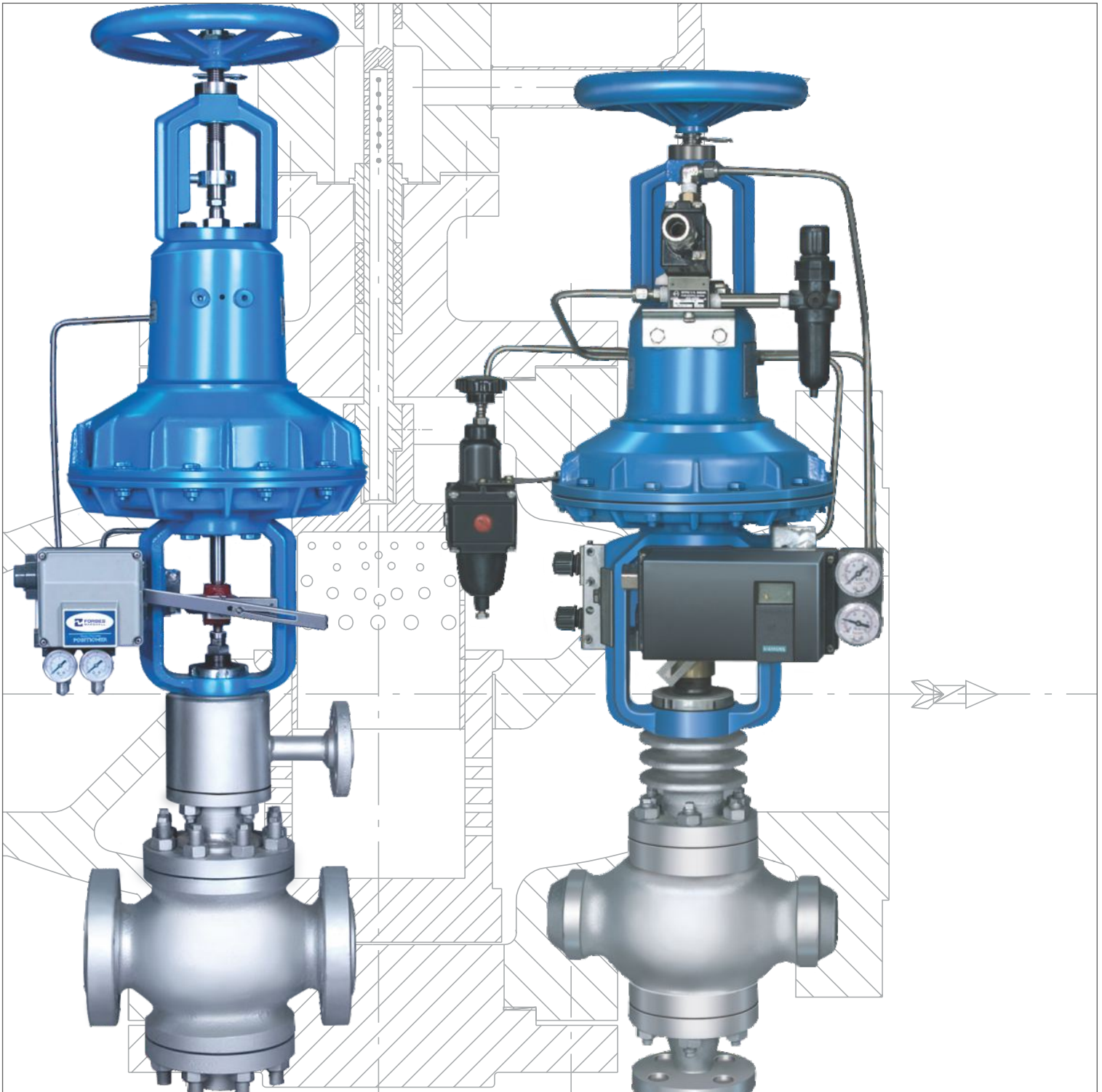




Pressure Reducing and Desuperheating Valves

Solutions for Steam Conditioning Applications

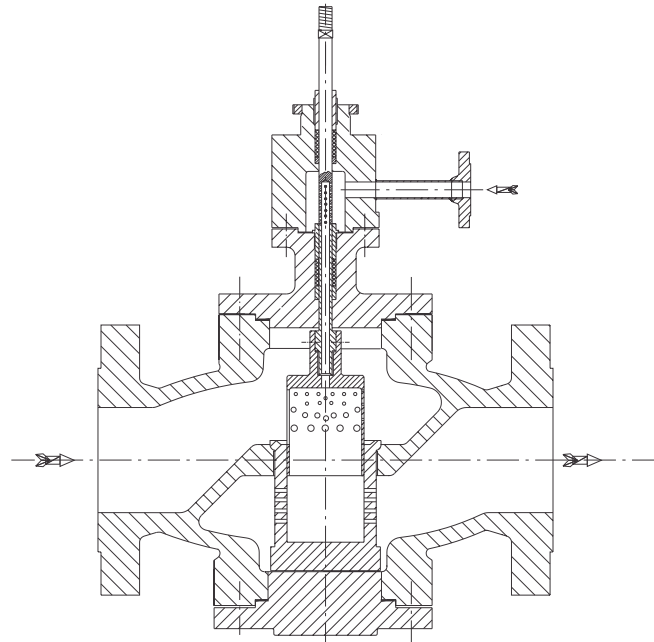


Pressure Reducing and Desuperheating Valves

The conventional method of pressure reducing and desuperheating steamcalls for a pressure reducing valve followed by a desuperheater.

We bring together the most advanced technologies to reduce pressure and temperature of steam in a single combined pressure reducing and desuperheating system (PRDS).

With an installed base of over 6000 combined pressure reducing and desuperheating systems, we rank among the world's leading suppliers of combined PRDS valves. .



Features

- Pressure reduction and desuperheating in a single valve
- Immediate response to flow changes
- No waterhammer
- No water carryover problems
- Efficient mixing of spray water
- Compact design
- Reduces need for separate desuperheater which reduces labour
- Reduces length of piping because of elimination of separate desuperheater
- Available in various types like water entry from top or bottom as per water quantity and pressure available at site
- Water is injected at the 'Vena Contracta' point which is the most turbulent zone causing complete atomization
- High turndown ratio possible
