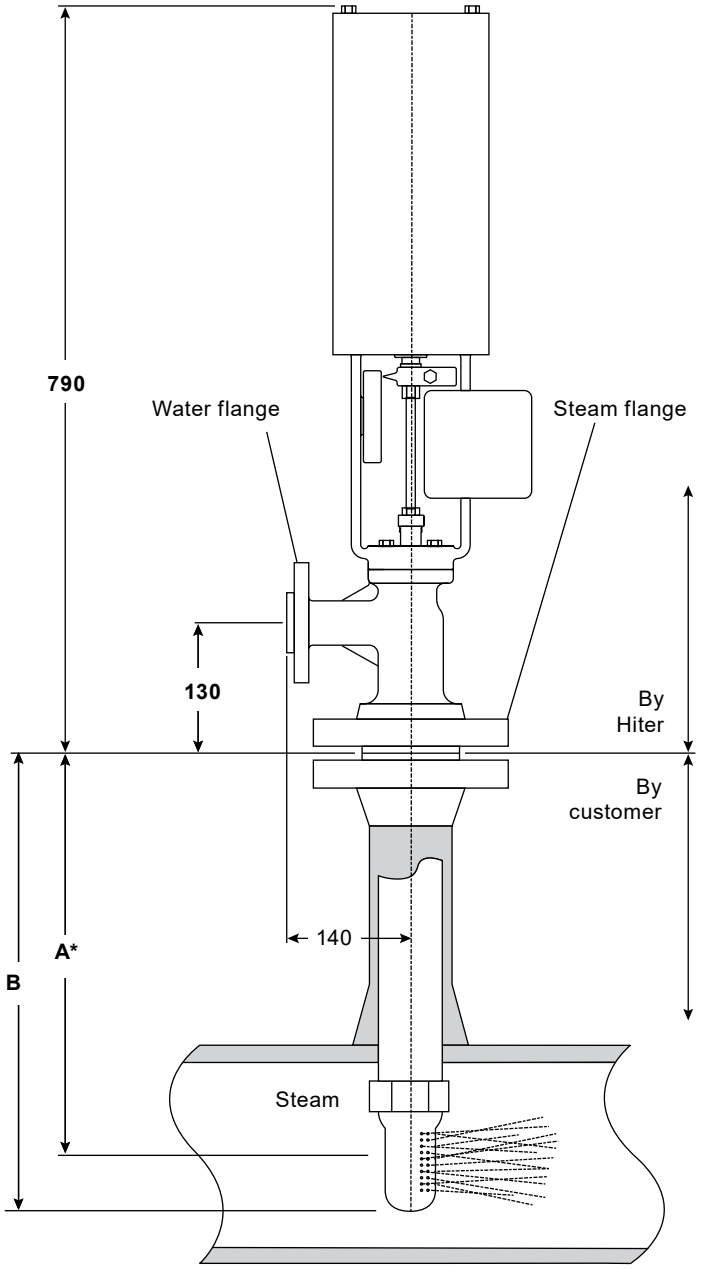
For full operational limitations of the DA by material and pressure rating, please refer to IM-P605-11.

Alternatively, please contact your local Spirax Sarco office.

Sizes (mm)

Nozzle	A (Central line insertion distance)	B Total insertion distance
6A	395	445
6A1		
9A1		
6B	402	457
9B		
6C	411	477
6D	415	485
3C6D		
6E	417	489
3C6E		
9E		





A* = Approximate distance to steam pipe centre

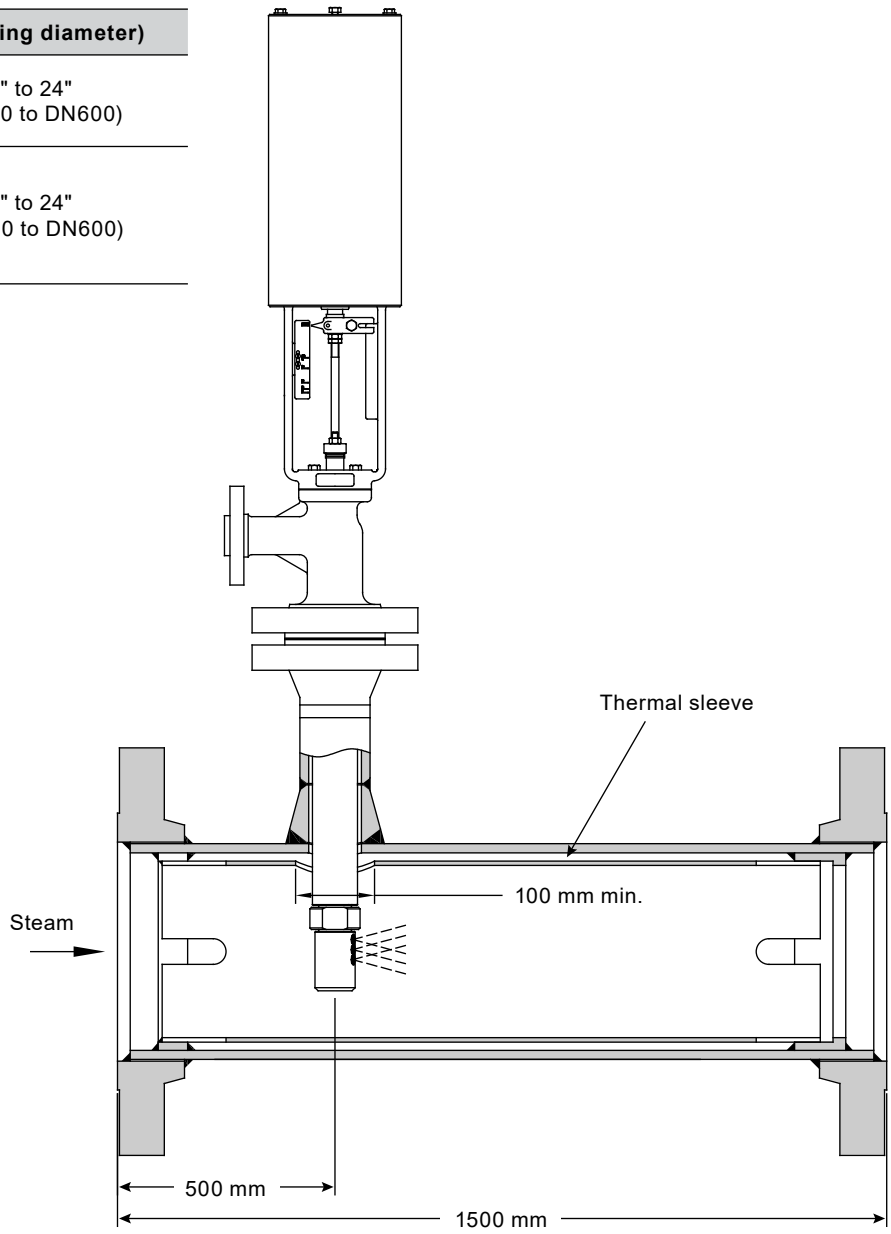
Branch height X calculation

$$X = A - \frac{ØD^*}{2}$$

***Note:** For pipes over 24". X = 83 mm (3¼ ")

Typical installation (mm)

Nozzle	ØD (Piping diameter)
6A/6A1/9A1	6" to 24" (DN150 to DN600)
6B/9B	
6C	8" to 24" (DN200 to DN600)
6D/3C6D	
6E/3C6E/9E	



Pneumatic supply

The maximum allowable compressed air supply pressure to the actuator is 6.21 bar g (90 psi g). Higher pressures must be regulated in accordance with this limitation. The DA position should be controlled by a positioner. In the event of a pneumatic or signal failure, the actuator will fail to a position that closes the water supply to the steam.

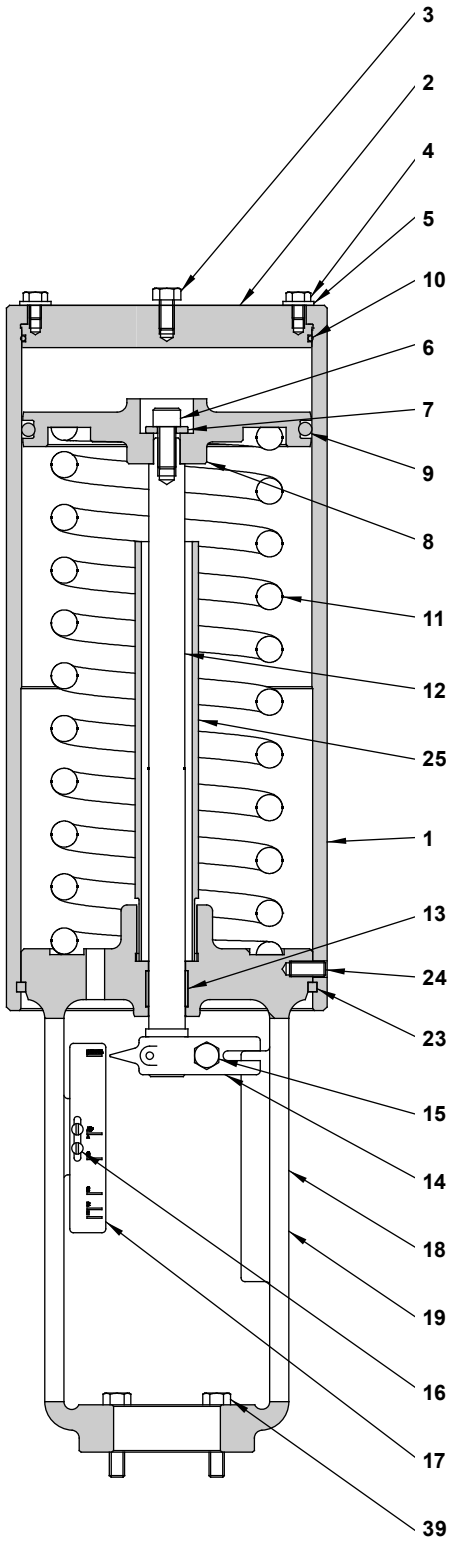
Positioners

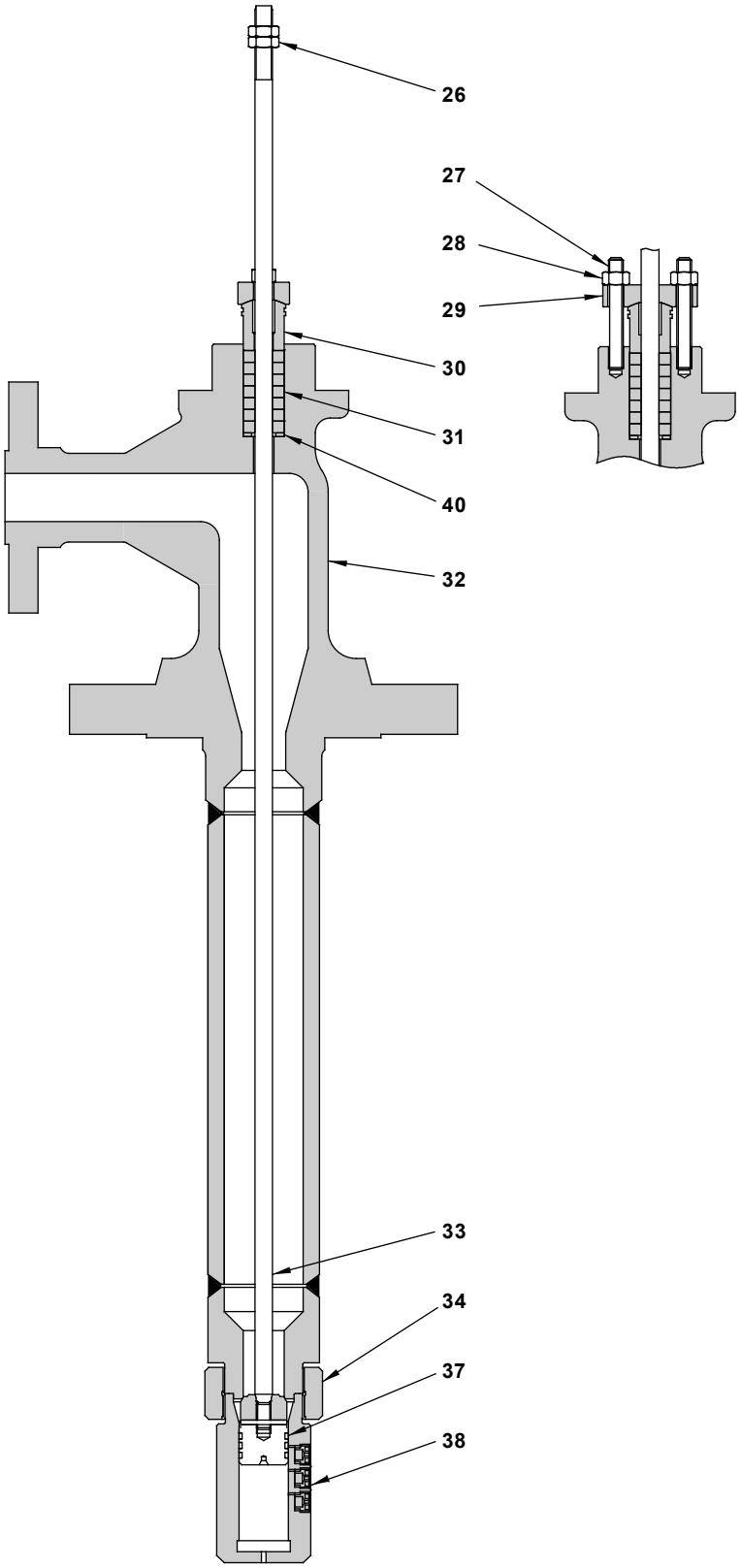
Positioners are available upon request.

Actuator parts list

Item	Description
1	Cylinder
2	Cover
3	Blanking bolt (Thread 5/16/18 UNC)
4	Bolt (cover)
5	Washer (cover)
6	Bolt (piston)
7	Washer (piston)
8	Piston
9*	Piston O-ring (Buna N)
10*	Cover O-ring (Buna N)
11	Spring
12	Stem
13	Bushing guide
14	Stroke indicator
15	Bolt (stroke indicator)
16	Screw (stroke nameplate)
17	Stroke nameplate
18	Nameplate
19	Yoke
23*	Split ring
24	Screw lock (cylinder)
25	Stroke limiter
39	Bolt (yoke)

* Recommended spare parts (see page 11)





Valve parts list

Item	Description
26	Nut (stem)
27	Bolt (packing)
28	Nut (packing)
29	Packing flange
30	Packing follower
31*	Packing set
32	Body assembly
33*	Plug/stem assembly
34	Sleeve
37*	Sealing ring
38	Cylinder/nozzle assembly
40	Retainer ring

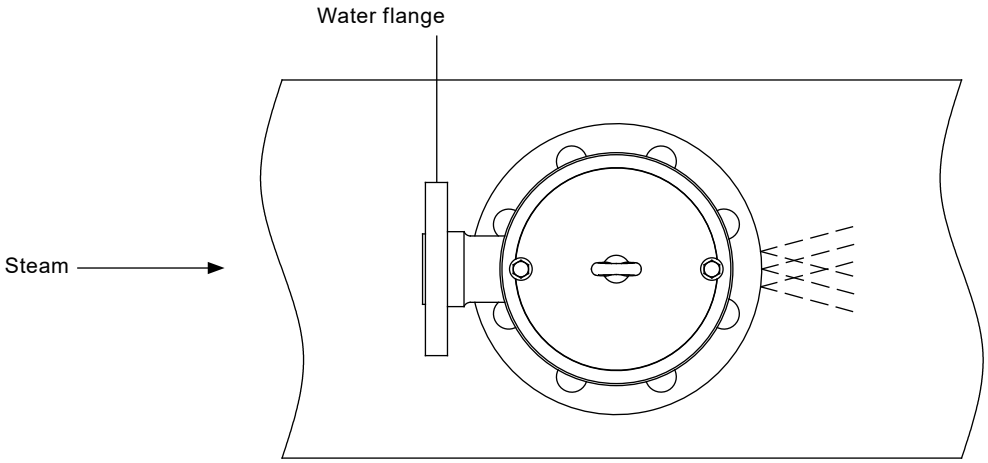
* Recommended spare parts (see page 11)

How to order

Product	**DA**				**DA**
Nominal Diameter	**3**				**3**
Nozzle and Stroke (mm)	**Code**	**Nozzle**		**Stroke (mm)**	**6A1**
	6A	[2]Cv = 0.19	[2]Kv = 0.16	40.90	
	6A1	[2]Cv = 0.30	[2]Kv = 0.26	40.90	
	9A1	[2]Cv = 0.45	[2]Kv = 0.39	40.90	
	6B	[2]Cv = 0.80	[2]Kv = 0.69	54.10	
	9B	[2]Cv = 1.20	[2]Kv = 1.04	54.10	
	6C	[3]Cv = 2.10	[3]Kv = 1.81	72.40	
	6D	[3]Cv = 3.18	[3]Kv = 2.75	80.30	
	3C6D	[3]Cv = 4.23	[3]Kv = 3.46	80.30	
	6E	[3]Cv = 5.40	[3]Kv = 4.67	84.80	
	3C6E	[3]Cv = 6.45	[3]Kv = 5.36	84.80	
	9E	[3]Cv = 8.10	[3]Kv = 7.00	84.80	
Class (Steam and Water) and Standard	**Code**	**Class (Steam and Water)**		**Standard**	**150**
	150	ASME 150		ASME B16.5	
	300	ASME 300		ASME B16.5	
	600	ASME 600		ASME B16.5	
	900	ASME 900		ASME B16.6	
	PN40	PN40		EN1092-1	
	PN63	PN63		EN1092-1	
	PN100	PN100		EN1092-1	
Steam Connection	**Code**	**Steam End Flange**		**Standard**	**FR**
	FR	Raised Face		ASME B16.5/EN1092-1	
	[1]RTJ	Ring Joint Face		ASME B16.5	
Water Connection	**Code**	**Water End Flange**		**Standard**	**FR**
	FR	Raised Face		ASME B16.5/EN1092-1	
	[1]RTJ	Ring Joint Face		ASME B16.5	
Body Material	**Code**	**Body Material**			**WC9**
	WCB	ASME SA-216 Gr. WCB /EN 10213 GP240GH (1.0619)[4]			
	WC9	ASME SA-217 Gr. WC9/EN 10213 G17CrMo9-10 (1.7379)[4]			
	CF8M	ASME SA-351 Gr. CF8M/EN 10213 GX5CrNiMo19-11-2 (1.4408)[4]			
Flange	**SOL**	Integral			**SOL**
Trim Material and Temperature (◦C)	**Code**	**Trim Material**			**Temperature**	**1**
		Stem	**Plug and seat**	**Seal Ring**	**Min.**	**Max.**
	1	SS316	SS410 and Stellite	Inconel	0 °C (32 °F)	538 °C (1000.4 °F)
Actuator	**Code**	**Actuator**				**0**
	0	Pneumatic actuator with spring return				
	3	Pneumatic actuator with spring return and handwheel (available on request)				
Spring Range and Differential Pressure	**Code**	**Spring Range**		**Maximum Differential Pressure**		**C**
	C	2.07 bar to 3.45 bar (30 psi to 50 psi)		75 bar (1087.78 psi)		

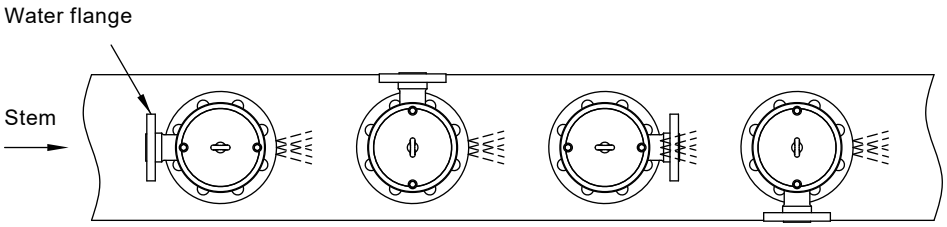
Notes:
[1] RTJ end flanges available on request, only for ASME 600 and ASME 900.
[2] Steam pipe: 6" (minimum)/24" (maximum)
[3] Steam Pipe: 8" (minimum)/24" (maximum)
[4] EN Material available for PN63 and PN100 only

Water connection



Standard assembly position

Spray water flange can be mounted in any orientation. This MUST be specified at point of order and confirmed with the factory prior to delivery.



Standard

Positions 2, 3 and 4 by customer request

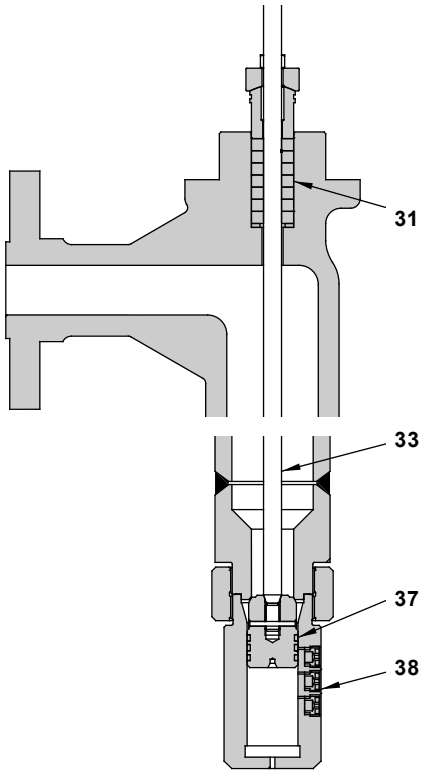
Ordering example:	DA	3	6A1	150	FR	FR	WC9	SOL	1	0	C

Desuperheater DA 3 inch nominal diameter with a Cv = 0.30, Steam and water ASME 150, flanged connections, body material ASME SA-217 Gr. WC9, integral flange, standard trim material, pneumatic spring return actuator with standard spring range.

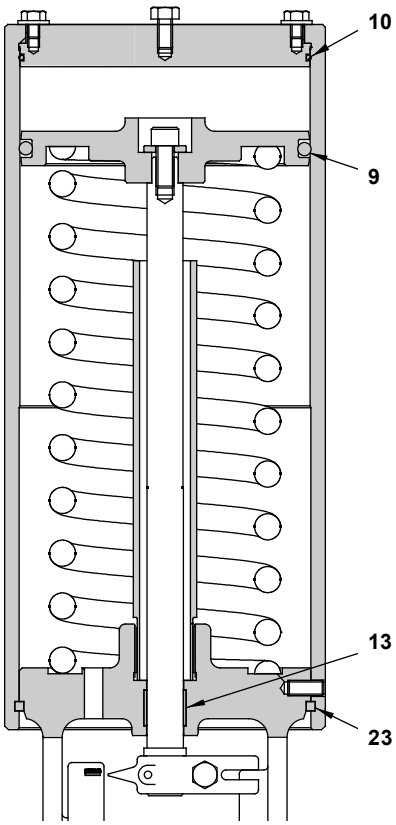
For safety, installation and maintenance information please refer to the Installation and Maintenance Instructions that are supplied with the product.

Spare parts

Item	Description
9	'O' ring (piston)
10	'O' ring (cover)
13	Bushing guide
23	Split ring
31	Packing set
33	Plug/stem assembly
37	Sealing ring (set of 3)
38	Cylinder/nozzle assembly



Valve



Actuator

TI-P605-18-US
Issue 2

DAB Series
Steam Desuperheater

Description

Spirax Sarco by Hiter DAB Series is a Steam Desuperheater with multiple nozzles designed to work with large spray water flows.

The DAB desuperheater, with the atomizing nozzles connected, is part of the steam line.



Technical specifications

Pipe diameters	24" up to 60". Other sizes available upon request, contact Spirax Sarco HITER.
Classes	ASME 150, 300, 600, 900, 1500 or 2500.
Nozzle body material	ASTM A216 Gr. WCB carbon steel, ASTM A351 Gr. CF8M stainless steel or ASTM A217 Gr. WC9 Cr-Mo Alloy Steel. Other materials are available on request.
Nozzle trim materials	420 stainless steel plug and Inconel spring.
Water pipe material	Carbon steel, Cr-Mo Alloy Steel or Stainless Steel
Steam pipe material	Carbon steel, Cr-Mo Alloy Steel or Stainless Steel.

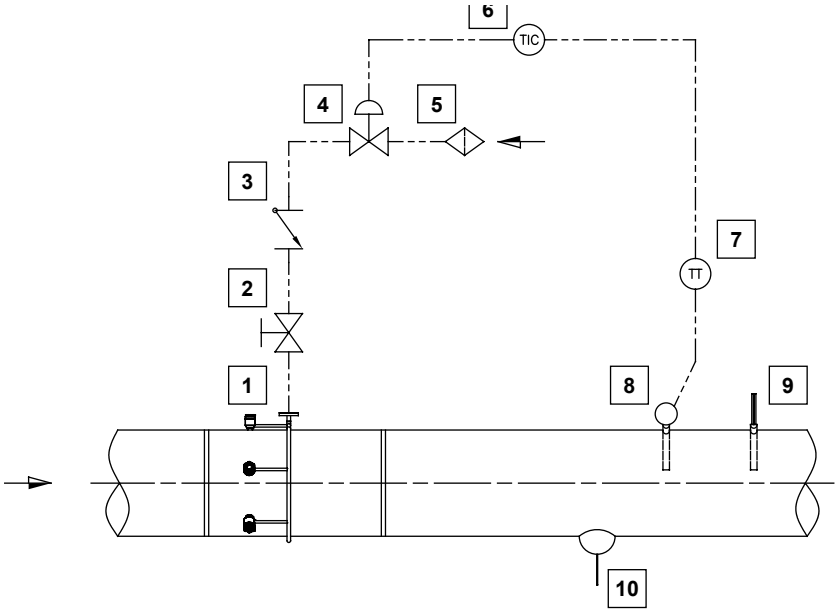
Flow coefficient - Cv

Nozzle	1A	2A	3A	4A	3B	3C	4C	5C	6C
Cv	0.5	1.0	2.0	3.0	4.0	6.0	8.0	10.0	12.0

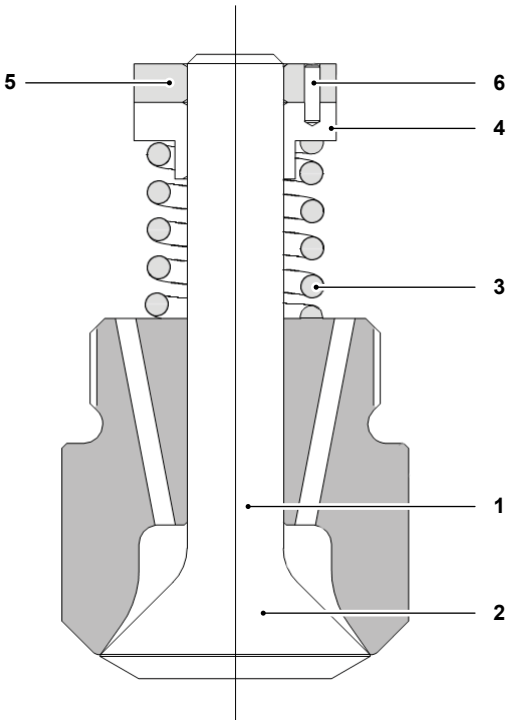
Nozzle	5D	6D	7D	4E	4B	5E	6E	7E
Cv	15.0	18.0	21.0	24.0	4.0	30.0	36.0	42.0

Typical installation

1	DAB desuperheater
2	Manual block valve
3	Check valve
4	Temperature control valve
5	Strainer
6	Temperatura indicator and controller
7	Temperature transmitter
8	Temperature sensor
9	Thermometer
10	Drain

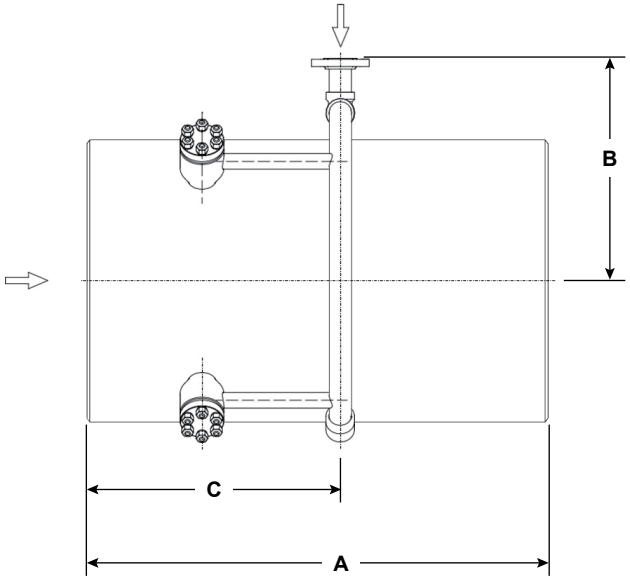


Components



No.	Part
1	Body
2	Plug
3	Spring
4	Nut
5	Jam nut
6	Locking pin

Dimensions (approximate) in inches (mm)



Nominal pipe diameter	A	B	C	Water connection maximum diameter
24	39.4 (1000)	19.0 (483)	17.4 (442)	4 (102)
26		19.9 (505)		
28	43.4 (1102)	20.9 (531)		
30		21.9 (556)		
32		22.9 (582)		
34	47.3 (1201)	23.9 (607)		
36		24.9 (632)		6 (152)
38		25.9 (658)		
40		27.0 (686)		
42		28.2 (716)		
44		29.3 (743)		
46	51.2 (1300)	29.3 (743)		
48		32.8 (833)		
50		31.9 (810)		
52		32.9 (836)		
56	55.2 (1402)	35.5 (902)	35.5 (902)	
60		37.5 (953)		

The dimensions are typical.

They depends on the quantity of nozzles are required.

In accordance to our policy of continuous development and improvement, this specification is subjected to modification at any time without prior notice.

Selection guide

Pipe size	24", 26", 28", 30", 32", 34", 36", 38", 40", 42", 44", 46", 48", 50", 52", 54", 58", 60"	
Pressure class	150, 300, 600, 900 or 1500	
Body materials	WCB, CF8M or WC9	
Nozzle body material	WCB or CF8M	
Trim nozzle material	420 Stainless Steel	
Cooling fluid piping material	Carbon Steel, Alloy Steel or Stainless Steel	
Steam pipe material	Carbon Steel, Alloy Steel or Stainless Steel	

Order example

DAB	30	300	WCB 420	Carbon Steel	Carbon Steel

How to order

Example: 1 Hiter DAB Desuperheater in 30" class 300 WCB tubing, 420 stainless steel housing, carbon steel refrigerant piping material and carbon steel steam piping material.

TI-P605-20-US
Issue 1

DAC Series
Steam Desuperheater

Description

Spirax Sarco by Hiter DAC Series is a compact desuperheater designed to work with low spray water flows in small diameter steam pipelines. The venturi type flow orifice provides an excellent steam desuperheating efficiency.



Technical data

Diameters	1" to 12". For installation between ASME class 150, 300, 600, 900 or 1500 RF or RTJ flanges - SCH 40, 80 or 120.
Body material	ASTM A 216 Gr. WCB carbon steel or ASTM A 217 Gr. WC9 alloy steel.
	Other materials available on request.
Venturi material	410 stainless steel hardened or Cr-Mo alloy steel nitrided. Other materials available on request.
Water flange sizes	½", ¾", 1" and 1½". [1]
	ASME classes 150, 300, 600, 900 or 1500.
Water flange material	ASTM A 105 carbon steel or ASTM A 182 Gr. F22 alloy steel
Flow coefficient - Cv	0.03 to 5.6. [2]
Differential pressure between water and steam	350 to 2500 kPa (50 to 360 psi). [3]

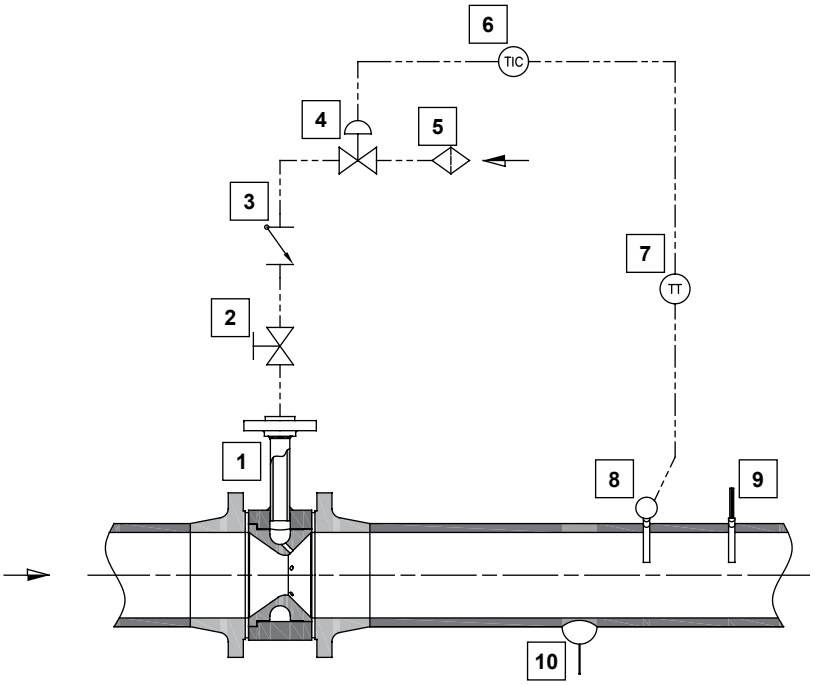
(1) For larger diameters, consult Spirax Sarco by Hiter.

(2) Water or condensate.

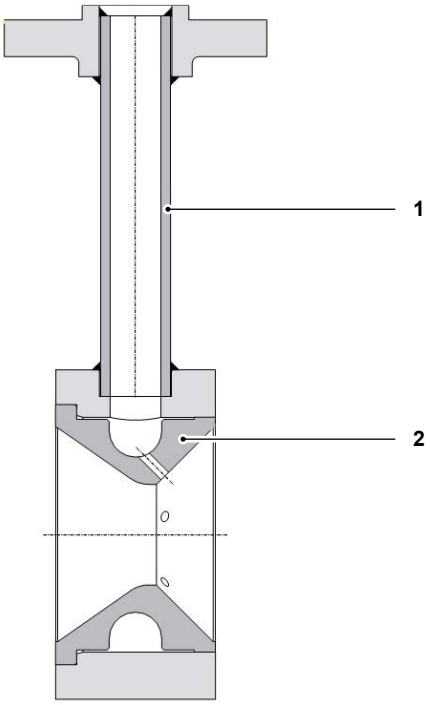
(3) For smaller pressure differential, consult Spirax Sarco by Hiter.

Typical installation

1	DAC Desuperheater
2	Manual block valve
3	Check valve
4	Temperature control valve
5	Strainer
6	Temperature indicator and controller
7	Temperature transmitter
8	Temperature sensor
9	Thermometer
10	Drain

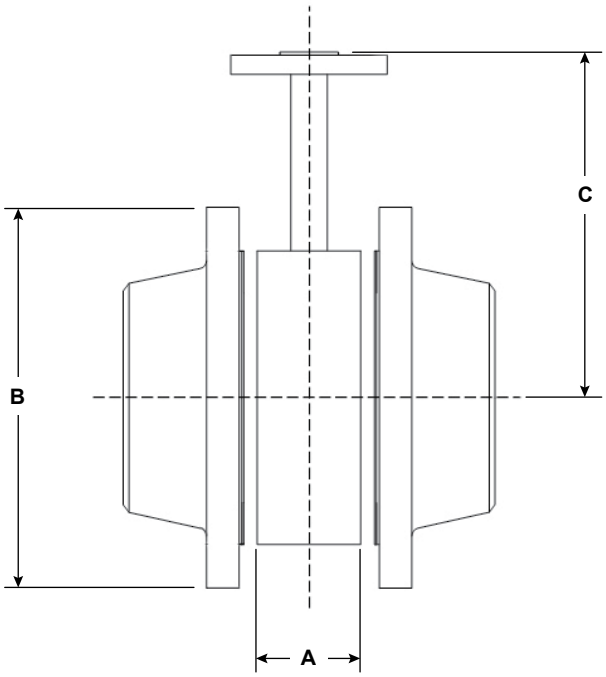


Components



No.	Part
1	Body
2	Venturi

Dimensions (approximate) in inches (mm)



Nominal pipe size	A	B	Water connection class		
			150 to 600	900	1500
			C		
1"	3 (76)	2 (51)	10 (254)	10 (254)	10 (254)
1½"		2.9 (74)			
2"		3.7 (94)			
3"		5 (127)			
4"		6.2 (157)			
6"		8.5 (216)		16 (406)	16 (406)
8"	4.1 (104)	10.7 (272)	16 (406)		
10"		12.8 (325)			
12"	6 (152)	15 (381)			20 (508)

How to order

Example: 3" Hiter DAC Series, WCB carbon steel and 410 stainless steel.

TI-P419-01-US
Issue 2

SCVH Series
Steam Conditioning Valve

Description

Spirax Sarco by Hiter SCVH Series is a Steam Conditioning Valve and is designed to simultaneously provide a pressure and temperature reduction of steam by using a single control valve. The SCVH valve concept gives a substantial reduction in the installation investment costs when compared against traditional Pressure Reducing plus Desuperheater solutions. The SCVH solution is popular in power plants, chemical plants and manufacturing industries to regulate steam pressures and steam temperatures. Each valve is designed to match specific customer requirements as inlet and outlet pressure, inlet and outlet temperature, connection diameters, capacity and safety function, etc, often require a customized design. These custom made features provide high efficiency as the processes can be precisely controlled, while extending the life of the valve as it can work without sacrifices that might wear out its components early.

Technical specifications

Construction	According to ASME B16.34 and ASME Sec. VIII Div. 1
Sizes	Inlet from 3" to 16" and oulet from 4" to 60"
Class	Inlet from CL 300 to CL 2500 and outlet from CL 150 to CL 900 by ANSI B16.34
End Connections	Flanged - ASME B16.5 Welded - BW B16.25
Flow Characteristic	Modified Parabolic
Trim Options	Low Noise w/ up to 8 stages
Flow coefficient - Cv	from 40 to 2,150
Leakage Class	IV or V according to FCI 70-2
Rangeability	50:1 (even when a multi-stage setting is used to reduce pressure)
Minimum speed with auxiliary spray mist:	1.5 m/s (5 ft/s)
Positive bonnet seal (pressure seal)	Yes
Minimum differential pressure between cooling fluid and desuperheated steam	7 bar (100 psi)
Blowing device	Can be supplied if necessary
Materials	See materials table



Applications

The SCVH series valve is mainly used in power generation centers, but also in pulp and paper industries, in refineries, petrochemicals, or any other process industry such as mining, food and beverage, sugar and ethanol, that uses steam to generate energy and/ or to run their process.

Benefits

The Steam Conditioning Valve SCVH series gives:

- Excellent rangeability in steam conditioning
- Direct control of cooling fluid, water or condensate
- Higher product lifetime with lower maintenance cost
- Customization for each specific applications

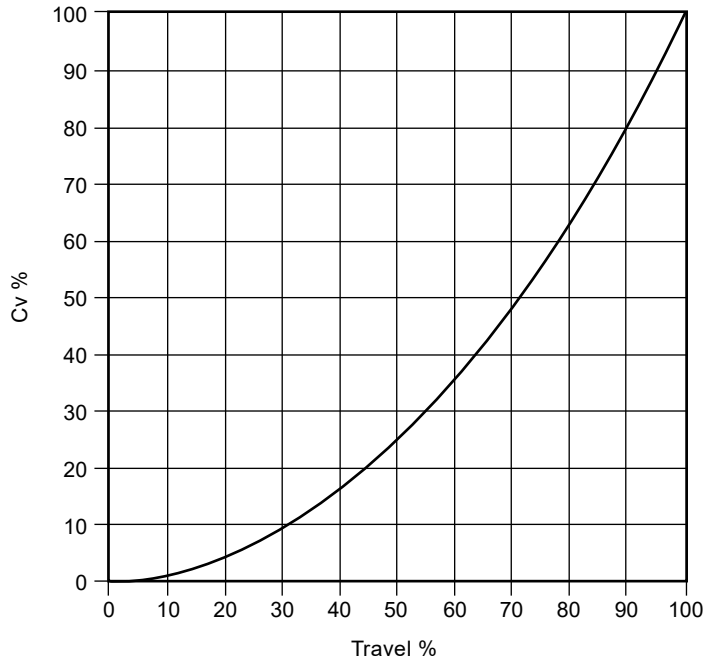
Features

Rangeability

The Parabolic Modified Flow Characteristic in the low noise trim design allows for excellent controllability when comparing against the traditional linear characteristic found in most of the low noise trims available.
The auxiliary steam assistance is taken after the first pressure reduction stage and passed through a nozzle where it is mixed with the cooling water, helping to pulverize the amount of water, even in the lowest steam flow.

Flow Characteristics - Cv

Modified parabolic



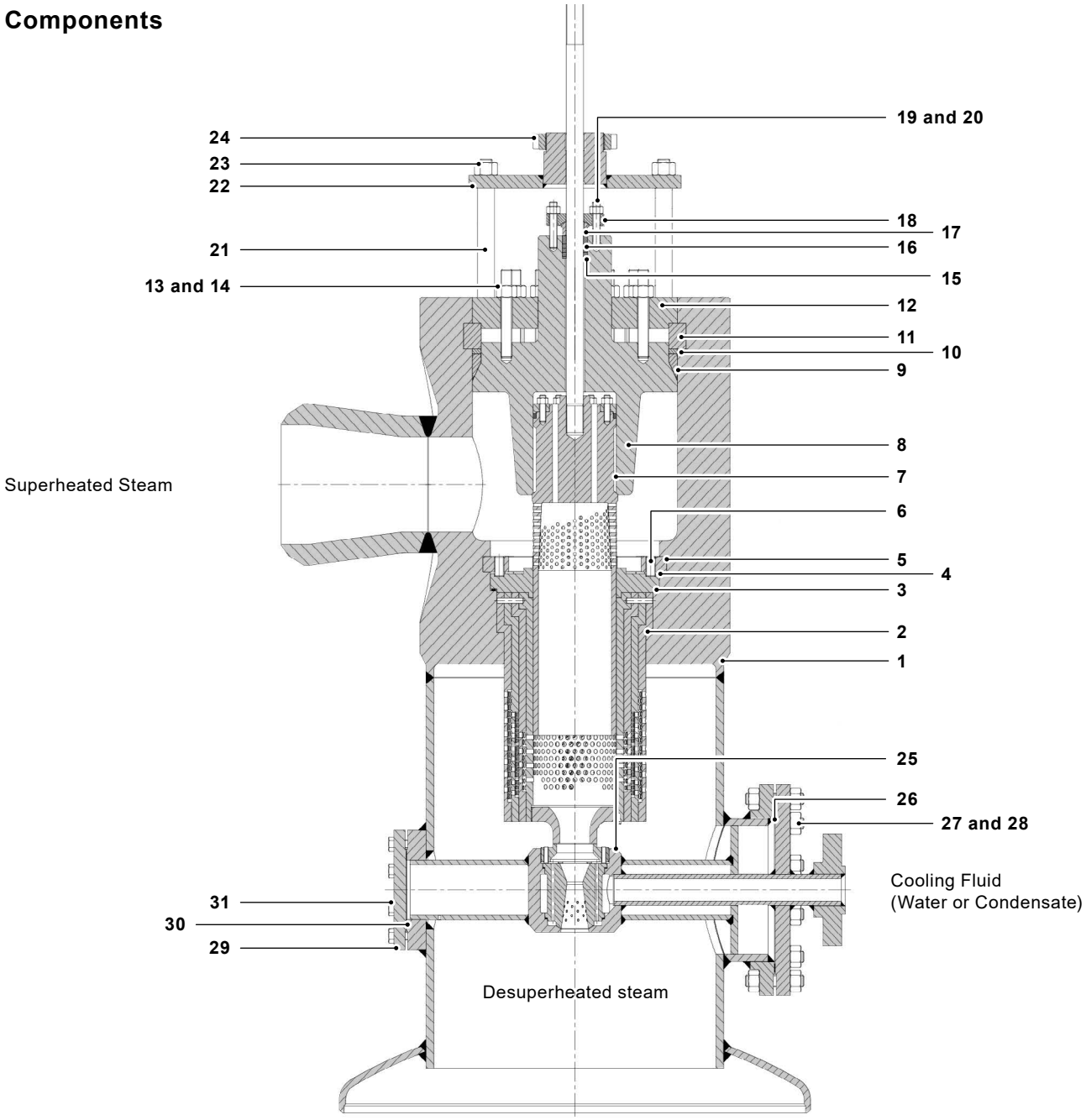
Noise reduction

The SCVH valve is designed to produce the lowest noise level as possible. The use of a special ported cage, results in a noise level perfectly acceptable in most applications. When required, an even higher noise reduction can be supplied as a special low noise trim configuration with pressure reduction through multiple stages in order to meet specification requirements.

Materials - ASME B16.34

Body	Cage	Plug	Seat	Pressure psi (bar)	Temperature °F (°C)
A216 Gr. WCB A182 Gr. 105	Stainless Steel 410 Hardened	Stainless Steel 410 Hardened		1208 (83.3)	788 (420)
A217 Gr. WC9 A182 Gr. F22	A182 Gr. F22 Nitrided	A182 Gr. F22 Nitrided / Stellite		2176 (150.0)	986 (530)
A217 Gr. C12A A182 Gr. F91	A182 Gr. F91 Nitrided	A182 Gr. F91 Nitrided / Stellite		2702 (186.3)	1050 (566)

Components



No.	Part
1	Body assembly
2	Cage assembly
3*	Gasket
4	Seat
5	Segmented Ring
6	Hexagon socket screw
7	Plug assembly
8	Bonnet

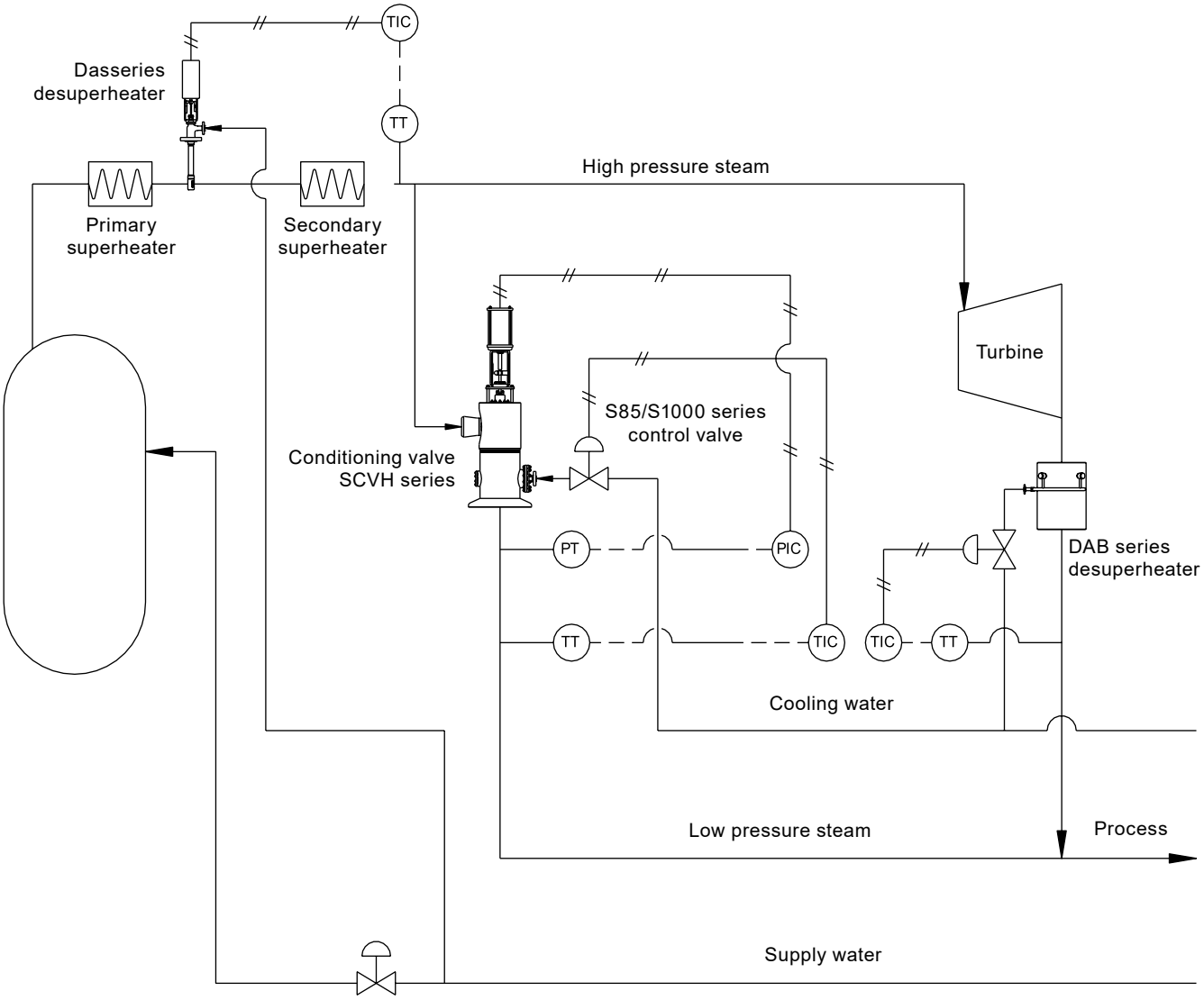
No.	Part
9*	Gasket
10	Spacer ring
11	Segmented ring
12	Cover
13	Stud
14	Nut
15	Packing retainer
16*	Packing

No.	Part
17	Packing follower
18	Packing flange
19	Packing studs
20	Packing nuts
21	Spacer
22	Adapter (Actuator)
23	Nut
24	Lock nut

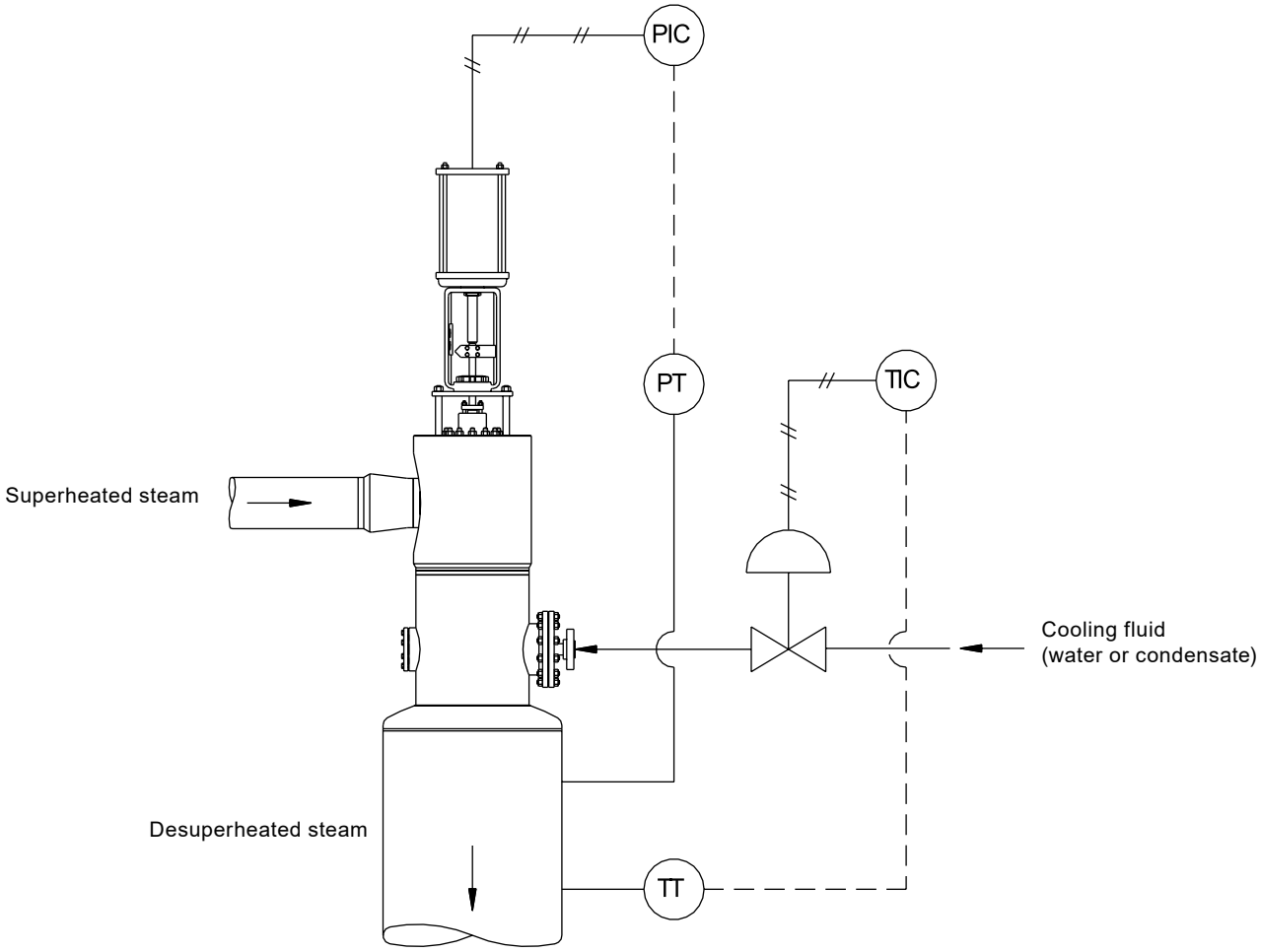
No.	Part
25	Desuperheater assembly
26*	Gasket
27	Stud
28	Nut
29	Flange
30*	Gasket
31	Hexagon bolt screw

*Spare parts.

Steam Conditioning Valve SCVH System



Steam Conditioning Valve SCVH System (continued)



FLOWMETERS
FOR STEAM, LIQUIDS AND GASES







Our range of Flowmeters are suitable for accurate measurement of steam, liquids and gases in pipe sizes ½" to 80" at flowing pressures to 5,000 psi g and flowing temperatures to 842 °F.

Section contents ⟩

SECTION 13 CONTENTS

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(CONTINUED)

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M610 Series II DP Transmitter Assembly	TI-P335-10-EN
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FP-93B Flow Processor	TI-F25-02-US
EL2270 and EL2271 Temperature Probes	TI-P322-06-EN
EL2600 Pressure Transmitter and ‘U’ Syphons	TI-P322-02-EN
Model F50C Isolating Valve	TI-P170-01-EN

TI-P505-01-US
Issue 3

UTM20 Series
Ultrasonic Transit-time Flowmeters

Description

The Spirax Sarco UTM20 ultrasonic transit time flowmeter measures volumetric flow and heating/cooling energy rates in clean liquids as well as those with small amounts of suspended solids or aeration, such as surface water or raw sewage.
UTM20 flow and energy meters clamp onto the outside of pipes and do not make contact with the liquid inside the pipe.



Benefits

By clamping onto the outside of pipes, the meters have inherent advantages over other flow meter technologies, including:

- Reduced installation time and cost
- Non-invasive, non-contact measurement
- Continued operation during installation - no need to shut down the process
- No pressure head loss
- No moving parts to maintain or replace

Features

- Large, bi-directional flow measuring range
- Data log up to 8 records
- Modbus® RTU or BACnet® MS/TP over EIA-485; Modbus TCP/IP; BACnet/IP
- Configure and troubleshoot over USB with SoloCUE software
- Reynolds number, ultrasonic speed and temperature compensation
- Large, easy-to-read graphical display
- Rugged, aluminum enclosure for a long service life in harsh environments

Applications

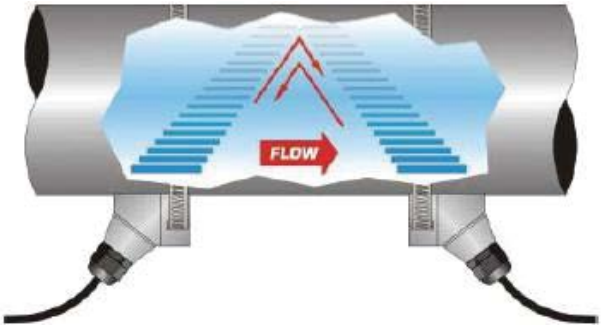
The UTM20 meter is available in a variety of configurations that permit the user to select a meter with features suitable to meet particular application requirements.

The UTM20 meter is available in two versions:

- A volumetric flow meter for water, sewage, cooling water, water-glycol mixtures, alcohols and chemicals.
- A heating/cooling energy flow meter used in conjunction with dual clamp-on RTDs for temperature measurement; ideal for hydronic process and HVAC applications.

Operation

Transit time flow meters measure the time difference between the travel time of an ultrasound wave going with the fluid flow and against the fluid flow. The time difference is used to calculate the velocity of the fluid traveling in a closed-pipe system. The transducers used in transit time measurements operate alternately as transmitters and receivers. Transit time measurements are bi-directional and are most effective for fluids that have low concentrations of suspended solids and are sonically conductive.



An ultrasonic meter equipped with heat flow capabilities measures the rate and quantity of heat delivered or removed from devices such as heat exchangers. By measuring the volumetric flow rate of the heat exchanger liquid, the temperature at the inlet pipe and the temperature at the outlet pipe, the energy usage can be calculated.

Technical specifications

System

Liquid Types	Most clean liquids or liquids containing small amounts of suspended solids or gas bubbles	
Flow Accuracy	Medium and Large Pipes (RZ, NZ, WZ, HZ, LZ, YZ, JZ, KZ)	± 0.5% ± 0.0049 ft/s (0.015 m/s)
	Small Pipes (CA-CT, UZ)	1" (25 mm) and larger = ±1% ± 0.03 ft/s (0.009 m/s) ¾" (19.05 mm) and smaller = ±1% of full scale
Repeatability	0 2% above 1 5 ft/s	
Velocity	Medium and Large Pipes	Up to 40 ft/s (12.2 m/s), depending on pipe and fluid
	Small Pipes	Up to 20 ft/s (6.1 m/s), depending on pipe and fluid
Straight Run Requirements	10 diameters upstream, 5 diameters downstream from single elbow	
Certification and Compliance	**General Safety (all models):** cCSAus, CE, Pollution Degree 2, CE compliance to Low Voltage Directive, 2014/35/EU **U.S./Canada Hazardous Location transmitter and transducers:** **Transmitter and transducers (certification option B): cCSAus Class I Division 2 Groups ABCD T4** **Volumetric Flow Meter Only (not available for Energy Meter)** Requires flexible conduit Not available with UZ, HZ or JZ and KZ (Easy Rail) transducers, Auxiliary Dry Contact card **Transmitter (certification option R):** cCSAus Class I Division 2 Groups ABCD T4; cCSAus Ex ec ic nC IIC T4 Gc; Ex tc IIIB T100° C Dc; Class I, Zone 2, AEx ec ic nC IIC T4 Gc; Zone 22, AEx tc IIIB T100° C Dc; Class II, Division 2, Groups FG; Class III Not available with Auxiliary Dry Contact card **Transducers LZ, NZ, RZ, WZ and YZ (certification option R):** cCSAus Ex ec IIC T6 Gc; Ex tc IIIB T60° C Dc; Class I, Zone 2, AEx ec IIC T6 Gc; Zone 22, AEx tc IIIB T60° C Dc; Class II, Division 2, Groups FG; Class III Requires flexible conduit Not available with CA-CT, UZ, HZ or JZ and KZ (Easy Rail) transducers	

Technical specifications (continued)

Transmitter

Power Options	24 Vdc/AC	9…28 Vdc @ 8 W max or 20…26 AC 47…63 Hz @ 0 5 A max , 2 Amp slow-blow fuse, not field replaceable
	Mains AC	85…264 Vac 47…63 Hz @ 24VA max 1 Amp slow-blow fuse, manually field replaceable
		Over-Voltage Rating Category II (CAT II)
Display	Options	Display with keypad or no display/keypad
	Keypad	4-button navigation, keypad with tactile feedback; polyester film
	Display	128 × 64 pixel LED backlit graphical display; adjustable brightness and timeout; polycarbonate window
	Flow rate/total	8-digit
Enclosure	NEMA Type 4X, IP67	
Construction	Aluminum construction; painted; wall, panel or pipe mounting; stainless steel fasteners and mounting hardware; EPDM gasket	
	Conduit Holes	(4) 1/2 in NPT, M20 × 1.5 or 1/2 BSPP; cable glands available for NPT and M20
Environmental Ratings	Pollution Degree	2
	Altitude Restriction	Up to 2000 m (6561 ft)
	Ambient Temperature Range	-4…140°F (-20…60°C)
	Storage Temperature Range	-40…176°F (-40…80°C)
	Humidity	0…85%, non-condensing
Configuration	Via optional keypad or SoloCUE configuration software; SoloCUE available on DVD or download	
Units (Field-Selectable)	Velocity	feet/second, meters/second
	Volumetric total	US Gallons, Million Gallons, Imperial Gallons, Million Imperial Gallons, Acre-Feet, Liters, Hectoliters, Cubic Meters, Cubic Feet, Oil Barrels (42 gallons), Fluid Barrels (31.5 gallons), Imperial Fluid Barrels (36 imperial gallons), Pounds (Kilograms) and custom units
	Flow rate	Acre Feet/Day, Liters/Second, Liters/Minute, Liters/Hour, Cubic Meters/Second, Cubic Meters/Minute, Cubic Meters/Hour, Cubic Feet/Minute, Cubic Feet/Minute, Cubic Feet/Hour, Gallons/Second, Gallons/Minute, Gallons/Hour, Million Gallons/Day, Imperial Gallons/Second, Imperial Gallons/Minute, Imperial Gallons/Hour, Million Imperial Gallons/Day, Oil Barrels/Day, Fluid Barrels/Day, Imperial Fluid Barrels/Day and custom units
	Energy total (energy meters)	British Thermal Unit (Btu), Thousand Btu, Millions Btu, Kilocalories, Mega calories, Kilowatt-hour, Megawatt hour, Kilojoules, Mega joules, Ton-hour (Refrigeration)
	Heat/cooling rate (energy meters)	Btu/hour, Thousand Btu/hour, Millions Btu/hour, Ton (Refrigeration), Watts, Kilowatts, Megawatts, Kilojoules/hour, Mega joules/hour, Kilocalories/hour, Mega calories/hour
	Temperature (energy meters)	Farenheit, Celcius, Kelvin

Technical specifications (continued)

Transmitter

		Flow Meter	Energy Meter
Inputs and Outputs	0/4…20 mA output	One 16-bit, isolated, max 800 Ohms, internal or external power	Two 16-bit, isolated, max 800 Ohms, internal or external power
	Digital input	One 5…30 Vdc, isolated, externally or internally sourced, reset totalizer or alarm output	
	Digital output	Two selectable pulse, alarm, flow direction, sink isolated open collector, 5…30 Vdc, max 50 mA externally or internally sourced, leakage current 1uA max	Three selectable pulse, frequency, alarm, flow direction, isolated open collector, 5…30 Vdc, externally or internally sourced, leakage current 1uA max
		Frequency output: 50% duty cycle, 63…10k Hz maximum frequency	
		Pulse (totalizer) output: 5 kHz max output, open collector, pulse width 5…500 ms programmable	
		Optional: Two dry contact output for alarm or flow direction 30 Vdc max , 5A max (Ethernet not available with this option)	
	RTD (energy only)	None	Two 2-wire, 3-wire or 4-wire Pt100/ Pt1000 RTD 12-bit inputs; Range of -40…200°C (-40...392 °F); Clamp-on resistor kits available
Ports	Programming	USB 2.0 mini B connector for connection to a device with SoloCUE configuration software	
	EIA-485	Modbus RTU command set or BACnet MS/TP; Baud rates 9600, 14400,19200, 38400, 57600, 76800, 115k; terminating resistor selectable	
	Ethernet	Optional 10/100 Base T RJ45, communication via Modbus TCP/IP or BACnet/IP	
Data Logging	Number of points	Up to 8 parameters per record Selectable 1 second to 1 day Transfer logs via memory card	
	Real Time Clock	Backed up with a super capacitor, minimum of 32 days of data retention without power; Requires no servicing	
	MicroSD card slot	8 GB card, included with transmitter	
Alarms	Records 150 previous alarms, warnings or errors		
Languages	English, French, German, Italian, Spanish		
Security	Four levels: Read-only, Operator, Service and Admin; 6-digit passcode number; selectable auto logout		

Technical specifications (continued)

Transducers

Model	Construction	Cable Length Max.	Pipe/Tubing Sizes [1]	Flow Rate Max. GPM (LPM)	Pipe/ Tubing Materials
CA-CT [5] fixed small pipe	CPVC, Ultem®, Nylon cord grip, PVC cable jacket; -40…194°F (-40...90 °C)	100 ft (30.5 m)	0.5…2 in (12.7...50.8 mm)	190 (719)	See [2]
UZ adjustable small pipe	CPVC, Ultem, and anodized aluminum track system; Nickel-plated brass connector with Teflon insulation; PVC cable jacket, -40…194°F (-40…90°C)				
NZ (IP67) standard pipe	PVC, Ultem®, Nylon cord grip, PVC cable jacket; -40…194°F (-40…90°C)	300 ft (91.4 m)	2.5…12 in (DN65…DN300)	4000 (15,142)	
RZ (IP54) standard pipe	PBT glass filled, Ultem®, Nylon cord grip; PVC cable jacket; -40…250°F (-40…121°C)				
JZ, KZ (IP54) standard pipe, integrated rail	PBT glass filled, Ultem, Nylon cord grip; PVC cable jacket; -40…250°F (-40… 121°C)		2.5…6 in (DN65…DN150) 2.5…12 in (DN65…DN300)		
WZ (IP68) standard pipe, submersible	CPVC, Ultem, Nylon cord grip; Polyethylene cable jacket; -40…194°F (-40…90°C)		2.5…12 in (DN65…DN300)		
HZ high temperature	PTFE, Vespel, Nickel-plated brass cord grip; FEP cable jacket; -40…350°F (-40…176°C)				
LZ (IP67) large pipe	CPVC, Ultem, Nylon cord grip PVC cable jacket; -40…194°F (-40…90°C)		8…48 in (DN200…DN1200) [3, 4]	33,000 (124,919)	
YZ (IP68) large pipe, submersible	CPVC, Ultem, Nylon cord grip; Polyethylene cable jacket; -40…194°F (-40…90°C)				

[1] Recommendations based on unlined, new pipes with water Recommended pipe or tubing sizes vary with pipe conditions and fluid

[2] PVC, CPVC, HDPE, PTFE, PDVF, stainless steel, ductile iron, aluminum, brass naval, carbon steel copper

[3] Large pipe transducers are recommended for 8…12" (203…305 mm) pipes if normal velocity is expected to be greater than 12 ft/s (3.6 m/s)

[4] Consult factory for larger pipe sizes

[5] Not for metric pipes

RTD Kits

Part Number	Description	Installation	RTD Type	Construction	Temperature Range
76290	RTD pair; 15 ft (4 5 m) cable	Pipe clamp, surface mount, IP54	Pt 1000, Class A ± (0.15 + 0 002*| t |) with t as temperature °C	Aluminum body, silicone cable jacket	-58…356°F (-50…180°C)
76291	RTD pair; 50 ft (15 m) cable				
76292	RTD pair; 100 ft (30 m) cable				

SoloCUE Flow Device Manager Software

The flow meter may be programmed through the keypad or with SoloCUE software. If the meter is ordered without a display/ keypad, the flow meter must be programmed with SoloCUE software. The software is used to configure, calibrate and communicate with UTM20 meters with English, French, German, Italian and Spanish menus. Additionally, it has numerous troubleshooting tools to make diagnosing and correcting installation problems easier.

SoloCUE	Used to configure, calibrate and troubleshoot flow meters and control valves; Software is compatible with Windows 7, 8, 10	
USB Cable	RC820648	USB 2.0 mini B connector to A connector, shielded

How to order the UTM20 Ultrasonic Transit-time Flowmeter

Category	Description	Suffix codes
Base Mode	Velocity Meter	UTM20-S
	Energy Meter	UTM20-E
Approvals	General Safety. cCSAus, CE	G
	Hazardous Location Class I, Division 2 (Certification available for Velocity Meter only) [5]	B
Transducer Type	½" ANSI Pipe -40 to 194 °F (-40 to 90 °C) [1]	CA
	¾" ANSI Pipe -40 to 194 °F (-40 to 90 °C) [1]	CB
	1" ANSI Pipe -40 to 194 °F (-40 to 90 °C) [1]	CC
	1¼" ANSI Pipe -40 to 194 °F (-40 to 90 °C) [1]	CD
	1½" ANSI Pipe -40 to 194 °F (-40 to 90 °C) [1]	CE
	2" ANSI Pipe -40 to 194 °F (-40 to 90 °C) [1]	CF
	½" Copper Tube -40 to 194 °F (-40 to 90 °C) [1]	CG
	¾" Copper Tube -40 to 194 °F (-40 to 90 °C) [1]	CH
	1" Copper Tube -40 to 194 °F (-40 to 90 °C) [1]	CT
	1¼" Copper Tube -40 to 194 °F (-40 to 90 °C) [1]	CJ
	1½" Copper Tube -40 to 194 °F (-40 to 90 °C) [1]	CK
	2" Copper Tube -40 to 194 °F (-40 to 90 °C) [1]	CL
	½" Stainless Steel Tube -40 to 194 °F (-40 to 90 °C) [1]	CM
	¾" Stainless Steel Tube -40 to 194 °F (-40 to 90 °C) [1]	CN
	1" Stainless Steel Tube -40 to 194 °F (-40 to 90 °C) [1]	CP
	1¼" Stainless Steel Tube -40 to 194 °F (-40 to 90 °C) [1]	CQ
	1½" Stainless Steel Tube -40 to 194 °F (-40 to 90 °C) [1]	CR
	2" Stainless Steel Tube -40 to 194 °F (-40 to 90 °C) [1]	CS
	Small pipe (½" to 2"), universal adjustable with track (conduit not available) -40 to 194 °F (-40 to 90 °C)	UZ
	2½" and larger -40 to 194 °F (-40 to 90 °C), NEMA 6 (IP67)	NZ
	2½" and larger -40 to 250 °F (-40 to 121 °C), NEMA 3 (IP54)	RZ
	2½" and larger, submersible -40 to 194 °F (-40 to 90 °C), NEMA 6P (IP68)	WZ
	2½ to 6" with Easy Rail (not available with conduit) -40 to 250 °F (-40 to 121 °C), NEMA 3 (IP54)	JZ
	2½ to 12" with Easy Rail (not available with conduit) -40 to 250 °F (-40 to 121 °C), NEMA 3 (IP54)	KZ
	2½" and larger, high temperature -40 to 350 °F (-40 to 177 °C)	HZ
	8" and larger -40 to 194 °F (-40 to 90 °C), NEMA 6 (IP67) [2]	LZ
	8" and larger, Submersible -40 to 194 °F (-40 to 90 °C), NEMA 6P (IP68) [2]	YZ

Notes:

[1] Not suitable for metric pipes.

[2] Large pipe transducers are recommended for 8" to 12" pipes if normal velocity is expected to be greater than 12 ft/s (3.7 m/s).

[5] Requires Conduit

How to order the UTT20 Ultrasonic Transit-time Transducers (continued)

Category	Description	Suffix codes
Electrical Power	110/220 VAC	R
	24 VDC/AC	B
Display	Display and Keypad	S
Cable Length	15 feet (9.1 m)	AC
	30 feet (9.1 m)	AF
	50 feet (15.2 m)	AK
	75 feet (22.9 m)	AR
	100 feet (30.5 m)	BW
	150 feet (45.7 m)	BK
	200 feet (61.0 m)	DW
	250 feet (76.2 m)	DK
	300 feet (91.4 m)	EW
	350 feet (106.7 m) [3]	EK
	400 feet (121.9 m) [3]	FW
	450 feet (137.2 m) [3]	FK
	500 feet (152.4 m) [3]	GW
	550 feet (167.6 m) [3]	GK
	600 feet (182.9 m) [3]	HW
Conduit Length [4]	None	WW
	5 feet (1.5 m)	AA
	15 feet (9.1 m)	AC
	30 feet (9.1 m)	AF
	50 feet (15.2 m)	AK
	75 feet (22.9 m)	AR
	100 feet (30.5 m)	BW
	150 feet (45.7 m)	BK
	200 feet (61.0 m)	DW
	250 feet (76.2 m)	DK
	300 feet (91.4 m)	EW
RTD Type	None	XX
	Surface, Commercial (Energy Meter Only)	C

Notes:

[3] Large pipe (LZ, YZ Transducers) only. Contact factory for pricing.

[4] For hazardous locations, conduit is required and must be the same length as the cable. For general area, conduit length can be less than or equal to cable length

How to order the UTT20 Ultrasonic Transit-time Transducers (continued)

Category	Description	Suffix codes
RTD Cable Length	15 feet (4.6 m)	AC
	50 feet (15.2 m)	AK
	100 feet (30.5 m)	BW
	none (user provided/Not Applicable)	WW
Cable Connection Hardware	½" NPT Threads, Poly cable glands	S
	½" NPT Threads, Nickel Plate Brass cable glands	T
	½" NPT Threads, no cable glands	N
	M20 Threads, no cable glands	A
	½" BSPP Threads, no cable glands	B
	M20 Threads, Poly cable glands	C
	M20 Threads, Nickel Plated Brass cable glands	D
Endpoint Wiring Method	None	XX
Digital Communications	Standard Output: Modbus RTU or BACnet MS/TP (field selectable)	S
	Standard Output plus 10/100 Base-T RJ45 Modbus TCP/IP	T
	Standard Output plus 10/100 Base-T RJ45 Ethernet/IP	U
	Standard Output plus 10/100 Base-T RJ45 BACnet/IP	V
	Standard Output plus Aux Output [6]	9
Unit of Measure	Volumetric Units: Gallons/gallons per minute (field selectable)	G
Totalizer/Rate	Energy Units: Thousand BTU/BTU per hour (field selectable)	C
Testing and Tagging	Factory Calibrated	F
	Factory Calibrated/Stainless Steel Tag	S

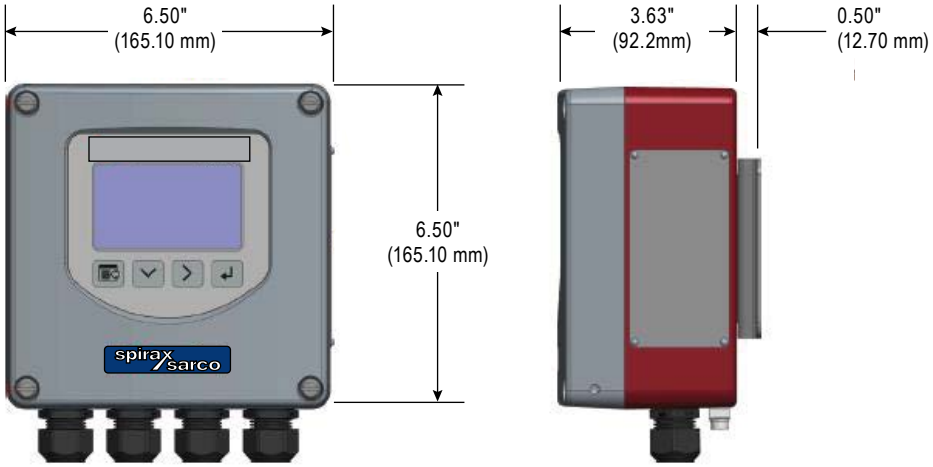
Example: **UTM20** - S - G - NZ - R - S - AK - WW - XX - WW - N - XX - S - G - F

Notes:

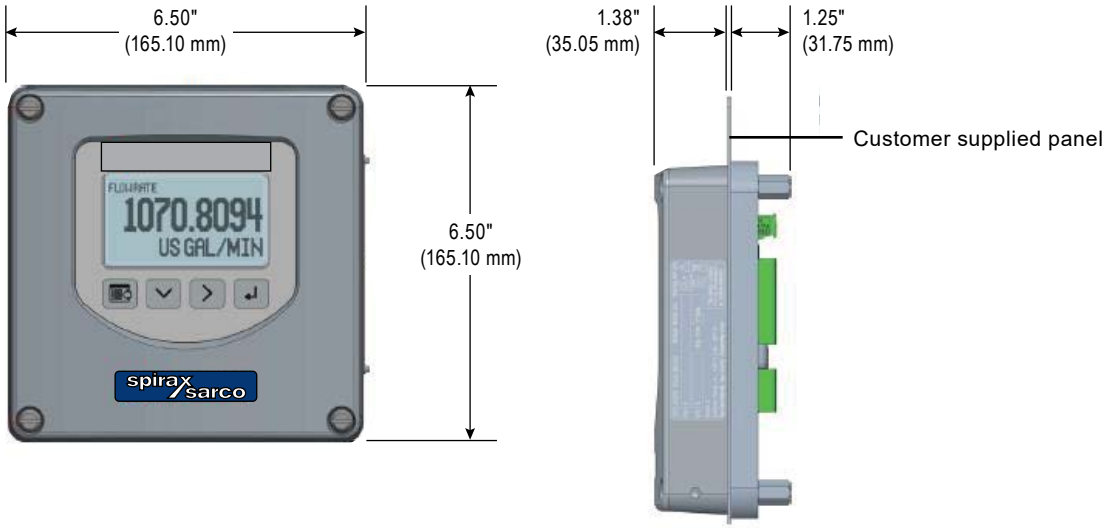
[6] Two dry contact pulse outputs 20 VDC max, 5A max, 16 Hz max (No Ethernet or HART)

Dimensions

Remote System Enclosure



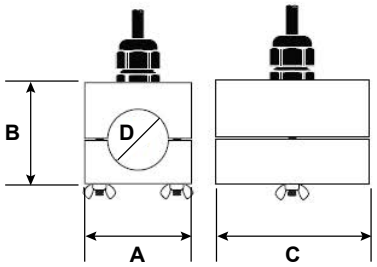
Panel Mount Enclosure



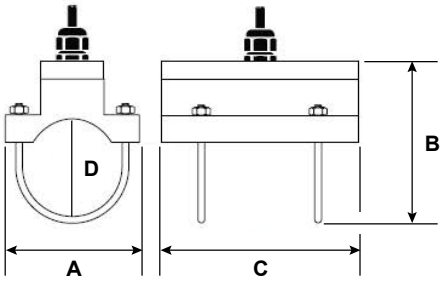
Consult factory for part number selection

Transdducers

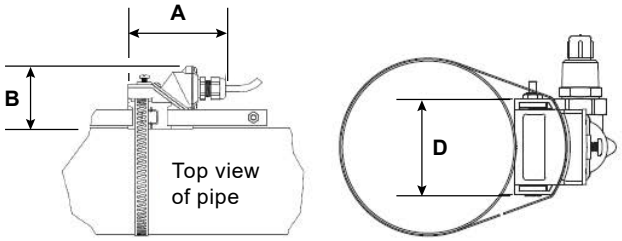
Fixed Small Pipe
Pipes and Tubing 1/2 . .. 2" (Not for metric pipes.)



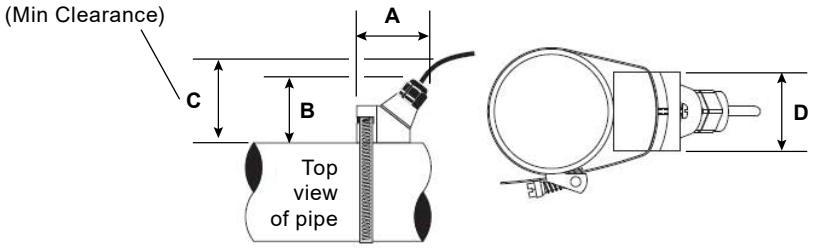
Fixed Small Pipe U-Bolt Connections CF, CL
ANSI/ON and Copper 2" Models /Not for metric pipes.)



RZ
Pipes Larger than 2" (51 mm)



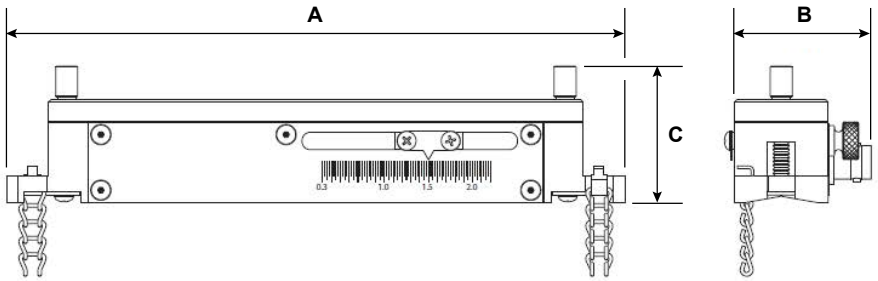
NZ, WZ, HZ, LZ, YZ
Pipes Larger than 2" (51 mm)



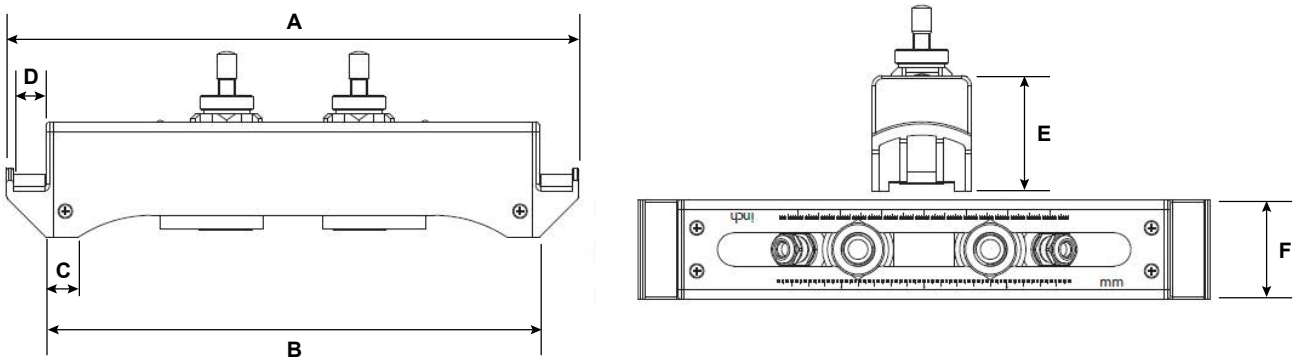
	RZ	NZ,WZ	HZ	LZ, YZ
A	3.75" (95.3 mm)	2.95" (74.9 mm)	2.95" (74.9 mm)	3.40" (86.4 mm)
B	2.35" (59.7 mm)	2.75" (69.9 mm)	2.75" (69.9 mm)	2.94" (74.7 mm)
C	-	3.00" (76.2 mm)	3.00" (76.2 mm)	3.20" (81.3 mm)
D	2.19" (55.6 mm)	1.70" (43.2 mm)	1 .71" (43.4 mm)	2.50" (63.5 mm)

Transducers (continued)

UZ
Adjustable Small Pipe



Easy Rail (JZ, KZ)



	UZ	JZ	KZ
A	7" (177.80 mm)	13.62" (345.95 mm)	19.92" (505.97 mm)
B	1.6" (40.64 mm)	11.73" (297.94 mm)	18.03" (457.96 mm)
C	1.5" (38.10 mm)	0.75" (19.05 mm)	0.75" (19.05 mm)
D	-	0.79" (20.07 mm)	0.79" (20.07 mm)
E	-	2.76" (70.10 mm)	2.76" (70.10 mm)
F	-	2.36" (59.94 mm)	2.36" (59.94 mm)

TI-P192-01
MI Issue 4

TVA
Flowmeter for Saturated and Superheated Steam Service

Description

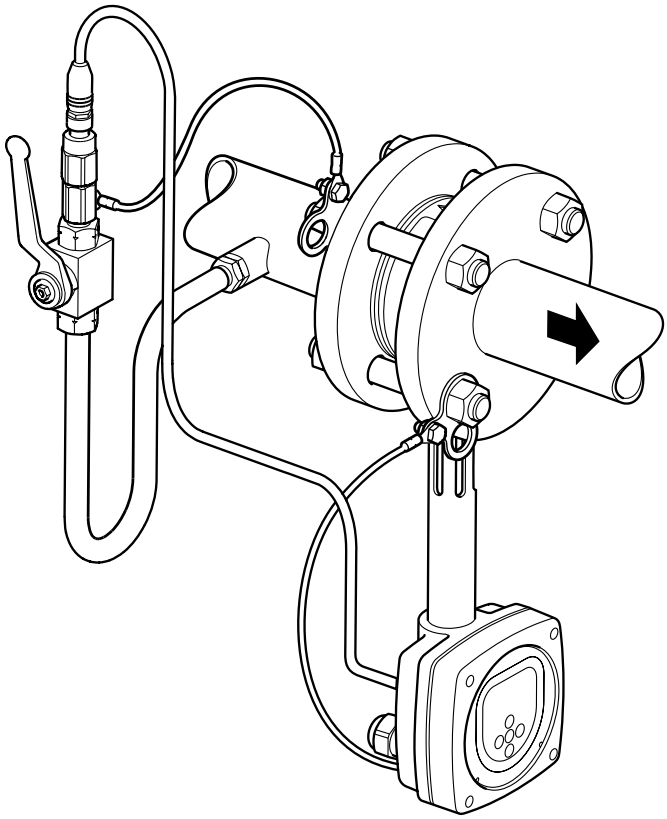
The Spirax Sarco TVA flowmeter is designed for use on saturated and superheated steam (with the dedicated pressure sensor kit) and operates on the target principle, by measuring the force produced on a moving cone by the fluid flow. This force is then converted into density compensated mass flowrate and is transmitted via a single loop powered 4 - 20 mA and pulsed output. TVA flowmeters also incorporate a totalised flow function and EAI 232C (RS 232) or EAI 485C (RS485) Modbus communications.

Sizes and pipe connections

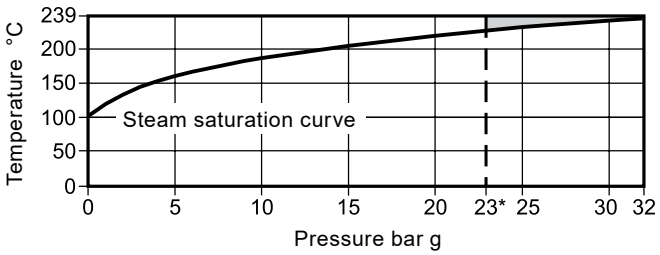
DN50, DN80 and DN100
The TVA flowmeter is of wafer design, suitable for fitting between the following flanges:

- EN 1092 PN16, PN25 and PN40
- BS 10 Table H
- ASME B 16.5 Class 150 and Class 300
- Japanese Industrial Standard JIS 20
- Korean Standard KS 20

Note: Spirax Sarco TVA flowmeters should be installed in pipework manufactured to BS 1600, ASME B 36.10 Schedule 40 or EN 10216-2 / EN 10216-5 equivalent. For systems with different standards / schedules , please contact Spirax Sarco.



Pressure/temperature limits



The product should not be used in this region due to software limitations.

Maximum design pressure			32 bar g @ 239 °C
Maximum design temperature			239 °C
Minimum design temperature			0 °C (non-freezing)
Maximum operating pressure	Horizontal flow	Superheated steam *	23 bar g @ 239 °C
		Saturated steam	32 bar g @ 239 °C
	Vertical flow	Saturated steam only	7 bar g @ 170 °C
Minimum operating pressure			0.6 bar g
Maximum operating temperature (saturation)			239 °C
Minimum operating temperature			0 °C (non-freezing)
Maximum electronics ambient temperature			55 °C
Maximum electronics humidity level			90% RH (non-condensing)
Designed for a maximum cold hydraulic test pressure of 52 bar g			

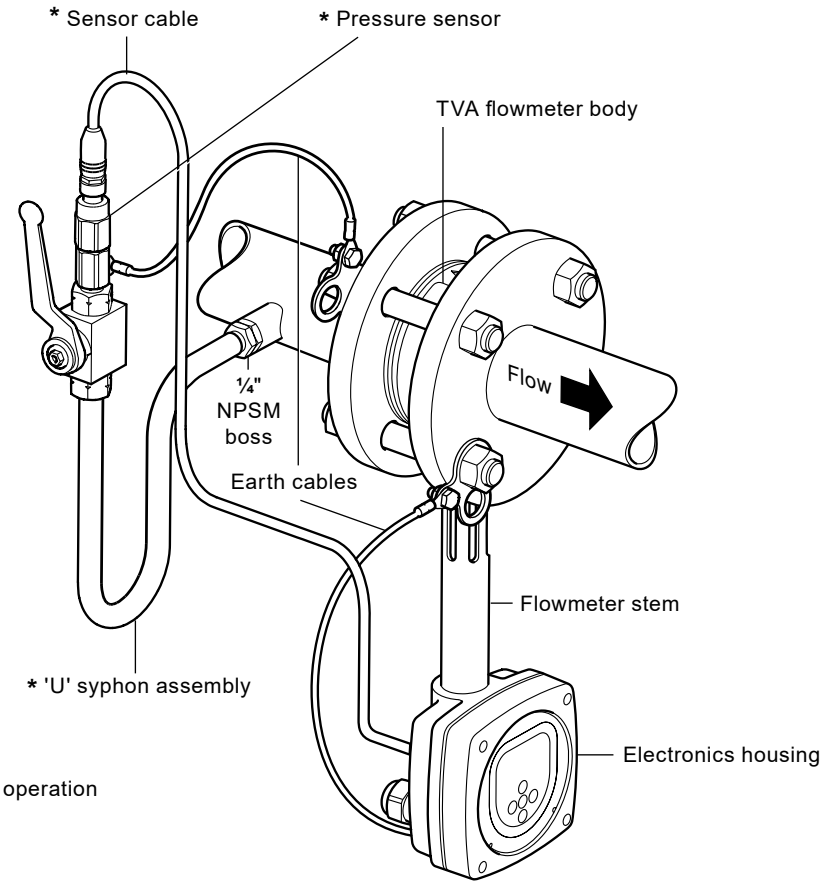
High pressure syphon tube assembly

Maximum design pressure	80 bar g
Maximum design temperature	450 °C
Maximum working conditions	60 bar g @ 450 °C

Pressure sensing kit

Maximum operating temperature	125 °C
Minimum operating temperature	0 °C (non-freezing)
Maximum operating pressure	50 bar g
Maximum ambient temperature (cable+connector)	70 °C

Materials



* Items required for superheat operation

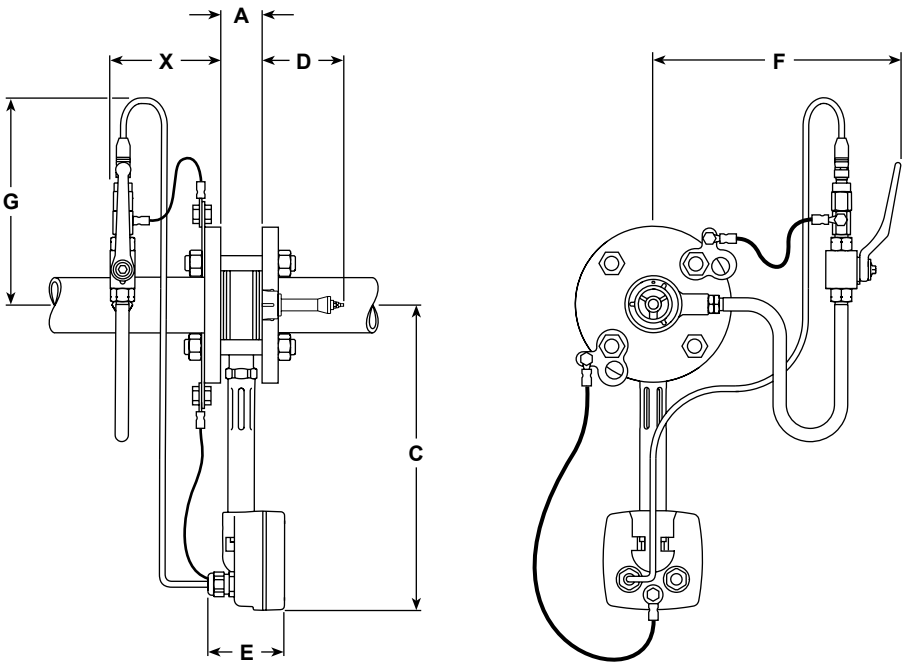
Unit	Part		Material
TVA	Flowmeter body		Stainless steel S.316 1.4408 CF8M
	Internals		431 S29 / S303 / S304 / S316
	Spring		Inconel X750 or equivalent
	Flowmeter stem		Stainless steel 300 series
	Electronics housing		Aluminium LM25
Pressure sensing kit	Cable		Polyvinyl chloride (PVC)
	Sensor housing		AISI 304 Stainless steel 1.4301
	Sensor		AISI 630 Stainless steel 1.4542
	'O' ring		Nitrile Butadiene Rubber (NBR)
	Adaptor		AISI 431 Stainless steel 1.4057
High pressure syphon tube assembly	Tube		Carbon steel BS 3602: Part.1 1987 CFS 360 (zinc plated / passivated)
	Valve	Body	Carbon steel
		Seat	PEEK/ Polymain

Technical data

IP rating	IP65 with correct cable glands
Power supply	Loop powered
	with optional RS485: 24VDC
Outputs	4-20mA (not available with RS485 option)
	Pulsed output (V_{max} 28 Vdc R_{min} 10 kΩ)
Communication port	Modbus EIA 232C (RS 232C)
	with optional RS485: EIA 485 (RS 485C)

Dimensions/weights (approximate) in mm and kg

Note:
Dimension '**X**' is a recommended minimum distance between the pressure tapping and the flowmeter. However it can be installed at any distance provided the cable allows (Standard cable length is 1 m).



Size	A	Flowmeter OD	C	D	E	F	G	X	Weight		
									TVA	Superheat kit	'U' syphon
DN50	35	103	322	125	65	250	160	300	2.67	0.3	0.5
DN80	45	138	334	115	65	270	160	300	4.38	0.3	0.5
DN100	60	162	344	155	65	280	160	300	7.28	0.3	0.5

Performance

The TVA flowmeter has inbuilt electronics which give a density compensated output. An LCD display is incorporated within the electronics head. The M750 display unit can be used to provide a remote display function if required, utilising the 4 - 20 mA output.

System uncertainty, to 95% confidence (2 STD):
(in accordance with ISO 17025)

±2% of measured value from 10% to 100% of maximum rated flow.

±0.2% FSD, from 2% to 10% of maximum rated flow.

Turndown : up to 50:1

As the TVA flowmeter is a self contained unit, the uncertainty quoted is for the complete system. Many flowmeters claim a pipeline unit uncertainty and for a true system uncertainty, the individual uncertainty values of any associated equipment, such as DP cells, need to be added to the pipeline value.

Pressure drop

The pressure drop across the TVA is nominally 750 mbar (300 ins water gauge) at maximum rated flow for the DN50, and 500 mbar (200 inches water gauge) for the DN80 and DN100.

TVA flowmeter flow capacities and pressure drops

Flowmeter type	QE litres/min		Maximum DP	
	Maximum	Minimum	Wg	m bar
DN50	300	3	300	750
DN80	770	8	200	498
DN100	1 200	12	200	498

Sizing the TVA flowmeter for saturated steam (kg/h) (Horizontal orientation)

Maximum flowrates in kg/h at different pressures (bar g).

Notes:
1 - Maximum steam flowrates are calculated at maximum differential pressure.
2 - The table below is a guide only.
3 - For superheated capacities please use the sizing software on our website www.spiraxsarco.com

Size	Steam pressure bar g		1	3	5	7	10	12	15	20	25	30	32	bar g
DN50	Q_E = 300	**Max. flow**	619	859	1 042	1 196	1 395	1 513	1 676	1 918	2 135	2 335	2 409	**kg/h**
		Min. flow	12	17	21	24	28	30	33	38	43	47	60	**kg/h**
DN80	Q_E = 770	**Max. flow**	1 588	2 204	2 674	3 070	3 581	3 885	4 301	4 922	5 480	5 994	6 183	**kg/h**
		Min. flow	32	44	53	61	72	78	86	98	110	120	128	**kg/h**
DN100	Q_E = 1 200	**Max. flow**	2 475	3 435	4 167	4 784	5 581	6 054	6 703	7 671	8 540	9 341	9 637	**kg/h**
		Min. flow	49	69	83	96	112	121	134	153	171	187	192	**kg/h**

Safety information, installation and maintenance

For full details see the Installation and Maintenance Instructions (IM-P192-02) supplied with the product.

The following main points are given for guidance only:

1. The TVA flowmeter should be mounted with a minimum of 6 straight pipe diameters upstream and 3 downstream. No valves, fittings or cross sectional changes are permitted within these pipe lengths. Where an increase in nominal pipe diameter is required, upstream of the flowmeter, the length of straight pipe should be increased to 12 diameters. Similarly, where a Spirax Sarco TVA is installed downstream of two 90° bends in two planes, a pressure reducing valve or a partly open valve, 12 upstream pipe diameters should be allowed.
2. It is important that the internal upstream and downstream diameters of pipe are smooth. Ideally seamless pipes should be used and there should be no intrusive weld beads on the internal diameter. It is also recommended that slip-on flanges are used to avoid this.
3. Care should be taken to install the TVA flowmeter concentrically in the line. If this is not done, flow measurement errors may occur.
4. The TVA flowmeter can be installed in any orientation up to a line pressure of 7 bar g whilst conditions are saturated. When conditions are superheated then the TVA flowmeter can only be installed in horizontal pipework, with the electronics below the pipeline.
5. As for all steam flowmetering installations, good basic steam engineering practices should be followed:
   - Correct line drainage through adequate trapping.
   - Good alignment and support of associated pipework.
   - Line size changes achieved by the use of eccentric reducers.
   - Do not lag (insulate) the TVA body or the mating flanges.
6. The TVA flowmeter must not be installed outside where it can be subjected to driving rain or where it is liable to freeze.

How to order

Saturated Service Example: 1 off Spirax Sarco DN100 TVA flowmeter for installation between EN 1092 PN40 flanges for use on saturated steam at 10 bar g - Maximum flow 5 581 kg/h.

Superheated Service Example: 1 off Spirax Sarco DN100 TVA flowmeter, Pressure sensing kit and 'U' syphon, for installation between EN 1092 PN40 flanges for use on superheated steam at 10 bar g.

Note: For details of the optional remote display see the relevant Spirax Sarco M750 literature.