- Improved rate of heat transfer
- Easy maintenance
- Some designs don't contain a nozzle which avoids possibility of choking

Typical Applications

- Turbine Bypass
- Condensor Dump
- Main Steam Line
- Turbine Extraction
- Auxiliary PRDSH
- Deaerator Pegging
- Ejector and Gland Sealing

PRDS Valve Models

Series 540-water entry from top of PRDS

For high steam pressure drop and high spray water quantity requirement.

Series 520-water entry from bottom of PRDS

Through stem : For low steam pressure drop and high or low spray water quantity requirement.

Through nozzle: For high steam pressure drop and low water quantity requirement (available only in valve sizes 1" and 2").

Specifications for Combined PRDS valve

Body material

Carbon steel, alloy steel, others on request

Trim material

SS 410 nitrited, SS 431 nitrited, SS 321 nitrited, A182 F22

Trim Form

Parabolic, perforated

Standard Characteristics

Linear, equal %, modified on request

End Connections

Flanged to ANSI standards, butt weldable, socket weldable

Bonnet

Standard, extended (cooling finned), Water cooled

Packing Material

Graphite

Rangeability

40:1

Sizing Parameters

Process parameters needed for PRDS valve sizing (min/max)

Steam flow (Inlet) (kg/hr)

Inlet pressure [bar(g)]

Outlet oressure [bar(g)]

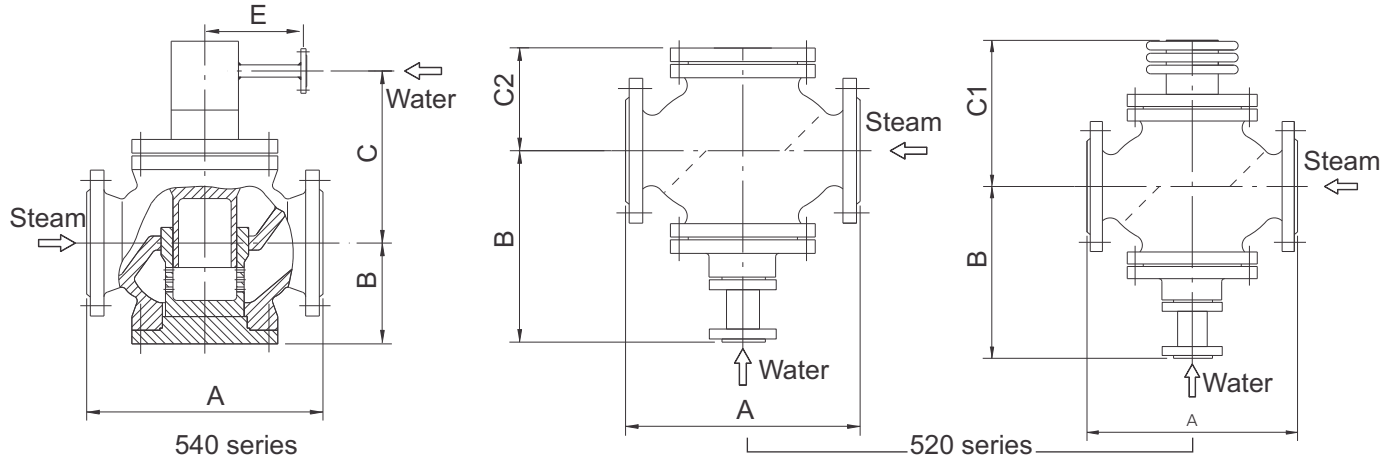
Inlet temperature (°C)

Outlet temperature (°C)

Water pressure [bar(g)]

Water temperature (°C)

Dimensions and Weight of Combined PRDS Valve



Series 540 Water Entry Through Top

Ansi Class		#300										#600									
Size (NB)	Size (Inch)	A mm	A Inch	B mm	B Inch	C mm	C Inch	E mm	E Inch	Wt Kgs	Wt Lbs	A mm	A Inch	B mm	B Inch	C mm	C Inch	E mm	E Inch	Wt Kgs	Wt Lbs
50	2	267	10.5	100	3.9	228	8.9	74	2.9	38	83.7	286	11.2	133	5.2	221	8.7	74	2.9	52	114.6
80	3	317	12.4	120	4.7	282	11.1	74	2.9	58	127.8	356	14.0	181	7.1	275	10.8	74	2.9	90	198.4
100	4	369	14.5	184	7.2	286	11.2	74	2.9	81	178.5	394	15.5	218	8.5	310	12.2	74	2.9	161	355.0
150	6	473	18.6	180	7.0	356	14.0	63	2.4	144	317.4	508	20.0	239	9.4	400	15.7	63	2.4	327	721.0
200	8	568	22.3	220	8.6	375	14.7	63	2.4	215	694.4	610	24.0	308	12.1	448	17.6	63	2.4	545	1201.5
250	10	708	27.8	317	12.4	504	19.8	65	2.5	468	1031.7	787	31.0	304	11.9	645	25.4	133	5.2	1080	2381.0
300	12	775	30.5	341	13.4	659	25.9	133	5.2	728	1605.0	-	-	-	-	-	-	-	-	-	-

Ansi Class		#900										#1500									
Size (NB)	Size (Inch)	A mm	A Inch	B mm	B Inch	C mm	C Inch	E mm	E Inch	Wt Kgs	Wt Lbs	A mm	A Inch	B mm	B Inch	C mm	C Inch	E mm	E Inch	Wt Kgs	Wt Lbs
50	2	375	14.7	89	3.5	221	8.7	74	2.9	59	130.0	-	-	-	-	-	-	-	-	-	-
80	3	381	15.0	182	7.1	275	10.8	74	2.9	105	231.4	470	18.5	187	7.3	283	11.1	74	2.9	129	284.4
100	4	457	18.0	218	8.5	310	12.2	74	2.9	191	421.0	-	-	-	-	-	-	-	-	-	-
150	6	610	24.0	220	8.6	408	16.0	82	3.2	380	837.7	787	31.0	284	11.1	408	16.0	82	3.2	395	870.8