Spare parts and accessories

- Spare electronics front panel (with standard RS 232C Communications)
- Spare electronics front panel (with RS485 Communications converter)

TI-P337-05
EMM Issue 18

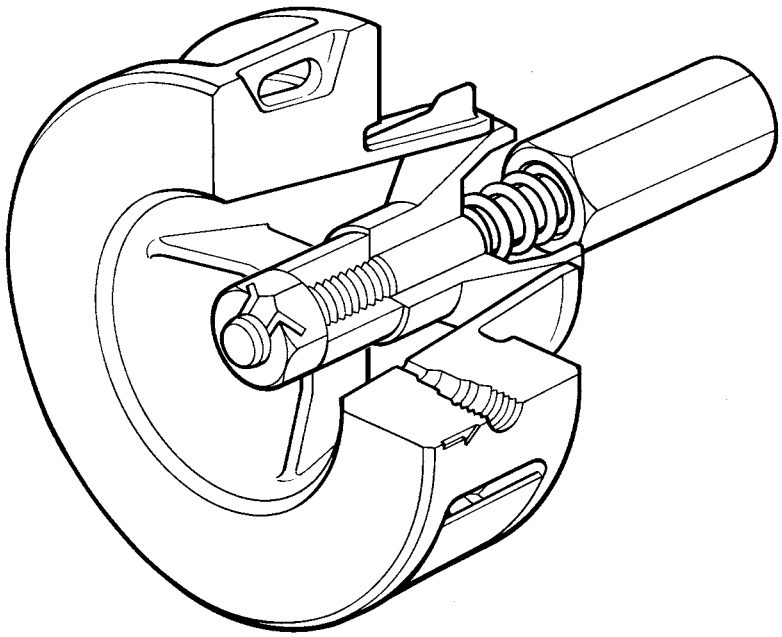
ILVA
Flowmeter

Description

The ILVA flowmeter operates on the spring loaded variable area principle and produces a differential pressure related to the rate of flow. It can be used with most industrial fluids, gases and both saturated and superheated steam. A general description of the ILVA flowmetering system and its associated equipment is given in a separate TI sheet.

Sizes and pipe connections

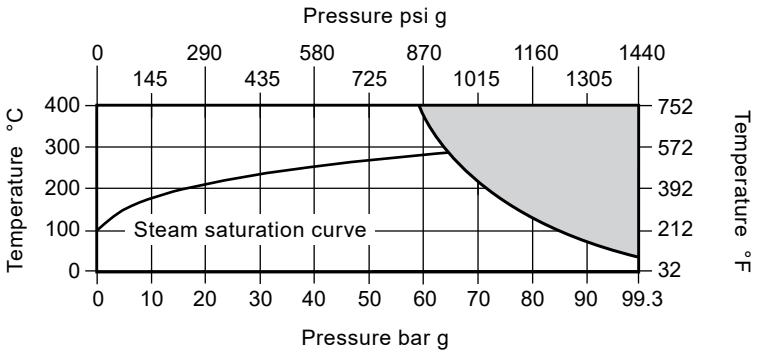
DN50, DN80, DN100, DN150, DN200 (2", 3" 4", 6", 8"). For DN250 and DN300 (10" and 12") sizes see separate literature.
Suitable for fitting between the following flanges:
EN 1092 PN16, PN25 and PN40.
BS 10 Table H.
ASME B 16.5 Class 150, 300 and 600.
JIS 20.
KS 20.
The ILVA flowmeter should be installed in pipework manufactured to BS 1600 or ASME B 36.10 Schedule 40.
For different pipe standards / schedules downstream spool pieces with equivalent internal diameter as in BS 1600 or ASME B 36.10 Schedule 40 should be used. If this is not possible, please contact Spirax Sarco.



Materials

Part	Material
Body	Cast stainless steel S.316 (CF8M / 1.4408)
Internals	431 S29 / S303 / S304 / S316
Spring	Inconel X750

Pressure/temperature limits



The product **must not** be used in this region.

Body design conditions			ASME 600
PMA	Maximum allowable pressure	99.3 bar g @ 38 °C	1440 psi g @ 100 °F
TMA	Maximum allowable temperature	400 °C @ 58.9 bar g	752 °F @ 854 psi g
Minimum allowable temperature		-29 °C	-20 °F
PMO	Maximum operating pressure is dependant on the flange specification		
Minimum operating pressure		0.6 bar g	9 psi g
TMO	Maximum operating temperature	400 °C @ 58.9 bar g	752 °F @ 854 psi g
Minimum operating temperature **Note:** For lower operating temperatures consult Spirax Sarco.		-29 °C	-20 °F
Maximum viscosity			30 centipoise
ΔPMX	Maximum differential pressure	498 m bar	200 in Wg
Designed for a maximum cold hydraulic test pressure of:		149 bar g	2161 psi g

Performance

The ILVA is designed to be used in conjunction with linearising electronics such as the range of flow computers or M750 display unit. Alternatively the output signal linearisation can be performed on an EMS / BEMS or equivalent.
Accuracy when used with Spirax Sarco flow computers or M750:
±1% of measured value from 5% to 100% of maximum rated flow.
±0.1% FSD from 1% to 5% of maximum rated flow.
Repeatability better than 0.25%
Turndown: up to 100:1
Caution: Scanner 2000 steam mass flow transmitters are uniquely configured at the factory to work with a single, specific ILVA flowmeter. For correct operation the configured Scanner 2000 transmitter must always be installed with its allocated flowmeter. Labels on the packaging give the serial numbers of the matched products.

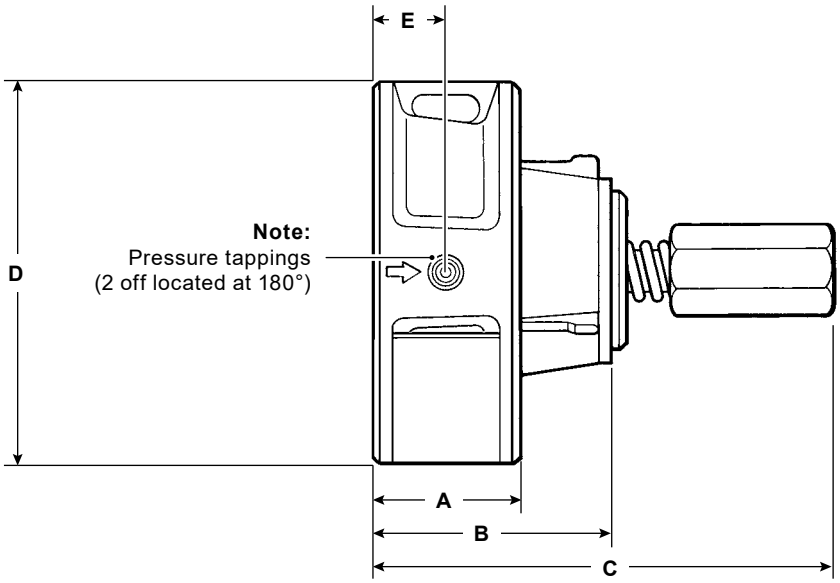
Pressure drop

The maximum pressure drop across the ILVA pipeline unit is 498 m bar (200 ins water gauge) at maximum rated flow.

Flow capacity

To determine the capacity of the ILVA for different fluids, it is necessary to calculate the equivalent water flowrate Q_E (in l/min) as described in Step 1, under the section 'sizing the ILVA' then selecting the appropriate size of flowmeter from the Table under Step 2 overleaf.

Dimensions/weights (approximate) in mm (inches) and kg (lbs)



Size	A	B	C	D	E	Weight
DN50 (2")	35 (1.4)	63 (2.5)	140 (5.5)	103 (4.1)	17.5 (0.7)	2.0 (4.4)
DN80 (3")	45 (1.8)	78 (3.1)	150 (5.9)	138 (5.4)	22.5 (0.9)	3.9 (8.6)
DN100 (4")	60 (2.4)	103 (4.1)	205 (8.1)	162 (6.4)	30.0 (1.2)	8.3 (18.3)
DN150 (6")	75 (3)	134 (5.3)	300 (11.8)	218 (8.6)	37.5 (1.5)	14.2 (31.3)
DN200 (8")	85 (3.3)	161 (6.4)	360 (14.2)	273 (10.7)	42.5 (1.7)	23.6 (52)

Note: Pressure tappings are threaded ¼" NPT

Sizing the ILVA for saturated steam - kg/h

Minimum and maximum flowrates in kg/h at different pressures (bar g)
Note: Maximum steam flowrates are calculated at maximum differential pressure.

Size		Steam pressure bar g										
		1	3	5	7	10	12	15	20	25	30	40
DN50	Maximum	307	427	517	594	693	752	832	952	1 060	1 160	1 341
	Minimum	3	4	5	6	7	8	8	10	11	12	13
DN80	Maximum	1 206	1 675	2 032	2 332	2 721	2 951	3 268	3 740	4 163	4 554	5 265
	Minimum	12	17	20	23	27	30	33	37	42	46	53
DN100	Maximum	2 475	3 435	4 167	4 784	5 581	6 054	6 703	7 671	8 540	9 341	10 800
	Minimum	25	34	42	48	56	61	67	77	85	93	108
DN150	Maximum	5 981	8 301	10 071	11 562	13 487	14 631	16 119	18 538	20 639	22 573	26 101
	Minimum	60	83	101	116	135	146	162	185	206	226	261
DN200	Maximum	11 756	16 317	19 796	22 726	26 509	28 757	31 840	36 437	40 566	44 368	51 301
	Minimum	118	163	198	227	265	288	318	364	406	444	513

How to order

Example: 1 off Spirax Sarco DN150 ILVA flowmeter for installation between flanges to EN 1092 PN40. Body material 316 stainless steel. Flow medium saturated steam at 10 bar g, maximum flow 8 000 kg/h.

Sizing the ILVA flowmeter

In order to determine the flow capacity of a ILVA pipeline unit, it is necessary to calculate the equivalent water flowrate (Q_E) based on the anticipated actual flow (see Step 1). The Table below is used to select the appropriate unit (steam only).

Step 1.

Determine equivalent water flowrate (Q_E) in l/min:-

	Mass flow units	Volumetric units
Liquids	$Q_E = \frac{q_m}{\sqrt{SG}}$	$Q_E = Q_L \sqrt{SG}$
Gases and steam actual flow conditions	$Q_E = q_M \sqrt{\frac{1000}{D_F}}$	$Q_E = Q_F \sqrt{\frac{D_F}{1000}}$
Gases standard conditions	$Q_E = \frac{q_M}{\sqrt{\frac{D_S}{1000} \times \frac{P_F}{P_S} \times \frac{T_S}{T_F}}}$	$Q_E = Q_S \sqrt{\frac{D_S}{1\,000} \times \frac{P_S}{P_F} \times \frac{T_F}{T_S}}$

Where:

Q_E = Equivalent water flowrate (litres/min)

q_m = Mass flowrate (kg/min)

Q_L = Maximum liquid flowrate (litres/min)

Q_S = Maximum gas flowrate at standard conditions (litres/min)

Q_F = Maximum gas flowrate at actual flow conditions (litres/min)

SG = Specific gravity

D_S = Density of gas at standard conditions (kg/m³)

D_F = Density of gas at actual flow conditions (kg/m³)

P_S = Standard pressure: 1.013 bar a, 1.033 kg/cm² a, 14.70 psi a

P_F = Actual flow pressure in same absolute units as P_S

T_S = Standard temperature (K) = °C + 273

T_F = Actual flow temperature (K) = °C + 273

Step 2.

Using the value of Q_E as determined in Step 1, select the correct size of the ILVA flowmeter using the Table below.

In practice, it will often be the line size that determines the choice of the flowmeter.

Flowmeter type	Q_E litres / min		Maximum DP	
	Maximum	Minimum	Wg	m bar
DN50	149	1	200	498
DN80	585	6	200	498
DN100	1 200	12	200	498
DN150	2 900	29	200	498
DN200	5 700	57	200	498

Example: Determine which ILVA pipeline unit is required to measure the flow of compressed air when:
1: Estimated maximum rate of flow = 500 s m³/h at 7 bar g and 20 °C

Note: Standard conditions = 1.013 bar a, 0 °C giving a standard density of 1.29 kg / m³

2: Calculate Q_E from: $$Q_E = Q_S \sqrt{\frac{D_S}{1\,000} \times \frac{P_S}{P_F} \times \frac{T_F}{T_S}}$$

$$Q_E = (500 \times 16.667) \times \sqrt{\frac{1.29}{1\,000} \times \frac{1.013}{8.013} \times \frac{293}{273}}$$

$$Q_E = 110 \text{ litres/min}$$

So a DN50 ILVA is recommended.
Note: 1 m³/h = 16.667 litres/min

How to order example

1 off Spirax Sarco DN50 ILVA flowmeter suitable for fitting between EN 1092 PN40 connections.

Sizing the Gilflo ILVA for saturated steam - lb/h

Minimum and maximum flowrates in lb/h at different pressures (psi g)
Note: Maximum steam flowrates are calculated at maximum differential pressure.

Size		Steam pressure psi g							
		15	**50**	**75**	**100**	**150**	**200**	**400**	**600**
2"	**Maximum**	682	988	1153	1299	1549	1764	2451	3009
	Minimum	7	10	12	13	15	18	25	30
3"	**Maximum**	2677	3877	4528	5103	6081	6926	9627	11815
	Minimum	27	39	45	51	60	69	96	118
4"	**Maximum**	5492	7953	9288	10466	12473	14206	19747	24236
	Minimum	55	79	93	105	125	142	197	242
6"	**Maximum**	13273	19220	22448	25295	30144	34333	47723	58571
	Minimum	132	192	224	252	301	343	477	585
8"	**Maximum**	26088	37778	44121	49718	59249	67483	93801	115123
	Minimum	261	377	441	497	592	674	938	1151

How to order

Example: 1 off Spirax Sarco 2" Gilflo ILVA flowmeter suitable for fitting between ASME B 16.5 Class 150 flanges.

Sizing the ILVA flowmeter

In order to determine the flow capacity of a ILVA pipeline unit, it is necessary to calculate the equivalent water flowrate (Q_E) based on the anticipated actual flow (see Step 1). The Table below is used to select the appropriate unit (steam only).

Step 1.

Determine equivalent water flowrate (Q_E) in U.S. GPM:

Liquids

$$Q_E = \frac{m}{500}\sqrt{\frac{D_E}{D_L}}$$

or

$$Q_E = Q_L\sqrt{\frac{D_E}{D_L}}$$

Q_E = equivalent flow rate of water at 70 °F (U.S. GPM)
m = maximum flow rate of service liquid (lb/hr)
D_E = density of water at calibration (62.305 lb/ft³)
D_L = density of service liquid (lb/ft³)
Q_L = maximum flow rate of service liquid (U.S. GPM)

Gases

$$Q_E = \sqrt{D \times \frac{P_F}{P_S} \times \frac{T_F}{T_S}}$$

or

$$Q_E = (0.948) \times Q_G\sqrt{D \times \frac{P_F}{P_S} \times \frac{T_F}{T_S}}$$

Q_E = Equivalent water flowrate (litres / min)
m = maximum flow rate of service liquid (lb/hr)
D = gas density at 14.7 psi a, 520 °R (60 °F) (lb/ft³)
P_F = flowing pressure of gas (psi a)
P_S = standard atmospheric pressure (14.7 psi a)
T_S = standard absolute temperature (520 °R)
T_F = flowing temperature of gas (°R = °F + 460)
Q_G = maximum flow rate of gas (SCFM)

Steam

$$Q_E = (0.0158) \times m\sqrt{v}$$

Q_E = water equivalent flow rate at 70 °F (U.S. GPM)
m = maximum flow rate of steam (lb/hr)
v = specific volume of steam at normal pressure and temperature (ft³/lb)

Step 2.

Select from the table below the Gilflo ILVA meter with a maximum Q_E that closely matches (but exceeds) the application Q_E determined in step 1.

In practice, it will often be the line size that determines the choice of the flowmeter.

Meter size	Q_E US Gal/min		Maximum DP
	Maximum	Minimum	ins Wg
2"	40	0.4	200
3"	158	1.6	200
4"	317	3.2	200
6"	781	7.8	200
8"	1535	15.4	200

How to order example

1 off Spirax Sarco DN50 ILVA flowmeter suitable for fitting between EN 1092 PN40 connections.

Safety information, installation and maintenance

For full details see the Installation and Maintenance Instructions supplied with the product.

Installation note

The following main points are given here for guidance:

1. The ILVA should be mounted with a minimum of 6 straight pipe diameters upstream and 3 downstream. No valves, fittings or cross sectional changes are permitted within these pipe lengths. Where an increase in nominal pipe diameter is required upstream of the flowmeter, the length of straight pipe should be increased to 12 diameters. Similarly, where a ILVA is installed downstream of two 90 degree bends in two planes, a pressure reducing valve or a partially open valve, 12 upstream pipe diameters should be allowed.
2. It is important that the internal upstream and downstream diameters of pipe are smooth. Ideally seamless pipes should be used. It is recommended that slip-on flanges be used to avoid any intrusive weld beads on the internal diameter of the pipe.
3. Care should be taken to install the ILVA concentrically in the line. If this is not done, flow measurement errors may occur.
4. The ILVA should be mounted horizontally. For vertical installations, consult Spirax Sarco.
5. For steam applications, good basic steam engineering practices should be followed:
   - Correct line drainage through adequate trapping.
   - Good alignment and support of associated pipework.
   - Line size changes achieved by the use of eccentric reducers

Maintenance note

There are no user serviceable parts in the ILVA. A visual check together with confirmation that the orifice/cone reference dimension is within tolerance is possible.

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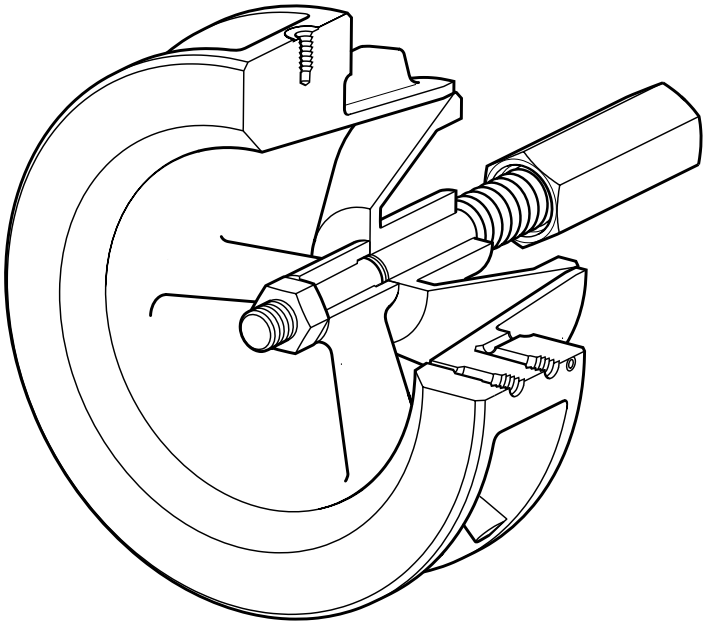
ILVA Flowmeter
DN250 and DN300

Description

The ILVA flowmeter operates on the spring loaded variable area principle and produces a differential pressure related to the rate of flow. It can be used with most industrial fluids, gases and both saturated and superheated steam. A general description of the ILVA flowmetering system and its associated equipment is given in a separate TI sheet.

Sizes and pipe connections

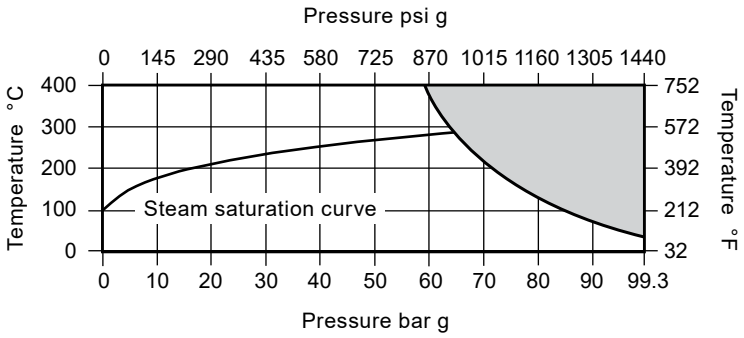
DN250 and DN300 (10" and 12"). For DN50, DN80, DN100, DN150 and DN200 (2", 3", 4", 6" and 8") sizes see separate literature.
Suitable for fitting between the following flanges:
EN 1092 PN16, PN25 and PN40.
ASME B 16.5 Class 150, 300 and 600.
JIS 20.
KS 20.
The ILVA flowmeter should be installed in pipework manufactured to BS 1600 or ASME B 36.10 Schedule 40.For different pipe standards/ schedules, downstream spool pieces with an equivalent internal diameter to BS 1600 or ASME B 36.10 Schedule 40 should be used. If this is not possible, please contact
Spirax Sarco Limited.



Materials

Part	Material
Body	Cast stainless steel S.316 (CF8M/1.4408)
Internals	431 S29/S303/S304/S316
Spring	Inconel X750

Pressure/temperature limits



The product **must not** be used in this region.

Body design conditions		ASME 600
PMA Maximum allowable pressure	99.3 bar g @ 38 °C	1440 psi g @ 100 °F
TMA Maximum allowable temperature	400 °C @ 58.9 bar g	752 °F @ 854 psi g
Minimum allowable temperature	-29 °C	-20 °F
PMO Maximum operating pressure is dependant on the flange specification		
Minimum operating pressure	0.6 bar g	9 psi g
TMO Maximum operating temperature	400 °C @ 58.9 bar g	752 °F @ 854 psi g
Minimum operating temperature **Note:** For lower operating temperatures consult Spirax Sarco.	-29 °C	-20 °F
Maximum viscosity		30 centipoise
ΔPMX Maximum differential pressure	498 m bar	7.2 psi
Designed for a maximum cold hydraulic test pressure of:	149 bar g	2161 psi g

Performance

The ILVA is used in conjunction with linearising electronics such as Spirax Sarco flow computers or M750 display unit. Alternatively the output signal linearisation can be performed on an EMS/BEMS or equivalent.

Accuracy when used with Spirax Sarco flow computers or M750:
±1% of measured value from 5% to 100% of maximum rated flow.
±0.1% FSD from 1% to 5% of maximum rated flow.
Repeatability better than 0.25%
Turndown: up to 100:1

Caution: The Scanner 2000 mass flow transmitters can be configured at the factory to work with a single, specific ILVA flowmeter. For correct operation the configured transmitter must always be installed with its allocated flowmeter. Labels on the packaging give the serial numbers of the matched products.

Pressure drop

The maximum pressure drop across the ILVA pipeline unit is 498 m bar (200 ins water gauge) at maximum rated flow.

Flow capacity

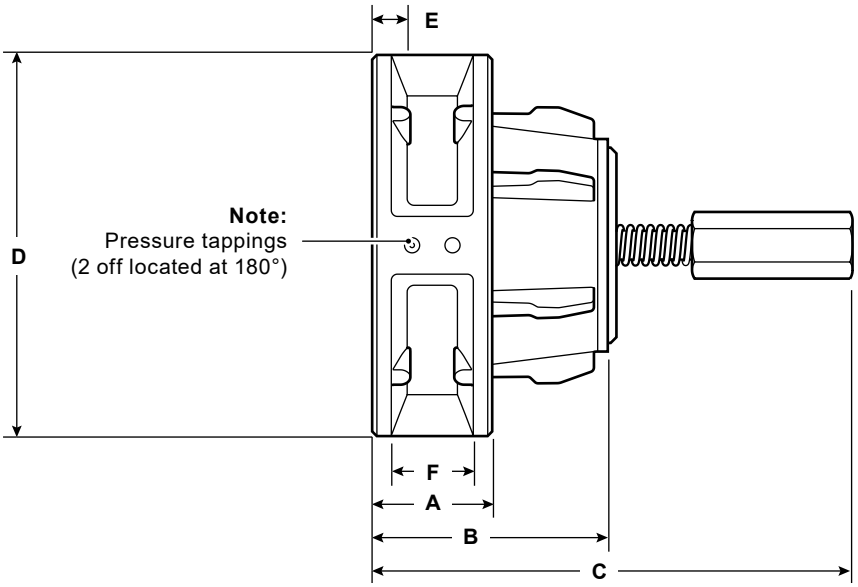
To determine the capacity of the ILVA for different fluids, it is necessary to calculate the equivalent water flowrate Q_E (in l/min) as described in Step 1, under the section 'sizing the ILVA' then selecting the appropriate size of flowmeter from the Table under Step 2 overleaf.

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How to order

Example: 1 off Spirax Sarco DN250 ILVA flowmeter for installation between EN 1092 PN40 flanges. The body material is to be 316 stainless steel. The flow medium will be saturated steam at 10 bar g and the maximum flow will be 28 000 kg/h.

Dimensions/weights (approximate) in mm (inches) and kg (lbs)



Size	A	B	C	D	E	F	Weight
DN250 (10")	104 (4.1)	204 (8.0)	444 (17.5)	330 (13.0)	35 (1.4)	35 (1.4)	41.5 (91.5)
DN300 (12")	120 (4.7)	250 (9.8)	530 (20.9)	385 (15.2)	42.5 (1.7)		67 (148)

Note: Pressure tappings are threaded ¼" NPT

Safety information, installation and maintenance

For full details see the Installation and Maintenance Instructions supplied with the product.

Installation note:

The following main points are given here for guidance:

1. The ILVA should be mounted with a minimum of 6 straight pipe diameters upstream and 3 downstream. No valves, fittings or cross sectional changes are permitted within these pipe lengths. Where an increase in nominal pipe diameter is required upstream of the flowmeter, the length of straight pipe should be increased to 12 diameters. Similarly, where a ILVA is installed downstream of two 90 degree bends in two planes, a pressure reducing valve or a partially open valve, 12 upstream pipe diameters should be allowed.
2. It is important that the internal upstream and downstream diameters of pipe are smooth. Ideally seamless pipes should be used. It is recommended that slip-on flanges be used to avoid any intrusive weld beads on the internal diameter of the pipe.
3. Care should be taken to install the ILVA concentrically in the line. If this is not done, flow measurement errors may occur.
4. The ILVA should be mounted horizontally. For vertical installations, consult Spirax Sarco.
5. For steam applications, good basic steam engineering practices should be followed:
   - Correct line drainage through adequate trapping.
   - Good alignment and support of associated pipework.
   - Line size changes achieved by the use of eccentric reducers

Maintenance note:

There are no user serviceable parts in the ILVA. A visual check together with confirmation that the orifice/cone reference dimension is within tolerance is possible.

Sizing (metric)

ILVA flowmeter minimum and maximum saturated steam flowrates in kg/h

Notes:
1. These capacities are based on a differential pressure across the flowmeter of 498 m bar H_20 (200 Inches).
2. Minimum flow is 1% of maximum (100:1 turndown).
3. The table below is a guide only.

Size		Q_E	Steam pressure bar g									
			1	3	5	7	10	12	15	20	25	30	40
DN250	Max	7 750	15 985	22 185	26 915	30 899	36 043	39 099	43 292	49 541	55 155	60 325	69 758
	Min	78	160	222	269	309	433	391	433	495	552	603	698
DN300	Max	10 975	22 637	31 417	38 115	43 758	51 042	55 369	61 307	70 157	78 107	85 428	98 778
	Min	110	226	314	381	438	510	554	613	702	781	854	988

Sizing the ILVA flowmeter

In order to determine the flow capacity of a ILVA pipeline unit, it is necessary to calculate the equivalent water flowrate (Q_E) based on the anticipated actual flow (see Step 1). The Table below is used to select the appropriate unit (steam only).

Step 1.

Determine equivalent water flowrate (Q_E) in l/min:-

	Mass flow units	Volumetric units
Liquids	$Q_E = \frac{q_m}{\sqrt{SG}}$	$Q_E = Q_L\sqrt{SG}$
Gases and steam actual flow conditions	$Q_E = q_M\sqrt{\frac{1000}{D_F}}$	$Q_E = Q_F\sqrt{\frac{D_F}{1000}}$
Gases standard conditions	$Q_E = Q_S\sqrt{\frac{D_S}{1000} \times \frac{P_F}{P_S} \times \frac{P_F}{T_S}}$	$Q_E = Q_S\sqrt{\frac{D_S}{1\,000} \times \frac{P_S}{P_F} \times \frac{T_F}{T_S}}$

Where:

Q_E = Equivalent water flowrate (litres/min)

q_m = Mass flowrate (kg/min)

Q_L = Maximum liquid flowrate (litres/min)

Q_S = Maximum gas flowrate at standard conditions (litres/min)

Q_F = Maximum gas flowrate at actual flow conditions (litres/min)

SG = Specific gravity

D_S = Density of gas at standard conditions (kg/m³)

D_F = Density of gas at actual flow conditions (kg/m³)

P_S = Standard pressure: 1.013 bar a, 1.033 kg/cm2 a, 14.70 psi a

P_F = Actual flow pressure in same absolute units as P_S

T_S = Standard temperature (K) = °C + 273

T_F = Actual flow temperature (K) = °C + 273

Step 2.

Using the value of Q_E as determined in Step 1, select the correct size of the ILVA flowmeter using the Table below.

In practice, it will often be the line size that determines the choice of the flowmeter.

Flowmeter type	Max. Q_E litres/min	Max. pressure drop Wg
DN250	7 750	200
DN300	10 975	200

Example: Determine which ILVA pipeline unit is required to measure the flow of compressed air when:
1: Estimated maximum rate of flow = 28 000 s m³/h at 7 bar g and 20 °C.
Note: Standard conditions = 1.013 bar a, 0°C giving a standard density of 1.29 kg/m³

2: Calculate Q_E from: $$Q_E = Q_S \sqrt{\frac{D_S}{1\,000} \times \frac{P_S}{P_F} \times \frac{T_F}{T_S}}$$

$$Q_E = (28\,000 \times 16.667) \times \sqrt{\frac{1.29}{1\,000} \times \frac{1.013}{8.013} \times \frac{293}{273}}$$

$$Q_E = 6\ 174 \text{ litres/min}$$

So a DN250 ILVA is recommended.
Note: 1 m³/h = 16.667 litres/min

How to order example

1 off Spirax Sarco DN250 ILVA flowmeter suitable for fitting between EN 1092 PN16 connections.

Sizing (imperial)

ILVA flowmeter minimum and maximum saturated steam flowrates in lb/h

Notes:
1. These capacities are based on a differential pressure across the flowmeter of 200 inches H_20.
2. Minimum flow is 1% of maximum (100:1 turndown).
3. The table below is a guide only.

Size		Q_E	Steam pressure psi g										
			15	44	73	102	145	174	218	290	383	435	580
10"	Max	2407	33786	47675	57708	66128	76959	83379	92162	105216	116909	127654	147172
	Min	21	334	476	578	661	769	833	919	1052	1168	1276	1473
12"	Max	2900	48782	67514	81723	93464	108983	118075	130514	148999	165558	114638	208414
	Min	29	487	675	820	939	1091	1179	1303	1490	1658	1808	2083

Sizing the ILVA flowmeter

In order to determine the flow capacity of a ILVA pipeline unit, it is necessary to calculate the equivalent water flowrate (Q_E) based on the anticipated actual flow (see Step 1). The Table below is used to select the appropriate unit (steam only).

Step 1.

Determine equivalent water flowrate (Q_E) in U.S. GPM:

Liquids

$$Q_E = \frac{m}{500}\sqrt{\frac{D_E}{D_L}}$$

or

$$Q_E = Q_L\sqrt{\frac{D_L}{D_E}}$$

Q_E = equivalent flow rate of water at 70 °F (U.S. GPM)

m = maximum flow rate of service liquid (lb/hr)

D_E = density of water at calibration (62.305 lb/ft^3)

D_L = density of service liquid (lb/ft^3)

Q_L = maximum flow rate of service liquid (U.S. GPM)

Gases

$$Q_E = \sqrt{D \times \frac{P_F}{P_S} \times \frac{T_S}{T_F}}^{(0.0158 \times m)}$$

or

$$Q_E = (0.948) \times Q_G\sqrt{D \times \frac{P_F}{P_S} \times \frac{T_F}{T_S}}$$

Q_E = Equivalent water flowrate (litres / min)

m = maximum flow rate of service liquid (lb/hr)

D = gas density at 14.7 psi a, 520 °R (60 °F) (lb/ft^3)

P_F = flowing pressure of gas (psi a)

P_S = standard atmospheric pressure (14.7 psi a)

T_S = standard absolute temperature (520 °R)

T_F = flowing temperature of gas (°R = °F + 460)

Q_G = maximum flow rate of gas (SCFM)

Steam

$$Q_E = (0.0158) \times m\sqrt{v}$$

Q_E = water equivalent flow rate at 70 °F (U.S. GPM)

m = maximum flow rate of steam (lb/hr)

v = specific volume of steam at normal pressure and temperature (ft^3/lb)

Step 2.

Using the value of Q_E as determined in Step 1, select the correct size of the ILVA flowmeter using the Table below.

In practice, it will often be the line size that determines the choice of the flowmeter.

Flowmeter type	Max. Q_E GPM	Max. pressure drop Wg
10"	636	200
12"	766	200

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Gilflo ILVA Flowmeters System Overview

Description

The Spirax Sarco Gilflo ILVA flowmetering system consists of two major parts:

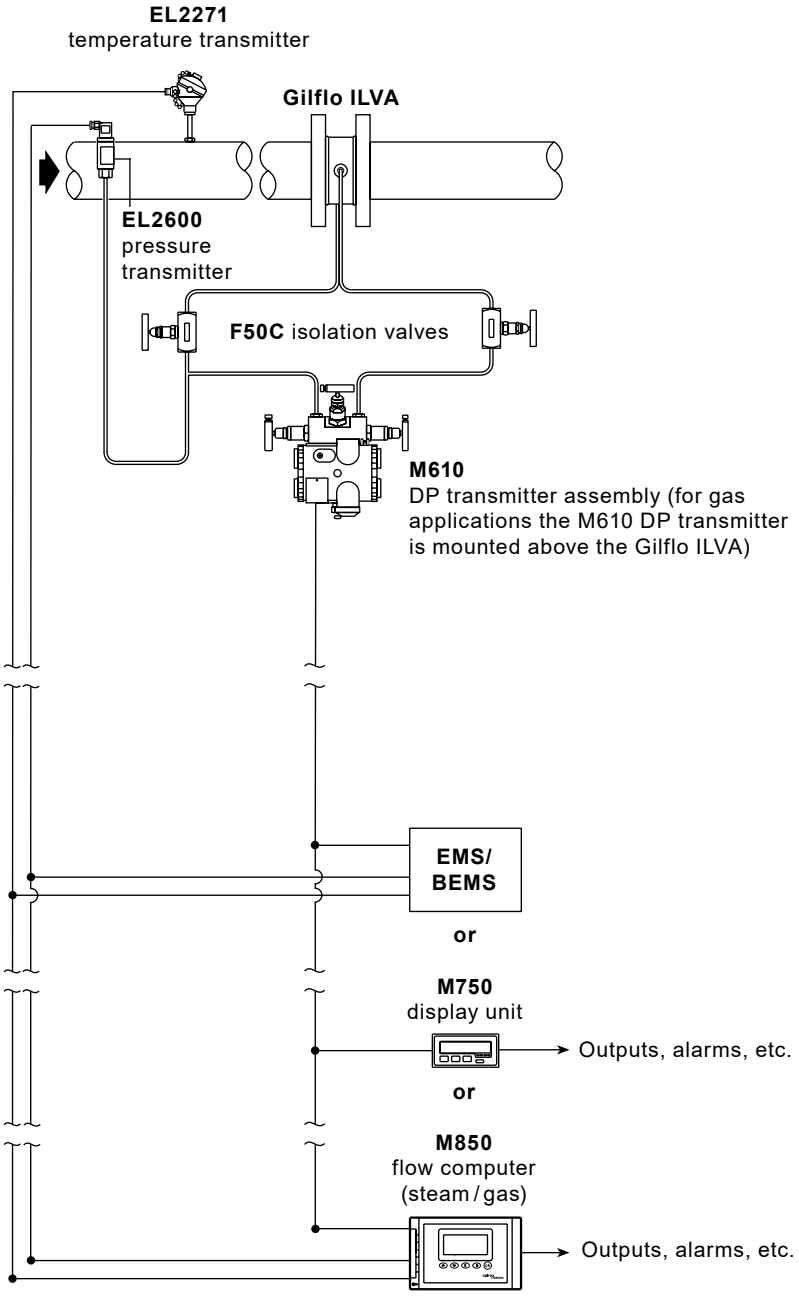
1. The Gilflo ILVA pipeline unit. This is installed in the line where the flow is to be measured. Using impulse pipework, this is connected to:
2. The M610 DP transmitter assembly. This measures the differential pressure across the Gilflo ILVA pipeline unit and converts it to a 4 -20 mA output signal. This output signal can be used in a number of ways:

   i- To act as a suitable input to an EMS / BEMS which can be programmed by the user to carry out the linearising of the output signal based on the calibration data that is supplied with each Gilflo ILVA flowmeter. Additional inputs from the EL2600 pressure transmitter and EL2271 temperature transmitter can be used to carry out density compensation for compressible flow applications

   ii- To supply an M750 display unit. This gives a non-compensated display of rate of flow and totalised flow. It is suitable for liquid, gas and steam applications where density compensation is not required.

   iii- To supply a Spirax Sarco M850 flow computer. Use of the pressure and temperature transmitters enables automatic density compensation to be carried out for compressible flow applications. See the relevant TI for details of pressure / temperature limits for flow computers.

The Gilflo ILVA pipeline unit can be used to measure the flow of most industrial liquids, gases and vapours within the pressure and temperature limits detailed in the TI's.



Installation

Care must be taken to meet all the requirements of the Installation and Maintenance Instructions that are included with the equipment. Some installation points to watch are noted overleaf.
In addition, heat metering is possible on saturated steam systems by replacing the EL2600 pressure transmitter with an EL2271 temperature transmitter in the condensate return line (M850 system only).

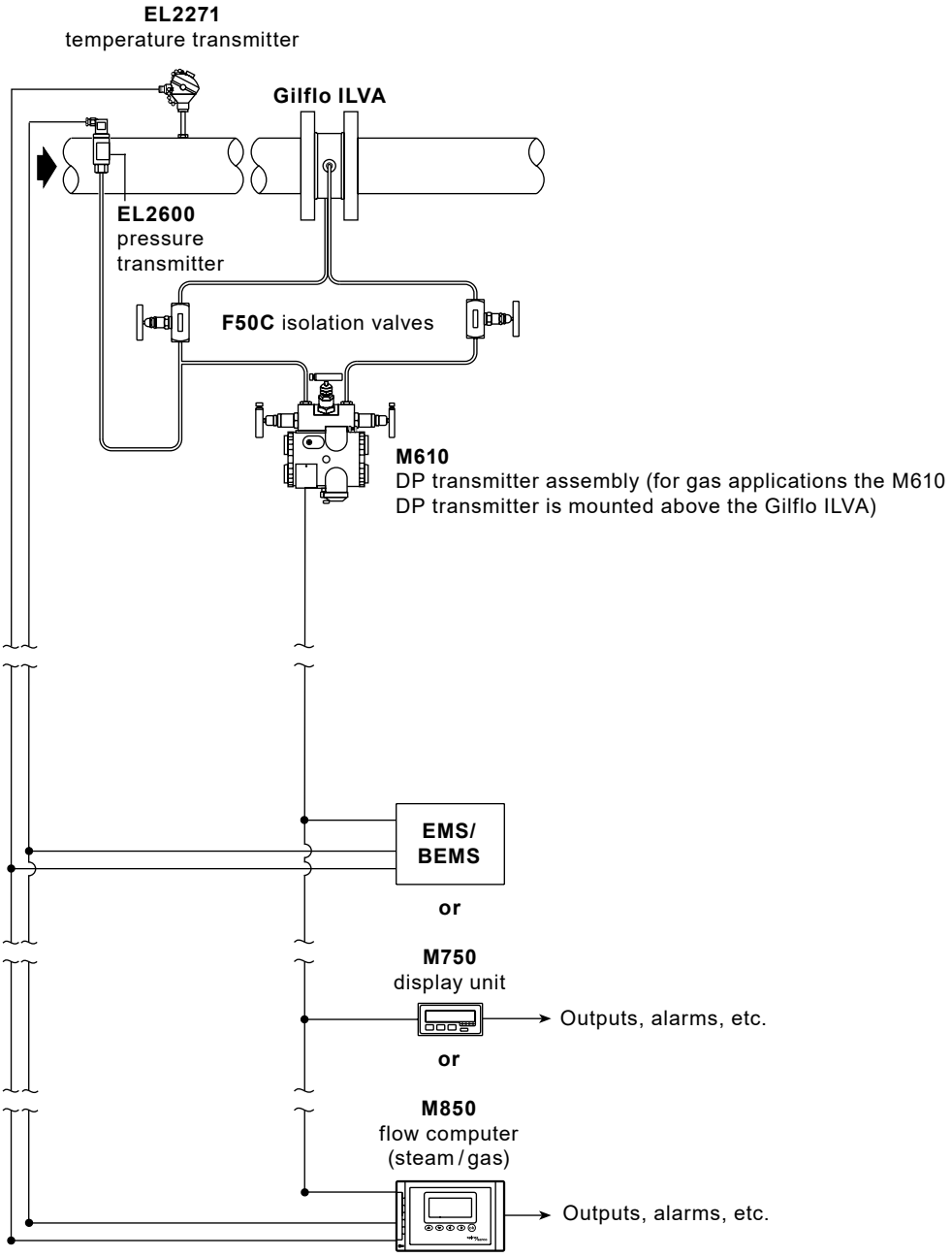
Electrical wiring

All electrical wiring must be carried out to the appropriate standards. Full wiring interconnection details are included with the equipment.

Associated equipment

Item	Description
EL2271	Temperature transmitter
EL2600	Pressure transmitter
F50C	Isolation valve
Gilflo ILVA	Pipeline unit

Item	Description
M610	DP transmitter assembly
M750	Display unit
M850 Flow computer	Steam or gas flow computer



Installation points to watch

1. Ensure that all pipework is adequately supported and properly aligned. Special care should be taken to ensure that the Gilflo ILVA pipeline unit is concentrically mounted in the line.

2. The Gilflo ILVA pipeline unit should be selected on capacity rather than line size. Where line size changes on steam systems are necessary, use eccentric reducers to avoid build-up of condensate.

3. The minimum recommended lengths of straight pipe upstream and downstream are 6 D and 3 D respectively. See other literature for more details concerning the Gilflo ILVA.

4. Take care to ensure the correct direction of flow as indicated by the arrow on the flowmeter body.

5. Take care to avoid reverse flow through the flowmeter.

6. Avoid installing the flowmeter downstream of a pressure reducing valve (especially on steam systems) as this may cause inaccurate readings. Similarly, avoid installing the flowmeter downstream of a partially open valve.

7. Remember that actuated valves may cause rapid pressure fluctuations which could cause damage.

8. On steam or liquid systems, the M610 DP transmitter assembly is mounted below the flowmeter. Take care to ensure that all impulse lines remain full to prevent damage to the DP transmitter through contact with steam or high temperature liquid.

9. For steam applications, care should be taken to ensure adequate line drainage, trapping etc., to avoid condensate slugs impacting the flowmeter. Where practicable, steam separators should be fitted. These should be drained using a float trap set.

10. For gas applications, the M610 DP transmitter assembly is installed above the pipework. Ensure that the impulse lines allow free drainage of moisture away from the DP transmitter and back into the pipeline.

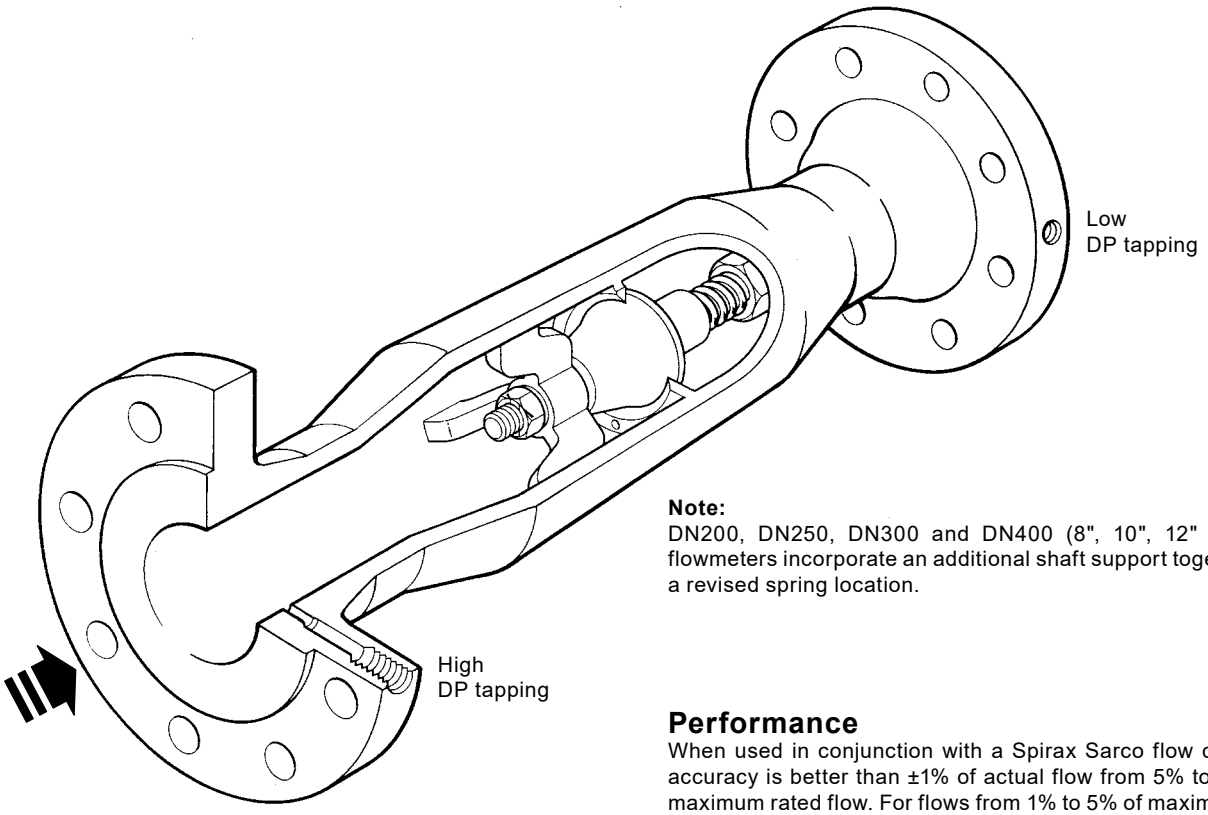
TI-P337-08
EMM Issue 9

Gilflo 'B' Flowmeter
Pipeline Unit

Description
The Gilflo 'B' flowmeter is installed in the pipeline and produces a differential pressure which is related to the rate of flow. It can be used with most industrial fluids, gases and both saturated and superheated steam.

Sizes and pipe connections
DN50*, DN80, DN100, DN150, DN200, DN250, DN300 and DN400 (2"*, 3", 4", 6", 8", 10", 12" and 16")
Flanges available to EN 1092 PN40* and ASME B 16.5 class 300.

***Note - DN50 (2") flowmeter:** flanges on the PN40 are thicker (to ASME 300, 22.2 mm) to accommodate pressure tappings. On the DN400 (16") flowmeter, the pressure tappings are on the body.



Note:
DN200, DN250, DN300 and DN400 (8", 10", 12" and 16") flowmeters incorporate an additional shaft support together with a revised spring location.

Materials

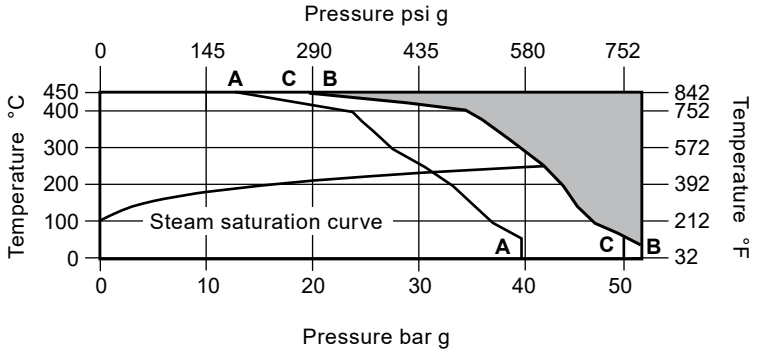
Part	Material	
Body	Carbon steel	ASTM A105/A106/A234
Internals	Mostly stainless steel	S304/S316
Spring	Inconel X750	

Performance
When used in conjunction with a Spirax Sarco flow computer, accuracy is better than ±1% of actual flow from 5% to 100% of maximum rated flow. For flows from 1% to 5% of maximum rated flow, accuracy will be better than ±0.1% FSD. Repeatability is better than 0.25%. Note: the accuracy figures quoted are for the pipeline unit only.

Pressure drop
Less than 349 m bar (140 inches H^2O) at rated capacity.

Flow capacity
To determine the maximum flow capacity of a Gilflo 'B', it is necessary to calculate the equivalent water flowrate (Q_E). See under section "Sizing the Gilflo 'B' flowmeter".

Pressure/temperature limits



The product **must not** be used in this region.

A - A Flanged ASME 300 DN50-DN300

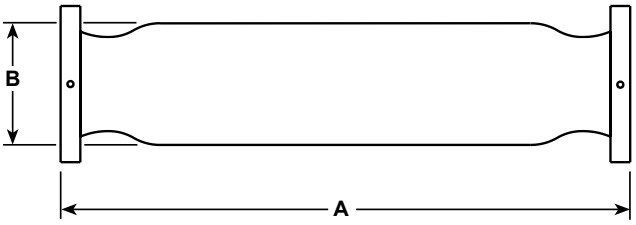
B - B Flanged ASME 300 DN400

C - C Flanged EN 1092 PN40

Body design conditions			ASME 300
PMA Maximum allowable pressure		51.1 bar g @ 38 °C	741 psi g @ 100 °F
TMA Maximum allowable temperature		450 °C @ 23 bar g	842 °F @ 334 psi g
Minimum allowable temperature		0°C	32 °F
PMO Maximum operating pressure	ASME	51.1 bar g @ 38 °C	741 psi g @ 100 °F
	DN400	49 bar g @ 65.7 °C	711 psi g @ 150 °F
Minimum operating pressure		0.6 bar g	9 psi g
TMO Maximum operating temperature		450 °C @ 23 bar g	842 °F @ 334 psi g
Minimum operating temperature **Note**: For lower operating temperatures consult Spirax Sarco.		0°C	32 °F
Maximum viscosity			30 centipoise
ΔPMX Maximum differential pressure			349 m bar
Designed for a maximum cold hydraulic test pressure of:	ASME	77 bar g	1117 psi g
	PN40	60 bar g	870 psi g

Dimensions/weights (approximate) in mm (inches) and kg (lbs)

Size	A	B	Weight
DN50* (2")	480 (18.9)	89 (3.5)	14 (31)
DN80 (3")	543 (21.4)	114 (5.7)	22 (49)
DN100 (4")	716 (28.2)	168 (6.6)	48 (106)
DN150 (6")	797 (31.4)	219 (8.6)	87 (192)
DN200 (8")	990 (39.0)	324 (12.8)	123 (271)
DN250 (10")	1458 (57.4)	406 (16.0)	257 (567)
DN300 (12")	1599 (63.0)	457 (18.0)	340 (750)
DN400* (16")	1995 (78.5)	610 (24.0)	900 (1984)



Pressure tappings:
The H.P. and L.P. pressure tappings are threaded ¼" NPT (female).On the DN400 flowmeter, the pressure tappings are on the body.

*** Note - DN50 flowmeter:** flanges on the PN40 are thicker (to ASME 300, 22.2 mm) to accommodate pressure tappings.

Safety information, installation and maintenance

For full details see the Installation and Maintenance Instructions supplied with the product.

Installation:
Installation and Maintenance Instructions are supplied with each flowmeter. The following main points are given for guidance:-

1. The Gilflo flowmeter should be installed with a minimum of 6 straight pipe diameters upstream and 3 downstream. No valves, fittings or cross sectional changes are permitted within these pipe lengths. Where an increase in pipe diameter is necessary upstream of a Gilflo flowmeter, the length of straight pipe should be increased to 12 diameters. Similarily, where a Gilflo flowmeter is installed downstream of two 90° bends in two planes, a pressure reducing valve or a partially open valve, 12 pipe diameters should be allowed.
2. The Gilflo flowmeter should normally be mounted horizontally. Vertical installation (with flow vertically downward) is also permissible and must be specified at the time of ordering. Ensure flow is in the correct direction and avoid reverse flow.
3. For steam applications, good basic steam engineering practice should be followed:
   - Ensure all pipework is adequately lagged.
   - Ensure correct line drainage through adequate trapping.
   - Where practicable, fit a steam separator upstream of the flowmeter. This should be drained using a float trap set.
   - Ensure good alignment and support of all associated pipework.
   - Achieve line size reduction by the use of eccentric reducers.
   - Avoid close installation (less than 25 pipe diameters) upstream or downstream of a pressure reducing valve or modulating valve.
4. See the 'Gilflo flowmeters - system overview', TI-S41-10 which provides information on the installation of a Gilflo flowmetering system.

Maintenance note:

There are no user serviceable parts within the Gilflo 'B' flowmeter.

Sizing the Gilflo 'B' flowmeter (metric)

In order to determine the flow capacity of a Gilflo 'B' flowmeter for a particular application, it is necessary to calculate the equivalent water flowrate (Q_E) based on the maximum anticipated actual flow.

	Mass flow units	Volumetric units
Liquids	$Q_E = \frac{q_m}{\sqrt{SG}}$	$Q_E = Q_L \sqrt{SG}$
Gases and steam actual flow conditions	$Q_E = q_m \sqrt{\frac{1\,000}{D_F}}$	$Q_E = Q_F \sqrt{\frac{D_F}{1\,000}}$
Gases standard conditions	$Q_E = \frac{q_m}{\sqrt{\frac{D_S}{1\,000} \times \frac{P_F}{P_S} \times \frac{T_S}{T_F}}}$	$Q_E = Q_S \sqrt{\frac{D_S}{1\,000} \times \frac{P_S}{P_F} \times \frac{T_F}{T_S}}$

Where:

D_S = Density of gas at standard conditions (kg/m³)

D_F = Density of gas at actual flow conditions (kg/m³)

= 1.013 bar a

P_S = Standard pressure (atmospheric) = 1.033 kg/cm² a

= 14.70 psi a

P_F = Actual flow pressure in same absolute units as P_S

Q_E = Equivalent water flowrate (litres/min)

Q_L = Maximum liquid flowrate (litres/min)

Q_S = Maximum gas flowrate at standard conditions (litres/min)

Q_F = Maximum gas flowrate at actual flow conditions (litres/min)

q_m = Mass flowrate (kg/min)

SG = Specific gravity

T_S = Standard temperature (K) = °C + 273

T_F = Actual flow temperature (K) = °C + 273

Sizing - Gilflo 'B' flowmeter minimum and maximum saturated steam flowrate in kg/h

Notes:

1. Q_E = The equivalent water flowrate litres/min for a Gilflo 'B' flowmeter. These equivalent water flowrates are based on a differential pressure across the flowmeter of 349 m bar.
2. Minimum flow is 1% of maximum (100:1 turndown).
3. The table below is a guide only.

Size		QE	Steam pressure bar g										
			1	3	5	7	10	12	15	20	25	30	40
DN50	Max.	355	732	1016	1233	1415	1651	1791	1983	2269	2526	2763	3195
	Min.	4	7	10	12	14	17	18	20	23	25	28	32
DN80	Max.	1165	2403	3335	4046	4645	5418	5877	6508	7447	8291	9068	10485
	Min.	12	24	33	40	46	54	59	65	74	83	91	105
DN100	Max.	1870	3857	5353	6494	7456	8697	9434	10446	11954	13308	14556	16830
	Min.	19	39	54	65	75	87	94	104	120	133	146	168
DN150	Max.	4550	9385	13025	15802	18141	21161	22955	25416	29085	32382	35416	40951
	Min.	46	94	130	158	181	212	230	254	291	324	354	410
DN200	Max.	8085	16675	23144	28078	32235	37601	40789	45163	51683	57539	62932	72767
	Min.	81	167	231	281	322	376	408	452	517	575	629	728
DN250	Max.	11120	22936	31832	38619	44335	51716	56101	62116	71084	79139	86556	100083
	Min.	111	229	318	386	443	517	561	621	711	791	866	1001
DN300	Max.	19305	39818	55262	67044	76970	89783	97395	107838	123406	137390	150267	173750
	Min.	193	398	553	670	770	898	974	1078	1234	1374	1503	1738
DN400	Max.	31360	64682	89770	108910	125033	145847	158213	175177	200467	223183	244101	282248
	Min.	314	647	898	1089	1250	1458	1582	1752	2005	2232	2441	2822

How to order example

1 off Spirax Sarco DN150 Gilflo 'B' flowmeter flanged to EN 1092 PN16.

Sizing the ILVA flowmeter (imperial)

In order to determine the flow capacity of a Gilflo 'B' flowmeter for a particular application, it is necessary to calculate the equivalent water flowrate (Q_E) in US GPM using the following formulas.

Liquids

$$Q_E = \frac{m}{500}\sqrt{\frac{D_E}{D_L}}$$

or

$$Q_E = Q_L\sqrt{\frac{D_L}{D_E}}$$

Gases and steam actual flow conditions

$$Q_E = (0.0158)\ x\ m\sqrt{v}$$

Gases standard conditions

$$Q_E = \sqrt{D\ x\ \frac{P_F}{P_S}\ x\ \frac{T_S}{T_F}}\ (0.0158)\ x\ m$$

or

$$Q_E = (0.948)\ x\ Q_G\sqrt{D\ x\ \frac{P_S}{P_F}\ x\ \frac{T_F}{T_S}}$$

D_S = Density of gas at 14.7 psi a, 520 °R (60 °F) (lb/ft^3)

D_E = Density of gas at of water at calibration (62.305 lb/ft^3)

D_L = Maximum flow rate of service liquid (US GPM)

m = maximum flow rate of service liquid (lb/hr)

P_S = Standard pressure 14.70 psi a

P_F = Actual flow pressure in same absolute units as P_S

Q_E = Equivalent water flowrate 70 °F (U.S. GPM)

Q_L = Maximum liquid flowrate (U.S. GPM)

Q_G = Maximum gas flowrate (SFCM)

T_S = Standard temperature (520 °R)

T_F = Actual flow temperature (°R = °F + 460)

v = specific volume of steam at normal pressure and temperature (ft^3/lb)

Sizing - Gilflo 'B' flowmeter minimum and maximum saturated steam flowrate in lb/h

Notes:

1. Q_E = The equivalent water flowrate U.S. GPM for a Gilflo 'B' flowmeter. These equivalent water flowrates are based on a differential pressure across the flowmeter of 140 inches H_2O.
2. Minimum flow is 1% of maximum (100:1 turndown).
3. The table below is a guide only.

Size		Q_E	Steam pressure psi g						
			15	50	75	100	150	200	400
2"	Max.	94	1625	2353	2748	3096	3690	4203	5842
	Min.	2	16	24	27	31	37	42	58
3"	Max.	308	5332	7721	9018	10162	12110	13793	19172
	Min.	7	53	77	90	102	121	138	192
4"	Max.	494	8559	12394	14475	16311	19438	22139	30773
	Min.	11	86	124	145	165	195	221	308
6"	Max.	1202	20825	30156	35220	39687	47295	53868	74876
	Min.	12	207	302	352	399	473	539	749
8"	Max.	2136	37004	53585	62582	70520	84040	95719	133050
	Min.	21	368	530	626	710	841	956	1331
10"	Max.	2938	50894	73700	86075	96993	115587	131651	182995
	Min.	29	505	737	861	977	1156	1317	1830
12"	Max.	5100	88356	127948	149431	168385	200666	228554	317690
	Min.	51	877	1280	1494	1698	2007	2286	3177
16"	Max.	8284	143530	207845	242744	273534	325972	371275	516072
	Min.	83	1430	2079	2428	2735	3260	3713	5161

How to order example

1 off Spirax Sarco DN150 Gilflo 'B' flowmeter flanged to EN 1092 PN16.

TI-S41-10
MI Issue 10

Gilflo Flowmeters
System Overview

Description

The Spirax Sarco Gilflo flowmetering system consists of 3 major parts:

1. The Gilflo 'B' pipeline unit.
   This is installed in the line where the flow is to be measured. Using impulse pipework, this is connected to:
2. A differential pressure transmitter which measures the differential pressure across the Gilflo and converts it into a 4 - 20 mA signal. This signal can then be transmitted to:
3. **a -** A Chart recorder, EMS / BMS or M750 display unit.

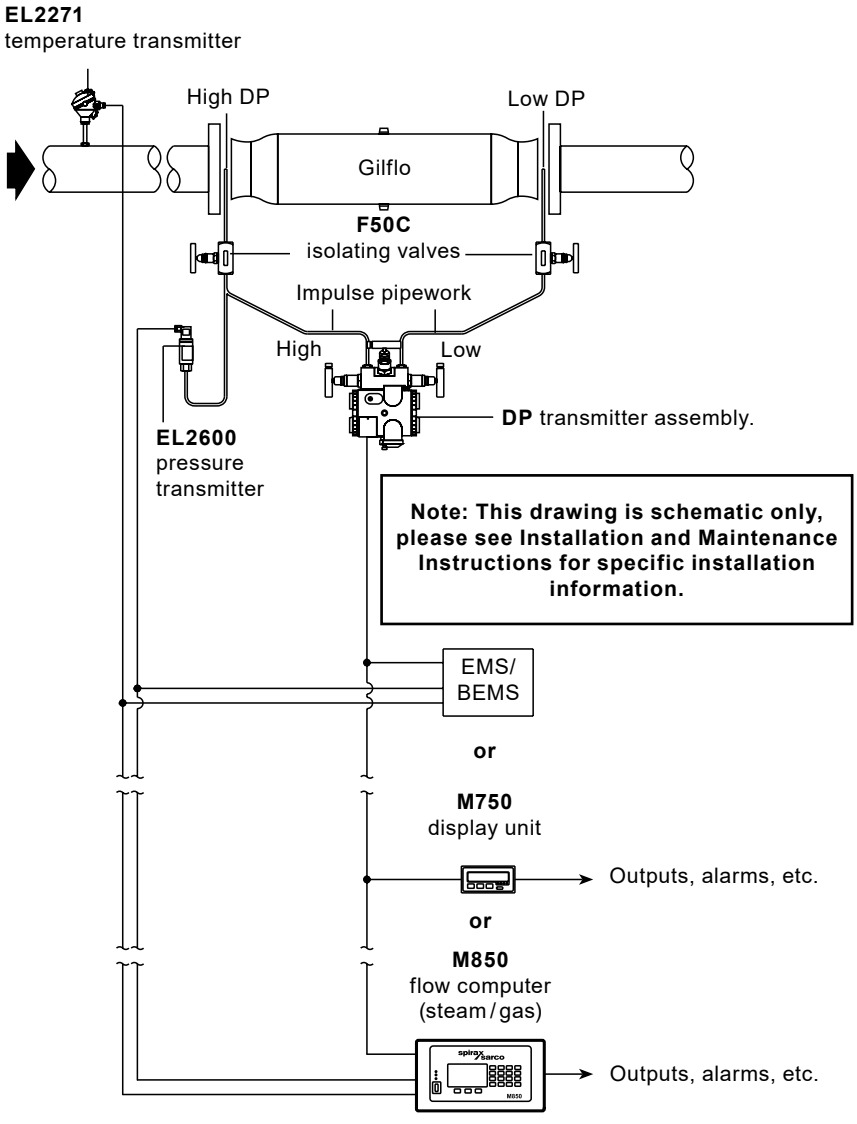
   b - An M850 flow computer.

Note: The Gilflo pipeline unit can be used to measure the flow of most industrial liquids, gases and vapours within the pressure and temperature limits detailed in the appropriate TI document(s).

M850 - Pressure and/or temperature compensated saturated or superheated steam. In addition heat metering is possible by replacing the EL2600 pressure transmitter with an EL2271 temperature transmitter in the condensate return line.

Caution: Steam mass flow transmitters are uniquely configured at the factory to work with a single, specific Gilflo, ILVA or M410 orifice plate flowmeter. For correct operation the configured transmitter must always be installed with its allocated flowmeter. Labels on the packaging give the serial numbers of the matched products.

Installation, electrical wiring and how to order are on the next page



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Installation

Care must be taken to meet all the requirements of the Installation and Maintenance Instructions, which are provided with the equipment.

Installation points to watch:

1. Ensure all pipework is adequately supported and properly aligned.
2. The Gilflo pipeline unit should be selected on capacity rather than line size. Where pipe size reduction on steam systems is necessary, use eccentric reducers to avoid waterlogging.
3. The minimum recommended lengths of straight pipe are 6D upstream and 3D downstream.
4. Take care to ensure the correct direction of flow as indicated by the arrow on the flowmeter body.
5. Take precautions to avoid reverse flow through the flowmeter.
6. Avoid installing the flowmeter downstream of a pressure reducing valve (especially on steam systems) as this may cause inaccuracies and/or possible damage. Similarly avoid installing the flowmeter downstream of a partially open valve.
7. Remember that actuated valves may cause rapid pressure fluctuations which could cause damage.
8. On steam or liquid systems take care to ensure that all impulse lines remain full to prevent damage to the DP transmitter through contact with steam or high temperature liquid.
9. For steam applications, care should be taken to ensure adequate line drainage, trapping etc., to avoid condensate slugs impacting the flowmeter. Where practicable, steam separators should be fitted. These should be drained using a float trap set.
10. For gas applications ensure that the DP cell and impulse lines are positioned above the pipework. Also ensure that the impulse lines allow free drainage of moisture away from the DP cell and back into the pipeline.

Electrical wiring

All electrical wiring must be carried out to the appropriate standards. Full wiring interconnection details are included with the equipment.

How to order

For details of how to specify system components refer to the relevant TI document.

TI-P799-01
EMM Issue 1

SLM30-E
Swirl Flow Meter

Description

The SLM30-E is designed to measure the flow of liquids, gases, and steam. The measured medium is conditioned at the inlet. As flow is introduced to the SLM30-E, a fixed impeller causes rotation of the medium. The frequency of rotation measured by piezo sensor is proportional to the flow rate.

Due to the inner geometry of the SLM30-E meter body, a constant Strouhal number (St) over a wide range of the Reynolds number (Re) is possible and excellent linear flow characteristics are achieved.

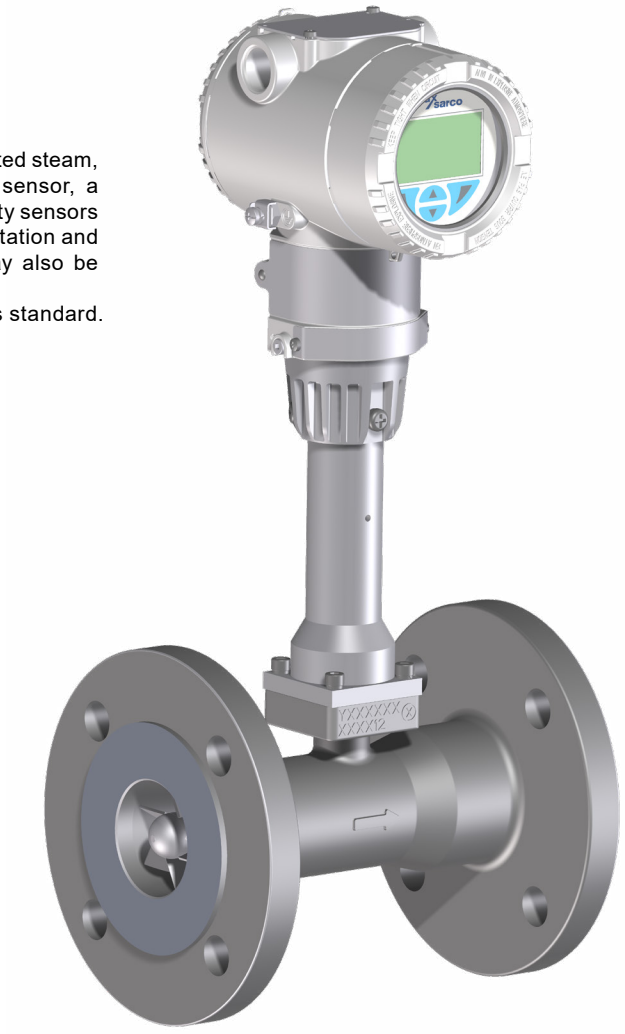
Since the flow is conditioned on entry, many considerations regarding laminar flow are mitigated. This technology allows the SLM30-E to operate with impressively short straight pipe considerations and provide unrivalled measurement performance.

The SLM30-E utilises three primary sensing elements to provide the mass flow rate of steam, liquids, and gases.

- Piezo frequency sensor (flow rate)
- Internal RTD temperature sensor (std) or external temperature transmitter (temperature compensation)
- Pressure (fixed or measured via external transducer*)

* Supplied separately

The SLM30-E swirl flowmeter is designed for saturated steam, superheated steam, liquid, and gas applications. Equipped with an internal temperature sensor, a 4-20mA input for integration with external pressure, temperature or density sensors and user selectable binary outputs, the capability to provide flow computation and energy calculation functionality is possible. Gas analyser outputs may also be integrated for enhanced measurements.
HART 7 or Modbus RTU digital communication protocols are offered as standard.



Compliance and approvals:

- 2014/30/EU Electromagnetic Compatibility EMC
- 2014/68/EU Pressure Equipment Directive
- CRN (Canada) Pending



Approvals

EMC	Electromagnetic compatibility of equipment for process and lab control technology 5/93 and EMC Directive 2014/30/EU. Devices with HART communication are optionally available with EMC protection in accordance with NAMUR NE 21.

Caution: When selecting a flow meter for steam flow measuring, care must be taken around the low flow velocity as this can cause instability in the flow measurement readings. Please ensure the appropriate flow meter size is selected via the sizing tool for the application.

Sizes and pipe connections

	DN15 (½")	DN20 (¾")	DN25 (1")	DN32 (1¼")	DN40 (1½")	DN50 (2")	DN80 (3")	DN100 (4")	DN150 (6")	DN200 (8")	DN300 (12")	DN400 (16")
PN16								•	•	•	•	•
PN40	•	•	•	•	•	•	•	•	•	•	•	•
PN63*	•	•	•	•	•	•	•	•	•	•		
PN100	•	•	•	•	•	•	•	•	•	•		
CL150	•	•	•	•	•	•	•	•	•	•	•	•
CL300	•	•	•	•	•	•	•	•	•	•	•	•
CL600*	•	•	•	•	•	•	•	•	•			

• **Available**

Not Available

*Price on application, extended lead times.

Technical data

	Mount type	Signal cable length
System Design	**Integral mount transmitter**	N/A
	Remote mount transmitter	5m standard
		10m / 20m / 30m options
Wetted materials	**Meter Tube and tower**	stainless steel CF3M
	Piezo Sensor housing	stainless steel 1.4571
	Swirler + outlet cross	stainless steel
	Sensor gasket	PTFE O-ring, −55 to 260 °C
		Kalrez 6375 O-ring, −20 to 275 °C
		Graphite, −55 to 280 °C
Application	Any gas, liquid or steam compatible with stainless steel and other listed wetted materials. Not recommended for multi-phase fluids.	

Technical data (continued)

Environmental	**LVD**	Electrical Safety	EN61010-1:2010
		Overvoltage Category	II
		Pollution Degree	2
	EMC	Emissions	Group 1, Class A (Suitable for Industrial Environments only)
		Immunity	Suitable for Industrial Environments
	Enclosure	IP66, IP67 and NEMA 4x in accordance with EN60529	

	Style connection	**Rating**
Pressure ratings	**Flanged**	ASME Class 150
		ASME Class 300
		ASME Class 600*
		EN 1092-1 PN16
		EN 1092-1 PN40
		EN 1092-1 PN63*
		EN 1092-1 PN100*

*Price on application, extended lead times.

			Supply voltage
Transmitter power supply	**HART®**		**12 to 42 Vdc**
	Modbus		**9 to 30 Vdc**
	Ethernet APL		**9 to 15 Vdc (via APL-Switch)**
	Digital output		**16 to 30 Vdc**
Display	**SLM30 - E**	LCD indicator with four operating buttons	
Output signals (all options)	**HART Digital Communication**	Support for HART communications up to the HART 7 protocol.	
	ModBus Communication	Modbus RTU - RS485 serial connection	
	4 to 20 mA	Re-Transmission of flow or temperature	
	Digital Contact Output	Optocoupler, 16 to 30 Vdc, max 20mA. User configurable as Frequency, Pulse or Binary output.	
	Ethernet-APL™ protocol.	Configurable for PROFINET, ModBus TCP, Webserver (default).**	

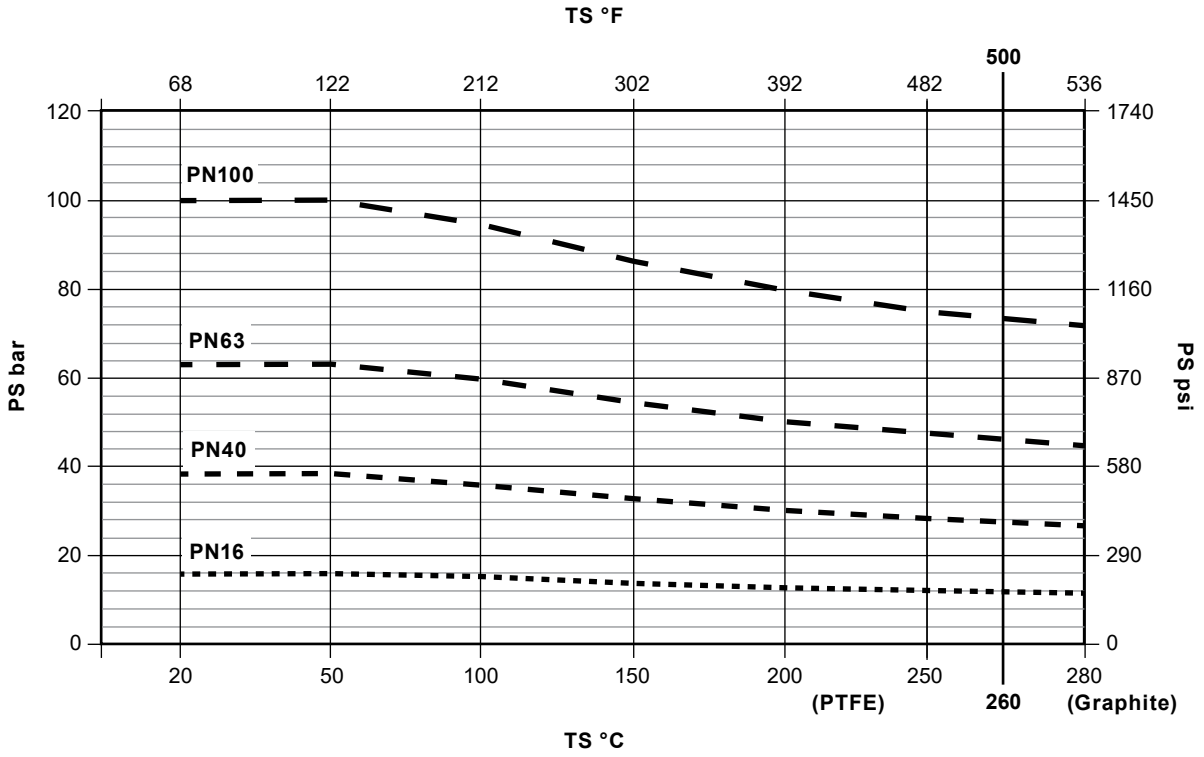
	Variant	Input Type	Input Voltage
Input Signals (For connection of external sensors e.g. pressure or temperature.)	**4-20mA HART®**	Analog 4 to 20 mA	16 to 30 Vdc
		HART® (burst mode)	
	Modbus	Analog 4 to 20 mA	
	Ethernet APL	Analog 4 to 20 mA	

	Transmitter material	**Cable gland thread**	**Cable gland included**
Transmitter material and cable gland options*	Die-cast aluminium, copper content < 0.3 %, epoxy resin coated	M20 × 1.5	No
		½ inch NPT	
	Stainless steel CF3M (316L)	M20 × 1.5	
		½ inch NPT	

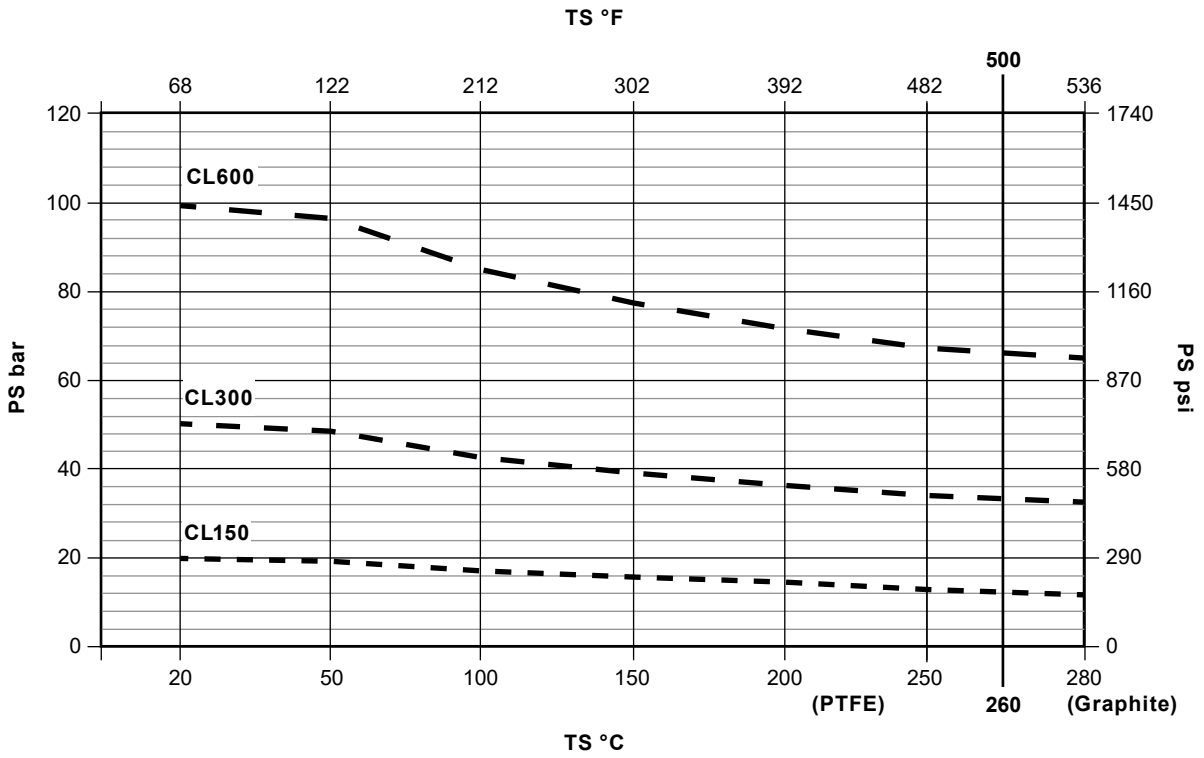
*Devices are supplied without cable glands
** Webserver is default, Profinet and Modbus TCP are selectable within the device menu see IMI for further details.

Pressure/temperature limits - SLM30-E

Flanged Devices - DIN Flange process connection



Flanged Devices - ASME Flange process connection



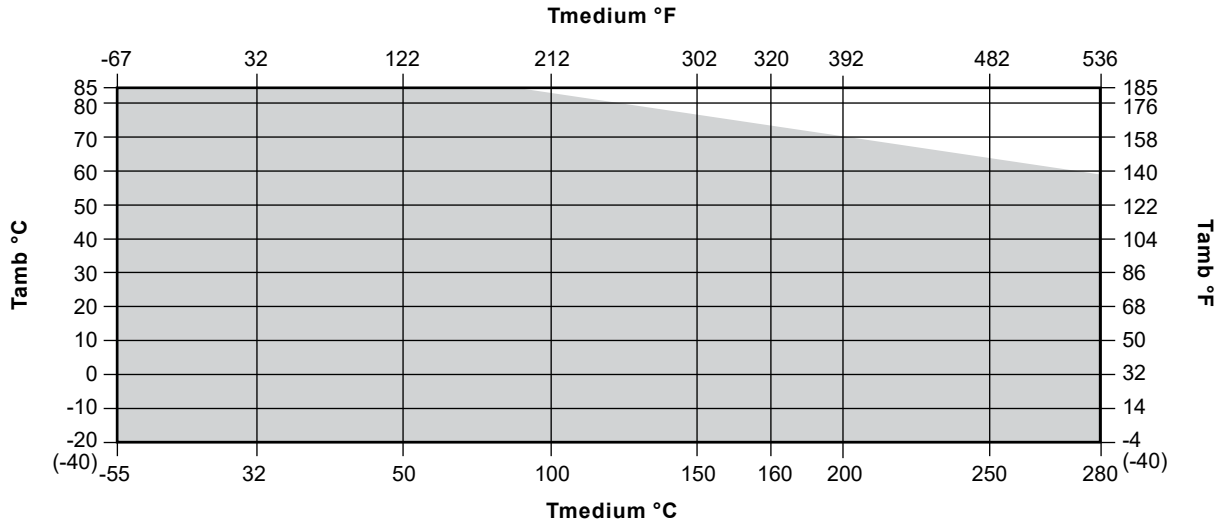
*Max temp defined by **piezo sensor sealing material**, check "How to Order"

Body material: Stainless Steel

Body design conditions		All Versions
Maximum process temperature		280 °C (536 °F)
Minimum process temperature		-55 °C (-67 °F)
Electronic ambient temperature range*	standard	-20 to +85 °C (-4 to +185 °F)
	extended	-40 to +85°C (-40 to +185 °F)

*temperatures are reduced to +80°C (+176 °F) for remote mount transmitter applications due to the signal cable specification.

Measuring medium temperature Tmedium dependent on the ambient temperature Tamb



Measuring accuracy - Reference conditions

Flow measurement	
Set flow range	0.5 to 1 x Q_{vmax}DN
Ambient temperature	20 °C (68 °F) ±2 K
Relative humidity	65 %, ±5 %
Air Pressure	86 to 106 kPa
Power supply	12-42 Vdc (4-20mA HART) / 10-30 Vdc (Modbus)
Signal cable length (for remote mount design)	30 m (98 ft)
Current output load	250 Ω (only 4 to 20 mA)
Measuring medium for calibration	Water, approx. 20 °C (68 °F), 2 bar (29 psi)
	Air, 960 mbar abs. ±50 mbar (14 psi a ±0.7 psi), 24 °C ±4 °C (75 °F ±7 °F)
Calibration loop internal diameter	corresponds to inside diameter of device
Unobstructed straight inlet section*	3 x DN
Outlet section*	1 x DN
Pressure measurement	3 x DN to 5 x DN behind the flowmeter
Temperature measurement	2 x DN to 3 x DN after the pressure measurement

*See IM for specific installation requirements.

Performance specifications

Measured error (including transmitter) depending on the measuring medium and operating mode	
Fluid	
Operating volume flow	±0,5 %
Standard volume flow	±0,6 %
Mass flow measurement	±0,6 %
Gas	
Operating volume flow	±0,50 %
Standard volume flow*	±0,64 %
Mass flow measurement*	±0,64 %
Steam	
Operating volume flow	±0,50 %
Measurement of overheated steam / saturated steam mass (with internal temperature measurement)	±2,50 %
Measurement of overheated steam / saturated steam mass (with internal temperature measurement and external pressure measurement)*	±0,71 %
Measurement of overheated steam / saturated steam mass (with external temperature and pressure measurement)**	±0,57 %

* When using a pressure transmitter with 0.1 % accuracy
** When using a pressure transmitter with 0.1 % accuracy and a temperature transmitter with PT100 Class A

Measured error for current output	
Additional measured error	< 0,1 %
At zero-point:	< 0,05 % / 10 K

A pipe offset in the inlet section or outlet section can influence the measured error. Additional measured errors may occur if there are deviations from the reference conditions.

Repeatability	
DN15 to DN20 (½ in to ¾ in)	0,3 %
DN25 to DN150 (1 to 6 in)	0,2 %
DN200 to DN400 (8 to 12 in)	0,2 %

Temperature measurement

Measured value deviation (including transmitter) ±1 °C or 1 % of measured value (in °C), whichever is greater
Repeatability ≤ 0.2 % of the measured value

Response time

200 ms (1 tau) or 3/f in seconds (with deactivated damping, the respective greater value shall apply). The response time depends on the respective swirl frequency f. Low flow rates can result in higher response times.

Flowrates

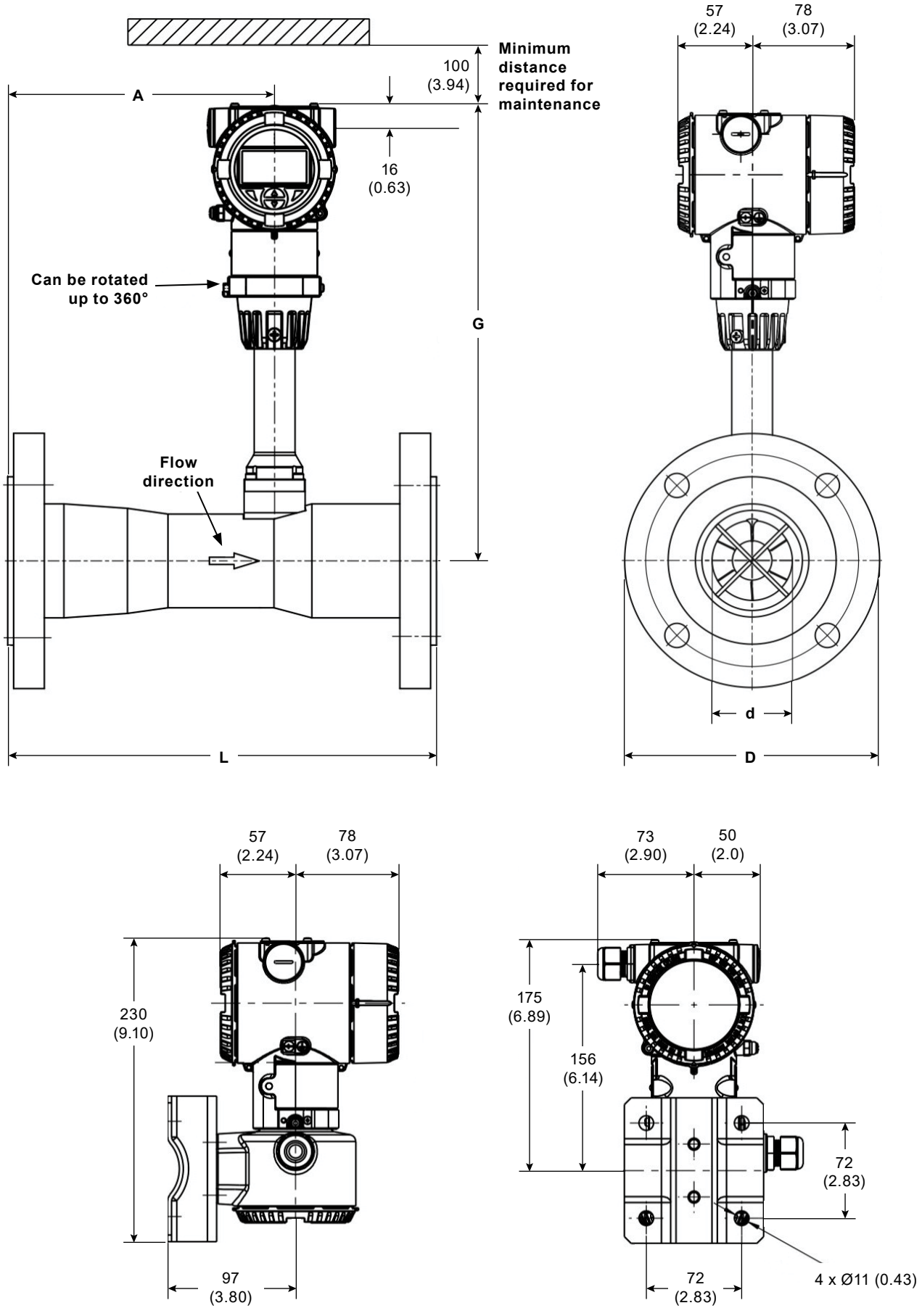
		Maximum Liquid		Maximum Gases and Steam	
		m^3/hr	US GPM	m^3/hr	ft3/min
15 mm	1/2"	2.5	11	20	12
20 mm	3/4"	4	18	44	26
25 mm	1"	8	35	90	53
32 mm	1 3/4"	16	70	230	135
40 mm	1 1/2"	20	88	300	177
50 mm	2"	30	132	440	259
80 mm	3"	120	528	1160	683
100 mm	4"	180	793	1725	1015
150 mm	6"	400	1760	3800	2237
200 mm	8"	700	3082	5800	3414
300 mm	12"	1600	7045	13600	8005
400 mm	16"	2500	11000	21500	12655

Sizing considerations

	Straight run piping requirements*	**Inlet Section**	**Outlet Section**
Piping conditions	Straight pipe section	minimum 3 × DN	minimum 1 × DN
	Valve upstream of the meter	minimum 5 × DN	minimum 1 × DN
	Pipe size reduction	minimum 3 × DN	minimum 1 × DN
	Pipe size expansion	minimum 3 × DN	minimum 3 × DN
	DN = valve nominal diameter		

*Check IM-P799-02 for full installation guidance.

Dimensions/weights (approximate) in mm (inches)



Dimensions with DN Flanges (approximate) in mm (inches) and kg (lbs)

Nominal Diameter	Pressure rating	L	G	A	D	d	Weight (Approx)			
							Integral		Remote	
							Stainless Steel	Aluminium	Stainless Steel	Aluminium
DN15	PN40	200 (7.87)	346 (13.62)	92.5 (3.64)	95 (3.74)	17.3 (0.68)	7.5 (16.5)	5.9 (13)	9.4 (20.7)	7.8 (17.2)
	PN63	205 (8.07)	350 (13.78)	93.5 (3.68)	105 (4.13)	15.7 (0.62)	8.1 (17.9)	6.5 (14.3)	10.7 (23.6)	9.1 (20.1)
	PN100									
DN20	PN40	200 (7.87)	349 (13.74)	104.5 (4.11)	105 (4.13)	22.6 (0.89)	8 (17.6)	6.4 (14.1)	9.9 (21.8)	8.3 (18.3)
	PN63	220 (8.66)	348 (13.7)	113.5 (4.47)	130 (5.12)	20.5 (0.81)	9.6 (21.2)	8 (17.6)	12.2 (26.9)	10.6 (23.4)
	PN100									
DN25	PN40	150 (5.91)	348 (13.7)	66 (2.6)	115 (4.53)	28.1 (1.11)	7.5 (16.5)	5.9 (13)	9.4 (20.7)	7.8 (17.2)
	PN63	265 (10.43)	343 (13.5)	123.5 (4.86)	140 (5.51)	28.5 (1.12)	11 (24.3)	9.4 (20.7)	13.6 (30)	12 (26.5)
	PN100									
DN32	PN40	150 (5.91)	346 (13.62)	67 (2.64)	140 (5.51)	37.1 (1.46)	8.8 (19.4)	7.2 (15.9)	10.7 (23.6)	9.1 (20.1)
	PN63	265 (10.43)	341 (13.43)	124.5 (4.9)	155 (6.1)	36.6 (1.44)	12.3 (27.1)	10.7 (23.6)	14.9 (32.8)	13.3 (29.3)
	PN100									
DN40	PN40	200 (7.87)	350 (13.78)	79.5 (3.13)	150 (5.91)	42.1 (1.66)	9.7 (21.4)	8.1 (17.9)	11.6 (25.6)	10 (22)
	PN63	320 (12.6)	349 (13.74)	140 (5.51)	170 (6.69)	42.1 (1.66)	16.2 (35.7)	14.6 (32.2)	18.8 (41.4)	17.2 (37.9)
	PN100									
DN50	PN40	200 (7.87)	353 (13.9)	105 (4.13)	165 (6.5)	51.1 (2.01)	11.3 (24.9)	9.7 (21.4)	13.2 (29.1)	11.6 (25.6)
	PN63	305 (12.01)	353 (13.9)	158 (6.22)	180 (7.09)	54.5 (2.15)	17.8 (39.2)	16.2 (35.7)	20.4 (45)	18.8 (41.4)
	PN100	320 (12.6)	353 (13.9)	165 (6.5)	195 (7.68)	53.9 (2.12)	20.1 (44.3)	18.5 (40.8)	22.7 (50)	21.1 (46.5)
DN80	PN40	300 (11.81)	356 (14.02)	159 (6.26)	200 (7.87)	82.6 (3.25)	18.8 (41.4)	17.2 (37.9)	20.7 (45.6)	19.1 (42.1)
	PN63	425 (16.73)	357 (14.06)	224 (8.82)	215 (8.46)	81.7 (3.22)	25.1 (55.3)	23.5 (51.8)	27.7 (61.1)	26.1 (57.5)
	PN100	440 (17.32)	357 (14.06)	232 (9.13)	230 (9.06)	80.9 (3.19)	29.8 (65.7)	28.2 (62.2)	33.4 (73.6)	30.8 (67.9)

Tolerance for dimension L: DN 15 to 200 +0 / −3 mm (+0 / −0.12 in), DN 300 to 400 +0 / −5 mm (+0 / −0.20 in)

Table continued on next page

Dimensions with DN Flanges (approximate) in mm (inches) and kg (lbs) (continued)

Nominal Diameter	Pressure rating	L	G	A	D	d	Weight (Approx)			
							Integral		Remote	
							Stainless Steel	Aluminium	Stainless Steel	Aluminium
DN100	PN16	350 (13.78)	360 (14.17)	188 (7.4)	220 (8.66)	101.1 (3.98)	23.7 (52.2)	22.1 (48.7)	25.6 (56.4)	24 (52.9)
	PN40	350 (13.78)	360 (14.17)	188 (7.4)	235 (9.25)	101.1 (3.98)	26 (57.3)	24.4 (53.8)	27.9 (61.5)	26.3 (58)
	PN63	485 (19.09)	359 (14.13)	256 (10.08)	250 (9.84)	106.3 (4.19)	34.8 (76.7)	33.2 (73.2)	37.4 (82.5)	35.8 (78.9)
	PN100	510 (20.08)	359 (14.13)	268.5 (10.57)	265 (10.43)	104.3 (4.11)	40.1 (88.4)	38.5 (84.9)	42.7 (94.1)	41.1 (90.6)
DN150	PN16	480 (18.9)	384 (15.12)	330 (12.99)	285 (11.22)	150.1 (5.91)	42.5 (93.7)	40.9 (90.2)	44.4 (97.9)	42.8 (94.4)
	PN40	480 (18.9)	384 (15.12)	330 (12.99)	300 (11.81)	150.1 (5.91)	55 (121.3)	53.4 (117.7)	56.9 (125.4)	55.3 (121.9)
	PN63	655 (25.79)	384 (15.12)	410 (16.14)	345 (13.58)	157.1 (6.19)	83.6 (184.3)	82 (180.8)	86 (189.6)	84.6 (186.5)
	PN100	695 (27.36)	384 (15.12)	430 (16.93)	355 (13.98)	157.1 (6.19)	96.6 (213)	95 (209.4)	99.2 (218.7)	97.6 (215.2)
DN200	PN 16	600 (23.62)	404 (15.91)	438.5 (17.26)	340 (13.39)	203.1 (8.00)	52.4 (115.5)	50.8 (112)	54.4 (119.9)	52.8 (116.4)
	PN40	600 (23.62)	404 (15.91)	438.5 (17.26)	375 (14.76)	203.1 (8.00)	68.4 (150.8)	66.8 (147.3)	70.4 (155.2)	68.8 (151.7)
	PN63	810 (31.89)	404 (15.91)	519 (20.43)	415 (16.34)	204.9 (8.07)	110.6 (243.8)	109 (240.3)	113.2 (249.6)	111.6 (246)
	PN100	855 (33.66)	404 (15.91)	541 (21.3)	430 (16.93)	204.9 (8.07)	139.6 (307.8)	138 (304.2)	142.2 (313.5)	140.6 (310)
DN300	PN16	1000 (39.37)	450 (17.72)	662 (26.06)	460 (18.11)	309.7 (12.19)	188.4 (415.4)	186.8 (411.8)	190.4 (419.8)	188.8 (416.2)
	PN40	1000 (39.37)	450 (17.72)	662 (26.06)	515 (20.28)	309.7 (12.19)	210 (463)	208.4 (459.4)	212 (467.4)	210.4 (463.9)
DN400	PN16	1274 (50.16)	486 (19.13)	841 (33.11)	580 (22.83)	390.4 (15.37)	268.4 (591.7)	266.8 (588.2)	270.4 (596.1)	268.8 (592.6)
	PN40	1274 (50.16)	486 (19.13)	841 (33.11)	660 (25.98)	390.4 (15.37)	290 (639.3)	288.4 (635.8)	292 (643.7)	290.4 (640.2)

Tolerance for dimension L: DN 15 to 200 +0 / −3 mm (+0 / −0.12 in), DN 300 to 400 +0 / −5 mm (+0 / −0.20 in)

Dimensions with ASME Flanges (approximate) in mm (inches) and kg (lbs)

Nominal Diameter	Pressure rating	L	G	A	D	d	Weight (Approx)			
							Integral		Remote	
							ST/ Steel	Aluminium	ST/ Steel	Aluminium
½"	CL150	200 (7.87)	346 (13.62)	92.5 (3.64)	88.9 (3.50)	15.8 (0.62)	6.9 (15.2)	5.3 (11.7)	8.8 (7.2)	7.2 (15.9)
	CL300	200 (7.87)	346 (13.62)	92.5 (3.62)	95.2 (3.75)	15.8 (0.62)	7.3 (16.1)	5.7 (12.6)	9.2 (7.6)	7.6 (16.8)
	CL600	235 (9.25)	346 (13.62)	106 (4.17)	95.0 (3.74)	15.7 (0.62)	6.7 (14.8)	5.1 (11.2)	8.6 (7)	7 (15.4)
¾"	CL150	220 (8.66)	349 (13.74)	114.5 (4.51)	98.4 (3.87)	22.6 (0.89)	7.2 (15.9)	5.6 (12.3)	9.1 (7.5)	7.5 (16.5)
	CL300	230 (9.06)	349 (13.74)	119.5 (4.70)	117.5 (4.63)	22.6 (0.89)	8.2 (18.1)	6.6 (14.6)	10.1 (8.5)	8.5 (18.7)
	CL600	246 (9.69)	349 (13.7)	127.5 (5.02)	115 (4.53)	18.9 (0.74)	7.2 (15.9)	5.6 (12.3)	9.1 (7.5)	7.5 (16.5)
1"	CL150	150 (5.91)	348 (13.70)	66 (2.59)	108 (4.25)	28.1 (1.1)	7.2 (15.9)	5.6 (12.3)	9.1 (7.5)	7.5 (16.5)
	CL300	150 (5.91)	348 (13.70)	66 (2.59)	124 (4.88)	28.1 (1.1)	8.2 (18.1)	6.6 (14.6)	10.1 (8.5)	8.5 (18.7)
	CL600	285 (11.22)	348 (13.70)	134.2 (5.28)	124 (4.88)	24.3 (0.96)	7.7 (17)	6.1 (13.4)	9.6 (8)	8 (17.6)
1¼"	CL150	150 (5.91)	346 (13.62)	67 (2.64)	118 (4.65)	37.1 (1.46)	7.9 (17.4)	6.3 (13.9)	9.8 (8.2)	8.2 (18.1)
	CL300	150 (5.91)	346 (13.62)	67 2.64)	133 (5.24)	37.1 (1.46)	9.2 (20.3)	7.6 (16.8)	11.1 (9.5)	9.5 (20.9)
	CL600	290 (11.41)	346 (13.62)	137.7 (5.42)	133 (5.24)	32.5 (1.28)	8.2 (18.1)	6.6 (14.6)	10.1 (8.5)	8.5 (18.7)
1½"	CL150	200 (7.87)	350 (13.78)	79.5 (3.11)	127 (5.0)	42.1 (1.66)	8.7 (19.2)	7.1 (15.7)	10.6 (9)	9 (19.8)
	CL300	200 (7.87)	350 (13.78)	79.5 (3.11)	155.0 (6.10)	42.1 (1.66)	11.4 (25.1)	9.8 (21.6)	13.3 (11.7)	11.7 (25.8)
	CL600	345 (13.59)	350 (13.78)	152 (5.98)	155 (6.10)	38.1 (1.5)	11.9 (26.2)	10.3 (22.7)	13.8 (12.2)	12.2 (26.9)
2"	CL150	200 (7.87)	353 (13.89)	105 (4.13)	152.4 (6.0)	51.1 (2.01)	10.6 (23.4)	9 (19.8)	12.5 (10.9)	10.9 (24)
	CL300	200 (7.87)	353 (13.89)	105 (4.13)	165 (6.5)	51.1 (2.01)	13.1 (28.9)	11.5 (25.4)	15 (13.4)	13.4 (29.5)
	CL600	340 (13.58)	353 (13.89)	176 (6.93)	165 (6.5)	49.2 (1.94)	13.9 (30.6)	12.3 (27.1)	15.8 (14.2)	14.2 (31.3)
3"	CL150	300 (11.81)	356 (14.01)	159 (6.26)	190.5 (7.5)	82.6 (3.25)	18.5 (40.8)	16.9 (37.3)	20.4 (18.8)	18.8 (41.4)
	CL300	300 (11.81)	356 (14.01)	159 (6.26)	210 (8.27)	82.6 (3.25)	24 (52.9)	22.4 (49.4)	25.9 (24.3)	24.3 (53.6)
	CL600	460 (18.11)	356 (14.01)	243 (9.57)	210 (8.27)	73.7 (2.90)	22.6 (49.8)	21 (46.3)	24.5 (22.9)	22.9 (50.5)

Tolerance for dimension L: DN 15 to 200 +0 / −3 mm (+0 / −0.12 in), DN 300 to 400 +0 / −5 mm (+0 / −0.20 in)

Table continued on next page

Dimensions with ASME Flanges (approximate) in mm (inches) and kg (lbs) (continued)

Nominal Diameter	Pressure rating	L	G	A	D	d	Weight (Approx)			
							Integral		Remote	
							ST/ Steel	Aluminium	ST/ Steel	Aluminium
4"	CL150	350 (13.78)	360 (14.17)	188 (7.4)	230 (9.06)	101.1 (3.98)	25 (55.1)	23.4 (51.6)	26.9 (25.3)	25.3 (55.8)
	CL300	350 (13.78)	360 (14.17)	188 (7.4)	255 (10.04)	101.1 (3.98)	38 (83.8)	36.4 (80.2)	39.9 (38.3)	38.3 (84.4)
	CL600	545 (21.46)	360 (14.17)	287.5 (11.32)	273 (10.75)	97.2 (3.82)	36.2 (79.8)	34.6 (76.3)	38.1 (36.5)	36.5 (80.5)
6"	CL150	480 (18.9)	384 (15.12)	330 (12.99)	280 (11.02)	150.1 (5.91)	42.5 (93.7)	40.9 (90.2)	44.4 (42.3)	42.3 (93.3)
	CL300	480 (18.9)	384 (15.12)	330 (12.99)	320 (12.60)	150.1 (5.91)	66 (145.5)	64.4 (142)	67.9 (66.3)	66.3 (146.2)
	CL600	710 (27.95)	384 (15.12)	438.5 (17.26)	355 (13.98)	146.4 (5.76)	78.3 (172.6)	76.7 (169.1)	80.2 (78.6)	78.6 (173.3)
8"	CL150	600 (23.62)	404 (15.90)	438.5 (17.26)	343 (13.5)	203.1 (8.0)	47.4 (104.5)	45.8 (101)	49.3 (47.7)	47.7 (105.2)
	CL300	600 (23.62)	404 (15.90)	438.5 (17.26)	381 (15.0)	203.1 (8.0)	77.4 (170.6)	75.8 (167.1)	79.3 (77.7)	77.7 (171.3)
12"	CL150	1000 (39.37)	450 (17.71)	662 (26.1)	485 (19.09)	309.7 (12.19)	184.4 (406.5)	182.8 (403)	186.3 (184.7)	184.7 (407.2)
	CL300	1000 (39.37)	450 (17.71)	662 (26.1)	520 (20.47)	309.7 (12.19)	195 (429.9)	197 (434.3)	196.9 (198.9)	198.9 (438.5)
16"	CL150	1274 (50.16)	486 (19.13)	841 (33.1)	595 (23.43)	390.4 (15.37)	262.4 (578.5)	260.8 (575)	264.3 (262.7)	262.7 (579.2)
	CL300	1274 (50.16)	486 (19.13)	841 (33.1)	650 (25.59)	390.4 (15.37)	280 (617.3)	282 (621.7)	281.9 (283.9)	283.9 (625.9)

Tolerance for dimension L: DN 15 to 200 +0 / −3 mm (+0 / −0.12 in), DN 300 to 400 +0 / −5 mm (+0 / −0.20 in)

How to order

Selection:

Category	Description	Suffix Code	Example
Base Code	In-line multivariable mass flowmeter with integrated binary output, temperature compensation, and flow computer functionality.	SLM30-E	**SLM30-E**
Explosion Protection Certification	None (Safe area)	Y0	**Y0**
System Design	Integral Transmitter.	C1	**C1**
	Remote mount transmitter - 5 m (16") signal cable supplied.	R1	
Process connection type	Flange/DN15 (1/2")/DN15 (1/2")	F015R0	**F050R0**
	Flange/DN20 (3/4")/DN20 (3/4")	F020R0	
	Flange/DN25 (1")/DN25 (1")	F025R0	
	Flange/DN32 (1 1/4")/DN32 (1 1/4")	F032R0	
	Flange/DN40 (1 1/2")/DN40 (1 1/2")	F040R0	
	Flange/DN50 (2")/DN50 (2")	F050R0	
	Flange/DN80 (3")/DN80 (3")	F080R0	
	Flange/DN100 (4")/DN100 (4")	F100R0	
	Flange/DN150 (6")/DN150 (6")	F150R0	
	Flange/DN200 (8")/DN200 (8")	F200R0	
	Flange/DN300 (12")/DN300 (12")	F300R0	
	Flange/DN400 (16")/DN400 (16")	F400R0	
Pressure range [5]	PN16	D2	**D4**
	PN40	D4	
	PN63	D5	
	PN100	D6	
	ASME Class 150	A1	
	ASME Class 300	A3	
	ASME Class 600	A6	
Temperature Range of Measuring Medium [6]	Standard -55 °C up to +280 °C (-67 °F up to +536 °F)	A1	**A1**
Housing Material/ Cable gland threads	Aluminium / Metric M20 × 1.5 (2 places), cable glands mounted	A1	**A1**
	Aluminium / ½ inch NPT (2 places), cable glands not included.	B1	
	Stainless steel / Metric M20 × 1.5 (2 places), cable glands mounted	S1	
	Stainless steel / ½ inch NPT (2 places), cable glands not included	T1	

Notes:
5 PN16 only available with Process Connection Type / Meter Size / Connection Size code F100R0, F150R0, F200R0, F300R0, F400R PN63, PN100, CL600 not available with Process Connection Type / Meter Size / Connection Size code F300R0, F400R0
[6] Maximum temperature +280°C is for graphite gasket only, reduced to +260°C when PTFE gasket is fitted

'How to order' continued on next page

How to order (continued)

Selection:

Category	Description	Suffix Code	Example
Output Signal	HART Digital Communication, 4 to 20 mA and digital contact output	H5	**H5**
	MODBUS Communication with digital contact output	M4	
	Ethernet APL	A1	
Integrated digital display (LCD)	Display and Glass cover	L1	**L1**
	Integrated Smart HMI incl. Bluetooth and backlight option [7]	LE	
Piezo sensor sealing material	PTFE - Suitable for -55 °C to +260 °C (-4 °F to +500 °F)	SP0	**SP0**
	Graphite - Suitable for -55 °C to -55 °C to +280 °C (-67 °F to 536 °F)	SP2	
Ambient temperature range [8]	Extended -40 °C to +85 °C (-40 °F to 185 °F)	TA4	
Signal cable length (remote mount transmitter models only)	10m (32' Approx)	SC2	
	20m (64' Approx)	SC4	
	30m (96' Approx)	SC6	
Calibration type [9]	5 Point Calibration	R5	**R5**
Certification	Material monitoring with inspection certificate 3.1 acc. EN 10204	C2	**C2**
	Material monitoring NACE MR 01-75 with inspection certificate 3.1 acc. EN 10204	CN	
	Declaration of compliance with the order 2.1 acc. EN 10204	C4	
	Inspection certificate 3.1 acc. EN 10204 of visual, dimensional and functional test	C6	
	Inspection certificate 3.1 acc. EN 10204 of positive material identification PMI with material analysis	C5	
	Inspection certificate 3.1 acc. EN 10204 of positive material identification PMI	CA	
	Pressure test acc. to factory test plan	CB	
	Test package (pressure test, non-destructive test, welder an welding procedure certificate) only sizes DN200, DN300 and DN400	CT	
Pressure Equipment Directive	DN15-DN150: PED compliant, via SEP or Category III (CE marked). Code CP is mandatory D200-DN400 available with or without PED compliance. Code CP is not mandatory.	CP	**CP**
Documentation language	English	M5	**M5**
Ethernet APL communication protocol	Integrated Webserver, Mandatory for Ethernet APL Output Signal'	MGW	
Configuration/Type	Parameters set customer specific (standard): A calculation using the Product Selection Assistant tool is required with each order	NCC	**NCC**
Hardware options	Integral RTD temperature measurement (standard)	G1	**G1**
	Increased EMC protection (only available with HART, Output Signal option H5)	G4	
Operation mode	Energy Flow	N1	**N1**

Notes:

[7] LE: Compulsory for Ethernet APL output signal, optional for HART versions. MODBUS versions use 'L1', HMI only

[8] Standard temperature range is -20°C to 85°C. Reduced to 80°C for remote mount transmitter.