Series 520 Water Entry Through Bottom

Ansi Class		#300										#600									
Size (NB)	Size (Inch)	A mm	A Inch	B mm	B Inch	C2 mm	C2 Inch	C1 mm	C1 Inch	Wt Kgs	Wt Lbs	A mm	A Inch	B mm	B Inch	C2 mm	C2 Inch	C1 mm	C1 Inch	Wt Kgs	Wt Lbs
25	1	197	7.7	219	8.6	81	3.1	166	6.5	14	30.8	210	8.2	190	7.4	133	5.2	159	6.2	24	52.9
50	2	267	10.5	253	9.9	121	4.7	225	8.8	37	81.5	286	11.2	279	11.0	131	5.1	189	7.4	51	112.4
80	3	317	12.4	263	10.3	142	5.6	247	9.7	58	127.8	-	-	-	-	-	-	-	-	-	-
100	4	369	14.5	274	10.7	152	6.0	257	10.1	79	174.1	394	15.5	334	13.1	225	8.8	303	12.0	161	354.9
150	6	473	18.6	364	14.3	213	8.4	339	13.3	144	317.4	-	-	-	-	-	-	-	-	-	-
200	8	568	22.3	355	13.9	244	9.6	369	14.5	215	474.0	-	-	-	-	-	-	-	-	-	-
250	10	708	27.8	424	16.7	320	12.6	468	18.4	467	1029.5	-	-	-	-	-	-	-	-	-	-
300	12	775	30.5	555	21.8	388	15.2	-	-	867	1911.4	-	-	-	-	-	-	-	-	-	-

Ansi Class		#900										#1500									
Size (NB)	Size (Inch)	A mm	A Inch	B mm	B Inch	C2 mm	C2 Inch	C1 mm	C1 Inch	Wt Kgs	Wt Lbs	A mm	A Inch	B mm	B Inch	C2 mm	C2 Inch	C1 mm	C1 Inch	Wt Kgs	Wt Lbs
25	1	273	10.7	190	7.4	133	5.2	159	6.2	34	74.9	273	10.7	190	7.4	133	5.2	161	6.3	38	83.7
50	2	375	14.7	205	8.0	-	-	189	7.4	59	130.0	-	-	-	-	-	-	-	-	-	-

Notes

C2 = without cooling fins, C1 = with cooling fins

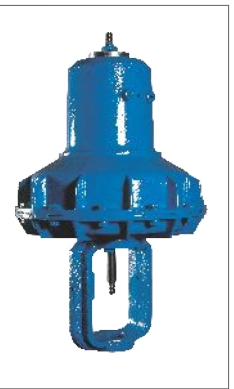
Mentioned weight is for subassembly of PRDS

Bottom entry through nozzle design is available only in 1" and 2" sizes

Universal Diaphragm Actuator - Series UI, UIII and UV

High actuating power at affordable cost

Forbes Marshall universal diaphragm actuator series UI, UIII and UV features a pneumatic actuator designed for applications that demand high actuating power. Its optional reinforced spring with compact air chamber delivers up to 14000 lbf thrust force for extreme pressure control applications. These diaphragm actuators can be fitted with standard accessories like positioner, feed-back transmitter, limit switches and air-filter regulator. Optional hand wheel is provided for emergency operations.



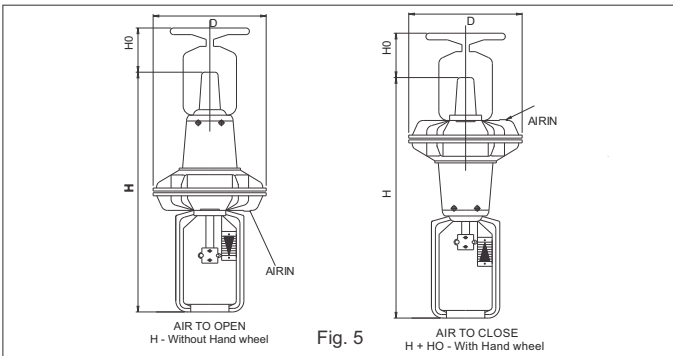
Actuator Technical Information

Temperature range	-13°C to 90°C
Maximum operating pressure	6 bar (g)
Linearity	< 2%
Hysteresis	Max. 3%
Air supply connection	¼" NPT*

*Others available on request

Materials

Diaphragm housing	Diecast Aluminium
Diaphragm	Purbunan Rubber
Springs	Stainless Chrome Steel
Spindle	Stainless Chrome Steel
Yoke	S G Iron



	H+HO	H	D
UI-20	630	495	270
UI-30	640	505	270
UIII-30	920	723	392
UIII-60	950	753	392
UV-60	1290	995	530
UV-100	1300	1005	530
UV-120	1315	1020	530

Features

- Field reversible - flexible control action
- High thrust forces - usable in extreme pressure reductions
- Low maintenance - less inventory
- Cast aluminum housing - light weight and corrosion resistance

Thrust force (Kgs) - Air to Close

Air Supply Range Bar	Standard UI-20 UI-30 0.2-1.0 Bar	Standard UIII-30 UIII-60 0.2-1.0 Bar	Standard UV-60 UV-100 UV-120 0.2-1.0 Bar
2.8	560	1270	2540
3.0	620	1410	2820
3.5	776	1760	3525
4.0	930	2115	4230
4.5	1085	2470	4935
5.0	1240	2820	5640
5.5	1395	3170	6345
6.0	1550	3525	7050

Note Side mounted handwheel available on request

Actuator weight remains same irrespective of spring range and actuator action
Above spring ranges are applicable for parabolic trims. For perforated, pressure balanced and three way trims spring ranges will be selected on a case to case basis

Thrust force (Kgs) - Air to Open

Actuator Model	Spring Range (Bar g)		Diaphragm Area (sq. cm)	Air to Open Spring to Close Thrust Force (Kgs)	With Handwheel		Without Handwheel		
	From	To			Kgs	Lbs	Kgs	Lbs	
UI-20.n	0.2	1	320	60	19	42	16.8	37	
	UI-20.n	0.4		1.2					125
	UI-20.n	0.6		1.4					185
	UI-20.n	0.8		1.6					250
	UI-20.n	1		1.8					310
UI-20.v	1.2	2.25		370					
	UI-20.v	1.4		2.45					435
	UI-20.v	1.6		2.65					500
	UI-20.v	1.8		2.25					560
	UI-30.n	0.2		1					60
UI-30.n	0.4	1.2		125					
UI-30.n	0.6	1.4		185					
UI-30.n	0.8	1.6		250					
UI-30.n	1	1.8		310					
UI-30.v	1.2	2.8		370					
UI-30.v	1.4	3	435						
UIII-30.n	0.2	1	720	140	49	108	45	99	
	UIII-30.n	0.4		1.2					280
	UIII-30.n	0.6		1.4					425
	UIII-30.n	0.8		1.6					565
	UIII-30.n	1		1.8					705
	UIII-30.v	1.2		2					845
	UIII-30.v	1.4		2.2					985
	UIII-30.v	1.6		2.4					1130
	UIII-30.v	1.8		2.6					1270
	UIII-30.v	2		2.8					1410
UIII-30.v	2.2	3		1550					
UIII-60.n	0.2	1		140					
	UIII-60.n	0.4		1.2					280
	UIII-60.n	0.6		1.4					425
	UIII-60.n	0.8		1.6					565
	UIII-60.v	1		2.6					705
UIII-60.v	1.2	2.8		845					
UIII-60.v	1.4	3		990					
UV-60.n	0.2	1		280					
UV-60.n	0.4	1.2		565					
UV-60.n	0.6	1.4		845					
UV-60.n	0.8	1.6		1130					
UV-60.n	1	1.8		1410					
UV-60.v	1.2	2.45		1690					
UV-60.v	1.4	2.65		1975					
UV-60.v	1.6	2.85		2255					
UV-60.v	1.75	3		2465					
UV-60.v	2.4	4.5		2800					
UV-60.v	2.9	4.55		3000					
UV-100.n	0.2	1		280					
UV-100.n	0.4	1.2	565						
UV-100.n	0.6	1.4	845						
UV-100.v	0.8	2.8	1130						
UV-100.v	1	3	1410						
For 10", 12" and 14"									
UV-120.n	0.2	1	1440	280	105.6	233	99.8	220	
UV-120.n	0.4	1.2		570					
UV-120.n	0.6	1.4		845					
UV-120.v	0.8	2.8		1130					
UV-120.v	1	3		1410					
For 16"									
UV-120.n	0.2	1.2	1440	250	105.6	233	99.8	220	
UV-120.n	0.4	1.5		650					
UV-120.v	0.6	3		840					

Technical Data Series 250 / 540

Kv / Cv Values for Parabolic Trim

Valve Size (mm / Inch)																					
15 / 0.5		25 / 1		40 / 1.5		50 / 2		80 / 3		100 / 4		150 / 6		200 / 8		250 / 10		300 / 12		400 / 16	
Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv
0.1	0.12	0.1	0.12	11	12.87	18	21.06	43	50.31	68	79.56	150	175.5	260	304.2	380	444.6	1300	1521	2500	2925
0.16	0.19	0.16	0.19	18	21.06	26	30.42	68	79.56	100	117	260	304.2	380	444.6	650	760.5	-	-	-	-
0.25	0.29	0.25	0.29	26	30.42	43	50.31	100	117	150	175.5	380	444.6	650	760.5	900	1053	-	-	-	-
0.4	0.47	0.4	0.47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.63	0.74	0.63	0.74	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	1.17	1	1.17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.6	1.87	1.6	1.87	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.5	2.93	2.5	2.93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	4.68	4	4.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	7	8.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	11	12.87	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Kv Value for Silencer Basket