[9] 3 point calibration as standard.

How to order example:

1 off Spirax Sarco SLM30-E.Y0.C1.F050R0.D4.A1.A1.H5.L1.SP0.C2.M5.NCC.G1 in-line swirl flowmeter for installation between EN 1092 PN40 flanges.

TI-P736-01
EMM Issue 6

VLM30/VLM30 Food+
In-line Vortex Flowmeter

Description

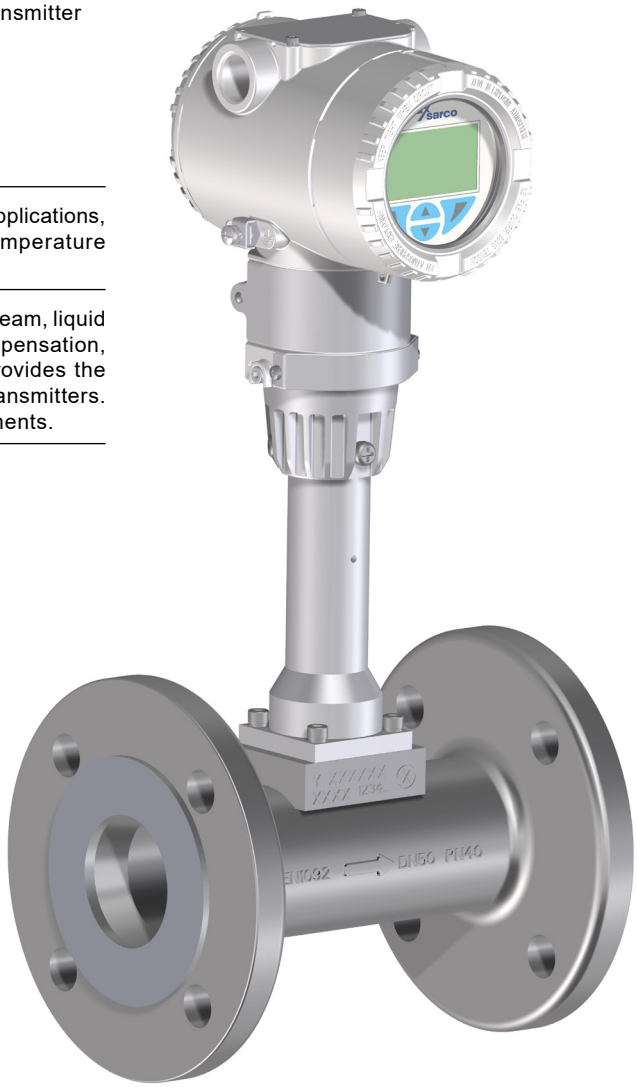
Vortex flowmeters measure the flow of liquid, gas and steam by detecting the frequency at which vortices are alternately shed from a bluff body. According to proven laws of physics, the frequency at which the vortices are alternately shed is directly proportional to the flow velocity.

In-line vortex flowmeters measure flow by detecting the local velocity at a strategically located position within the pipe. The VLM30 detects the frequency at which vortices are alternately shed from the bluff body located within the sensor head.

The VLM30 uses the local velocity, along with other parameters, such as fluid type, pipe size and Reynolds number to calculate the average pipe velocity, and consequently, the volumetric flowrate.

The VLM30 In-line Vortex Flowmeter utilises three primary sensing elements to measure the mass flowrate of steam, liquids and gases:

- Vortex shedding velocity sensor
- Internal RTD temperature sensor (std) or external temperature transmitter
- External pressure transducer (supplied separately)



VLM30 range

The **VLM30-S** vortex flowmeter for saturated steam, liquid and gas applications, with graphical display, optional binary output and integrated temperature measurement.

The **VLM30-E** vortex flowmeter for saturated steam, superheated steam, liquid and gas applications, with integrated binary output, temperature compensation, flow computer and energy calculation functionality. The VLM30-E provides the possibility to connect external temperature, pressure and density transmitters. Gas analyser outputs may also be integrated for enhanced measurements.

Compliance and approvals:

- EMC Directive IEC61326-1 2020
- PED Directive EN 12516-2:2014+A1:2021
- CRN: 0F24350.5C (CA)
- Food+ : EC1935.2004
- Food+ : FDA

Approvals

EMC
Electromagnetic compatibility of equipment for process and lab control technology 5/93 and EMC Directive 2004/108/EC (IEC61326-1 2020). Devices with HART communication are optionally available with EMC protection in accordance with NAMUR NE 21.

Food+ EC1935
DN15 to DN150 range available with a food contact regulation Declaration of Compliance.

Designed, manufactured and approved for Steam and Condensate applications, the VLM30 PTFE seat range Food+ product complies with:

- (EC)1935:2004 Materials and Articles Intended to come into Contact with Food.
- (EC)2023:2006 Good Manufacturing Practice for Materials and Articles Intended to come into Contact with Food.
- (EU)10/2011 Plastic Materials and Articles Intended to come into Contact with Food.

This product is intended to be connected into a system that can operate a food contact compliant process.

A list of the materials that could come directly or indirectly into contact with foodstuffs can be found in the Declaration of Compliance available for this product.

Food+ FDA
DN15 - DN300 :

- FDA Code of Federal Regulations - title 21 - Food and Drugs.

Caution: When selecting a vortex flow meter for steam flow measuring, care must be taken around the low flow velocity as this can cause instability in the flow measurement readings. Please ensure the appropriate flow meter size is selected via the sizing tool for the application.

Sizes and pipe connections
Flanged [1]
DN15, DN25, DN40, DN50, DN80, DN100, DN150, DN200 and DN300
Flanged EN 1092-1 PN16, PN40, PN63, PN100 connections
or
½", 1", 1½", 2", 3", 4", 6", 8", 10" and 12"
Flanged ASME B16.5 Class 150, 300 and 600 connections

Wafer type [2]
DN25, DN40, DN50, DN80, DN100 and DN150 suitable for fitting between EN 1092-1 PN40/PN63 flanges
or
1", 1½", 2", 3", 4" and 6" suitable for fitting between ASME B16.5 Class 300/600 flanges [2]

Notes:
[1] PN160/Class 900 available upon special request
[2] Class 600 or PN100 pressure rating available upon special request. Standard wafer unit is rated to PN63/Class 300.

Technical data

Wetted materials	**Meter Tube**	Stainless steel 1.4571 (AISI 316 Ti)/AISI 316L/CF8C/CF3M
	Sensor	Stainless steel 1.4571 (AISI 316 Ti)
	Sensor gasket *	PTFE O-ring/Graphite (optional for high temperature design)
Application	Any gas, liquid or steam compatible with stainless steel and other listed wetted materials. Not recommended for multi-phase fluids.	

* PTFE is the only available option for Food+ (EC1935/FDA).

Technical data (continued)

	Style connection	Rating
Pressure ratings	**Flanged** [1]	ASME Class 150
		ASME Class 300
		ASME Class 600
		EN 1092-1 PN16
		EN1092-1 PN40
		EN 1092-1 PN63
		EN 1092-1 PN100, DN25 - DN200 only
	Wafer [2]	For installing between 1" to 6" ASME Class 300/600 or DN15 to DN100 EN 1092-1 PN40/PN63/PN100 flanges

Notes:

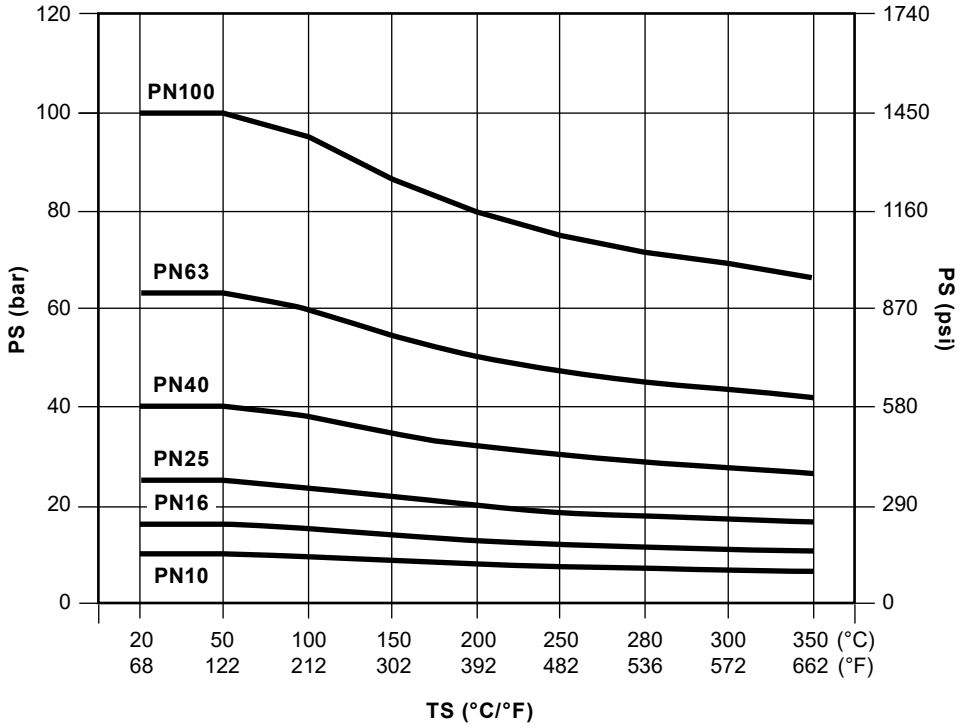
[1] PN160 Available upon special request
[2] Class 600 or PN100 pressure rating available upon special request. Standard wafer unit is rated to PN63/Class 300.

		Supply voltage	Power consumption
Power requirements	**Transmitter**	12 to 42 Vdc	N/A
	Devices with HART communication	12 to 24 Vdc	< 1 W
	Devices with Modbus communication	9 to 30 Vdc	< 1 W

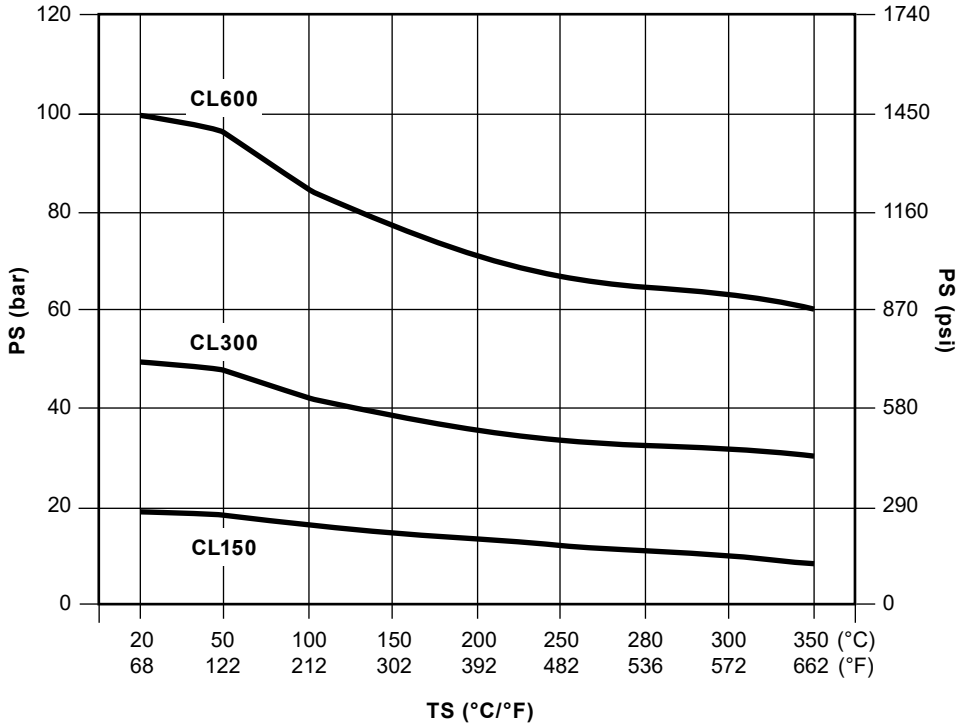
Display	**VLM30 - S**	Optional LCD indicator with four operating buttons for operation through front glass
	VLM30 - E	Standard LCD indicator with four operating buttons for operation through front glass
Output signal	**HART Digital Communication**	Support for HART communications up to the HART 7 protocol.
	ModBus Communication	Modbus RTU - RS485 serial connection (optional for ModBus)
	4 to 20 mA	Re-Transmission of flow or temperature
	Digital Contact Output (option for VLM30-S)	Optocoupler, 16 to 30 Vdc, max 20mA. User configurable as Frequency, Pulse or Binary output.
Input Signal	**4 to 20 mA**	For remote transmitter, e.g. for temperature, pressure, etc.
		16 to 30 Vdc, 3.8 to 20.5 mA
Cable Glands		Aluminium/M20 x 1.5 (2 Places)
		Aluminium/½" NPT (2 Places)

Pressure/temperature limits - VLM30

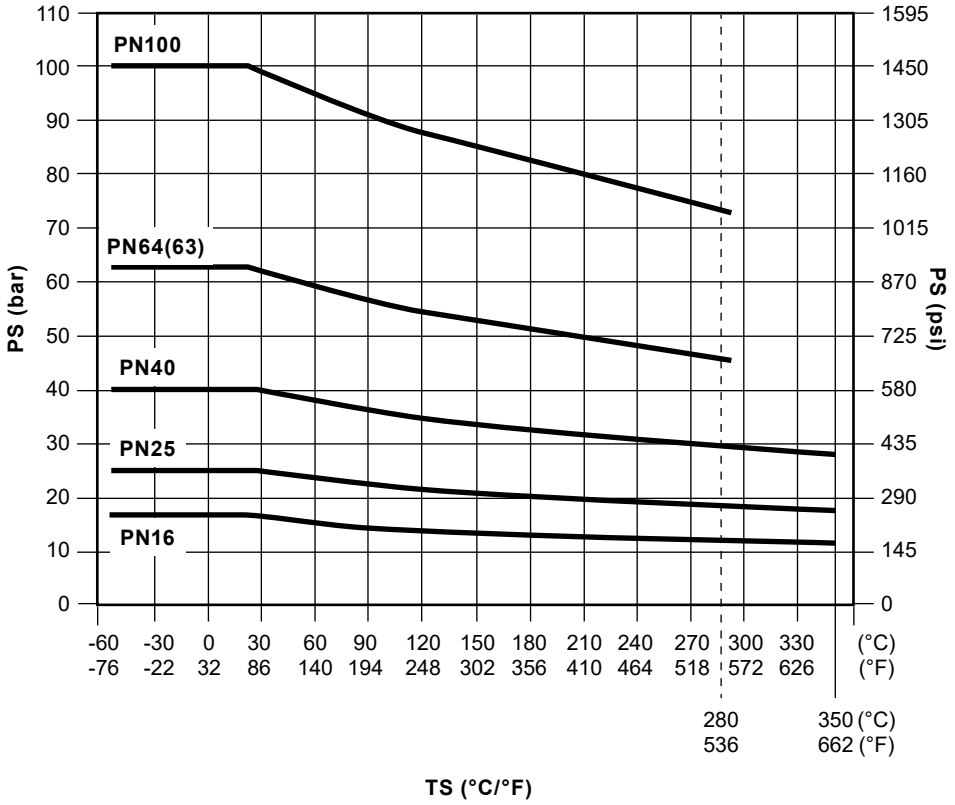
Flanged Devices - DIN Flange process connection



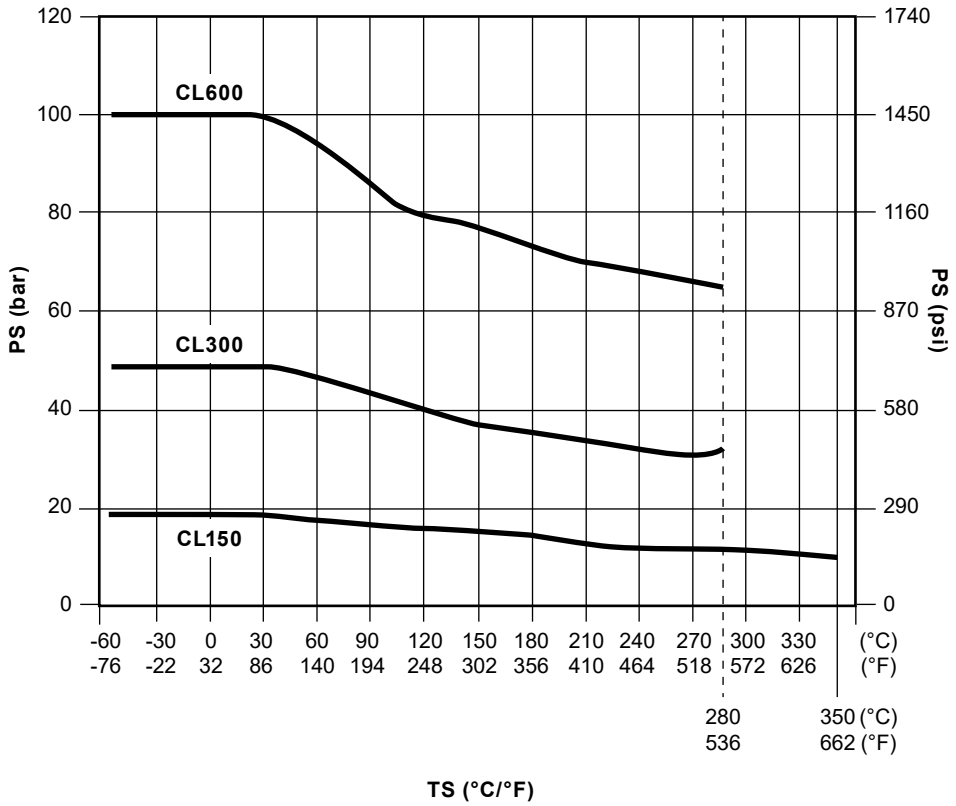
Flanged Devices - ASME Flange process connection



Wafer Type Devices - DIN Wafer type process connection



Wafer Type Devices - ASME Wafer type process connection



Body material: Stainless Steel

Body design conditions		Class 150	Class 300	Class 600
Minimum allowable temperature		-200 °C (-328 °F)		
Maximum process temperature		280 °C (536 °F)		
Minimum process temperature		-55 °C (-427 °F)		
Electronic ambient temperature range	Operating	-20 to +85 °C (-4 to +185 °F)		
	Storage	-40 to +85°C (-40 to +185 °F)		

Performance specifications

Under reference conditions

Accuracy	Mass flowrate accuracy for gas and steam based on 50 - 100% of pressure range			
Process variables	**Liquids**	**Gas and steam**	**Repeatability**	
			DN25-150 (1" - 6")	**DN200-300 (8" - 12")**
Mass flowrate	±0.75%	±0.90% of rate	0.2%	0.25%
Volumetric flowrate	±0.65% of rate	±0.90% of rate		
Temperature	±1C or 1% of measured value			
Response time	200 ms (1 tau) or 3/f in seconds (with deactivated damping, the respective greater value shall apply). The response time depends on the respective vortex frequency f. Low flow rates can result in higher response times.			

*** Indication of accuracy in % of the measured value (% of measured value)**

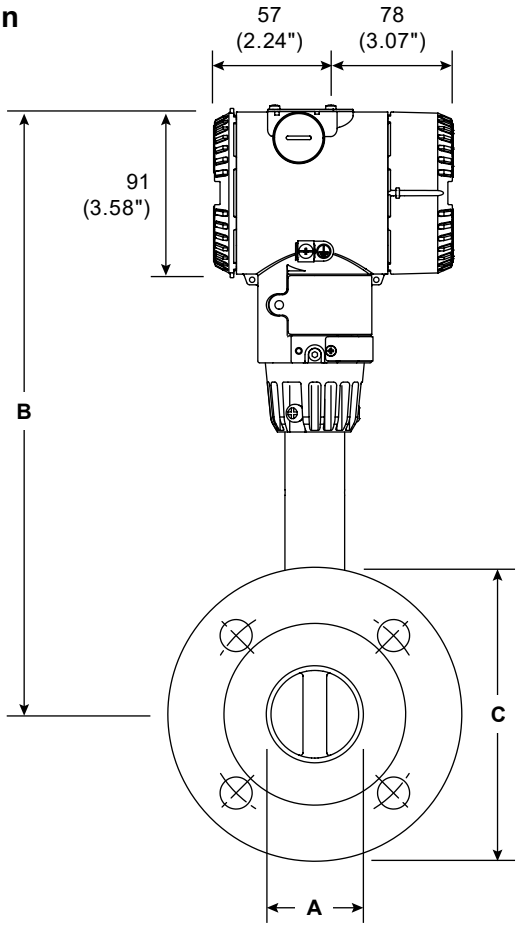
Measuring accuracy - Reference conditions

Flow measurement	
Set flow range	0.5 to 1 x Q_{vmax}DN
Ambient temperature	20 °C (68 °F) ±2 K
Relative humidity	65 %, ±5 %
Air Pressure	86 to 106 kPa (12.5 to 15.4 psi)
Power supply	24 Vdc
Signal cable length (for remote mount design)	30 m (98 ft)
Current output load	250 Ω (only 4 to 20 mA)
Measuring medium for calibration	Water, approx. 20 °C (68 °F), 2 bar (29 psi)
	Air, 960 mbar abs. ±50 mbar (14 psi a ±0.7 psi), 24 °C ±4 °C (75 °F ±7 °F)
Calibration loop internal diameter	corresponds to inside diameter of device
Unobstructed straight inlet section	15 x DN [3]
Outlet section	5 x DN [3]
Pressure measurement	3 x DN to 5 x DN behind the flowmeter

[3] Check IM-P736-04 for full installation guidance.

Dimensions (approximate) in mm (inches)

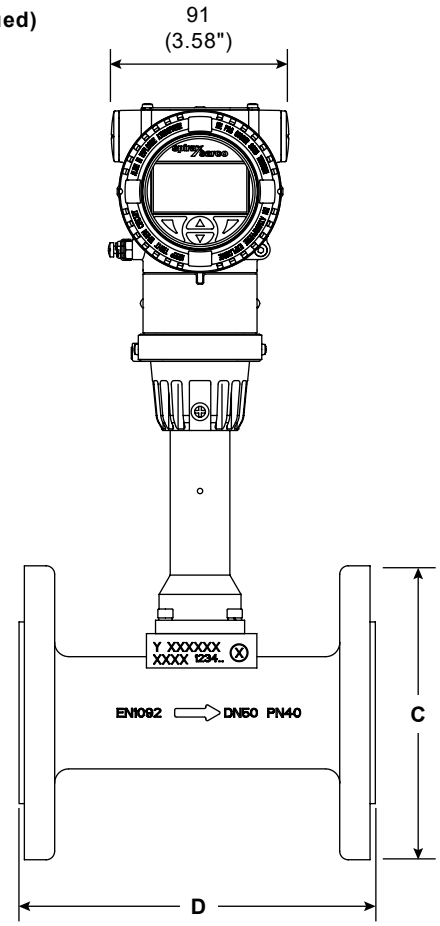
Flanged type connection



Connection	A	B	C Pressure rating EN1092-1					
EN1092-1	ASME		PN10	PN16	PN25	PN40	PN63	PN100
DN15	½"	342 (13.46)	95 (3.74)	95 (3.74)	95 (3.74)	105 (4.13)	105 (4.13)	105 (4.13)
DN25	1"	359 (14.13)	115 (4.53)	115 (4.53)	115 (4.53)	115 (4.53)	140 (5.51)	140 (5.51)
DN40	1½"	337 (13.27)	150 (5.91)	150 (5.91)	150 (5.91)	150 (5.91)	170 (6.69)	170 (6.69)
DN50	2"	334 (13.15)	165 (6.5)	165 (6.5)	165 (6.5)	165 (6.5)	180 (7.09)	195 (7.68)
DN80	3"	362 (14.25)	200 (7.87)	200 (7.87)	200 (7.87)	200 (7.87)	215 (8.46)	230 (9.06)
DN100	4"	371 (14.61)	220 (8.66)	220 (8.66)	235 (9.25)	235 (9.25)	250 (9.84)	265 (10.43)
DN150	6"	398 (15.67)	285 (11.22)	285 (11.22)	300 (11.81)	300 (11.81)	345 (12.56)	355 (13.98)
DN200	8"	460 (18.11)	340 (13.39)	340 (13.39)	360 (14.17)	375 (14.76)	415 (16.34)	
DN250	10"	485 (19.09)	395 (15.55)	405 (15.94)	425 (16.73)	450 (17.72)	470 (18.5)	
DN300	12"	510 (20.08)	445 (17.52)	460 (18.11)	485 (19.09)	515 (20.28)	530 (20.87)	

Dimensions (approximate) in mm (inches)

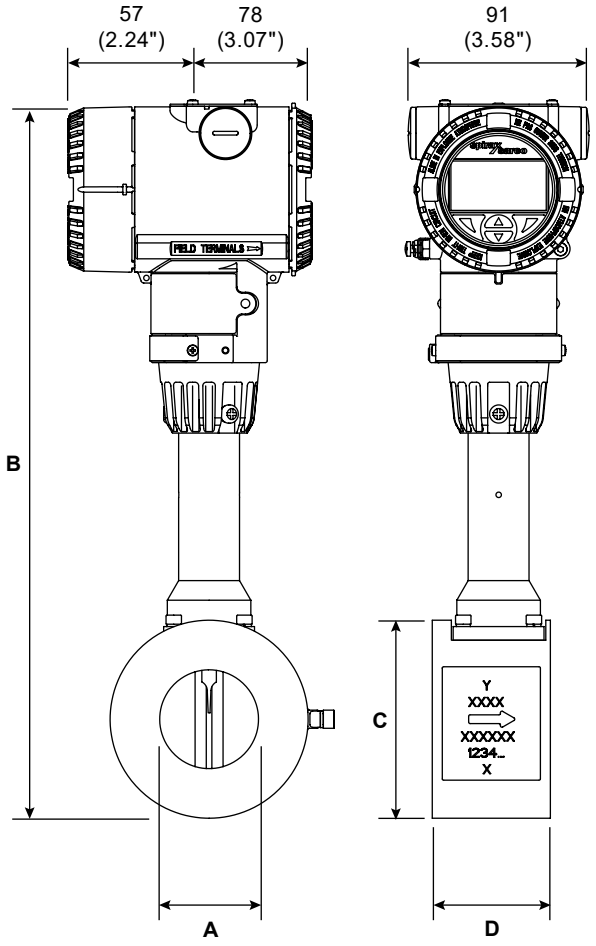
Flanged type connection (continued)



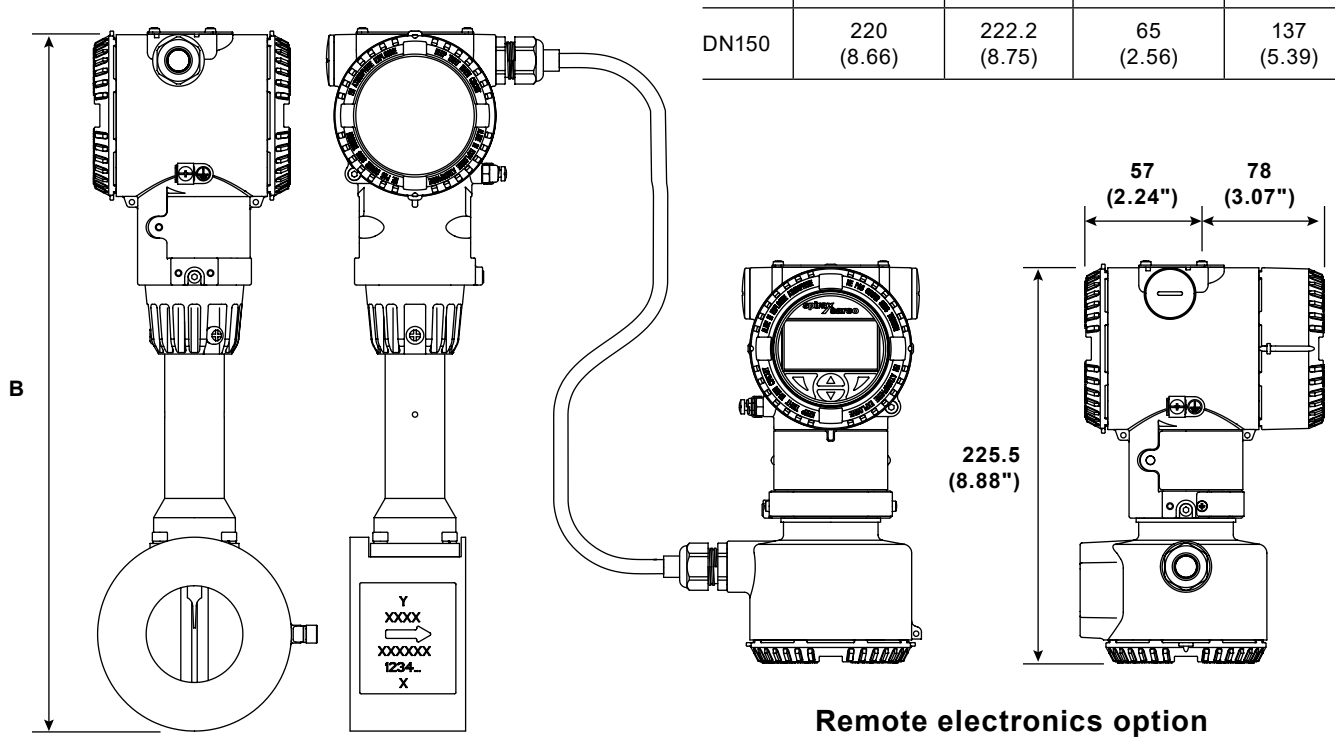
Connection	C Pressure rating ASME CLASS			D Pressure rating EN1092-1			 ASME CLASS		
EN1092-1	Class 150	Class 300	Class 600	PN 10-40	PN 63	PN 100	Class 150	Class 300	Class 600
DN25	108 (4.25)	124 (4.88)	124 (4.88)	200 (7.87)	210 (8.27)	210 (8.27)	200 (7.87)	200 (7.87)	200 (7.87)
DN40	127 (5)	155.6 (6.13)	155.6 (6.13)	200 (7.87)	220 (8.66)	220 (8.66)	200 (7.87)	200 (7.87)	235 (9.25)
DN50	152.4 (6)	165 (6.5)	165 (6.5)	200 (7.87)	220 (8.66)	230 (9.06)	200 (7.87)	200 (7.87)	240 (9.45)
DN80	190.5 (7.5)	209.5 (8.25)	209.5 (8.25)	200 (7.87)	250 (9.84)	260 (10.24)	200 (7.87)	200 (7.87)	265 (10.43)
DN100	228.6 (9)	254 (10)	273.1 (10.75)	250 (9.84)	270 (10.63)	300 (11.81)	250 (9.84)	250 (9.84)	315 (12.4)
DN150	279.4 (11)	317.5 (12.5)	355.6 (14)	300 (11.81)	330 (12.99)	370 (14.57)	300 (11.81)	300 (11.81)	365 (14.37)
DN200	343 (13.5)	381 (15)	419.1 (16.5)	350 (13.78)	370 (14.57)		350 (13.78)	370 (14.57)	415 (16.34)
DN250	406.4 (16)	444.5 (17.5)	508 (20)	450 (17.72)	450 (17.72)		450 (17.72)	450 (17.72)	470 (18.5)
DN300	482 (19)	520.7 (20.5)	558.8 (22)	500 (19.69)	500 (19.69)		500 (19.69)	500 (19.69)	580 (22.83)

Dimensions (approximate) in mm (inches)

Wafer type connection



	A		B	
	EN1092-1 PN16/40/63	ASME 150/300	EN1092-1 PN16/40/63	ASME 150/300
DN25	28.5 (1.12)	28.5 (1.12)	320 (12.60)	330 (12.99)
DN40	43 (1.69)	43 (1.69)	336 (13.23)	336 (13.23)
DN50	54.4 (2.14)	54.4 (2.14)	344 (13.15)	342 (13.46)
DN80	82.4 (3.24)	82.4 (3.24)	358 (14.09)	358 (14.09)
DN100	106.8 (4.20)	106.8 (4.20)	366 (13.23)	371 (14.61)
DN150	159.3 (6.27)	159.3 (6.27)	398 (15.67)	398 (15.67)
	C		D	
	EN1092-1 PN16/40/63	ASME 150/300	EN1092-1 PN16/40/63	ASME 150/300
DN25	73 (2.87)	70.5 (2.78)	65 (2.56)	112.5 (4.43)
DN40	94 (3.70)	89.5 (3.52)	65 (2.56)	113 (4.45)
DN50	109 (4.29)	106.5 (4.19)	65 (2.56)	112.5 (4.43)
DN80	144 (5.67)	138.5 (5.45)	65 (2.56)	111 (4.37)
DN100	164 (6.46)	176.5 (6.95)	65 (2.56)	116 (4.57)
DN150	220 (8.66)	222.2 (8.75)	65 (2.56)	137 (5.39)



Remote electronics option

Weights (approx) in kg (lbs)

EN1092-1	Wafer models		Flanged models								
	PN40/63	Class 150/300	PN10/16	PN25/40	PN63	PN100	PN160	ASME 150	ASME 300	ASME 600	ASME 900
DN15 ½"			4.5 (9.9)	4.5 (9.9)	5.4 (11.9)	5.4 (11.9)	5.4 (11.9)	5.0 (11)	5.1 (11.2)	5.2 (11.5)	7.9 (17.4)
DN25 1"	4.1 (9)	5.1 (11.2)	5.1 (11.2)	5.1 (11.2)	7.8 (17.2)	7.8 (17.2)		5.7 (12.6)	6.7 (14.8)	7.3 (16.1)	
DN40 1½"	4.8 (10.6)	6.1 (13.4)	6.6 (14.6)	6.6 (14.6)	10.1 (22.3)	10.1 (22.3)		8.5 (18.7)	10.9 (24)	12.1 (26.7)	
DN50 2"	5.6 (12.3)	8.4 (18.5)	8.7 (19.2)	8.7 (19.2)	12.2 (26.9)	15.1 (33.3)		10.1 (22.3)	11.7 (25.8)	13.6 (30)	
DN80 3"	7.6 (16.8)	11.2 (24.7)	13.1 (28.9)	13.1 (28.9)	17 (37.5)	21.4 (47.6)		17.6 (38.8)	21.7 (47.8)	25.8 (56.9)	
DN100 4"	8.5 (18.7)	17.2 (37.9)	14 (30.86)	17.8 (39.2)	24.1 (53.1)	32.2 (71)		20.1 (44.3)	28.8 (63.5)	41.4 (91.3)	
DN150 6"	13 (28.7)	25.7 (56.7)	25.4 (56)	33.6 (74.1)	53.8 (118.6)	70.4 (155.2)		32.8 (72.3)	49.8 (109.8)	81.6 (179.9)	
DN200 8"			45.3 (99.9)	66.3 (146.2)	93.1 (205.3)			51 (112.4)	77 (169.8)	106 (233.7)	
DN250 10"			67.4 (148.6)	106.4 (234.6)	135.6 (298.9)			77 (169.8)	106 (233.7)	156 (343.9)	
DN300 12"			77.2 (170.2)	123.2 (271.6)	170.6 (376.1)			95 (209)	143 (315.3)	196 (432.1)	

For remote electronics add 4.4 kg (9.7 lbs)

Water flowrates

Size			m^3/hr		US GPM	
			Minimum	Maximum	Minimum	Maximum
Nominal pipe size	15 mm	½"	0.5	7	2.2	31
	25 mm	1"	0.5	15	2.2	67
	40 mm	1 ½"	1.3	38	5.5	165
	50 mm	2"	2.1	63	9.2	276
	80 mm	3"	4.7	140	21	618
	100 mm	4"	8.1	244	36	1 075
	150 mm	6"	18	554	81	2 437
	200 mm	8"	32	970	142	4 270
	250 mm	10"	53	1 586	233	6 981
Stainless steel	300 mm	12"	77	2 303	338	10 139

Sizing considerations

	Straight run piping requirements [4]	Inlet Section	Outlet Section
Piping conditions	Straight pipe section	minimum 15 × DN	minimum 5 × DN
	Valve upstream of the meter tube	minimum 50 × DN	minimum 5 × DN
	Pipe reduction	minimum 15 × DN	minimum 5 × DN
	Pipe extension	minimum 18 × DN	minimum 5 × DN
	D = Internal diameter of the pipe - If there is not a sufficient straight run of pipe, a flow rectifier may be used to reduce the above diameter measurements. Consult your local Spirax Sarco representative or the factory for your specific application.		

[4] Check IM-P736-04 for full installation guidance.

How to order

Selection:

Category	Description	Suffix Code	Example
Base Model	In-line multivariable mass vortex flowmeter	VLM30-S	**VLM30-S**
	In-line multivariable mass vortex flowmeter with integrated binary output, temperature compensation, and flow computer functionality.	VLM30-E	
Explosion Protection Certification	None (Safe area)	Y0	**Y0**
System Design	Integral single sensor.	C1	**C1**
	Remote single sensor - 5 m (16 ft) signal cable supplied.	R1	
Process connection type	Wafer/DN25 (1")/DN25 (1")	W025R0	**F050R0**
	Wafer/DN40 (1½")/DN40 (1½")	W040R0	
	Wafer/DN50 (2")/DN50 (2")	W050R0	
	Wafer/DN80 (3")/DN80 (3")	W080R0	
	Wafer/DN100 (4")/DN100 (4")	W100R0	
	Wafer/DN150 (6")/DN150 (6")	W150R0	
	Flange/DN15 (½") / DN15 (½")	F015R0	
	Flange/DN25 (1")/DN25 (1")	F025R0	
	Flange/DN40 (1½")/DN40 (1½")	F040R0	
	Flange/DN50 (2")/DN50 (2")	F050R0	
	Flange/DN80 (3")/DN80 (3")	F080R0	
	Flange/DN100 (4")/DN100 (4")	F100R0	
	Flange/DN150 (6")/DN150 (6")	F150R0	
	Flange/DN200 (8")/DN200 (8") *	F200R0	
	Flange/DN250 (10")/DN250 (10") *	F250R0	
	Flange/DN300 (12")/DN300 (12") *	F300R0	

* Note this size is not available for EC1935 compliant products.

'How to order' continued on next page

How to order (continued)

Selection:

Category	Description	Suffix Code	Example
Pressure range [5]	PN10	D1	**D4**
	PN16	D2	
	PN25	D3	
	PN40	D4	
	PN63	D5	
	PN100	D6	
	ASME Class 150	A1	
	ASME Class 300	A3	
	ASME Class 600	A6	
Temperature Range of Measuring Medium	Standard -55 °C to +280 °C (-67 °F to +536 °F) [6]	A1	**A1**
Housing Material/ Cable gland threads	Aluminium/M20 x 1.5 (2 Places)	A1	**A1**
	Aluminium/½" NPT (2 Places)	B1	
Output Signal	HART Digital Communication and 4 to 20 mA	H1	**H1**
	HART Digital Communication, 4 to 20 mA and digital contact output	H5	
	MODBUS Communication with digital contact output	M4	
Integrated digital display (LCD)	Display and Glass cover	L1	**L1**
Piezo sensor sealing material	PTFE - Suitable for -55 °C to +260 °C (-67 °F to +500 °F)	SP0	**SP0**
	Graphite - Suitable for -55 °C to 350 °C (-67 °F to 662 °F)	SP2	

Notes:
[5] PN160/ASME Class 900 available on application. Please request if required.
[6] High Temperature Version expected Q4 2024.

13.1
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'How to order' continued on next page

How to order (continued)

Selection:

Category	Description	Suffix Code	Example
Ambient temperature range	Extended -40 °C to +85 °C (-40 °F to 185 °F)	TA4	
Signal cable length (Remote sensor models only)	10m (32 ft Approx)	SC2	
	20m (64 ft Approx)	SC4	
	30m (96 ft Approx)	SC6	
Calibration type	5 Point Calibration	R5	
Certification	Material monitoring with inspection cert. 3.1 Acc. to EN 10204.	C2	**C2**
	Declaration of compliance with the order 3.1 Acc. to EN 10204	C4	
	Inspection cert. 3.1 Acc to EN 10204 of postive material identification PMI with material analysis	C5	
	Inspection cert. 3.1 Acc to EN 10204 of visual, dimensional and functional test.	C6	
	Inspection cert. 3.1 Acc to EN 10204 of positive material indentification and PMI	CA	
	Pressure test Acc. To factory plan	CB	
	Declaration of Compliance for EC1935 [9]	CF	
	Material monitoring to NACE MR 01-75 with inspection cert. 3.1 ACC. to EN 10204 [7]	CN	
	Test package (pressure test, non-destructive test, welder and welding procedure cert)	CT	
Documentation language	English	M5	**M5**
Configuration/Setup	Basic setup for steam	NCS	**NC1**
	Full application factory set up	NCC	
	Standard setup for water	NC1	
Hardware options	Integral RTD [8]	G1	**G1**
Operation mode	Energy Flow (Only available for VLM30-S with Modbus output)	N1	**N1**

Notes:
[7] CN is not available when C2 is selected.
[8] Integral RTD - Option 'G1' is standard for all VLM30 versions.
[9] Food+ : EC1935.2004 Product size range DN50 - DN150.

How to order example:

1 off Spirax Sarco VLM30-S.Y0.C1.F050R0.D4.A1.A1.H1.L1.SP0.C2.M5.NC1.G1.N1 in-line vortex flowmeter for installation between EN 1092 PN40 flanges with energy measurement function.

TI-P339-04
EMM Issue 4

VLM20
In-line Vortex Flowmeter

Description

The VLM20 In-line Vortex Flowmeter utilises three primary sensing elements to measure the mass flowrate of steam, liquids and gases:

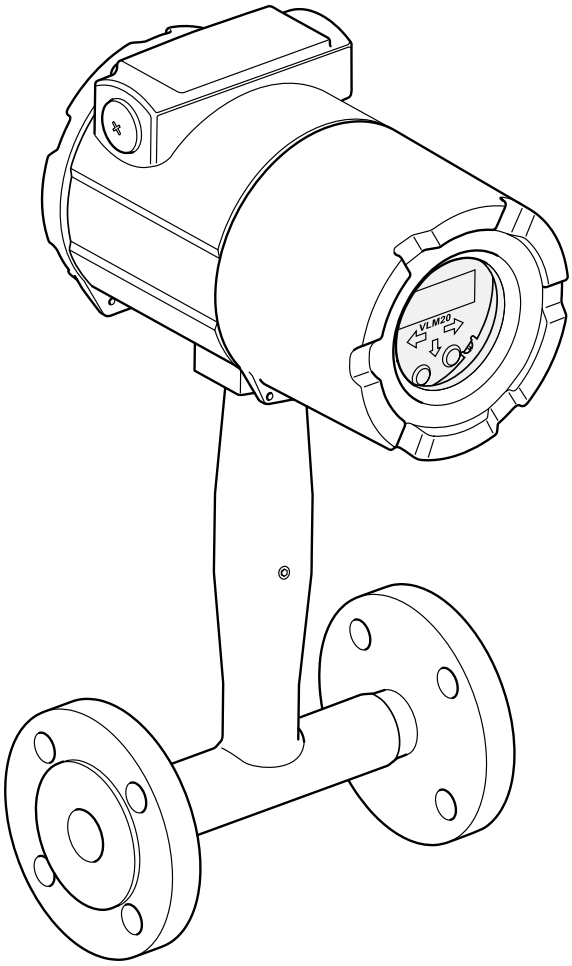
- Vortex shedding velocity sensor
- RTD temperature sensor
- Solid-state pressure transducer

Compliance

- Electromagnetic Compatibility Directive
- ATEX Directive
- Low Voltage Directive
- Pressure Equipment Directive

Principle of operation

Vortex flowmeters measure the flow of liquid, gas and steam by detecting the frequency at which vortices are alternately shed from a bluff body. According to proven laws of physics, the frequency at which the vortices are alternately shed is directly proportional to the flow velocity.
In-line vortex flowmeters measure flow by detecting the local velocity at a strategically located position within the pipe. The VLM20 detects the frequency at which vortices are alternately shed from the bluff body located within the sensor head.
The VLM20 uses the local velocity, along with other parameters, such as fluid type, pipe size and Reynolds number to calculate the average pipe velocity, and consequently, the volumetric flowrate.



VLM20 range and benefits

The **VLM20-V** delivers a direct reading of volumetric flowrate, generally the most cost-effective solution for liquid flow monitoring, in applications ranging from general water flows to hydrocarbon fuel flow measurement.

The **VLM20-VT** integrates a precision 1000 Ω platinum RTD temperature sensor that can be used to calculate and output a compensated mass reading. This device is typically used to measure flowrates of saturated steam.

The **VLM20-VTP** offers you flow computer functionality in a compact field device. This multivariable instrument incorporates temperature and pressure sensors to provide an instantaneous reading of the compensated mass flowrate of gases, liquids and steam. In addition to outputs for totalized mass and alarm settings, the field-configurable electronics deliver up to three analogue 4-20 mA outputs of five process measurements, including volumetric flowrate, mass flowrate, pressure, temperature and density.

The **VLM20-EM** Energy Monitoring option permits real-time calculation of energy consumption for a facility or process. The meter can be programmed to measure steam, hot water or chilled water. The VLM20-EM flowmeter monitors one side of the process, either sent or returned, and uses the input from a second separate temperature sensor on the opposite leg of the process to calculate the change in energy. Selectable energy units include BTU, joules, calories, Watt-hours, Megawatt-hours and Horsepower-hours. The local or remote electronics indicate two temperatures, delta T, mass total and energy total.

Approvals

"FM and FMC"	Class I, Division 1, Groups B, C and D	
	Class II/III, Division 1, Groups E, F and G	
	Type 4X and IP66, T6, Ta = -40 °C to +70 °C	
ATEX	S Temp.	II 2 G Ex db IIB + H2 T6...T2 Gb
		II 2 D Ex tb IIIB T85 °C Db
	H Temp.	II 2 G Ex db IIB + H2 85 °C...405 °C Gb
		II 2 D Ex tb IIIB T85°C Db
IECEx	Ex d IIB +H2 T6 Gb	
	EX tb IIIB T85°C Db, Ta= -40 °C to +60 °C	

Sizes and pipe connections

Flanged

DN15, DN20, DN25, DN40, DN50, DN80, DN100, DN150, DN200, DN250 and DN300
Flanged EN 1092-1 PN40 and PN100 connections
or
½", ¾", 1", 1½", 2", 3", 4", 6", 8", 10" and 12"
Flanged ASME 16.5 Class 150, 300 and 600 connections

Wafer type

DN15, DN20, DN25, DN40, DN50, DN80 and DN100 suitable for fitting between EN 1092-1 PN40 flanges
or
½", ¾", 1", 1½", 2", 3" and 4" suitable for fitting between ASME B16.5 Class 300 flanges

Technical data

Wetted materials			316L stainless steel, plus: • DuPont Teflon® based thread sealant on models with pressure transducer
Application			Any gas, liquid or steam compatible with 316L stainless steel and other listed wetted materials. Not recommended for multi-phase fluids
Temperature	**Process**		**S** option - **Standard** -200 °C to +260 °C (-330 °F to +500 °F) *Where ATEX is required the lower temperature is further limited to -40 °C (-40 °F).
			H option - **High** +260 °C to +400 °C (+500 °F to +750 °F)
Environmental	**Temperature**	**ambient**	**Operating** -40 °C to +60 °C (-40 °F to +140 °F)
			Storage -40 °C to +85 °C (-40 °F to +185 °F)
	LVD	Electrical Safety EN61010-1:2010	
		Overvoltage Category	II
		Pollution Degree	2
	EMC	Emissions	Group 1, Class A (Suitable for Industrial Environments only)
		Immunity	Suitable for Industrial Environments
	Enclosure	NEMA 4X, IP66	

Pressure transducer ratings

Full-scale operating pressue		Maximum over-range pressure	
2 bar a	30 psi a	4 bar a	60 psi a
7 bar a	100 psi a	14 bar a	200 psi a
20 bar a	300 psi a	41 bar a	600 psi a
34 bar a	500 psi a	64 bar a	1 000 psi a
100 bar a	1 500 psi a	175 bar a	2 500 psi a

Technical data (continued)

	Style connection	Rating
Pressure ratings	**Flanged**	ASME Class 150
		ASME Class 300
		ASME Class 600
		EN1092-1 PN40
		EN 1092-1 PN100, DN15 - DN200 only
	Wafer	For fitting between ASME Class 300 or EN1092-1 PN40 flanges

Power requirements	**DL** option - 12 to 36 Vdc, 25 mA, 1 W maximum, Loop powered (single output)	
	DH option - 12 to 36 Vdc, 300 mA, 9 W maximum, (multiple outputs)	
	AC option - 100 to 240 Vac, 50/60 Hz line power, 5 W maximum (multiple outputs)	
Display	Alphanumeric 2 line x 16 character LCD digital display	
	Six pushbuttons for full field configuration	
	Pushbuttons can be operated with magnetic wand without removal of the enclosure covers	
	Display can be mounted in 90 ° intervals for better viewing	
Output signals	**Analogue**	4 - 20 mA
	Alarm	Solid state relay, 40 Vdc
	Totalizer pulse	50 millisecond pulse, 40 Vdc
	Volumetric or Loop powered mass	One analogue, one totalizer pulse, HART®, scaled frequency output
	Multivariable option 1	Up to three analogue signals, three alarms, one totaliser pulse, HART®, scaled frequency output
	Multivariable option 2	Modus RTU or BACnet MS/TP compatible process monitoring
Conduit connections	**ATEX/IECEx/PED/FM/FMC version**	2 x M20 female ports
	FM/FMC version	2 x ¾" NPT female ports

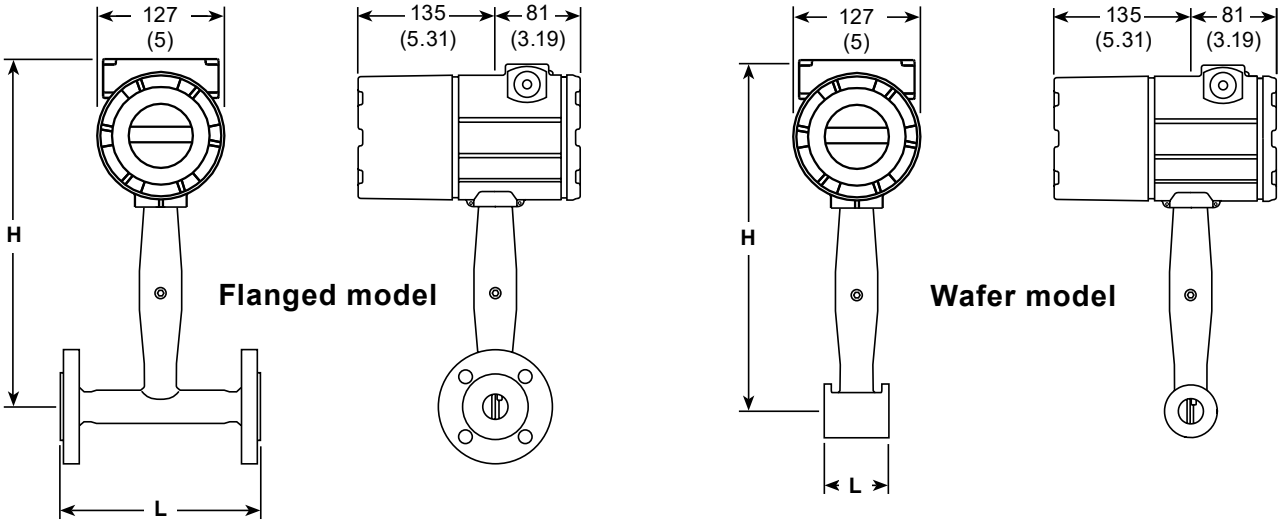
Performance specifications

Accuracy Mass flowrate accuracy for gas and steam based on 50 - 100% of pressure range

Process variables	Liquids	Gas and steam	Repeatability	Stability over 12 months
Mass flowrate	±1% of rate	±1.5% of rate	±0.2% of rate	± 0.2% of rate
Volumetric flowrate	±0.7% of rate	±1% of rate	±0.1% of rate	± Negligible
Temperature	±1 °C (±2 °F)	±1 °C (±2 °F)	±0.1 °C (±0.2 °F)	± 0.5 °C (± 0.9 °F)
Pressure	±0.3% of full-scale	±0.3% of full-scale	±0.05% of full-scale	± 0.1% of full-scale
Density	±0.3% of reading	±0.5% of reading	±0.1% of reading	± 0.1% of reading

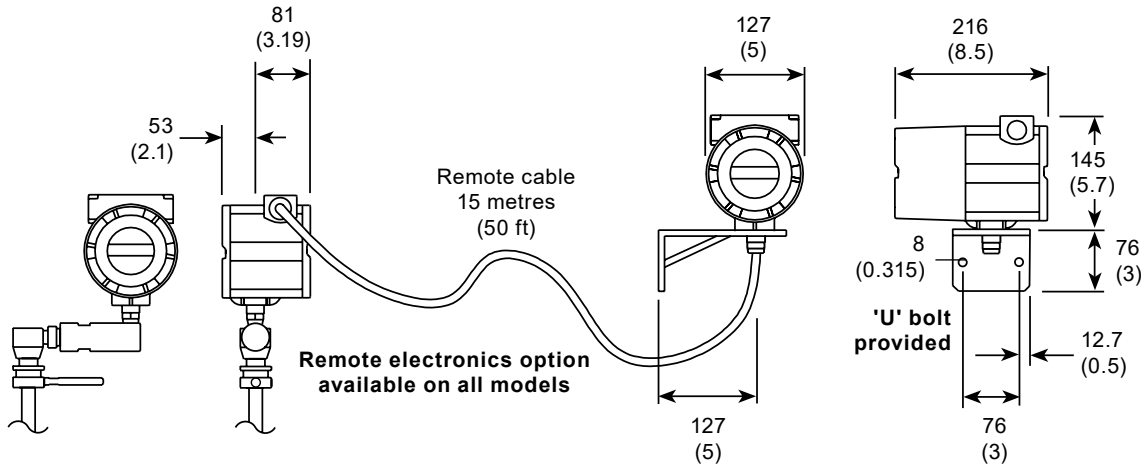
Response time Adjustable from 1 to 100 seconds

Dimensions (approximate) in mm (in)



		Flanged				Wafer			
		L		H		L		H	
Metric	Imperial	mm	inches	mm	inches	mm	inches	mm	inches
DN15	½"	200	7.9	343	13.5	65	2.56	343	13.5
DN20	¾"								
DN25	1"								
DN40	1½"			351	13.8			351	13.8
DN50	2"			356	14			356	14
DN80	3"			371	14.6			371	14.6
DN100	4"	250	9.84	384	15.1			384	15.1
DN150	6"	300	11.81	411	16.2				
DN200	8"			437	17.2				
DN250	10"	381	15	462	18.2				
DN300	12"	450	17.7	488	19.2				

Remote electronics option



Weights (approximate) in kg (lb)

		Flanged					Wafer	
Metric	**Imperial**	PN40	PN100	ASME 150	ASME 300	ASME 600	PN40	ASME 300
DN15	**½"**	6.0 (13.2)	6.9 (15.2)	5.4 (12.0)	5.9 (13.0)	6.4 (14.0)	4.2 (9.3)	9.2 (20.3)
DN20	**¾"**	6.8 (15.0)	8.6 (19.0)	6.0 (13.3)	6.9 (15.3)	7.4 (16.3)	4.3 (9.5)	9.5 (21.0)
DN25	**1"**	7.0 (15.4)	9.5 (21.0)	6.4 (14.0)	7.3 (16.0)	7.7 (17.0)	4.7 (10.4)	10.3 (22.7)
DN40	**1½"**	9.1 (20.1)	12.6 (27.8)	7.7 (17.0)	10.9 (24.0)	10.9 (24.0)	5.5 (12.1)	12.1 (26.7)
DN50	**2"**	10.9 (24.0)	16.0 (35.3)	10.0 (22.0)	11.8 (26.0)	12.7 (28.0)	6.4 (14.1)	14.1 (31.1)
DN80	**3"**	16.4 (36.2)	23.1 (51.0)	15.4 (33.9)	19.0 (41.9)	20.8 (45.9)	8.5 (18.7)	18.7 (41.2)
DN100	**4"**	22.3 (49.2)	33.1 (73.0)	21.9 (48.2)	31.4 (69.2)	40.0 (88.2)	10.6 (23.3)	23.4 (51.6)
DN150	**6"**	39.9 (88.0)	66.3 (146.2)	34.1 (75.1)	51.3 (113.1)	91.2 (201.1)		
DN200	**8"**	64.4 (142.0)	113.6 (250.4)	53.2 (117.3)	78.6 (173.3)	115.8 (255.3)		
DN250	**10"**	105.7 (233.0)		53.6 (118.1)	118.9 (262.1)	209.6 (462.1)		
DN300	**12"**	161.0 (355.0)		135.5 (298.7)	182.7 (402.7)	275.2 (606.7)		

Please note: Add 11 lb (5 kg) if the unit has remote electronics.

Typical Metric flowrates

Saturated steam (kg/h)

Pressure		Nominal pipe size										
		15 mm	20 mm	25 mm	40 mm	50 mm	80 mm	100 mm	150 mm	200 mm	250 mm	300 mm
0 bar g	Min.	3	5	8	19	32	72	126	286	500	786	1 113
	Max.	18	42	91	224	375	838	1 459	3 309	5 797	9 116	12 898
5 bar g	Min.	6	11	18	45	75	167	290	658	1 153	1 813	2 565
	Max.	95	224	485	1 192	1 992	4 455	7 754	17 581	30 799	48 434	68 530
10 bar g	Min.	8	15	24	59	99	222	387	877	1 537	2 417	3 419
	Max.	168	397	862	2 118	3 539	7 915	13 777	31 237	54 720	86 053	121 758
15 bar g	Min.	9	17	29	71	119	266	463	1 050	1 840	2 893	4 094
	Max.	241	569	1 236	3 036	5 073	11 347	19 750	44 779	78 444	123 360	174 543
20 bar g	Min.	11	20	33	81	136	304	529	1 199	2 100	3 303	4 673
	Max.	314	742	1 610	3 956	6 611	14 787	25 738	58 355	102 226	160 761	227 463
30 bar g	Min.	13	24	40	99	165	369	642	1 455	2 548	4 007	5 669
	Max.	463	1 092	2 370	5 822	9 729	21 763	37 880	85 884	150 451	236 599	334 766

Air (nm³/h) at 20 °C

Pressure		Nominal pipe size										
		15 mm	20 mm	25 mm	40 mm	50 mm	80 mm	100 mm	150 mm	200 mm	250 mm	300 mm
0 bar g	Min.	3	5	9	21	36	79	138	313	549	863	1 221
	Max.	28	66	142	350	584	1 307	2 275	5 157	9 034	14 207	20 102
5 bar g	Min.	7	13	21	52	87	194	337	764	1 339	2 105	2 979
	Max.	165	390	847	2 080	3 476	7 775	13 533	30 682	53 749	84 525	119 596
10 bar g	Min.	9	17	29	70	117	262	457	1 035	1 814	2 853	4 036
	Max.	304	716	1 554	3 819	6 381	14 273	24 844	56 329	98 676	155 178	219 563
15 bar g	Min.	11	21	34	85	142	317	551	1 250	2 190	3 444	4 873
	Max.	442	1 044	2 265	5 565	9 299	20 801	36 205	82 087	143 801	297 386	319 968
20 bar g	Min.	13	24	40	97	162	363	632	1 434	2 511	3 949	5 588
	Max.	582	1 373	2 979	7 318	12 229	27 354	47 612	107 949	189 105	297 386	420 775
30 bar g	Min.	16	29	48	118	198	442	770	1 745	3 057	4 807	6 801
	Max.	862	2 034	4 414	10 843	18 119	40 529	70 544	159 942	280 187	440 621	623 439

Typical Imperial flowrates

Saturated steam (lb/h)

Pressure		Nominal pipe size										
		½"	¾"	1"	1½"	2"	3"	4"	6"	8"	10"	12"
5 psi g	Min.	6.5	12	20	49	82	183	318	722	1 264	1 988	2 813
	Max.	52	122	265	650	1 087	2 431	4 231	9 594	16 806	26 429	37 395
100 psi g	Min.	15	27	46	112	187	419	728	1 652	2 893	4 550	6 438
	Max.	271	639	1 386	3 405	5 690	12 729	22 156	50 233	87 998	138 386	195 803
200 psi g	Min.	20	37	62	151	253	565	983	2 229	3 905	6 141	8 689
	Max.	493	1 163	2 525	6 203	10 365	23 184	40 354	91 494	160 279	252 055	356 635
300 psi g	Min.	24	45	74	182	304	680	1 184	2 685	4704	7 397	10 466
	Max.	716	1 688	3 664	9 000	15 040	33 642	58 556	132 763	232 575	365 747	517 499
400 psi g	Min.	28	51	85	209	349	780	1 358	3 079	5 393	8 481	12 000
	Max.	941	2 220	4 816	11 831	19 770	44 222	76 971	174 516	305 717	480 771	680 247
500 psi g	Min.	31	57	95	233	389	870	1 514	3 433	6 014	9 457	13 381
	Max.	1 170	2 760	5 988	14 711	24 582	54 987	95 710	217 001	380 148	597 812	845 850

Air (SCFM) at 70 °F

Pressure		Nominal pipe size										
		½"	¾"	1"	1½"	2"	3"	4"	6"	8"	10"	12"
5 psi g	Min.	1.8	3	5	13	22	50	87	198	347	546	773
	Max.	18	41	90	221	369	826	1 437	3 258	5 708	8 976	12 701
100 psi g	Min.	5	9	15	38	63	141	245	555	972	1 529	2 163
	Max.	138	325	704	1 730	2 890	6 466	11 254	25 515	44 698	70 292	99 456
200 psi g	Min.	7	13	21	52	86	193	335	761	1 332	2 059	2 965
	Max.	258	609	1 322	3 248	5 427	12 140	21 131	47 911	83 931	131 895	186 752
300 psi g	Min.	8	15	25	63	104	234	407	922	1 615	2 540	3 594
	Max.	380	896	1 944	4 775	7 978	17 847	31 064	70 431	123 375	19 025	274 529
400 psi g	Min.	10	18	29	72	120	269	467	1 060	1 857	2 920	4 132
	Max.	502	1 183	2 568	6 309	10 542	23 580	41 043	93 057	163 000	256 358	362 724
500 psi g	Min.	11	20	33	80	134	300	521	1 182	2 071	3 257	4 608
	Max.	624	1 472	3 195	7 849	13 115	28 034	51 063	115 775	203 000	318 941	451 272

Water flowrates

Size		m^3/hr		GPM	
		Minimum	Maximum	Minimum	Maximum
Nominal pipe size	DN15 ½"	0.23	5.0	1.0	22.0
	DN20 ¾"	0.30	9.1	1.3	40.0
	DN25 1"	0.50	15.0	2.2	67.0
	DN40 1½"	1.30	38.0	5.5	166.0
	DN50 2"	2.10	63.0	9.2	273.0
	DN80 3"	4.70	140.0	21.0	618.0
	DN100 4"	8.10	244.0	36.0	1076.0
	DN150 6"	18.00	554.0	81.0	2437.0
	DN200 8"	32.00	970.0	142.0	4270.0
	DN250 10"	51.00	1525.0	224.0	6715.0
	DN300 12"	72.00	2158.0	317.0	9501.0

Sizing considerations

	Straight run piping requirements	Upstream	Downstream
Piping conditions	One 90 ° elbow before the flowmeter	10 D	5 D
	Two 90 ° elbows before the flowmeter	15 D	5 D
	Two 90 ° elbows out of plane before the flowmeter	25 D	5 D
	Reduction before the flowmeter	10 D	5 D
	Expansion before the flowmeter	20 D	5 D
	Partially open valve	25 D	5 D

D = Internal diameter of the pipe - If there is not a sufficient straight run of pipe, a flow rectifier may be used to reduce the above diameter measurements.
Consult your local Spirax Sarco representative or the factory for your specific application.

Velocity range	Liquid	Maximum	9 metres/second	(30 feet/second)
		Minimum	0.3 metres/second	(1 feet/second)
	Gas or steam	Maximum	90 metres/second	(300 feet/second)
		Minimum	$\frac{6.1}{\sqrt{\text{density}\left(\frac{kg}{m^3}\right)}}$	$\frac{5}{\sqrt{\text{density}\left(\frac{lb}{ft^3}\right)}}$

How to order

Selection:

Category	Description		Suffix Code	Grey = Standard
Flowmeter	In-line multivariable mass vortex flowmeter		**VLM20**	**VLM20 -**
Electronics * Not available with loop powered option	Volumetric flowmeter for liquid		**V**	**V**
	Velocity and temperature sensors		**VT**	
	Velocity, temperature and pressure sensors		**VTP**	
	Velocity, temperature and external 4 - 20 mA input (T or P)		**VTEP**	
	Velocity, external RTD temperature input, external 4 - 20 mA input (T or P)		**VETEP**	
	Energy output option		**VTEM**	
	Energy output options with pressure sensor		**VTPEM**	
	Energy output options, temperature and external 4 - 20 mA input (T or P)		**VTEPEM**	
	Energy output options external RTD temperature input, external 4 - 20 mA input (T or P) *		**VETEPEM**	
Body size and type	DN15 ½" Nominal Bore	DN15 or DN20 connections are not available with body material in carbon steel	**04**	**24**
	DN20 ¾" Nominal Bore		**06**	
	DN25 1" Nominal Bore		**08**	
	DN40 1½" Nominal Bore		**12**	
	DN50 2" Nominal Bore		**16**	
	DN80 3" Nominal Bore		**24**	
	DN100 4" Nominal Bore		**32**	
	DN150 6" Nominal Bore		**48**	
	DN200 8" Nominal Bore		**64**	
	DN250 10" Nominal Bore		**80**	
	DN300 12" Nominal Bore		**96**	
Body material	Stainless steel 316L		**S**	**S**
	Carbon steel A105 - Not available if DN15 or DN20 connections are required		**C**	
Connection	Flanged	ASME Class 150	**150**	**40**
		ASME Class 300	**300**	
		ASME Class 600	**600**	
		EN 1092-1 PN40	**40**	
		EN 1092-1 PN100, DN15 - DN200 only	**100**	
	Wafer	For fitting between ASME Class 300 or EN 1092-1 PN40 flanges	**W**	
Electronics enclosure mounting	Local mount NEMA 4X, IP66 enclosure		**L**	**L**
	Remote electronics	Remote electronics NEMA 4X, IP66 25' cable with display	**R25**	
		25' (7.6 m) Armored cable with glands V meter only	**A25**	
		25' (7.6 m) Armored cable with glands VT, VTP meter only	**A25P**	
		Remote electronics NEMA 4X, IP66 50' cable with display	**R50**	
		50' (15.2 m) Armored cable with glands V meter only	**A50**	
		50' (15.2 m) Armored cable with glands VT, VTP meter only	**A50P**	

'How to order' continued on next page

How to order (continued)

Selection:

Category	Description		Suffix Code	Grey = Standard
Display option	Digital display		**D**	**D**
Power supply	12 - 36 Vdc, 25 mA, 1 W max. required on loop powered meters, 1HL only		**DL**	**DL**
	12 - 36 Vdc, 300 mA, 9 W max.	These options are for use with: 1H, 1M, 1B, 3H, 3M, 3B Output/Comms	**DH**	
	100 - 240 Vac, 50/60 Hz line power, 5 W max.		**AC**	
Output signal	Loop powered	One analogue output (4 - 20 mA), one pulse, HART® DL input power only	**1HL**	**1HL**
	One analogue output	4 - 20 mA, one alarm, one pulse, HART® DH or AC option only	**1H**	
		4 - 20 mA, one alarm, one pulse, MODBUS RTU DH or AC option only	**1M**	
		4 - 20 mA, one alarm, one pulse, BACnet MS/TP DH or AC option only	**1B**	
	Three analogue output	4 - 20 mA, three alarms, one pulse, HART® (VT, VTP only)	**3H**	
		4 - 20 mA, three alarms, one pulse, MODBUS RTU (VT, VTP only)	**3M**	
		4 - 20 mA, three alarms, one pulse, BACnet MS/TP (VT, VTP only)	**3B**	
Process temperature	Standard temperature -200 °C to +260 °C (-330 °F to +500 °F) *Where ATEX is required the lower temperature is limited to -40 °C (-40 °F)		**S**	**S**
	High temperature +260 °C to +400 °C (+500 °F to +750 °F)		**H**	
Pressure sensor	No pressure sensor		**P0**	**P0**
	Maximum 2 bar a (30 psi a), Proof 4 bar a (60 psi a)		**P1**	
	Maximum 7 bar a (100 psi a), Proof 14 bar a (200 psi a)		**P2**	
	Maximum 20 bar a (300 psi a), Proof 41 bar a (600 psi a)		**P3**	
	Maximum 34 bar a (500 psi a), Proof 64 bar a (1 000 psi a)		**P4**	
	Maximum 100 bar a (1 500 psi a), Proof 175 bar a (2 500 psi a)		**P5**	
Approvals	FM/FMC not CE marked		**S**	**A**
	PED and CE marked		**C**	
	ATEX/IECEx/PED and CE marked		**A**	
Face-to-face dimensions	Standard dimensions		**1**	**1**
	Supplied for retrofitting into the space left by either a PhD or VLM10 flowmeter		**2**	

Selection example: VLM20 - V - 24 - S - 40 - L - D - DL - 1HL - S - P0 - A - 1

How to order example:

1 off Spirax Sarco VLM20-V-24-S-40-L-D-DL-1HL-S-P0-A-1 in-line vortex flowmeter for installation between EN 1092 PN40 flanges.

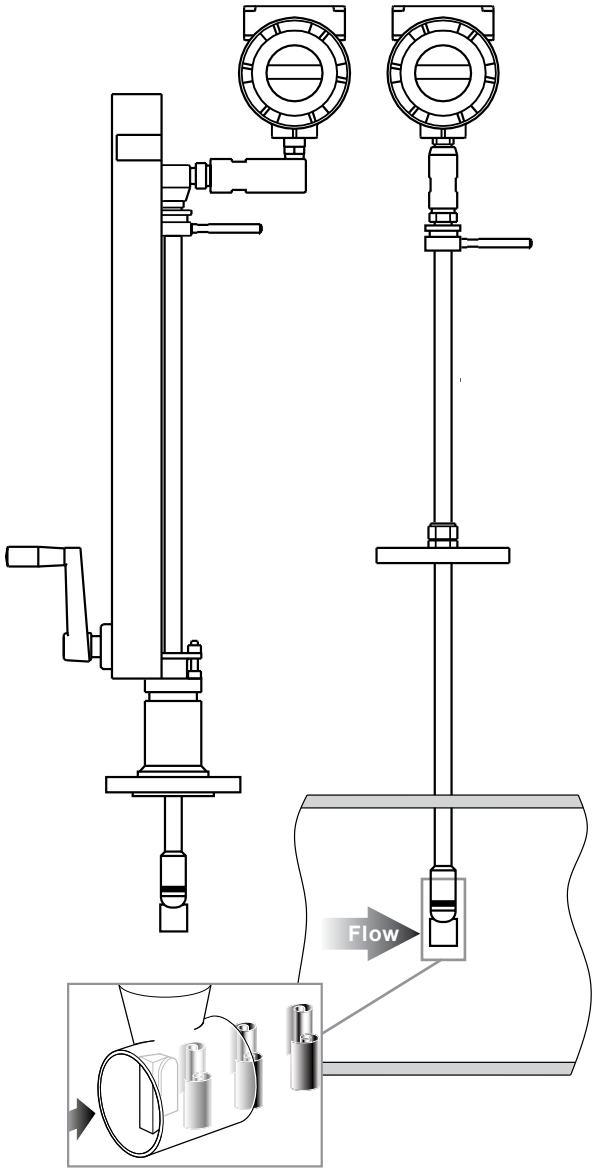
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CMGT Issue 5

VIM20
Vortex Insertion Flowmeter

Description

The VIM20 Vortex Insertion Flowmeter utilises **three primary sensing elements** to measure the mass flowrate of steam, liquids and gases:

- Vortex shedding velocity sensor
- RTD temperature sensor
- Solid-state pressure transducer



Principle of operation

Vortex flowmeters measure the flow of liquid, gas and steam by detecting the frequency at which vortices are alternately shed from a bluff body. According to proven laws of physics, the frequency at which the vortices are alternately shed is directly proportional to the flow velocity.
Insertion vortex flowmeters measure flow by detecting the local velocity at a strategically located position within the pipe. The VIM20 detects the frequency at which vortices are alternately shed from the bluff body located within the sensor head.
The VIM20 uses the local velocity, along with other parameters, such as fluid type, pipe size and Reynolds number to calculate the average pipe velocity, and consequently, the volumetric flowrate.

VIM20 range and benefits

The **VIM20-V** delivers a direct reading of volumetric flowrate, generally the most cost-effective solution for liquid flow monitoring, in applications ranging from general water flows to hydrocarbon fuel flow measurement.

The **VIM20-VT** integrates a precision 1000 Ω platinum RTD temperature sensor that can be used to calculate and output a compensated mass reading. This device is typically used to measure flowrates of saturated steam.

The **VIM20-VTP** offers you flow computer functionality in a compact field device. This multivariable instrument incorporates temperature and pressure sensors to provide an instantaneous reading of the compensated mass flowrate of gases, liquids and steam. In addition to outputs for totalized mass and alarm settings, the field-configurable electronics deliver up to three analogue 4 - 20 mA outputs of five process measurements, including volumetric flowrate, mass flowrate, pressure, temperature and density.

The **VIM20-EM** Energy Monitoring option permits real-time calculation of energy consumption for a facility or process. The flowmeter can be programmed to measure steam, hot water or chilled water. The VIM20-VTP-EM flowmeter monitors one side of the process, either sent or returned, and uses the input from a second separate temperature sensor on the opposite leg of the process to calculate the change in energy. Selectable energy units include BTUs, joules, calories, Watt-hours, Megawatt-hours and Horsepower-hours. The local or remote electronics indicate two temperatures, delta T, mass total and energy total.

Compliance

- Electromagnetic Compatibility Directive
- Low Voltage Directive

Approvals

FM and FMC	Class I, Division 1, Groups B, C and D
	Class II / III, Division 1, Groups E, F and G
	Type 4X and IP66, T6, Ta = - 40 °C to + 70 °C

Sizes

Insertion style mounting permits installation in any pipe DN50 (2") and greater.

Technical data

Wetted materials			316L stainless steel, plus: - DuPont Teflon® based thread sealant on models with pressure transducer - DuPont Teflon® packing on standard temperature models with packing gland - Graphite based packing on high temperature models with packing gland
Application			Any gas, liquid or steam compatible with 316L stainless steel and other listed wetted materials. Not recommended for multi-phase fluids
Temperature	**Process**		**S** option - **Standard** -200 °C to +260 °C (-330 to +500 °F) **H** option - **High** +260 °C to +400 °C (+500 °F to +750 °F) *The permissible temperatures may be further limited where explosion proof approvals are required
Environmental	**Temperature**	**Ambient**	**Operating** -40 °C to +60 °C (-40 °F to +140 °F) **Storage** -40 °C to +85 °C (-40 °F to +185 °F)
	LVD	Electrical Safety EN61010-1:2010	
		Overvoltage Category	II
		Pollution Degree	2
	EMC	Emissions	Group 1, Class A (Suitable for Industrial Environments only)
		Immunity	Suitable for Industrial Environments
	Enclosure	NEMA 4X, IP66	

Pressure transducer ratings	**Full-scale operating pressure**		**Maximum over-range pressure**	
	2 bar a	30 psi a	4 bar a	60 psi a
	7 bar a	100 psi a	14 bar a	200 psi a
	20 bar a	300 psi a	41 bar a	600 psi a
	34 bar a	500 psi a	69 bar a	1 000 psi a
	100 bar a	1 500 psi a	175 bar a	2 500 psi a

Technical data (continued)

Pressure ratings	**Style connection**	**Connection rating**
	Compression fitting	2" Male NPT ASME Class 600
		2" ASME B16.5 Class 150 or 2" EN1092-1 PN16
		2" ASME B16.5 Class 300 or 2" EN1092-1 PN40
		2" ASME B16.5 Class 600 or 2" EN1092-1 PN63
	Packing gland	2" Male NPT ASME Class 300
		2" ASME B16.5 Class 150 or 2" EN1092-1 PN16
		2" ASME B16.5 Class 300 or 2" EN1092-1 PN40
	Packing gland and Permanent retractor	2" Male NPT ASME Class 600
		2" ASME B16.5 Class 150 or 2" EN1092-1 PN16
		2" ASME B16.5 Class 300 or 2" EN1092-1 PN40
		2" ASME B16.5 Class 600 or 2" EN1092-1 PN63

Power requirements	**DL** option - 12 to 36 Vdc, 25 mA, 1 W maximum, Loop powered (single output)	
	DH option - 12 to 36 Vdc, 300 mA, 9 W maximum (multiple outputs)	
	AC option - 100 to 240 Vac, 50/60 Hz line power, 5 W maximum (multiple outputs)	
Display	Alphanumeric 2 line x 16 character LCD digital display	
	Six pushbuttons for full field configuration	
	Pushbuttons can be operated with magnetic wand without removal of the enclosure covers	
	Display can be mounted in 90 ° intervals for better viewing	
Output signals	**Analogue**	4-20 mA
	Alarm	Solid state relay, 40 Vdc
	Totalizer pulsem	50 millisecond pulse, 40 Vdc
	Volumetric or Loop powered mass	One analogue, one totalizer pulse, HART®, scaled frequency output
	Multivariable option 1	Up to three analogue signals, three alarms, one totaliser pulse, HART®, scaled frequency output
	Multivariable option 2	Modus RTU or BACnet MS/TP compatible process monitoring

Performance specifications

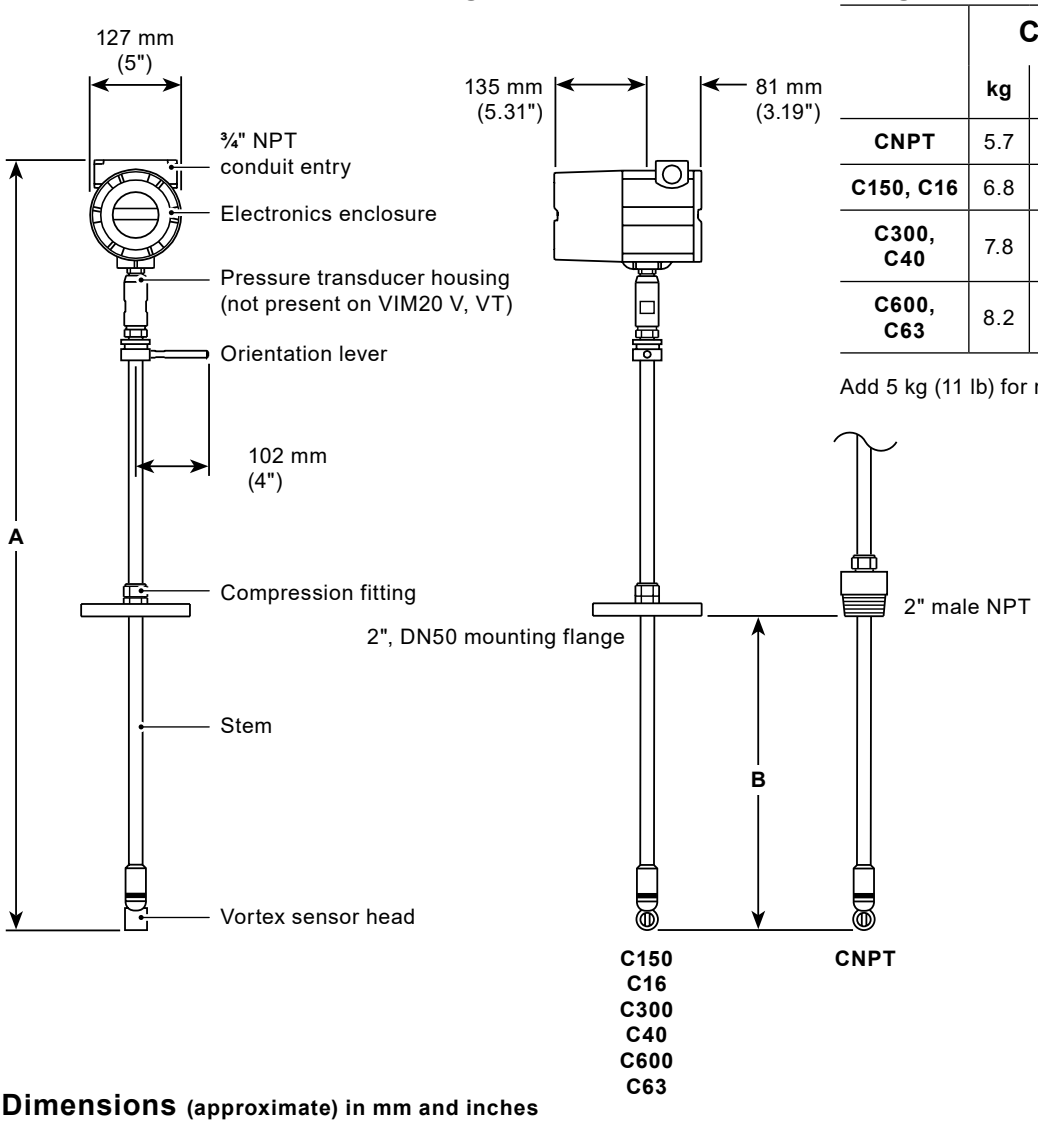
Accuracy Mass flowrate accuracy for gas and steam based on 50-100% of pressure range

Process variables	**Liquids**	**Gas and steam**	**Repeatability**	**Stability over 12 months**
Volumetric flowrate	± 1.2% of rate	± 1.5% of rate	± 0.1% of rate	± Negligible
Mass flowrate	± 1.5% of rate	± 2.0% of rate	± 0.2% of rate	± 0.2% of rate
Temperature	± 1.0 °C (± 2.0 °F)	± 1.0 °C (± 2.0 °F)	± 0.1 °C (± 0.2 °F)	± 0.5 °C (± 0.9 °F)
Pressure	± 0.3% of full-scale	± 0.3% of full-scale	± 0.05% of full-scale	± 0.1% of full-scale
Density	± 0.3% of reading	± 0.5% of reading	± 0.1% of reading	± 0.1% of reading

Response time Adjustable from 1 to 100 seconds

Dimensions and weights (approximate) in mm and inches

Compression fitting models



Weight (approximate) in kg and lbs

	C		S		E	
	kg	lbs	kg	lbs	kg	lbs
CNPT	5.7	13	6.2	14	6.7	15
C150, C16	6.8	15	7.3	16	7.8	17
C300, C40	7.8	17	8.3	18	8.8	19
C600, C63	8.2	18	8.7	19	9.2	20

Add 5 kg (11 lb) for remote electronics

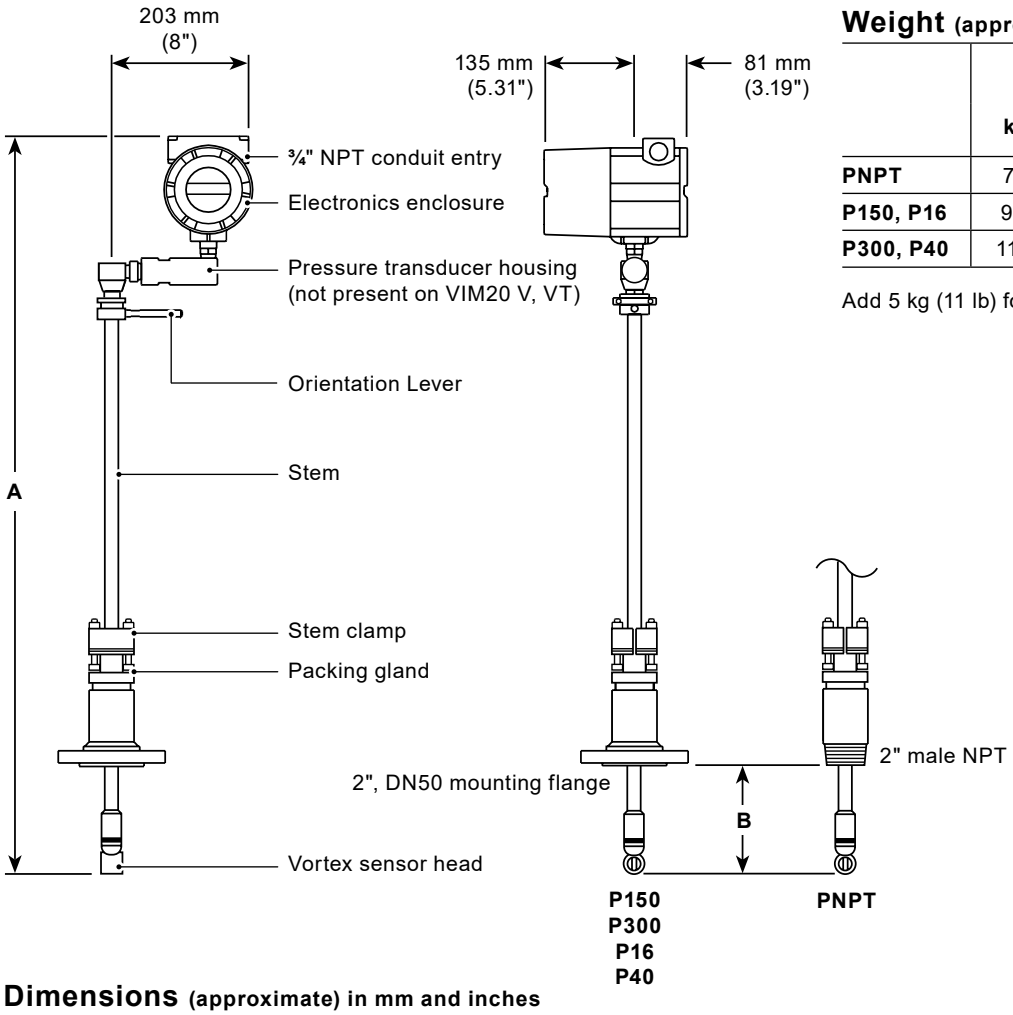
Dimensions (approximate) in mm and inches

VIM20 V and VT	C Compact Length				S Standard Length				E Extended Length			
	A		B (max.)		A		B (max.)		A		B (max.)	
	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches
Compression fitting, Male NPT	549	21.6	249	9.8	965	38	665	26.2	1 270	50	970	38.2
Compression fitting, 150 lb, PN16			277	10.9			693	27.3			998	39.3
Compression fitting, 300 lb, PN40			274	10.8			691	27.2			996	39.2
Compression fitting, 600 lb, PN63			264	10.4			681	26.8			986	38.8

VIM20 VTP	C Compact Length				S Standard Length				E Extended Length			
	A		B (max.)		A		B (max.)		A		B (max.)	
	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches
Compression fitting, Male NPT	625	24.6	249	9.8	1041	41	685	26.2	1 346	53	970	38.2
Compression fitting, 150 lb, PN16			277	10.9			693	27.3			998	39.3
Compression fitting, 300 lb, PN40			274	10.8			691	27.2			996	39.2
Compression fitting, 600 lb, PN63			264	10.4			681	26.8			986	38.8

Dimensions and weights (approximate) in mm and inches

Packing gland models - Please note that a removable retractor can be used with these models



Weight (approximate) in kg and lbs

	S		E	
	kg	lbs	kg	lbs
PNPT	7.1	16	7.6	17
P150, P16	9.4	21	9.9	22
P300, P40	11.3	25	11.8	26

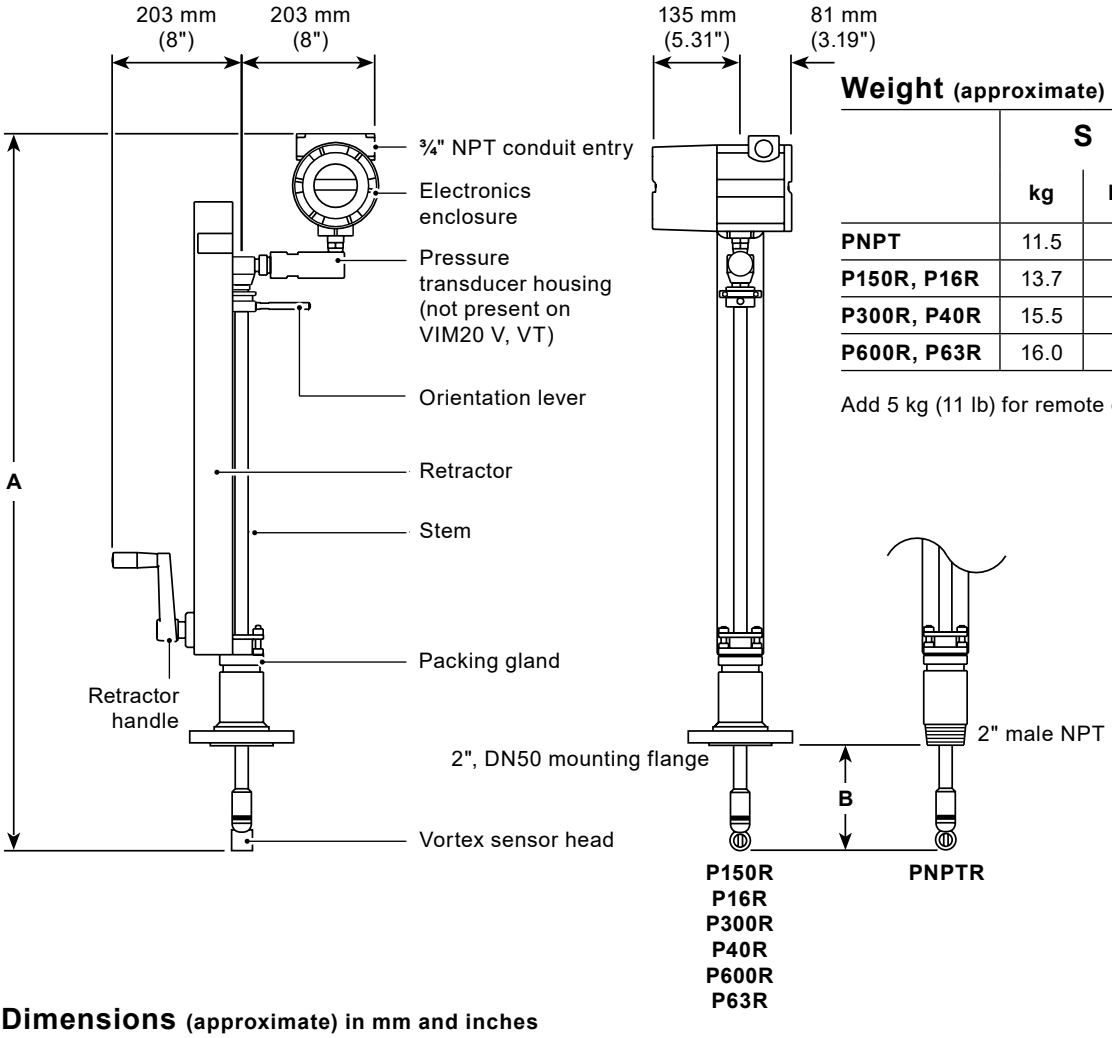
Add 5 kg (11 lb) for remote electronics

Dimensions (approximate) in mm and inches

VIM20 V, VT and VTP	S Standard Length				E Extended Length			
	A		B (max.)		A		B (max.)	
	mm	inches	mm	inches	mm	inches	mm	inches
Packing gland, Male NPT	1 029	40.5	546	21.5	1 334	52.5	851	33.5
Packing gland, 150 lb, PN16			536	21.1			841	33.1
Packing gland, 300 lb, PN40								

Dimensions and weights (approximate) in mm and inches

Packing gland models with permanent retractor



Weight (approximate) in kg and lbs

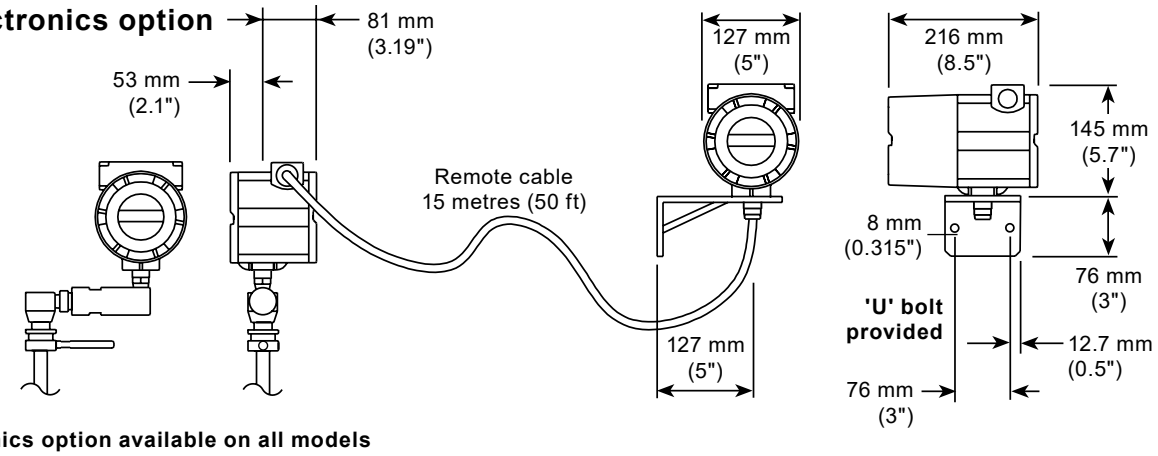
	S		E	
	kg	lbs	kg	lbs
PNPT	11.5	25	14.5	32
P150R, P16R	13.7	30	16.7	37
P300R, P40R	15.5	34	18.5	41
P600R, P63R	16.0	35	19.0	42

Add 5 kg (11 lb) for remote electronics

Dimensions (approximate) in mm and inches

VIM20 V, VT and VTP with permanent retractor	S Standard Length				E Extended Length			
	A		B (max.)		A		B (max.)	
	mm	inches	mm	inches	mm	inches	mm	inches
Packing gland, Male NPT	1 029	40.5	546	21.5	1 334	52.5	851	33.5
Packing gland, 150 lb, PN16								
Packing gland, 300 lb, PN40			536	21.1			841	33.1
Packing gland, 600 lb, PN63								

Remote electronics option



Remote electronics option available on all models

Typical Metric flowrates - VIM20

Saturated steam flowrates (kg/hr)

Pressure		Nominal Pipe Size					
		80 mm	150 mm	200 mm	300 mm	400 mm	600 mm
0 bar g	Minimum	81	316	548	1 226	1 936	4 404
	Maximum	938	3667	6 350	14 209	22 432	51 039
5 bar g	Minimum	187	729	1 263	2 826	4 461	10 151
	Maximum	4 986	19 486	33 742	75 495	119 189	271 187
10 bar g	Minimum	249	972	1 683	3 767	5 947	13 530
	Maximum	8 859	34 620	59 949	134 132	211 764	481 821
15 bar g	Minimum	298	1164	2 016	4 510	7 120	16 200
	Maximum	12 700	49 629	85 939	192 283	303 570	690 705
20 bar g	Minimum	340	1329	2 301	5 148	8 128	18 493
	Maximum	16 550	64 676	111 995	250 581	395 609	900 119
30 bar g	Minimum	413	1612	2 791	6 246	9 860	22 435
	Maximum	24 357	95 187	164 827	368 789	582 234	1 324 739

Air (nm^3/h) at 20 °C

Pressure		Nominal Pipe Size					
		80 mm	150 mm	200 mm	300 mm	400 mm	600 mm
0 bar g	Minimum	89	347	601	1 345	2 124	4 833
	Maximum	1 463	5 716	9 897	22 145	34 962	79 547
5 bar g	Minimum	217	847	1 467	3 282	5 181	11 788
	Maximum	8 702	34 006	58 885	131 751	208 004	473 266
10 bar g	Minimum	294	1 148	1 987	4 446	7 020	15 972
	Maximum	15 975	62 430	108 105	241 878	381 870	868 857
15 bar g	Minimum	355	1 385	2 399	5 368	8 474	19 282
	Maximum	23 280	90 979	157 542	352 487	556 497	1 266 182
20 bar g	Minimum	407	1 589	2 751	6 156	9 718	22 112
	Maximum	30 615	119 642	207 175	463 539	731 823	1 665 095
30 bar g	Minimum	495	1 934	3 349	7 493	11 829	26 915
	Maximum	45 361	177 268	306 961	686 801	1 084 302	2 467 081

Typical Imperial flowrates are on page 8

Typical Imperial flowrates - VIM20

Typical Metric flowrates are on page 7

Saturated steam (lb / h)

Pressure		Nominal Pipe Size					
		3"	6"	8"	12"	16"	24"
5 psi g	Minimum	205	800	1 385	3 099	4 893	11 132
	Maximum	2 721	10 633	18 412	41 196	65 039	147 954
100 psi g	Minimum	468	1 831	3 170	7 092	11 197	25 472
	Maximum	14 246	55 674	96 407	215 703	340 546	774 698
200 psi g	Minimum	632	2 471	4 278	9 572	15 111	34 377
	Maximum	25 948	101 405	175 595	392 880	620 268	1 411 029
300 psi g	Minimum	762	2 976	5 153	11 530	18 203	41 410
	Maximum	37 652	147 145	254 799	570 093	900 047	2 047 489
400 psi g	Minimum	873	3412	5 908	13 219	20 870	47 477
	Maximum	49 494	193 420	334 930	749 382	1 183 103	2 691 404
500 psi g	Minimum	974	3 805	6 588	14 741	23 272	52 942
	Maximum	61 543	240 507	416 468	931 816	1 471 125	3 346 615

Air (SCFM) at 70 °F

Pressure		Nominal Pipe Size					
		3"	6"	8"	12"	16"	24"
5 psi g	Minimum	56	220	381	852	1 345	3 059
	Maximum	924	3 611	6 253	13 991	22 089	50 250
100 psi g	Minimum	157	615	1 065	2 383	3 763	8 560
	Maximum	7 236	28 279	48 969	109 564	172 977	393 500
200 psi g	Minimum	216	843	1 460	3 266	5 156	11 729
	Maximum	13 588	53 101	91 950	205 732	324 804	738 886
300 psi g	Minimum	262	1 022	1 770	3 960	6 251	14 221
	Maximum	19 974	78 059	135 169	302 430	477 467	1 086 176
400 psi g	Minimum	301	1 175	2 034	4 551	7 186	16 346
	Maximum	26 391	103 136	178 593	399 588	630 859	1 435 121
500 psi g	Minimum	335	1 310	2 269	5 077	8 015	18 233
	Maximum	32 834	128 314	222 191	497 136	784 865	1 785 464

Water flowrates

Size			m3/hr		GPM	
			Minimum	Maximum	Minimum	Maximum
Nominal pipe size	80 mm	3"	5.2	157	20.6	618
	150 mm	6"	20.4	614	81.3	2 437
	200 mm	8"	35.4	1 062	142.0	4 270
	300 mm	12"	79.2	2 337	317.0	9 501
	400 mm	16"	125.0	3 753	501.0	15 043
	600 mm	24"	284.0	8 537	1 138.0	34 144

Sizing considerations

	Straight run piping requirements	Upstream	Downstream
Piping conditions	One 90 ° elbow before the flowmeter	10 D	5 D
	Two 90 ° elbows before the flowmeter	15 D	5 D
	Two 90 ° elbows out of plane before the flowmeter	25 D	5 D
	Reduction before the flowmeter	10 D	5 D
	Expansion before the flowmeter	20 D	5 D
	Partially open valve	25 D	5 D

D = Internal diameter of the pipe - If there is not a sufficient straight run of pipe, a flow rectifier may be used to reduce the above diameter measurements.
Consult your local Spirax Sarco representative or the factory for your specific application.

Velocity range	Liquid	Maximum	9 m/s	(30 ft/s)
		Minimum	0.3 m/s	(1 ft/s)
	Gas or steam	Maximum	90 m/s	(300 ft/s)
		Minimum	$\frac{6.1}{\sqrt{\text{density}\left(\frac{\text{kg}}{\text{m}^3}\right)}}$	$\frac{5}{\sqrt{\text{density}\left(\frac{\text{lb}}{\text{ft}^3}\right)}}$

Other installation considerations:

- **Mounting position**
  The VIM20 may be installed in vertical, horizontal, or angled pipe sections. The flowmeter is attached perpendicular to the axis of the pipe and should not be mounted 'upside-down' (with its top section hanging below the pipe mount). For liquid service, the fluid must completely fill the pipe.
- **Site selection**
  The flow measurement location should be selected to minimize turbulence and swirl. The extent of these flow disturbances depends upon the piping configuration. Valves, elbows, pumps, and other piping components may add disturbances to the flow.
- **Hot-tap compatibility**
  With the removable or permanent retractor assembly the VIM20 is 'hot-tappable' and can be installed and removed without shutting down the process. An isolation valve with a pipe mounting kit is used to isolate the flowmeter from the process.

Accessories

Removable Retractor
For models without a permanent retractor, one removable retractor must be used if the process pressure is >3.4 bar g (50 psi g).

Removable retractor options	Removable retractor
	Extended length removable retractor – For use with extended length probes

How to order example: 1 off Spirax Sarco VIM20 - Removable retractor.

How to order

Selection:

Category	Description	Suffix code	Grey = Standard
Flowmeter	Insertion vortex flowmeter	**VIM20**	**VIM20**
Electronics	Volumetric flowmeter for liquid	**V**	**V**
	Velocity and temperature sensors	**VT**	
	Velocity, temperature and pressure sensors	**VTP**	
	Velocity, temperature and external 4 - 20 mA pressure input	**VTEP**	
	Velocity, external RTD temperature input, external 4 - 20 mA pressure input	**VETEP**	
	Energy output options	**VTEM**	
	Energy options with pressure sensor	**VTPEM**	
	Energy options, velocity, temperature and external 4 - 20 mA pressure input	**VTEPEM**	
	Energy options, velocity, external RTD temperature input, external 4 - 20 mA pressure input	**VETEPEM**	
Probe length	Standard length	**S**	**S**
	Compact length - Only available for compression fitting connections CNPT, C150, C300, C600, C16, C40 and C63	**C**	
	Extended length	**E**	
Electronics enclosure	NEMA 4X, IP66 enclosure	**L**	**L**
	Remote electronics NEMA 4X, IP66 25' cable with display	**R25**	
	25' (7.6 m) Armored cable with glands V meter only	**A25**	
	25' (7.6 m) Armored cable with glands VT, VTP meter only	**A25P**	
	Remote electronics NEMA 4X, IP66 50' cable with display	**R50**	
	50' (15.2 m) Armored cable with glands V meter only	**A50**	
	50' (15.2 m) Armored cable with glands VT, VTP meter only	**A50P**	
Display	Digital display and programming buttons	**D**	**D**
Power supply	12 - 36 Vdc, 25 mA. 1 W max, required on loop powered meters, 1HL only	**DL**	**DL**
	12 - 36 Vdc, 300 mA, 9 W max. – use with 1H, 1M, 1B, 3H, 3M, 3B	**DH**	
	100 -240 Vac, 50 / 60 Hz line power, 5 W max – use with 1H, 1M, 1B, 3H, 3M, 3B	**AC**	
	12-28 VDC or Power over Ethernet, 5 Watts max, required on 1MI, 1BIP, 3MIP, 3BIP	**DHPOE**	

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How to order continued on next page

How to order (continued)

Selection:

Category	Description	Suffix code	Grey = Standard
Output signal Inclusive of the scaled frequency output	Loop powered option - one analogue output (4 - 20 mA),one alarm, one pulse, HART®, DL input power only	**1HL**	**1HL**
	One analogue output (4 - 20 mA), one alarm, one pulse, HART® Communication Protocol, DH or AC option only	**1H**	
	One analogue output (4 - 20 mA), one alarm, one pulse, MODBUS Communication Protocol, DH or AC option only	**1M**	
	One analog output (4-20 mA), one alarm, one pulse, MODBUS TCP/IP Communication Protocol. DHPOE ONLY	**1MIP**	
	One analog output (4-20 mA), one alarm, one pulse, BACnet/IP Communication Protocol, DHPOE ONLY	**1BIP**	
	One analogue output (4 - 20 mA), one alarm, one pulse, BACnet Communication Protocol, DH or AC option only	**1B**	
	Three analogue outputs (4 - 20 mA), three alarms, one pulse, HART® (VT, VTP only), DH or AC option only	**3H**	
	Three analogue outputs (4 - 20 mA), three alarms, one pulse, MODBUS (VT, VTP only), DH or AC option only	**3M**	
	Three analog outputs (4-20 mA), three alarms, one pulse, MODBUS TCP/IP (VT, VTP only). DHPOE ONLY	**3MIP**	
	Three analog outputs (4-20 mA), three alarms. one pulse, BACnet/IP (VT, VTP only). DHPOE ONLY	**3BIP**	
	Three analogue outputs (4 - 20 mA), three alarms, one pulse, BACnet (VT, VTP only), DH or AC option only	**3B**	

Selection:

Process temperature	Standard temperature	Process temperature -200 to 260 °C (-330 to 500 °F)					**S**	**S**
	High temperature	Process temperature 260 °C to 400 °C (500 °F to 750 °F)					**H**	
Pressure sensor	No pressure sensor						**P0**	**P0**
	Maximum	2 bar a	30 psi a	Proof	4 bar a	60 psi a	**P1**	
	Maximum	7 bar a	100 psi a	Proof	14 bar a	200 psi a	**P2**	
	Maximum	20 bar a	300 psi a	Proof	41 bar a	600 psi a	**P3**	
	Maximum	34 bar a	500 psi a	Proof	69 bar a	1 000 psi a	**P4**	
	Maximum	100 bar a	1 500 psi a	Proof	175 bar a	2 500 psi a	**P5**	

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How to order continued on next page

How to order (continued)

Selection:

Category	Description			Suffix code	Grey = Standard
Process connections	Compression, 2" NPT	CNPT	Packing gland, 2" NPT, retractor (use with E probe)	PNPTR-E	PNPTR
	Compression, 2" ASME 150 flange	C150	Packing gland, 2" DN150 flange, retractor	P150R	
	Compression, DN50 PN16 flange	C16	Packing gland, 2" DN150 flange, retractor (E probe)	P150R-E	
	Compression, 2" ASME 300 flange	C300	Packing gland, DN50 PN16 flange, retractor	P16R	
	Compression, DN50 PN40 flange	C40	Packing gland, DN50 PN16 flange, retractor (E probe)	P16R-E	
	Compression, 2" ASME 600 flange	C600	Packing gland, 2" DN300 flange, retractor	P300R	
	Compression, DN50 PN63 flange	C63	Packing gland, 2" DN300 flange, retractor (E probe)	P300R-E	
	Packing gland*, 2" NPT	PNPT	Packing gland, DN50 PN40 flange, retractor	P40R	
	Packing gland*, 2" ASME 150 flange	P150	Packing gland, DN50 PN40 flange, retractor (E probe)	P40R-E	
	Packing gland*, DN50 PN16 flange	P16	Packing gland, 2" DN600 flange, retractor	P600R	
	Packing gland*, 2" ASME 300 flange	P300	Packing gland, 2" DN600 flange, retractor (E probe)	P600R-E	
	Packing gland*, DN50 PN40 flange	P40	Packing gland, DN50 PN63 flange, retractor	P63R	
	Packing gland, 2" NPT, retractor	PNPTR	Packing gland, DN50 PN63 flange, retractor (E probe)	P63R-E	
	* One removable retractor must be ordered if the process pressure is >3.4 bar g (50 psi g).				
Approvals	FM/FMC and CE marked			S	S

Selection example: VIM20 - V - S - L - D - DL - 1HL - S - P0 - PNPTR - S

How to order example: 1 off Spirax Sarco VIM20 - V - S - L - D - DL - 1HL - S - P0 - PNPTR - S - vortex insertion flowmeter.

TI-P198-04
CMGT Issue 6

RIM20
Rotor Insertion Flowmeter

Description

The RIM20 multivariable insertion turbine flowmeter utilises **three primary sensing elements** to measure the mass flowrate of steam, liquids and gases:

- Turbine velocity sensor,
- RTD temperature sensor,
- Solid-state pressure transducer.

Principle of operation

Insertion turbine flowmeters measure flow of liquid, gas, and steam by detecting the frequency of rotation of the turbine blades. According to the proven laws of physics, the frequency at which the turbine rotates is directly proportional to the flow velocity.
Insertion turbine flowmeters measure flow by detecting the local velocity at a strategically located position within the pipe. The RIM20 detects the frequency within the sensor head. It uses the local velocity, along with other parameters such as fluid type, pipe size, and Reynolds Number to calculate the average pipe velocity, and consequently, the volumetric flowrate.

Compliance

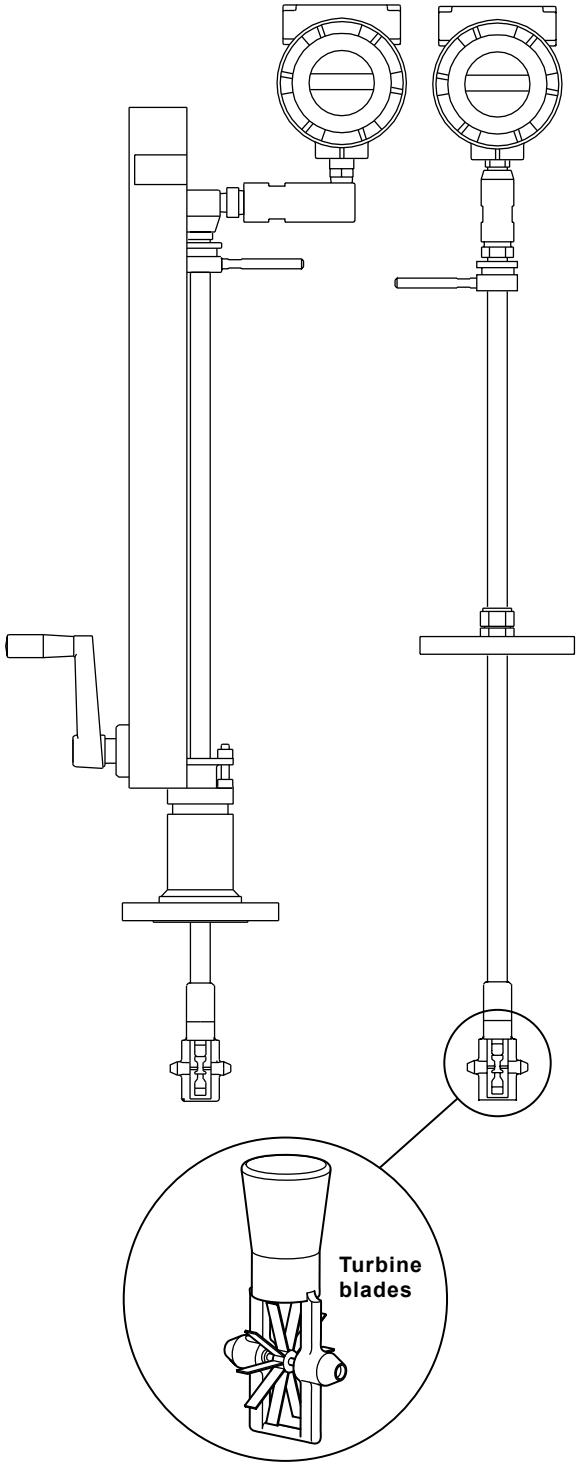
- Electromagnetic Compatibility Directive
- Low Voltage Directive

Approvals

	Class I, Division 1, Groups B, C and D
FM and **FMC**	Class II/III, Division 1, Groups E, F and G
	Type 4X and IP66, T6, Ta = -40 °C to +60 °C

Sizes

Insertion style mounting permits installation in any pipe DN80 (3") and greater.



RIM20 range and benefits

The **RIM20-V** delivers a direct reading of volumetric flowrate, generally the most cost-effective solution for liquid flow monitoring, in applications ranging from general water flows to hydrocarbon fuel flow measurement.

The **RIM20-VT** integrates a precision 1000 Ω platinum RTD temperature sensor that can be used to calculate and output a compensated mass reading. This device is typically used to measure flowrates of saturated steam.

The **RIM20-VTP** offers you flow computer functionality in a compact field device. This multivariable instrument incorporates temperature and pressure sensors to provide an instantaneous reading of the compensated mass flowrate of gases, liquids and steam. In addition to outputs for totalized mass and alarm settings, the field-configurable electronics deliver up to three analogue 4 - 20 mA outputs of five process measurements, including volumetric flowrate, mass flowrate, pressure, temperature and density.

The **RIM20-EM** Energy Monitoring option permits real-time calculation of energy consumption for a facility or process. The flowmeter can be programmed to measure steam, hot water or chilled water. The RIM20-VTP flowmeter monitors one side of the process, either sent or returned, and uses the input from a second separate temperature sensor on the opposite leg of the process to calculate the change in energy. Selectable energy units include BTUs, joules, calories, Watt-hours, Megawatt-hours and Horsepower-hours. The local or remote electronics indicate two temperatures, delta T, mass total and energy total.

Technical data

Wetted materials		316L, 302, and 17-4PH, and 18-8 stainless steel, tungsten carbide, sapphire, plus: • DuPont Teflon® based thread sealant on models with pressure transducer • DuPont Teflon® packing on standard temperature models with packing gland • Graphite based packing on high temperature models with packing gland	
Application		Any gas, liquid or steam compatible with 316L stainless steel and other listed wetted materials. Not recommended for multi-phase fluids	
Temperature	**Process**	**S** option - **Standard** -55 °C to +238 °C (-67 °F to +460 °F)	
		H option - **High** -267 °C to +454 °C (-448 °F to +850 °F)	
Environmental	**Temperature**	**Ambient**	**Operating** -40 °C to +60 °C (-40 °F to +140 °F)
			Storage -40 °C to +85 °C (-40 °F to +185 °F)
	LVD	Electrical Safety EN61010-1:2010	
		Overvoltage Category	II
		Pollution Degree	2
	EMC	Emissions	Group 1, Class A (Suitable for Industrial Environments only)
		Immunity	Suitable for Industrial Environments
	Enclosure	NEMA 4X, IP66	

Pressure transducer ratings	**Full-scale operating pressure**		**Maximum over-range pressure**	
	2 bar a	30 psi a	4 bar a	60 psi a
	7 bar a	100 psi a	14 bar a	200 psi a
	20 bar a	300 psi a	41 bar a	600 psi a
	34 bar a	500 psi a	69 bar a	1000 psi a
	100 bar a	1500 psi a	175 bar a	2500 psi a

Technical data (continued)

Pressure ratings	**Style connection**	**Connection/Rating**
	Compression fitting	2" Male NPT ASME Class 600
		2" ASME B16.5 Class 150 or DN50 EN1092-1 PN16
		2" ASME B16.5 Class 300 or DN50 EN1092-1 PN40
		2" ASME B16.5 Class 600 or DN50 EN1092-1 PN63
	Packing gland	2" Male NPT ASME Class 300
		2" ASME B16.5 Class 150 or DN50 EN1092-1 PN16
		2" ASME B16.5 Class 300 or DN50 EN1092-1 PN40
	Packing gland and Permanent retractor	2" Male NPT ASME Class 600
		2" ASME B16.5 Class 150 or DN50 EN1092-1 PN16
		2" ASME B16.5 Class 300 or DN50 EN1092-1 PN40
		2" ASME B16.5 Class 600 or DN50 EN1092-1 PN63
Power requirements	**DL** option - 12 to 36 Vdc, 25 mA, 1 W maximum, Loop powered (single output)	
	DH option - 12 to 36 Vdc, 300 mA, 9 W maximum, (multiple outputs)	
	AC option - 100 to 240 Vac, 50/60 Hz line power, 5 W maximum (multiple outputs)	
Display	Alphanumeric 2 line x 16 character LCD digital display	
	Six pushbuttons for full field configuration	
	Pushbuttons can be operated with magnetic wand without removal of the enclosure covers	
	Display can be mounted in 90° intervals for better viewing	
Output signals	**Analogue**	4 - 20 mA
	Alarm	Solid state relay, 40 Vdc
	Totalizer pulse	50 millisecond pulse, 40 Vdc
	Volumetric or Loop powered mass	One analogue, one totalizer pulse, HART®, scaled frequncy output
	Multivariable option 1	Up to three analogue signals, three alarms, one totalizer pulse, HART®, scaled frequency output
	Multivariable option 2	Modus RTU or BACnet MS/TP compatible process monitoring

Performance specifications

Accuracy Mass flowrate accuracy for gas and steam based on 50 - 100% of pressure range

Process variables	**Liquids**	**Gas and steam**	**Repeatability**	**Stability over 12 months**
Volumetric flowrate	± 1.2% of rate	± 1.5% of rate	± 0.1% of rate	± Negligible
Mass flowrate	± 1.5% of rate	± 2.0% of rate	± 0.2% of rate	± 0.2% of rate
Temperature	± 1.0 °C (± 2.0 °F)	± 1.0 °C (± 2.0 °F)	± 1.0 °C (± 2.0 °F)	± 0.5 °C (± 0.9 °F)
Pressure	± 0.3% of full-scale	± 0.3% of full-scale	± 0.05% of full-scale	± 0.1% of full-scale
Density	± 0.3% of reading	± 0.5% of reading	± 0.1% of reading	± 0.1% of reading

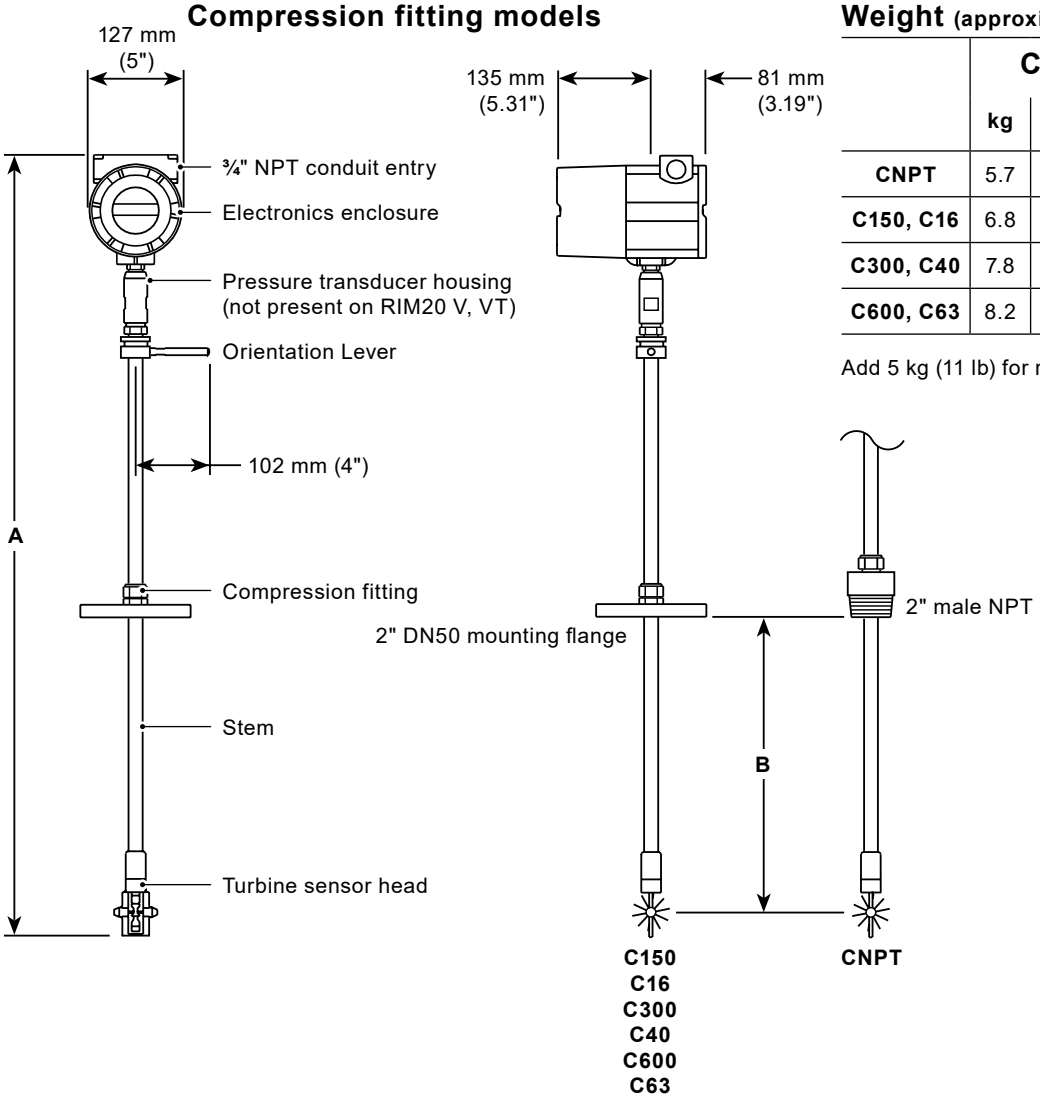
Response time Adjustable from 1 to 100 seconds

Dimensions (approximate) in mm and inches

RIM20 V and VT	C Compact Length				S Standard Length				E Extended Length			
	A		B (max)		A		B (max)		A		B (max)	
	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches
Compression fitting, Male NPT	536	21.1	229	9	953	37.5	645	25.4	1 257	49.5	950	37.4
Compression fitting, 150 lb, PN16			257	10.1			673	26.5			978	38.5
Compression fitting, 300 lb, PN40			254	10			671	26.4			975	38.4
Compression fitting, 600 lb, PN63			244	9.6			660	26.0			965	38.0

RIM20 VTP	C Compact Length				S Standard Length				E Extended Length			
	A		B (max)		A		B (max)		A		B (max)	
	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	inches
Compression fitting, Male NPT	612	24.1	229	9	1 029	40.5	645	25.4	1 334	52.5	950	37.4
Compression fitting, 150 lb, PN16			257	10.1			673	26.5			978	38.5
Compression fitting, 300 lb, PN40			254	10			671	26.4			975	38.4
Compression fitting, 600 lb, PN63			244	9.6			660	26.0			965	38.0

Compression fitting models



Weight (approximate) in kg and lbs

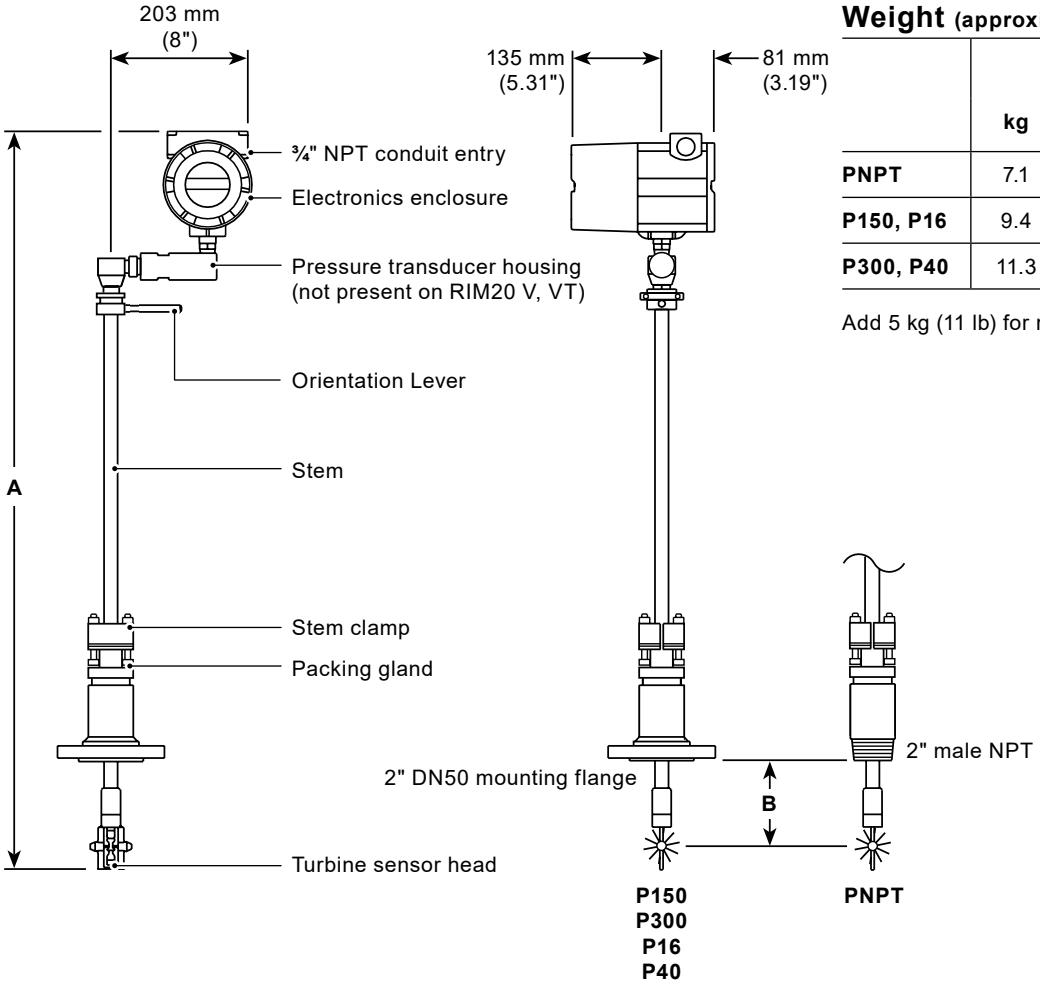
	C		S		E	
	kg	lbs	kg	lbs	kg	lbs
CNPT	5.7	13	6.2	14	6.7	15
C150, C16	6.8	15	7.3	16	7.8	17
C300, C40	7.8	17	8.3	18	8.8	19
C600, C63	8.2	18	8.7	19	9.2	20

Add 5 kg (11 lb) for remote electronics

Dimensions (approximate) in mm and inches

RIM20 V, VT and VTP	S Standard Length				E Extended Length			
	A		B (max)		A		B (max)	
	mm	inches	mm	inches	mm	inches	mm	inches
Packing gland, Male NPT	1 016	40	526	20.7	1321	52	831	32.7
Packing gland, 150 lb, PN16			516	20.3			820	32.3
Packing gland, 300 lb PN40								

Packing gland models - Please note that a removable retractor can be used with these models

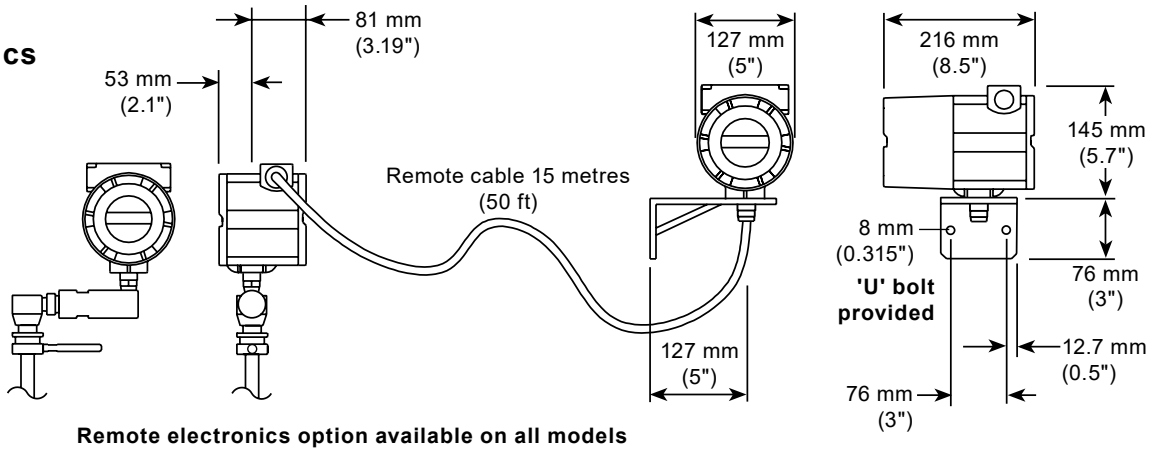


Weight (approximate) in kg and lbs

	S		E	
	kg	lbs	kg	lbs
PNPT	7.1	16	7.6	17
P150, P16	9.4	21	9.9	22
P300, P40	11.3	25	11 .8	26

Add 5 kg (11 lb) for remote electronics

Remote electronics option

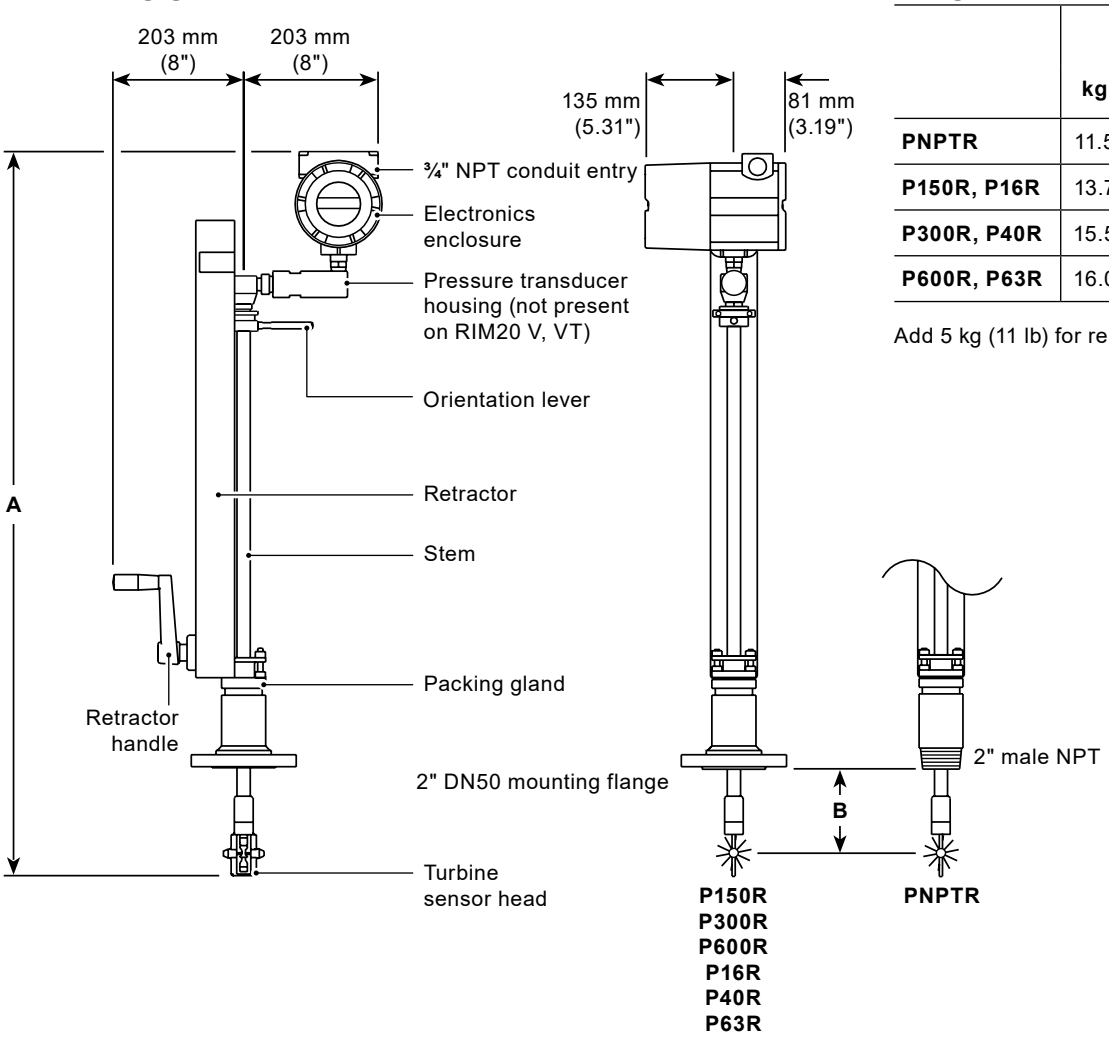


Remote electronics option available on all models

Dimensions (approximate) in mm and inches

RIM20 V, VT and VTP with permanent retractor	S Standard Length				E Extended Length			
	A		B (max)		A		B (max)	
	mm	inches	mm	inches	mm	inches	mm	inches
Packing gland, Male NPT	1 016	40.0	526	20.7	1321	52	831	32.7
Packing gland, 150 lb, PN16			516	20.3			820	32.3
Packing gland, 300 lb, PN40								
Packing gland, 600 lb, PN63								

Packing gland models with permanent retractor



Weight (approximate) in kg and lbs

	S		E	
	kg	lbs	kg	lbs
PNPTR	11.5	25	14.5	32
P150R, P16R	13.7	30	16.7	37
P300R, P40R	15.5	34	18.5	41
P600R, P63R	16.0	35	19.0	42

Add 5 kg (11 lb) for remote electronics

Typical Metric flowrates

Saturated steam (kg/h)

Rotor	Pressure		Nominal pipe size					
			80 mm	150 mm	200 mm	300 mm	400 mm	600 mm
R40	1.4 bar g	Minimum	17	72	127	297	491	1 219
		Maximum	225	929	1 642	3 817	6 270	15 367
	5 bar g	Minimum	42	173	306	713	1 176	2 907
		Maximum	537	2 216	3 915	9 090	14 905	36 400
	10 bar g	Minimum	75	310	549	1 279	2 106	5 194
		Maximum	962	3 963	6 999	16 239	26 600	64 815
R30	1.4 bar g	Minimum	20	82	146	341	563	1 396
		Maximum	329	1 358	2 399	5 575	9 149	22 384
	5 bar g	Minimum	48	198	350	817	1 347	3 328
		Maximum	785	3 237	5 716	13 265	21 735	52 993
	10 bar g	Minimum	86	355	629	1 465	2 411	5 943
		Maximum	1 405	5 786	10 215	23 687	38 771	94 337
R20	1.4 bar g	Minimum	35	146	259	604	995	2 463
		Maximum	530	2 187	3 863	8 968	14 704	35 898
	5 bar g	Minimum	85	350	620	1 444	2 377	5 856
		Maximum	1 265	5 207	9 194	21 322	34 903	84 940
	10 bar g	Minimum	152	628	1 111	2 586	4 252	10 448
		Maximum	2 261	9 303	16 419	38 049	62 227	151 156
R10	1.4 bar g	Minimum	61	253	448	1 045	1 721	4 247
		Maximum	1 098	4 522	7 985	18 520	30 320	73 805
	5 bar g	Minimum	147	606	1 072	2 496	4 103	10 082
		Maximum	2 615	10 755	18 979	43 967	71 883	174 497
	10 bar g	Minimum	263	1 087	1 921	4 466	7 335	17 975
		Maximum	4 672	19 197	33 862	78 386	128 050	310 382

Typical Imperial flowrates are on pages 9 and 10

Typical Metric flowrates

Air (nm^3/h) at 20 °C

Rotor	Pressure		Nominal pipe size					
			80 mm	150 mm	200 mm	300 mm	400 mm	600 mm
R40	1.4 bar g	Minimum	12	49	87	204	337	838
		Maximum	154	639	1 130	2 628	4 320	10 607
	5 bar g	Minimum	74	305	540	1 259	2 072	5 107
		Maximum	946	3 898	6 884	15 969	26 152	63 694
	10 bar g	Minimum	137	567	1 002	2 332	3 835	9 423
		Maximum	1 751	7 205	12 718	29 476	48 216	117 169
R30	1.4 bar g	Minimum	14	56	100	234	386	960
		Maximum	226	934	1 651	3 839	6 306	15 455
	5 bar g	Minimum	84	350	619	1 441	2 373	5 844
		Maximum	1 382	5 690	10 046	23 290	38 115	92 698
	10 bar g	Minimum	157	649	1 148	2 671	4 390	10 779
		Maximum	2 556	10 511	18 548	42 965	70 237	170 473
R20	1.4 bar g	Minimum	24	100	178	415	684	1 696
		Maximum	365	1 505	2 660	6 179	10 139	24 794
	5 bar g	Minimum	150	618	1 094	2 544	4 182	10 271
		Maximum	2 224	9 149	16 145	37 407	61 166	148 520
	10 bar g	Minimum	278	1 146	2 026	4 709	7 731	18 929
		Maximum	4 110	16 888	29 789	68 956	112 643	273 032
R10	1.4 bar g	Minimum	42	174	308	718	1 184	2 927
		Maximum	756	3 115	5 502	12 768	20 919	50 995
	5 bar g	Minimum	259	1 069	1 890	4 393	7 214	17 668
		Maximum	4 595	18 874	33 290	77 048	125 842	304 938
	10 bar g	Minimum	480	1 980	3 499	8 125	13 323	32 541
		Maximum	8 481	34 799	61 349	141 871	231 535	560 318

Typical Imperial flowrates

Saturated steam (lb/h)

Rotor	Pressure		Nominal pipe size 3"	6"	8"	12"	16"	24"
R40	5 psi g	Minimum	22	91	162	378	625	1 555
		Maximum	287	1 187	2 098	4 883	8 029	19 727
	100 psi g	Minimum	119	496	878	2 046	3 371	8 328
		Maximum	1 540	6 350	11 216	26 034	42 668	104 092
	200 psi g	Minimum	220	913	1 615	3 761	6 191	15 249
		Maximum	2 827	11 643	20 558	47 681	78 064	190 027
R30	5 psi g	Minimum	25	105	186	434	717	1 782
		Maximum	420	1 735	3 068	7 135	11 721	28 745
	100 psi g	Minimum	137	568	1 006	2 344	3 861	9 530
		Maximum	2 251	9 272	16 373	37 984	62 207	151 526
	200 psi g	Minimum	253	1 046	1 850	4 308	7 088	17 446
		Maximum	4 129	16 994	29 996	69 532	113 761	276 542
R20	5 psi g	Minimum	45	186	330	770	1 270	3 150
		Maximum	677	2 797	4 943	11 485	18 849	46 119
	100 psi g	Minimum	243	1 005	1 778	4 140	6 811	16 762
		Maximum	3 623	14 915	26 328	61 035	99 870	242 834
	200 psi g	Minimum	447	1 848	3 268	7 601	12 492	30 657
		Maximum	6 643	27 317	48 203	111 658	182 535	443 035
R10	5 psi g	Minimum	78	323	572	1 334	2 199	5 440
		Maximum	1 405	5 790	10 227	23 736	38 897	94 870
	100 psi g	Minimum	421	1 739	3 075	7 153	11 755	28 849
		Maximum	7 490	30 791	54 325	125 807	205 605	498 759
	200 psi g	Minimum	774	3 195	5 647	13 123	21 541	52 728
		Maximum	13 719	56 341	99 362	229 926	375 467	909 528

Typical Metric flowrates are on pages 7 and 8

Typical Imperial flowrates

Air (SCFM) at 70 °F

Rotor	Pressure		Nominal pipe size 3"	6"	8"	12"	16"	24"
R40	5 psi g	Minimum	7	31	55	129	213	529
		Maximum	98	404	714	1 660	2 729	6 702
	100 psi g	Minimum	62	255	451	1 051	1 730	4 257
		Maximum	790	3 252	5 741	13 313	21 791	53 019
	200 psi g	Minimum	117	484	857	1 992	3 273	8 031
		Maximum	1 494	6 146	10 846	25 128	41 083	99 739
R30	5 psi g	Minimum	9	36	63	148	244	606
		Maximum	143	590	1 043	2 426	3 984	9 765
	100 psi g	Minimum	71	292	517	1 204	1 980	4 871
		Maximum	1 153	4 746	8 376	19 412	31 753	77 152
	200 psi g	Minimum	134	555	981	2 281	3 747	9 186
		Maximum	2 181	8 964	15 814	36 617	59 832	145 094
R20	5 psi g	Minimum	15	63	112	262	432	1 071
		Maximum	230	951	1 680	3 904	6 406	15 665
	100 psi g	Minimum	125	517	913	2 124	3 489	8 557
		Maximum	1 855	7 628	13 458	31 168	50 942	123 591
	200 psi g	Minimum	237	979	1 730	4 020	6 595	16 126
		Maximum	3 506	14 397	25 389	58 747	95 927	232 348
R10	5 psi g	Minimum	26	110	195	454	748	1 849
		Maximum	478	1 968	3 476	8 067	13 217	32 219
	100 psi g	Minimum	216	893	1 578	3 666	6 016	14 715
		Maximum	3 831	15 728	27 734	64 166	104 762	253 698
	200 psi g	Minimum	410	1 691	2 987	6 933	11 362	27 714
		Maximum	7 230	29 650	52 259	120 804	197 092	476 732

Water flowrates

Size		m³/hr		GPM	
		Minimum	Maximum	Minimum	Maximum
Nominal pipe size	80 mm 3"	2.62	157	12	691
	150 mm 6"	12.30	614	54	2701
	200 mm 8"	24.80	1062	109	4678
	300 mm 12"	56.00	2402	247	10575
	400 mm 16"	87.60	3753	386	16524
	600 mm 24"	199.00	8538	877	37590

Sizing considerations

D = Internal diameter of the pipe -
If there is not a sufficient straight run of pipe, a flow rectifier may be used to reduce the above diameter measurements. Consult your local Spirax Sarco representative or the factory for your specific application.

		Straight run piping requirements	Upstream	Downstream
Piping conditions		One 90° elbow before the flowmeter	10 D	5 D
		Two 90° elbows before the flowmeter	15 D	5 D
		Two 90° elbows out of plane before the flowmeter	30 D	5 D
		Reduction before the flowmeter	10 D	5 D
		Expansion before the flowmeter	20 D	5 D
		Partially open valve	30 D	5 D
Velocity range	Liquid	Maximum 9 m/s (30 ft/s)		
		Minimum 0.15 m/s (0.5 ft/s)		
	Gas or steam	Maximum m/s (43 to 205 ft/s) depending on rotor pitch		
		Minimum 1 to 3.7 m/s (3.5 to 12 ft/s) depending on rotor pitch		

Other installation considerations

Mounting position: The RIM20 may be installed in vertical, horizontal, or angled pipe sections. The flowmeter is attached perpendicular to the axis of the pipe and should not be mounted 'upside-down' (with its top section hanging below the pipe mount). For liquid service, the fluid must completely fill the pipe.

Site selection: The flow measurement location should be selected to minimize turbulence and swirl. The extent of these flow disturbances depends upon the piping configuration. Valves, elbows, pumps, and other piping components may add disturbances to the flow.

Hot-tap compatibility: With the removable or permanent retractor assembly the RIM20 is 'hot-tappable' and can be installed and removed without shutting down the process. An isolation valve with a pipe mounting kit is used to isolate the flowmeter from the process.

Accessories

Removable retractor

For models without a permanent retractor, one removable retractor must be used if the process pressure is >3.4 bar g (50 psi g).

Removable retractor options	Removable retractor
	Extended length removable retractor – For use with extended length probes

How to order example: 1 off Spirax Sarco RIM20 - Removable retractor.

Replacement rotors	Rotor spares	Rotor assembly, liquid, 40° pitch	L40
		Rotor assembly, steam/gas, 10° pitch	R10
		Rotor assembly, steam/gas, 15° pitch	R15
		Rotor assembly, steam/gas, 20° pitch	R20
		Rotor assembly, steam/gas, 25° pitch	R25
		Rotor assembly, steam/gas, 30° pitch	R30
		Rotor assembly, steam/gas, 40° pitch	R40

How to order example: 1 off Spirax Sarco RIM20 - L40 – Rotor Assembly.

How to order

Selection:

Category	Description	Suffix code	Grey = Standard
Flowmeter	Insertion multivariable mass turbine flowmeter	**RIM20**	**RIM20**
Electronics	Volumetric flowmeter for liquid	**V**	**V**
	Velocity and temperature sensors	**VT**	
	Velocity, temperature and pressure sensors	**VTP**	
	Velocity, temperature and external 4-20 mA pressure input	**VTEP**	
	Velocity, external RTD temperature input, external 4-20 mA pressure input	**VETEP**	
	Energy output options	**VTEM**	
	Energy options with pressure sensor	**VTPEM**	
	Energy options, velocity, temperature and external 4-20 mA pressure input	**VTEPEM**	
	Energy options, velocity, external RTD temperature input, external 4-20 mA pressure input	**VETEPEM**	
Probe length	Standard length	**S**	**S**
	Compact length - Only available for compression fitting connections CNPT, C150, C300, C600, C16, C40 and C63	**C**	
	Extended length	**E**	
Electronics enclosure mounting	Local mount NEMA 4X, IP66 Enclosure	**L**	**L**
	Remote electronics NEMA 4X, IP66 25' cable with display	**R25**	
	25' (7.6 m) armored cable with glands 'V' flowmeter only	**A25**	
	25' (7.6 m) armored cable with glands 'VT', 'VTP' flowmeter only	**A25P**	
	Remote electronics NEMA 4X, IP66 50' cable with display	**R50**	
	50' (15.2 m) armored cable with glands 'V' flowmeter only	**A50**	
	50' (15.2 m) armored cable with glands 'VT', 'VTP' flowmeter only	**A50P**	
Display	Digital display and programming buttons	**D**	**D**
Power supply	12-36 Vdc, 25 mA, 1 W maximum required on loop powered flowmeters, 1HL only	**DL**	**DL**
	12-36 Vdc, 300 mA, 9 W maximum - use with 1H, 1M, 1B, 3H, 3M, 3B	**DH**	
	100-240 Vac, 50/60 Hz line power, 5 W maximum - use with 1H, 1M, 1B, 3H, 3M, 3B	**AC**	
	12-28 VDC or Power over Ethernet, 5 Watts max, required on 1MI, 1BIP, 3MIP, 3BIP	**DHPOE**	

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How to order continued on next page

How to order (continued)

Selection:

Category	Description	Suffix code	Grey = Standard
Output signal Inclusive of the scaled frequency output	Loop powered option - one analogue output (4 - 20 mA), one alarm, one pulse, HART®, DL input power only	**1HL**	**1HL**
	One analogue output (4 - 20 mA), one alarm, one pulse, HART® communication protocol, DH or AC option only	**1H**	
	One analogue output (4 - 20 mA), one alarm, one pulse, MODBUS communication protocol, DH or AC option only	**1M**	
	One analog output (4-20 mA), one alarm, one pulse, MODBUS TCP/IP Communication Protocol. DHPOE ONLY	**1MIP**	
	One analog output (4-20 mA), one alarm, one pulse, BACnet/IP Communication Protocol, DHPOE ONLY	**1BIP**	
	One analogue output (4 - 20 mA), one alarm, one pulse, BACnet communication protocol, DH or AC option only	**1B**	
	Three analogue outputs (4 - 20 mA), three alarms, one pulse, HART® ('VT', 'VTP' only), DH or AC option only	**3H**	
	Three analogue outputs (4 - 20 mA), three alarms, one pulse, MODBUS ('VT', 'VTP' only), DH or AC option only	**3M**	
	Three analog outputs (4-20 mA), three alarms, one pulse, MODBUS TCP/IP (VT, VTP only). DHPOE ONLY	**3MIP**	
	Three analog outputs (4-20 mA), three alarms. one pulse, BACnet/IP (VT, VTP only). DHPOE ONLY	**3BIP**	
	Three analogue outputs (4 - 20 mA), three alarms, one pulse, BACnet ('VT', 'VTP' only), DH or AC option only	**3B**	
Process temperature	Standard temperature Process temperature -55 °C to 238 °C -67 °F to 460 °F	**S**	**S**
	High temperature Process temperature -267 °C to 454 °C -448 °F to 850 °F	**H**	
Pressure sensor	No pressure sensor	**P0**	**P0**
	Maximum 2 bar a 30 psi a Proof 4 bar a 60 psi a	**P1**	
	Maximum 7 bar a 100 psi a Proof 14 bar a 200 psi a	**P2**	
	Maximum 20 bar a 300 psi a Proof 41 bar a 600 psi a	**P3**	
	Maximum 34 bar a 500 psi a Proof 69 bar a 1 000 psi a	**P4**	
	Maximum 100 bar a 1 500 psi a Proof 175 bar a 2 500 psi a	**P5**	

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How to order continued on next page

How to order (continued)

Selection:

Category	Description			Suffix code	Grey = Standard
Process connections	Compression, 2" NPT	CNPT	Packing gland, 2" NPT, retractor (use with E probe)	PNPTR-E	PNPTR
	Compression, 2" ASME 150 flange	C150	Packing gland, 2" ASME 150 flange, retractor	P150R	
	Compression, DN50 PN16 flange	C16	Packing gland, 2" ASME 150 flange, retractor (E probe)	P150R-E	
	Compression, 2" ASME 300 flange	C300	Packing gland, DN50 PN16 flange, retractor	P16R	
	Compression, DN50 PN40 flange	C40	Packing gland, DN50 PN16 flange, retractor (E probe)	P16R-E	
	Compression, 2" ASME 600 flange	C600	Packing gland, 2" ASME 300 flange, retractor	P300R	
	Compression, DN50 PN63 flange	C63	Packing gland, 2" ASME 300 flange, retractor (E probe)	P300R-E	
	Packing gland*, 2" NPT	PNPT	Packing gland, DN50 PN40 flange, retractor	P40R	
	Packing gland*, 2" ASME 150 flange	P150	Packing gland, DN50 PN40 flange, retractor (E probe)	P40R-E	
	Packing gland*, DN50 PN16 flange	P16	Packing gland, 2" ASME 600 flange, retractor	P600R	
	Packing gland*, 2" ASME 300 flange	P300	Packing gland, 2" ASME 600 flange, retractor (E probe)	P600R-E	
	Packing gland*, DN50 PN40 flange	P40	Packing gland, DN50 PN63 flange, retractor	P63R	
	Packing gland, 2" NPT, retractor	PNPTR	Packing gland, DN50 PN63 flange, retractor (E probe)	P63R-E	
	* One removable retractor must be ordered if the process pressure is >3.4 bar g (50 psi g).				
Approvals	FM/FMC and CE marked			S	S
Rotor options	Gas or Steam Vmin = 1.07 m/s (3.5 ft/s) Vmax = 13.1 m/s (43 ft/s) 40° pitch			R40	R40
	Gas or Steam Vmin = 1.2 m/s (4.0 ft/s) Vmax = 19.0 m/s (62.5 ft/s) 30° pitch			R30	
	Gas or Steam Vmin = 1.5 m/s (5.0 ft/s) Vmax = 24.4 m/s (80 ft/s) 25° pitch			R25	
	Gas or Steam Vmin = 2.1 m/s (7.0 ft/s) Vmax = 30.5 m/s (100 ft/s) 20° pitch			R20	
	Gas or Steam Vmin = 2.6 m/s (8.5 ft/s) Vmax = 41.0 m/s (134.6 ft/s) 15° pitch			R15	
	Gas or Steam Vmin = 3.7 m/s (12.0 ft/s) Vmax = 62.5 m/s (205 ft/s) 10° pitch			R10	
	Liquid Vmin = 0.3 m/s (1.0 ft/s) Vmax = 9.1 m/s (30 ft/s) 40° pitch			L40	

Selection example: RIM20 - V - S - L - D - DL - 1HL - S - P0 - PNPTR - S - R40

How to order example: 1 off Spirax Sarco RIM20 - V - S - L - D - DL -1HL - S - P0 - PNPTR - S -R40 rotor insertion flowmeter.

TI-P176-02
EMM Issue 6

M410
Orifice Plate Flowmeter and Carrier Assembly

Description
The M410 orifice plate and carrier assembly is a primary flow element consisting of a tab handled square edged orifice plate and optional carrier. The orifice plate is designed and manufactured to meet the requirements of British Standard BS 1042 and International Standard Organisation ISO 5167 in all respects and is suitable for the measurement of the rate of flow for most liquids, gases and steam. The tab handled orifice plate can be used for either:

a: on its own fitted between flanges with pressure tappings in the users pipework or flanges.

or

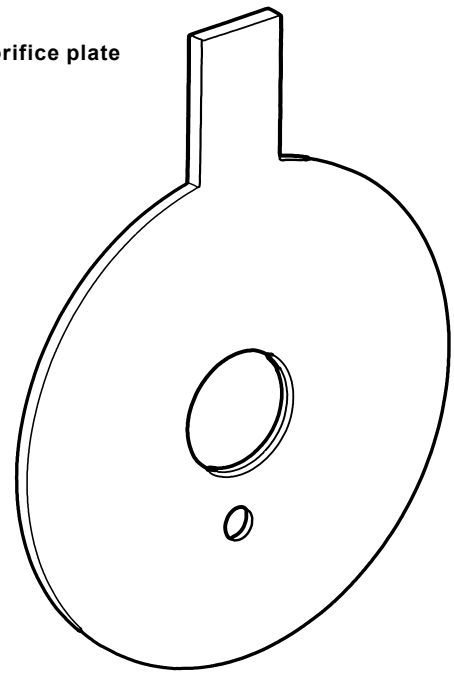
b: fitted into a carrier with integral flange tappings designed to fit between customer flanges.

Limiting conditions
The pressure and temperature limitations of both the tab handled plate and the carrier assembly are the same as the specified flange ratings.

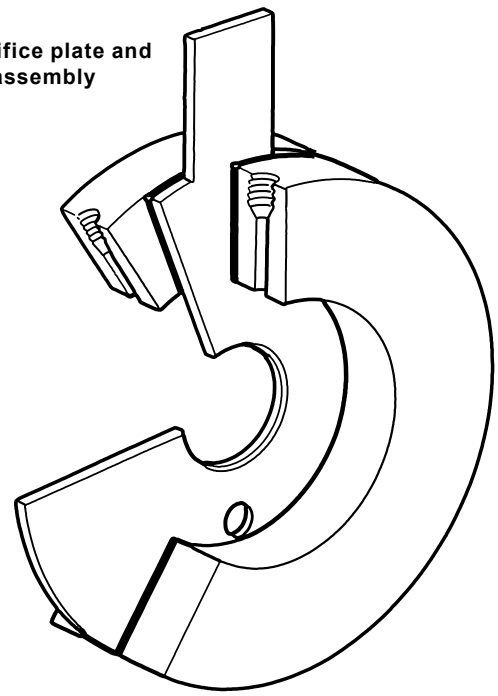
Performance
To BS 1042 and ISO 5167.
The performance of an orifice plate flowmetering system can be greatly influenced by installation variables, so the figures given below are for guidance only:

Accuracy	Typically ±3% of actual flow (equivalent to ±1.5% full scale deflection at 50% of rated maximum flow)
Repeatability	Typically ±0.3%
Turndown	Typically 4:1

M410 orifice plate



M410 orifice plate and carrier assembly



Pipe sizes available

Tab handled plates with or without carriers are available to suit the following pipe sizes:
DN25, DN40, DN50, DN65, DN80, DN100, DN125, DN150, DN200, DN250, DN300, DN350, DN400, DN450, DN500 and DN600.
(1”, 1½”, 2”, 2½”, 3”, 4”, 5”, 6”, 8”, 10”, 12”, 14”, 16”, 18”, 20” and 24”)

Connections

Tab handled plates and carriers are available to suit the following flange specifications:
EN 1092 PN16, PN25 and PN40.
BS 10 Table H.
ASME B 16.5 Class 150, 300, 600.
Japanese Industrial Standard JIS 20.
Korean Standard KS 20.

Materials

Tab handled orifice plate	BS 1449 S 316 (Stainless Steel Grade 316)
Carrier	Passivated zinc plated carbon steel
Gaskets	Exfoliated graphite

Pressure tappings

When the tab handled orifice plates are used without the optional carrier, it is the responsibility of the user to provide appropriate presssure tappings in either his flanges or upstream and downstream pipework in line with BS 1042/ISO 5167.
The optional carrier assembly incorporates upstream and downstream pressure tappings threaded ½" NPT. These tappings are 25.4 mm either side of the orifice plate face in line with the requirements of BS 1042 /ISO 5167.

Safety information, installation and maintenance

For full details see the Installation and Maintenance Instructions supplied with the product.

Installation note:

It is important that all details of the installation conform to BS 1042 /ISO 5167. Of special note, is the long, straight lengths of pipe that must be present upstream of the orifice plate. As an approximate guide, 20 to 30 pipe diameters upstream and 5 downstream should be adequate but it is recommended that reference is made to the relevant standard (BS 1042 / ISO 5167). A summary of the basic requirements is included with the M410 equipment.

Maintenance note:

A visual inspection of the orifice plate should be made at regular intervals to check for dirt build-up, damage or a loss of sharpness of the upstream edge of the plate. Replacement orifice plates and gaskets are available from Spirax Sarco.

How to specify

Orifice plate primary element with/without optional carrier assembly conforming to BS 1042 / ISO 5167.

Associated equipment

Item	Description
EL2211	Temperature sensor/transmitter
EL2230	Temperature sensor/transmitter
EL2600	Pressure transmitter
EL2810	Temperature sensor/transmitter
F50C	Isolation valve
M610	Transmitter assembly
M750	Display unit
M850	Steam flow computer

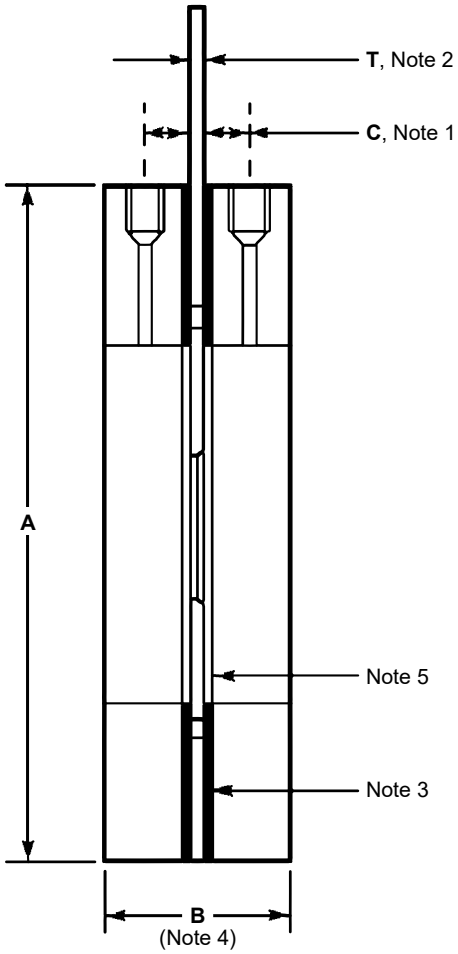
For a general description of Spirax Sarco orifice plate flowmetering systems, see TI-P176-03 (density compensated system) and TI-P176-01 (non density compensated system).

Dimensions/weights (approximate) in mm and kg

Size	EN 1092 PN16 A	EN 1092 PN25 A	EN 1092 PN40 A	BS 10: Table H A	ASME 150 A	ASME 300 A	ASME 600 A	JIS 20 A	KS 20 A	Maximum weight kg
DN25	73	73	73	71.4	66.7	73.0	73.0	74	74	2.36
DN40	94	94	94	88.9	85.7	95.3	95.3	89	89	3.72
DN50	109	109	109	111.1	104.7	111.1	111.1	104	104	4.91
DN65	129	129	129	130.1	123.8	130.2	130.2	124	124	6.21
DN80	144	144	144	149.2	136.5	149.3	149.3	140	140	7.91
DN100	164	170	170	174.6	174.6	181.0	193.7	165	165	13.75
DN125	194	196	196	215.9	196.9	216.0	241.3	203	203	20.98
DN150	220	226	226	241.3	222.3	250.9	266.7	238	238	23.51
DN200	275	286	293	304.9	279.4	308.0	320.6	383	383	31.25
DN250	331	343	355	358.8	339.7	361.9	400.0	356	356	47.95
DN300	386	403	420	415.9	409.6	422.2	457.1	406	400	58.74
DN350	446	460	477	469.9	450.8	485.7	492.1	450	450	60.20
DN400	498	517	549	527.0	574.3	539.7	565.1	570	570	85.99
DN450	559	567	574	581.0	549.2	596.8	612.7	575	575	94.38
DN500	620	627	631	644.5	606.4	654.0	682.6	630	630	117.69
DN600	737	734	750	749.3	717.5	774.7	790.6	734	734	146.37

Notes:

1. Dimension **C** is 2.54 mm for all sizes in line with BS 1042/ISO 5167.
2. For line sizes DN25 to DN350, orifice plate thickness **T** is 3 mm, above DN350, **T** is 6 mm.
3. Gaskets are 1.6 mm thick.
4. For line sizes up to DN350, carrier assembly thickness **B** is 82 mm, above DN 350, B is 85 mm.
5. An optional drain hole that meets BS 1042 can be incorporated if required.
6. Maximum weights shown above are based on ASME 600 flanges.



How to order

Example: 1 off Spirax Sarco M410 orifice plate and carrier assembly.
Important note: In order that a correctly sized orifice plate can be supplied, it is essential that full details of the installation and estimated flowrates are supplied to Spirax Sarco. This is best done using a customer orifice plate datasheet available from Spirax Sarco.

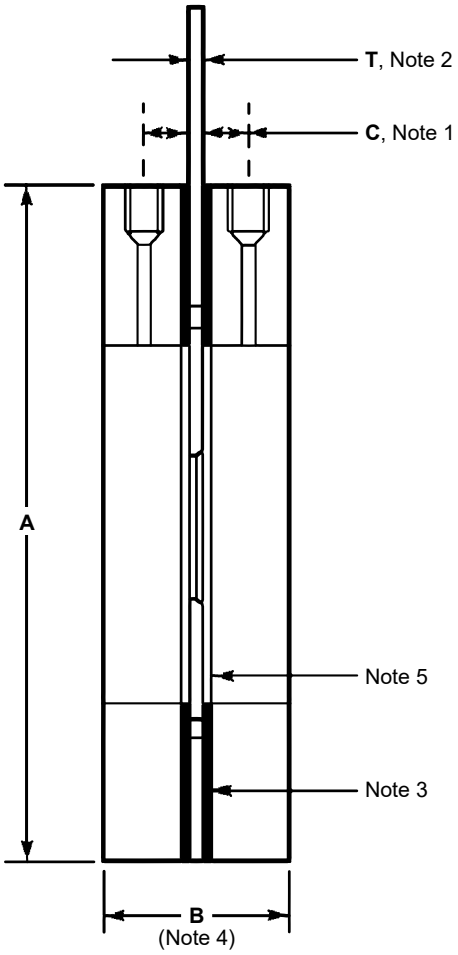
For imperial dimensions/weights, see next page

Dimensions/weights (approximate) in inches and lbs

Size	EN 1092 PN16 A	EN 1092 PN25 A	EN 1092 PN40 A	BS 10: Table H A	ASME 150 A	ASME 300 A	ASME 600 A	JIS 20 A	KS 20 A	Maximum weight lbs
1					2.63	2.87	2.87			5.20
1½					3.37	3.75	3.75			8.20
2					4.12	4.37	4.37			10.82
2½					4.87	5.13	5.13			13.69
3					5.37	5.88	5.88			17.44
4					6.87	7.13	7.63			30.31
5					7.75	8.50	9.50			46.25
6					8.75	9.88	10.50			51.83
8					11.00	12.13	12.62			68.89
10					13.37	14.25	15.75			105.71
12					16.13	16.62	18.00			129.50
14					17.75	19.12	19.37			132.72
16					22.61	21.25	22.25			189.58
18					21.62	23.50	24.12			208.07
20					23.87	25.75	26.87			259.46
24					27.25	30.5	31.13			322.69

Notes:

1. Dimension **C** is 1" for all sizes in line with BS 1042/ISO 5167.
2. For line sizes DN25 to DN350, orifice plate thickness **T** is 7/64", above DN350, **T** is 15/64".
3. Gaskets are 1/16" thick.
4. For line sizes up to DN350, carrier assembly thickness **B** is 8 37/32", above DN 350, B is 3 11/32".
5. An optional drain hole that meets BS 1042 can be incorporated if required.
6. Maximum weights shown above are based on ASME 600 flanges.



How to order

Example: 1 off Spirax Sarco M410 orifice plate and carrier assembly.
Important note: In order that a correctly sized orifice plate can be supplied, it is essential that full details of the installation and estimated flowrates are supplied to Spirax Sarco. This is best done using a customer orifice plate datasheet available from Spirax Sarco.

TI-P488-01-US
Issue 1

Orifice Plate Flowmeters
Orifice Plate Flowmetering System (density compensated)

Description

The Orifice Plate Metering system is suitable for measuring the rate of flow of steam, liquids and most gases. For steam and gas flowmetering applications, it is important to take account of changes in flowing density due to flowing pressure and temperature variations. If ignored these changes in flow density will cause significant measurement errors. Liquids being non- compressible do not suffer from this problem and generally density compensation is not required. Compatible flow computers, pressure and temperature transmitters are listed in the Associated equipment section.

Options available:

The Orifice Plate Metering package is available in a number of options to suit most requirements. For applications requiring density compensation, select one of the four basic options and add a flow computer and pressure/temperature measuring equipment as required:

Option 1	M410 orifice plate and gaskets
Option 2	M410 orifice plate, gaskets and M610 DP transmitter assembly
Option 3	M410 orifice plate, gaskets, carrier ring assembly and F50C isolation valves
Option 4	M410 orifice plate, gaskets, carrier ring assembly and F50C isolation valves and M610 DP transmitter assembly

M410 orifice plate

This is installed in the line at the point where the flow is to be measured. It produces a differencial pressure proportional to the rate of flow.

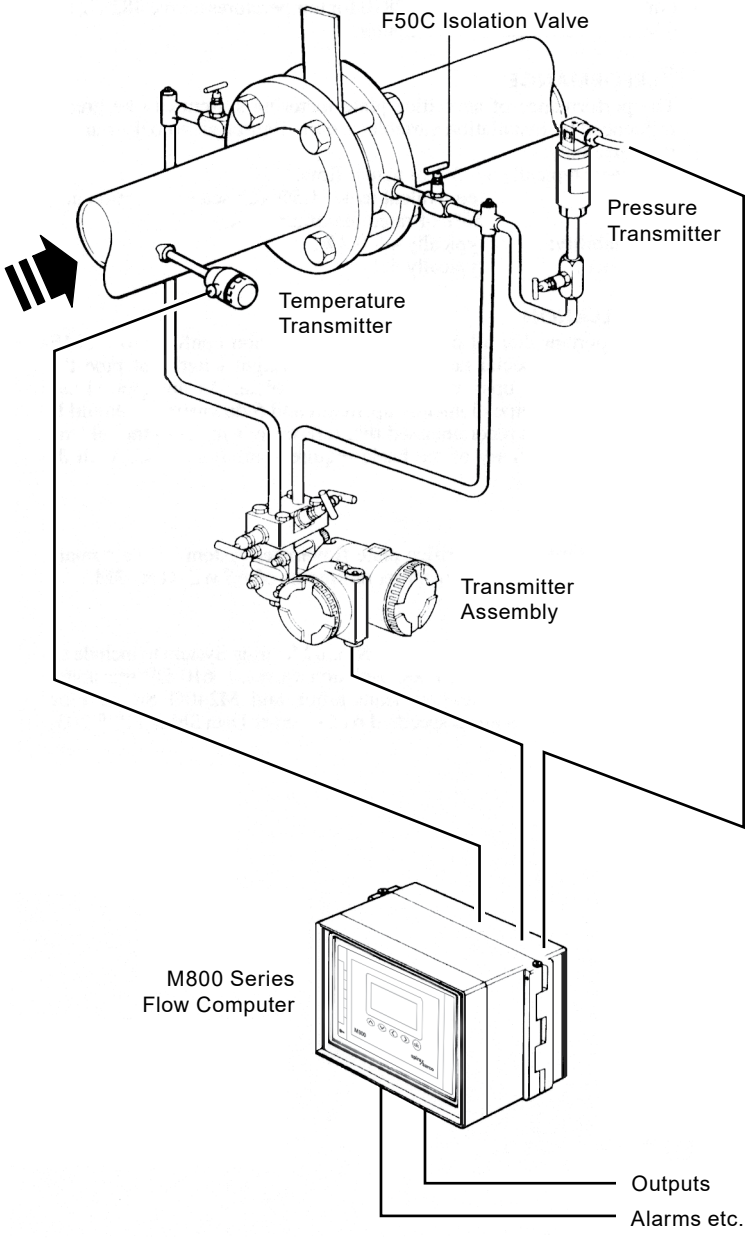
F50C isolation valves

These are used to isolate the impulse lines close to the orifice plate.

M610 DP transmitter assembly

This is installed close to the orifice plate and converts the differential pressure to a 4-20mA signal for retransmission to other equipment.
The M610 is supplied ready fitted with a 3 way manifold which acts as secondary isolation and pressure equalization valve.

M410 Orifice plate and Carrier assembly



Typical configuration shown here is for a superheated steam application. Gas applications will differ slightly.

Associated equipment

EL2600 Pressure transmitter
This is installed in the impulse piping (high pressure side) and provides a pressure signal for density compensation.

EL2271 Temperature sensor and transmitter assembly
This is installed in the line upstream of the orifice plate and provides a temperature signal for density compensation (Suitable for temperatures up to 250 °C (482 °F).

EL2270 Temperature sensor
This is a Pt100 temperature sensor that is installed in the line to provide a temperature signal to the remote M800 temperature transmitter. (Suitable for temperatures up to 500 °C (932 °F).

M800 Temperature transmitter
This is a remote temperature transmitter for use in conjunction with the EL2270 temperature sensor for applications with temperatures between 250 °C (482 °F) and 500 °C (932 °F).

M800 Series Steam flow computer
This flow computer is suitable for use with orifice plates on saturated and superheated steam flow applications. It uses the flow, pressure and temperature signals to carry out necessary density compensation calculations for all steam conditions up to a maximum of 42 bar g (609 psi g)/500 °C (932 °F) Outputs to drive the DP, pressure and temperature transmitters are standard.

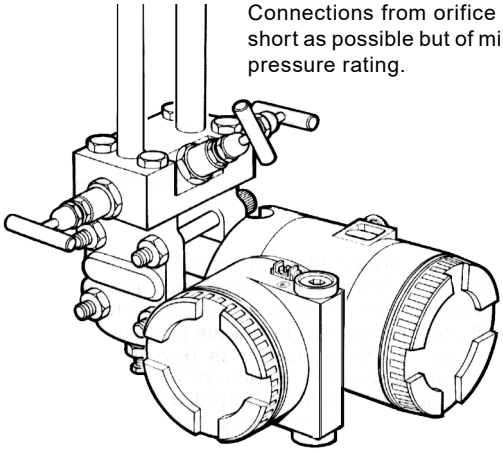
M800 Series Gas flow computer
Details as for the M800 gas flow computer except that the M800 gas flow computer is for gas applications.

Density compensated system requirements
In addition to a M410 assembly (Option 1 - 4), the following components are required:

Saturated steam	Either a EL2600 pressure transmitter or a EL2271 temperature transmitter (substitute with EL2270 for temperatures above 250 °C (482 °F)), and a M800 series steam flow computer.
Superheated steam	Both a EL2600 pressure transmitter and a EL2271 temperature transmitter (substitute with EL2270 for temperatures above 250 °C (482 °F)), and a M800 series steam flow computer.
Gases	Both a EL2600 pressure transmitter and a EL2271 temperature transmitter (substitute with EL2270 for temperatures above 250 °C (482 °F)), and a M800 series gas flow computer.

Typical M610 installation for steam applications

Connections from orifice plate assembly to 3-way manifold is via 2 impulse lines to be kept as short as possible but of minimum length of 101.6 cm (40 inches), minimum ½" bore pipe of suitable pressure rating.

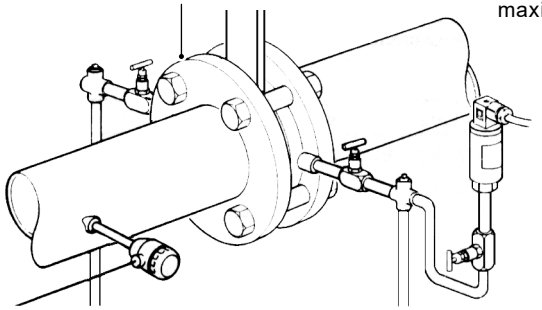


M610 DP
Transmitter Assembly

Configuration showing M410 orifice plate with carrier for steam applications

M410 orifice plate and carrier assembly

Wiring from pressure transmitter to computer (503 m (1650 ft). maximum length) by user/installer.24 AWG cable or similar



F50C Isolation Valve

Wiring from the temperature transmitter to computer (503 m (1650 ft). maximum length) by user/installer. 24 AWG cable or similar.

Performance

The performance of an orifice plate metering system can be greatly influenced by installation variables, so the figures given below are for guidance only:

Accuracy:	typically +/- 3% of actual flow. (equivalent to +/- 1.5% full scale deflection at 50% of rated maximum flow).
Repeatability:	typically +/- 0.3%.
Turndown:	typically 4:1.

Installation

It is important that all details of the installation conform to ASME-MFC-3M. Of special note, is the long, straight lengths of pipe that must be present upstream of the orifice plate. As an approximate guide, 20 to 30 pipe diameters upstream and 5 downstream should be adequate but it is recommended that reference is made to the relevant standard. A summary of the basic requirements is included with the M410 equipment.

How to specify

1- M410 Orifice plate flowmeter system with automatic density compensation to meet requirements of ASME-MFC-3M.

How to order

1- M410 Orifice Plate Steam Metering System to include tab handled plate and carrier, F50C isolation valves, M610 DP transmitter assembly, EL2600 pressure transmitter and M800 Steam Flow Computer.

TI-P487-03-US
Issue 1

Orifice Plate Flowmeters
Orifice Plate Flowmetering System (non-compensated)

Description

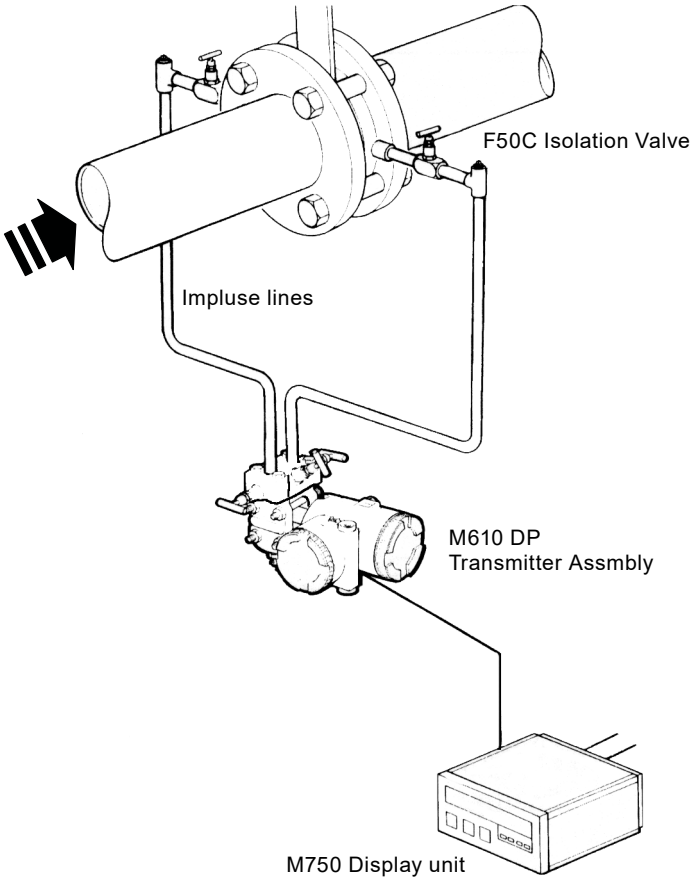
The Orifice Plate Metering system is suitable for measuring the rate of flow of steam, liquids and most gases. For steam and gas flowmetering applications where the operating pressure and temperature are steady, it is not necessary to incorporate any means of automatic density compensation. Liquids, being non compressible, are not significantly affected by pressure and temperature variations and so density compensation is not normally required.

Options available:

The Orifice Plate Metering package is available in a number of options to suit most requirements.
For non density compensated applications,the following options are available.

Option 1	M410 orifice plate and gaskets
Option 2	M410 orifice plate, gaskets and M610 DP transmitter assembly
Option 3	M410 orifice plate, gaskets, carrier ring assembly and F50C isolation valves
Option 4	M410 orifice plate, gaskets, carrier ring assembly, F50C isolation valves and M610 DP transmitter assembly

M410 Orifice Plate and Carrier Assembly



M410 orifice plate

This is installed in the line at the point where the flow is to be measured. It produces a differential pressure proportional to the rate of flow.

F50C isolation valves

These are used to isolate the impulse lines close to the orifice plate.

M610 DP transmitter assembly

This is installed close to the orifice plate and converts the differential pressure to a 4-20mA signal for retransmission to other equipment. The M610 is supplied ready fitted with a 3 way manifold which acts as secondary isolation and pressure equalization valve.

Associated equipment

M750 Display Unit.
This is a panel mounting flow indicator that displays flow rate and total flow, with analog and digital outputs available. The M750 supplies 19v DC to power the M610 DP transmitter.

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Performance

The performance of an orifice plate metering system can be greatly influenced by installation variables, so the figures given below are for guidance only:

Accuracy:	typically +/- 3% of actual flow (equivalent to +/- 1.5% full scale deflection at 50% of rated maximum flow).
Repeatability:	typically +/- 0.3%.
Turndown:	typically 4:1.

Installation

It is important that all details of the installation conform to ASME-MFC-3M. Of special note, is the long, straight lengths of pipe that must be present upstream of the orifice plate. As an approximate guide, 20 to 30 pipe diameters upstream and 5 diameters downstream should be adequate but it is recommended that reference is made to the relevant standard. A summary of the basic requirements is included with the M410 equipment.

How to specify

1- M410 Orifice plate flowmeter system conforming to ASME-MFC-3M.

How to order

1- M410 Orifice Plate Steam Metering System to include tab handled plate and carrier, F50C isolation valves, M610 DP transmitter assembly and M750 Display Unit. (Full details as specified on Customer Data Sheet TI-P488-03-US and TI-P176-02)

TI-P488-03-US
Issue 1

Orifice Plate Flowmeters
Customer Data Sheet

This Customer Data Sheet is intended to gather together all relevant information necessary to size and specify an Orifice Plate Flowmetering System. All equipment will be supplied to the customer based on the information received.

Company name	
Address	
Contact	
Project reference	
Notes	

Please complete all sections and supply drawings, sketches etc. where appropriate.

Section A: Working fluid details

Name of fluid (e.g. steam, water, air)				
State of fluid (e.g. liquid, vapor, gas)				
	Min value	**Normal value**	**Max value**	**Units**
Flowing pressure				
Flowing yemperature				
Flowing density				
Estimated rate of flow				

Notes:
The pressure drop at specified maximum rate of flow will be 2.54 m (100") water gauge unless otherwise stated. Below 25% of specified maximum rate of flow, system accuracy cannot be guaranteed due to turndown limitations of orifice plates.

Section B: Pipeline details

	Value
Nominal pipe size (inches)	
Pipe inside diameter (inches)	
Pipe schedule	
Flange rating (ANSI)	
Number of straight pipe diameters upstream	
Number of straight pipe diameters downstream	
Pipe material	
DP Trapping position*	

*If ordering plate only (no carrier) specify tapping position (corner, flange, D and D/2, or 2.5D and 8D).

Please provide a sketch showing all details of pipework including any valves, bends, fittings etc in the area where the M410 orifice plate is to be fitted. This is important as the performance of all orifice plates can be affected greatly by installation factors.
Using the information from sections A and B the correct orifice plate sizing will be accomplished.

Section C: M410 Kit options

The Orifice Plate is available in 4 basic kits. To create a complete metering system, additional components should be selected. The composition of the system is dependent on whether or not density compensation is required.
Note: Check all items required.

Option		Check
1	M410 orifice plate and gaskets	
2	M410 orifice plate, gaskets, M610 DP transmitter assembly	
3	M410 orifice plate, gaskets, carrier rings and 2 F50C isolation valves	
4	M410 orifice plate, gaskets, carrier rings, 2 F50C isolation valves and M610 DP transmitter assembly	

Section D: Associated transmitters required for density compensated systems

Item	Range length	Insert	Check	See technical sheet
EL2600 pressure transmitter				TI-P322-02-US
EL2270 temperature transmitter				TI-P322-06-US
EL2271 temperature sensor & transmitter				
Temperature Sensor Pocket				
M800 steam flow computer				TI-P331-04-US

Section E: Associated flow computers

	Item	Supply (volts)	Check	See technical sheet
M750 uncompensated panel mounted display				TI-P332-08-US
M800 steam flow computer, wall mounted *				TI-P331-04-US
M800 steam flow computer, panel mounted *				
M800 gas flow computer, wall mounted *				TI-P333-24-US
M800 gas flow computer, panel mounted *				

*Provide density compensation

TI-P335-23-US
Issue 3

Scanner 2000
Steam Mass Flow Transmitter

Description
The Scanner 2000 steam mass flow transmitter takes its inputs from a primary flowmeter, (Gilflo or ILVA) through impulse lines. It converts the differential and static pressure into a corrected mass flowrate of saturated steam, which is accessible via the RS485 Modbus link or optionally via a 4 - 20 mA signal.

Configuration
Scanner 2000 steam mass flow transmitters are uniquely configured at the factory to work with a single, specific Gilflo or ILVA flowmeter, for a specific flow application.
For correct operation the Scanner 2000 transmitter must be installed with its allocated flowmeter. A label on the packaging gives the serial number of the matched product.
The Scanner 2000 can be configured using an RS485 equipped PC with the supplied configuration software.

Note: A DB9 Serial RS232 to RS485 converter will otherwise be required to connect your PC to the Scanner 2000.
If your PC only has USB ports a USB to DB9 Serial port converter will be required. These are available from most electronic equipment suppliers.

Available types and approvals
Explosion proof types available:

CSA
- Class 1, Div 1, Groups B, C and D
- Type 4 Enclosure
- T6 Temperature Class

ATEX
- ATEX II 2 GD
- Ex d IIC T6 (-40 °F to 158 °F (-40 °C to 70 °C)) or
- Ex td A21 IP68 T85C (-40 °F to 158 °F (-40 °C to 70 °C))
- All Scanner 2000's are compliant



Features
In head LCD providing local indication of density compensated rate and total saturated steam flow. RS485 Modbus RTU slave functionality for remote indication, data logging and configuration.

Associated equipment
- Gilflo flowmeter
- ILVA flowmeter
- M750 flow indicator
- Optional local display

Materials

Enclosure	Cast aluminium (painted with epoxy and polyurethane)	
Body	Stainless steel	AISI 316
3-way manifold	Stainless steel	AISI 316
Fluid fill	Silicone oil	

Pipe connections

The process ports on the 3-way manifold are threaded ½" NPT connections at 2⅛" (54 mm) center.

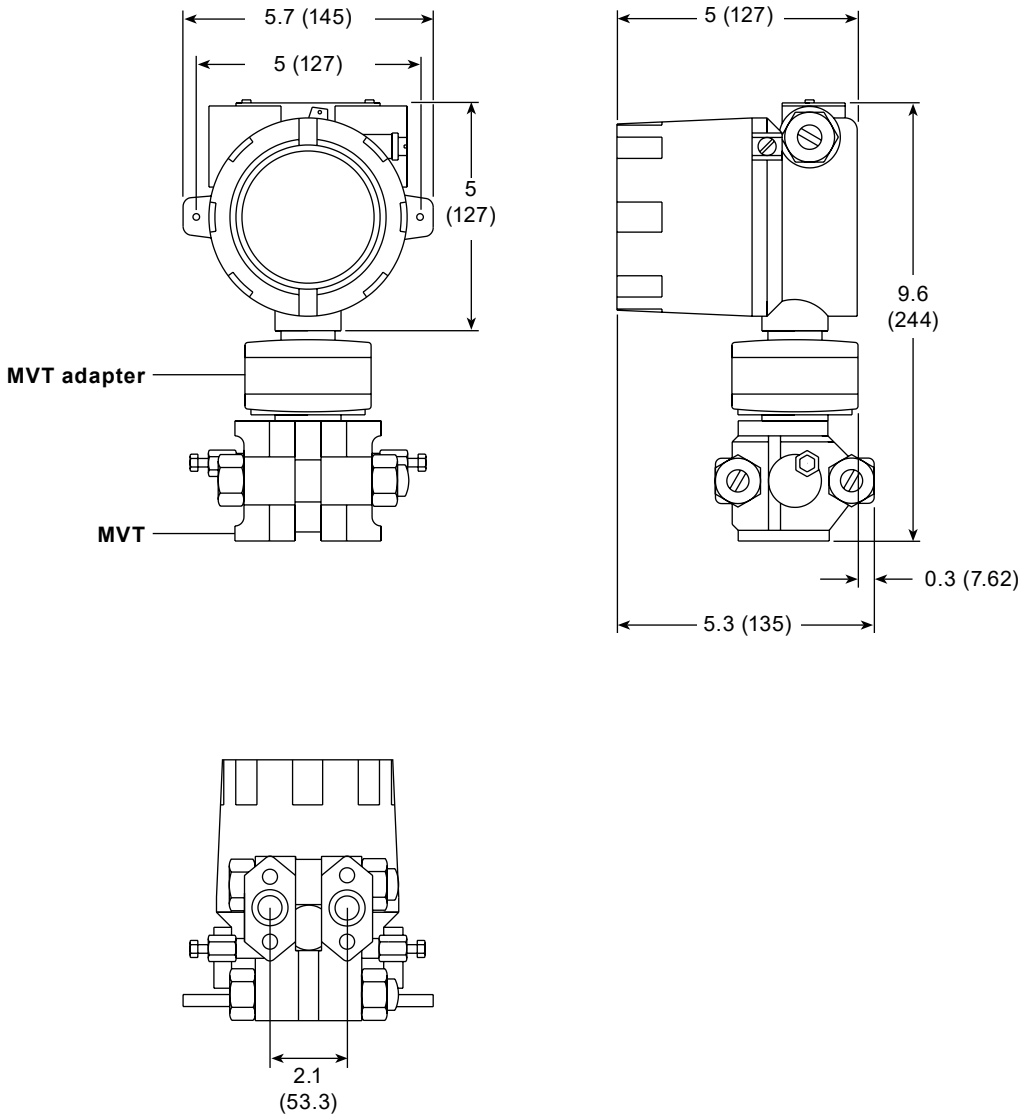
Electrical connections

¾" NPT	Non approved and ATEX units
¾" NPT	CSA units

Technical data

Range	Minimum 2" (50.8 mm) H_20 (.498 KPa)
	Maximum 200" (5,080 mm) H_20 (49.8 KPa)
Outputs	4 - 20 mA (expansion board required)
	RS485 Modbus RTU slave (baud rate 300 to 38.4 K)
	Solid state relay, configurable as pulse or alarm
Power supply	6 V to 30 Vdc at 31 mA
Pressure limits	155 bar (2,248 psi g)
Temperature limits	-40 °F to 158 °F (-40 °C to 70 °C)
	LCD contrast is reduced below -22 °F (-30 °C)
Accuracy	±0.05% for Spans >10% of the URL
	±0.005 (URL/SPAN) for Spans <10% of the sensor
Enclosure rating	IEC IP68

Dimensions (approximate) inches (mm)



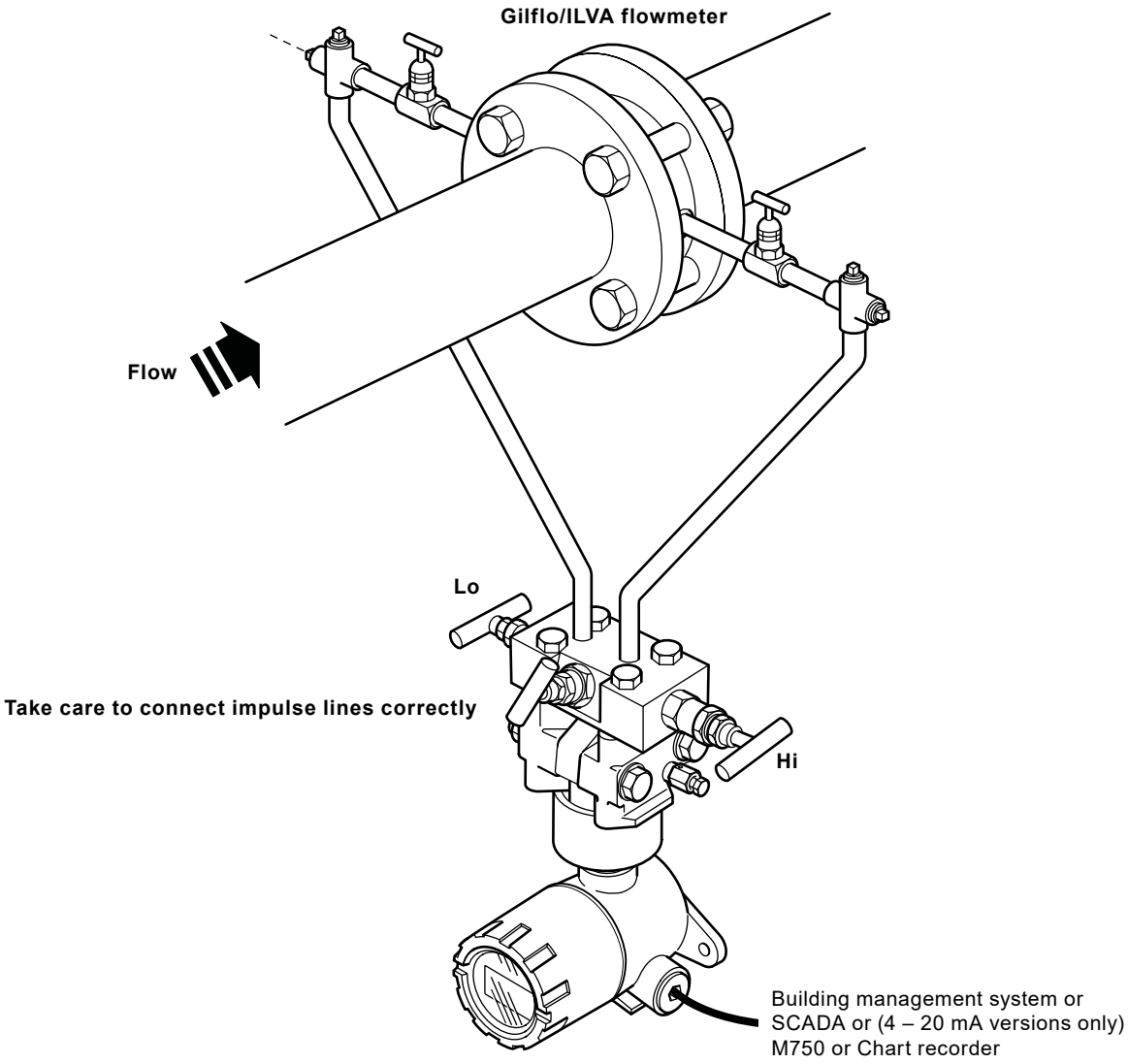
Weights (approximate) in lbs (kg)

DP transmitter	3-way manifold	Scanner 2000 assembly
11 (5)	2.2 (1)	13.2 (6)

Safety information, Installation and Maintenance

Warning: This document does not give sufficient information for safe installation of the product.
Full details are given in the Installation and Maintenance Instructions supplied with the Scanner 2000.

Typical installation



How to order

The following information will allow us to uniquely configure the Scanner 2000 for each application prior to despatch.

Parameter	Range of values	Customer requirement	Notes
Flowmeter type	Gilflo or ILVA		Specific flowmeter type
Gilflo/ILVA serial number	-		Required for existing flowmeters only
Analog output units	kg/h, lb/h, Btu/h, or kJ/h		Specific required units
Analog output scaling (4 mA)	kg/h, lb/h, Btu/h, or kJ/h		Normally zero
Analog output scaling (20 mA)	kg/h, lb/h, Btu/h, or kJ/h		Normally maximum required flowrate
Maximum range Δp	2" to 200" (50.8 to 5080 mm) H_20 (0.498 to 49.8 KPa)		From Gilflo and ILVA sizing sheet
Steam quality (Dryness fraction)	60 to 100%		Set at 100% unless otherwise specified

Example: 1 off Scanner 2000 steam mass flow transmitter configured for use with a 3" (DN80) ILVA flowmeter passing 4400 lb/h of saturated steam at 101 psi g.

TI-P335-10
EMM Issue 9

M610 Series II
DP Transmitter Assembly

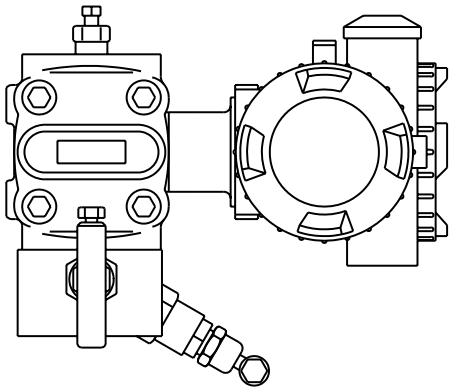
Description

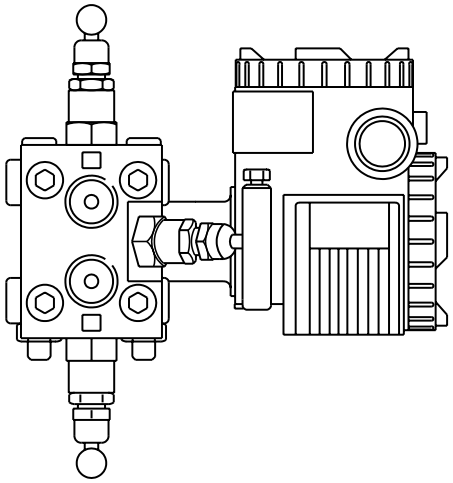
The M610 Series II DP transmitter assembly is designed to accept a differential pressure input from a primary flow element such as an orifice plate or Gilflo flowmeter and convert it into an analogue 4 - 20 mA output signal. The standard version comes with digital communications in the form of HART® 5.2 which is superimposed on the 4 - 20 mA output. The 3-way manifold which is supplied already assembled to the DP transmitter acts as a means of secondary isolation and as a pressure equalisation valve to check the zero of the DP transmitter.

The M610 Series II DP transmitter assembly consists of two items:

- A high accuracy (0.1%) differential pressure transmitter.
- A 3-way carbon steel isolation manifold.

Note: These items are supplied already assembled.





Pipe connections

The process ports on the 3-way manifold are threaded ½" NPT at 54 mm centres.

Electrical connections

½" NPT x 1.5 screwed terminals (M20 adaptor supplied).

M610 Series II technical data

Span	0 - 1 326 mm (0 - 52.2") H_2O (0 -13 kPa) minimum
	0 - 13 256 mm (0 - 522") H_2O (0 -130 kPa) maximum
Output	4 - 20 mA dc and HART® protocol 5.2
Power supply	16 V to 45 Vdc (for non-certified application)
	16 V to 28 Vdc (for E Ex ia 11c T4/T5)
Pressure limits	-1 to 140 bar g (-14.5 to 2030 psi g)
Temperature limits	-40 °C to + 85 °C (-40 °F to +185 °F) (ambient for non-certified application)
	-40 °C to + 100 °C (-40 °F to +212 °F) (process)
Accuracy	±0.1% of calibrated span to include effects of linearity, hysteresis and repeatability
Materials of construction	Body - Stainless steel
	Diaphragm - Austenitic stainless steel 316L
	3-way manifold - Carbon steel
	Fluid fill - Silicone oil
Intrinsic safety	ATEX Ex II 1GD - E EX ia 11c T4/T5 Ga Ex ia 111C T100 °C/T135 °C Da
Enclosure rating	IEC IP67 (NEMA 6/6P)
EMC emissions and immunity	To BS EN 61326:1997

Note: If HART® communications are required in intrinsically safe applications, barriers must be used which are designed to pass the HART® signal.

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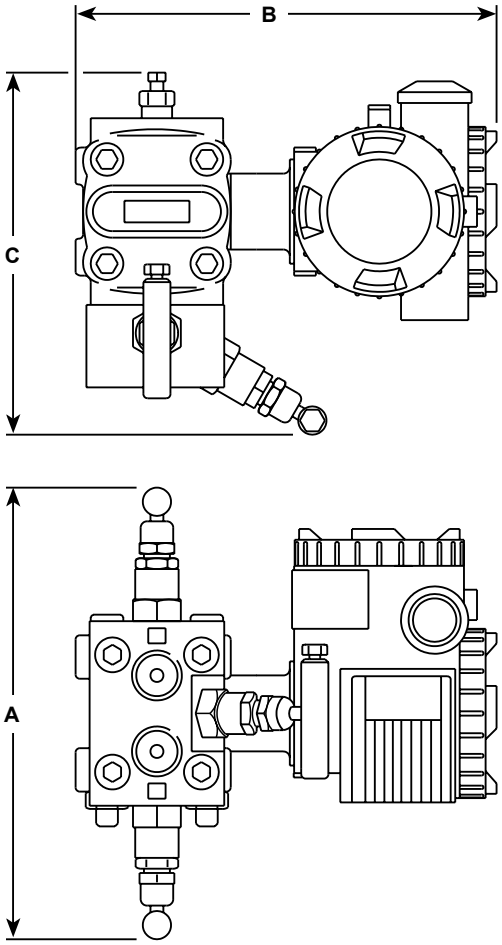
Calibration

The M610 Series II DP transmitter assembly is supplied with a span factor set to suit a particular application.
However, should load conditions and/or details of actual installation change, the range of the M610 can be adjusted within the limits 0 - 1 326 mm (0 - 52.2") H_2O (0 - 13 kPa) and 0 - 13 256 mm (0 - 522") H_2O (0 - 130 kPa) as described in the Installation and Maintenance Instructions supplied with the product.

Installation

Full installation details are given in the literature that accompanies the M610 Series II DP transmitter assembly.

Dimensions/weights (approximate) in mm (inches) and kg (lbs)



A	B	C	DP transmitter	3-Way manifold	M610 assembly
220 (8.7)	193 (7.6)	175 (6.9)	6.5 kg (14.3)	1 kg (2.2)	7.5 kg (16.5)

How to order

Example: 1 off Spirax Sarco M610 Series II DP transmitter assembly calibrated to give an output of 20 mA at an applied differential pressure of specified value.

Associated equipment:

- Orifice plate flowmeter
- Gilflo flowmeter system

TI-P332-08
EMM Issue 4

M750
Display unit

Description

The Spirax Sarco M750 is an intelligent digital panel display unit that is fully programmable from the front panel. It can accept inputs from a wide variety of sensors, and digitally processes and displays the relevant signal.
The M750 totaliser function enables non-volatile storage of the integrated total to be maintained within the unit, even after loss of power.
The M750 is ideally suited as a display unit for use with Spirax Sarco flowmeters. It can provide an indication of flowrate and totalised flow for Gilflo, ILVA, DIVA, orifice plates and vortex flowmeters as well as providing a 24 Vdc loop power supply where required.
The M750 has Modbus RTU protocol using RS485 serial communications.
Up to two 'Option Pods' can be fitted to the M750 to provide the following functions:

- An isolated 4 - 20 mA retransmission pod.
- A pod with two normally-open relays.

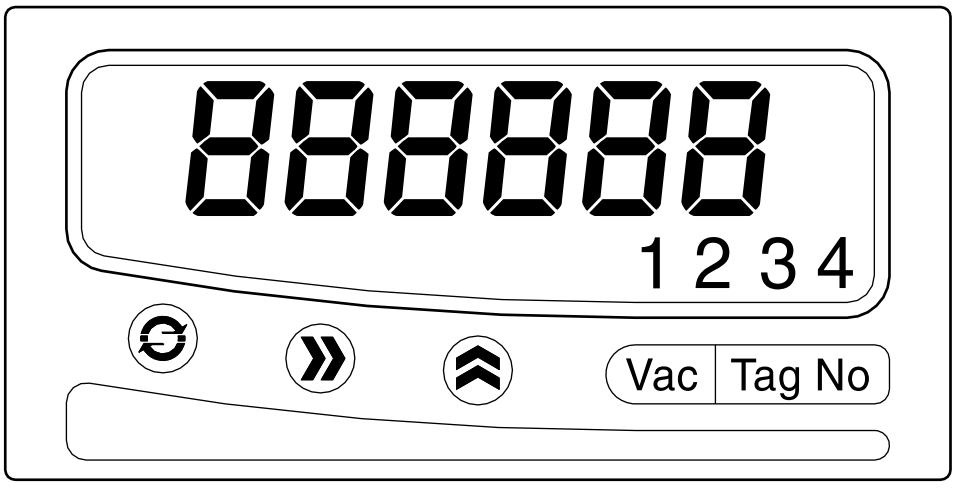
It is possible to have one or two relay pods, but only one 4 - 20 mA retransmission pod. The Option Pods can be selected to operate on Process Variable (Rate), or Total.

Technical data

See pages 2 and 3.

Weight

227 grams (0.5 lbs)



Technical data (at 20 °C)

Power supply	90-264 Vac 50/60 Hz	
	90-253 Vac 50/60 Hz for compliance with LVD and UL	
	BS EN 61010-1 for connection to an installation over-voltage Category II supply (Pollution degree 2)	
Power consumption	10 VA (worst case)	
Isolation (tested to)	500 V	
	Supply to I/O 3 750 V	
Relay supply	BS EN 61010-1 for connection to an installation over-voltage Category II supply (Pollution degree 2)	
Environmental	IP rating	IP65 (front panel only)
	Ambient operating temperature	-30 to +60 °C (-22 °F to +140 °F)
	Ambient storage	-50 to +85 °C (-58 °F to +185 °F)
	Ambient humidity	10 to 90% RH
	EMC: Emissions and immunity	BS EN 61326
	Safety	BS EN 61010-1

Universal input types

	Sensor	**Sensor range and linearisation**
Sensor and Sensor range and linearisation	**mA**	4-20 mA, ± 20 mA, ± 10 mA
	RTD	Pt 100, NI 120, custom
	T/C	K, J, T, R, S, B, N, L, B, E, Custom*
	mV	± 100 mV
	Volts	± 10 V, ± 5 V, 1 - 5 V, ± 1 V
	Minimum span	Any span within the range can be selected, but the recommended span is > 10% of range.
Current input	**Basic accuracy**	0.05% FS ± 0.05% of reading
	Thermal drift	200 ppm/ °C
	Input impedance	20 Ω
	Linearity	Linear, X1/2, X3/2, X5/2, custom*

A 19 V @ 25 mA isolated power supply is provided to power the current loop.

* Custom can be up to 60 co-ordinate pairs or up to 7 segments of 15th order polynomial.

Communications

RS485 Modbus communications	The M750 has Modbus RTU protocol with RS485 serial communications as standard.
Physical layer	4 wire or 2 wire half duplex RS485
Protocol	Modbus RTU format
Isolation	500 Vac
Maximum fan out	32 units (this can be increased with repeaters)
Termination standard	RS485

Option pods

The M750 has interchangeable output pods that are automatically recognised by the unit. The dual relay pod has two independent mains rated relays that can be configured for high or low alarms or pulse output. The isolated re-transmission pod provides 0-10 mA, 0-20 mA or 4-20 mA active or passive outputs.

Dual relay alarm pod

Two independent mains rated relay outputs, which can operate as alarms or pulsed output

Contacts	2 x changeover relays with common	
Ratings	ac	dc
Maximum load	5 A @ 250 V	5 A @ 30 V (inductive load 2 A)
Maximum power	1 250 VA	150 W
Maximum switching	253 volts	125 volts
Termination	5 way tension clamp connector	

Isolated 4-20 mA re-transmission pod

Isolated analogue retransmission for use with chart recorders, Building Management Systems, etc.

Ranges	0-10 mA (Active or Passive), 0-20 mA (Active or Passive), 4-20 mA (Active or Passive)
Minimum current output	0 mA
Maximum current output	23 mA
Accuracy	0.07% FS
Maximum output load	Active 1 K Ω Passive [(Vsupply - 2)/20] K Ω
Maximum external supply voltage	30 V (Passive mode)
Isolation	500 Vac
Termination	5-way tension clamp connector

How to specify:

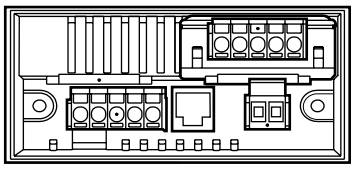
M750 panel mounted digital display unit that accepts all commonly used process signals. Designed to allow current retransmission or dual relay output option pods to be easily installed without the need for dismantling or recalibration.

How to order

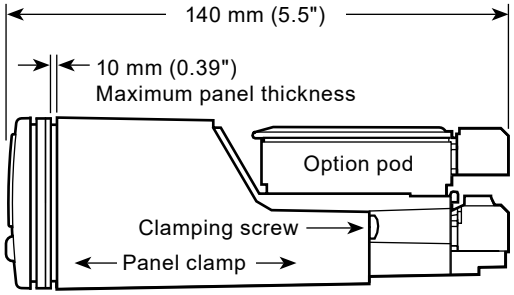
Example: 1 off Spirax Sarco M750 display unit complete with dual relay and 4 - 20 mA current retransmission option pods.

Dimensions (approximate) in millimetres (inches)

Rear elevation

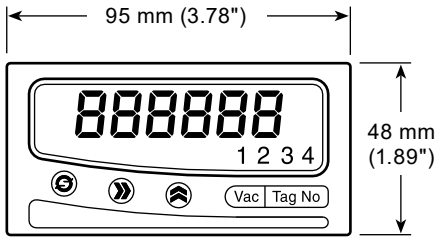


Side elevation

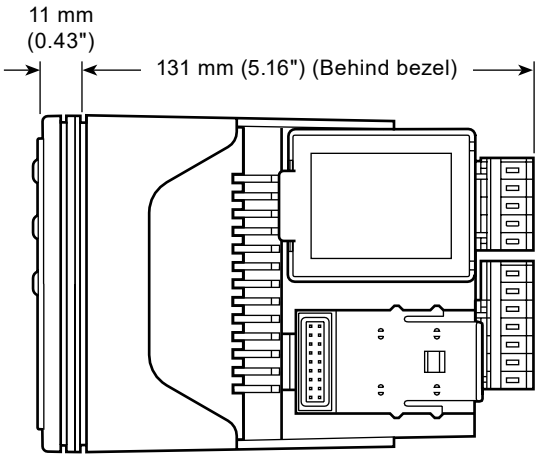


Panel cut out
92 mm (3.62") x 45 mm (1.77")

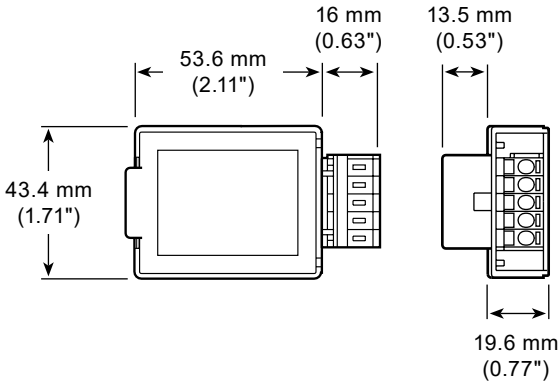
Front elevation



Plan elevation



Option pod



TI-F25-02-US
Issue 1

FP 93B
Flow Processor

Description

The FP-93B Flow Processor satisfies the instrument needs for a variety of flowmeter types in steam, liquid, gas, and heat metering applications.



Features

- "EZ Setup"- Guided Setup for First Time Users
- Liquid, Gas, Steam and Heat Flow Equations
- Utility Metering - Steam, Heating/Cooling, Chilled Water, Natural Gas, Compressed Air
- Menu Selectable Hardware & Software Features
- Internal Data Logging Standard
- Isolated Pulse, Analog and Relay Outputs Standard
- RS-232 Port Standard
- RS-485 Optional, Modbus RTU
- BACnet MS/TP and BACnet IP available as optional communications
- Windows™ Setup Software
- NX19 Gas Equations
- DDE, OPC Server and HMI Software Available
- Remote Metering by Wireless or Modem

Specifications

Environmental	Operating Temperature:	32 to 120 °F
	Storage Temperature:	-40 to 185 °F
	Humidity	0-95% Non-condensing
	Materials	UL, CSA, VDE approved
Display	Type:	2 lines of 20 characters
	Types:	Backlit LCD
	Character Size:	0.2” nominal
	User selectable label descriptors and units of measure	
Keypad	Keypad Type:	Membrane Keypad
	Keypad Rating:	Sealed to NEMA 4X
	Number of keys:	16
Enclosure	Enclosure Options:	Panel, Wall, Explosion Proof
	Size:	See Dimensions
	Depth behind panel:	6.5” including mating connector
	Type:	DIN
	Materials:	Plastic, UL94V-0, Flame retardant
	Bezel:	Textured per matt finish
Power Input	The factory equipped power option is internally fused. An internal line to line filter capacitor is provided for added transient suppression. MOV protection for surge transient is also supported	
	Universal AC Power:	85 to 276 Vac, 50/60 Hz
	DC Power Option:	24 Vdc (16 to 48 Vdc)
	Power Consumption	
	AC Power:	6.5 V/A (6.5 W)
	DC Power:	300 mA max.

Flowmeter types

Linear:	Vortex, Turbine, Gilflo, Gilflo 16 point, ILVA 16 Point Mass Flow and others
Square Law:	Orifice, Target and others
Multi-Point Linearization:	May be used with all flowmeter types. Including 16 point, UVC and dynamic compensation.

Flow inputs

Analog Input:

Accuracy: 0.02% FS at 68 °F

Ranges

Voltage: 0-10 Vdc, 0-5 Vdc, 1-5 Vdc

Current: 4-20 mA, 0-20 mA,

4-20 mA stacked, 0-20 mA stacked

Basic Measurement Resolution: 16 bit

Update Rate: 4 updates/sec

Automatic Fault detection: Signal over/under-range,

Current Loop Broken

Calibration: Operator assisted learn mode

Extended calibration: Learns Zero and Full Scale of each range

Fault Protection:

Fast Transient: 500 V Protection (capacitive clamp)

Reverse Polarity: No ill effects

Over-Voltage Limit: 50 Vdc Over voltage protection

Over-Current Protection: Internally current limited protected to 24 Vdc

Pulse inputs

Number of Flow Inputs: one

Input Impedance: 10 k Ω nominal

Trigger Level: (menu selectable)

- High Level Input
- Logic On:2.5 to 30 Vdc
- Logic Off:0 to 2 Vdc
- Low Level Input (mag pickup)
- Selectable sensitivity: 10 mV and 100 mV

Minimum Count Speed: 0.25 Hz (to maintain rate display)

Maximum Count Speed: Selectable: 0 to 50 kHz

Overvoltage Protection: 50 Vdc

Temperature, pressure, density inputs

The compensation inputs usage are menu selectable for temperature, temperature 2, pressure, density or not used.

Calibration: Operator assisted learn mode

Operation: Ratiometric

Accuracy: 0.02% FS at 68 °F

Basic Measurement Resolution: 16 bit

Update Rate: 2 updates/sec minimum

Automatic Fault detection:

Signal Over-range/under-range

Current Loop Broken

RTD short

RTD open

Reverse Polarity: No ill effects

Over-Current Limit

(current input)Internally limited to protect input to 24 Vdc)

Available Input Ranges

Current: 4-20 mA, 0-20 mA

Resistance: 100 Ohms DIN RTD

100 Ohm DIN RTD (DIN 43-760, BS 1904):

Three Wire Lead Compensation

Internal RTD linearization learns ice point resistance

1 mA Excitation current with reverse polarity protection

Temperature Resolution: 0.02 °F

Temperature Accuracy: 1.0 °F

Stored information (ROM)

Steam Tables (saturated & superheated),

Fluid Properties: Water, Air, Natural Gas or Generic

User entered stored information (EEPROM/Nonvolatile RAM)

Transmitter Ranges, Signal Types

Fluid Properties

(specific gravity, expansion factor, specific heat, viscosity, isentropic exponent, combustion heating value, Z factor)

Units Selections (English/Metric)

Language Translations (optional)

Excitation voltage

24 Vdc @ 100 mA (fault protected)

Relay outputs

The relay outputs usage is menu assignable to (Individually for each relay) Hi/Lo Rate Alarm, Hi/Lo Temperature Alarm, Hi/Lo Pressure Alarm, Pulse Output (pulse options), Wet Steam or General purpose warning (security).

Number of relays: 2 (3 optional)

Contact Style: Form C contacts

Contact Ratings: 240 V, 5 amp

Analog outputs

The analog outputs are menu assignable to correspond to the Uncompensated Volume Rate, Corrected Volume Rate, Mass Rate, Heat Rate, Temperature, Density, Delta Temperature or Pressure.

Number of outputs: 2

Type: Isolated Current Sourcing (shared common)

Available Ranges: 0-20 mA, 4-20 mA (menu selectable)

Resolution: 16 bit

Accuracy: 0.05% FS at 68 °F

Update Rate: 5 updates/sec

Temperature Drift: Less than 200 ppm/C

Maximum Load: 1000 ohms

Compliance Effect: Less than .05% Span

60 Hz rejection: 40 dB minimum

EMI: No effect at 3 V/M

Calibration: Operator assisted Learn Mode

Averaging: User entry of DSP Averaging constant to cause a smooth control action

Listing: CE Approved, UL/CSA Pending

Serial communication

The serial port can be used for printing, datalog retrieval, modem connection and communication with a computer.

RS-232:

Device ID: 01-99

Baud Rates: 300, 1200, 2400, 9600

Parity: None, Odd, Even

Handshaking: None, Software, Hardware

Print Setup: Configurable print list and formatting

RS-485: (optional 2nd COM port)

Device ID: 01-247

Baud Rates: 300, 600, 1200, 2400, 4800, 9600, 19200

Parity: None, Odd, Even

Protocol: Modbus RTU (Half Duplex)

Data logging

The data logger captures print list information to internal storage for aproximately 5000 transactions. This information can be used for later uploading or printing. Storage format is selectable for Comma-Carriage Return or Printer formats.

Isolated pulse output

The isolated pulse output is menu assignable to Uncompensated Volume Total, Compensated Volume Total, Heat Total or Mass Total.

Pulse Output Form (menu selectable): Open Collector NPN or 24 Vdc voltage pulse

Nominal On Voltage: 24 Vdc

Maximum Sink Current: 25 mA

Maximum Source Current: 25 mA

Maximum Off Voltage: 30 Vdc

Saturation Voltage: 0.4 Vdc

Pulse Duration: User selectable

Pulse output buffer: 8 bit

Fault Protection

Reverse polarity:

Shunt Diodes

Over-current Protected

Over-voltage Protected

Real time clock

The Flow Processor is equipped with a non-volatile real time clock with display of time and date.

Format: 24 hour format for time

Day, Month, Year for date

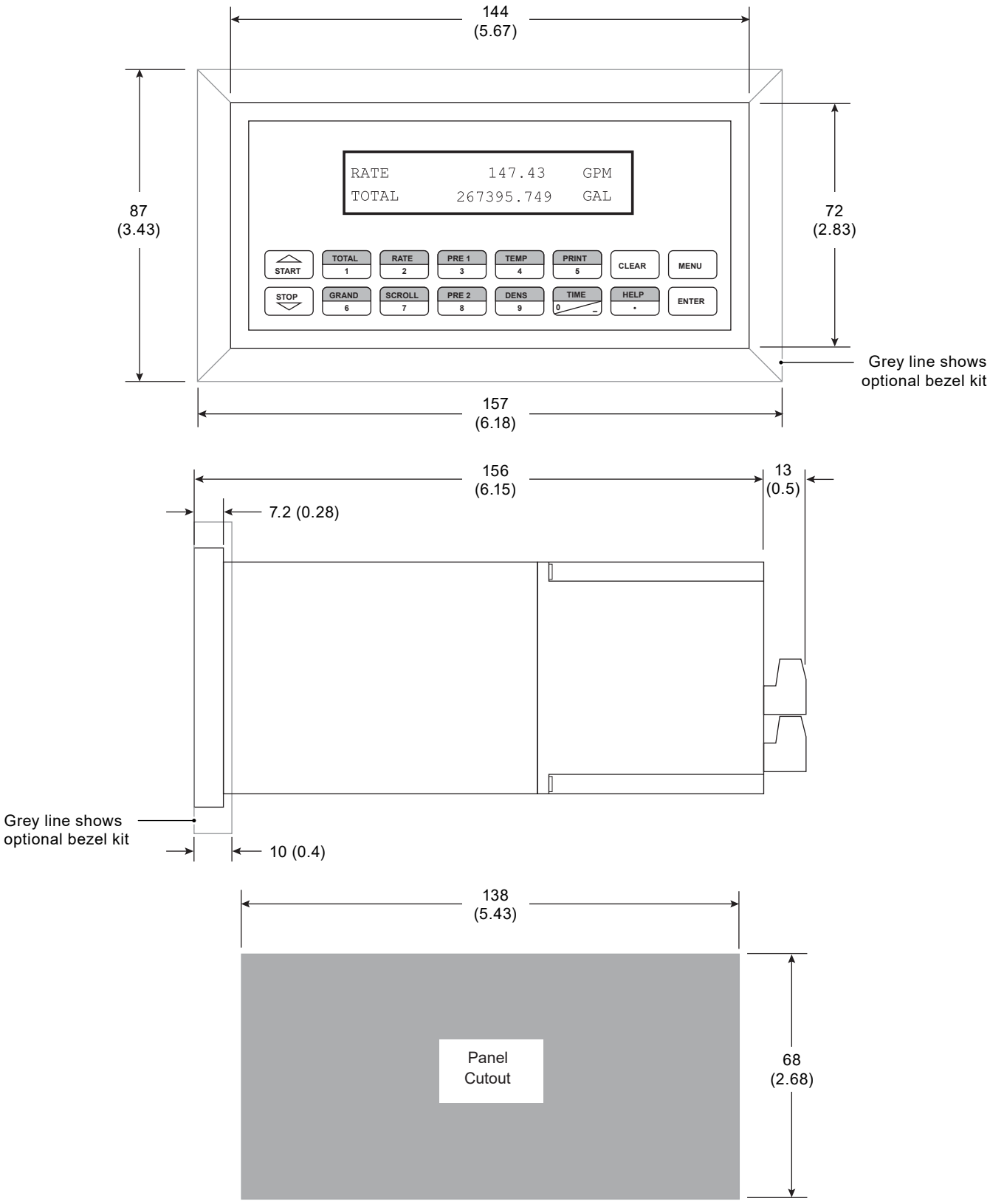
Optional Daylight Savings Time

Terminal designations

1	DC OUTPUT		FLOW IN
2	PULSE IN	Vin (+)	
3	- - - - - - - - - -	Iin (+)	
4	COMMON		
5	RTD EXCIT (+)		TEMPERATURE IN
6	RTD SENS (+)		
7	RTD SENS (-)	Iin (+)	
8	DC OUTPUT		
9	RTD EXCIT (+)		PRESSURE (TEMP 2) IN
10	RTD SENS (+)		
11	RTD SENS (-)	Iin (+)	
12	PULSE OUTPUT (+)		
13	PULSE OUTPUT (-)		
14	ANALOG OUTPUT 1 (+)		
15	ANALOG OUTPUT 2 (+)		
16	ANALOG OUTPUT COMMON (-)		
17	NO		
18	COM RLY1		
19	NC		
20	NC		
21	COM RLY2		
22	NO		
23	AC LINE	DC (+)	POWER IN
24	AC LINE	DC (-)	

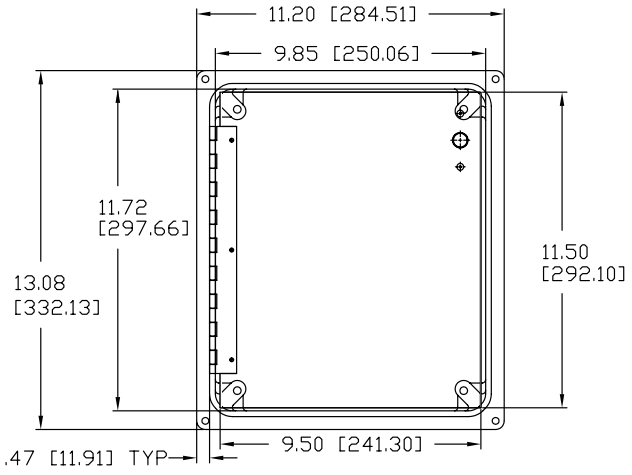
Dimensions approximate in mm (inches)

Panel mount (option P)

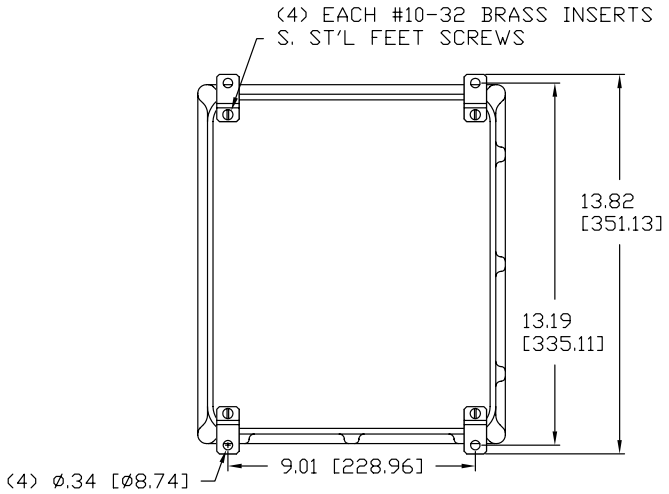


Dimensions approximate in mm (inches)

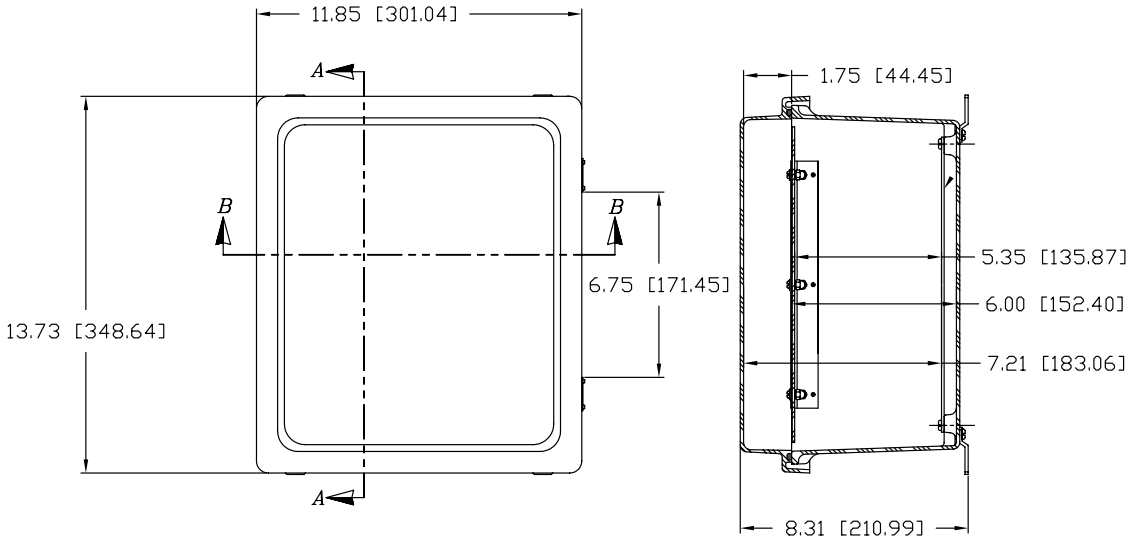
Wall mount (option N)



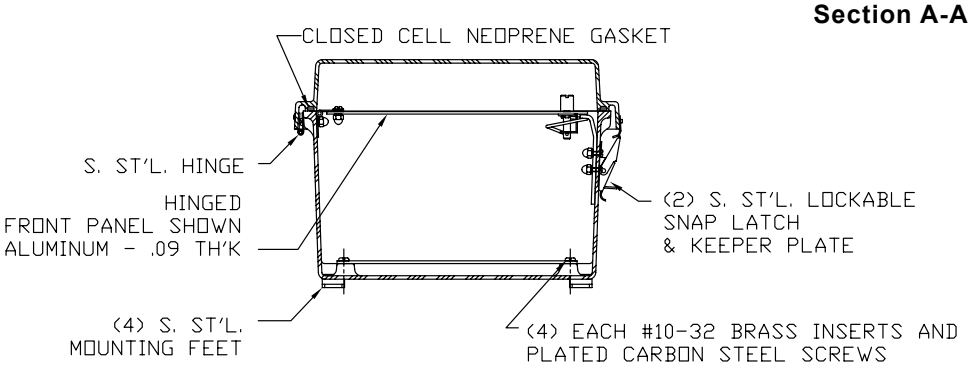
Front view with lid removed



Back view



Section A-A



Section B-B

Material

Box	-	Compression molded fibreglass reinforced polyester
Cover	-	Compression molded fibreglass reinforced polyester
Windows	-	Polycarbonate

Model code

Category	Description	Suffix Codes					
Model	Microprocessor-based flow processor	FP-93B					
Display	LCD		L				
Power Supply	85 to 276 Vac 24 Vdc			1 3			
Network Card	None RS485/Modbus BACnet MS/TP RS485 BACnet IP				0 1 2 3		
Mounting	NEMA 4 Wall Mount Panel Mount					N P	
Options	RS485 Terminal Block Connector None						TB N

The standard unit includes: Peak Demand, AGA NX-19 calculation for natural gas, Stacked DP, Datalogger, Stack Emissions Controller and Manifold Flowmeter Controller.

TI-P322-06
EMM Issue 15

EL2270 Temperature Sensor
EL2271 Temperature Sensor with transmitter with optional Food+ Thermowell

Description

EL2270

The EL2270 is a Pt100 platinum resistance temperature sensor for general industrial use.It is a single 3 wire device that meets EN 60751: Class A, over a process temperature range of -100 °C to +450 °C (-148 °F to 842 °F). This sensor can be connected directly to any temperature indicator or controller that has a 3 wire Pt100 input.

A single or dual element quick response version (40 mm probe length only) is also available for applications such as plate heat exchanger control.

A miniature version may also be ordered, **with an integrated thermowell**, a ¼" BSP taper thread, a probe length of 35 mm (1.37") and a process temperature range of -50 °C to +205 °C (-58 °F to 401 °F)

EL2271

The EL2271 is a combined Pt100 sensor and transmitter assembly. The sensing element is a 3 wire device that meets EN 60751: Class A.

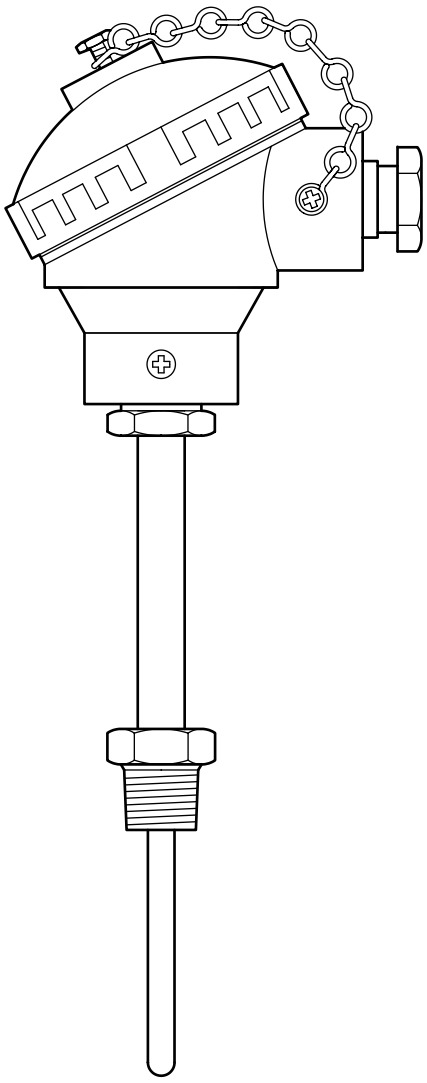
The output is a two wire loop powered 4 - 20 mA transmitter, with a diverse supervisory function.

A comprehensive range of standard process temperature ranges and probe lengths are normally available from stock. Please see page 2.

The 4 - 20 mA output can be connected directly to any temperature indicator, controller or flow computer that has a 4 - 20 mA input.

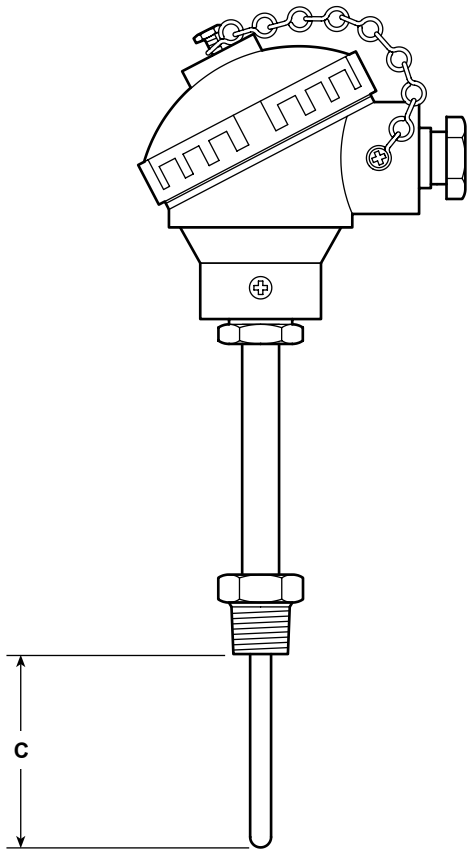
The EL2271 may be ordered with a 3 point calibration certificate.

Note: The thermowell is typically used to separate the EL2270 or EL2271 temperature sensor from the process fluid. It additionally enables replacement of the sensor during operation. The use of a Food+ thermowell is mandatory in any food contact compliant process.



EL2270 and EL2271

EL2270 and EL2271 options



	Process temperature measuring range	Probe length options available Dimension C mm (inches)	Certification
EL2270	-100 °C to 450 °C (-148 °F to 842 °F)	25, 50, 75, 125, 225, 725 (0.98, 1.96, 2.95, 4.92, 8.85, 28.54)	Type 2.2, non specific.
EL2270 Quick response	-100 °C to 450 °C (-148 °F to 842 °F)	40 (1.57)	
EL2270 Duplex quick response	-100 °C to 450 °C (-148 °F to 842 °F)	40 (1.57)	
EL2270 Miniature	-50 °C to 205 °C (-58 °F to 401 °F)	40 (1.57)	
EL2271	-50 °C to 50 °C (-58 °F to 122 °F)	25, 50, 75, 125 (0.98, 1.96, 2.95, 4.92)	As standard - Type 2.2, non specific. Optional - 3 point calibration certificate.
	0 °C to 100 °C (32 °F to 212 °F)	25, 50, 75, 125 (0.98, 1.96, 2.95, 4.92)	
	0 °C to 150 °C (32 °F to 302 °F)	25, 50, 75, 125 (0.98, 1.96, 2.95, 4.92)	
	100 °C to 250 °C (212 °F to 482 °F)	25, 50, 75, 125 (0.98, 1.96, 2.95, 4.92)	
	-100 °C to 450 °C (-148 °F to 842 °F)	75 (2.95)	
	-100 °C to 450 °C (-148 °F to 842 °F)	125 (4.92)	

Food+ Thermowells

General

Three types of Thermowells are available.

Type A 1½" ASME BPE sanitary clamp connection, two piece welded construction.

Type B ½" NPT pipe thread connection, one piece.

Type C ½" NPT pipe thread connection, fabricated and welded construction for non flow applications.

Surface finish of all wetted faces is Ra < 0.76µm. The EL2270 Miniature does not require the use of a thermowell and is not suitable for food contact compliant processes.

Certification

The thermowells are available with certification to EN 10204 3.1 at additional cost.
Note: All certification/inspection requirements must be stated at the time of order placement.

Designed, manufactured and approved for steam and condensate applications, all Food+ thermowells comply with:

- (EC)1935:2004 Materials and Articles Intended to come into Contact with Food
- (EC)2023:2006 Good Manufacturing Practice for Materials and Articles Intended to come into Contact with Food
- (EU)10/2011 Plastic Materials and Articles Intended to come into Contact with Food
- FDA Code of Federal Regulations - title 21 - Food and Drugs

This product is intended to be connected into a system that can operate a food contact compliant process. A list of the materials that could come directly or indirectly into contact with foodstuffs can be found in the Declaration of Compliance available for this product.

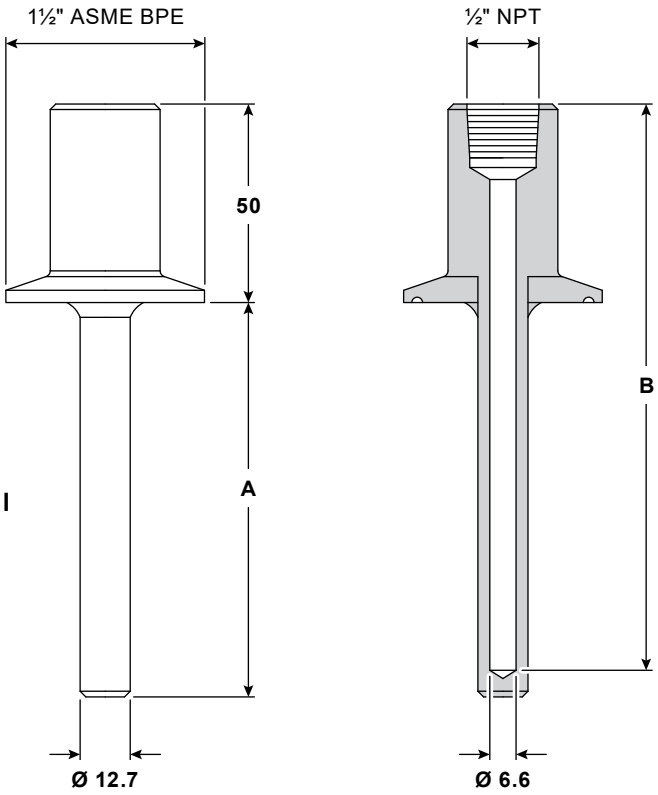
Material

Type A and Type B 316 / 316L

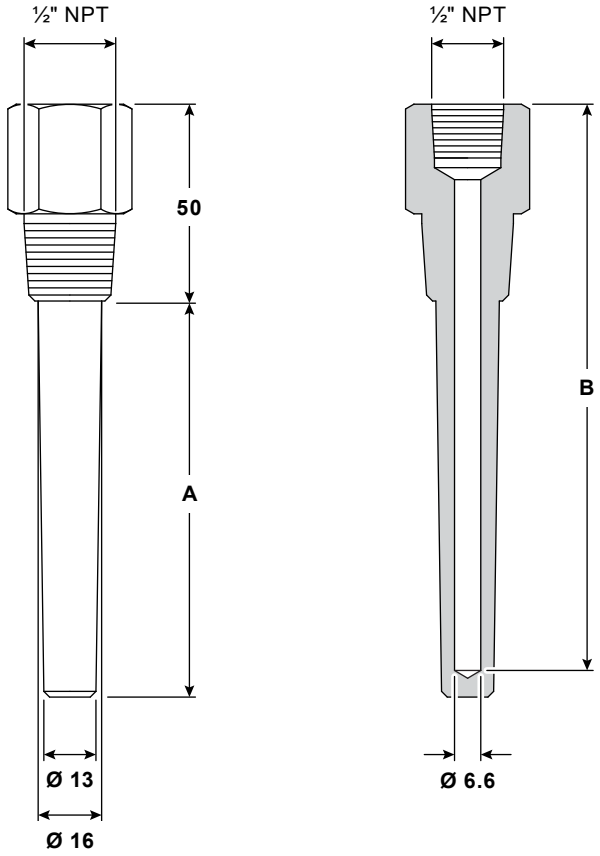
Type C 316 Ti (1.4571)

Thermowell Pocket options

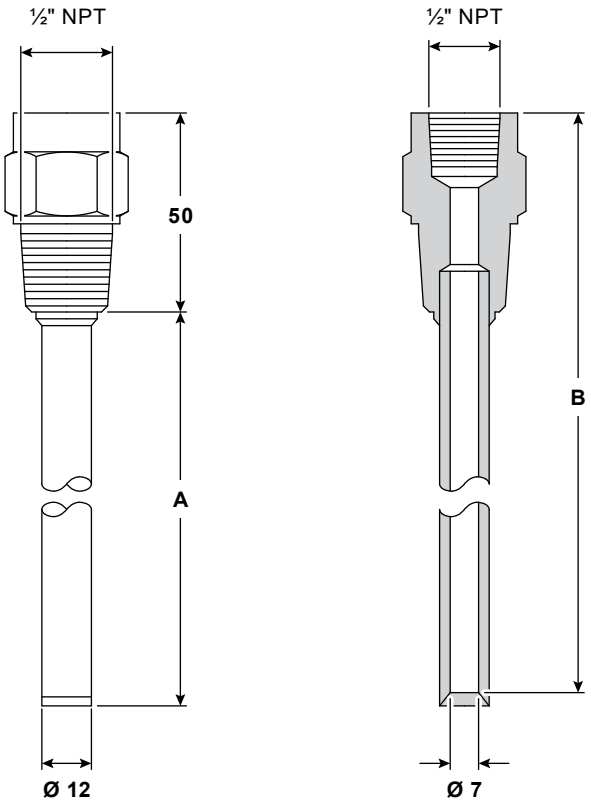
Type A Thermowell



Type B Thermowell



Type C Thermowell



Thermowells are sized to suit the probe length, refer to the following table.

	Insertion length Dimension A mm (inches)	Thermowell depth Dimension B mm (inches)	For use with probe length Dimension C mm (inches)	Mass kg (lbs)	Pressure rating	Maximum allowable pressure bar g (psi g)	Maximum allowable temperature °C (°F)
Type A Sanitary Clamp Thermowell	25 (0.98)	68.5 (2.39)	50 (1.96)	0.27 (0.59)	ASME BPE Table DT-2-1	13.79 (200	204 (399)
	50 (1.96)	93.5 (3.68)	75 (2.95)	0.29 (0.63)			
	100 (3.93)	143.5 (5.64)	125 (4.92)	0.325 (0.71)			
	200 (7.87	243.5 (9.23)	225 (8.85)	0.4 (0.88)			
Type B Screwed One Piece Thermowell	25 (0.98)	68.5 (2.39)	50 (1.96)	0.2 (0.44)	PN40	40 (580)	450 (852)
	50 (1.96)	93.5 (3.68)	75 (2.95)	0.225 (0.49)			
	100 (3.93)	143.5 (5.64)	125 (4.92)	0.27 (0.59)			
***Type C Screwed Fabricated Thermowell**	200 (7.87	243.5 (9.23)	225 (8.85)	0.28 (0.61)	PN40	40 (580)	450 (852)
	700 (27.55)	743.5 (29.27)	725 (28.54)	0.57 (1.25)			

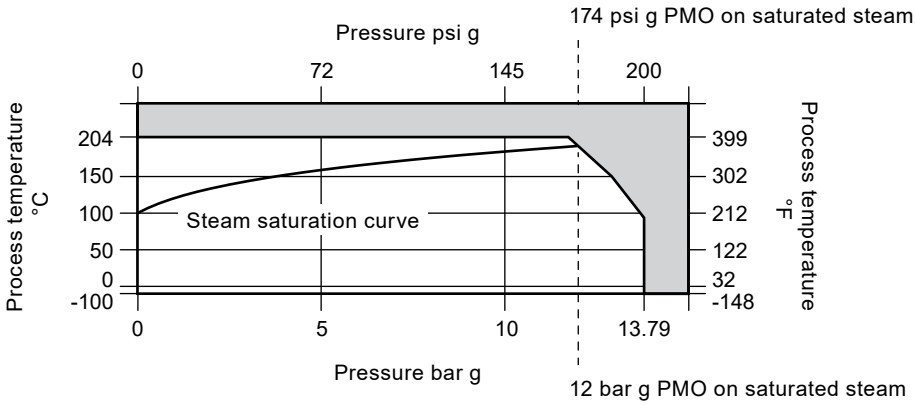
* Type C fabricated thermowells are for use in non-flow applications only.
Note: the EL2270 Miniature does not require the use of a thermowell and is not suitable for food contact compliant processes.

Pressure/temperature limits

The temperature probes when used in conjunction with associated thermowells, can be used in applications where the pressure/ temperature is within the following limits.
For air and steam applications, flow velocities must be below 45 m/s (32 m/s for fabricated thermowells).

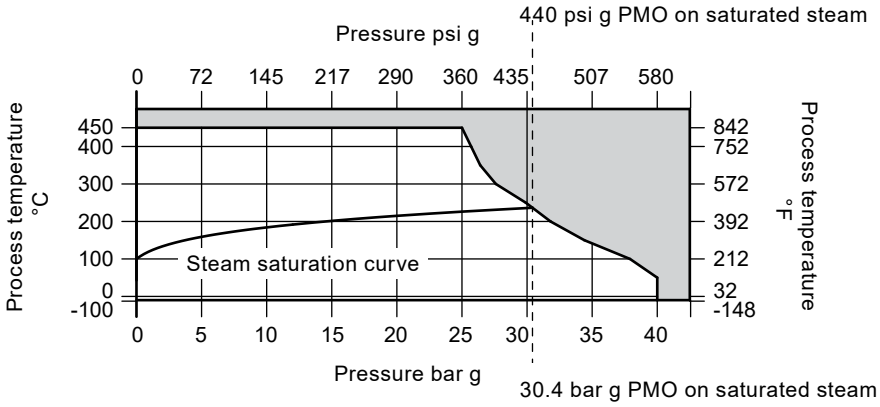
For liquids, a maximum velocity of 5 m/s is recommended. Type C thermowells are for use in non flow applications only.

Type A Thermowell - Sanitary clamp connection



The product **must not** be used in this region.

Type B and Type C Thermowells



The product **must not** be used in this region.

Mechanical data

Product range		EL2270	EL2271
Enclosure material		Aluminium (epoxy coated)	
Probe material		316 stainless steel	
Terminals/transmitter material	Single element	Ceramic 45%Al203	Plastic PBT, glass-fibre reinforced
	Dual element	Plastic PBT, glass fibre reinforced	
Process connection	Standard	½" NPT	½" NPT
	Minature	¼" R (BSPT)	
Absolute process temperature	Standard	-100 °C to +450 °C (-148 °F to 842 °F) (See note 1 and 2)	
	Minature	-50 °C to +205 °C (-58 °F to 122 °F (See note 1 and 2)	-
Weight (Max.)	Standard	0.6 kg (1.32 lbs) (length dependent)	0.6 kg (1.32 lbs) (approx)
	Minature	0.255 kg (0.56 lbs) (approx)	-

Notes :

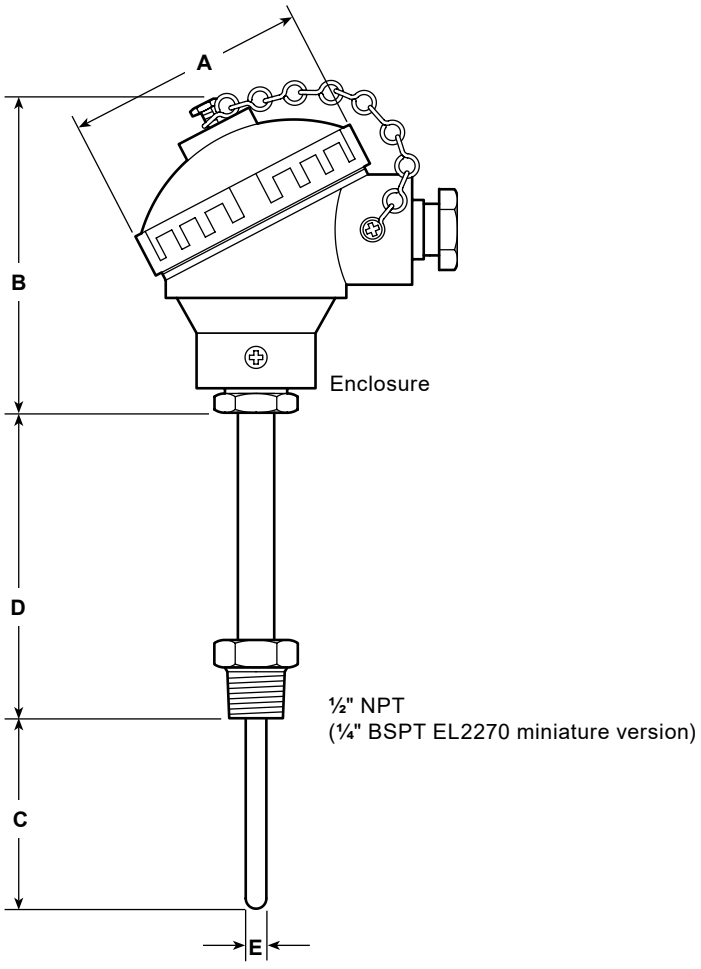
1. **Warning: Risk of damaging the product if upper or lower limits of the absolute process temperature are exceeded.**
2. Also see the Thermowells and Pressure/temperature limits sections.

Electrical data

Product range		EL2270	EL2271
Output		Pt100 to EN 60751: Class A	Two wire loop powered 4 - 20 mA
Output on sensor failure		-	< 3.6 mA (3.5 mA typically)
Output over-range		-	3.8 mA to 20.5 mA
Supply (UB)		-	8 to 35 Vdc
Maximum loop resistance (RA)		-	≤ (UB - 8 V) / 0.0215 A with RA in Ω and UB in V.
			744 Ω at 24 Vdc
			1023 Ω at 30 Vdc
PT100 measuring current		0.1...1mA	-
Electrical Connection	Standard	M20 x 1.5 mm with cable gland	M20 x 1.5 mm with cable gland
	Miniature	M16 x 1.5 mm with cable gland	

Dimensions (approximate) in mm (inches)

Product range	EL2270 and EL2271		
	Standard EL2270 and EL2271	Miniature EL2270	Quick repsonse and duplex quick response EL2270
A	82 (3.22)	58 (2.28)	82 (3.22)
B	94 (3.70)	70 (2.75)	94 (3.70)
C	25, 50, 75, 125, 225, 725 (0.98, 1.96, 2.95, 4.92, 8.85, 28.54)	35 (1.37)	40 (1.57)
D	110 (4.33)	61 (2.4)	110 (4.33)
E	6 (0.23)	4.5 (0.177)	4.5 (0.177)



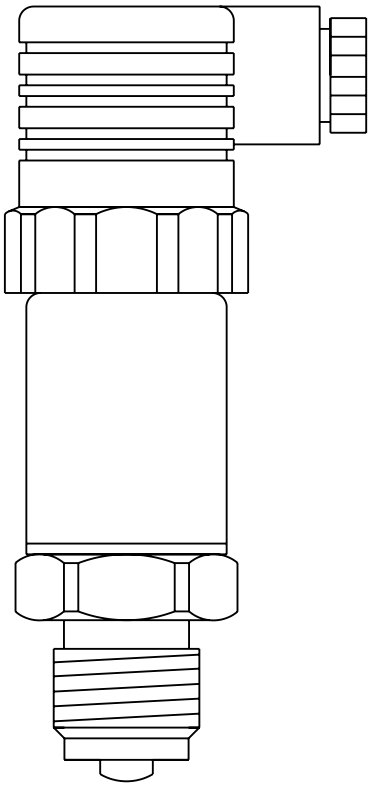
EL2270 and EL2271 probe

TI-P322-02
EMM Issue 9

EL2600
Pressure Transmitter and 'U' Syphons

Description

The EL2600 is a combined pressure sensor and transmitter which is designed for general and industrial use.
It has a 2-wire 4-20 mA current loop, and a ¼" NPT process connection. Two syphon tube and valve assemblies are available, one with a maximum design pressure of 25 bar g (362 psi g) and, and one with a maximum design pressure of 80 bar g (1160 psi g.).



Available ranges

m bar g	0-100	0-250	0-600					
(m psi g)	(0- 1450)	(0-3625)	(0-8702)					
bar g	0-0.1	0-0.25	0-0.6	0-1	0-1.6	0-2.5	0-4	0-6
(psi g)	(0-1.45)	(0-3.62)	(0-8.7)	(0-14.5)	(0-23.2)	(0-36.2)	(0-58)	(0-87)
bar g	0-10	0-16	0-25	0-40	0-60	0-100*	0-160*	0-250*
(psi g)	(0-145)	(0-232)	(0-362)	(0-580)	(0-870)	(0-1450)	(0-2320)	(0-3,625)
bar a	0-1.6	0-2.5						
(psi a)	(0-23.2)	(0-36.2)						

* No 'U' syphon is available for these ranges, therefore maximum operating temperature is limited to 100 °C

Limiting conditions

Pressure/temperature limits EL2600

Minimum operating temperature	Medium	-30 °C (-22 °F)
	Ambient	-20 °C (-4 °F)
Maximum operating temperature (without syphon tube)	Medium	100 °C (212 °F)
	Ambient	80 °C (176 °F)
Low pressure syphon tube/valve		
Maximum design pressure		25 bar g (362 psi g)
Maximum design temperature		260 °C (500 °F)
Maximum working conditions		21 bar g @ 217 °C (304 psi g @ 422 °F)
High pressure syphon tube		
Maximum design pressure		80 bar g (1160 psi g)
Maximum design temperature		450 °C (842 °F)
Maximum working conditions		60 bar g @ 450 °C (870 psi g @ 842 °F)

Overpressure limit table

Calibrated pressure range - bar (psi)		Overpressure P max - bar (psi)	
0-1.6 bar a, 0-2.5 bar a	(0-23.2 psi a) (0-36.25 psi a)	10	(145)
0-0.1 bar g	(0-1.45 psi g)	1	(14.5)
0-0.25 bar g	(0-3.6 psi g)	2	(29)
0-0.6 bar g	(0-8.7 psi g)	4	(87)
0-1 bar g	(0-14.5 psi g)	5	(72)
0-1.6 bar g,	(0-23.2 psi g)	10	(145)
0-2.5 bar g	(0-36 psi g)	10	(145)
0-4 bar g	(0-58 psi g)	17	(246)
0-6 bar g,	(0-87 psi g)	35	(507)
0-10 bar g	(0-145 psi g)	35	(507)
0-16 bar g,	(0-232 psi g)	80	(1160)
0-25 bar g	(0-362 psi g)	80	(1160)
0-40 bar g	(0-580 psi g)	120	(1740)
0-60 bar g	(0-870 psi g)	200	(2900)
0-100 bar g	(0-1450 psi g*)	320	(4640)
0-160 bar g	(0-2320 psi g*)	500	(7250)
0-250 bar g	(0-3626 psi g*)	800	(11600)

Note: High pressure 'spikes' above maximum overpressure, even of very short (milli-seconds) duration, could damage sensors. If pressure peaks are likely to occur in your application, we recommend the use of a pressure snubber. Alternatively, a higher range pressure transmitter could be used, though this would mean some loss of signal resolution.

Process connection

For fluids below 100 °C (212 °F) the EL2600 may be mounted directly via its ¼" NPT connection.
Above 100 °C (212 °F), a 'U' syphon and isolating valve must be fitted between the EL2600 and the vessel or pipeline.

Technical data

Sensor type	0-1.6 bar a to 0-25 bar g (0-23 psi g to 0-230 psi g)	Piezoresistive
	0-40 bar g to 0-250 bar g (0-580 psi g to 0-5800 psi g)	Thin film
Supply voltage		10 Vdc to 30 Vdc
Accuracy		≤ 0.5%
Repeatability		≤ 0.05 of span
Hysteresis		≤ 0.1% of span
Protection rating		IP65

Approvals

EMC emissions	2004/108/EC, EN 61 326 Emission (Group 1, Class B)
EMC emissions	2004/108/EC, EN 61 326 Emission (Group 1, Class B) emissions and Immunity (industrial locations)

Materials

EL2600

Part	Material	
Body	Stainless steel	316L WS 1.4435
Connector	Moulded plastic	Polyamide PA 66

Low pressure syphon tube assembly (Valve ordered separately)

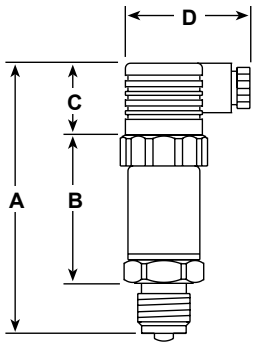
Part	Material	
Tube	Carbon steel	ASTM A 106 Gr. B. Phosphated
Valve	Body	Brass
	Handle	Phenolic

High pressure syphon tube assembly

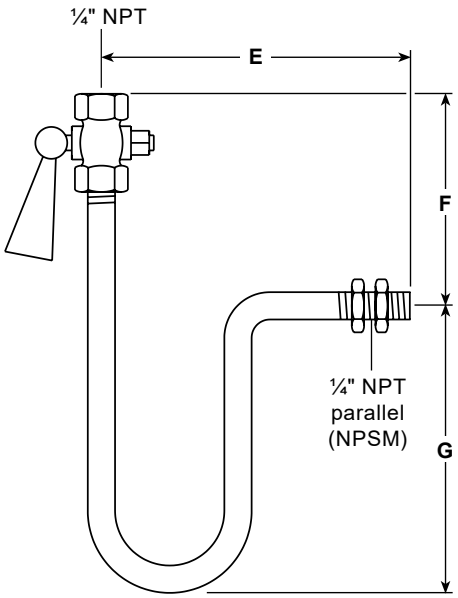
Part	Material	
Tube	Carbon steel (zinc plated/passivated).	BS 3602: Part.1 1987 CFS 360
Valve	Body	Carbon steel
	Seat	PEEK/Polymain

Dimensions/weights (approximate) in mm (inches) and kg (lbs)

EL2600



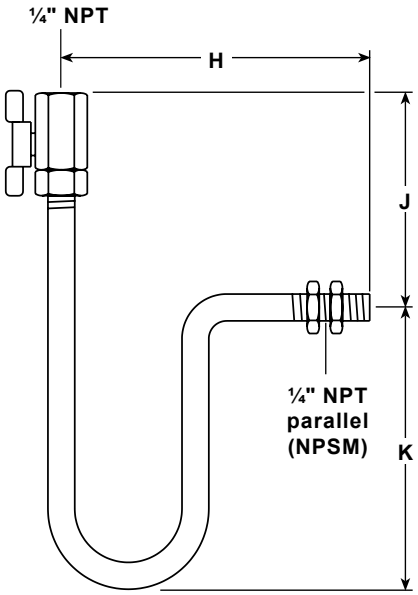
Low pressure 'U' syphon



EL2600

A	B	C	D	Weight
104	57	28	48	0.2
(4.1)	(2.25)	(1.1)	(1.9)	(0.44)

High pressure 'U' syphon



'U' Syphon and isolating valve

E	F	G	H	J	K	Weight
160	50	150	160	60	150	0.5
(6.3)	(2)	(6)	(6.3)	(2.4)	(6)	(1.1)

Safety information, installation and maintenance

This document does not contain sufficient information to install the product safely. See the Installation and Maintenance Instructions supplied with the product.

Safety

Your attention is drawn to Safety Information Leaflet IM-GCM-10.

Installation

It is essential to use a 'U' syphon and valve for temperatures above 100 °C (212 °F) to avoid damage to the unit.

Maintenance

No specific maintenance is required, but we recommend inspection and re-calibration of the transmitter once a year.

How to order

Example:
1 - Spirax Sarco EL2600 pressure transmitter, range 0 - 16 bar g (0 - 232 psi g), with low pressure 'U' syphon and isolating valve.

TI-P170-01
EMM Issue 6

F50C
Isolating Valve

Description
The F50C is a needle type isolating valve designed for primary isolation in flowmetering applications with steam and other industrial fluids. No spares are available.

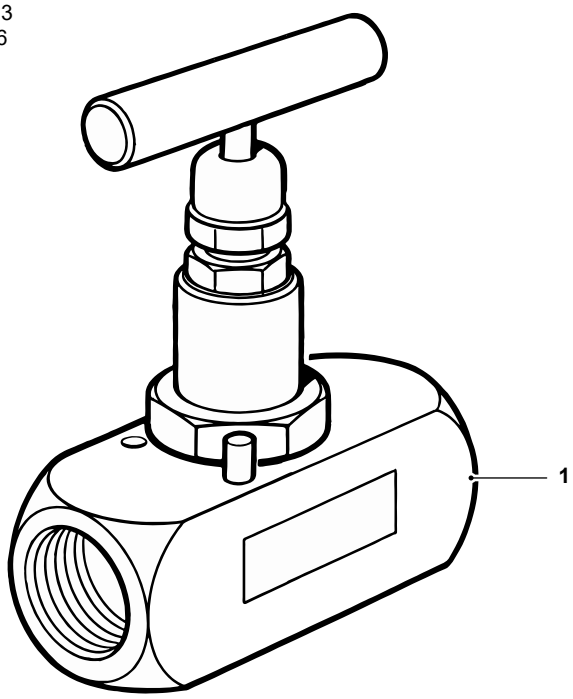
Materials

No.	Part	Material
1	Body	Carbon steel, zinc plated and passivated
2	Seals	Graphoil (not shown)

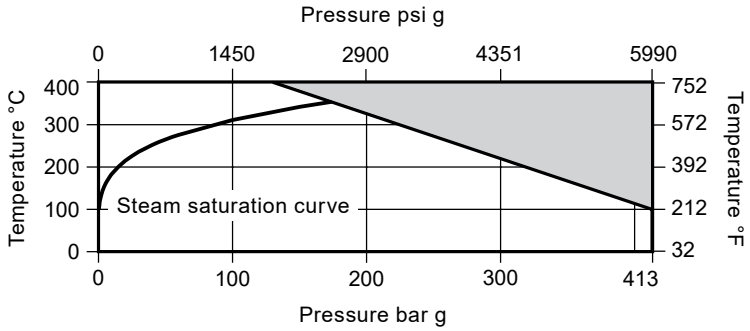
Sizes and pipe connections
½" screwed NPT.

Kv values
0.474

For conversion:
Cv (UK) = Kv x 0.963
Cv (US) = Kv x 1.156



Pressure/temperature limits



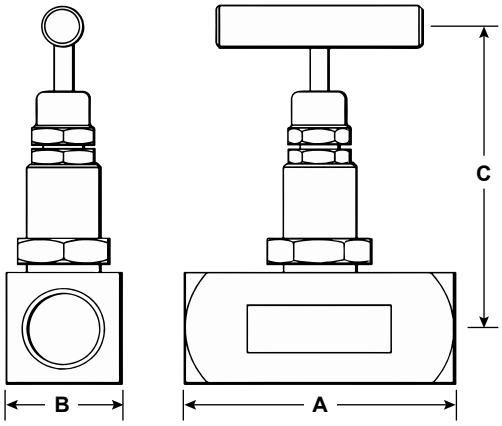
The product **must not** be used in this region.

Maximum operating pressure	413 bar g (5990 psi g)
Maximum operating temperature	430 °C (806 °F)

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Dimensions/weight (approximate) in mm (inches) and kg (lbs)

A	B	C With valve open	Connections	Weight
66 (2.6)	28 (1.1)	76* (3)*	½" NPT	0.5 (1.1)



Safety information, installation and maintenance

Your attention is drawn to Safety information leaflet IM-GCM-10.
This document does not give sufficient information to install the product in a safe manner.
See the relevant system Installation and Maintenance Instructions for full details.
The F50C valve may be installed in any position, but the flow should be in the direction of the arrow on the valve body.
When used as an isolating valve in a steam meter impulse line, it is important to install the valve on the centre line of the flowmeter rather than below it, so that the valve is in steam rather than water.

How to order

Example: 1 off Spirax Sarco F50C isolating valve.

BOILER CONTROLS

FOR LEVEL CONTROL/ALARM AND TDS CONTROL



Accurate control of water level/alarm within the boiler or tank while maintaining the proper TDS level of the boiler water, are vital in the boiler room.

Section contents ⟩

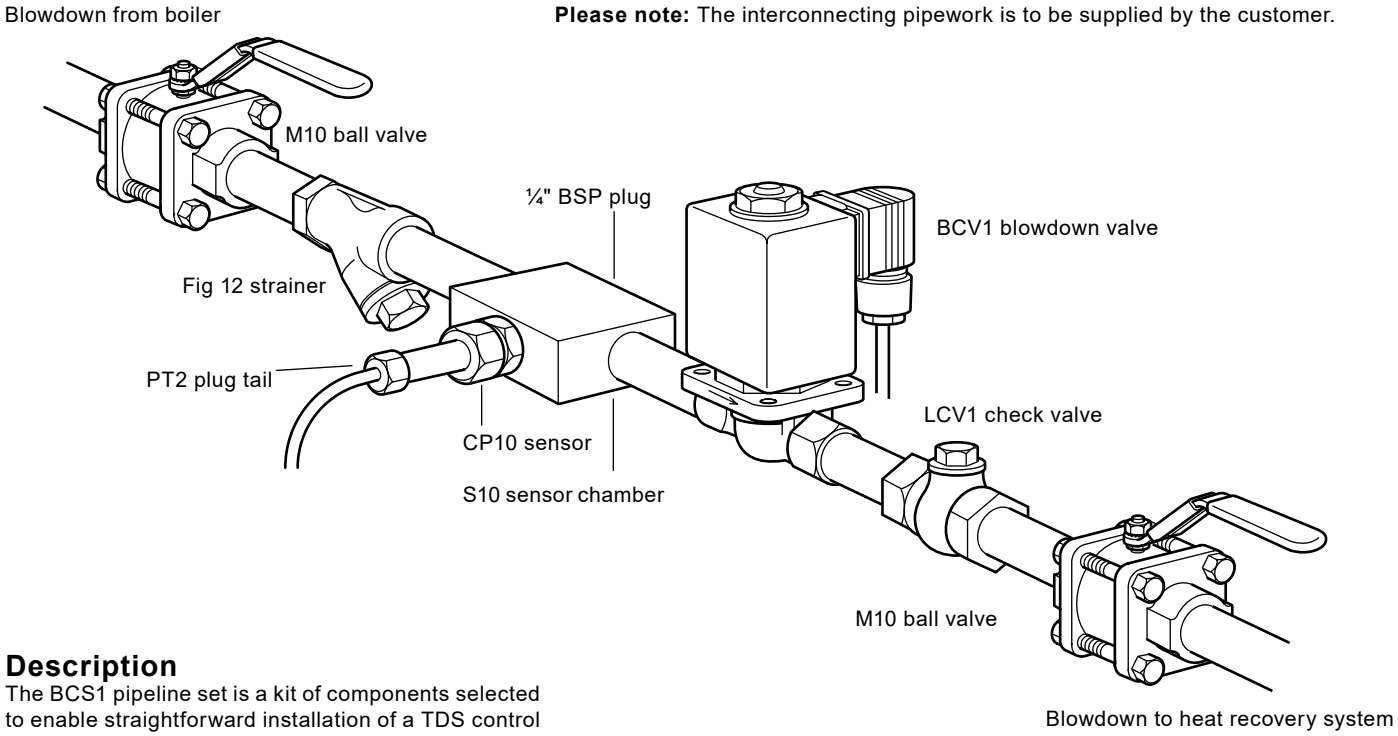
spirax sarco

SECTION 14 CONTENTS

Boiler Blowdown and CCD	BCS1 Blowdown System Pipeline Set	TI-P403-57-EN
	S20 Sensor Chamber, TP20 Temperature Sensor, CP10 Sensor and PT2 Plug-tail Cast Iron Valves	TI-P403-09-EN
	BCV1 and BCV20 Blowdown Valve	TI-P403-60-EN
	¾" BCV 30 Blowdown Control Valve	TI-P403-72-US
	1½" BCV 31 Blowdown Control Valve	TI-P403-74-US
	BCV Blowdown Control Valves (½" to 2")	TI-P403-102-US
	MS1 Conductivity Meter	TI-P403-25-EN
	SC20 and SCS20 Sample Coolers	TI-P403-09-EN
Bottom Blowdown	KBV21i and KBV40i Key Operated Boiler Blowdown Valves	TI-P405-47-EN
	ABV21i and ABV40i Air Actuated Boiler Blowdown Valves	TI-P405-45-EN
	Steam Injectors IN15, IN25M, IN40M	TI-P401-05-EN
	INS Direct Steam Injection Heating Systems	TI-P401-03-EN
	VHT Vent Heads	TI-P405-42-EN

TI-P403-57
EMM Issue 5

BCS1
Pipeline Set



Please note: The interconnecting pipework is to be supplied by the customer.

Description

The BCS1 pipeline set is a kit of components selected to enable straightforward installation of a TDS control system where the probe assembly is to be mounted in the pipeline, rather than directly in the boiler shell.

The BCS1 pipeline set consists of the following items:
1 x S10 sensor chamber ½" BSP.
1 x CP10 sensor and gasket.
1 x PT2 plug tail.
1 x Sensor chamber plug ¼" BSP.
1 x BCV1 solenoid valve ½" BSP, 230 V.
1 x LCV1 check valve ½" BSP.
1 x Fig 12 SG iron strainer ½" BSP.
2 x M10 ball valves ½" BSP.

Alternative products are available, but not as part of a kit. A controller is also required, and should be selected from the Spirax Sarco range.
The BC3150 and BC3250 are both suitable, and offer a choice of features. Full details are available in separate literature.

Principal features:

- For TDS systems with probe in pipeline.
- Complete pipeline kit - choice of controller.
- Suitable for boiler pressures of 14 bar g (203 psi g).
- For blowdown rates up to 590 kg/h (1,300 lb/h).

Weight

Boxed kit approximately 3.7 kg (8.2 lb).

Materials

S10 sensor chamber	Stainless steel	BS 970 303 S31
CP10 sensor body and pin	Stainless steel	BS 970 303 S31
PT2 plug tail	Brass body	
Sensor chamber plug	Carbon steel	
BCV1 solenoid valve	Brass body, stainless steel seat, PTFE seal.	
LCV1 check valve	Bronze	
Fig 12 strainer	SG iron	
M10 ball valve	Zinc plated forged carbon steel	

See individual product literature for further information.

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Pressure / temperature limits

Maximum boiler pressure 14 bar g (203 psi g).

Capacities

The capacity of the system is limited by the blowdown valve capacity at various boiler pressures.

Boiler pressure		Low to medium flowrates (Standard setting*)		Medium to high flowrates (High setting*)	
bar g	(psi g)	kg/hr	(lb/hr)	kg/hr	(lb/hr)
1	(14.5)	60	(132)	175	(386)
2	(29)	85	(187)	250	(551)
4	(58)	115	(254)	350	(771)
6	(87)	130	(287)	385	(849)
8	(116)	150	(331)	445	(981)
10	(145)	165	(364)	495	(1,091)
14	(203)	200	(441)	590	(1,300)

* At 'Standard setting' the controller is set to open the valve for 10 seconds every 30 seconds.
When blowing down at 'High setting' the controller opens the valve continuously.

Electrical data

BCV1 solenoid (blowdown) valve	
Voltage range	209 V to 264 V
Frequency range	50 to 60 Hz
Power consumption	40 VA (inrush)
	16 VA/10 W (hold)
Protection rating	IP65

Safety information, installation and maintenance

For full details see the installation and maintenance instructions supplied with the product.

Warning

The BCV1 valve and CP10 sensor contain PTFE which can give off toxic fumes if exposed to excessive heat.

Installation note

The products contained in the BCS1 pipeline set are designed and constructed to withstand the forces encountered during normal use. Use of the BCS1 pipeline set other than for the control of TDS could cause damage to the products and may cause injury or fatality to personnel.

Spare parts

Armature and spring set for the BCV1 blowdown valve (kit)	Stock No. 4034080

How to order example: 1 off Spirax Sarco BCS1 pipeline set.

TI-P403-09
EMM Issue 15

SC20 Food+ and SCS20 Sample Coolers

Description

The Spirax Sarco SC20 sample cooler is used to cool samples of boiler water or steam. The cooler consists of a 316L stainless steel coil, through which the sample flows, and a 316L stainless steel body, through which cooling water flows and utilises a counter current flow to maximise cooler efficiency.

The unit is provided with separate mounting brackets and screws to allow simple installation at point of use. The SC20 is also available with a clamp adaptor for connecting to an industry standard ½" sanitary clamp fitting.

SC20 Food+

Designed, manufactured and approved for Steam and Condensate applications. This product is intended to be connected into a system that can operate a food contact compliant process.

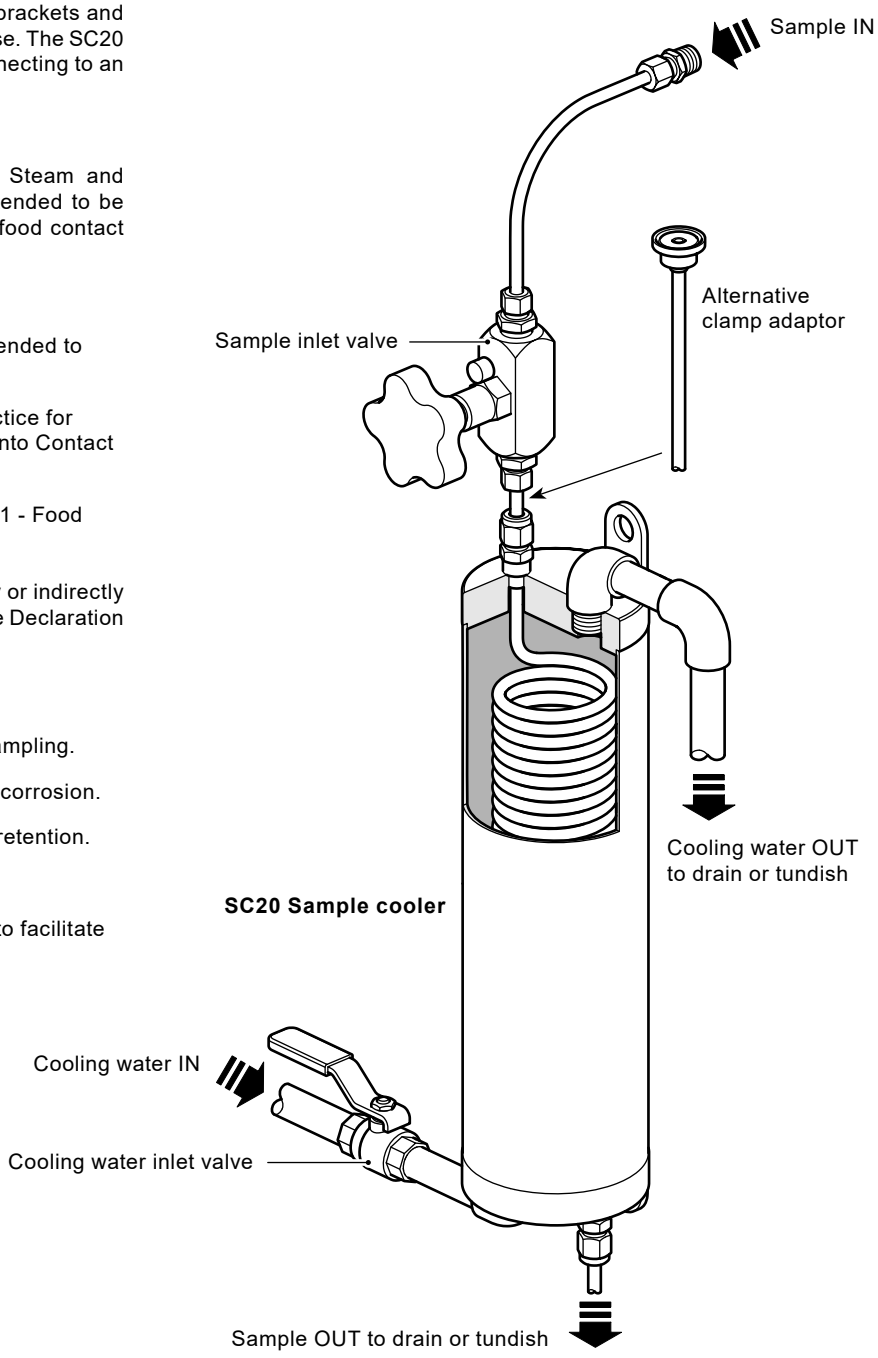
This product complies with:

- (EC)1935:2004 Materials and Articles Intended to come into Contact with Food
- (EC)2023:2006 Good Manufacturing Practice for Materials and Articles Intended to come into Contact with Food
- FDA Code of Federal Regulations - title 21 - Food and Drugs

A list of the materials that could come directly or indirectly into contact with foodstuffs can be found in the Declaration of Compliance available for this product.

Principal features:

- For boiler water, steam, or condensate sampling.
- Stainless steel body and coil to minimise corrosion.
- Self-draining design to eliminate sample retention.
- Counter current flow for efficient cooling.
- Separate mounting brackets and screws to facilitate simple installation.



SC20 Sample cooler

Available types

SC20 Food+ Range
BSP connections (6 mm (0.24") O/D tube).

NPT connections (6 mm (0.24") O/D tube). A ¼" NPT male x 6 mm (0.24") O/D stud coupling is supplied loose for connecting the sample inlet tube to an NPT inlet valve or fitting.

A sample cooler (BSP or NPT) with a clamp adaptor suitable for connection to an industry standard ½" ASME BPE compatible sanitary clamp fitting (clamp not supplied).

SCS20 Range
BSP sample cooler kit (SCS20), complete with sample inlet valve, cooling water inlet valve, and carbon steel fittings.

A kit (SCS20), as above, but with stainless steel fittings.

Note: **ONLY the SC20 product is available as EC1935:2004 compliant. The SCS20 systems are not.**

Note: The SC20 sample cooler is not polished or specially treated internally, and the internal finish of the coil is not specified.

Stainless steel couplings are also available separately:-
¼" BSP male x 6 mm (0.24") O/D tube.
¼" NPT male x 6 mm (0.24") O/D tube.

Certification
The SC20 Food+ can be supplied with the following certification if requested at the time of ordering:

- EN 10204 3.1 material certificates - Chargeable
- EC1935:2004 Declaration of Compliance - F.O.C.
- Declaration of Conformity BS EN ISO 14644-1:2015 Class 7 Clean Room - F.O.C.
- TSE-BSE Statement - F.O.C.
- FDA Code of Federal Regulations - title 21 - Food and Drugs - F.O.C

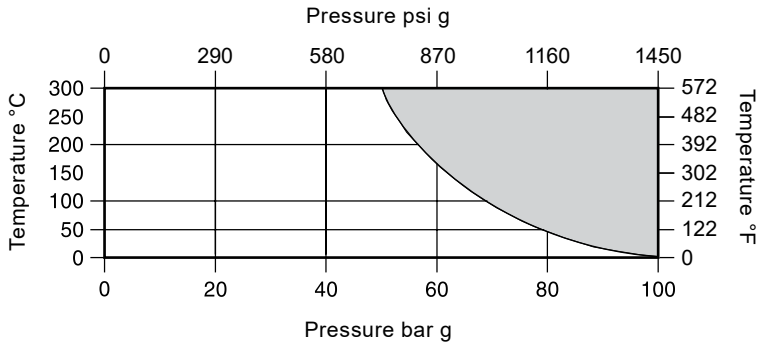
Sizes and pipe connections

Cooling water inlet and outlet connections	BSP T Rp (ISO 7-1) version	½" BSP
	NPT version	½" NPT
	Clamp adaptor versions	½" BSP or ½" NPT
Sample tube inlet and outlet connections	BSP T Rp (ISO 7-1) version	6 mm (0.24") O/D
	NPT version	6 mm (0.24") O/D*
	Clamp adaptor versions	6 mm (0.24") O/D with ½" ASME BPE compatible adaptor for clamp fitting

* A ¼" NPT male x 6 mm O/D stud coupling is provided.

Pressure/temperature limits

Coil



The product **must not** be used in this region.

Body

Maximum design pressure	10 bar g @ 100 °C (145 psi g @ 212 °F)
Maximum design temperature	100 °C @ 10 bar g (212 °F @ 145 psi g)
Designed for a maximum cold hydraulic test pressure of	16 bar g (282 psi g)

Note: The pressure/temperature limits for the clamp adaptor are dependant on the manufacturer's recommendations.

Materials

Coil	Stainless steel 316L (1.4404)
Body	

Performance

The tables below show typical sample outlet temperatures above cooling water inlet temperatures for several pressures and cooling water flowrates.

Example

A sample flowrate of 30 l/h is required from a boiler operating at 10 bar g (145 psi g).
For a cooling water flowrate of 0.3 l/s from Table 1 the sample outlet temperature would be 4 °C (39.2 °F) above the cooling water inlet temperature. If the cooling water is at 15 °C (59 °F), the sample temperature would be 19 °C (66.2 °F).
Table 2 is used in the same way for steam.
Samples may not be taken where marked '-' as the flow is limited by the sample inlet valve capacity.

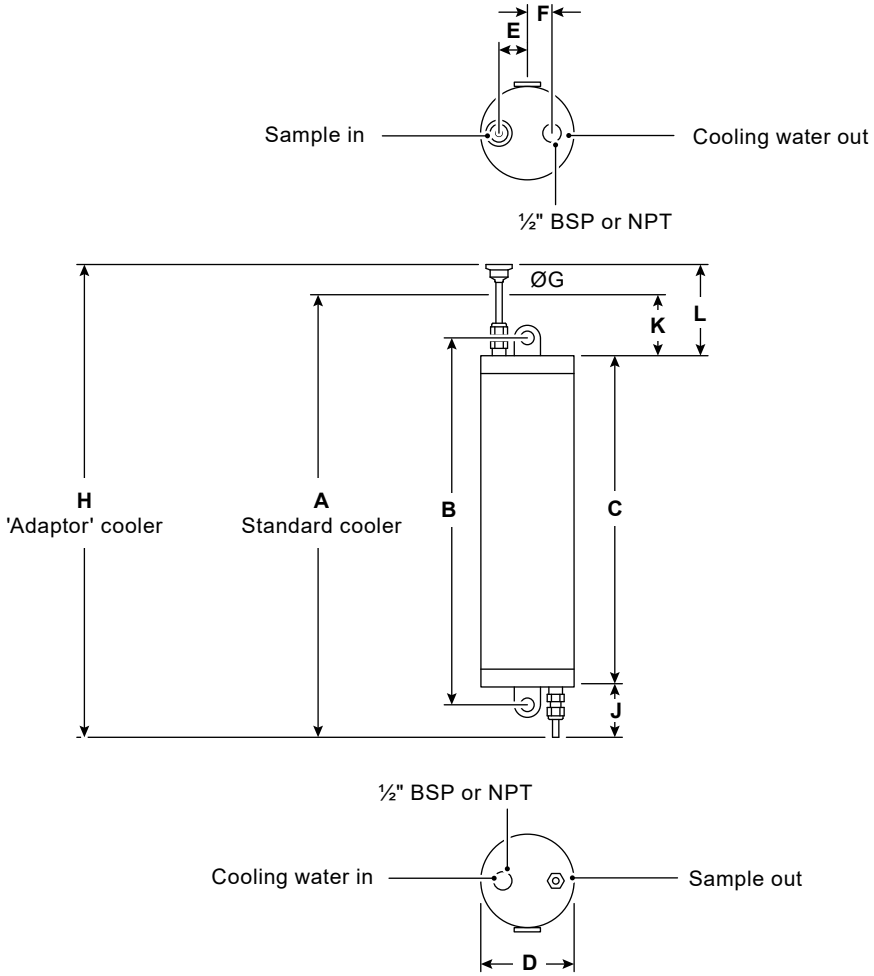
Table 1 Saturated water (e.g. boiler water)

Sample flowrate l/h (g/h)	Boiler pressure bar g (psi g)																			
	Cooling water flowrate 0.1 l/sec (0.02 g/sec)					Cooling water flowrate 0.3 l/sec (0.07 g/sec)					Cooling water flowrate 0.6 l/sec (0.15 g/sec)									
	1 (14.5)	3 (43.5)	7 (101.5)	10 (145)	20 (290)	1 (14.5)	3 (43.5)	7 (101.5)	10 (145)	20 (290)	1 (14.5)	3 (43.5)	7 (101.5)	10 (145)	20 (290)	1 (14.5)	3 (43.5)	7 (101.5)	10 (145)	20 (290)
10 (2.6)	1 °C (33.8 °F)	1 °C (33.8 °F	3 °C (37.4 °F)	6 °C (42.8 °F	6 °C (42.8 °F	0 °C (32 °F)	0 °C (32 °F)	1 °C (33.8 °F	1 °C (33.8 °F	4 °C (39.2 °F)	0 °C (32 °F)	0 °C (32 °F)	0 °C (32 °F)	0 °C (32 °F)	2 °C (35.6 °F)	0 °C (32 °F)	0 °C (32 °F)	0 °C (32 °F)	0 °C (32 °F)	2 °C (35.6 °F)
20 (5.2)	2 °C (35.6 °F)	2 °C (35.6 °F)	6 °C (42.8 °F	8 °C (46.4°F)	8 °C (46.4°F)	1 °C (33.8 °F	1 °C (33.8 °F	2 °C (35.6 °F)	2 °C (35.6 °F)	6 °C (42.8 °F	0 °C (32 °F)	0 °C (32 °F)	0 °C (32 °F)	1 °C (33.8 °F	4 °C (39.2 °F)	1 °C (33.8 °F	1 °C (33.8 °F	2 °C (35.6 °F)	3 °C (37.4 °F)	6 °C (42.8 °F
30 (7.9)	5 °C (41 °F)	4 °C (39.2 °F)	8 °C (46.4°F)	11 °C (51.8 °F)	11 °C (51.8 °F)	3 °C (37.4 °F)	3 °C (37.4 °F)	4 °C (39.2 °F)	4 °C (39.2 °F)	8 °C (46.4°F)	0 °C (32 °F)	0 °C (32 °F)	2 °C (35.6 °F)	3 °C (37.4 °F)	6 °C (42.8 °F	3 °C (37.4 °F)	3 °C (37.4 °F)	4 °C (39.2 °F)	5 °C (41 °F)	8 °C (46.4°F)
40 (10.5)	7 °C (44.6°F)	7 °C (44.6°F)	11 °C (51.8 °F)	13 °C (55.4 °F)	13 °C (55.4 °F)	5 °C (41 °F)	5 °C (41 °F)	6 °C (42.8 °F	6 °C (42.8 °F	10 °C (50 °F	1 °C (33.8 °F	1 °C (33.8 °F	2 °C (35.6 °F)	3 °C (37.4 °F)	8 °C (46.4°F)	4 °C (39.2 °F)	5 °C (41 °F)	5 °C (41 °F)	6 °C (42.8 °F	9 °C (48.2°F)
50 (13.2)	10 °C (50 °F	10 °C (50 °F	13 °C (55.4 °F)	15 °C (59 °F)	15 °C (59 °F)	6 °C (42.8 °F	6 °C (42.8 °F	8 °C (46.4°F)	8 °C (46.4°F)	12 °C (53.6 °F)	3 °C (37.4 °F)	3 °C (37.4 °F)	4 °C (39.2 °F)	5 °C (41 °F)	11 °C (51.8 °F)	5 °C (41 °F)	5 °C (41 °F)	6 °C (42.8 °F	6 °C (42.8 °F	11 °C (51.8 °F)
60 (15.8)	14 °C (57.2 °F)	14 °C (57.2 °F)	16 °C (60.8 °F)	18 °C (64.4 °F)	18 °C (64.4 °F)	9 °C (48.2°F)	9 °C (48.2°F)	10 °C (50 °F	10 °C (50 °F	14 °C (57.2 °F)	4 °C (39.2 °F)	4 °C (39.2 °F)	5 °C (41 °F)	6 °C (42.8 °F	14 °C (57.2 °F)	6 °C (42.8 °F	6 °C (42.8 °F	7 °C (44.6°F)	9 °C (48.2°F)	15 °C (59 °F)
80 (21.3)	16 °C (60.8 °F)	18 °C (64.4 °F)	20 °C (68 °F)	22 °C (71.6 °F)	22 °C (71.6 °F)	11 °C (51.8 °F)	12 °C (53.6 °F)	13 °C (55.4 °F)	14 °C (57.2 °F)	18 °C (64.4 °F)	6 °C (42.8 °F	7 °C (44.6°F)	8 °C (46.4°F)	9 °C (48.2°F)	15 °C (59 °F)	8 °C (46.4°F)	9 °C (48.2°F)	10 °C (50 °F	11 °C (51.8 °F)	18 °C (64.4 °F)
100 (26.4)	18 °C (64.4 °F)	20 °C (68 °F)	24 °C (75.2 °F)	26 °C (78.8 °F)	27 °C (80.6 °F)	15 °C (59 °F)	16 °C (60.8 °F)	16 °C (60.8 °F)	18 °C (64.4 °F)	22 °C (71.6 °F)	10 °C (50 °F	11 °C (51.8 °F)	12 °C (53.6 °F)	13 °C (55.4 °F)	18 °C (64.4 °F)	11 °C (51.8 °F)	12 °C (53.6 °F)	13 °C (55.4 °F)	15 °C (59 °F)	22 °C (71.6 °F)
120 (31.7)	22 °C (71.6 °F)	23 °C (73.4 °F)	29 °C (84.2 °F)	30 °C (86 °F)	31 °C (87.8 °F)	17 °C (62.6 °F)	18 °C (64.4 °F)	20 °C (68 °F)	23 °C (73.4 °F)	26 °C (78.8 °F)	11 °C (51.8 °F)	13 °C (55.4 °F)	15 °C (59 °F)	17 °C (62.6 °F)	22 °C (71.6 °F)	13 °C (55.4 °F)	15 °C (59 °F)	17 °C (62.6 °F)	18 °C (64.4 °F)	26 °C (78.8 °F)

Table 2 Saturated steam

Sample flowrate l/h (g/h)	Boiler pressure bar g (psi g)	Cooling water flowrate 0.1 l/sec (0.02 g/sec)						Cooling water flowrate 0.3 l/sec (0.07 g/sec)						Cooling water flowrate 0.6 l/sec (0.15 g/sec)					
		0.5 (7.25)	2 (29)	5 (72.5)	7 (101.5)	10 (145)	20 (290)	0.5 (7.25)	2 (29)	5 (72.5)	7 (101.5)	10 (145)	20 (290)	0.5 (7.25)	2 (29)	5 (72.5)	7 (101.5)	10 (145)	20 (290)
5 (1.3)		3 °C (37.4 °F)	3 °C (37.4 °F)	4 °C (39.2 °F)	4 °C (39.2 °F)	6 °C (42.8 °F	6 °C (42.8 °F	2 °C (35.6 °F)	2 °C (35.6 °F)	3 °C (37.4 °F)	3 °C (37.4 °F)	4 °C (39.2 °F)	4 °C (39.2 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	2 °C (35.6 °F)	2 °C (35.6 °F)	2 °C (35.6 °F)
10 (2.6)			7 °C (44.6°F)	8 °C (46.4°F)	8 °C (46.4°F)	8 °C (46.4°F)	9 °C (48.2°F)		4 °C (39.2 °F)	4 °C (39.2 °F)	4 °C (39.2 °F)	4 °C (39.2 °F)	5 °C (41 °F)			1 °C (33.8 °F)	2 °C (35.6 °F)	2 °C (35.6 °F)	2 °C (35.6 °F)
15 (4.0)				9 °C (48.2°F)	10 °C (50 °F	10 °C (50 °F	11 °C (51.8 °F)			5 °C (41 °F)	6 °C (42.8 °F	6 °C (42.8 °F	7 °C (44.6°F)			2 °C (35.6 °F)	2 °C (35.6 °F)	3 °C (37.4 °F)	4 °C (39.2 °F)
20 (5.2)					12 °C (53.6 °F)	13 °C (55.4 °F)	14 °C (57.2 °F)				8 °C (46.4°F)	9 °C (48.2°F)	9 °C (48.2°F)				4 °C (39.2 °F)	5 °C (41 °F)	6 °C (42.8 °F
30 (7.9)						21 °C (69.8 °F)	21 °C (69.8 °F)					14 °C (57.2 °F)	14 °C (57.2 °F)					9 °C (48.2°F)	10 °C (50 °F
40 (10.5)							28 °C (82.4 °F)						20 °C (68 °F)						13 °C (55.4 °F)
50 (13.2)							35 °C (95 °F)						25 °C (77 °F)						17 °C (62.6 °F)
60 (15.8)							42 °C (107.6 °F)						30 °C (86 °F)						21 °C (69.8 °F)
70 (18.5)																			

Dimensions (approximate) in mm (inches)



A	B	C	D	E	F	G	H	J	K	L
410 (16.1)	350 (13.8)	316 (12.4)	90 (3.5)	27 (1.0)	23.5 (0.9)	13 (0.5)	450 (17.7)	47 (1.85)	47 (1.85)	87 (3.42)

Weights (approximate) in kg (lbs)

Cooler	3.6 kg (7.9 lbs)
SCS20 system	4.7 kg (10.4 lbs)

How to order

Example:
1 off Spirax Sarco SC20 sample cooler having BSP T Rp (ISO 7-1) connections.

Spare parts

The spare parts available are listed below.
No other parts are supplied as spares.

Available spares

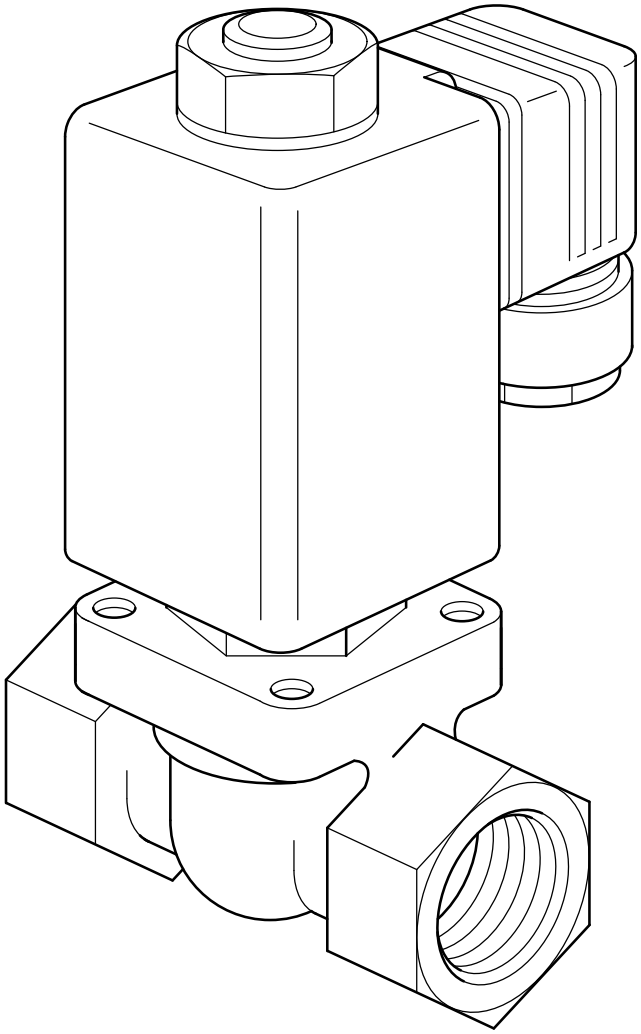
Component	Stock number
Sample inlet valve BSP T Rp (ISO 7-1)	4037900
Sample inlet valve NPT	4037990
Stud coupling carbon steel BSP T Rp (ISO 7-1)	0962373
Stud coupling stainless steel BSP T Rp (ISO 7-1)	0963243
Stud coupling ¼" NPT male x 6 mm stainless steel (for connecting SC20 to an NPT valve or fitting)	0963209

TI-P403-60
EMM Issue 6

BCV1 and BCV20 Blowdown Valves

Description

The BCV1 and BCV20 valves are small bore, normally closed valves with a brass body and corrosion resistant internal components. They are primarily intended for low and medium pressure boiler blowdown applications.
BCV1 and BCV20 valves are identical apart from the orifice size, the BCV1 having a 3 mm (⅛") orifice and the BCV20 a 6 mm (¼") orifice. Valves are supplied complete with a mains connector, which is protected to IP65 and is suitable for 3 x 1 mm² (18 AWG) cable.



Available sizes and pipe connections

½" screwed BSP - 230 V version
½" screwed BSP - 110 V version
½" screwed NPT - 120 V version

Electrical data

230 V version	207 V to 253 V
110 V version	99 V to 121 V
120 V version	108 V to 132 V
Frequency	50 - 60 Hz
Maximum power consumption	40 VA (inrush)
	16 VA/12 W (hold)
Protection rating	IP65 (Nema 4)

Materials

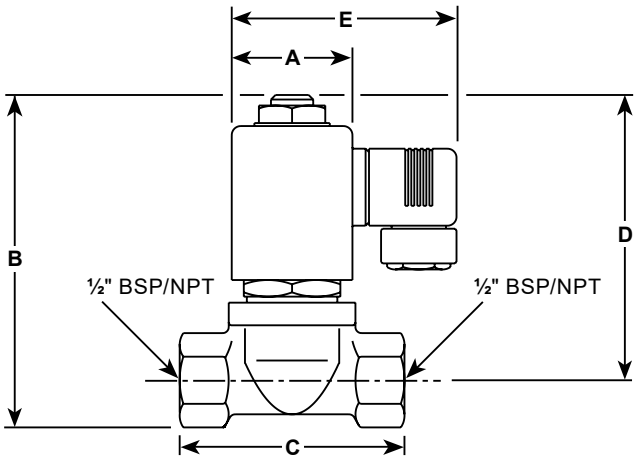
Body	Brass
Soft seal	PTFE
Internal components	Stainless steel

Limiting conditions

Blowdown valves	**BCV1**		**BCV20**	
Maximum boiler or steam pressure - Intermittent operation	14 bar g	203 psi g	4 bar g	58 psi g
Medium temperature range	-40 to +200 °C	-40 to +392 °F	-40 to +180 °C	-40 to +356 °F
Maximum ambient temperature	55 °C	130 °F	55 °C	130 °F
Medium	Water and steam		Water and steam	

Dimensions/weight (approximate) in mm (ins) and kg (lbs)

A	B	C	D	E	Weight
40 (1.57)	110 (4.33)	74.5 (2.93)	94.5 (3.72)	73 (2.87)	0.75 (1.65)



Capacities

Model	BCV1	BCV20	For conversion: C_v (UK) = K_v x 0.963 C_v (US) = K_v x 1.156
Orifice size	3 mm (⅛")	6 mm (¼")	
K_V value	0.25	0.8	

When used for boiler blowdown purposes, the valve will be controlling a mixture of water and flash steam, so the following capacity table applies:

Boiler pressure		Capacities			
		BCV1		BCV20	
bar g	psi g	kg/h	lb/h	kg/h	lb/h
1	14.5	175	385	560	1232
2	29	250	550	790	1738
4	58	350	770	1120	2464
6	87	385	847		
8	116	445	979		
10	145	495	1089		
14	203	590	1298		

When the BCV20 valve is used as part of the BCS2 blowdown control system, downstream of a steam trap, the following capacity table applies:

Head across valve		Capacities			
		Cold water		Hot water with flash steam	
m	ft	kg/h	lb/h	kg/h	lb/h
1	3	253	557	63	138
2	6	358	787	90	198
3	9	438	963	110	242
5	15	566	1245	142	312
10	30	800	1760	200	440

How to specify

BCV1
Solenoid valves shall be Spirax Sarco normally closed blowdown valve type BCV1 with brass bodies and stainless steel valve seat with a PTFE seal.

BCV20
Solenoid valves shall be Spirax Sarco normally closed, low pressure blowdown valve type BCV20 with brass bodies and stainless steel valve seat with a PTFE seal.

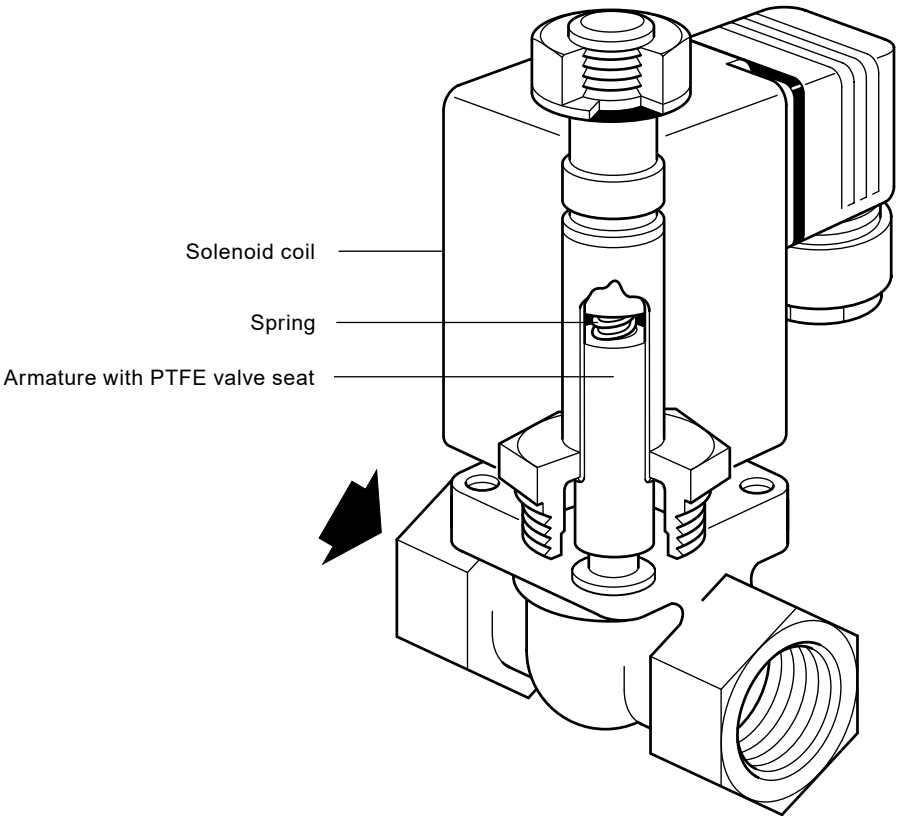
Spare parts
The spare parts available are detailed below. No other parts are supplied as spares.

Available spares

Armature and spring set (kit).	Stock No. 4034080
Solenoid coil 230 V	Stock No. 4034081
Solenoid coil 110/120 V	Stock No. 4034082

How to order spares
Always order spares by using the description given in the column headed 'Available spares' and state the valve type.

Example: 1 off Armature and spring set (Stock No. 4034080) for a Spirax Spirax BCV20 blowdown valve.

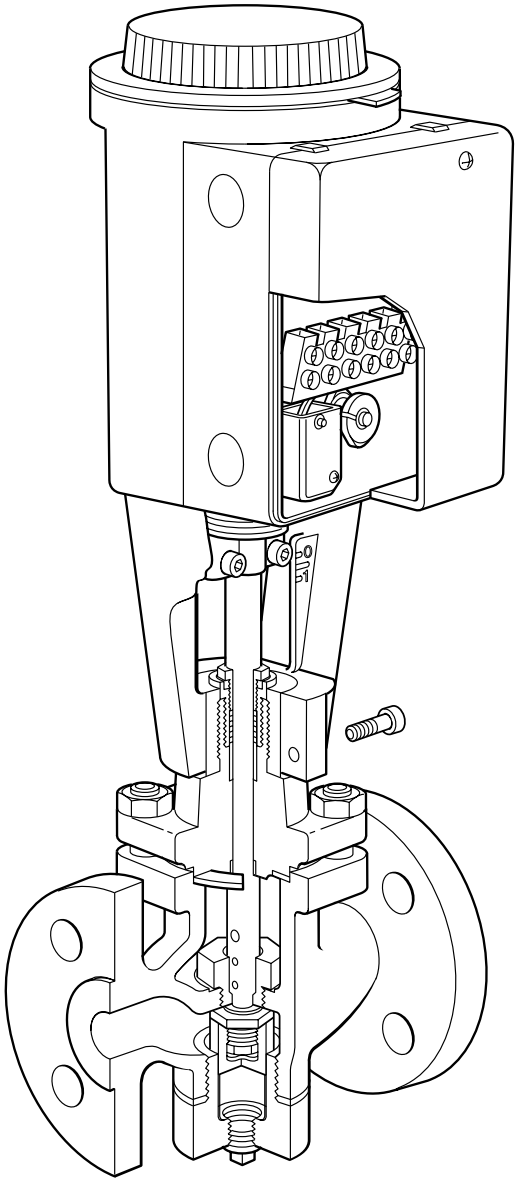


How to order
Example: 1 off Spirax Sarco BCV1 or BCV20 blowdown valve having screwed BSP connections, 230 V 50-60 Hz.

TI-P403-72-US
Issue 1

BCV30
¾" Blowdown Control Valve

- Electrohydraulically actuated valve with manual override
- Cast steel body with stainless steel internals
- Articulated valve cone ensures tight shut-off and correct alignment
- Spring closure on power failure
- Valve position indicator



Description

The Spirax Sarco BCV30 is an electrohydraulically actuated control valve for the blowdown of steam boilers or other high pressure drop, low flowrate applications.
It is generally used with a blowdown controller as part of an auto- matic TDS control system.
The flowrate is adjusted by limiting the spindle stroke to regulate the number of orifices that are uncovered.
The valve, which is supplied adjusted to its low flowrate setting of 0.4" stroke, is especially designed to minimize seat erosion and ensure consistent tight shut-off.
It can be adjusted to 0.6" stroke for medium flowrates, or to 0.8" stroke for high flowrates, by repositioning the internal cam. A valve position indicator is provided.
The valve can be opened manually by turning the actuator hand-wheel clockwise.
A ¼" BSP tapping is provided for a sample cooler.
Full installation, adjustment and maintenance information is provided with the valve.

Sizes and pipe connections

¾" Flanged ANSI 300

Operation

The valve is spring loaded to the closed position.
When power is applied to the actuator the valve opens to the position set by the internal limit switch.

Limiting conditions

Maximum pressure	464 psi g (32 bar g)
Maximum temperature	462 ˚F (239 ˚C)
Maximum ambient temperature	122 ˚F (50 ˚C)
Protection rating	IP54

Outdoor installation is not recommended without additional protection.

Electrical data

230 V version	187 - 264 V	50 - 60 Hz
24 V version	19.2 - 28 V	50 - 60 HZ
Power consumption		15 VA

Approval (24V version)

UL United States Standard	UL-429 Electrically operated
ULC Canadian Standard	C22.2 No. 139-1982 Electrically operated valves

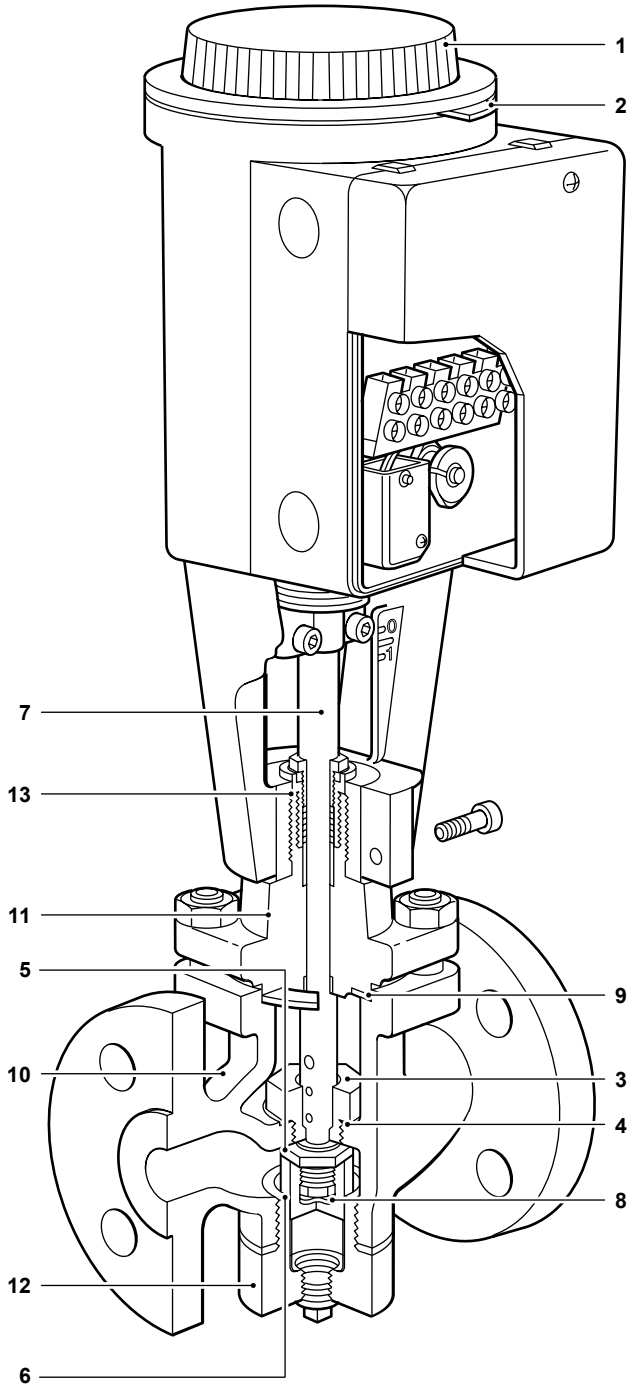
Blowdown valve capacity in lb/h (kg/h)

Boiler pressure		Low flowrates		Medium flowrates		High flowrates	
psi g (bar g)		0.4" stroke (10mm)		0.6" stroke (15 mm)		0.8" stroke (20 mm)	
80	(5.5)	880	(400)	1210	(549)	1900	(862)
102	(7)	1015	(460)	1565	(710)	2540	(1152)
145	(10)	1260	(572)	2100	(953)	3310	(1501)
218	(15)	1540	(699)	2540	(1111)	3640	(1651)
290	(20)	1720	(780)	2760	(1211)	3750	(1701)
464	(32)	2075	(941)	3090	(1402)	3970	(1801)

Materials

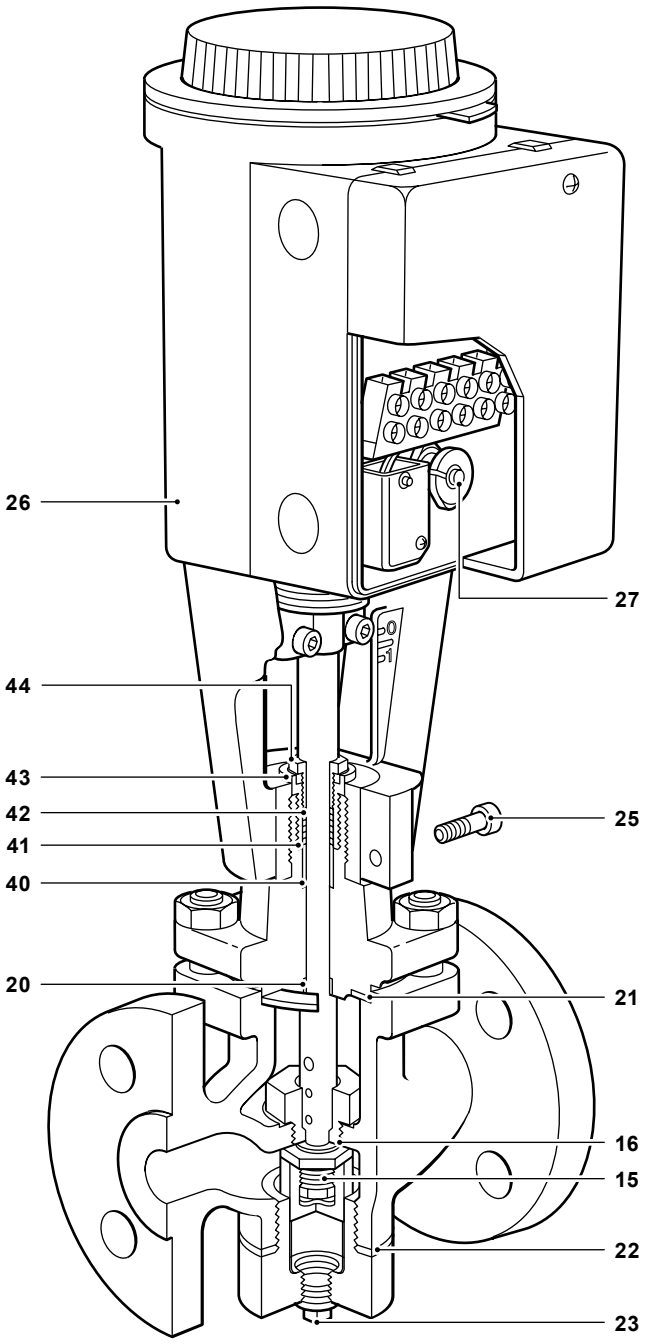
No.	Description	Material	
1	Actuator handwheel		
2	Manual indicator		
3	Seat	Martenistic stainless steel	Type 431
4	Washer (seat)		
5	Valve cone	Martenistic stainless steel	Type 431
6	Cap		
7	Stem		
8	Wave spring		
9	Gasket		
10	Body	Cast carbon steel	DIN 17245 GS-C25
11	Bonnet	Forged steel carbon	DIN 17234 C 22.8
12	Bottom Cover	Carbon steel	BS 907 230 M07
13	Gasket		

For clarity, the materials table is continued on the next page



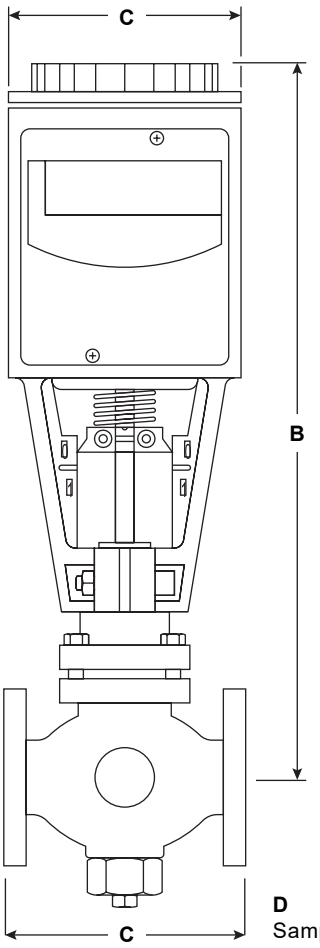
Materials (continued)

No.	Description	Material	
15	Plug		
16	Gasket		
20	Guide bush		
22	Gasket		
23	Plug ¼" BSP		
25	Clamping screw		
26	Actuator (without limit switch assembly)		
27	Limit switch assembly		
40	Bottom support ring		
41	Graphite stem seal set		
42	Top support ring		
43	Stuffing box	Martenistic stainless steel	Type 431
44	Gland nut		



Dimensions/Weights (approximate) in inches (mm) and pounds (kg)

Size	A	B	C	D	Weight
¾"	6 (152)	15.4 (391)	5 (127)	¼" BSP	20 (9.1)



D
Sample bake-off

Safety Information

WARNING
Your attention is drawn to Safety Information Leaflet IM-GCM-10, as well as to any National or Regional regulations. This product is designed and constructed to withstand the forces encountered dur- ing normal use. Use of the product for any purpose other than a blowdown control valve could cause damage to the product and may cause injury or fatality to personnel.

Installation
This document does not contain sufficient information to install the product safely. See the Installation and Maintenance Instructions provided with every unit. Do not install the valve outside without additional weather protection.

Maintenance
It is recommended that the valve is examined annually and parts replaced if necessary. For detailed maintenance instructions, see Installation and Maintenance Instructions (IM-P403-15).

How to order
Example: Spirax Sarco BCV30 blowdown valve, 24V, flanged ¾" ANSI 300, and approved by Underwriters Laboratory as a Listed Product.

Spare parts

Spare parts are available as listed below. No other parts are available as spares.

Gasket and packing set	
24V (UL) Stock No. 4034480	**4, 9, 10, 11, 12, 13, 16, 20, 22**
115/230V Stock No. 4034482	**4, 9, 13, 16, 22, 41**

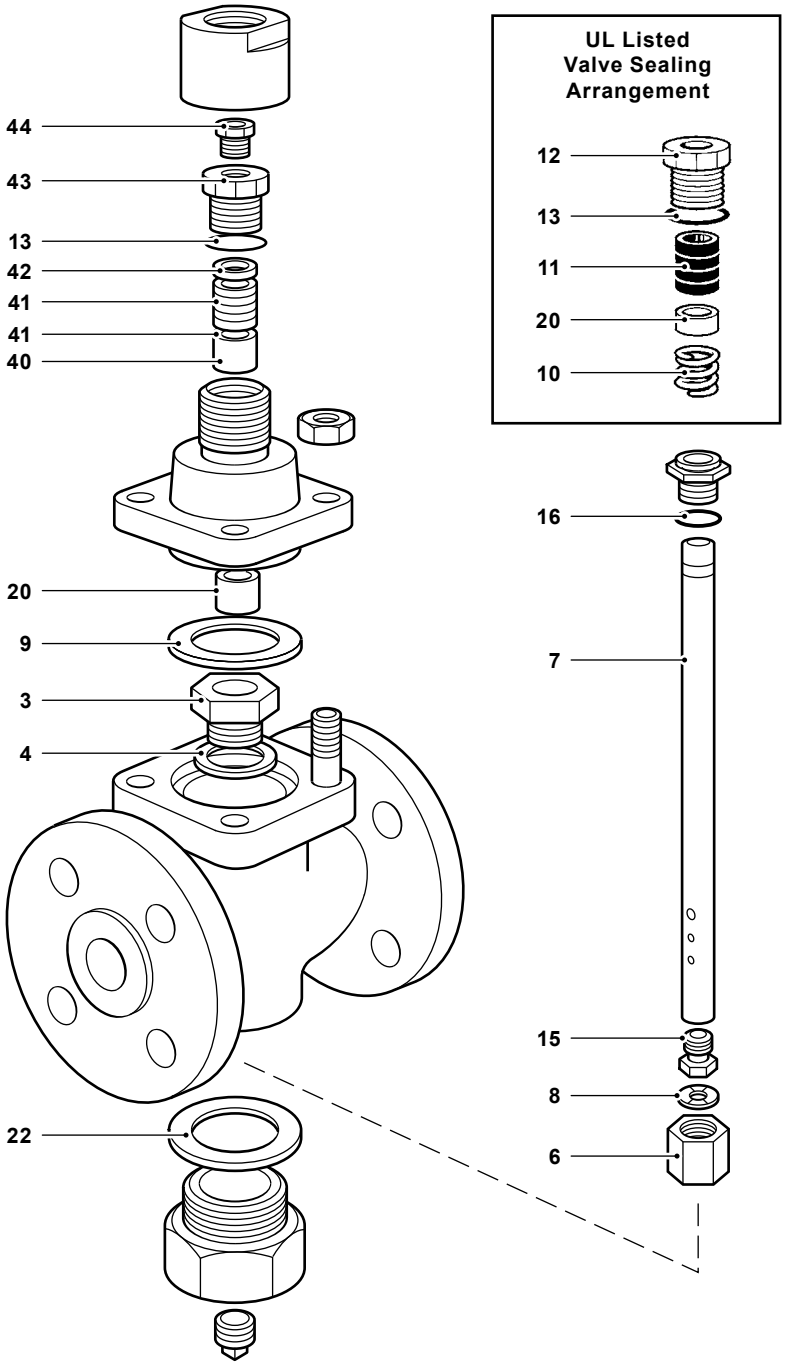
Valve cone, seat and stem set	
24V (UL) Stock No. 4034481	**3, 5, 6, 7, 8, 15**
115/230V Stock No. 4034483	**3, 5, 6, 7, 8, 15, 16, 45 + Gasket and packing set**

Adjustable stuffing box kit	
115/230V Stock No. 4034484	**40, 42, 43, 44 + Gasket and packing set**

Note: The adjustable graphite seal system is not currently approved for use on the UL Listed valve.

Actuator with limit switch assembly	
115V	Stock No. 4034466
230V	Stock No. 4034467
24V (UL)	Stock No. 4034468

Actuator limit switch assembly:
24 (UL) /115/230V versions Stock No. 4034419



TI-P403-74-US
Issue 1

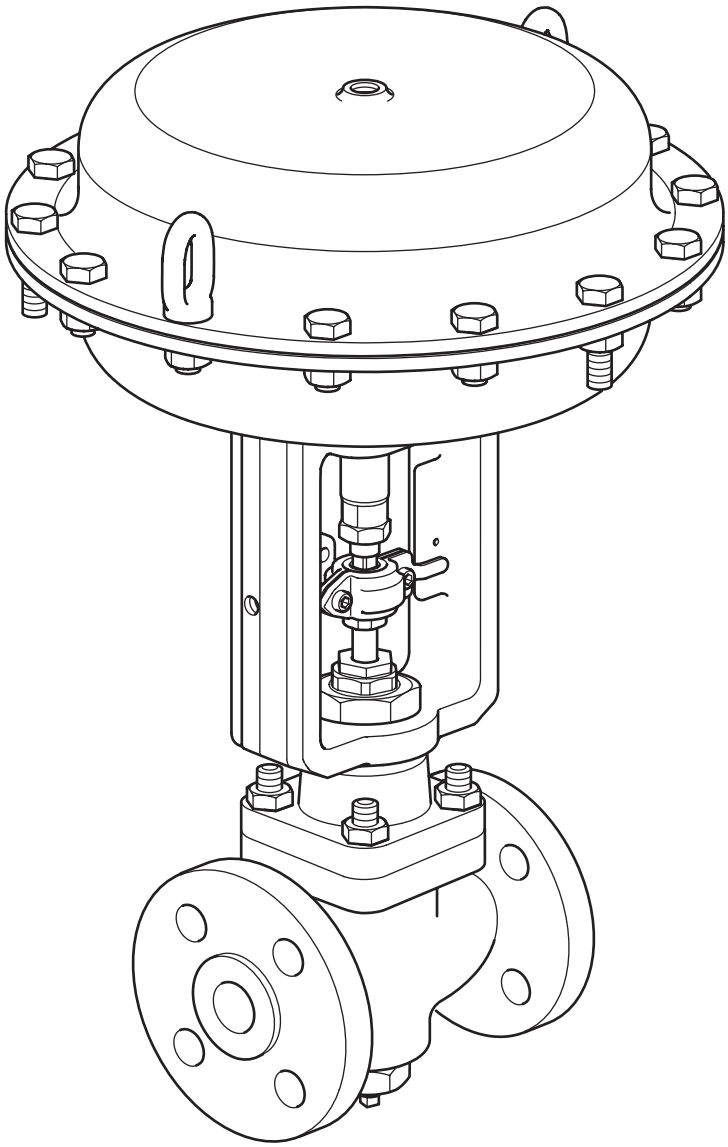
BCV 31
1½" Blowdown Control Valve

Description

The Spirax Sarco BCV31 is a pneumatically operated control valve for the blowdown of steam boilers. It is normally used with a controller as part of an automatic TDS control system, though it can also be used for other high pressure drop flowrate applications. The flowrate is adjusted by limiting the spindle stroke to regulate the size of the orifice that is uncovered.
The valve, which is specially designed to minimise seat erosion and ensure consistent tight shut-off, is supplied adjusted to a flowrate setting of 10 mm.
It can be adjusted to give different flowrates. The actuator has a mechanical stroke indicator and incorporates a rolling diaphragm. A ¼" NPT plug at the base of the valve may be removed to allow a sample cooler to be fitted (available from Spirax Sarco).
The BCV31 requires a regulated and filtered air supply (¼" NPT), which should be free of oil and water, and a solenoid valve, (available from Spirax Sarco).

Operation

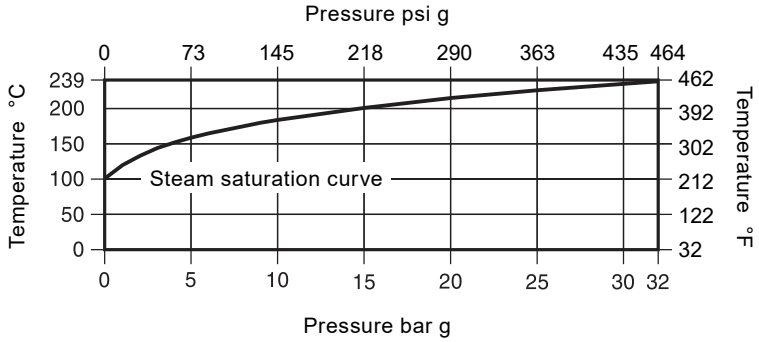
The valve is spring loaded to the closed position (spring retract), and is also held closed by the boiler pressure. When the solenoid valve opens, air is admitted to the actuator causing the valve to open to the selected stroke.



Sizes and pipe connections

ANSI Class 300
Note: All certification / inspection requirements must be stated at the time of order placement.

Pressure/temperature limits



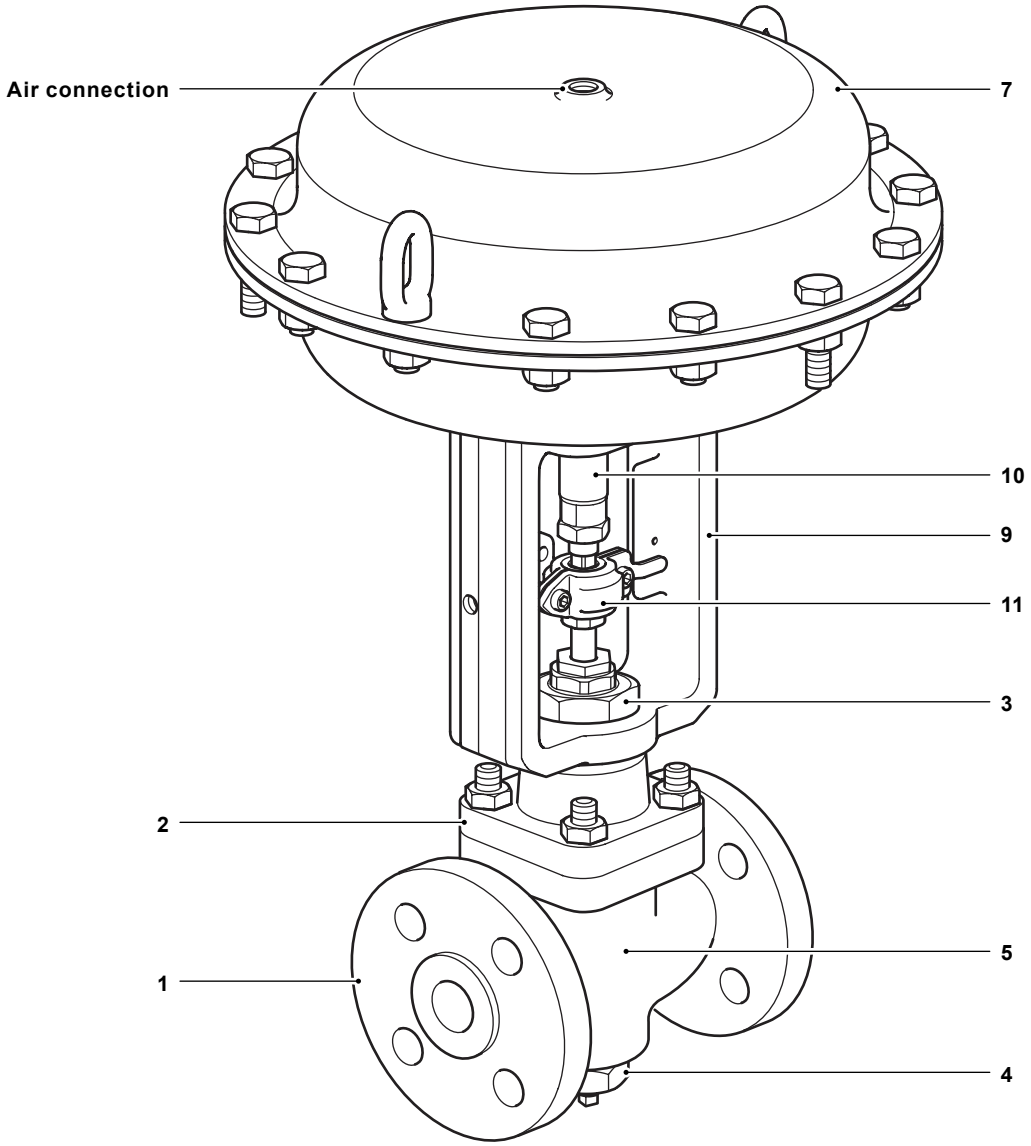
Maximum operating pressure	32 bar g	(464 psi g)
Maximum operating temperature	239 °C	(462 °F)
Maximum ambient temperature	110 °C	(230 °F)
Minimum ambient temperature	0 °C	(32 °F)
Minimum operating temperature	0 °C	(32 °F)
Air pressure range	2.5 to 6 bar g	(36 to 87 psi g)
Air consumption - normal	1.606 litres	(0.565 ft³)

Capacities in kg/h and lb/h

Boiler pressure bar g (psi g)	Blowdown valve capacity kg/h (lb/h)			
	5 mm stroke	10 mm stroke	15 mm stroke	20 mm stroke
5 (73)	450 (992)	2900 (6393)	3450 (7606)	3550 (7826)
7 (102)	475 (1047)	3300 (7275)	4100 (9039)	4500 (9921)
10 (145)	500 (1102)	3700 (8157)	4750 (10472)	5450 (12015)
15 (218)	550 (1212)	4550 (10031)	6450 (14210)	7150 (15763)
20 (290)	800 (1764)	5750 (12677)	8100 (17857)	8650 (19070)
32 (464)	1300 (2866)	8400 (18519)	10300 (22708)	11050 (24361)

Note: Intermediate flowrate strokes can be set on the 1½" BCV31.

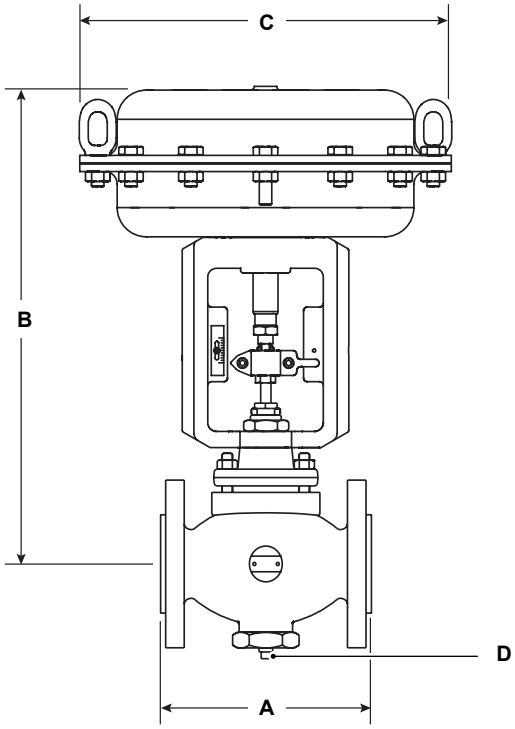
Materials



No.	Part	Material	
1	Body	Cast carbon steel	DIN 17245 GS-C25
2	Bonnet	Forged carbon steel	DIN 17243 C 22.8
3	Stuffing box assembly	Stainless steel/graphite seals	ASTM A276 316L
4	Bottom cover	Carbon steel	BS 970 230 MO7
5	Internal components	Stainless steel (valve cone and seat are hardened)	Type 431
6	Guide bush	Phosphor bronze	BS EN 12163 CW451K
7	Diaphragm housing	Pressed steel	
8	Diaphragm	Reinforced NBR	
9	Yoke	SG iron	
10	Spindle	Stainless steel	
11	Connector	Carbon steel	

Note: These items are clearly shown in Spare parts.

Dimensions/weight (approximate) in mm (in) and kg (lb)



Size	A	B	C	D	Weight
DN40 (1½)	198 (7.8)	404 (15.9)	300 (11.8)	(¼" NPT)	29 (64)

Safety information,installation and maintenance

For full details see the Installation and Maintenance Instructions supplied with the product.

Important

Your attention is drawn to Safety Information Leaflet IM-GCM-10, as well as to any national or regional regulations.

Installation note

The valve itself may be installed outdoors without additional pro- tection. The solenoid valve however, must be installed indoors, or adequately protected against outdoor conditions.

Maintenance note

We recommend that the valve and actuator are examined annually and parts replaced as necessary.

How to order

Example: 1 off Spirax Sarco 1½" BCV31 blowdown control valve having flanged ANSI 300 connections.

Spare parts

The spare parts available are shown in solid line.
Parts shown in broken line are not supplied as spares.

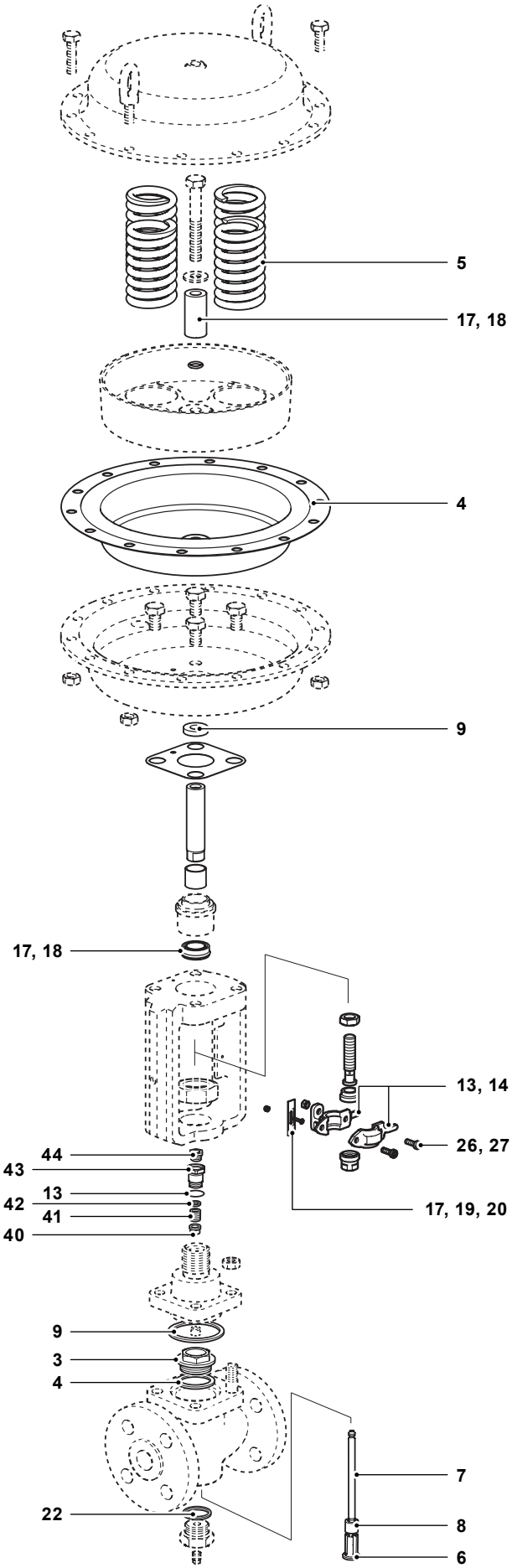
Available spares

Valve	Gasket and stem seal set	Stock No. 4034880	**9, 13, 40, 41, 42, 43, 44**
	Valve cone,seat and stem set	Stock No. 4034882	**3, 4, 6, 7, 8, 22**
Actuator	Stem seal kit		**17, 18, 30**
	Diaphragm kit		**4, 9**
	Travel indicator kit		**15, 19, 20**
	Spring kit		**5**
	Linkage kit (suitable for MK1 and Mk2 valves)		**10, 13, 14, 26, 27**

How to order spares

Always order spares by using the description given above, and state the size and flange type of blowdown control valve.

Example: 1 off Gasket and stem seal set, Stock No. 4034880, for a Spirax Sarco 1½" BCV31 blowdown control valve having flanged ANSI 300 connections.



TI-P403-102
EMM Issue 9

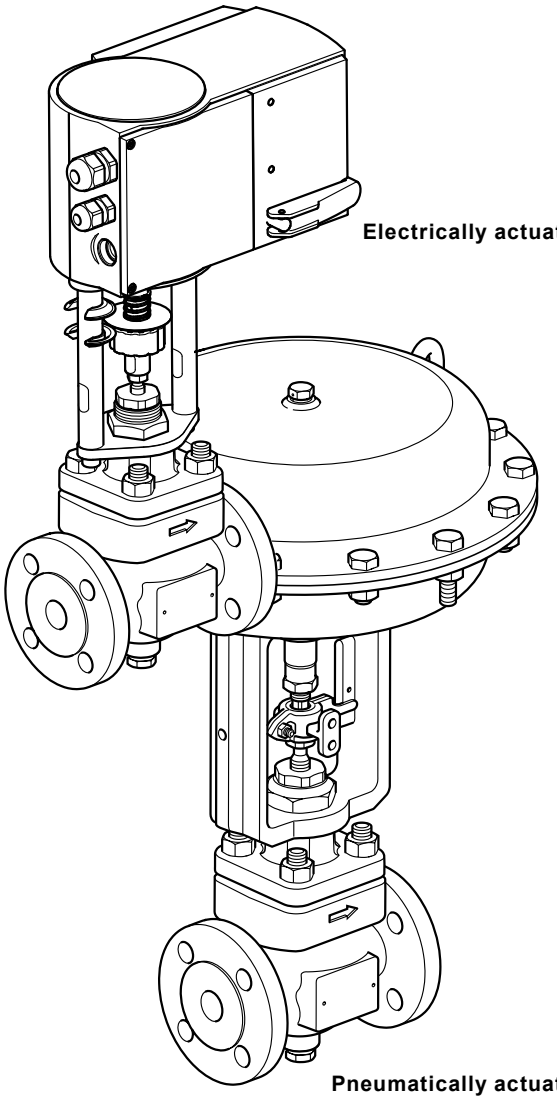
BCV
Blowdown Control Valves
DN15 to DN50 (½" to 2")

Description

Spirax Sarco's BCV blowdown control valves are manufactured using the market proven Spira-trol™ body. These valves are designed for the blowdown of steam boilers or for other high pressure drop, low flow applications, and are generally used with a blowdown controller as part of an automatic BCV control system.
The flowrate is adjusted by setting the stroke of the valve spindle.
These valves have been specially designed to minimize seat erosion and ensure consistent tight shut-off.
A ¼" BSP plug at the base of the valve may be removed to allow a sample cooler to be fitted.

Two versions are available:

- Electrically actuated BCV blowdown control valve.
- Pneumatically actuated BCV blowdown control valve.



Electrically actuated

Pneumatically actuated

Available models:

Material	Connections		
	Screwed	Socket weld	Flanged
Carbon steel	**BCV41**	**BCV42**	**BCV43**
Stainless steel	**BCV61**	**BCV62**	**BCV63**
SG iron	**BCV71**		**BCV73**

Spira-trol™ valve body options:

Stem sealing	Graphite packing	High temperature applications
Seating	Hard facing	316L stainless steel with Stellite 6 facing

BCV blowdown control valves are compatible with the following actuators:

Version	Actuator
Electric	AEL3 series
Pneumatic	PN9_ _ _ series

Operation

BCV blowdown control valves are supplied loaded to the closed position.
Electrical version: When the power is connected to the actuator the valve opens to the position set by the internal limit switch.
Pneumatic version: When the solenoid valve opens, air is admitted to the actuator activating the valve to open to the selected stroke.

Standards
These products fully comply with the requirements of the European Pressure Equipment Directive 2014/68/EU.

The Electric actuator complies with LV Directive 2014/35/EU, EN60730-1, EN60730-2-14 and with EMC Directive 2014/30/EU, EN61000-6-2, EN6100-6-4

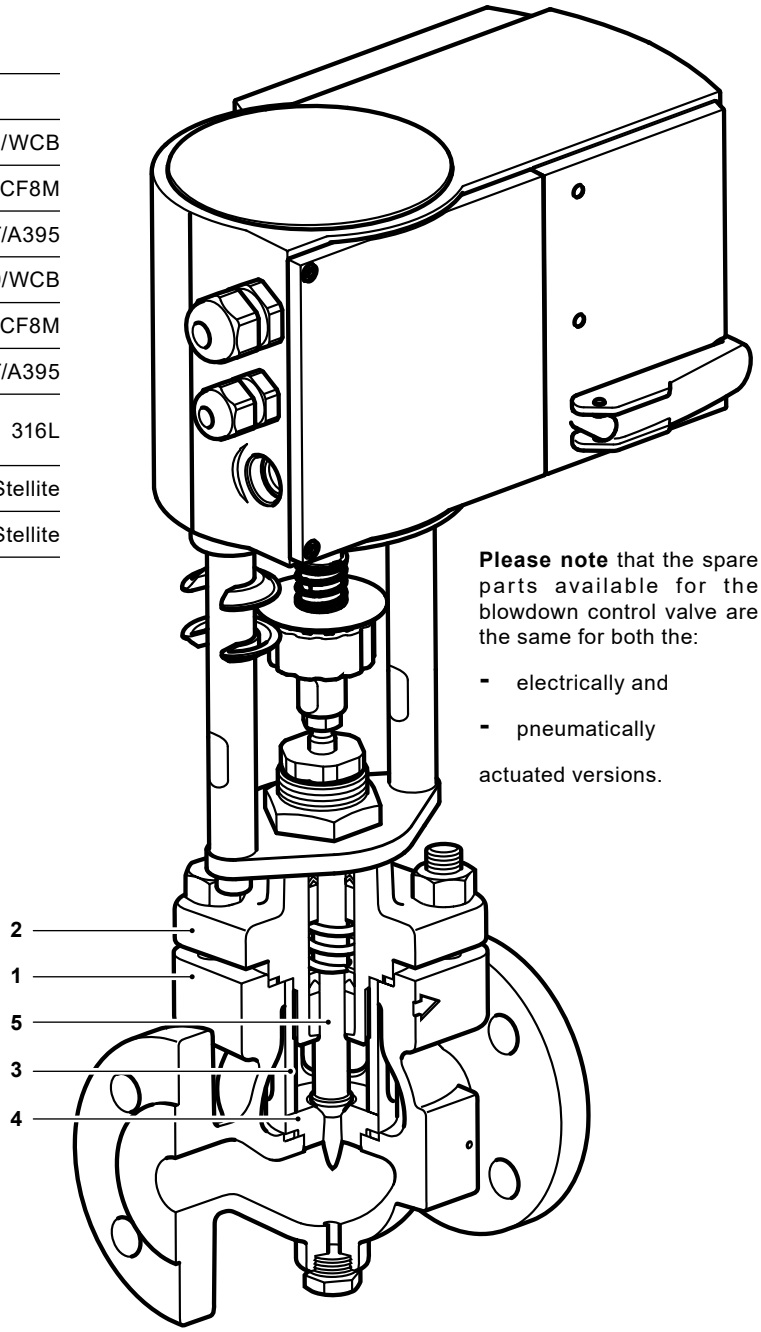
Certification
These products are available with material certification to EN 10204 3.1.
Note: All certification/inspection requirements must be stated at the time of order placement.

Size and pipe connections
½", ¾", 1", 1¼", 1½" and 2" Screwed BSP T Rp (ISO 7-1) or NPT, Socket weld and Butt weld.

DN15, DN20, DN25, DN32, DN40 and DN50 (½", ¾", 1", 1¼", 1½" and 2") Flanged:
EN 1092 PN25 and PN40
ASME class 125, 150, 250 and 300
JIS/KS 10K and 20K

Materials

No.	Part	Material	
1	Body	Carbon steel	1.0619+N/WCB
		Stainless steel	1.4408/CF8M
		SG iron	EN-GJS-400-18-LT/A395
2	Bonnet	Forged steel	1.0460/A105N or 1.0619/WCB
		Stainless steel	1.4408/CF8M
		SG iron	EN-GJS-400-18-LT/A395
3	Seat retainer	Stainless steel	316L
4	Seat	Stainless steel	316L with Stellite
5	Plug	Stainless steel	316L with Stellite



Please note that the spare parts available for the blowdown control valve are the same for both the:

- electrically and
- pneumatically

actuated versions.

Electrical data

Actuator	**AEL3 series**
Supply voltage	Standard 24 Vac/dc, Optional card 230 Vac and 110 Vac
Supply frequency	50 to 60 Hz
Power consumption	12W (24 Vac/dc) 28W (230 Vac, 110 Vac)
Actuator speed mm/s (in/s)	2 mm/s, 4 mm/s or 6 mm/s (0.07, 0.16, or 0.24 in/s)
Actuators thrust maximum	2 kN

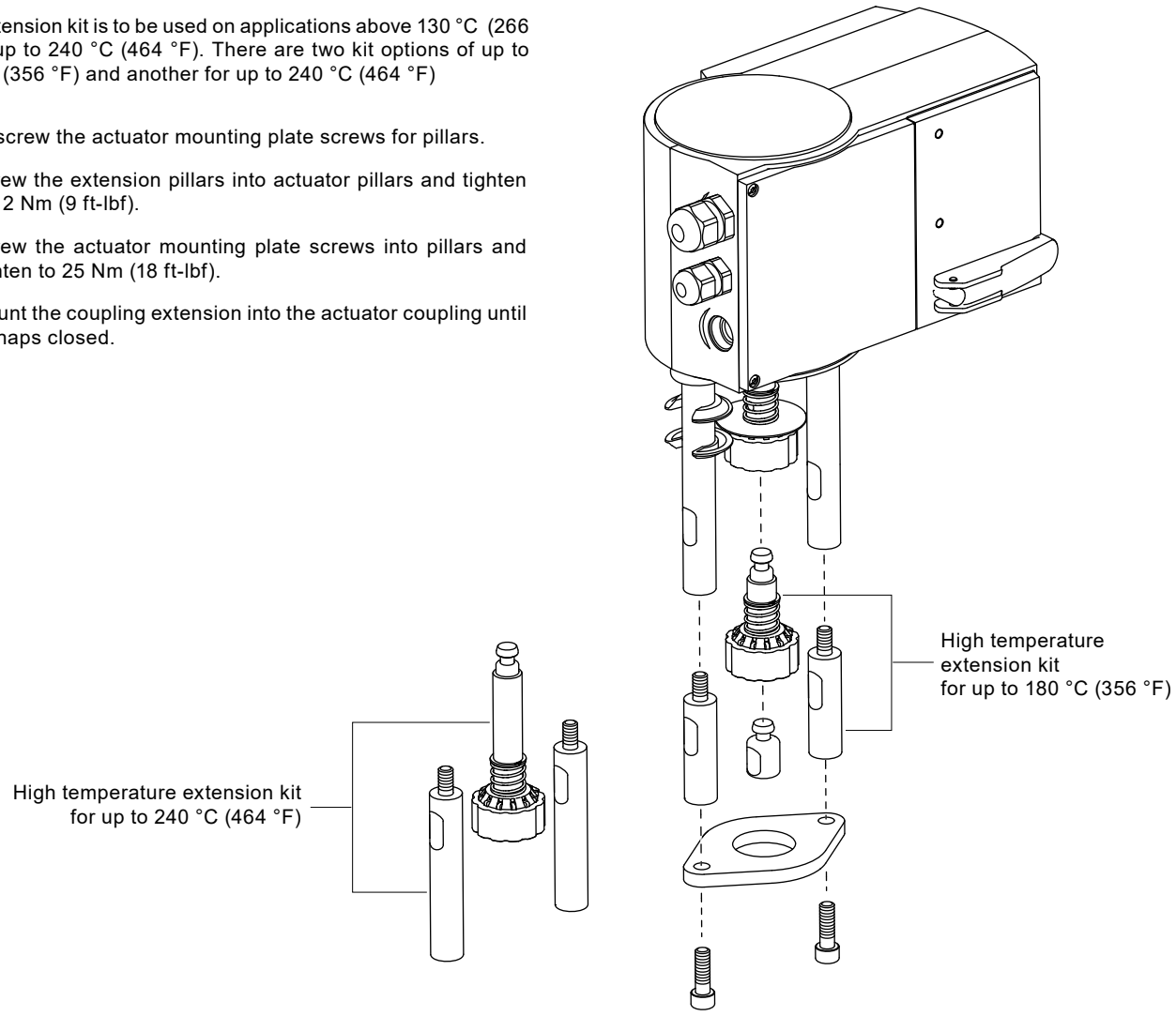
Size		Actuator	Maximum shut-off value
DN15 to DN25	**½" to 1"**	AEL3 series/PN9123E-B	103.4 bar g @ 100 °C (1,499 psi g @ 212 °F)
DN32 to DN50	**1¼" to 2"**	AEL3 series/PN9223E-B	

Warnings:
If the temperature of the medium in the valve is high, the drive columns and the shaft may also reach high temperatures.

High temperature extension:

The extension kit is to be used on applications above 130 °C (266 °F) to up to 240 °C (464 °F). There are two kit options of up to 180 °C (356 °F) and another for up to 240 °C (464 °F)

1. Unscrew the actuator mounting plate screws for pillars.
2. Screw the extension pillars into actuator pillars and tighten to 12 Nm (9 ft-lbf).
3. Screw the actuator mounting plate screws into pillars and tighten to 25 Nm (18 ft-lbf).
4. Mount the coupling extension into the actuator coupling until it snaps closed.

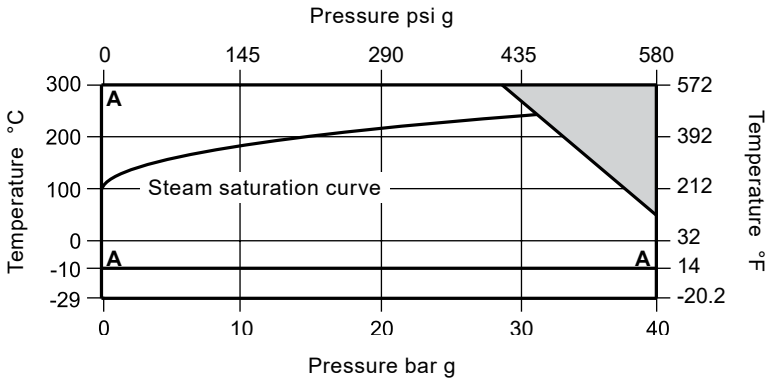


Pressure/temperature limits – BCV4_

Body design conditions:			PN40, JIS / KS 20K	ASME class 150, class 300
PMA Maximum allowable pressure	**EN**	PN40	40 bar g @ 50 °C	580 psi g @ 122 °F
	ASME	ASME 150	19.6 bar g @ 38 °C	284 psi g @ 100 °F
		ASME 300	51.1 bar g @ 38 °C	741 psi g @ 100 °F
	JIS / KS	JIS / KS 20K	34 bar g @ 120 °C	493 psi g @ 248 °F
TMA Maximum allowable temperature	**EN**	PN40	300 °C @ 27.6 bar g	572 °F @ 400 °F
	ASME	ASME 150	425 °C @ 5.5 bar g	797 °F @ 80 psi g
		ASME 300	425 °C @ 28.8 bar g	797 °F @ 418 psi g
	JIS / KS	JIS / KS 20K	300 °C @ 20 bar g	572 °F @ 290 psi g
Minimum allowable temperature	**EN**	PN40	-10 °C	14 °F
	ASME	ASME 150	-29 °C	-20 °F
		ASME 300	-29 °C	-20 °F
	JIS / KS	JIS / KS 20K	-10 °C	14 °F
PMO Maximum operating pressure for saturated steam service	**EN**	PN40	31.1 bar g @ 237 °C	451 psi g @ 458 °F
	ASME	ASME 150	13.9 bar g @ 197 °C	201 psi g @ 386 °F
		ASME 300	41.7 bar g @ 254 °C	605 psi g @ 489 °F
	JIS / KS	JIS / KS 20K	30.6 bar g @ 236 °C	443 psi g @ 456 °F
TMO Maximum operating temperature	**EN**	PN40	300 °C @ 27.6 bar g	572 °F @ 400 psi g
	ASME	ASME 150	425 °C @ 5.5 bar g	797 °F @ 80 psi g
		ASME 300	425 °C @ 28.8 bar g	797 °F @ 418 psi g
	JIS / KS	JIS / KS 20K	300 °C @ 20 bar g	572 °F @ 290 psi g
Minimum operating temperature	**EN**	PN40	-10 °C	14 °F
	ASME	ASME 150	-29 °C	-20 °F
		ASME 300	-29 °C	-20 °F
	JIS / KS	JIS / KS 20K	-10 °C	14 °F
Designed for a maximum cold hydraulic test pressure of:			1.5 x PMA of the relative end connection of choice	

Pressure/temperature limits – BCV4_

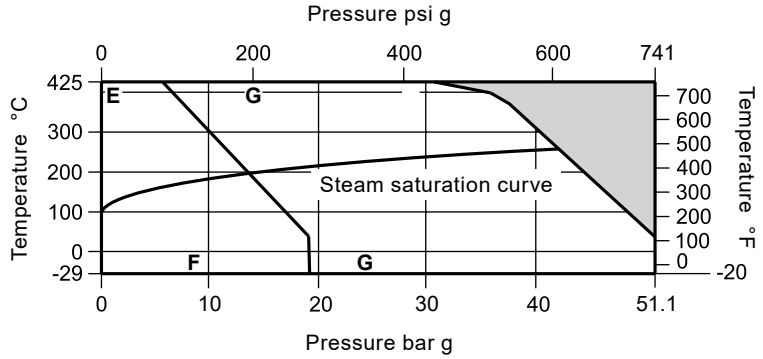
BCV41 Screwed BSP
BCV43 Flanged EN 1092



The product **must not** be used in this region.

A - A Flanged EN 1092 PN40 and Screwed BSP

BCV41 Screwed NPT
BCV42 Socket weld
BCV43 Flanged ASME

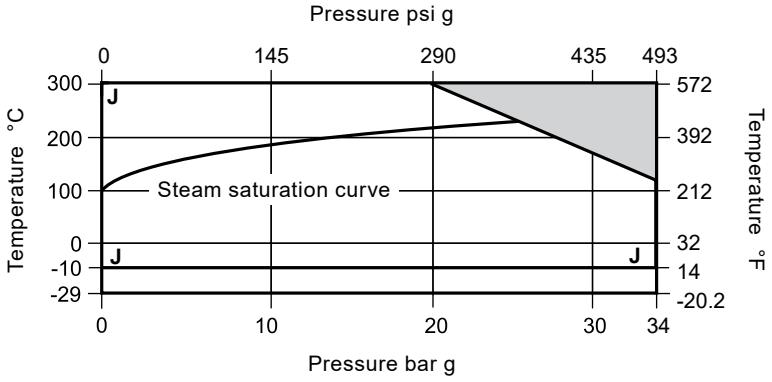


The product **must not** be used in this region.

E - F Flanged ASME class 150

E - G Flanged ASME class 300, Screwed NPT and Socket weld class 3000 (B 16.11)

BCV43 Flanged JIS / KS



The product **must not** be used in this region.

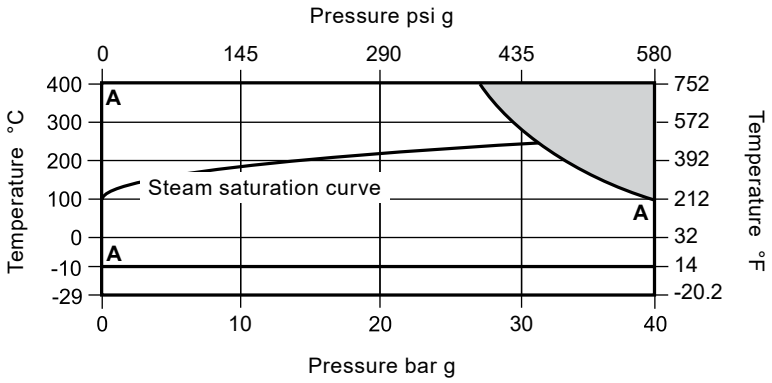
J - J Flanged JIS / KS 20K

Pressure/temperature limits – BCV6_

Body design conditions:				PN40, JIS / KS 20K	ASME class 150, class 300
PMA Maximum allowable pressure		**EN**	PN40	40 bar g @ 100 °C	580 psi g @ 212 °F
		ASME	ASME 150	19.0 bar g @ 38 °C	275 psi g @ 100 °F
			ASME 300	49.6 bar g @ 38 °C	719 psi g @ 100 °F
		JIS / KS	JIS / KS 20K	34 bar g @ 120 °C	493 psi g @ 248 °F
TMA Maximum allowable temperature		**EN**	PN40	400 °C @ 27.4 bar g	752 °F @ 397 psi g
		ASME	ASME 150	538 °C @ 1.4 bar g	1 000 °F @ 20 psi g
			ASME 300	538 °C @ 25.2 bar g	1 000 °F @ 365 psi g
		JIS / KS	JIS / KS 20K	425 °C @ 20 bar g	797 °F @ 290 psi g
Minimum allowable temperature		**EN**	PN40	-10 °C	14 °F
		ASME	ASME 150	-29 °C	-20 °F
			ASME 300	-29 °C	-20 °F
		JIS / KS	JIS / KS 20K	-10 °C	14 °F
PMO Maximum operating pressure for saturated steam service		**EN**	PN40	32.2 bar g @ 240 °C	467 psi g @ 464 °F
		ASME	ASME 150	13.8 bar g @ 197 °C	200 psi g @ 386 °F
			ASME 300	33.8 bar g @ 242 °C	490 psi g @ 467 °F
		JIS / KS	JIS / KS 20K	30.6 bar g @ 236 °C	443 psi g @ 456 °F
TMO Maximum operating temperature		**EN**	PN40	400 °C @ 27.4 bar g	797 °F @ 397 psi g
		ASME	ASME 150	538 °C @ 1.4 bar g	1 000 °F @ 20 psi g
			ASME 300	538 °C @ 25.2 bar g	1 000 °F @ 365 psi g
		JIS / KS	JIS / KS 20K	425 °C @ 20 bar g	797 °F @ 290 psi g
Minimum operating temperature		**EN**	PN40	-10 °C	14 °F
		ASME	ASME 150	-29 °C	-20 °F
			ASME 300	-29 °C	-20 °F
		JIS / KS	JIS / KS 20K	-10 °C	14 °F
Designed for a maximum cold hydraulic test pressure of:				1.5 x PMA of the relative end connection of choice	

Pressure/temperature limits – BCV6_

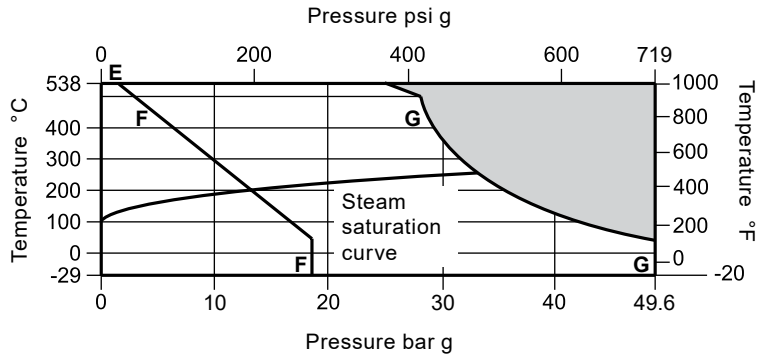
BCV61 Screwed BSP
BCV63 Flanged EN 1092



The product **must not** be used in this region.

A - A Flanged EN 1092 PN40 and Screwed BSP

BCV61 Screwed NPT
BCV62 Socket weld
BCV63 Flanged ASME

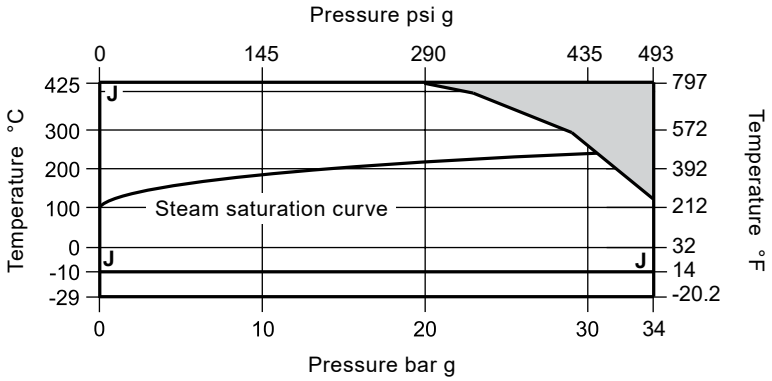


The product **must not** be used in this region.

E - F Flanged ASME class 150

E - G Flanged ASME class 300, Screwed NPT and Socket weld class 3000 (B 16.11)

BCV63 Flanged JIS / KS



The product **must not** be used in this region.

J - J Flanged JIS / KS 20K

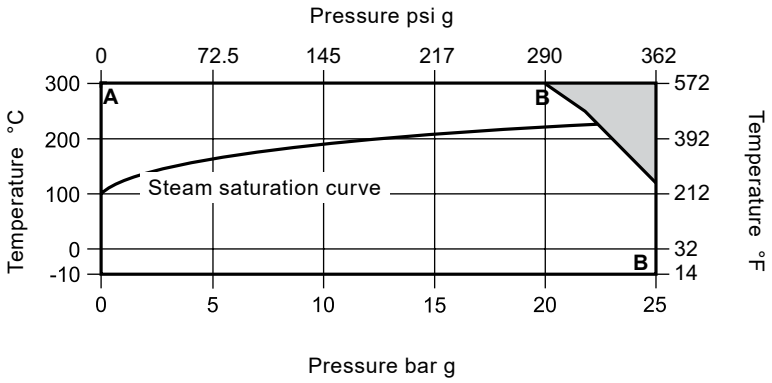
Pressure/temperature limits – BCV7_

Body design conditions:			PN25 JIS / KS 10K	ASME class 125 or ASME class 250
PMA Maximum allowable pressure	**EN**	PN25	25.0 bar g @ 120 °C	362 psi g @ 248 °F
	ASME	ASME 125	11.5 bar g @ 140 °C	166 psi g @ 284 °F
		ASME 250	26.7 bar g @ 140 °C	387 psi g @ 284 °F
	JIS / KS	JIS / KS 10K	13.7 bar g @ 120 °C	198 psi g @ 248 °F
TMA Maximum allowable temperature	**EN**	PN25	300 °C @ 20 bar g	572 °F @ 290 psi g
	ASME	ASME 125	232 °C @ 8.6 bar g	449 °F @ 125 psi g
		ASME 250	232 °C @ 17.2 bar g	449 °F @ 249 psi g
	JIS / KS	JIS / KS 10K	300 °C @ 9.8 bar g	572 °F @ 290 psi g
Minimum allowable temperature	**EN**	PN25	-10 °C	14 °F
	ASME	ASME 125	-29 °C	-20 °F
		ASME 250	-29 °C	-20 °F
	JIS / KS	JIS / KS 10K	-10 °C	14 °F
PMO Maximum operating pressure for saturated steam service	**EN**	PN25	22.5 bar g @ 220 °C	326 psi g @ 428 °F
	ASME	ASME 125	10.0 bar g @ 184 °C	145 psi g @ 363 °F
		ASME 250	18.0 bar g @ 209 °C	261 psi g @ 408 °F
	JIS / KS	JIS / KS 10K	12.3 bar g @ 191 °C	178 psi g @ 376 °F
TMO Maximum operating temperature	**EN**	PN25	300 °C @ 20.0 bar g	572 °F @ 290 psi g
	ASME	ASME 125	232 °C @ 8.6 bar g	449 °F @ 125 psi g
		ASME 250	232 °C @ 17.2 bar g	449 °F @ 249 psi g
	JIS / KS	JIS / KS 10K	300 °C @ 9.8 bar g	572 °F @ 290 psi g
Minimum operating temperature	**EN**	PN25	-10 °C	14 °F
	ASME	ASME 125	-29 °C	-20 °F
		ASME 250	-29 °C	-20 °F
	JIS / KS	JIS / KS 10K	-10 °C	14 °F

Designed for a maximum cold hydraulic test pressure of: 1.5 x PMA of the relative end connection of choice

Pressure/temperature limits – BCV7_

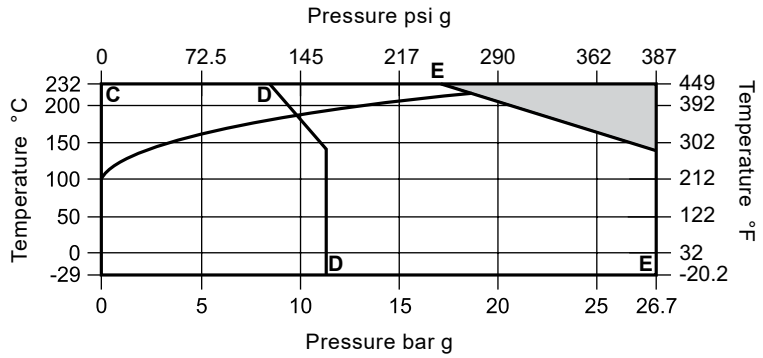
BCV71 Screwed BSP
BCV73 Flanged EN 1092



The product **must not** be used in this region.

A - B Flanged EN 1092 PN25 and Screwed BSP

BCV71 Screwed NPT
BCV73 Flanged ASME

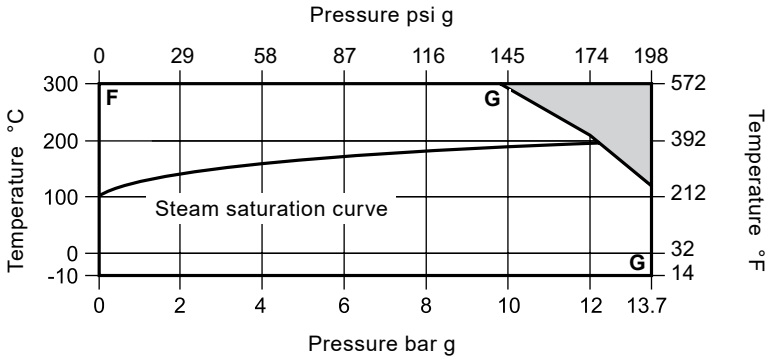


The product **must not** be used in this region.

C - D Flanged ASME class 125

C - E Flanged ASME class 250 and Screwed NPT

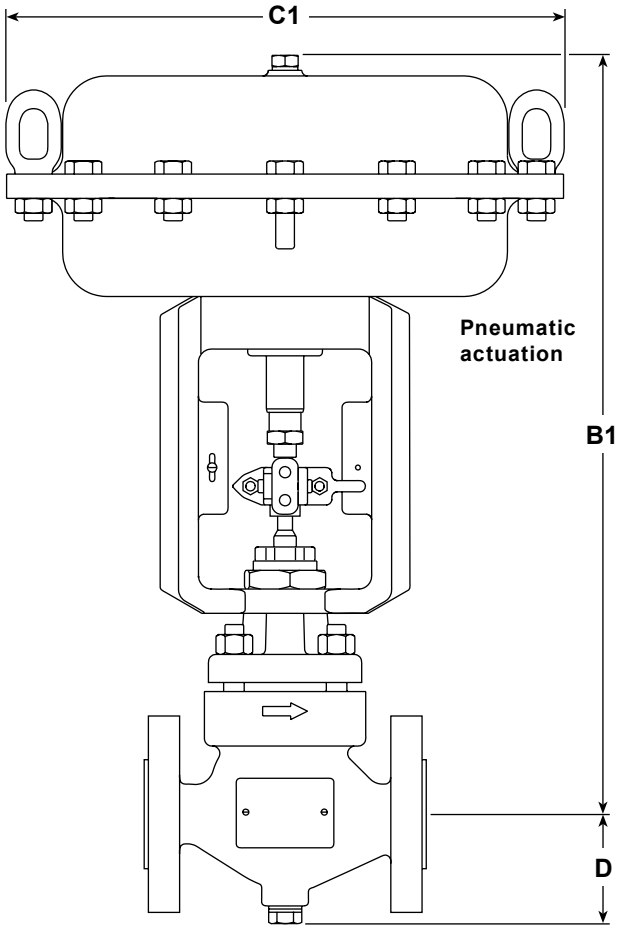
BCV63 Flanged JIS / KS

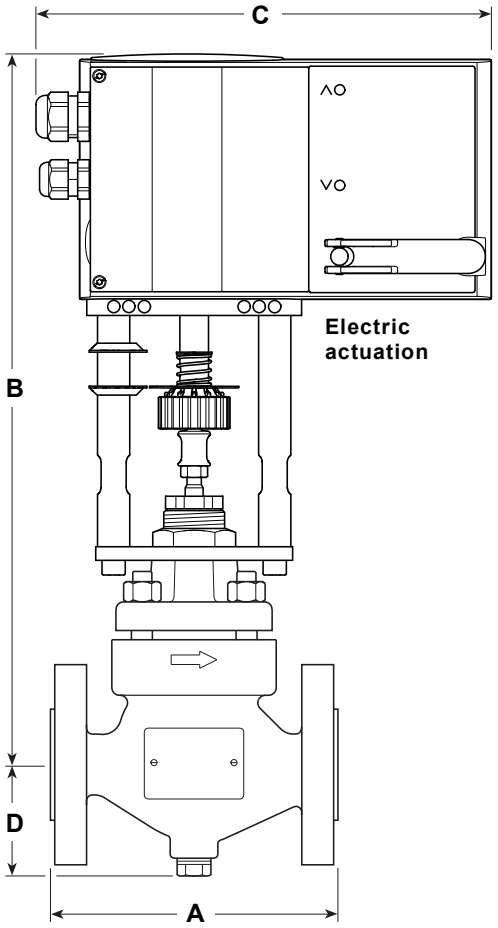


The product **must not** be used in this region.

F - G Flanged JIS / KS 10K

Dimensions (approximate) in mm (in)





Size	ASME	PN		DN15 (½")	DN20 (¾")	DN25 (1")	DN32 (1¼")	DN40 (1½")	DN50 (2")
A	125		JIS/KS 10K			184 (7.2)		222 (8.7)	254 (10)
	300		JIS/KS 20K	190.5 (7.5)		197 (7.8)		235 (9.3)	267 (10.5)
		40		130 (5.1)	150 (5.9)	160 (6.3)	180 (7.1)	200 (7.9)	230 (9.1)
B	125		JIS/KS 10K JIS/KS 20K	392 (15.4)			421 (16.6)		416 (16.4)
	300								
		40							
B1	125		JIS/KS 10K JIS/KS 20K	378 (14.9)			432 (17)		427 (16.8)
	300								
		40							
C				230 (9.1)					
C1				170 (3.69)			300 (11.8)		
D	125		JIS/KS 10K JIS/KS 20K	42.5 (1.7)	57.0 (2.2)	54.5 (2.1)	65.5 (2.6)	76.5 (3)	84.5 (3.3)
	300								
		40							

Weights (approximate) in kg (lbs)

Size	ASME		PN			DN15 (½")	DN20 (¾")	DN25 (1")	DN32 (1¼")	DN40 (1½")	DN50 (2")
Electric version	125				JIS/KS 10K JIS/KS 20K	12 (26)	12.8 (28)	13 (29)	19.5 (43)	20 (44)	23 (51)
		300									
			40								
Pneumatic version	125				JIS/KS 10K JIS/KS 20K				30.5 (67)	31 (68)	34 (75)
		300									
			40								

Kvs values

Valve size	DN15 (½")	DN20 (¾")	DN25 (1")	DN32 (1¼")	DN40 (1½")	DN50 (2")
Kvs value	0.5	0.5	0.5	1.6	1.6	1.6

For conversion:
Cv (UK) = Kv x 0.963
Cv (US) = Kv x 1.156

BCV selection guide

Valve size	DN15, DN20, DN25, DN32, DN40 and DN50 ½", ¾", 1", 1¼", 1½" and 2"		**DN15**
Valve series	**BCV**		**BCV**
Body material	**4** = Carbon steel **6** = Stainless steel **7** = SG iron		**4**
Connections	**1** = Screwed **2** = Socket weld - Not available for the BCV7_ **3** = Flanged		**3**
Stem sealing	**H** = Graphite		**H**
Seating	**W** = Stainless Steel 316L with Stellite		**W**
Type of trim	**S** = Standard trim		**S**
Trim-balancing	**U** = Unbalanced		**U**
Bonnet type	**S** = Standard		**S**
Bolting	**S** = Standard		**S**
Flow coefficient	To be specified		**K_{VS} 0.5**
Connection type	To be specified		**Flanged ASME 300**
Actuation	**PN** = Pneumatic		**PN**
	EL = Electrical	230 Vac,	
		110 Vac or	
		24 Vac/dc	

Selection example

DN15	-	BCV	4	3	H	W	S	U	S	S	-	K_{VS} 0.5	-	Flanged ASME 300	PN

How to order

Example: 1 off Spirax Sarco DN15 BCV43 pneumatically actuated control valve having flanged ASME 300 connections.

Safety information, installation and maintenance

For full details see the Installation and Maintenance Instructions (IM-P403-103) supplied with the product.

Installation note: The blowdown control valve should preferably be installed with the actuator vertically above the pipework and the flow direction as indicated on the valve body. It can be fitted in other positions, but not upside down.

Disposal: This product is recyclable. No ecological hazard is anticipated with the disposal of the product, providing due care is taken.

Spare parts

The spare parts available are detailed below. No other parts are supplied as spares.

Please note that the spare parts available for the BCV blowdown control valve are the same for both the electrically and pneumatically actuated versions.

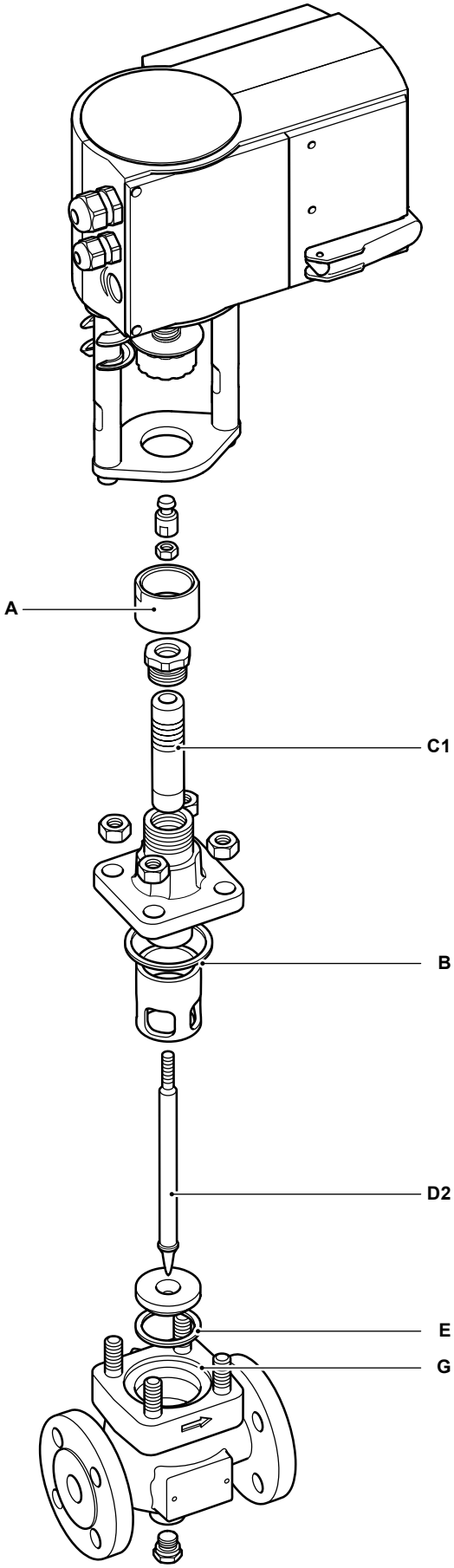
Available spares

Actuator clamping nut (Only for high pressure version)		**A**
Gasket set		**B, G**
Stem seal kits	Graphite packing	**C1**
Plug stem and seat kit	Linear trim (No gaskets supplied)	**D2, E**

How to order spares

Always order spares by using the description given in the column headed 'Available spares', and state the size and type of valve and specify clearly the full product description as found on the label of the blowdown control valve body, as this will ensure that the correct spare parts are supplied.

Example: 1 off Actuator clamping nut for a Spirax Sarco DN15 BCV43 blowdown control valve.



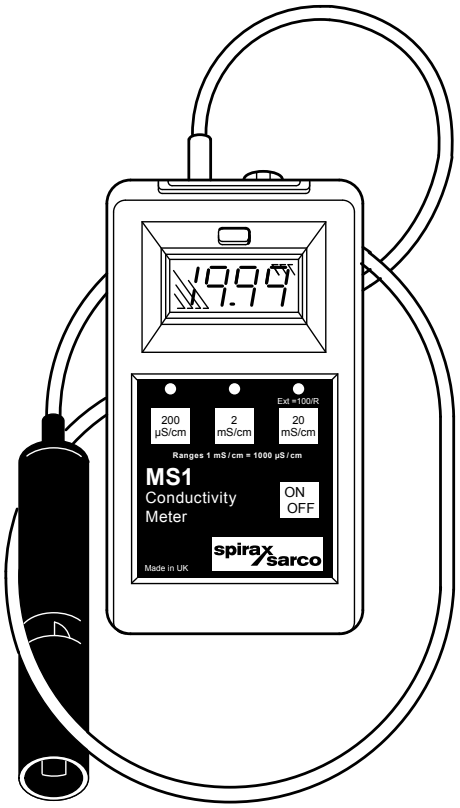
TI-P403-25
EMM Issue 6

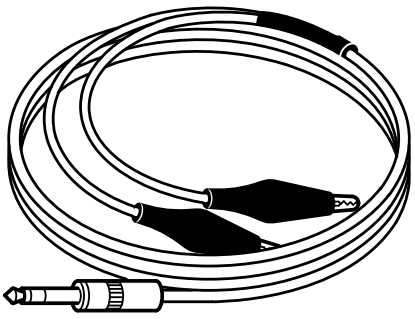
MS1
Conductivity Meter

Description

The Spirax Sarco MS1 is a battery powered conductivity meter designed for use with liquids. It is particularly suitable for measuring the conductivity of boiler water, feedwater, or condensate samples in order to estimate the level of Total Dissolved Solids, or TDS.
The instrument is fitted with a permanently wired carbon electrode sensor with integral temperature sensor.
A plug-in extension lead is also provided to allow ac resistance measurements to be made on installed conductivity probes in order to check their condition. Calibration to a master instrument or standard solution is possible using the adjustment screw on the side of the case. The instrument is supplied in a protective wallet.

Principal features:
- Automatic temperature compensation.
- Wide selectable range.
- Automatic switch-off.





Limiting conditions

Maximum recommended sensor operating temperature 45 °C (113 °F).

Specification

Ranges	0 to 1.999 µS/cm 0 to 19.99 µS/cm 0 to 199.9 µS/cm
Range indication	Decimal point and LED above selection key
Temperature compensation	Automatic, 2% / °C Reference temperature 25 °C (77 °F)
Resolution	0.1 µS / cm
Accuracy	±1.5% or ± 3 digits (whichever is greatest) at 25 °C (77 °F)
Calibration range	± 20%. 20 turns (approximately)
On/off	Auto-off timer
Sensor	PVC cell with carbon electrodes
Extension cable	Twin core. 3.5 mm jack plug and crocodile clips
Battery	PP3 or equivalent. A low battery warning indicator is fitted

Dimensions/weight (approximate) in mm (in) and grams (lb)

Instrument	80 x 147 x 39 (3.1 x 5.8 x 1.5)
Sensor	140 x 21 (5.5 x 0.8) diameter
Sensor cable	1000 (39)
Extension cable	1000 (39)
Weight	430 (1) with case

How to order : **Example:** 1 off Spirax Sarco MS1 conductivity meter.

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TI-P403-09
EMM Issue 14

SC20 Food+ and SCS20 Sample Coolers

Description

The Spirax Sarco SC20 sample cooler is used to cool samples of boiler water or steam. The cooler consists of a 316L stainless steel coil, through which the sample flows, and a 316L stainless steel body, through which cooling water flows and utilises a counter current flow to maximise cooler efficiency.

The unit is provided with integral pre-drilled mounting brackets to allow simple installation at point of use. The SC20 is also available with a clamp adaptor for connecting to an industry standard ½" sanitary clamp fitting.

SC20 Food+

Designed, manufactured and approved for Steam and Condensate applications. This product is intended to be connected into a system that can operate a food contact compliant process.

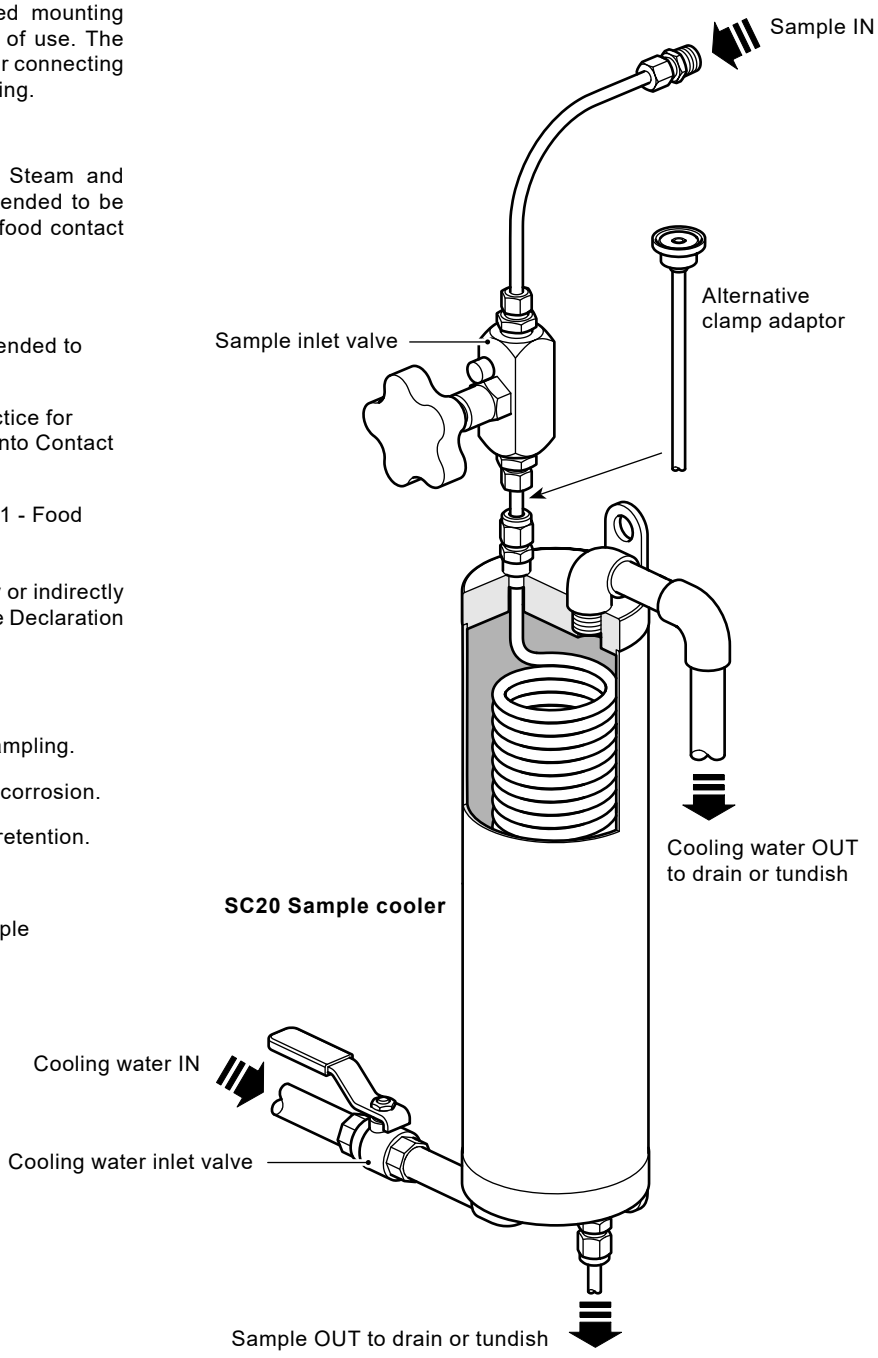
This product complies with:

- (EC)1935:2004 Materials and Articles Intended to come into Contact with Food
- (EC)2023:2006 Good Manufacturing Practice for Materials and Articles Intended to come into Contact with Food
- FDA Code of Federal Regulations - title 21 - Food and Drugs

A list of the materials that could come directly or indirectly into contact with foodstuffs can be found in the Declaration of Compliance available for this product.

Principal features:

- For boiler water, steam, or condensate sampling.
- Stainless steel body and coil to minimise corrosion.
- Self-draining design to eliminate sample retention.
- Counter current flow for efficient cooling.
- Integral mounting bracket to facilitate simple installation.



Available types

SC20 Food+ Range
BSP connections (6 mm (0.24") O/D tube).

NPT connections (6 mm (0.24") O/D tube). A ¼" NPT male x 6 mm (0.24") O/D stud coupling is supplied loose for connecting the sample inlet tube to an NPT inlet valve or fitting.

A sample cooler (BSP or NPT) with a clamp adaptor suitable for connection to an industry standard ½" ASME BPE compatible sanitary clamp fitting (clamp not supplied).

SCS20 Range
BSP sample cooler kit (SCS20), complete with sample inlet valve, cooling water inlet valve, and carbon steel fittings.

A kit (SCS20), as above, but with stainless steel fittings.

Note: **ONLY the SC20 product is available as EC1935:2004 compliant. The SCS20 systems are not.**

Note: The SC20 sample cooler is not polished or specially treated internally, and the internal finish of the coil is not specified.

Stainless steel couplings are also available separately:-
¼" BSP male x 6 mm (0.24") O/D tube.
¼" NPT male x 6 mm (0.24") O/D tube.

Certification
The SC20 Food+ can be supplied with the following certification if requested at the time of ordering:

- EN 10204 3.1 material certificates - Chargeable
- EC1935:2004 Declaration of Compliance - F.O.C.
- Declaration of Conformity BS EN ISO 14644-1:2015 Class 7 Clean Room - F.O.C.
- TSE-BSE Statement - F.O.C.
- FDA Code of Federal Regulations - title 21 - Food and Drugs - F.O.C

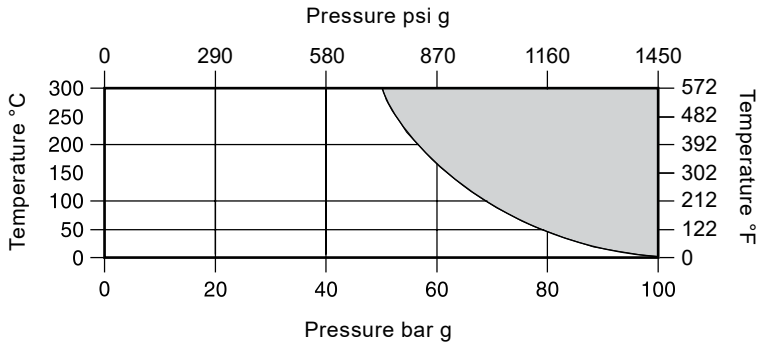
Sizes and pipe connections

Cooling water inlet and outlet connections	BSP T Rp (ISO 7-1) version	½" BSP
	NPT version	½" NPT
	Clamp adaptor versions	½" BSP or ½" NPT
Sample tube inlet and outlet connections	BSP T Rp (ISO 7-1) version	6 mm (0.24") O/D
	NPT version	6 mm (0.24") O/D*
	Clamp adaptor versions	6 mm (0.24") O/D with ½" ASME BPE compatible adaptor for clamp fitting

* A ¼" NPT male x 6 mm O/D stud coupling is provided.

Pressure/temperature limits

Coil



The product **must not** be used in this region.

Body

Maximum design pressure	10 bar g @ 100 °C (145 psi g @ 212 °F)
Maximum design temperature	100 °C @ 10 bar g (212 °F @ 145 psi g)
Designed for a maximum cold hydraulic test pressure of	16 bar g (282 psi g)

Note: The pressure/temperature limits for the clamp adaptor are dependant on the manufacturer's recommendations.

Materials

Coil	Stainless steel 316L (1.4404)
Body	

Performance

The tables below show typical sample outlet temperatures above cooling water inlet temperatures for several pressures and cooling water flowrates.

Example

A sample flowrate of 30 l/h is required from a boiler operating at 10 bar g (145 psi g).
For a cooling water flowrate of 0.3 l/s from Table 1 the sample outlet temperature would be 4 °C (39.2 °F) above the cooling water inlet temperature. If the cooling water is at 15 °C (59 °F), the sample temperature would be 19 °C (66.2 °F).
Table 2 is used in the same way for steam.
Samples may not be taken where marked '-' as the flow is limited by the sample inlet valve capacity.

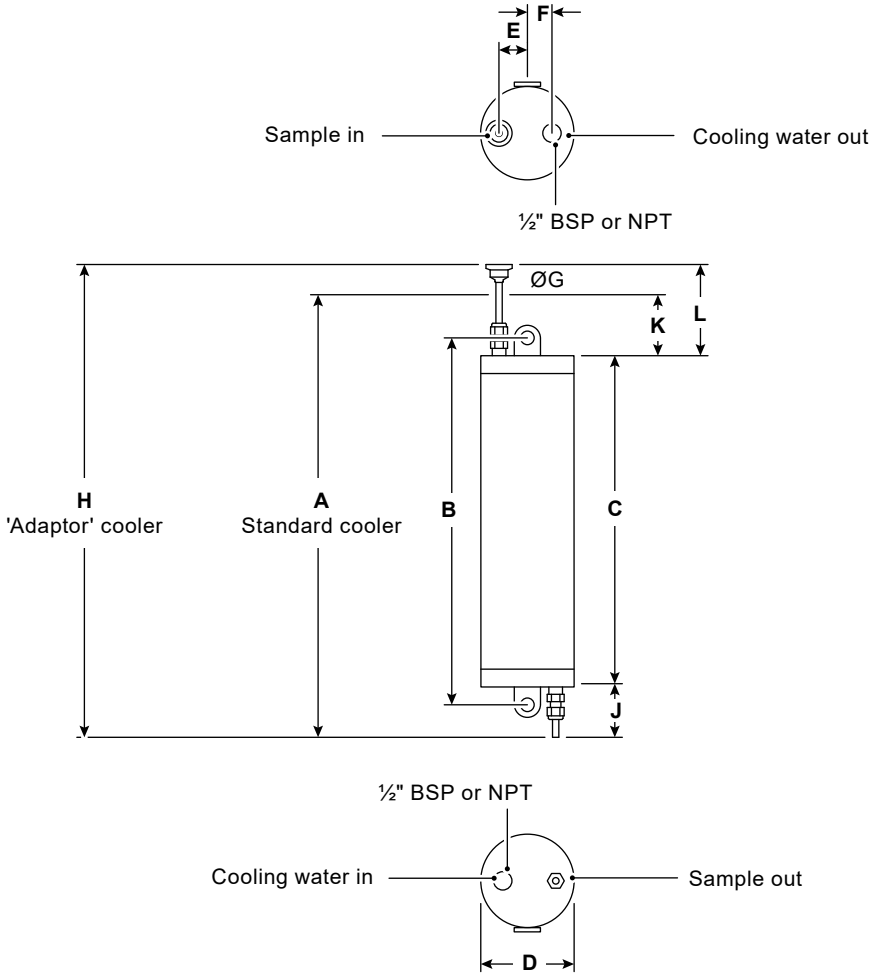
Table 1 Saturated water (e.g. boiler water)

Sample flowrate l/h (g/h)	Boiler pressure bar g (psi g)																			
	Cooling water flowrate 0.1 l/sec (0.02 g/sec)					Cooling water flowrate 0.3 l/sec (0.07 g/sec)					Cooling water flowrate 0.6 l/sec (0.15 g/sec)									
	1 (14.5)	3 (43.5)	7 (101.5)	10 (145)	20 (290)	1 (14.5)	3 (43.5)	7 (101.5)	10 (145)	20 (290)	1 (14.5)	3 (43.5)	7 (101.5)	10 (145)	20 (290)	1 (14.5)	3 (43.5)	7 (101.5)	10 (145)	20 (290)
10 (2.6)	1 °C (33.8 °F)	1 °C (33.8 °F	3 °C (37.4 °F)	6 °C (42.8 °F	6 °C (42.8 °F	0 °C (32 °F)	0 °C (32 °F)	1 °C (33.8 °F	1 °C (33.8 °F	4 °C (39.2 °F)	0 °C (32 °F)	0 °C (32 °F)	0 °C (32 °F)	0 °C (32 °F)	2 °C (35.6 °F)					
20 (5.2)	2 °C (35.6 °F)	2 °C (35.6 °F)	6 °C (42.8 °F	8 °C (46.4°F)	8 °C (46.4°F)	1 °C (33.8 °F	1 °C (33.8 °F	2 °C (35.6 °F)	2 °C (35.6 °F)	6 °C (42.8 °F	0 °C (32 °F)	0 °C (32 °F)	0 °C (32 °F)	1 °C (33.8 °F	4 °C (39.2 °F)					
30 (7.9)	5 °C (41 °F)	4 °C (39.2 °F)	8 °C (46.4°F)	11 °C (51.8 °F)	11 °C (51.8 °F)	3 °C (37.4 °F)	3 °C (37.4 °F)	4 °C (39.2 °F)	4 °C (39.2 °F)	8 °C (46.4°F)	0 °C (32 °F)	0 °C (32 °F)	2 °C (35.6 °F)	3 °C (37.4 °F)	6 °C (42.8 °F					
40 (10.5)	7 °C (44.6°F)	7 °C (44.6°F)	11 °C (51.8 °F)	13 °C (55.4 °F)	13 °C (55.4 °F)	5 °C (41 °F)	5 °C (41 °F)	6 °C (42.8 °F	6 °C (42.8 °F	10 °C (50 °F	1 °C (33.8 °F	1 °C (33.8 °F	2 °C (35.6 °F)	3 °C (37.4 °F)	8 °C (46.4°F)					
50 (13.2)	10 °C (50 °F	10 °C (50 °F	13 °C (55.4 °F)	15 °C (59 °F)	15 °C (59 °F)	6 °C (42.8 °F	6 °C (42.8 °F	8 °C (46.4°F)	8 °C (46.4°F)	12 °C (53.6 °F)	3 °C (37.4 °F)	3 °C (37.4 °F)	4 °C (39.2 °F)	5 °C (41 °F)	9 °C (48.2°F)					
60 (15.8)	14 °C (57.2 °F)	14 °C (57.2 °F)	16 °C (60.8 °F)	18 °C (64.4 °F)	18 °C (64.4 °F)	9 °C (48.2°F)	9 °C (48.2°F)	10 °C (50 °F	10 °C (50 °F	14 °C (57.2 °F)	4 °C (39.2 °F)	5 °C (41 °F)	5 °C (41 °F)	6 °C (42.8 °F	11 °C (51.8 °F)					
80 (21.3)	16 °C (60.8 °F)	18 °C (64.4 °F)	20 °C (68 °F)	22 °C (71.6 °F)	22 °C (71.6 °F)	11 °C (51.8 °F)	12 °C (53.6 °F)	13 °C (55.4 °F)	14 °C (57.2 °F)	18 °C (64.4 °F)	6 °C (42.8 °F	7 °C (44.6°F)	8 °C (46.4°F)	9 °C (48.2°F)	15 °C (59 °F)					
100 (26.4)	18 °C (64.4 °F)	20 °C (68 °F)	24 °C (75.2 °F)	26 °C (78.8 °F)	27 °C (80.6 °F)	15 °C (59 °F)	16 °C (60.8 °F)	16 °C (60.8 °F)	18 °C (64.4 °F)	22 °C (71.6 °F)	10 °C (50 °F	11 °C (51.8 °F)	12 °C (53.6 °F)	13 °C (55.4 °F)	18 °C (64.4 °F)					
120 (31.7)	22 °C (71.6 °F)	23 °C (73.4 °F)	29 °C (84.2 °F)	30 °C (86 °F)	31 °C (87.8 °F)	17 °C (62.6 °F)	18 °C (64.4 °F)	20 °C (68 °F)	23 °C (73.4 °F)	26 °C (78.8 °F)	11 °C (51.8 °F)	13 °C (55.4 °F)	15 °C (59 °F)	17 °C (62.6 °F)	22 °C (71.6 °F)					

Table 2 Saturated steam

Sample flowrate l/h (g/h)	Boiler pressure bar g (psi g)	Cooling water flowrate 0.1 l/sec (0.02 g/sec)						Cooling water flowrate 0.3 l/sec (0.07 g/sec)						Cooling water flowrate 0.6 l/sec (0.15 g/sec)					
		0.5 (7.25)	2 (29)	5 (72.5)	7 (101.5)	10 (145)	20 (290)	0.5 (7.25)	2 (29)	5 (72.5)	7 (101.5)	10 (145)	20 (290)	0.5 (7.25)	2 (29)	5 (72.5)	7 (101.5)	10 (145)	20 (290)
5 (1.3)		3 °C (37.4 °F)	3 °C (37.4 °F)	4 °C (39.2 °F)	4 °C (39.2 °F)	6 °C (42.8 °F	6 °C (42.8 °F	2 °C (35.6 °F)	2 °C (35.6 °F)	3 °C (37.4 °F)	3 °C (37.4 °F)	4 °C (39.2 °F)	4 °C (39.2 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	1 °C (33.8 °F)	2 °C (35.6 °F)	2 °C (35.6 °F)	2 °C (35.6 °F)
10 (2.6)			7 °C (44.6°F)	8 °C (46.4°F)	8 °C (46.4°F)	8 °C (46.4°F)	9 °C (48.2°F)		4 °C (39.2 °F)	4 °C (39.2 °F)	4 °C (39.2 °F)	4 °C (39.2 °F)	5 °C (41 °F)			1 °C (33.8 °F)	2 °C (35.6 °F)	2 °C (35.6 °F)	2 °C (35.6 °F)
15 (4.0)				9 °C (48.2°F)	10 °C (50 °F	10 °C (50 °F	11 °C (51.8 °F)			5 °C (41 °F)	6 °C (42.8 °F	6 °C (42.8 °F	7 °C (44.6°F)			2 °C (35.6 °F)	2 °C (35.6 °F)	3 °C (37.4 °F)	4 °C (39.2 °F)
20 (5.2)					12 °C (53.6 °F)	13 °C (55.4 °F)	14 °C (57.2 °F)				8 °C (46.4°F)	9 °C (48.2°F)	9 °C (48.2°F)				4 °C (39.2 °F)	5 °C (41 °F)	6 °C (42.8 °F
30 (7.9)						21 °C (69.8 °F)	21 °C (69.8 °F)					14 °C (57.2 °F)	14 °C (57.2 °F)					9 °C (48.2°F)	10 °C (50 °F
40 (10.5)							28 °C (82.4 °F)						20 °C (68 °F)						13 °C (55.4 °F)
50 (13.2)							35 °C (95 °F)						25 °C (77 °F)						17 °C (62.6 °F)
60 (15.8)							42 °C (107.6 °F)						30 °C (86 °F)						21 °C (69.8 °F)
70 (18.5)																			

Dimensions (approximate) in mm (inches)



A	B	C	D	E	F	G	H	J	K	L
410 (16.1)	350 (13.8)	316 (12.4)	90 (3.5)	27 (1.0)	23.5 (0.9)	13 (0.5)	450 (17.7)	47 (1.85)	47 (1.85)	87 (3.42)

Weights (approximate) in kg (lbs)

Cooler	3.6 kg (7.9 lbs)
SCS20 system	4.7 kg (10.4 lbs)

How to order

Example:
1 off Spirax Sarco SC20 sample cooler having BSP T Rp (ISO 7-1) connections.

Spare parts

The spare parts available are listed below.
No other parts are supplied as spares.

Available spares

Component	Stock number
Sample inlet valve BSP T Rp (ISO 7-1)	4037900
Sample inlet valve NPT	4037990
Stud coupling carbon steel BSP T Rp (ISO 7-1)	0962373
Stud coupling stainless steel BSP T Rp (ISO 7-1)	0963243
Stud coupling ¼" NPT male x 6 mm stainless steel (for connecting SC20 to an NPT valve or fitting)	0963209

TI-P405-47
EMM Issue 3

KBV21i and KBV40i
Key Operated Boiler Blowdown Valves

Description

The key operated boiler blowdown valve consists of a carbon steel reduced bore ball valve with carbon reinforced PTFE seats and a key operated mechanism in stainless steel. Two types of key are sold as optional extras and are available as follows:

- **Standard length key**.
- **Extended length 'T' bar type key** for use where access to the valve is limited.

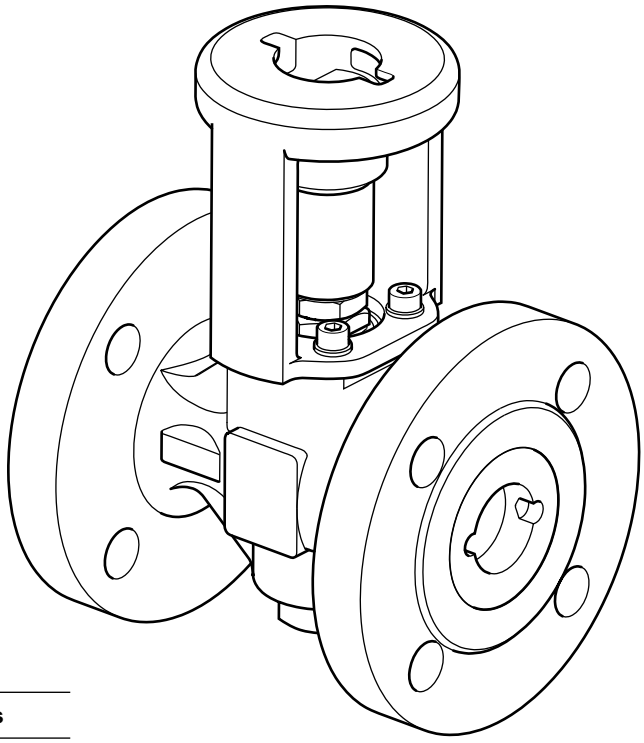
To ensure compliance with boiler regulations the key cannot be removed when the valve is open.
Note: The standard length key and extended length 'T' bar type key are sold separately. It is recommended that an extended length 'T' bar type key is purchased for valve sizes DN50 and DN65 (2" - 2½").

Standards

These products comply with the requirements of the European Pressure Equipment Directive 2014/68/EU and carries the CE mark when so required.
ISO mounting in accordance with ISO 5211.
Antistatic device complying with ISO 7121 and BS 5351.

Certification

These products are available with certifiifcation to EN 10204 3.1.
Note: All certification / inspection requirements must be stated at the time of order placement.



Sizes and pipe connections

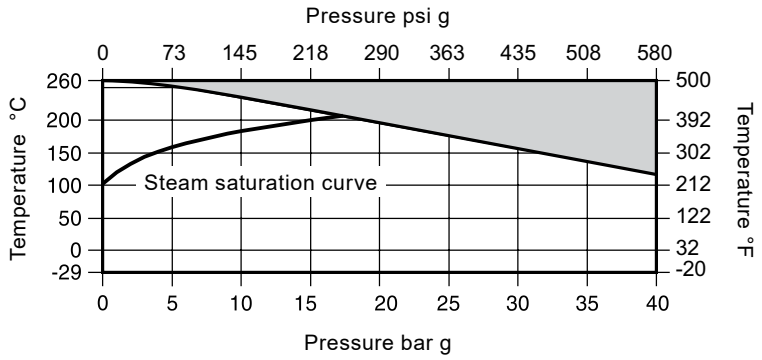
DN25, DN32, DN40, DN50 and DN65
(1", 1¼", 1½", 2" and 2½")
Flanged PN40 (F4), PN40 (BS) or ASME (ANSI) B 16.5 Class 300.

Available flange options:

Flange	Face-to-face	Flange thickness
PN40 (F4)	DIN 3002 F4	EN 1092 Part 1
PN40 (BS)	BS 2080	EN 1092 Part 1
ASME (ANSI) 300	ASME B 16.10	ASME B 16.5

Pressure / temperature limits

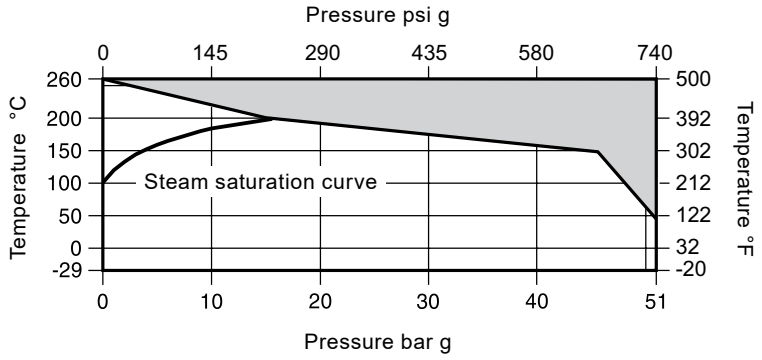
KBV21i



The product **must not** be used in this region

Body design conditions			PN40
PMA	Maximum allowable pressure	40 bar g @ 120 °C	580 psi g @ 248 °F
TMA	Maximum allowable temperature	260 °C @ 0 bar g	500 °F @ 0 psi g
Minimum allowable temperature		-29 °C	-20 °F
PMO	Maximum operating pressure for saturated steam service	17.25 bar g	250 psi g
TMO	Maximum operating temperature	260 °C @ 0 bar g	500 °F @ 0 psi g
Minimum operating temperature. **Note:** For lower operating temperatures consult Spirax Sarco		-29 °C	-20 °F
ΔPMX	Maximum differential pressure is limited to the PMO		
Designed for a maximum cold hydraulic test pressure of :		60 bar g	870 psi g

KBV40i



The product **must not** be used in this region

Body design conditions			ASME 300
PMA	Maximum allowable pressure	51 bar g @ 38 °C	740 psi g @ 100 °F
TMA	Maximum allowable temperature	260 °C @ 0 bar g	500 °F @ 0 psi g
Minimum allowable temperature		-29 °C	-20 °F
PMO	Maximum operating pressure for saturated steam service	17.25 bar g	250 psi g
TMO	Maximum operating temperature	260 °C @ 0 bar g	500 °F @ 0 psi g
Minimum operating temperature. **Note:** For lower operating temperatures consult Spirax Sarco		-29 °C	-20 °F
ΔPMX	Maximum differential pressure is limited to the PMO		
Designed for a maximum cold hydraulic test pressure of :		76.5 bar g	1110 psi g

Materials

Body and insert		Zinc plated carbon steel	ASTM A216 WCB
Stem seals		Antistatic R-PTFE	
Vented ball		Austenitic stainless steel	AISI 316
Stem	DN65 (2½")	Austenitic stainless steel	AISI 316
	DN25 - DN50 (1" - 2")	Martensitic stainless steel	AISI 420
Seats		Carbon and graphite reinforced PTFE	PDR 0.8

Valve coefficients

Size	**DN25 (1")**	**DN32 (1¼")**	**DN40 (1½")**	**DN50 (2")**	**DN65 (2½")**
Kv value	30	40	81	103	197

For conversion:
Cv (UK) = Kv x 0.963
Cv (US) = Kv x 1.156

How to specify

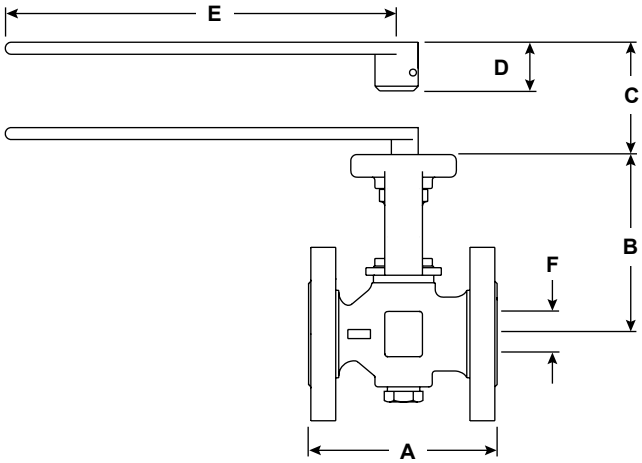
DN40 key operated boiler blowdown valve, flanged PN40 with carbon reinforced seats and stainless steel key.

How to order

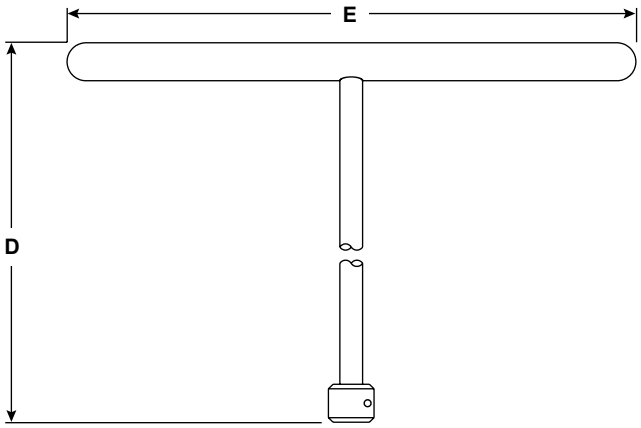
Example: 1 off Spirax Sarco DN40 KBV21i key operated boiler blowdown valve having PN40 (F4) flanged connections.

Dimensions/weights (approximate) in mm (in) and kg (lb)

Standard key



'T' bar key

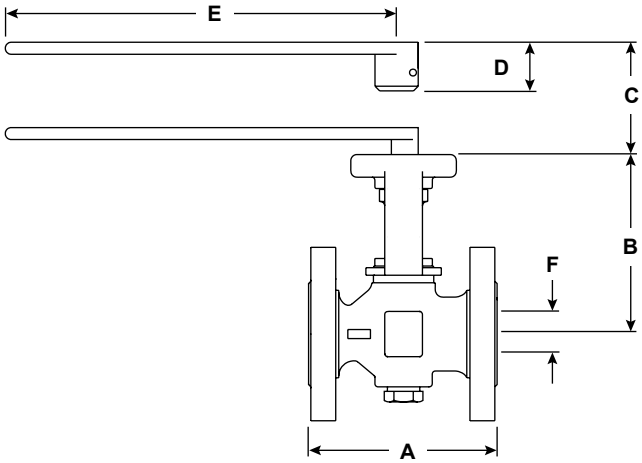


Valve size	Flange	A	B	C	D	E	F	Weight
DN25 (1")	PN40 (F4)	125 (4.9)	119 (4.7)	35 (1.4)			19 (0.75)	3.9 (8.6)
	PN40 BS	165 (6.5)	119 (4.7)	35 (1.4)			19 (0.75)	4.1 (9)
	Class 300	165 (6.5)	119 (4.7)	35 (1.4)			19 (0.75)	4.3 (9.5)
DN32 (1¼")	PN40 (F4)	130 (5.1)	130 (5.1)	35 (1.4)			25 (0.9)	5.3 (11.7)
	PN40 BS	178 (7)	130 (5.1)	35 (1.4)			25 (0.9)	5.7 (12.6)
	Class 300	178 (7)	130 (5.1)	35 (1.4)			25 (0.9)	5.5 (12.1)
DN40 (1½")	PN40 (F4)	140 (5.5)	131 (5.2)	35 (1.4)			30 (1.2)	6.7 (14.8)
	PN40 BS	190 (7.5)	131 (5.2)	35 (1.4)			30 (1.2)	7.1 (15.7)
	Class 300	190 (7.5)	131 (5.2)	35 (1.4)			30 (1.2)	8.0 (17.6)
Standard length key					32 (1.3)	258 (10.2)		0.4 (0.9)
Extended length 'T' bar key					500 (19.7)	375 (14.8)		0.9 (2)

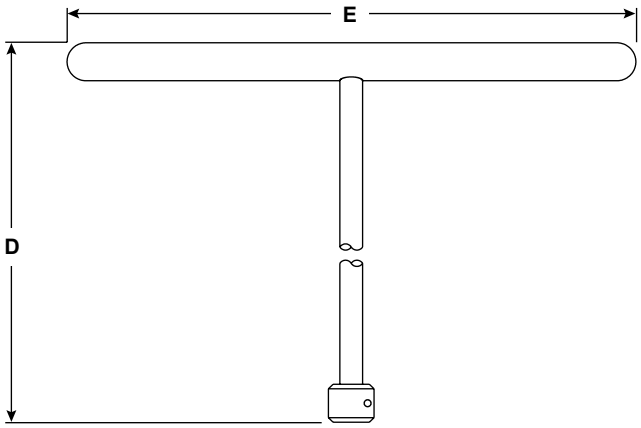
Dimensions/weights continued on next page

Dimensions/weights (approximate) in mm (in) and kg (lb) (continued)

Standard key



'T' bar key



Valve size	Flange	A	B	C	D	E	F	Weight
DN50 (2")	PN40 (F4)	150 (5.5)	139 (5.4)	35 (1.4)			37 (1.5)	9.0 (19.8)
	PN40 BS	216 (8.5)	139 (5.4)	35 (1.4)			37 (1.5)	9.9 (21.8)
	Class 300	216 (8.5)	139 (5.4)	35 (1.4)			37 (1.5)	10.1 (22.3)
DN65 (2½")	PN40 (F4)	170 (6.7)	140 (5.5)	35 (1.4)			50 (1.9)	12.4 (27.3)
	PN40 BS	241 (9.5)	140 (5.5)	35 (1.4)			50 (1.9)	13.9 (30.6)
	Class 300	241 (9.5)	140 (5.5)	35 (1.4)			50 (1.9)	15.0 (33.1)
Standard length key					32 (1.3)	258 (10.2)		0.4 (0.9)
Extended length 'T' bar key					500 (19.7)	375 (14.8)		0.9 (2)

Spare parts - DN25 to DN50 (1" to 2")

The spare parts available are shown in solid outline. Parts drawn in a grey line are not supplied as spares.
To ensure correct operation and maintain the warranty, use only Spirax Sarco original parts.
Before actioning any maintenance programme observe the 'Safety Information' in Section 1 of the Information and Maintenance Instructions IM-P405-48 supplied with the unit.

Available spares

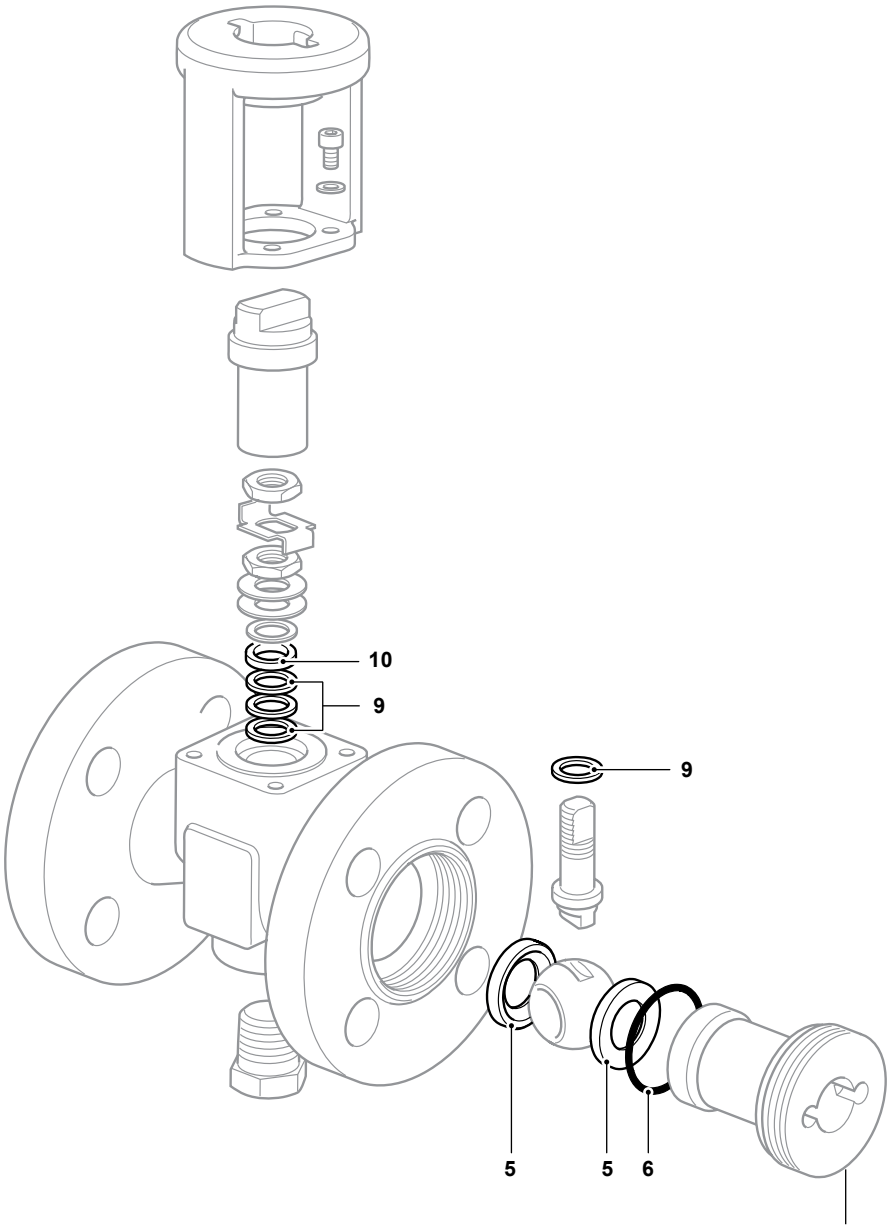
Seats, insert 'O' ring and stem seals	**5, 6, 9, 10**
Insert tool - Required to aid the removal of the ball valve insert (**2**)	**Not shown**

Please note: Spare parts are common for both the KBV21i and KBV40i.

Caution - The ball must be installed with the vent hole on the upstream side of the valve.

How to order spares

Always order spares by using the description given in the column headed 'Available spares' and state the size and type of ball valve.
Example: 1 set of seats, insert 'O' ring and stem seals for a Spirax Sarco DN50 KBV21i boiler blowdown valve.



Ball valve insert (**2**)
(not an available spare).
Please note: You will need to order the **Insert tool** listed in the table above to aid removal.

Spare parts - DN65 (2½")

The spare parts available are shown in solid outline. Parts drawn in a grey line are not supplied as spares.
To ensure correct operation and maintain the warranty, use only Spirax Sarco original parts.
Before actioning any maintenance programme observe the 'Safety Information' in Section 1 of the Information and Maintenance Instructions IM-P405-48 supplied with the unit.

Available spares

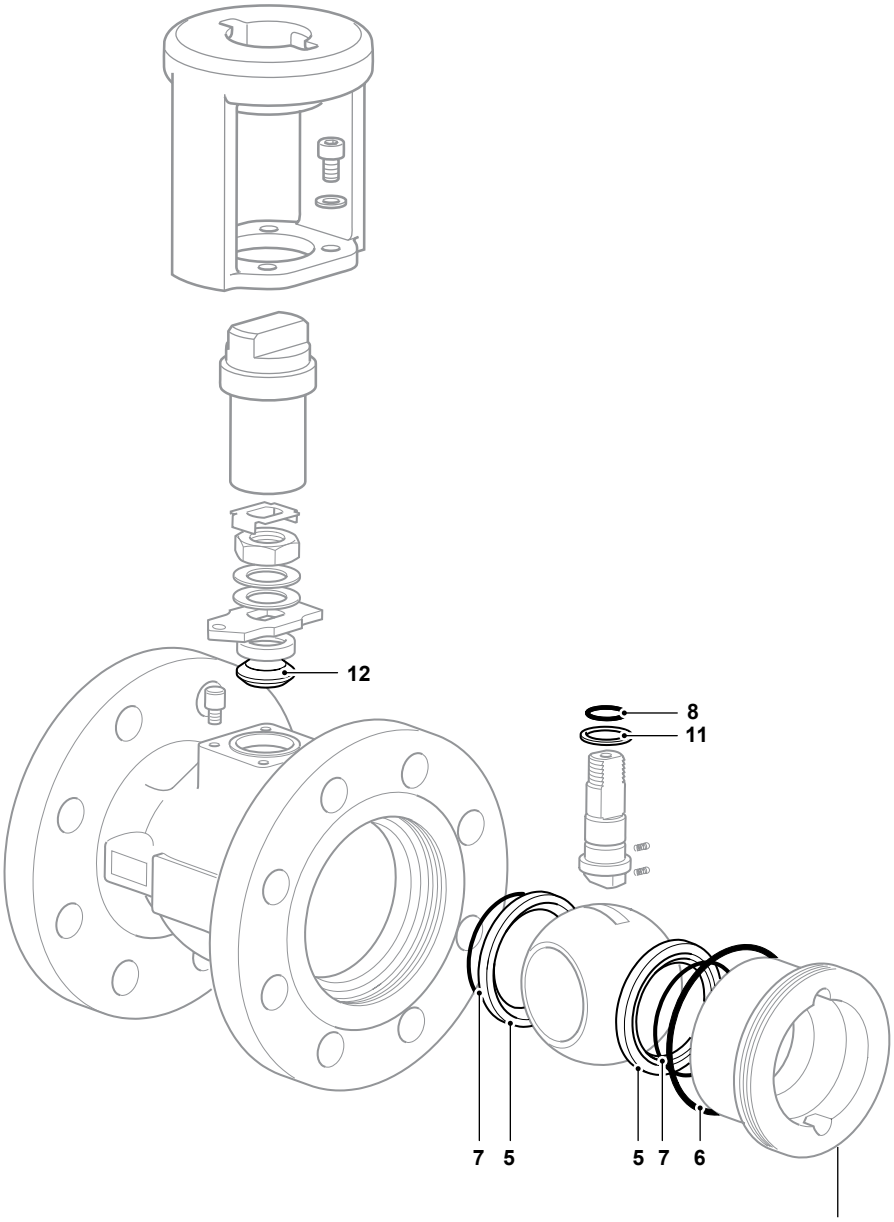
Seats, insert 'O' ring, seat 'O' ring, stem 'O' ring, lower stem seals and upper stem packing	**5, 6, 7, 8, 11, 12**
Insert tool - Required to aid the removal of the ball valve insert (**2**)	**Not shown**

Please note: Spare parts are common for both the KBV21i and KBV40i.

Caution - The ball must be installed with the vent hole on the upstream side of the valve.

How to order spares

Always order spares by using the description given in the column headed 'Available spares' and state the size and type of ball valve.
Example: 1 set of seats, insert 'O' ring, seat 'O' ring, stem 'O' ring, lower stem seals and upper stem packing for a Spirax Sarco DN65 KBV40i boiler blowdown valve.



Ball valve insert (**2**)
(not an available spare).
Please note: You will need to order the **Insert tool** listed in the table above to aid removal.

TI-P405-45
EMM Issue 4

ABV21i and ABV40i
Air Actuated Boiler Blowdown Valves

Description

The Spirax Sarco ABV21i and ABV40i one piece end entry, reduced bore ball valves are fitted with 90° rotary spring return pneumatic actuator, for boiler blowdown duties.

They are used in conjunction with a Spirax Sarco blowdown timer to provide timed control of bottom blowdown, ensuring that the recommended boiler blowdown cycles occur with minimum heat loss, avoiding duplication or omission.

The pneumatic actuator, (which can also be operated with other non-corrosive gases), moves through 90° to open the valve, and has a spring return fail-close operation.

A switch box is mounted on the actuator, and either or both microswitches may be wired to a Building Management System if required.
Note: The BT1050 blowdown timer uses one switch only to indicate 'valve fully closed' or 'valve not fully closed' positions, and does not indicate that the valve has opened fully.

A solenoid valve is required, which may be directly mounted to the NAMUR (VDI/VDE 3845) interface on the actuator.

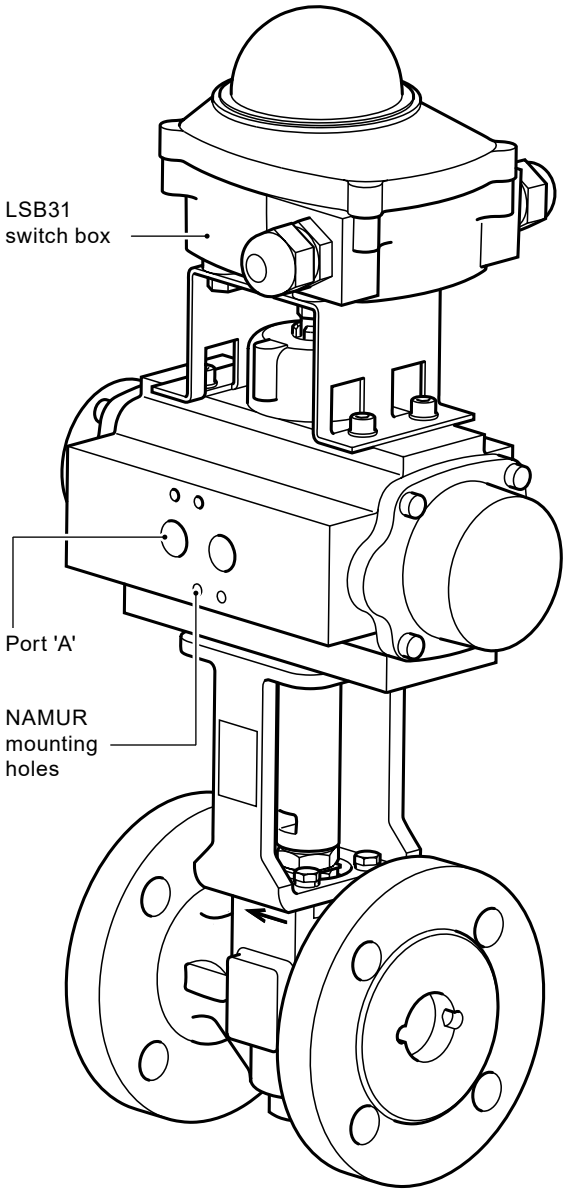
A suitable solenoid valve may be selected from the Spirax Sarco MV range. Alternatively, an air supply may be connected directly to the actuator port 'A' (¼" BSP), where it is necessary to install the solenoid valve remote from the actuator.

A standard ¼" BSP 3-way solenoid valve may also be used.

3-port/2-way NAMUR mounting solenoid types:

MV11 - 230 Vac, **MV12** - 110 Vac, **MV13** - 24 Vac, **MV14** - 24 Vdc

The ABV21i and ABV40i must be installed with the flow in the direction of the arrow on the body.



Principal features:

- Automatic timed blowdown minimises wasted heat.
- Suitable for boiler pressures up to 17.25 bar g (250 psi g).
- Spring return for fail-safe operation.
- Pneumatic actuator for fast response.

Standards

These products comply with the requirements of the European Pressure Equipment Directive 2014/68/EU and carries the CE mark when so required.
ISO mounting in accordance with ISO 5211.
Antistatic device complying with ISO 7121 and BS 5351.

Certification

These products are available with certififcation to EN 10204 3.1.
Note: All certification/inspection requirements must be stated at the time of order placement.

Sizes and pipe connections

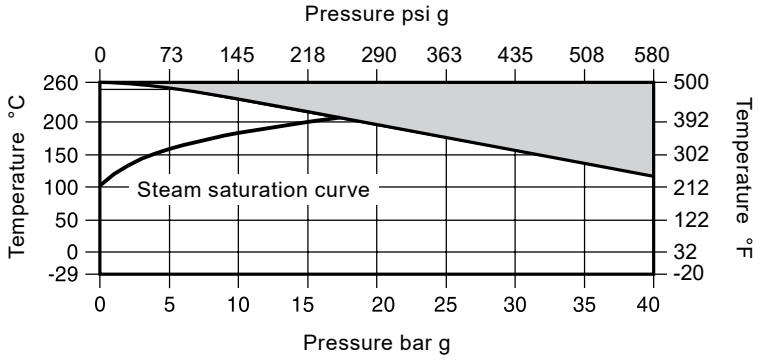
DN25, DN32, DN40, DN50 and DN65 (1", 1¼", 1½", 2" and 2½")
Flanged PN40 (F4), PN40 (BS) or ASME B 16.5 Class 300.

	Flange	Face-to-face	Flange thickness
Available flange options	PN40 (F4)	DIN 3002 F4	EN 1092 Part 1
	PN40 (BS)	BS 2080	EN 1092 Part 1
	ASME 300	ASME B 16.10	ASME B 16.5

Technical data

Operating time (full stroke)			0.25 - 0.6 seconds
Operating media			Clean compressed air Non-corrosive gas
Compressed air consumption @ 6 bar g (87 psi g)	DN25 (1")	BVA315S/14	0.0002 (N)m³/ stroke (0.0071 ft³/stroke)
	DN32 (1¼")	BVA320S/14	0.0006 (N)m³/ stroke (0.0212 ft³/stroke)
	DN40 (1½") DN50 (2")	BVA325S/14 actuator	0.0008 (N)m³/ stroke (0.0283 ft³/stroke)
	DN65 (2½")	BVA330S/14 actuator	0.0011 (N)m³/ stroke (0.0388 ft³/stroke)
LSB31 switch rating			10 A 250 Vac
Protection rating			IP67
Switch sensor			Mechanical 2 - SPDT

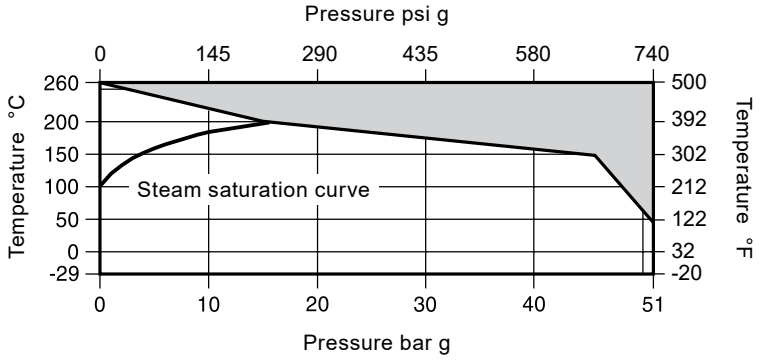
Pressure / temperature limits - ABV21i



The product **must not** be used in this region.

Valve		
Body design conditions		PN40
PMA Maximum allowable pressure	40 bar g @ 120 °C	580 psi g @ 248 °F
TMA Maximum allowable temperature	260 °C @ 0 bar g	400 °F @ 0 psi g
Minimum allowable temperature	-29 °C	-20 °F
PMO Maximum operating pressure for saturated steam service	17.25 bar g	250 psi g
TMO Maximum operating temperature	260 °C @ 0 bar g	400 °F @ 0 psi g
Minimum operating temperature (**Note:** For lower operating temperatures consult Spirax Sarco)	-29 °C	-20 °F
ΔPMX Maximum differential pressure is limited to the PMO		
Designed for a maximum cold hydraulic test pressure of:	60 bar g	870 psi g
Actuator		
Maximum ambient temperature	80 °C	176 °F
Minimum ambient temperature	0 °C	32 °F
Maximum air supply pressure	8 bar g	116 psi g
Minimum air supply pressure		Depends on operating conditions
MV series solenoid		
Maximum ambient temperature	50 °C	122 °F
Minimum ambient temperature	0 °C	32 °F

Pressure / temperature limits - ABV40i



The product **must not** be used in this region.

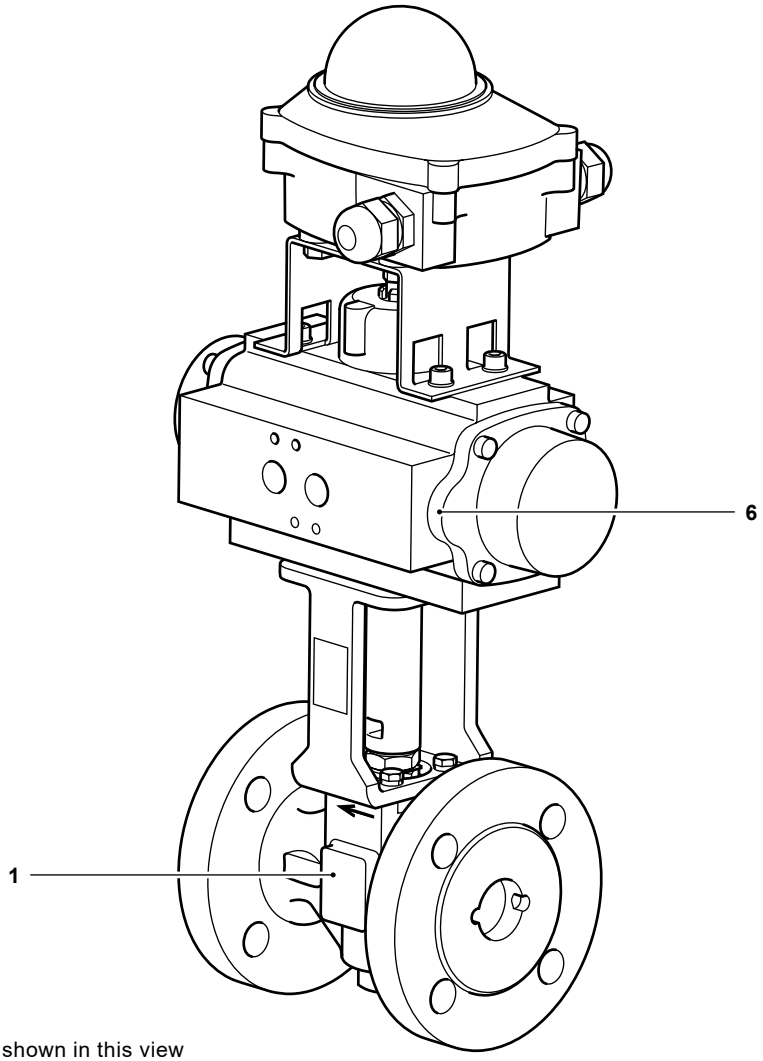
Valve		
Body design conditions		ASME 300
PMA Maximum allowable pressure	51 bar g @ 38 °C	740 psi g @ 100 °F
TMA Maximum allowable temperature	260 °C @ 0 bar g	400 °F @ 0 psi g
Minimum allowable temperature	-29 °C	-20 °F
PMO Maximum operating pressure for saturated steam service	17.25 bar g	250 psi g
TMO Maximum operating temperature	260 °C @ 0 bar g	400 °F @ 0 psi g
Minimum operating temperature (**Note:** For lower operating temperatures consult Spirax Sarco)	-29 °C	-20 °F
ΔPMX Maximum differential pressure is limited to the PMO		
Designed for a maximum cold hydraulic test pressure of:	76.5 bar g	1110 psi g
Actuator		
Maximum ambient temperature	80 °C	176 °F
Minimum ambient temperature	0 °C	32 °F
Maximum air supply pressure	8 bar g	116 psi g
Minimum air supply pressure		Depends on operating conditions
MV series solenoid		
Maximum ambient temperature	50 °C	122 °F
Minimum ambient temperature	0 °C	32 °F

Valve coefficients

Size	**DN25 (1")**	**DN32 (1¼")**	**DN40 (1½")**	**DN50 (2")**	**DN65 (2½")**
Kv value	30	40	81	103	197

For conversion:
Cv (UK) = Kv x 0.963
Cv (US) = Kv x 1.156

Materials



* Items not shown in this view

	No.	Part		Materials	
Valve	1	Body and insert		Zinc plated carbon steel	ASTM A216 WCB
	2 *	Stem seals		Antistatic R-PTFE	
	3 *	Vented ball		Austenitic stainless steel	AISI 316
	4 *	Stem	DN65 (2½")	Austenitic stainless steel	AISI 316
			DN25 - DN50 (1" - 2")	Martensitic stainless steel	AISI 420
	5 *	Seats		Carbon and graphite reinforced PTFE	PDR 0.8
Actuator	6	Body, piston and end caps		Aluminium - anodised	
	7 *	Pinion		Carbon steel - nickel plated	
	8 *	'O' ring seals		Nitrile rubber	

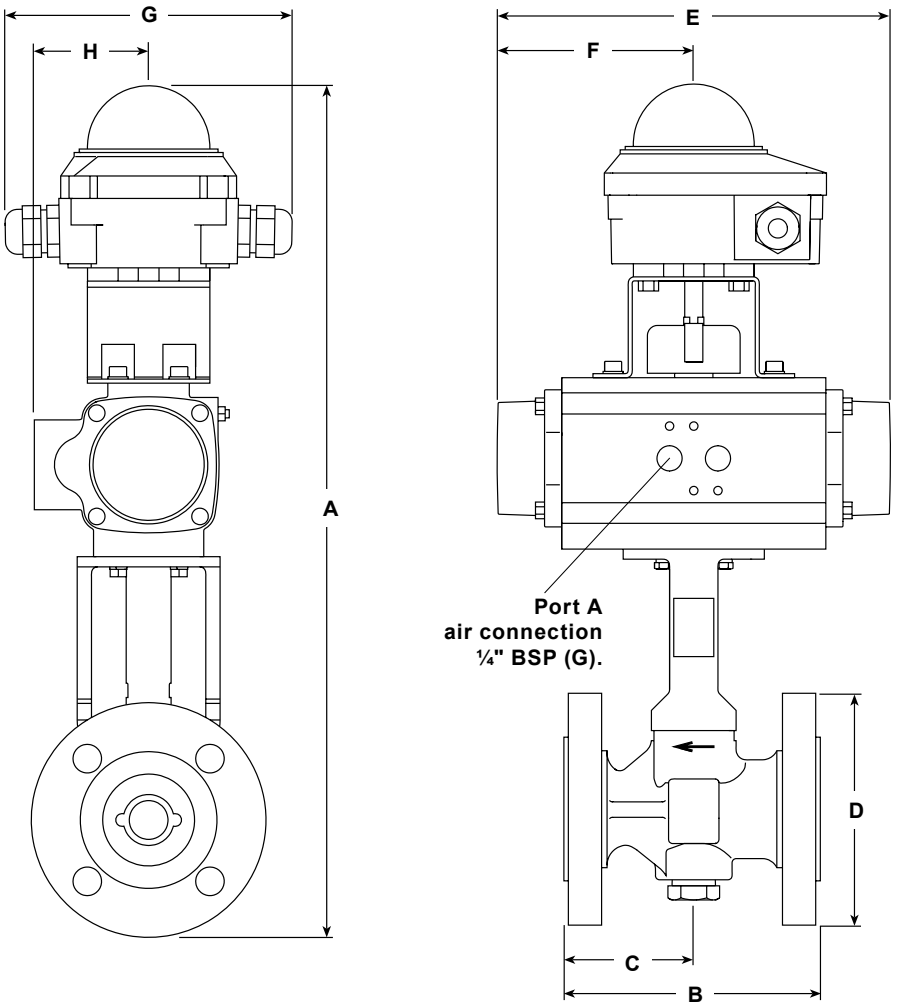
How to specify

Air actuated ball valve, DN40, PN40 with carbon reinforced seats, 90 degree rotary pneumatic actuator and switch box. NAMUR compatible solenoid valve 220 / 240 Vac.

How to order

Example: 1 off Spirax Sarco DN40 ABV21i air actuated boiler blowdown valve having PN40 (F4) flanged connections plus 1 off MV11 solenoid valve 220 / 240 Vac.

Dimensions/weights (approximate) in mm (in) and kg (lb)



Valve size	Actuator type	Flange	A	B	C	D	E	F	G	H	Weight
DN25 (1")	BVA315S/14	PN40 (F4)	417 (16.4)	125 (4.9)	63 (2.5)	115 (4.5)	196 (7.7)	98 (3.9)	140 (5.5)	56 (2.2)	6.7 (14.8)
		PN40 BS		165 (2.6)	103 (4.1)						6.5 (14.3)
		Class 300	421 (16.6)			124 (4.9)					6.8 (15)
DN32 (1¼")	BVA320S/14	PN40 (F4)	456 (18)	130 (5.1)	65 (2.6)	140 (5.5)	217 (8.5)	108.5 (4.3)		66 (2.6)	9.2 (20.3)
		PN40 BS		178 (7)	113 (4.4)	140 (5.5)					9.6 (21.2)
		Class 300	450 (17.7)		65 (2.6)	134 (5.3)					9.4 (20.7)
DN40 (1½")	BVA325S/14	PN40 (F4)	475 (18.7)	140 (5.5)	70 (2.8)	150 (5.9)	258 (10.2)	129 (5.1)		71 (2.8)	11.7 (26)
		PN40 BS		190 (7.5)	120 (4.7)	150 (5.9)					12.2 (26.9)
		Class 300	478 (18.8)			156 (6.1)					13.0 (28.7)
DN50 (2")	BVA325S/14	PN40 (F4)	488 (19.2)	150 (5.9)	75 (3)	165 (6.5)		129 (5.1)		71 (2.8)	14.1 (31)
		PN40 BS		216 (8.5)	141 (5.6)	165 (6.5)					15.0 (33)
		Class 300		216 (8.5)							15.1 (33.1)
DN65 (2½")	BVA330S/14	PN40 (F4)	530 (20.9)	170 (6.7)	91 (3.6)	185 (7.3)	299 (11.8)	149.5 (5.9)		78 (3.1)	20.7 (45.6)
		PN40 BS		241 (9.5)	162 (6.4)	185 (7.3)	299 (11.8)				22.2 (48.9)
		Class 300	533 (21)			191 (7.5)					23.3 (51.1)

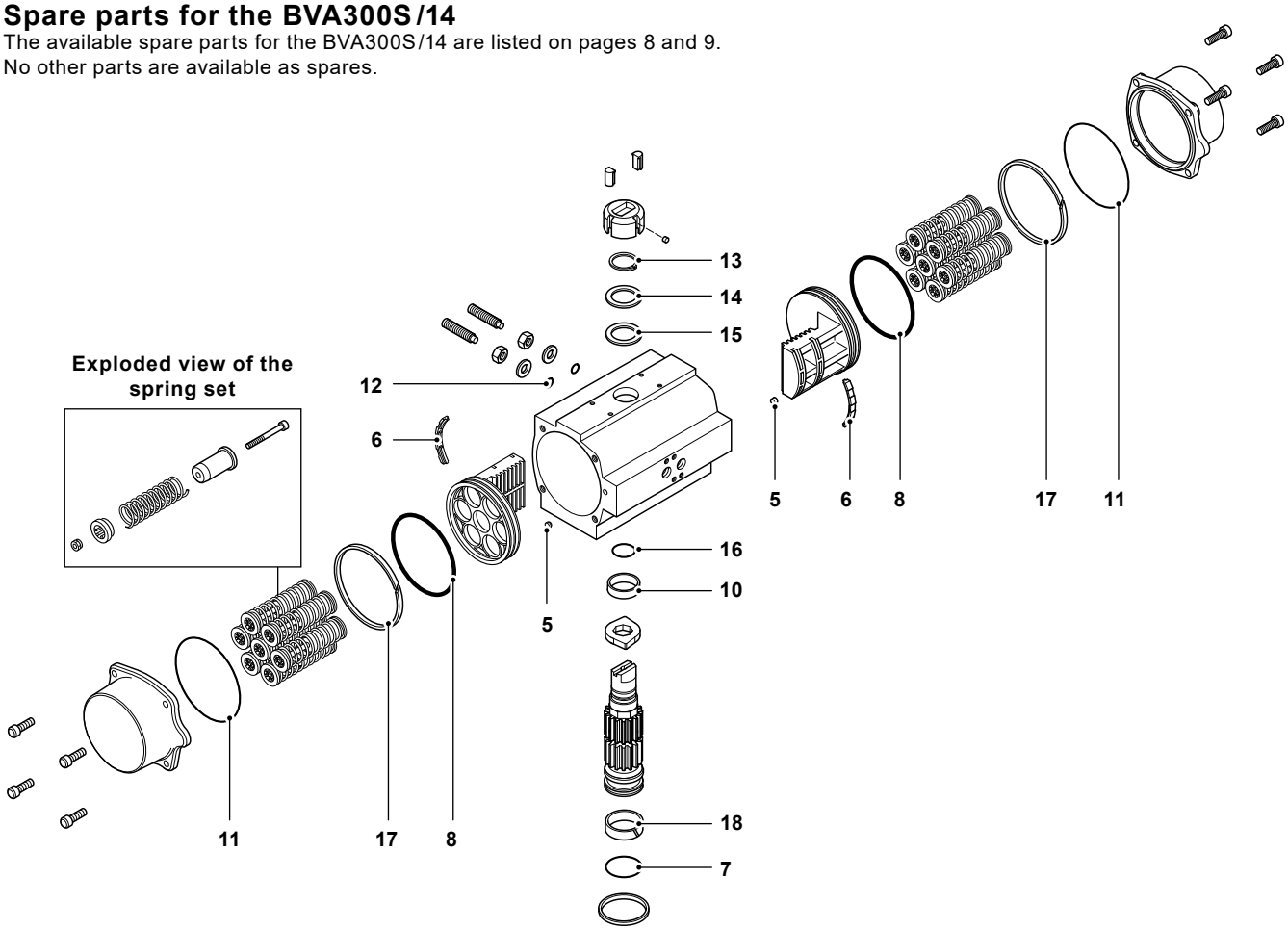
Spare parts

The spare parts available are detailed below. No other parts are available as spares.
Please note: There are no spares available for the switch box.
To ensure correct operation and maintain the warranty, use only Spirax Sarco original parts.
Before actioning any maintenance programme observe the 'Safety Information' in Section 1 of IM-P405-46 supplied with the unit.

Actuator

Spare parts for the BVA300S/14

The available spare parts for the BVA300S/14 are listed on pages 8 and 9.
No other parts are available as spares.



Spare parts

The spare parts available are detailed below. No other parts are supplied as spares.

Available spares		
BVA300 series maintenance kit	'O' rings set (NBR)	**7, 8, 11, 12, 16**
	Pinion washers	**13, 14, 15**
	Others	**5, 6, 10, 17, 18**

How to order spares

Always order spares by using the description given in the column headed 'Available spares' and state the nomenclature of the pneumatic actuator that they are intended for.
Note: all the spares mentioned above are sold together in one spare part kit.

Example: 1 - BVA300 series maintenance kit with 'O' rings in NBR for a Spirax Sarco BVA320S/14 pneumatic actuator.

Valve

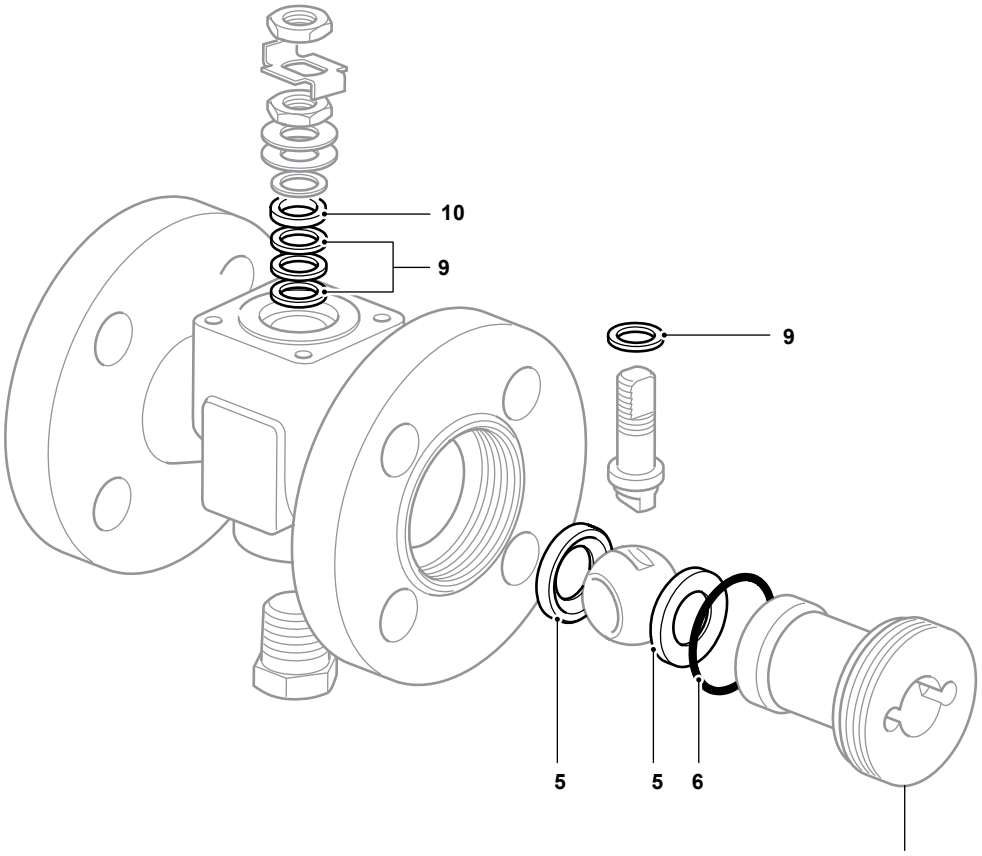
DN25 to DN50 (1" - 2") Spare parts

The spare parts available are shown in solid outline. Parts drawn in a grey line are not supplied as spares.

Available spares	
Seats, insert 'O' ring and stem seals	**5, 6, 9, 10**
Insert tool - Required to aid the removal of the ball valve insert (**2**)	**Not shown**

Please note: Spare parts are common for both the ABV21i and ABV40i.

Caution - The ball must be installed with the vent hole on the upstream side of the valve.



Ball valve insert (**2**)
(not an available spare).
Please note: You will need to order the **Insert tool** listed in the table above to aid removal.

How to order spares

Always order spares by using the description given in the column headed 'Available spares' and state the size and type of ball valve.
Example: 1 set of seats, insert 'O' ring and stem seals for a Spirax Sarco DN50 ABV21i boiler blowdown valve.

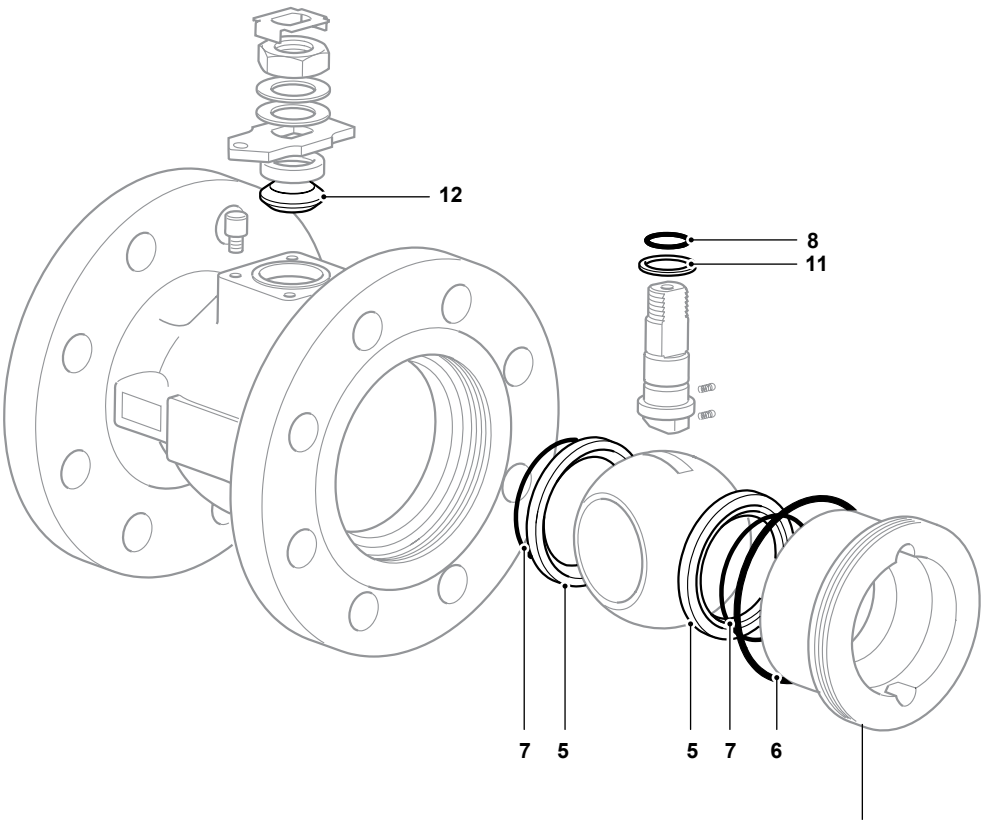
DN65 (2½") Spare parts

The spare parts available are shown in solid outline. Parts drawn in a grey line are not supplied as spares.

Available spares	
Seats, insert 'O' ring, seat 'O' ring, stem 'O' ring, lower stem seals and upper stem packing	**5, 6, 7, 8, 11, 12**
Insert tool - Required to aid the removal of the ball valve insert (**2**)	**Not shown**

Please note: Spare parts are common for both the ABV21i and ABV40i.

Caution - The ball must be installed with the vent hole on the upstream side of the valve.



Ball valve insert (**2**)
(not an available spare).

Please note: You will need to order the **Insert tool** listed in the table above to aid removal.

How to order spares

Always order spares by using the description given in the column headed 'Available spares' and state the size and type of ball valve.
Example: 1 set of seats, insert 'O' ring, seat 'O' ring, stem 'O' ring, lower stem seals and upper stem packing for a Spirax Sarco DN50 ABV40i boiler blowdown valve.

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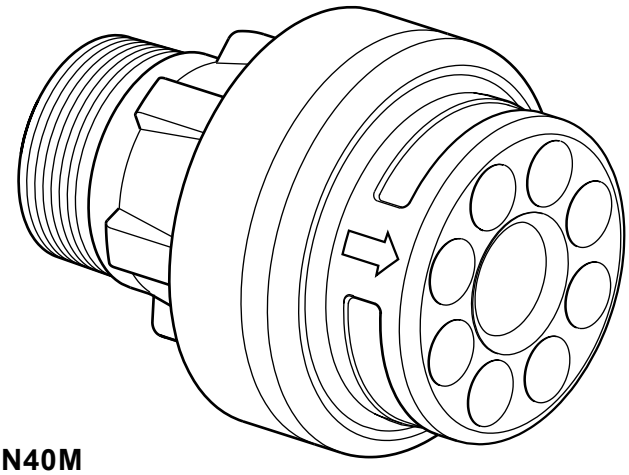
IN15, IN25M and IN40M Steam Injectors

Description

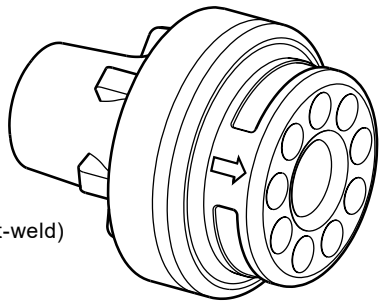
Spirax Sarco steam injectors use steam to raise the temperature of water or other liquids. They work by using a jet of steam to draw in the liquid through radial ports, mix it, and distribute the heated liquid throughout the tank or vessel. The circulation induced by the injector ensures thorough mixing and avoids temperature stratification. Three sizes of injector are available to suit a wide range of flowrates.
The smallest, the IN15, has a male and female thread for direct mounting to a tank wall from the outside, or to pipework within the tank. The IN25M and IN40M are available with either male thread or butt-weld connection and are fitted to pipework in the tank, or to a tank wall connection.
For higher capacities, two or more injectors may be mounted in parallel.

Principal features:

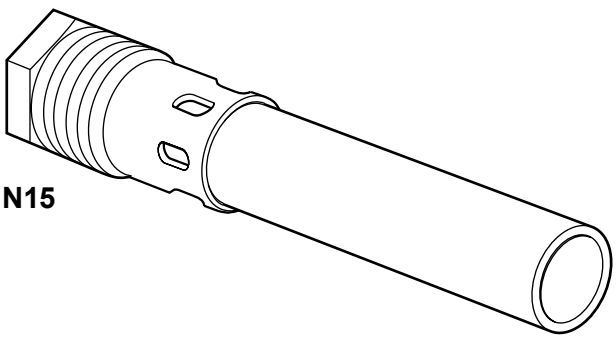
- All stainless steel.
- Ideal for boiler feedtank heating and de-aeration.
- For efficient steam heating of water and other fluids.
- Heats, mixes and circulates - no moving parts.
- Compact design - minimises noise and vibration.



IN40M
(available screwed or butt-weld)



IN25M
(available screwed or butt-weld)



IN15

Pressure/temperature limits

Body design rating	PN25
Minimum operating pressure	0.5 bar g (7.3 psi g)
Maximum saturated steam condition	17 bar g @ 207 °C (247 psi g @ 405 F)
Maximum heated liquid temperature (tank/vessel vented to atmosphere)	90 °C (194 °F)

Materials

Austenitic stainless steel ASTM A351 CF3M.

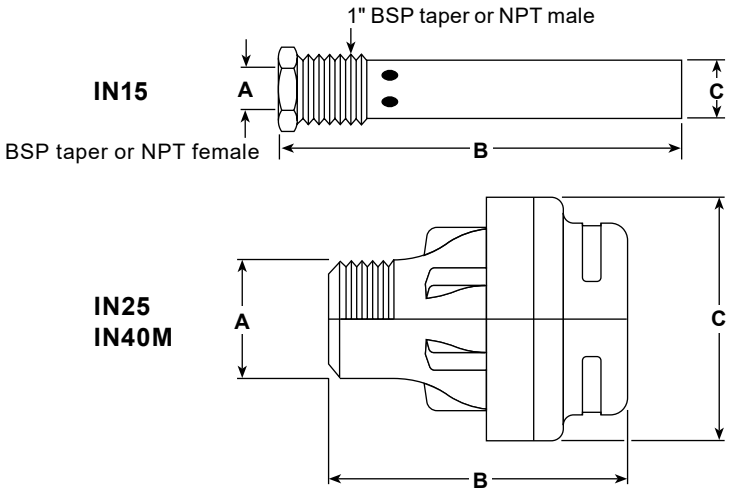
Available types

The IN15 is supplied with a ½" female and 1" male thread, available in BSPT or NPT.

Options for the larger injectors are shown below:

	IN25M	IN40M
BSPT male	1"	1½"
NPT male	1"	1½"
Butt-weld	1" Schedule 80	1½" Schedule 80

Dimensions/weights (approximate) in mm (inches) and kg (lbs)



Type	A	B		C		Weight	
IN15	½"	205	(8.1")	28	(1.1")	0.4	(0.88)
IN25M	1"	84	(3.3")	71	(2.8")	0.8	(1.8)
IN40M	1½"	115	(4.5")	88	(3.5")	1.6	(3.5)

How to order

Example: 1 off Spirax Sarco IN25M steam injector having a 1" BSPT screwed connection.

Safety information, installation and maintenance

This document does not contain sufficient information to install the product safely. See the Installation and Maintenance Instructions supplied with the product.

Important

Your attention is drawn to Safety Information Leaflet IM-GCM-10.

Installation note

The injectors are installed at a low level in a tank, ideally along the centre line, and discharging horizontally along the length. Pipework may be routed inside or outside the tank. In all cases, steam supply pipework must be firmly anchored to prevent vibration and stress in the tank wall. We recommend the use of a suitable thread locking compound on all threaded connections.

Use the same size pipe as the injector, i.e. 25 mm (1") pipe for IN25M.

Pipe sizes for multiple injector installations are as follows:-

No. of injectors	Type	Minimum pipe size
2	IN15	20 mm (0.79")
2	IN40M	65 mm (2.6")
3	IN40M	80 mm (3.1")

Allow a minimum of 150 mm (5.9") between the injector(s) and the sides and bottom of the tank, and as much as possible between the injector outlet and the end of the tank.

See the IMI for the minimum limits. Space multiple injectors equally across the tank width.

Capacity - selecting a steam injector

The choice of steam injector depends on the flowrate of steam required to heat the liquid. The table below shows steam injector capacities in kg/h (lb/h) of injected steam when heating tanks are vented to atmosphere, and are up to 3 metres (9.8 feet) deep. The choice of control valve can affect the steam capacity.

For higher capacities use two or more injectors in parallel.

Injector type		IN15		IN25M		IN40M	
System pressure bar g (psi g)		Saturated steam capacity kg/h (lbs)					
0.5	**(7.3)**	11	(24)	75	(165)	222	(489)
1	**(14.5)**	20	(44)	135	(298)	400	(882)
2	**(29)**	48	(106)	175	(386)	580	(1279)
3	**(43.5)**	66	(146)	280	(617)	805	(1775)
4	**(58)**	84	(185)	350	(772)	970	(2138)
5	**(72.5)**	102	(225)	410	(904)	1125	(2480)
6	**(87)**	120	(265)	500	(1102)	1295	(2855)
7	**(102)**	138	(304)	580	(1279)	1445	(3186)
8	**(116)**	156	(344)	640	(1411)	1620	(3571)
9	**(131)**	174	(384)	700	(1543)	1820	(4012)
10	**(145)**	192	(423)	765	(1687)	1950	(4299)
11	**(160)**	210	(463)	830	(1830)	2250	(4960)
12	**(174)**	228	(503)	900	(1984)	2370	(5225)
13	**(189)**	246	(542)	975	(2150)	2595	(5721)
14	**(203)**	264	(582)	1045	(2304)	2710	(5975)
15	**(218)**	282	(622)	1095	(2414)	2815	(6206)
16	**(232)**	300	(661)	1170	(2579)	3065	(6757)
17	**(247)**	318	(701)	1225	(2701)	3200	(7055)

System examples

The tables below give steam capacities for some typical injector/valve/controller combinations for tanks vented to atmospheric pressure. Intermediate values may be obtained by linear interpolation.
For alternatives or special applications refer to specific Spirax Sarco literature or contact our sales engineers.
The tables below are examples only, and the valve/controller combinations shown may not be available in all markets.
Note: Steam pressure at the injector will be much reduced and proper injection and mixing may not occur if a smaller valve (or larger injector) is fitted.

Self-acting control system examples

Injector type	**IN15**		**IN25M**	**IN40M**		
Number off	1	2	1	1	2	3
Valve type/size	BX6 DN15 (½")	SB DN15 (½")	SB DN20 (¾")	KB51 DN25 (1")	KC51 DN40 (1½")	KC51 DN50 (2")
Valve Kv	1.65	2.58	3.81	9.8	16.48	34.0
Controller type	Self-acting control with 2 m (6.6 ft) capillary Range 1. -20 °C to 110 °C (-4 F to 230 F)			Self-acting control with 2 m (6.6 ft) capillary Range 2. 40 °C to 105 °C (104 F to 221 F)		
Steam supply pressure bar g (psi g)	**System saturated steam capacity kg/h (lb/h)**					
2 (29)	47 (104)	82 (181)	110 (243)	350 (772)	580	1150 (2540)
4 (58)	78 (172)	140 (309)	200 (441)	550 (1213)	1000 (2205)	1750 (3858)
6 (87)	109 (240)	195 (430)	280 (617)	750 (1653)	1400 (3086)	2525 (5567)
8 (116)	142 (313)	236 (520)	360 (794)	1000 (2205)	1750 (3858)	3200 (7055)
10 (145)	171 (377)	310 (683)	450 (992)	1200 (2646)	2075 (4575)	3800 (8378)
12 (174)	201 (443)	365 (805)			2500 (5512)	4500 (9921)
13 (189)	218 (481)	393 (866)			2675 (5897)	5000 (11023)

Electric or pneumatic control system examples

Injector type	IN15		IN25	IN40M		
Number off	1	2	1	1	2	3
Valve type/ size	KE71/KE73 DN15 (½")	KE71/KE73 DN15 (½")	KE71/KE73 DN15 (½")	KE71/KE73 DN25 (1")	KE71/KE73 DN32 (1¼")	KE71/KE73 DN50 (2")
Valve Kv	1.6	4	4	10	16	36
Steam supply pressure bar g (psi g)	**System saturated steam capacity kg/h**					
2 (29)	47 (104)	96 (212)	110 (243)	350 (772)	580	1150 (2540)
4 (58)	78 (172)	168 (370)	200 (441)	550 (1213)	1100 (2425)	1750 (3858)
6 (87)	109 (240)	240 (529)	280 (617)	750 (1653)	1400 (3086)	2525 (5567)
8 (116)	142 (313)	312 (688)	360 (794)	1000 (2205)	1750 (3858)	*
10 (145)	171 (377)	384 (847)	450 (992)	1200 (2646)	2075 (4575)	*
12 (174)	201 (443)	456 (1005)	650 (1433)	1650 (3638)	*	*
13 (189)	218 (481)	492 (1085)	750 (1653)	1750 (3858)	*	*

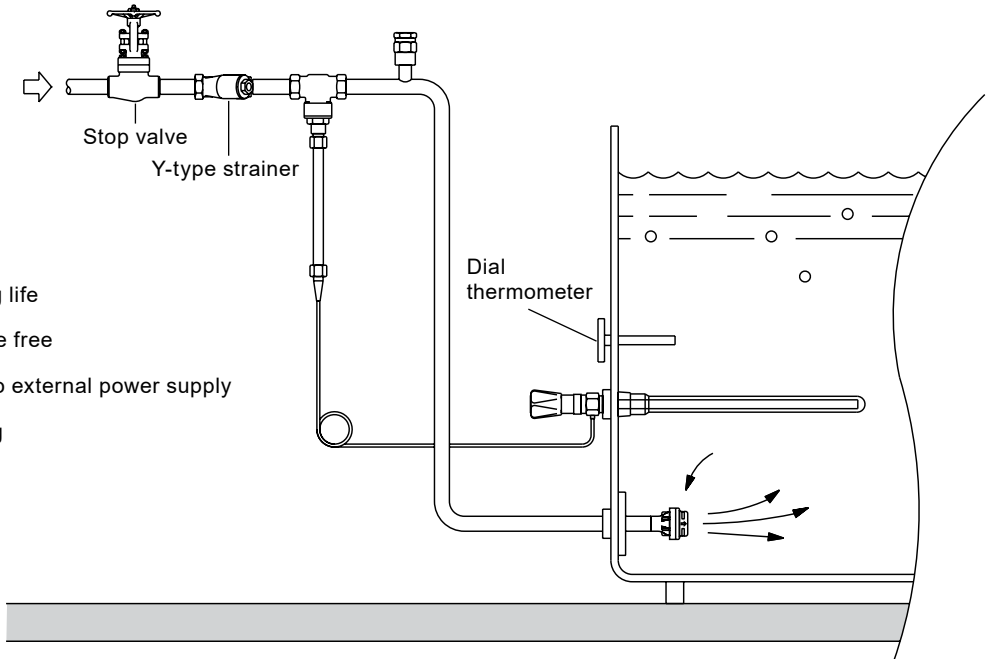
The information given in the tables is empirical and must not be used for critical applications. Use PN5123 or EL5601 actuator, EP5 positioner (PN), SX65 controller (available with mA output for PN actuator, or VMD output for EL actuator), EL2270 sensor or pocket, and MP2 regulator.

*** Consult your local Spirax Sarco sales engineer for information.**

TI-P401-03
AB Issue 5

INS
Direct Steam Injection Heating Systems

A complete system for boiler feedtank, hot water storage and other industrial process heating requirements.



Principal features:

- Stainless steel injector for long life
- No moving parts - maintenance free
- Self-acting system requiring no external power supply
- Efficient and economic heating

Description

Spirax Sarco INS direct steam injection heating systems are designed to inject steam into tanks of water or process liquor to ensure quiet and efficient heating of the tank contents. The injector draws in cold liquid, mixes it with the steam within the injector nozzle and distributes the hot liquid throughout the tank. In many applications the circulation induced by the injector is an advantage ensuring thorough mixing and avoiding temperature stratification.

Available system types

INS15, INS20, INS25, INS40, INS50, INS65 and INS80, screwed BSP (BS 21 parallel) or NPT.
The injectors are for horizontal installation.
The selection of a system depends on the flowrate of steam required to heat the tank contents and the steam supply pressure to the control valve.

Boiler feedtank applications

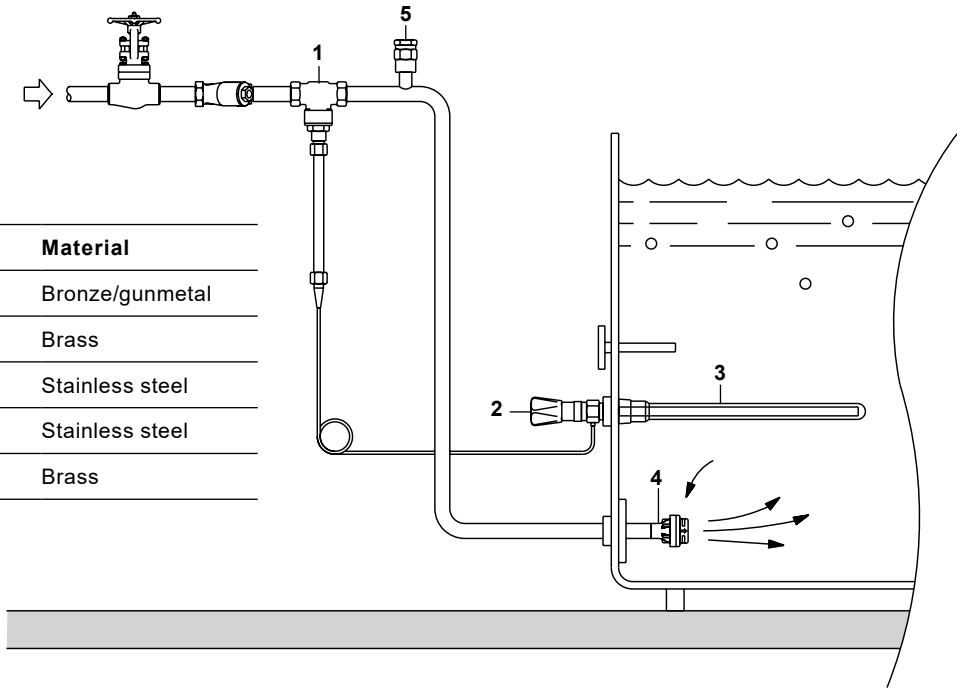
Oxygen must be removed from boiler water if corrosion is to be prevented. Oxygen can be removed in two ways, either by the use of oxygen scavenging chemicals or by thermal de-aeration.

The dissolved oxygen content of water:

- At 20 °C is 9 ppm
- At 60 °C is 5 ppm
- At 90 °C is just under 2 ppm.

By heating the boiler feedwater typically to 85 - 90 °C to remove most of the oxygen, and using oxygen scavenging chemicals in the feedline after the tank, the use of chemicals can be reduced by up to 75%. Additionally, boiler efficiency may be increased since blowdown requirements may be lowered. The fitting of a dial thermometer on the tank is recommended and is available from Spirax Sarco.

System components



No.	Part	Material
1	Control valve	Bronze/gunmetal
2	Controller and sensor	Brass
3	Sensor pocket	Stainless steel
4	Horizontal injector	Stainless steel
5	Vacuum breaker	Brass

Capacities

System capacities in kg/h of injected steam when heating tanks vented to atmospheric pressure.

System type		INS15	INS20	INS25	INS40	INS50	INS65	INS80
Control valve Size		½" BSP	¾" BSP	1" BSP	1½" BSP	2" BSP	2½" BSP	3" BSP
Steam supply pressure		Capacities in kg/h of saturated steam						
bar g	psi g							
2	29	87	110	350	580	1 150	2 500	3 700
3	44	120	160	425	750	1 400	3 350	4 900
4	58	150	200	550	1 000	1 750	4 200	6 000
5	73	180	240	650	1 150	2 100	5 000	7 200
6	87	215	280	750	1 400	2 525	5 800	8 400
6.9	100	237	316	840	1 535	2 800	6 500	9 450
7	102	240	320	850	1 550	2 950	6 600	9 550
8	116	275	360	1 000	1 750	3 200	7 400	10 700
8.2	118	278	370	1 020	1 780	3 280	7 550	10 950
9	131	290	410	1 100	1 900	3 600	8 200	11 850
10	145	315	450	1 200	2 075	3 800	9 000	13 000
10.3	150	325	460	1 230	2 135	3 920	-	-
11	160	350	-	-	2 275	4 200	-	-
12	174	375	-	-	2 500	4 500	-	-
13	189	400	-	-	2 675	5 000	-	-

Where steam supply pressures are higher consider the use of a pressure reducing valve or alternatively, the use of a combined pressure reducing and temperature control valve. Please consult Spirax Sarco for a suitable type.

Equipment details

Note: All equipment is available screwed BSP. For options of NPT or API connections refer to relevant literature.

System type	Control valve*		Controller type	Range	Sensor pocket	Steam injector	Vacuum breaker
INS15	SB	½"	SA128 with 2 m capillary	Range 1 -20 to 110 °C	Stainless steel - 1" to suit SA128	1 x IN25M - 1"	VB14 - ½"
INS20	SB	¾"	SA128 with 2 m capillary	Range 1 -20 to 110 °C	Stainless steel - 1" to suit SA128	1 x IN25M - 1"	VB14 - ½"
INS25	KB51	1"	SA128 with 2 m capillary	Range 1 -20 to 110 °C	Stainless steel - 1" to suit SA128	1 x IN40M - 1½"	VB14 - ½"
INS40	KC51	1½"	SA121 with 2 m capillary	Range 2 40 to 105 °C	Stainless steel - 1" to suit SA121	2 x IN40M - 1½"	VB14 - ½"
INS50	KC51	2"	SA121 with 2 m capillary	Range 2 40 to 105 °C	Stainless steel - 1" to suit SA121	3 x IN40M - 1½"	VB14 - ½"
INS65	NS	2½"	SA121 with 2 m capillary	Range 2 40 to 105 °C	Stainless steel - 1" to suit SA121	5 x IN40M - 1½"	VB14 - ½"
INS80	NS	3"	SA121 with 2 m capillary	Range 2 40 to 105 °C	Stainless steel - 1" to suit SA121	7 x IN40M - 1½"	VB14 - ½"

* SB control valve is bronze, single seat, normally open, direct acting.
KB51 and KC51 control valves are bronze, single seat, normally open, bellows balanced, direct acting.
NS control valve is gunmetal, double seat, normally open, stainless steel trim, direct acting.

A Y-type strainer is recommended upstream of the control valve. The Y-type strainer should normally be the same size as the steam supply pipeline. Consider a Spirax Sarco brass / bronze Fig 12 strainer.

An isolating valve is recommended upstream of the Y-type strainer.
Consider the use of an M10 Spirax Sarco carbon steel ball valve or a HV3 bronze stop valve.

Safety information, installation and maintenance

This document does not contain sufficient information to install the system safely. See the relevant Installation and Maintenance Instructions supplied with the system components.

Safety note

Your attention is drawn to Safety Information Leaflet IM-GCM-10.

Installation note

Spirax Sarco direct steam injection heating systems are designed to operate with the minimum of noise provided the installation is correct.

How to order

Example: 1 off Spirax Sarco INS15, ½" screwed BSP, direct steam injection heating system.

TI-P405-42
EMM Issue 4

VHT
Vent Heads

Description

Spirax Sarco VHT vent heads are designed for fitting to vertical open ended steam vent pipes. The vent head will discharge dry steam safely to the atmosphere, avoiding the possibility of discomfort or even injury to personnel and material damage to buildings.

The vent head incorporates an internal baffle to separate entrained water from the steam.



Principle features

- Efficient separation.
- Stainless steel body for long maintenance free life.
- A simple and effective vent head for general applications.

Applications

Vent heads are ideal for use on blowdown vessels, condensate vessels, boiler feedtanks, hot water storage tanks etc.

Warning: Vent heads must not be used for safety valve outlets.

Vent heads are selected to be the same nominal size as the vent pipe.

Sizes and pipe connections

Description	Size		Inlet connection
VHT2	DN50	2"	Screwed BSP
			Screwed NPT
VHT3	DN80	3"	Screwed BSP
			Screwed NPT
			Flanged EN 1092 PN16 or ASME 150
VHT4	DN100	4"	Flanged EN 1092 PN16 or ASME 150
VHT6	DN150	6"	Flanged EN 1092 PN16 or ASME 150
VHT8	DN200	8"	Flanged EN 1092 PN16 or ASME 150
VHT10	DN250	10"	Flanged EN 1092 PN16 or ASME 150
VHT12	DN300	12"	Flanged EN 1092 PN16 or ASME 150

Materials

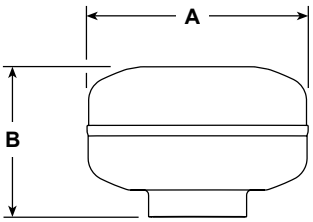
Body	Austenitic stainless steel 304L
Flanges	Carbon steel, black electrophoretic coating

First for Steam Solutions
EXPERTISE | SOLUTIONS | SUSTAINABILITY

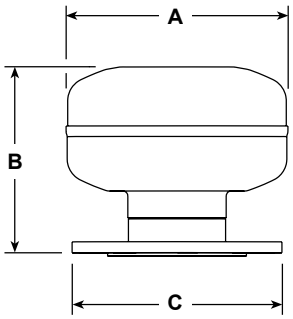
Dimensions/weights (approximate) in mm (inches) and kg (lbs)

Description	Size		Inlet connection	A	B	C	Weight
VHT2	DN50	2"	Screwed BSP	203 (8.0)	137 (5.4)	-	2.08 (4.59)
			Screwed NPT	203 (8.0)	137 (5.4)	-	2.08 (4.59)
VHT3	DN80	3"	Screwed BSP	203 (8.0)	145 (5.7)	-	2.70 (5.95)
			Screwed NPT	203 (8.0)	145 (5.7)	-	2.70 (5.95)
			Flanged EN 1092 PN16 or ASME 150	203 (8.0)	173 (6.8)	192 (7.6)	3.65 (8.05)
VHT4	DN100	4"	Flanged EN 1092 PN16 or ASME 150	304 (12)	237 (9.3)	224 (8.8)	6.31 (13.9)
VHT6	DN150	6"	Flanged EN 1092 PN16 or ASME 150	403 (16)	302.5 (11.9)	280 (11.0)	10.76 (23.72)
VHT8	DN200	8"	Flanged EN 1092 PN16 or ASME 150	403 (16)	314 (12.4)	334 (13.1)	12.28 (27.07)
VHT10	DN250	10"	Flanged EN 1092 PN16 or ASME 150	503 (20)	372.5 (14.7)	406 (16.0)	19.17 (42.26)
VHT12	DN300	12"	Flanged EN 1092 PN16 or ASME 150	503 (20)	343.5 (13.5)	483 (19.0)	22.29 (49.14)

Screwed



Flanged



Safety information, installation and maintenance

For full details see the Installation and Maintenance Instructions supplied with the product.

Installation note

Installation of the screwed and flanged vent heads is relatively straight forward. The flanged vent heads have a lightweight flange drilled to suit both the PN and ASME flange standards.

Disposal

The product is recyclable. No ecological hazard is anticipated with the disposal of this product providing due care is taken.

How to specify

Spirax Sarco type VHT with austenitic stainless steel construction, screwed / carbon steel flanges & internal baffle.

How to order

Example: 1 off Spirax Sarco DN100 VHT4 vent head having a flanged EN 1092 PN16 inlet connection.

THERMAL ENERGY SOLUTIONS



Section contents

SECTION 15 CONTENTS

EasiHeat	TI-P565-08-US
Steam Jet Thermocompressor	TI-P493-02-US
Blowdown Separators BDSP Series	TI-P573-01-US
Blowdown Heat Recovery Modules BDHR Series	TI-P541-01-US
RediHeat Instantaneous Water Heater	TI-P571-01-US
Sizing RediHeat Instantaneous Water Heaters	TI-P571-02-US
Mialo Water Blending System	TI-P612-33-US
EVC (Exhaust Vapour Condenser), EVC Food+ Turflow Type Heat Exchanger	TI-P222-02-EN
VEP and VES, VEP and VES Food+ Turflow Heat Exchangers	TI-P222-03-EN

TI-P565-08-US
Issue 1

EasiHeat

Heating system (HTG)

Our Spirax EasiHeat is a complete, compact and ready-to-use steam to water heat transfer solution that delivers superior energy efficient performance for applications with stable loads conditions such as closed circuit heating.

These systems can be sized for heating duties from approximately 240 KBTU/hr to 10.2 MMBTU/hr and are supplied full assembled and pressure tested.

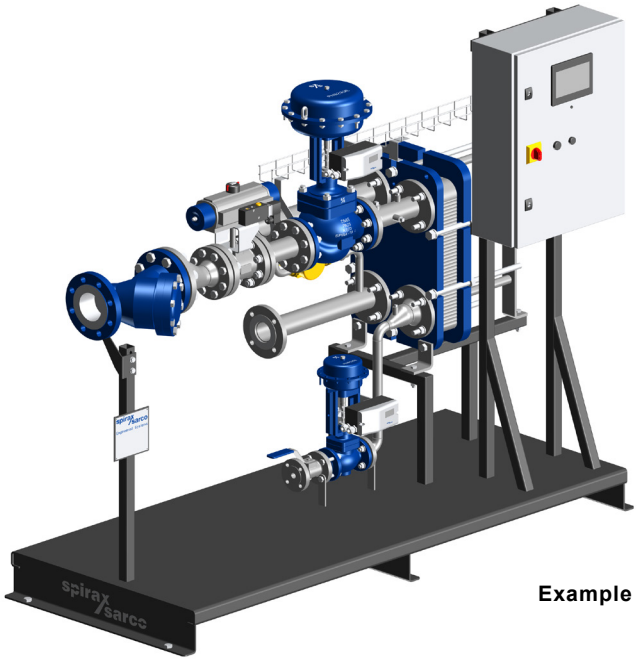
Spirax EasiHeat will help lower operational costs.

Domestic Hot Water system (DHW)

The Spirax EasiHeat DHW is a complete, compact system for accurate heating of domestic hot water or hot water for process.

These systems can be sized for any heating duty from 240 KBTU/hr to 12 MMBTU/hr and are supplied fully assembled and pressure tested ready for installation.

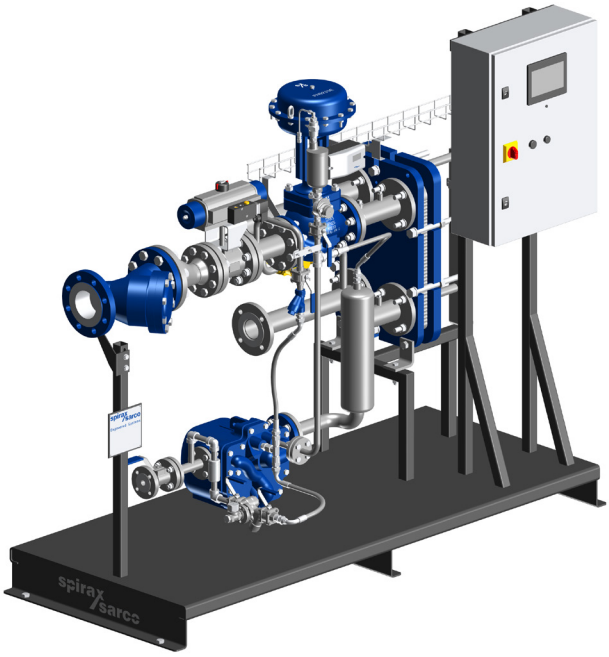
The standard Spirax EasiHeat system is expandable by the inclusion of additional items such as a steam pressure reduction valve, safety valve and safety high limit shut-off these should be selected separately.



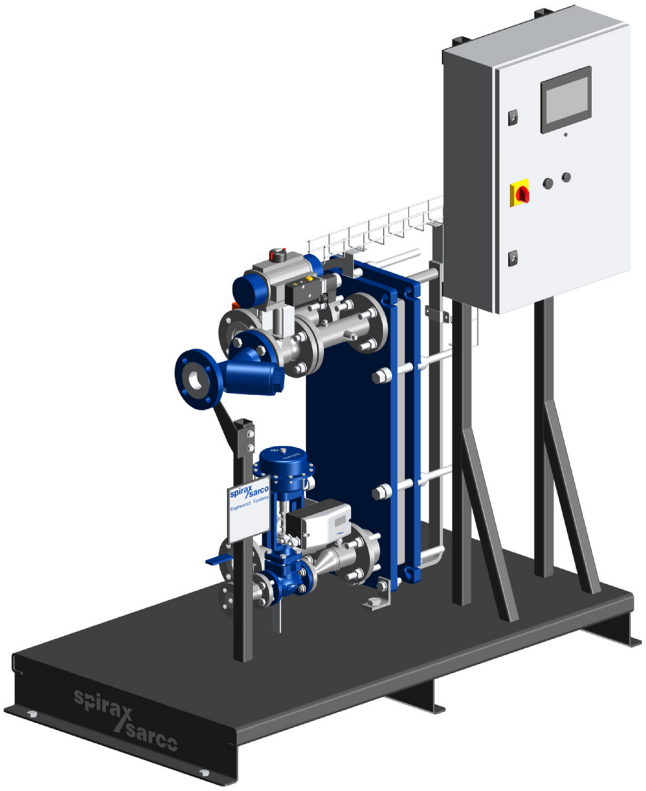
Example of the DHW Dual Control system

Principal features and benefits:

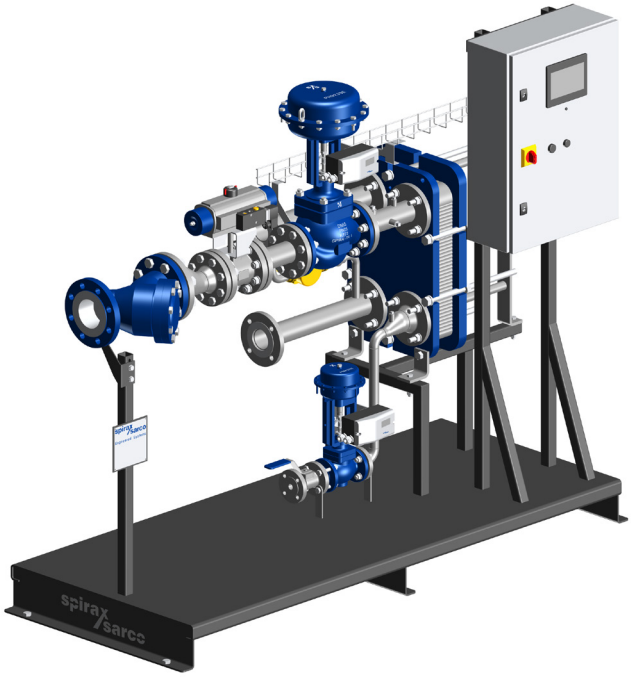
- Compact heat transfer solution
- Energy monitoring, Communications
- Cloud based monitoring and reporting
- Safety start up / shutdown sequencing
- Dual Control Option , for improved temperature and pressure control
- Precisely engineered system and matched components that provides accurate temperature control even with sudden load changes.
- Guaranteed performance
- Integrity test, Fouling detection and intelligent diagnostics
- Options to suit all applications
- New Legionella Guardian feature(cloud based only)



EasiHeat Steam Control System



EasiHeat Condensate Control System



EasiHeat Dual Control System

Heat exchanger
One of the components that guarantees system performance is the heat exchanger, which is sized and selected to match the specific duty requirements.
With a high efficiency and low volume to pressure ratio, the plate and frame heat exchanger ensures reduced inspection requirements whilst being fully maintainable.

Control panel
The Spirax EasiHeat now features our new innovative control system delivering increased monitoring and communications.
A color touch screen provides ease of use and clear visual access to all operating parameters and access to energy data has digital connection capabilities.

Steam control
Steam side control can respond to rapid fluctuations in secondary water flow.
Only heats the water that is required.
Reducing steam demand helps to reduce CO_2 emissions by using the Latent heat from the condensate.

Condensate control
Condensate Control ensures all of the useful energy in the steam is used within the unit resulting in less waste than other available alternatives which, in turn, reduces both fuel demand and CO_2 emissions. A correctly sized heat exchanger and downstream control valve guarantees system performance, with both electric and pneumatically actuated systems are available.

Dual control
The innovative design combines all the benefits of both steam and condensate control, providing high level of set point accuracy while ensuring sub-cooled condensate under any operating load changes.

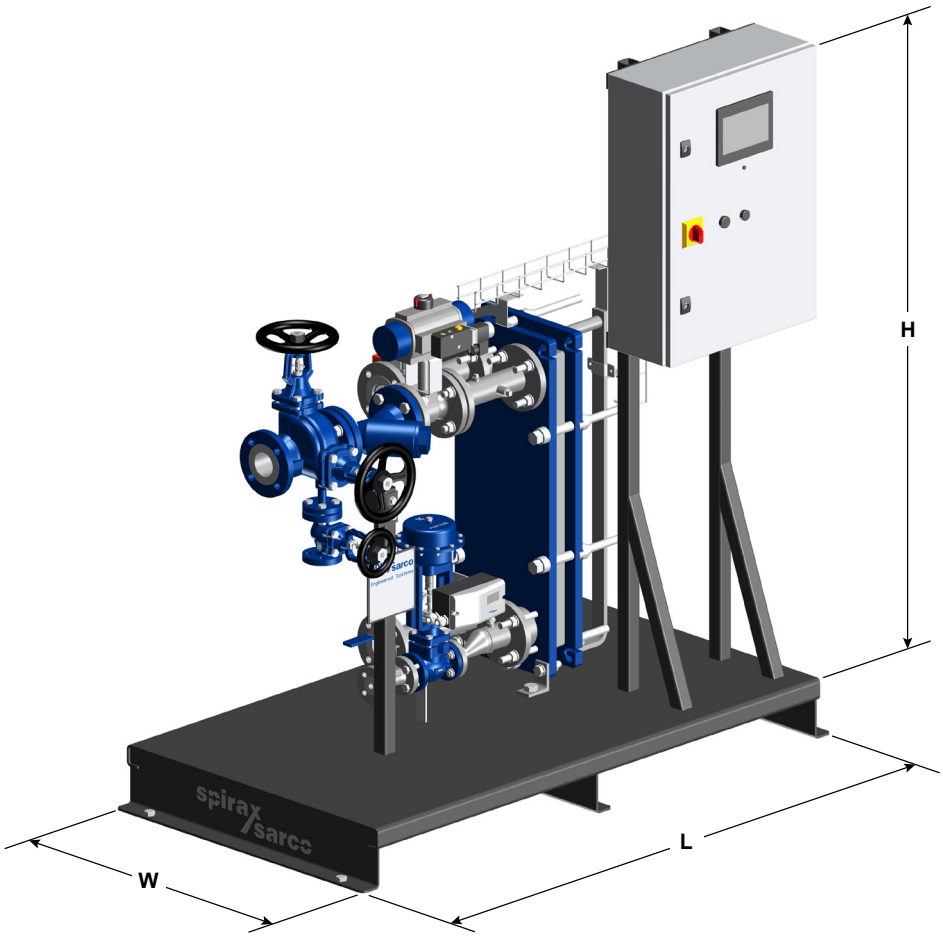
Intelligent monitoring and control
The EasiHeat control system can be connected to existing customer networks can integrate with a broad range of building management systems. The new features include: configurable E-Stops, Start-up and shutdown sequencing.
(Optional) Cloud based monitoring and reporting

Fail-safe high limit option
High limit temperature control should always be specified to ensure the system will automatically and safely shut down to prevent risk of scalding should a problem occur. The EasiHeat can be specified with a range of different independent, fail-safe, high limit options, including an EN14597 or INAIL compliant version.

Materials

Steam and condensate pipework		Carbon steel
Steam control valve and condensate pump trap		SG Iron
Water side pipework	**HTG**	Carbon steel
	DHW	Stainless steel
Condensate control valve		SG Iron

Dimensions (approximate)



Metric		Maximum dimensions (mm)			Piping connections		
Type	Valve actuation	H	L	W	Steam	Water	Condensate
EHDSC	EL or PN	1760	1950	850	DN65	DN65	DN25
EHDDC	EL or PN	1760	2320	950	DN65	DN65	DN15
EHHCC (T6)	EL or PN	1760	1480	870	DN50	DN50	DN15
EHHCC (T8)	EL or PN	1760	1950	850	DN80	DN80	DN20
EHHCC (T10)	EL or PN	1760	1760	870	DN100	DN100	DN25

Imperial		Maximum dimensions (inches)			Piping connections		
Type	Valve actuation	H	L	W	Steam	Water	Condensate
EHDSC	EL or PN	70	77	34	2½"	2½"	1"
EHDDC	EL or PN	70	92	38	2½"	2½"	½"
EHHCC (T6)	EL or PN	70	59	35	2"	2"	½"
EHHCC (T8)	EL or PN	70	77	34	3"	3"	¾"
EHHCC (T10)	EL or PN	70	70	35	4"	4"	1"

*** EHHDC has the same dimensions as the EHHCC versions**

Options selected may impact overall dimensions.

Pressure and temperature limits

Pipework design condition	PN16	ANSI 150
Maximum saturated steam supply pressure to heat exchanger	9 bar g	135 psi g
Maximum water pressure	9 bar g	135 psi g
Maximum water temperature	105 °C	220 °F
Maximum gasket temperature	180 °C	350 °F
Maximum Ambient temperature	50 °C	122 °F

Pipework

All pipework is correctly sized for the application and is fabricated using modern welding techniques, approved welders and weld procedures. Flanged products are used for reliability and easy maintenance.

Electrics and pneumatics

All control equipment is pre-wired and piped ready for connection to the air supply and power source.

Electrical panel supply requirements	110 Vac/60 Hz	
	230 Vac/50Hz	
Actuators supply	Electric	24 Vac/50-60 Hz
	Pneumatic	3 to 6 bar g (45-90 psi g)
Power consumption		400 W

Support frame

The whole system is delivered pre-assembled on a compact frame and baseplate, option of fitted wheels for ease of moving the unit into position, alternatively a fork lift truck can be used for ease of moving.

Typical specification

The heating system shall be a Spirax EasiHeat system complete with PLC functionality with digital data collection to provide energy monitoring and remote access. The system will be pre-assembled and mounted on a compact frame with either pneumatic or electric control option.

Europe

In order to meet EN14597 or INIAL, which specifies temperature control devices and temperature limiters for heat generating systems, the selection of an Independent High Limit (IHL) is to be included.

Enquiries and Ordering

All systems are designed for the required heat load with controls to suit the application. The best way of ensuring that we have all the necessary information for quotation and manufacture is to contact your local Spirax Sarco office or sales engineer. Special requirements should be detailed.

TI-P493-02-US
Issue 3

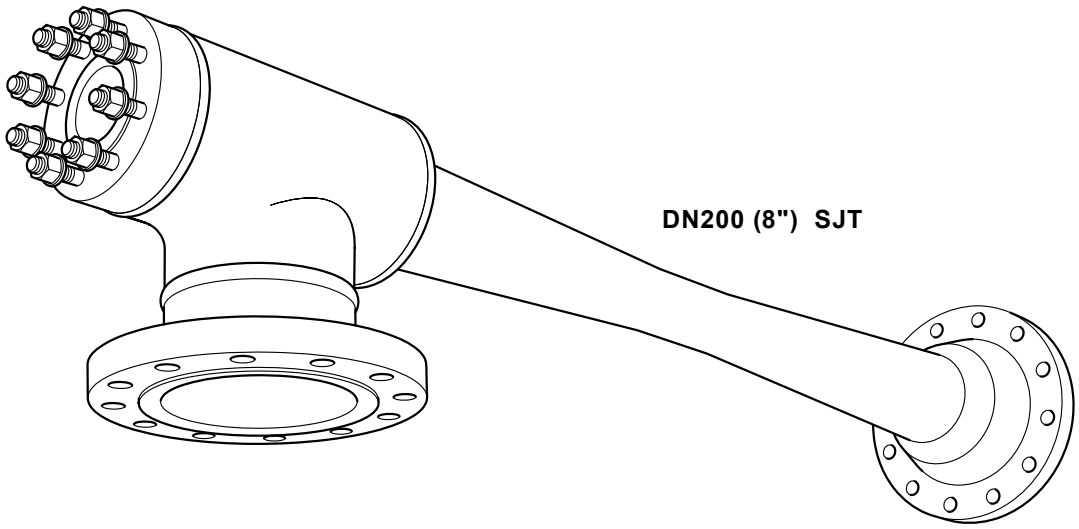
SJT
Steam Jet Thermocompressor

Description

Jet Compressors can be utilized in a number of applications for steam circulation and increasing lower pressures to be functional.

Jet Compressors are generally referred as thermocompressors when steam is both motive and suction medium, or if the aim is to recover latent heat content of low pressure steam to be utilized elsewhere in a process.

The Spirax Sarco thermocompressors are a specific type of ejector in which steam under pressure (motive) is used to entrain steam that is at a lower pressure (suction). Within the body of the ejector, the motive steam and suction steam become mixed and are subsequently discharged at an intermediate pressure.



DN200 (8") SJT

Features and benefits

The SJT Steam Jet Thermocompressors features and benefits include:

- Simple construction
- Available in alternative machined materials for increased abrasion resistance.
- Compact design and comparatively lightweight which enables overhead installations.
- Low capital cost and operating costs.
- No moving or rotating parts with minimal maintenance and therefore the units can be installed in remote or with limited accessibility.
- No specialist maintenance experience required.
- Discharge steam is oil free, no lubrication contamination.
- Suitable for hazardous areas, no explosion proof motors required.
- Recirculation without loss of heat or energy through reducing valves.
- Insulation available.

SJT Construction and Operation

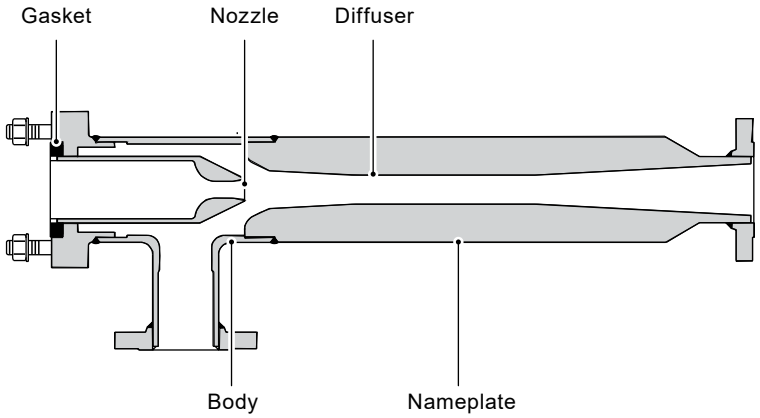
SJT's typically include the following main design features:-

- Body
- Nozzle
- Diffuser
- Spindle
- Actuator to move spindle (option for variable type SJT)

SJTs can be supplied in alternative materials to suit various application conditions.

High pressure motive steam enters the SJT Steam Jet Thermocompressor and passes through the nozzle where the high pressure steam energy is converted into kinetic energy. On leaving the nozzle at high velocity, the steam enters the suction chamber where it is brought in contact with the suction steam. There is then an exchange of momentum between the motive and suction steam, resulting in an acceleration of the suction steam, giving rise to their subsequent entrainment. A uniform mixture results at the narrowest part of the diffuser (called the throat) and finally the reconversion of the velocity energy into pressure energy occurs in the diverging section of the diffuser.

SJT cross section



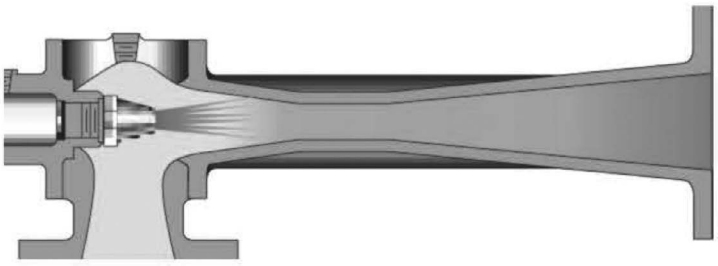
Types of Thermocompressor

Fixed nozzle type

This type of compressor has no regulating spindle. An element of control is achievable by throttling the motive steam pressure via a separate valve upstream of the SJT (See below).

Typically the fixed nozzle is used when operating loads are stable.

Cross section of fixed nozzel type SJT
Fixed Orifice (loads stable, less than 10% variation)

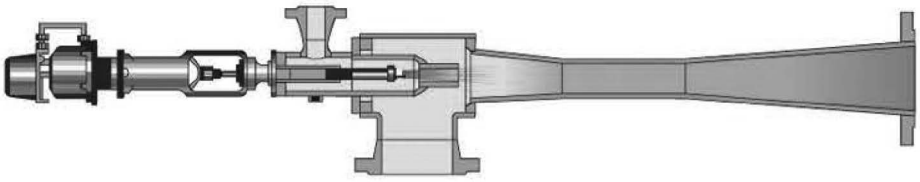


Variable Area

This compressor includes a motive steam regulating spindle to vary the cross sectional area of the motive steam nozzle (See below). It varies the area through which the steam is flowing. This approach maximizes the energy per lb of motive steam that is available at the nozzle to do the work.

Typically the variable area SJT is used when either; motive, or suction, or discharge steam varies in condition, and the specific flow or pressure of the discharge is required.

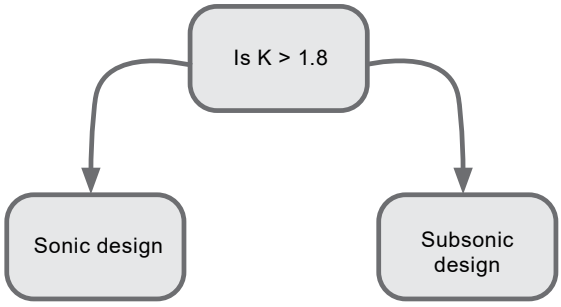
Cross section of variable area SJT
Variable Area (Loads/Conditions vary)



Performance - Critical or Non-critical

Thermocompressors can be categorized as either critical or noncritical based on the compression ratio. In order to determine what type of design the SJT will be, the following compression calculation is completed;

$$\text{Compression ratio (K)} = \frac{\text{Discharge pressure } (P^d)}{\text{Suction pressure } (P^s)}$$



For example:

- The discharge pressure = 36.3 psi g (2.5 bar g) = 51.0 psi a (3.516 bar a)
- The suction pressure = 17.4 psi g (1.2 bar g) = 32.1 psi a (2.213 bar a)
- The compression ratio (K) = 51.0 psi g (3.516 bar g)/32.1 psi g (2.213 bar g) = 1.59

If the steam velocity in the diffuser throat is sonic, the design is defined as critical. Sonic velocity exists when the compression ratio (discharge pressure/suction pressure) is equal to or greater than 1.8 to 1.

The ratio value changes as a function of the ratio of the specific heat of the motive and suction steam.

Unless motive pressure and discharge pressure are decreased proportionally with a critical design, a reduction in motive steam pressure will result in a sudden increase to suction pressure. The relationship between motive pressure and discharge pressure depends on the specific characteristics of the individual design.

Sonic designs	Compression ratio (K) greater than 1.8
	With a sonic design, the Motive (HP) steam flowrate is "fixed"
	The Suction (LP) steam flowrate can operate with full turndown (100% to 0%)

Subsonic designs	Compression ratio (K) is less than 1.8
	With a subsonic design, the motive (HP) steam flowrate can be varied to 'save' steam when process conditions become more favorable.
	The Suction (LP) steam flowrate can operate with full turndown (100% to 0%).
	Spirax Sarco offers a special design called a 'Variable Orifice' thermocompressor which has integrated motive steam control.

Control options

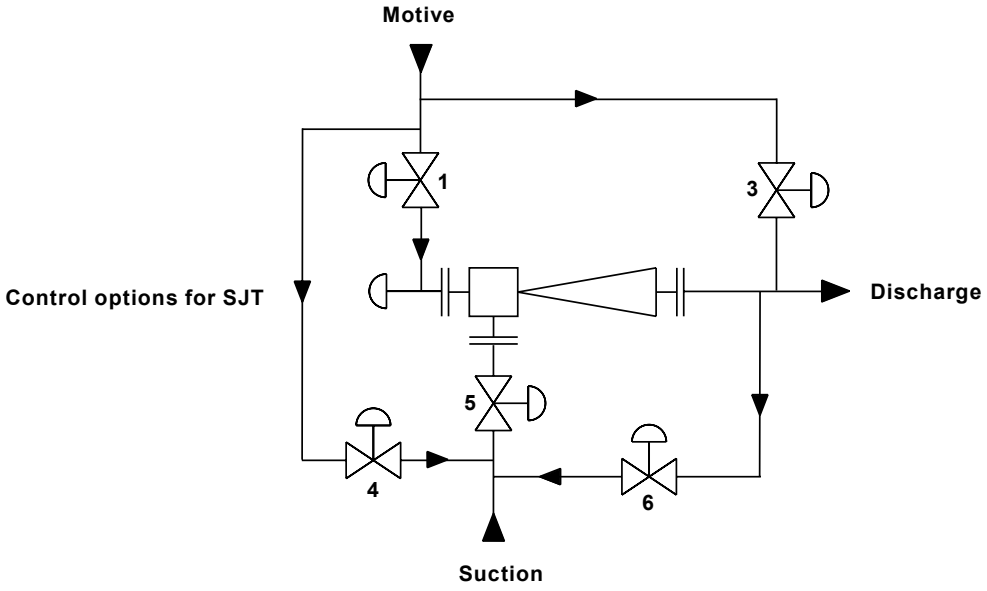
The schematic below illustrates every possible control option that could be used to control an SJT Steam Jet Thermocompressor.

Subsonic designs:

Option 1	Can be used to control the motive (HP) steam flow from 100% to 80%
Option 2	Can be used to control the motive (HP) steam flow from 100% to 35%
Option 3	Can be used to bypass additional steam to the discharge. Options 4 or 5 or 6 are occasionally used to maintain the suction (LP) pressure

Sonic designs:

Option 3	Can be used to bypass additional steam to the discharge
Option 4 or 5	Are occasionally used instead of option 6
Option 6	Is usually used to maintain the Suction (LP) pressure (if required)



Note: You cannot choose Options 1 or 2 if the SJT Steam Jet Thermocompressor is 'Sonic'
Most applications will only use one of the options. Some applications do not require any control. An SJT Steam Jet Thermocompressor will always balance itself to the system pressures.

Variable orifice SJT Steam Jet Thermocompressors

Spirax Sarco offers several types of Thermocompressor. The first is the fixed nozzle type where control is achievable by throttling the motive steam pressure via a separate valve upstream of the SJT Steam Jet Thermocompressor (See Control Option 1, previous page, for subsonic units).

The other type relies on a motive steam regulating spindle to vary the cross sectional area of the motive steam nozzle (Control Option 2, previous page). Unlike a throttling valve positioned upstream, the regulating spindle does not reduce the motive steam pressure, it simply varies the area through which the steam is flowing, maximizing the utilization of energy in the motive steam.
SJT Steam Jet Thermocompressors utilizing a motive steam regulating spindle are often referred to as Variable Orifice Ejectors. The spindle is operated automatically.

Selection

Variable orifice SJT Steam Jet Thermocompressors should be specified in cases where the suction load, suction pressure or discharge pressure are continually varying, and it is necessary to control one or more of these process parameters as quickly as possible.
For cases which involve large variations in load, it is sometimes more cost effective to use several various sized units connected in parallel, than to have one large controlled unit. It may also be necessary to install a bypass valve in some applications.
Defining the parameters to be controlled (E.g. pressure, flow, etc.) Will determine the optimum solution for the application, and best return on investment. Spirax Sarco can provide assistance in selecting the right solution for your needs.

Typical applications

The following lists the applications where SJT Steam Jet Thermocompressors can be installed, typically for circulating and boosting low pressure steam which would normally go to waste:

Applications	Industries
Drum dryers	Paper and Board Industries
Flash evaporators	Desalination
Condensate receivers	Chemical, Petro-chemical, Oil and Power Generation
Vulcanisers	Rubber Industry
Single and Multi-stage effect evaporators	Food, Dairy, Pharmaceutical & Chemical Industries
Wort vessels	Brewing Industry
Exhaust steam lines	Most Process Industries
Blanching machines	Food Industry

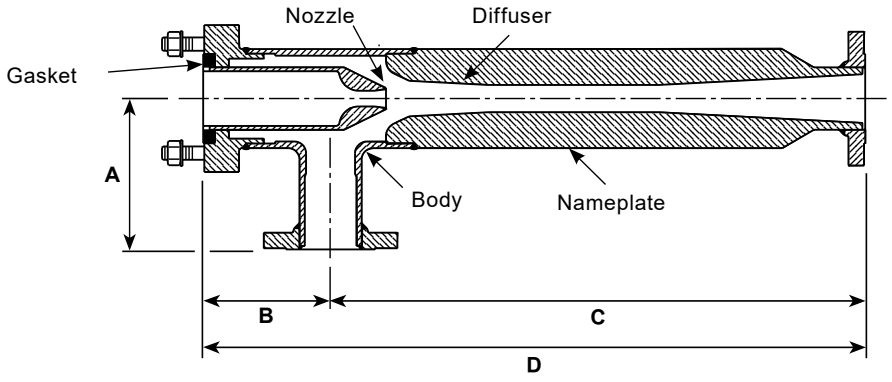
How to order

Please use the following format to specify a Thermocompressor and include a datasheet detailing all values.
Example: 1 off Spirax Sarco Size 6 SJT150CS Steam Jet Thermocompressor having ASME 300 RF slip on flange connections.
Note: Attach the SJT Datasheet to the order.

Datasheet generated by the online software program

A typical example is illustrated below:

Spirax Sarco SJT Steam Jet Thermocompressor Datasheet							
1	**Client:**	Spirax-Sarco Inc.		**Client Project Ref:**			
2	**Client's Ref:**			**Plant Location:**			
3	**Spirax Ref:**	SJT Example/SJT00824		**Name-plate Tag No.**			
4	**Description:**	Size 6 Steam Jet Thermocompressor		**No. OFF:**	1		
5	**Unit Ref:**	SJT150CS4F0		**Operation:**			
6	**Drawing No:**	DE-SJT00824-1		**Serial No:**			
7	**Unit Body Size:**	6					
8	**MOTIVE CONDITIONS**			**MATERIALS OF CONSTRUCTION**			
9	Pressure	(psi g)	293.92	Main body	Carbon Steel		
10	Temperature	(°F)	419.0	Nozzle	Stainless Steel		
11	Flowrate	(lb/hr)	5689	Diffuser	Carbon Steel		
12				Flanges	Carbon Steel		
13	**SUCTION CONDITIONS**			Gaskets	Spirax Sarco to select		
14	Pressure	(psi g)	1.47	Bolts	Carbon Steel (if applicable)		
15	Temperature	(°F)	216.9	Name-plate	Stainless Steel		
16	Flowrate	(lb/hr)	3308				
17				**MECHANICAL DESIGN**	Motive	Suction/Discharge	
18	**DISCHARGE CONDITIONS**				Side	Side	
19	Pressure	(psi g)	22.04	Max Design Pressure	22.04	22.04	(psi g)
20	Temperature	(°F)	294.1	Max Design Temp	428	428	(°F)
21	Flowrate	(lb/hr)	8996	Internal Corrosion Allowance	38.1	38.1	(in)
22	**DIFFUSER IS SONIC**			Mechanical Design Code	ASME B31.3		
23				Welding Standard	ASME IX		
24				External Surface Finish	High Temp Silicone Aluminum		
25				Weight	TBC (lb)		
26							
27	**DIMENSIONS**		**CONNECTIONS DETAILS**	Size	Rating		
28	**A - 9.65 in**		Motive Steam (A)	2 ½	300 lb		
29	**B - 11.42 in**		Suction Steam (B)	6	300 lb		
30	**C - 54.13 in**		Discharge Steam (C)	6	300 lb		
31	**D - 65.55 in**		Flange Type	ASME B 16.5 Slip-On			
32	**GA DRAWING**						
33							
34							
35							
36							
37							
38							
39							
40							
41							
42							
43	NOTE: Confirmed dimensions to be issued shortly after order placement						

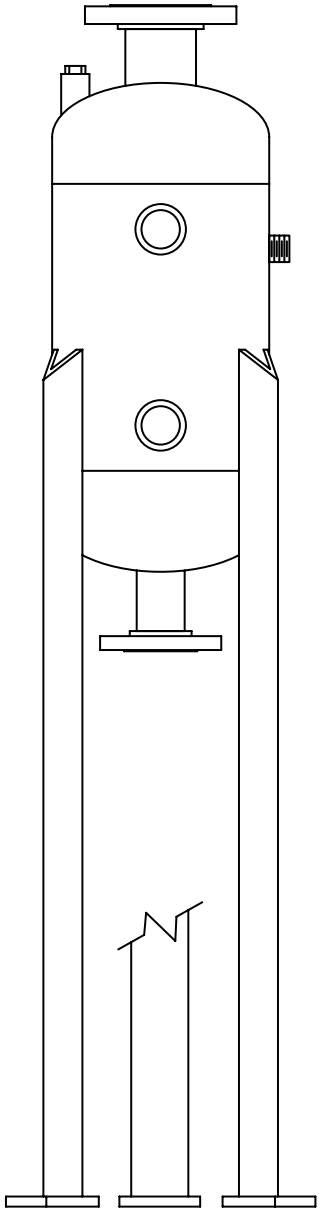


TI-P573-01-US
Issue 1

Blowdown Separators "BDSP" Series

Description

The Blowdown Separator system is an effective means of processing water from the boiler during bottom blowdown reducing the pressures to atmospheric levels and cooling the residual condensate for safe discharge to drain. The BDSP units centrifugally separate the flash steam from the hot discharge systems. The separators are ASME Section VIII Div I constructed and stamped. Various options and accessories are available.



Model	BDSP- Series
PMO	150 psi g (10.3 bar g)
Design pressure (PMA)	150 psi g @ 550 °F (10.3 bar g @ 288 °C)
Capacity range	100 to 100,000 lb/h (45 to 45,000 kg/h)
Vessel	ASME Constructed and Stamped 150 psi g @ 550 °F (10.3 bar g @ 288 °C)
Hydrotest pressure construction materials	225 psi g (15.5 bar g)
	Flash Vessel – Carbon Steel
	Supports- Carbon steel
	Piping - A106 Seamless Carbon Steel
Dimensions and weight	See SSI Sales Drawings

Typical applications

Boiler blowdown controlling the presence of sediment and particulates in the boiler. Use with single or multiple boilers to handle the blow down loads and cool the effluent for safe discharge to drain.

Standard features

- Spirax Sarco centrifugal high efficiency flash tank
- Heavy duty C/S base
- Hydrotested, blasted, and coated with SSI Hi temp black enamel
- ASME Section VIII Code Stamped separator vessel with SS internal wear plate

Additional Options are available

Capacity

For sizing data, see Selection and Capacity Chart.

Suggested specification

- Furnish and install where shown on plans, Spirax Sarco Inc.
  Model# BDSP____-___-___-___-__,
  Blowdown Separator
- The carbon steel receiver shall be ASME constructed and stamped for 150 psi g WP. With integral stainless steel wear plate.
- No threaded connections above 2" NPS on the package piping are permitted.
- The package shall be sized to meet (or exceed) the actual required blowdown system load.
- The package shall include a structural steel skid and painted with 1 coat Hi-Temp black enamel.

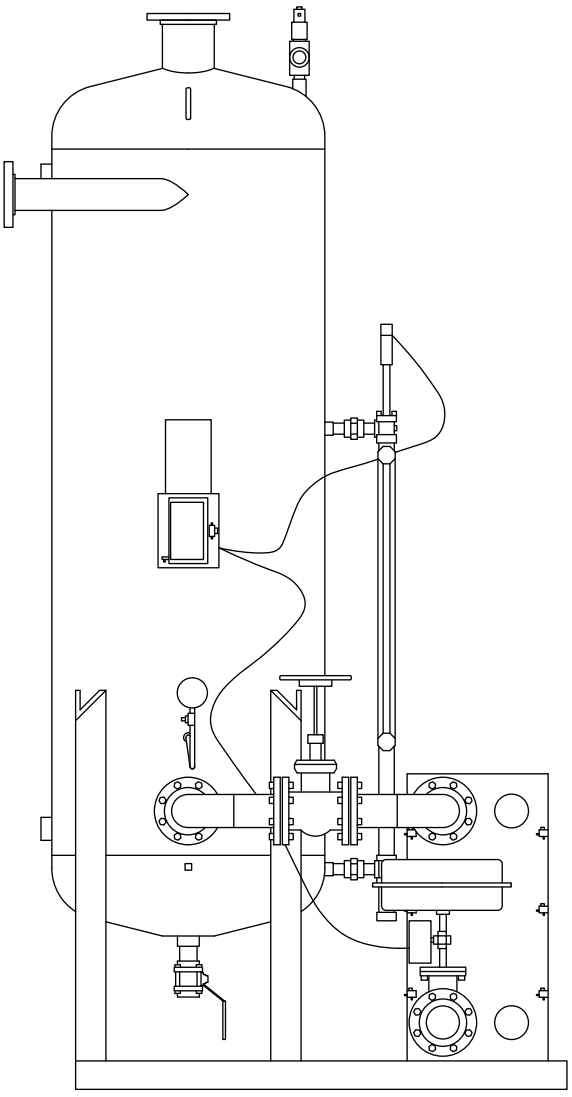
TI-P541-01-US
Issue 1

Blowdown Heat Recovery Modules "BDHR" Series

Description

The packaged Blowdown Heat Recovery system is an effective means of reclaiming valuable heat normally lost in the control of boiler water chemistry and cooling the wastewater to temperatures safe for discharge into sewer systems. The centrifugal blowdown vessel effectively separates flash energy from the condensate and discharges condensate through a heat exchanger typically to preheat make up water. The flash steam generated is used to heat make up water in the DA tank maximizing energy efficiency.

Model	BDHR- Series
PMO	125 psi g (8.6 bar g)
Design pressure (PMA)	125 psi g @ 320 °F (8.6 bar g @ 160 °C)
Capacity range	100 to 100,000 lbs/hr (45 to 45359 kg/hr)
Flash vessel	ASME Constructed and Stamped 150 psi g @ 550 °F (10.3 bar g @ 288 °C)
Heat exchanger	Plate and Frame – ASME Constructed and stamped for 150 psi g (10.3 bar g) 316L stainless steel plates and EPDM gaskets
Hydrotest pressure	188 psi g (13.0 bar g)
Construction materials	Flash Vessel – Carbon Steel
	Heat exchanger- Carbon steel covers with 316L SS plates
	Frame- Carbon steel
	Isolation valves - Carbon Steel 150#
	Piping - A106 Seamless Carbon Steel
Dimensions and weight	See SSI Sales Drawings



Typical applications

Automatic Boiler Blowdown Systems controlling the level of dissolved solids in make up water. Use with single or multiple boilers to recover valuable heat energy.

Standard features

- Spirax Sarco centrifugal high efficiency flash tank
- Pressure relief valve
- Spirax Sarco mechanical or electronic level controls
- Plate and Frame heat exchanger
- Heavy duty C/S base
- Hydrotested, blasted, and coated with SSI Hi temp black enamel
- Fabricated in accordance with ANSI/ASME B31.3 by ASME Section IX certified welders.
- ASME Section VIII Code Stamped flash vessel and heat exchanger.

Additional Options are available

Suggested specification

- Furnish and install where shown on plans,
  Spirax Sarco Inc. Model# BDHR____-___-___-___-__ Blowdown Heat Recovery System
- The system shall be a complete pre-piped factory package requiring only service connections for a fully functional system.
- The carbon steel receiver shall be ASME Constructed and stamped for 150 psi g WP.
- All condensate piping shall be schedule 40 Seamless C/S pipe
- No threaded connections above 2" NPS on the package piping are permitted.
- The package shall be sized to meet (or exceed) the actual required condensate system load.
- The package shall include a structural steel skid and painted with 1 coat Hi-Temp black enamel.

Capacity

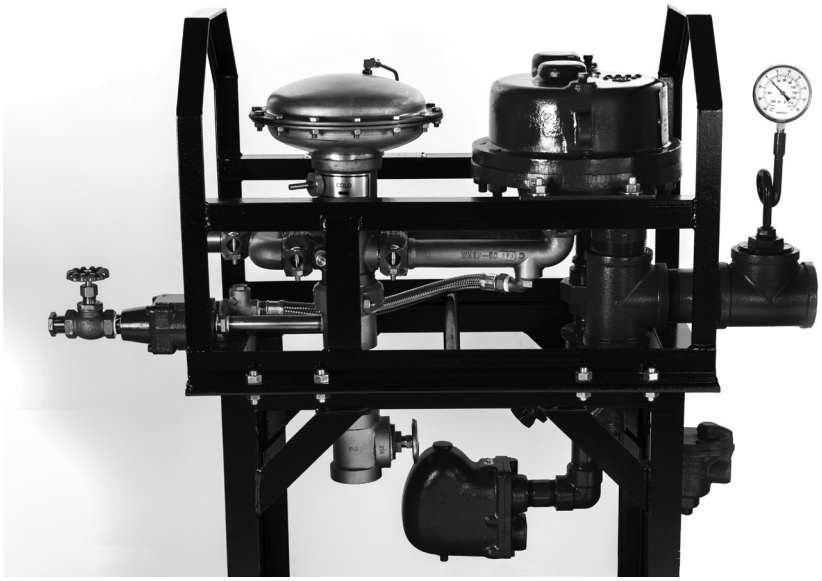
For sizing data, see Selection and Capacity Chart.

TI-P571-01-US
Issue 1

RediHeat Instantaneous Water Heater

Description

The RediHeat is a steam (shell side) to water (tube side) heat exchange package that incorporates a unique feed-forward temperature control system to instantly produce hot water within +/-4 °F (-15 °C) of the set temperature under widely varying demands. This outstanding performance makes the RediHeat the ideal solution for domestic hot water applications where tight temperature control and instant response to changes in demand are required.



Temperature control

Water temperature is controlled by a mechanical blending valve that operates based on demand. A manual adjustment compensates for seasonal changes in cold water supply temperature. The blending valve has a fail-safe design ensuring consumers can never be exposed to hot water at temperatures above set point – vital for domestic hot water applications. Potential failure or damage to the unit will produce only cold water.

Heat exchanger

The RediHeat features a spiral tubed helical heat exchanger for efficient heat transfer in a compact space. The coiled tube technology does not require tube supports allowing the tubes to be in very close proximity resulting in a more compact heat transfer bundle. The rugged casing and bourdon tube configuration also allows the entire assembly to expand and contract in response to temperature change without localized stressing. This is ideal for intermittent cycling that is common with domestic hot water applications.

Efficiency

The typical domestic hot water system only places a demand on the heat exchanger 15% of the time. The feed forward design of the RediHeat only consumes energy when responding to demand. With no hot water storage required, this mode of operation can save as much as 40% in energy costs when compared to a hot water tank system.

Anti-bacterial

The perfect environment for the growth of legionella bacteria is stagnant water between 68 °F and 122 °F (20 °C and 50 °C). The presence of scale and sediment only expedites colonization.
With the RediHeat feed-forward design, water is over-heated to 160 °F - 200 °F (71 °C - 93 °C) in the heat exchanger before being blended (in response to demand) with incoming cold water to the desired output temperature. In this way the presence of stagnant water at bacteria-friendly temperatures is eliminated.

Recirculation system

A problem many hot water systems encounter is the delayed supply of hot water to fixtures that are a substantial distance from the heater. During idle periods, heat loss in the piping system will result in cool water at the faucet until hot water produced from the heater is able to reach that point. Delays in providing hot water at the faucet can result in user dissatisfaction. To provide instantaneous hot water on demand in systems with long pipe runs a recirculation system incorporating a pump (not included) to maintain constant flow should be installed. The RediHeat recirculation system maintains loop temperatures by measuring the temperature of the returning hot water and, dependent on temperature, either passing it back through the heat exchanger for re-heating or diverting it back to the hot water loop.

Installation

With a footprint of only 6.5 square feet and a height of 33.5" for the largest unit, the RediHeat is the most compact instantaneous water heater available – important when space is at a premium. The unit requires no extraneous power sources, controls or temperature sensors making installation quick and simple. The RediHeat may be wall or floor stand mounted or can be suspended from the ceiling. Approximately 3' clearance from the floor is required to allow room for steam and condensate connections and the hot water outlet. An optional angle iron stand is available and recommended for floor mounting. For optimal heater performance, the steam trap should discharge to 0 psig, below the level of the trap. If lift of condensate is required or the trap must discharge to a back pressure, an automatic pump trap (APT) should be fitted for correct operation. Contact Spirax Sarco for details. The steam inlet pressure to the heat exchanger is limited to 15 psi g (1.03 bar). Greater steam supply pressures require installation of a pressure regulator. A pressure relief valve set at 75 psi g (5.2 bar) (for RH-30 and RH-60) or 50 psi g (3.4 bar) (for RH-90 and RH-120) should be installed in the steam inlet pipe downstream of the pressure regulator if steam pressure to the heat exchanger can exceed these limits.
Acceptable cold water inlet pressure range is 30 to 150 psi (2.07 to 10.3 bar g). Water pressure must be at least 15 psi (1.03 bar) greater than steam pressure for correct operation. The RediHeat incorporates an integral pressure relief valve (located on side of the blending valve) to relieve excess water pressure caused by thermal expansion.

Maintenance

When maintenance on the helical heat exchanger is required, the coiled tube bundle can be either removed for cleaning or cleaned in place. Due to the helical design, removal is easy and does not require the withdraw space typical with other shell and tube designs. An acid pump cleaning system is available for cleaning the coil in situ when poor water quality can result in scaling.

Typical specification

The domestic hot water heater shall be a Spirax Sarco RediHeat steam-fired, instantaneous water heater incorporating feed forward temperature control to instantly produce hot water within +/-4 °F (-15 °C) of the set temperature under widely varying demands. The unit will incorporate an ASME code stamped helical coil heat exchanger and blending valve. The coiled tube bundle must be capable of being removed for inspection and service without breaking steam connections or removing the unit from its installed position. The unit shall be completely self-contained and require hook-up only to steam and water. There shall be no electric or pneumatic requirements. Each heater shall be a factory assembled package with the capacity to heat ___ gpm of water from __ to ___ degrees Fahrenheit without the use of thermostatic control devices or storage tanks. Supply steam pressure is ___ psig.

RediHeat Model	RH-30		RH-60		RH-90		RH-120	
Performance								
Nominal maximum output in gpm (litres)	30 (114 L)		60 (227 L)		90 (341 L)		120 (454 L)	
Capacity	Heat 40 °F (4.4 °C) water up to 140 °F (60 °C). Outlet temperature adjustable.							
Steam inlet pressure	10 to 15 psi g (0.69 to 1.03 bar g) standard 20 to 250 psi g (1.38 to 17.2 bar g) requires pressure regulator (H package)							
Steam flow	Approximately 50 lbs/hr (22.7 kg/hr) per 1 gpm (3.79 L) of water heated.							
Water inlet pressure	30 to 150 psi g (2.07 to 10.3 bar g) (must be at least 15 psi (1.03 bar) above steam pressure for correct operation)							
Connections (NPT)								
Potable Water: In – Out	1½"	2"	2"		2½"		2½"	
Steam In - Condensate Out	3"	1¼"	3"	2"	4" ANSI	2"	4" ANSI	2½"
Materials of Construction								
Steam side piping	Steel							
Potable water side piping	Brass							
Heat Exchanger (standard)	Cast iron shell, copper tubes							
Heat Exchanger (options)	Cast steel shell Tubes: admiralty, 70/30 Cu Ni, 316SS and Double Wall (copper only)							
Blending Valve	Bronze body, Hastalloy valve plug, Neoprene diaphragm							
Design								
Blending Valve	Instantaneous: responds to pressure differential Fail-safe (cold) Integral pressure relief valve							
Piping	Quick disconnect Victaulic fittings							
Pressure	Potable water side: 150 psi (5.2 bar) Steam side: 50 psi (3.4 bar) (RH-90 and RH-120), 75 psi (5.2 bar) (RH-30 and RH-60)							
Certification	ASME Section VIII							
Accessories								
Included with RediHeat	Steel frame, steam inlet pressure gauge, water outlet temperature gauge							
Required (not included)	Main and Drip traps plus strainers							
Optional	"H" (pressure reducing) package, angle iron stand, recirculation package, solenoid safety shut-off system, thermal insulation blanket, OSHA cover, chemical cleaning system							
Nominal dimensions in inches (mm)								
Height	21 (533)		22.5 (572)		33 (838)		33.5 (851)	
Width	22.5 (572)		25 (635)		23.5 (597)		24.5 (622)	
Length	31.5 (800)		31.5 (800)		31.5 (800)		39 (991)	

TI-P571-02-US
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Sizing RediHeat Instantaneous Water Heaters

Use the tables below to select the RediHeat model that meets the required GPM of hot water at the desired temperature.
Note: Supply pressures above 15 psi g (1 bar g) must be reduced through a pressure regulator ("H" Package).

Single wall

Desired Outlet Temp (°F)		Winter Conditions 40 °F (4.4 °C) Inlet Water Hot Water Output (GPM)					Summer Conditions 60 °F (15.6 °C) Inlet Water Hot Water Output (GPM)				
	Pressure psi g (bar g)	10 (0.69)	15 (1.03)	20 (1.38)	25 (1.72)	30+ (2.07)	10 (0.69)	15 (1.03)	20 (1.38)	25 (1.72)	30+ (2.07)
110 (43 °C)	RH-30	30	30	30	32	35	30	30	30	40	40
	RH-60	60	60	60	65	70	60	60	60	75	80
	RH-90	90	90	90	90	90	90	90	90	90	90
	RH-120	120	120	120	120	120	120	120	120	120	120
120 (49 °C)	RH-30	30	30	30	30	35	30	30	30	35	40
	RH-60	60	60	60	60	65	60	60	60	75	80
	RH-90	90	90	90	90	90	90	90	90	90	90
	RH-120	120	120	120	120	120	120	120	120	120	120
140 (60 °C)	RH-30	25	25	25	30	30	25	30	30	30	35
	RH-60	60	60	60	60	60	60	60	60	60	70
	RH-90	90	90	90	90	90	90	90	90	90	90
	RH-120	115	120	120	120	120	120	120	120	120	120
150 (66 °C)	RH-30	20	25	25	25	30	25	25	30	30	30
	RH-60	55	55	55	55	55	55	60	60	60	65
	RH-90	80	80	80	80	80	85	90	90	90	90
	RH-120	110	110	110	110	110	115	115	115	115	120
160 (71 °C)	RH-30	10	15	20	25	25	15	15	20	30	30
	RH-60	45	45	45	50	50	50	55	55	55	60
	RH-90	65	70	70	70	70	75	85	85	85	85
	RH-120	90	90	90	90	95	105	110	110	110	115

Capacities are based on water pressure ranges of 30 to 150 psi g (2.1 bar g to 10.3 bar g).

Presence of residual superheat following pressure reduction on steam supply pressures greater than 15 psi g (1 bar g) can increase capacity as shown.
Inlet steam pressure above 50 psi g (3.4 bar g) (RH-90 and RH-120) and 75 psi g (5.1 bar g) (RH-30 and RH-60) require the installation of a safety relief valve.

Units utilizing alternate tube materials will exhibit lower maximum capacities. To determine actual capacity, multiply the above values as follows: Admiralty - 0.95, Cupro Nickel - 0.81, Stainless Steel - 0.85

Double Wall

Desired Outlet Temp (°F)		Winter Conditions 40 °F (4.4 °C) Inlet Water Hot Water Output (GPM)					Summer Conditions 60 °F (15.6 °C) Inlet Water Hot Water Output (GPM)				
	Pressure psi g (bar g)	10 (0.69)	15 (1.03)	20 (1.38)	25 (1.72)	30+ (2.07)	10 (0.69)	15 (1.03)	20 (1.38)	25 (1.72)	30+ (2.07)
110 (43 °C)	RH-30D	30	30	30	30	30	30	30	30	30	30
	RH-60D	60	60	60	60	60	60	60	60	60	60
120 (49 °C)	RH-30D	30	30	30	30	30	30	30	30	30	30
	RH-60D	60	60	60	60	60	60	60	60	60	60
140 (60 °C)	RH-30D	25	25	25	25	25	25	30	30	30	30
	RH-60D	60	60	60	60	60	60	60	60	60	60
160 (71 °C)	RH-30D	10	15	20	20	20	15	15	20	20	20
	RH-60D	45	45	45	45	45	50	55	55	55	60

Capacities are based on water pressure ranges of 30 to 150 psi g (2.1 to 10.3 bar g).
Inlet steam pressure above 50 psi g (3.4 bar g) (RH-90 and RH-120) and 75 psi g (5.1 bar g) (RH-30 and RH-60) requires the installation of a safety relief valve.
Double wall units are available only with copper tubes

When steam supply pressure to the RediHeat unit exceeds 15 psi g (1 bar g) the “H" Package must be furnished with the base unit. The “H" Package consists of 1 pressure reducing valve complete with pressure pilot and 1 strainer.

1. Determine the flow of steam in lbs/hr required to meet the unit’s capacity.
2. Enter chart below at supply steam pressure and continue to move across until the required capacity in lbs/hr is found. From that point move vertically and read the valve size indicated.

Example: RH-30 to heat 20 GPM water from 40-120 °F. Supply steam pressure is 100 psi g.

$$\text{Formula: } \frac{\text{GPM x 500 x } \Delta T\ (\ ^\circ F)}{946} = \text{lbs/hr}$$

$$\frac{20 \times 500 \times 80}{946} = 846 \text{ lbs/hr}$$

In this example with a 100 psi g steam supply pressure, a ¾" pressure regulator will be suitable for the required duty of 846 lbs/hr of steam.

Steam Supply Pressure psi g (bar g)	Pressure Regulator Selection Chart Capacity (lbs/hr) by valve size								
	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	4"
25 (1.7 bar g)	145	270	435	580	830	1,450	2,325	3,070	4,770
30 (2.1 bar g)	220	410	665	890	1,270	2,220	3,555	4,700	7,300
40 (2.8 bar g)	280	525	850	1,135	1,620	2,835	4,535	5,995	9,315
50 (3.4 bar g)	350	650	1,050	1,400	2,000	3,500	5,600	7,400	11,500
60 (4.1 bar g)	385	720	1,165	1,555	2,220	3,885	6,215	8,215	12,765
75 (5.2 bar g)	470	875	1,415	1,890	2,700	4,725	7,560	9,990	15,525
85 (5.9 bar g)	515	960	1,555	2,070	2,960	5,180	8,290	10,950	17,020
100 (6.9 bar g)	600	1,120	1,815	2,420	3,460	6,055	9,690	12,800	19,895
125 (8.6 bar g)	730	1,365	2,200	2,940	4,200	7,350	11,760	15,540	24,150
150 (10.3 bar g)	860	1,600	2,590	3,460	4,940	8,645	13,830	18,280	28,400
175 (12.1 bar g)	985	1,840	2,970	3,960	5,660	9,900	15,850	20,950	32,545
200 (13.8 bar g)	1,125	2,100	3,390	4,520	6,460	11,300	18,000	23,900	37,145
225 (15.5 bar g)	1,250	2,340	3,780	5,000	7,200	12,600	20,160	26,640	41,400
250 (17.2 bar g)	1,385	2,590	4,180	5,570	7,960	13,930	22,300	29,450	45,800

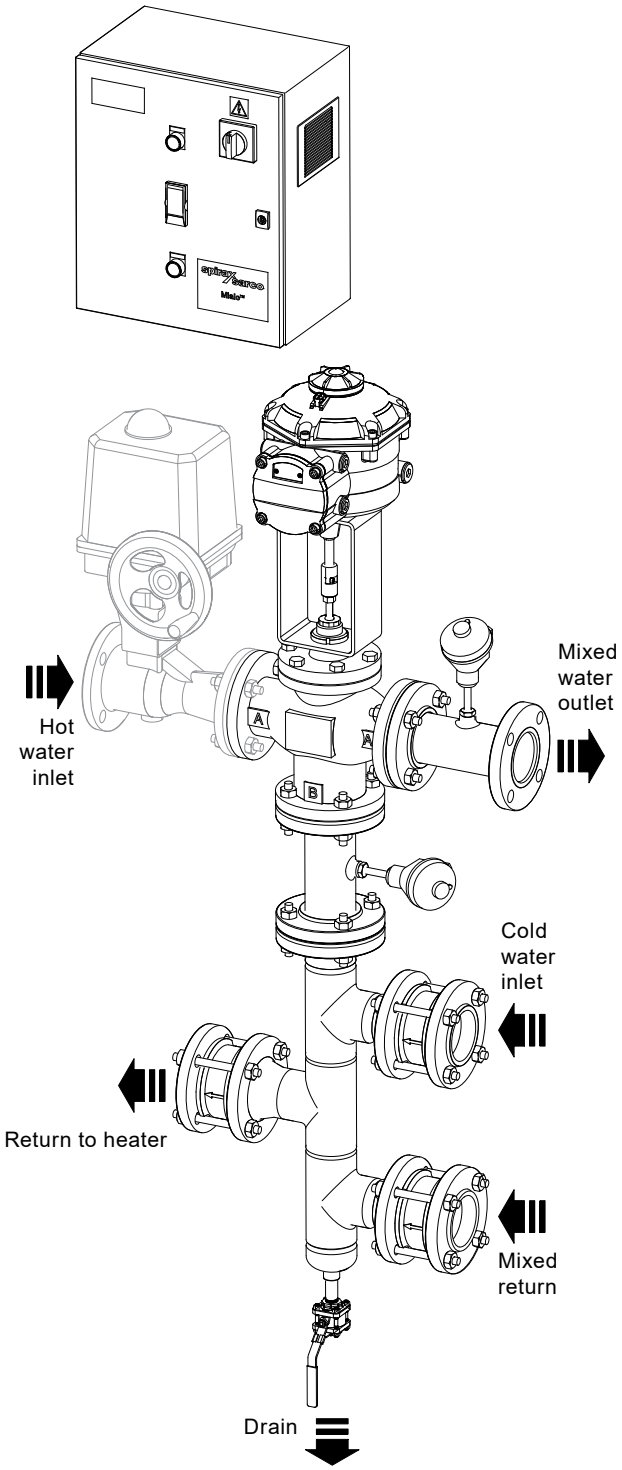
Notes:
Pressure regulators supplied are Cast Iron as standard.
½" – 2" regulators are threaded NPT as standard.
2½" – 4" regulators (for steam supply pressures up to 125 psi g (8.6 bar g)) are flanged ANSI 125 as standard.
For 2½" – 4" regulators where the steam supply pressure is above 125 psi g (8.6 bar g), consult Spirax Sarco for 150 ANSI flanged regulator pricing.

TI-P612-33-US
TES Issue 2

Mialo Water Blending System

Description

The Mialo water blending system is an efficient, safe, and cost effective solution for hot water blending. It's compact design and precise integration of pre-selected equipment ensures the delivery of constant and stable temperature, even under varying load conditions.



Operational specifications

- Fast, accurate water temperature controls
- Temperature will be controlled accurately to within +/- 2°F
- Automatic hot water flow shut off in case of cold water supply failure
- Automatic hot water flow shut off in case of sensor failure
- Automatic hot water flow shut off in case of power failure
- Programmable set point range for 80 °F to 180 °F (27 °C to 82 °C)
- Programmable real time functions, which can be used for thermal disinfection cycles, or other time specific temperature profiles
- Four programmable high/low temperature alarms
- Programmable temperature error level
- Hand wheel for manual control
- Optional high limit hot water supply solenoid valve

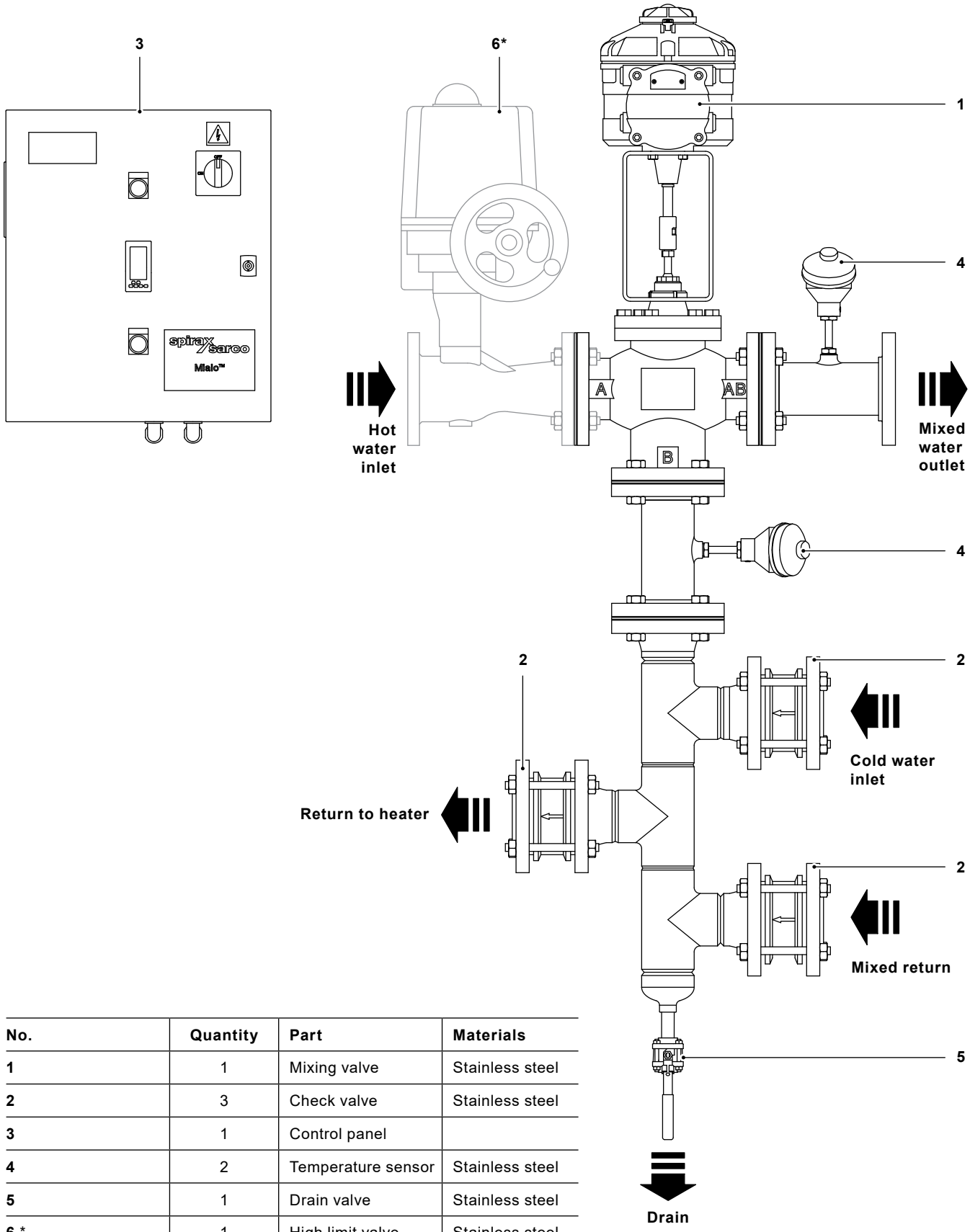
Technical specifications

- Power Supply - 120 VAC
- Enclosure - NEMA 1
- Minimum system draw off – 0 GPM
- Maximum operating pressure: 125 psi g (8.6 bar g)
- Maximum operating temperature: 230 °F (110 °C)
- Positioning time: <2 seconds

Connectivity

- Dry contact relays for all alarms, can be set to be NO or NC
- 4-20mA re-transmission of valve position, inlet temperature, or outlet temperature
- Optional BACnet connectivity

Materials



No.	Quantity	Part	Materials
1	1	Mixing valve	Stainless steel
2	3	Check valve	Stainless steel
3	1	Control panel	
4	2	Temperature sensor	Stainless steel
5	1	Drain valve	Stainless steel
6 * High limit hot water supply solenoid valve is optional	1	High limit valve	Stainless steel

Connections approximate in inches (mm)

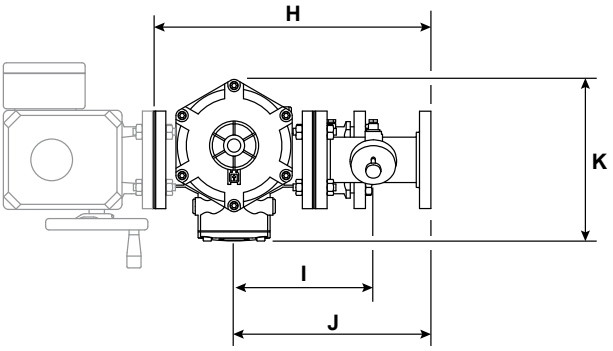
ANSI 150 connections, unless otherwise specified

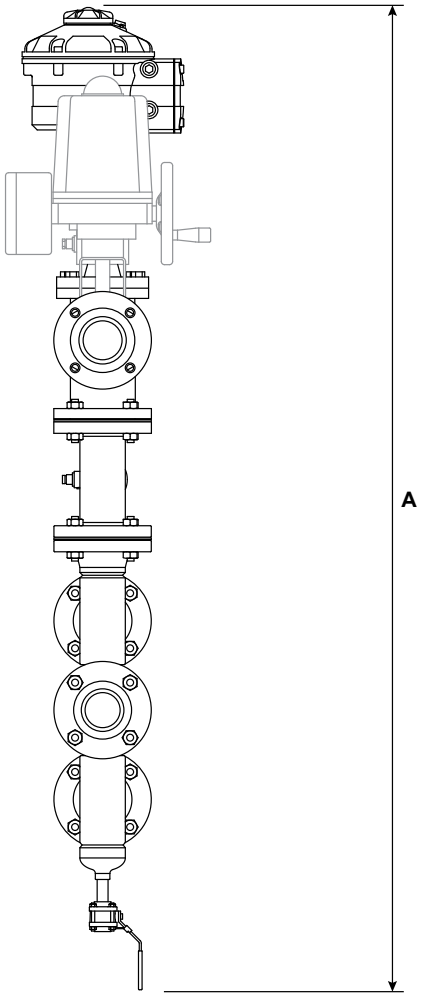
(GPM)	Hot water inlet	Mixed water outlet	Cold water inlet	Return to heater	Mixed return	Drain (NPT)
Mialo025SS	1" (25.4 mm)	1" (25.4 mm)	1" (25.4 mm)	1" (25.4 mm)	1" (25.4 mm)	½" (12.7 mm)
Mialo040SS	1½" (38.1 mm)	1½" (38.1 mm)	1½" (38.1 mm)	1½" (38.1 mm)	1½" (38.1 mm)	
Mialo050SS	2" (50.8 mm)	2" (50.8 mm)	2" (50.8 mm)	2" (50.8 mm)	2" (50.8 mm)	
Mialo065SS	2½" (63.5 mm)	2½" (63.5 mm)	2" (50.8 mm)	2" (50.8 mm)	2" (50.8 mm)	
Mialo080SS	3" (76.2 mm)	3" (76.2 mm)	3" (76.2 mm)	3" (76.2 mm)	3" (76.2 mm)	

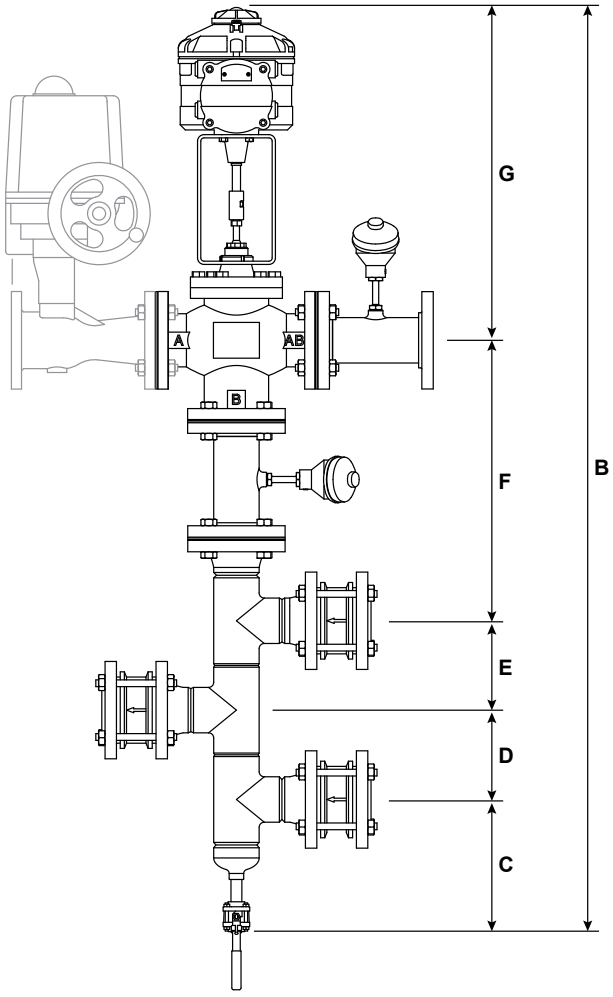
Capacity chart

Gallons Per Minute (US) (GPM)	Pressure drop psi (bar)				Min system draw off	Pipe flow @ 7.5 ft/sec	CV
	5 (0.34)	**10 (0.69)**	**15 (1.0)**	**20 (1.4)**			
Mialo025SS	26 (98.4)	38 (144)	46 (174)	54 (204)	0	20	12
Mialo040SS	65 (246)	92 (348)	112 (424)	130 (492)	0	48	29
Mialo050SS	89 (337)	126 (477)	154 (583)	178 (674)	0	78	40
Mialo065SS	160 (606)	227 (859)	279 (1056)	322 (1219)	0	112	72
Mialo080SS	259 (980)	366 (1385)	449 (1700)	518 (1961)	0	173	116

Dimensions/weights
(approximate) in inches (mm) and lbs (kg)







Model	A	B	C	D	E	F	G	H	I	J	K	Weight
Mialo025SS	57 7/16 (1459)	54 (1372)	6 1/2 (165)	5 (127)	5 (127)	13 1/2 (343)	24 (610)	18 9/16 (471)	5 1/2 (140)	11 1/4 (286)		90 (40.8)
Mialo040SS	64 11/16 (1643)	61 1/4 (1556)	6 15/16 (176)	6 (152)	6 (152)	17 1/4 (438)	25 1/16 (637)	19 15/16 (506)	7 5/16 (186)	11 1/16 (281)		140 (63.5)
Mialo050SS	73 3/16 (1859)	69 3/4 (1772)	11 11/16 (297)	6 1/2 (165)	6 1/2 (165)	19 1/2 (495)	25 3/8 (645)	23 1/4 (591)	8 15/16 (227)	12 11/16 (322)	12 7/16 (316	155 (70.3)
Mialo065SS	75 11/16 (1922)	72 1/4 (1835)				22 7/16 (570)	25 1/16 (637)	24 3/8 (619)		13 13/16 (351)		170 (77.1)
Mialo080SS	74 5/8 (1895)	71 3/16 (1808)	10 9/16 (268)	6 7/8 (175)	6 7/8 (175)	21 5/8 (549)	25 1/4 (641)	26 7/16 (672)	9 3/16 (233)	15 1/4 (387)		220 (99.8)

Note: A range of alternative body, plate and component materials are available to satisfy special applications. Please contact Spirax Sarco for further information on availability and how to order.

Optional high limit hot water supply solenoid valve is shown in grey.

TI-P222-02
TES Issue 8

EVC (Exhaust Vapour Condenser), EVC Food+ Turflow Type Heat Exchanger



Description

The Spirax Sarco EVC is based on the Turflow heat exchanger with an additional connection and utilises flash steam from discharge and exhaust vent pipework to pre-heat make-up or process water thereby recovering valuable heat energy that would otherwise be lost to atmosphere.
The Spirax Sarco EVC will improve steam system efficiency and is environmentally friendly, reducing CO^2 + carbon emissions and removing visible discharges from the atmosphere whilst saving valuable energy. It is easy to install and provides an optimised heat transfer solution when compared to other heat exchanger designs used in similar applications.
As standard the construction is completely stainless steel and the tube side is all in AISI 316. There are no gaskets (with the exception of the piping connection) and no painted components.
The heat-exchanging surface is of straight corrugated tubes designed for low viscosity fluids and for turbulent flow working conditions.
The tube sheets are of an integral type and are supplied ready for installation.

EVC Food+ available with a food contact regulation Declaration of Compliance

Designed, manufactured and approved for Steam and Condensate applications, the EVC Food+ product complies with:

- (EC)1935:2004 Materials and Articles Intended to come into Contact with Food
- (EC)2023:2006 Good Manufacturing Practice for Materials and Articles Intended to come into Contact with Food
- (EU)10/2011 Plastic Materials and Articles Intended to come into Contact with Food
- FDA Code of Federal Regulations - title 21 - Food and Drugs

This product is intended to be connected into a system that can operate a food contact compliant process.

A list of the materials that could come directly or indirectly into contact with foodstuffs can be found in the Declaration of Compliance available for this product.

Standards

Designed and manufactured in accordance with EN 13445 code and fully complies with the requirements of the Pressure Equipment Directive (PED).
Turflow type heat exchangers fully comply with the requirements of the ASME Boiler and Pressure Vessel Code and carry the "U" ASME Stamp when so required.

Certification

This product is available with a manufacturers Typical Test Report.
Note: All certification/inspection requirements must be stated at the time of order placement.

Food+ can be supplied with material Certification for all wetted parts at extra cost.
Note: All certification/inspection requirements must be stated at the time of order placement.

Food contact

For EC1935 compliance (tube side only) "FB" designation must be selected in the nomenclature at time of order.

EN	ASME	GB National standard
CE mark with Pressure Equipment Directive (PED)	ASME VIII design with U stamp certification	Chinese GB national standard

Available models

Heat exchanger	Steam mass flow		Heat load		Water flow	
	kg/h	(lb/h)	kW	(MBtu/h)	kg/h	(Gal/m)
EVC 1½" - 1F	30	(66)	19	(0.06)	804	(3.5)
EVC 2" - 1F	50	(110)	31	(0.1)	1 350	(6)
EVC 3" - 1F	100	(220)	62	(0.2)	2 690	(11.8)
EVC 4" - 1F	200	(440)	125	(0.42)	5 370	(23.5)
EVC 6" - 1F	300	(660)	187	(0.6)	8 060	(35.5)
EVC 8" - 1F	500	(1 102)	312	(1.06)	13 400	(59)
EVC 10" - 1F	750	(1 653)	469	(1.6)	20 100	(88.5)

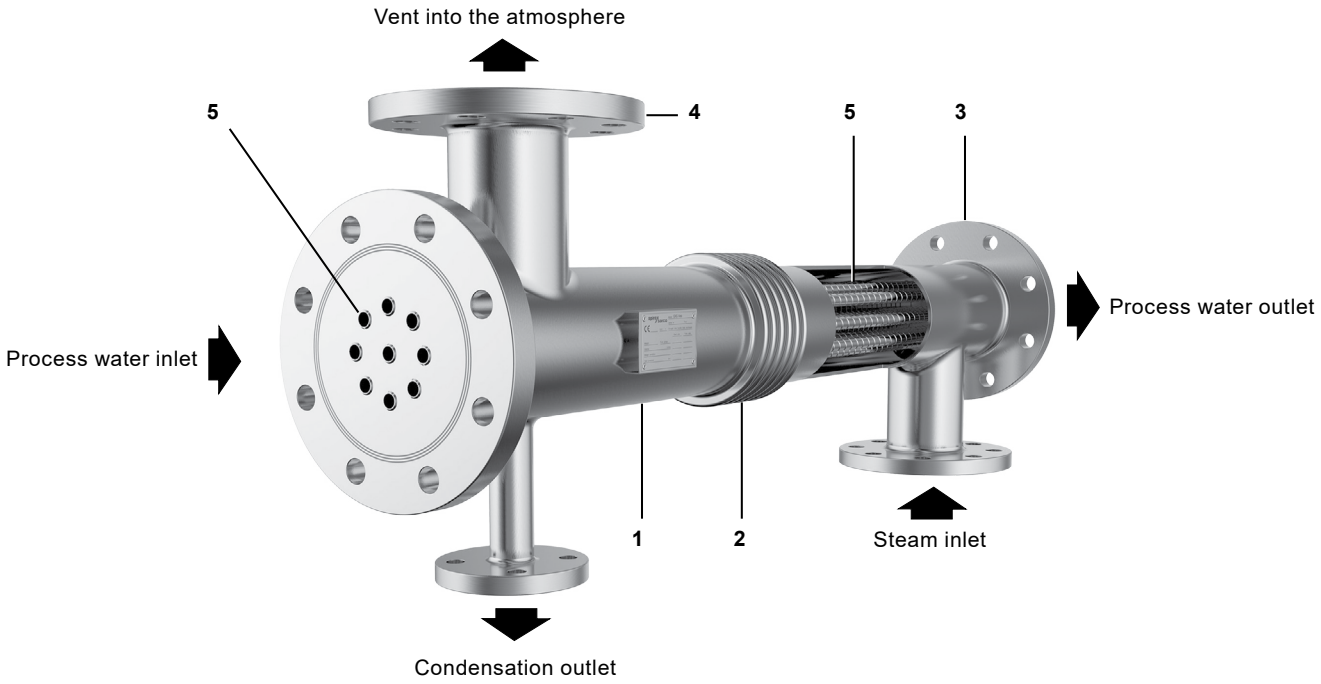
* Performance sized with water from 50 °C to 70 °C (122 °F to 158 °F).
** Sized with maximum inlet steam velocity 15 m/s (49 ft/s).

Pressure/temperature limits

TMA	Maximum allowable temperature	Shell side	6 bar g (87 psi g)	300 °C (572 °F)
		Tube side	12 bar g (174 psi g)	200 °C (392 °F)
PMA	Maximum allowable pressure	Shell side	-10 °C to +200 °C (14 °F to 392 °F)	12 bar g (174 psi g)
		Tube side		

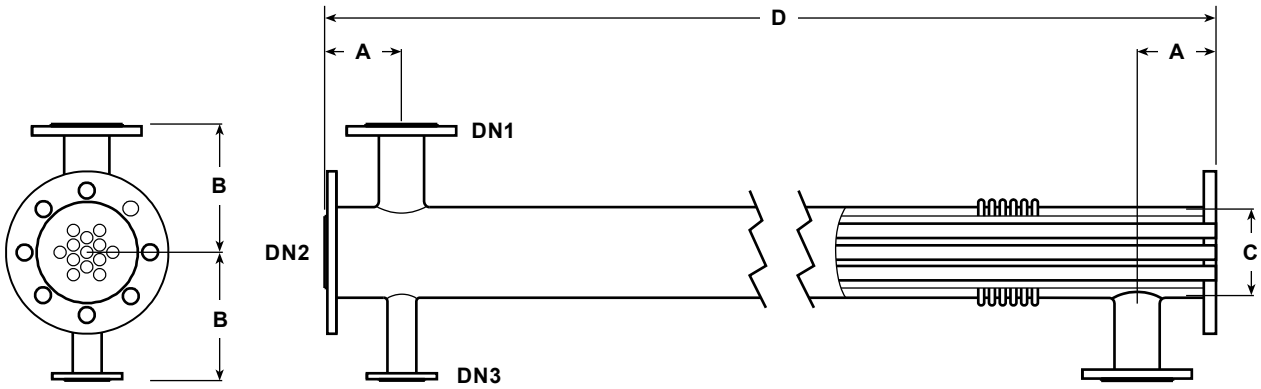
The cold hydraulic tests are performed at 21 bar g with design limit to 12 bar g (304.5 psi g with design limit to 174 psi g) and at 10.5 bar g with design limit to 6 bar g (152.2 psi g with design limit to 87 psi g). This pressure meets with the requirements of Section 7.4, attachment 1, of the Pressure Equipment Directive (PED).

Materials



No.	Part	Material	ASTM designation
1	Shell	Stainless steel	A312 TP304
2	Expansion joint	Stainless steel	A240 TP321
3	Tubesheet	Stainless steel	A182 F316
4	Shell side connections	Stainless steel	A182 F304
5	Tubes (corrugated)	Stainless steel	A249 TP316

Dimensions/weights (approximate) in mm and kg (inches and lbs)



Model	DN1	DN2	DN3	A	B	C	D	Weight
EVC 1½" - 1F	32 (1¼")	40 (1½")	15 (½")	94 (3¾")	140 (5½")	48.3 (2")	1000 (39¼")	13.2 (29)
EVC 2" - 1F	40 (1½")	50 (2")	15 (½")	90 (3½")	140 (5½")	60.3 (2¼")	1000 (39¼")	16.5 (36)
EVC 3" - 1F	65 (2½")	80 (3")	15 (½")	110 (4¼")	160 (6¼")	88.9 (3½")	1000 (39¼")	23.0 (50)
EVC 4" - 1F	80 (3")	100 (4")	25 (1")	125 (5")	180 (7")	114.3 (4½")	1000 (39¼")	36.4 (80)
EVC 6" - 1F	100 (4")	150 (6")	25 (1")	140 (5½")	220 (8½")	168.3 (6½")	1000 (39¼")	68.2 (138)
EVC 8"- 1F	125 (5")	200 (8")	32 (1¼")	160 (6¼")	250 (9¾")	219.1 (8½")	1000 (39¼")	106.0 (233)
EVC 10" - 1F	150 (6")	250 (10")	40 (1½")	180 (7")	280 (11")	273.0 (10¾")	1000 (39¼")	145.0 (319)

Table notes:

- **Dimension tolerance:**
  A = ± 3 mm,
  B = ± 3 mm,
  D = ± 6 mm,
  Flange rotation = ± 1°,
  Connection alignment = ± 3 mm.
- Flange sizes according to EN 1092-1 rating PN16, optional equivalent diameter according to ASME B16.5 rating 150 lb.
- PED categorisation assuming a 'not dangerous fluid', Group 2 according to the classification as per the Pressure Equipment Directive (PED).

Safety information, installation and maintenance

For full details see the Installation and Maintenance Instructions supplied with the product.

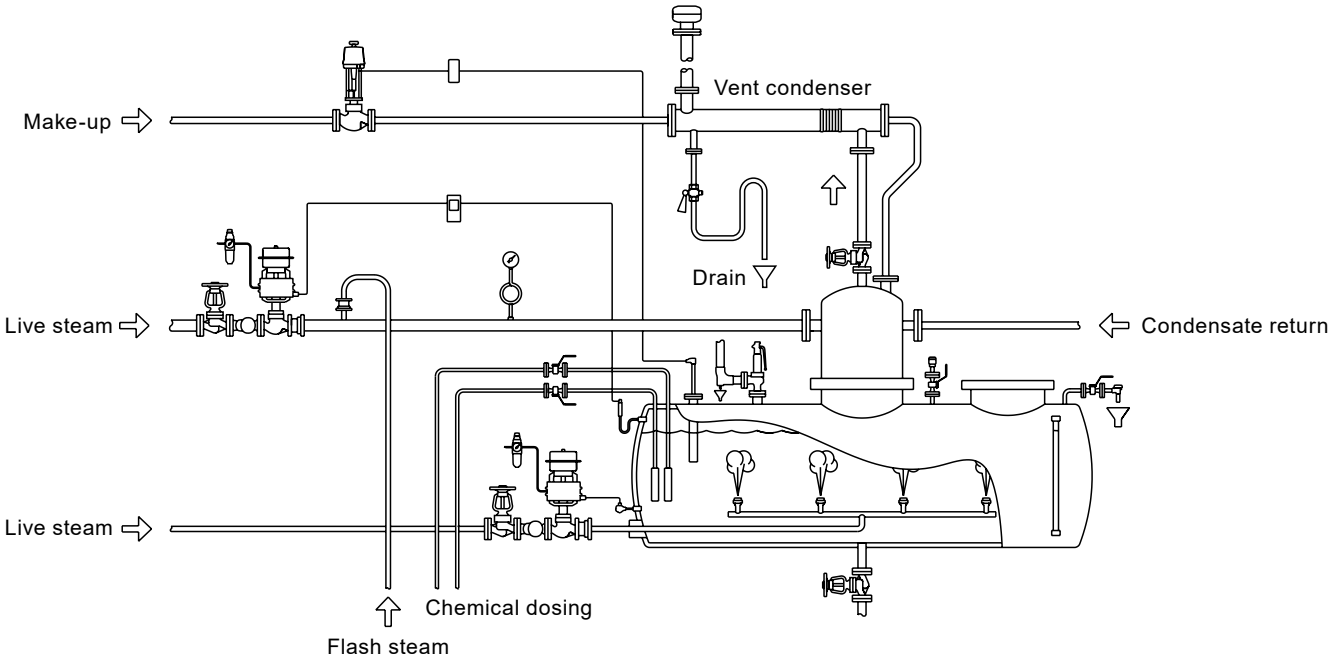
Installation note:

The installation depends on the application and on the service required; however **the unit must always be installed horizontally**.
It is always necessary that one end of the heat exchanger is allowed to move axially, in order to permit the normal expansion of the exchangers tubes during operation.
We recommend that an air vent be fitted to the unit to continuously vent during start-up and operation.
Insulation is recommended, and it is absolutely necessary, if the shell temperature is much higher than the ambient one - If insulation is required it is suggested that it be fitted on site to eradicate its damage whilst in transit.

Disposal

This product is recyclable. No ecological hazard is anticipated with the disposal of this product providing due care is taken.

Typical installation



Sizing and selection

Spirax Sarco has developed integrated thermal modelling, sizing and selection software, to select and fully optimise an EVC heat exchanger to precisely match your application needs. Trained technicians are available at your local Spirax Sarco company to ensure the correct heat exchanger is always selected. Because of Spirax Sarco's expertise and wide product range we can provide a complete heat transfer solution, advising on the most suitable control system and ancillary equipment for your heat exchanger.
Our technicians can also advise on the suitability and sizing of heat exchangers for most gases, vapours and superheated liquids other than water.

EVC product nomenclature:

Please note that other units are available on request to suit the specifics of a particular process application.

Turflow type	EVC = Large diameter tubes		EVC
Shell diameter	1½", 2", 3", 4", 6", 8", 10" = Range in inches		3"
Tube and tubesheet material	SX = Stainless steel AISI 316		SX
Tube length	1 m (39") = Range in meter		1
Connection type	F = UNI 2278/2229 PN16 flanges		FE
	FA = ANSI B16.5 Class 150 Flanges		
	FE = EN1092-1 PN16 flanges		
Mechanical code	Empty = VSR		E
	E = EN13445		
	A = ASME VIII Div.1		
Shell design pressure	V = 12 bar g (174 psi g)		V
Tube to tube sheet coupling	Empty = Expanding		
Certifications	Empty = None		
	FB = EC 1935 certificate (tube side) (**)		
PED category	Empty = CE marking not supplied		CI
	CI = Category I		
	CII = Category II		

Product selection example	EVC	3"	SX	1	FE	E	V		CI

TI-P222-03
TES Issue 8

VEP and VES, VEP and VES Food+ Turflow Heat Exchangers



Description

The Turflow heat exchanger range is a shell & tube design consisting of straight corrugated tubes within a shell. The tubes are secured at either end of the shell by fixed tube sheets.
The corrugated tube design promotes increased turbulent flow conditions to provide the Turflow's high heat transfer efficiency.
The shell incorporates a bellows type expansion joint that ensures thermal stress does not damage the heat exchanger. The shell is also fitted with drain and vent connections. The heat exchanger is a gasket free design constructed wholly from stainless steel.
Normally the heated fluid will flow through the tubes and the heating medium will be in the shell; both countercurrent and concurrent flow paths can be accommodated, inclusive of horizontal or vertical installation.

VEP and VES Food+ available with a food contact regulation Declaration of Compliance

Designed, manufactured and approved for Steam and Condensate applications, the VEP and VES Food+ product complies with:

- (EC)1935:2004 Materials and Articles Intended to come into Contact with Food
- (EC)2023:2006 Good Manufacturing Practice for Materials and Articles Intended to come into Contact with Food
- (EU)10/2011 Plastic Materials and Articles Intended to come into Contact with Food
- FDA Code of Federal Regulations - title 21 - Food and Drugs

This product is intended to be connected into a system that can operate a food contact compliant process.

A list of the materials that could come directly or indirectly into contact with foodstuffs can be found in the Declaration of Compliance available for this product.

Standards

Turflow type heat exchangers fully comply with the requirements of the EU Pressure Equipment Directive/UK Pressure Equipment (Safety) Regulations and carry the CE mark when so required. All units are supplied with a Declaration of Compliance.

Turflow type heat exchangers fully comply with the requirements of the ASME Boiler and Pressure Vessel Code and carry the "U" ASME Stamp when so required.

Certification
A manufacturer's Hydraulic Test Report and Material Certification documentation is available on request.
Note: All certification/inspection requirements must be stated at the time of order placement.

Food+ can be supplied with material Certification for all wetted parts at extra cost.
Note: All certification/inspection requirements must be stated at the time of order placement.

EN	ASME	GB National standard
CE mark with PED EU Pressure Equipment Directive/UK Pressure Equipment (Safety) Regulations	ASME VIII design with U stamp certification	Chinese GB national standard

Food contact
For EC1935 compliance (tube side only) "FB" designation must be selected in the nomenclature at time of order.

Pressure/temperature limits

		DIN	ASME
PMA Shell/Tube side	-10 °C to 200 °C	12 bar g (176 psi g)	12 bar g (176 psi g)
	200 °C to 300 °C	6 bar g (87 psi g)	6 bar g (87 psi g)
	This option is to be specified at the time of order placement.		
TMA Shell/Tube side	12 bar g	-10 °C to 200 °C (14 °F to 392 °F)	-10 °C to 200 °C (14 °F to 392 °F)
	6 bar g	200 °C to 300 °C (392 °F to 572 °F)	200 °C to 300 °C (392 °F to 572 °F)
	This option is to be specified at the time of order placement.		
Cold hydraulic test pressure		21 bar g with design limit to 12 bar g (304.5 psi g with design limit to 174 psi g)	17.1 bar g with design limit to 12 bar g (241 psi g) with design limit to 174 psi g)
		10.5 bar g with design limit to 6 bar g (152.2 psi g with design limit to 87 psi g)	8.55 bar g with design limit to 12 bar g (124 psi g with design limit to 174 psi g)

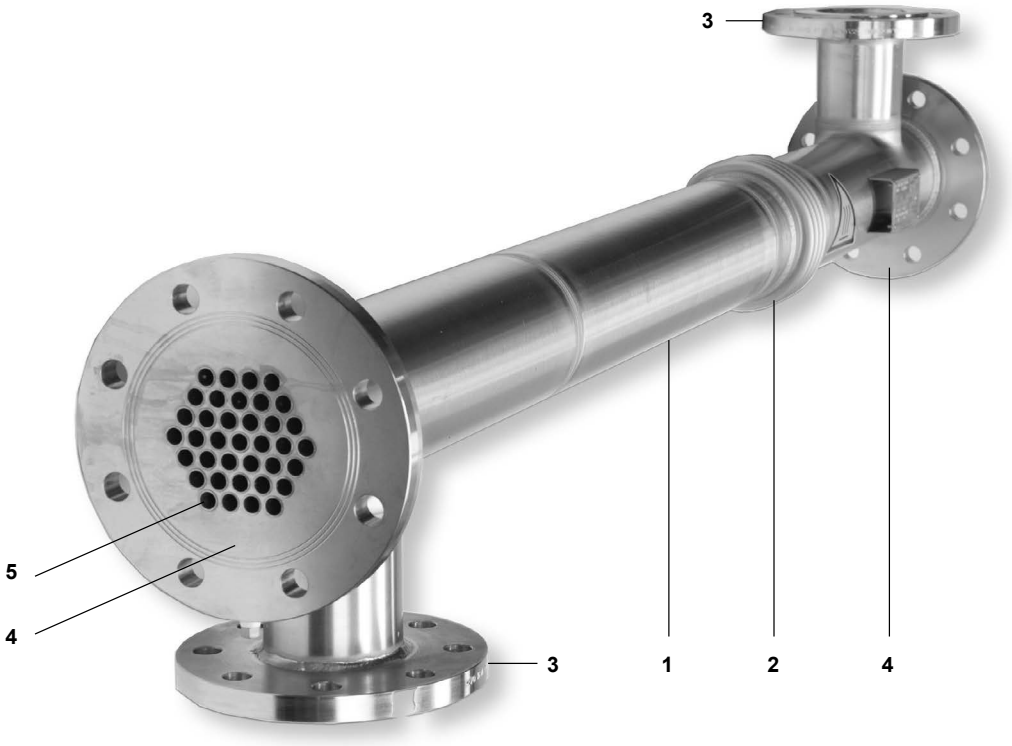
Turflow type heat exchangers
The **VEP** design is fitted with small diameter tubes.
The **VES** design is fitted with large diameter tubes.
Please contact Spirax Sarco for advice regarding selection – The most suitable unit will be selected by Spirax Sarco and will be specific for the given application.

Sizes and end connections

Type	Shell length (metres)	Shell Ø	Connections
VEP	0.6, 1, 1.5 and 2 *	1½", 2", 3" 4", 5", 6", 8" and 10"	Flanged EN 1092 PN16 or ASME B16.5 Class 150
VES	1, 2 and 3	2", 3" 4", 5", 6", 8" and 10"	Flanged EN 1092 PN16 or ASME B16.5 Class 150

* **Note** 0.6 and 1.5 shell lengths are not available for shell diameters 5" to 10".

Materials



No.	Part		Material		Surface finish
1	Shell		Stainless steel	ASTM A312 – TP304	Pickling
2	Expansion joint		Stainless steel	ASTM A240 – TP321	Pickling
3	Shell side flanges		Stainless steel	ASTM A182 F304	Pickling
4	Tube sheets/tube side flanges (Different options available according to the specific model)	SX	Stainless steel 316	ASTM A182 F316	Pickling
		SS	Stainless steel 304	ASTM A182 F304	
5	Corrugated tubes (Different options available according to the specific model)	SX	Stainless steel 316	ASTM A249-TP316L	Pickling *
		SS	Stainless steel 304	ASTM A249-TP304	

*** Note** "FB" version will undergo tube side passivation internal tube in addition to specified treatments.

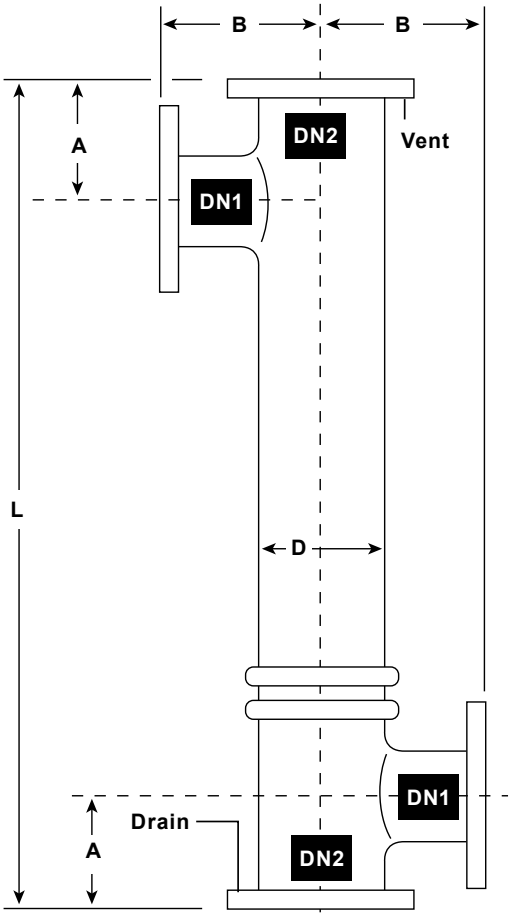
Dimension for shell size 1½" and 2" (approximate) in mm (inches)

Weight in Kg (Lbs) and Volume in Ltr (gal)

							VEP				VES			
Shell	Flange		Dimensions				Weight	Volume		PED Cat.	Weight	Volume		PED Cat.
Ø	DN1	DN2	A	B	D	L		Tube	Shell			Tube	Shell	
1½"	DN32 (1¼")	DN40 (1½")	94 (3½")	140 (5½")	48.3 (2")	600 (23½")	11.2 (24.5)	0.21 (0.05)	0.84 (0.22)	SEP	-	-	-	-
						1000 (39½")	12.4 (27.3)	0.35 (0.09)	1.28 (0.33)	SEP	-	-	-	-
						1500 (59")	14 (30.8)	0.53 (0.14)	1.85 (0.48)	SEP	-	-	-	-
						2000 (78¾")	15.5 (34)	0.71 (0.18)	2.42 (0.64)	SEP	-	-	-	-
2"	DN40 (1½")	DN50 (2")	90 (3½")	140 (5½")	60.3 (2¼")	600 (23½")	13.9 (30.6)	0.46 (1.12)	1.18 (0.31)	SEP	-	-	-	-
						1000 (39½")	15.8 (34.8)	0.76 (0.20)	1.81 (0.47)	SEP	15 (33)	0.85 (0.22)	1.86 (0.49)	SEP
						1500 (59")	18.2 (40)	1.15 (0.30)	2.59 (0.68)	SEP	-	-	-	-
						2000 (78¾")	20.5 (45)	1.53 (0.40)	3.88 (1.02)	SEP	19 (42)	1.69 (0.44)	3.42 (0.90)	SEP
						3000 (118")	-	-	-	-	22.9 (50)	2.54 (0.67)	4.98 (1.31)	I

Table notes:

- Dimension tolerance:
  A = ± 3 mm,
  B = ± 3 mm,
  L = ± 6 mm,
  Flange rotation = ± 1°,
  Connection alignment = ± 3 mm.
- Flange sizes according to EN 1092-1 rating PN16, optional equivalent diameter according to ASME B16.5 rating 150 lb.
- PED categorisation Group 2 according to the classification as per the EU Pressure Equipment Directive/UK Pressure Equipment (Safety) Regulations.



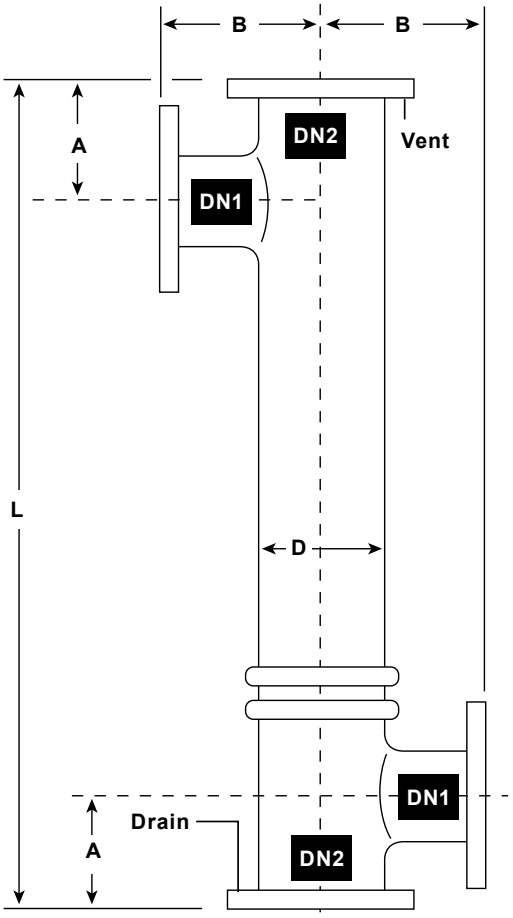
Dimension for shell size 3" and 4" (approximate) in mm (inches)

Weight in Kg (Lbs) and Volume in Ltr (gal)

							VEP				VES			
Shell	Flange		Dimensions				Weight	Volume		PED Cat.	Weight	Volume		PED Cat.
Ø	DN1	DN2	A	B	D	L		Tube	Shell			Tube	Shell	
3"	DN65 (2½")	DN80 (3")	110 (4¼")	160 (6¼")	88.9 (3½")	600 (23½")	19.7 (43)	1.07 (0.5)	2.63 (0.7)	SEP	-	-	-	-
						1000 (39½")	22.5 (49)	1.79 (0.4)	3.95 (1)	SEP	23.9 (53)	2.0 (0.52)	4.3 (1.1)	I
						1500 (59")	25.9 (57)	2.67 (0.7)	5.63 (1.5)	I	-	-	-	-
						2000 (78¾")	29.3 (65)	3.57 (0.9)	7.24 (1.9)	I	32.1 (70)	3.9 (1)	7.7 (2)	I
						3000 (118")	-	-	-	-	40.3 (88)	5.9 (1.55)	11.1 (2.93)	I
4"	DN80 (3")	DN100 (4")	125 (5")	180 (7")	114.3 (4½")	600 (23½")	28.3 (62)	1.88 (0.5)	4.15 (1.1)	SEP	-	-	-	-
						1000 (39½")	35.3 (78)	3.14 (0.8)	6.25 (1.6)	I	32.3 (70)	3.7 (0.98)	6.4 (1.7)	I
						1500 (59")	44.1 (97)	4.71 (1.2)	8.88 (2.4)	I	-	-	-	-
						2000 (78¾")	52.8 (116)	6.28 (1.6)	10.5 (2.7)	I	46.9 (103)	7.4 (1.9)	11.4 (3)	I
						3000 (118")	-	-	-	-	61.5 (135)	11.1 (2.93)	16.4 (4.3)	I

Table notes:

- Dimension tolerance:
  A = ± 3 mm,
  B = ± 3 mm,
  L = ± 6 mm,
  Flange rotation = ± 1°,
  Connection alignment = ± 3 mm.
- Flange sizes according to EN 1092-1 rating PN16, optional equivalent diameter according to ASME B16.5 rating 150 lb.
- PED categorisation Group 2 according to the classification as per the EU Pressure Equipment Directive/UK Pressure Equipment (Safety) Regulations.



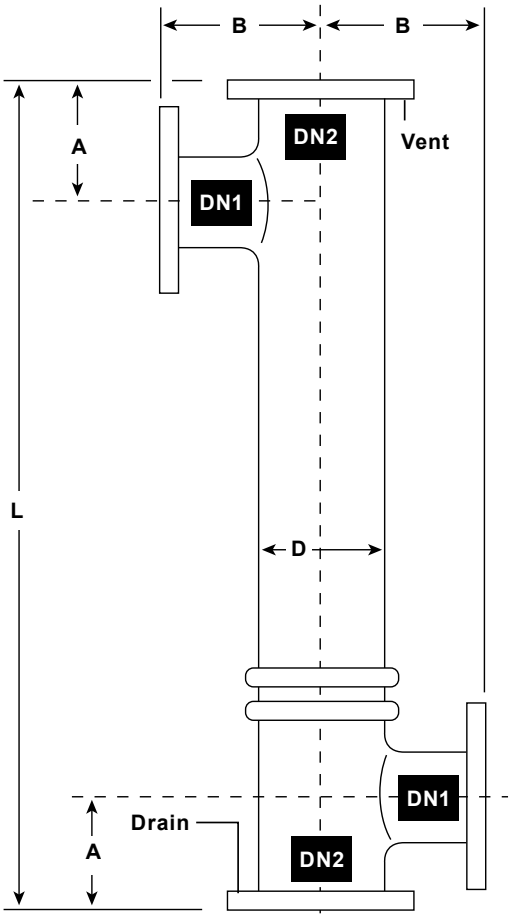
Dimension for shell size 5" and 6" (approximate) in mm (inches)

Weight in Kg (Lbs) and Volume in Ltr (gal)

							VEP				VES			
Shell	Flange		Dimensions				Weight	Volume		PED Cat.	Weight	Volume		PED Cat.
Ø	DN1	DN2	A	B	D	L		Tube	Shell			Tube	Shell	
5"	DN80 (3")	DN125 (5")	125 (5")	200 (8")	141.3 (5½")	1000 (39½")	49 (108)	5.18 (1.3)	8.5 (2.2)	I	43.7 (96)	5.9 (1.5)	9.0 (2.3)	I
						2000 (78¾")	77.6 (171)	10.36 (2.7)	16.07 (4.2)	I	67 (147)	11.7 (3)	16.6 (4.3)	I
						3000 (118")	-	-	-	-	90.3 (198)	17.6 (4.6)	24.2 (6.4)	II
6"	DN100 (4")	DN150 (6")	140 (5½")	220 (8½")	168.3 (6½")	1000 (39½")	67.7 (149)	7.73 (2)	11.88 (3)	I	58.7 (127)	8.1 (2)	13.4 (3.5)	I
						2000 (78¾")	106.9 (236)	15.45 (4)	22.06 (5.8)	II	88.6 (194)	16.1 (4)	24.5 (6.5)	II
						3000 (118")	-	-	-	-	118.5 (260)	24.1 (6.3)	35.6 (9.4)	II

Table notes:

- Dimension tolerance:
  A = ± 3 mm,
  B = ± 3 mm,
  L = ± 6 mm,
  Flange rotation = ± 1°,
  Connection alignment = ± 3 mm.
- Flange sizes according to EN 1092-1 rating PN16, optional equivalent diameter according to ASME B16.5 rating 150 lb.
- PED categorisation Group 2 according to the classification as per the EU Pressure Equipment Directive/UK Pressure Equipment (Safety) Regulations.



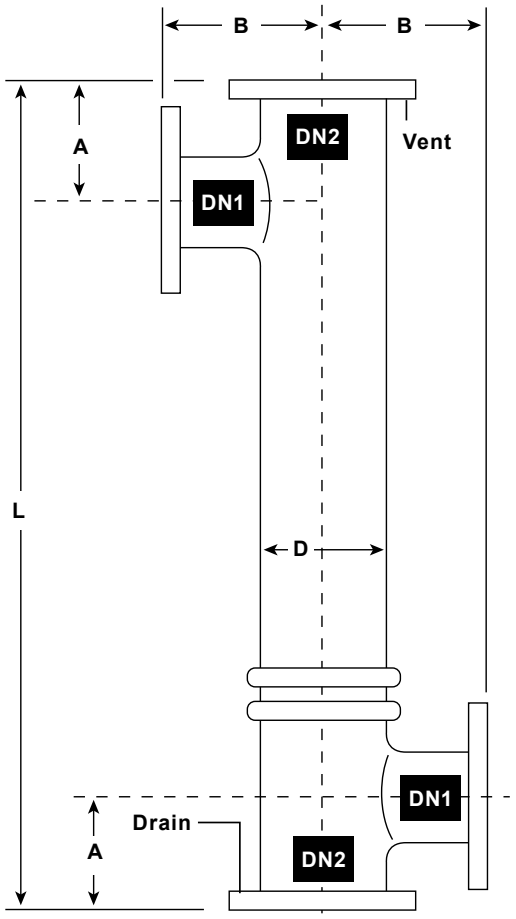
Dimension for shell size 8 and 10" (approximate) in mm (inches)

Weight in Kg (Lbs) and Volume in Ltr (gal)

							VEP				VES			
Shell	Flange		Dimensions				Weight	Volume		PED Cat.	Weight	Volume		PED Cat.
Ø	DN1	DN2	A	B	D	L		Tube	Shell			Tube	Shell	
8"	DN125 (5")	DN200 (8")	160 (6¼")	250 (10")	219.1 (8½")	1000 (39½")	103.3 (227)	12.7 (3.3)	18.74 (5)	II	86 (189)	13.3 (3.4)	23.2 (6)	II
						2000 (78¾")	168.9 (372)	25.6 (6.6)	35.5 (9.3)	II	132 (291)	26.5 (7)	42.8 (11.3)	II
						3000 (118")	-	-	-	-	178.4 (392)	39.7 (10.5)	62.5 (16.5)	II
10"	DN150 (6")	DN250 (10")	180 (7")	280 (11")	273.0 (10¾")	1000 (39½")	171 (377)	20.2 (5.2)	29.1 (7.6)	II	142.2 (313)	19.3 (5.1)	35.6 (9.4)	II
						2000 (78¾")	270.5 (595)	40.5 (10.5)	55 (14.5)	II	209.5 (461)	38.5 (10)	67.5 (17.8)	II
						3000 (118")	-	-	-	-	276.7 (608)	57.7 (15.2)	99.3 (26.2)	III

Table notes:

- Dimension tolerance:
  A = ± 3 mm,
  B = ± 3 mm,
  L = ± 6 mm,
  Flange rotation = ± 1°,
  Connection alignment = ± 3 mm.
- Flange sizes according to EN 1092-1 rating PN16, optional equivalent diameter according to ASME B16.5 rating 150 lb.
- PED categorisation Group 2 according to the classification as per the EU Pressure Equipment Directive/UK Pressure Equipment (Safety) Regulations.



Product nomenclature

Turflow type	VEP = Small diameter tubes		**VES**
	VES = Large diameter tubes		
Shell diameter	1½", 2", 3", 4", 5", 6", 8" and 10" = VEP range in inches		**2"**
	2", 3", 4", 5", 6", 8" and 10" = VES range in inches		
Tube and tube sheet material	SS = Stainless steel AISI 304		**SX**
	SX = Stainless steel AISI 316L		
Tube length	0.6 , 1, 1.5, 2 = VEP range in metres		**3**
	1, 2, 3 = VES range in metres		
Connections type	F = UNI 2278/2229 PN16 flanges	**(*) (**)**	**FE**
	FE = EN1092-1 PN16 flanges	**(**)**	
	FA = ASME B16.5 Class 150 flanges	**(^)**	
Mechanical code	Empty = VSR	**(*) (**)**	**E**
	E = EN13445	**(**)**	
	A = ASME VIII Div.1	**(*) (^)**	
Shell design pressure	V = 12 bar		**V**
	Empty = Other	**(*)**	
Tube to tube sheet coupling	Empty = Expanding	**(^)**	**S**
	S = Welding		
Certifications	Empty = None		
	FB = EC 1935 certificate (tube side)	**(**)**	
PED category (not relevant for ASME version)	Empty = CE marking not supplied		**CI**
	CI = Category I		
	CII = Category II		
	CIII = Category III		

(*) = Option not standard for EN version – available on request
(**) = Option not standard for ASME version – available on request
(^) = Not available for "FB" version

Product selection example	**VES**	**2"**	**SX**	**3**	**FE**	**E**	**V**	**S**		**CI**

How to order

Contact your local Spirax Sarco office with your application details - We will provide the correct product selection, and quotation for the Turflow exchanger that will provide optimum performance for your application.