Valve Size NB	Parabolic Kvs (Cvs)	Single fold silencer (LK1) Kvs	Double fold silencer (LK2) Kvs
25	11	-	-
25	7	-	-
25	4	3.9	-
40	11	10.9	-
50	43	41	-
50	26	25	23.8
50	18	17.8	17.2
80	100	-	-
80	68	63	-
80	43	41	39
100	150	132	-
100	100	94	86
100	68	66	63
150	380	317	250
150	260	237	205
150	150	145	137
200	650	556	512
200	380	358	329
200	260	253	242
250	380	358	329

Kv Value for Perforated Trim

Valve Size (NB)	Lift (mm)	SeatDia (mm)	L1 1step EP	L1 1 step Linear	L2 2 step Linear	L3 3 step Linear
15	20	16	2.7	2.2	2.1	-
25	20	19	3.9	4.5	4.1	4.1
	20	24	5.5	6.7	6.1	-
40	20	32	8.1	13.5	10.8	-
	20	37	10.9	17.9	14	-
50	30	32	15	15	13.8	8.4
	30	37	17.8	20	17.9	9.7
	30	48	25	40	23.5	-
80	30	62	36	60	30.6	18.2
	30	71	42	70	35.3	-
100	30	90	52	85	47.1	-
150	60	71	90	105	67.5	67
	60	90	125	160	103	88
	60	113	159	240	132	107
200	60	143	200	320	1/1	-
	60	172	250	400	209	-
250	100	143	333	420	270	-
	100	172	485	560	395	-
300	100	265	-	-	560	-
400	100	400	-	2500	-	-

Notes

Noise reduction same as that of perforated trims.

Use of Roboter (pneumatic pressure reducer) is possible with silencer baskets

To get Cv values use following formula
 $Cv = 1.17 \times Kvn$ is available only in 1" and 2" sizes.

Notes

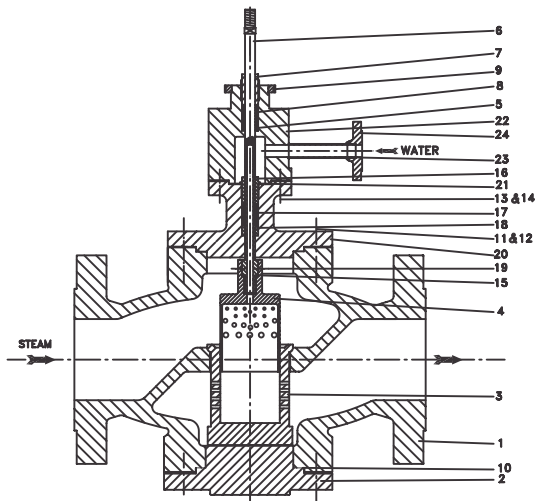
For calculations and selection of summary Kv values, it is necessary to apply the correct x values in the calculation

The Kv values mentioned in the chart are the maximum values for a particular seat diameter

Intermediate Kv values shall be applicable based on customer specifications

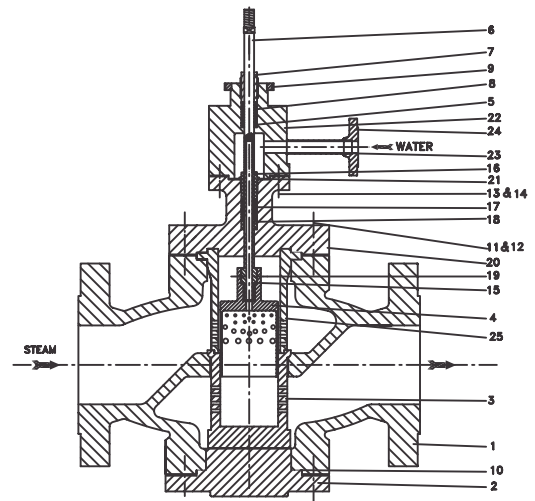
To get Cv values use following formula $Cv = 1.17 \times Kv$

Cross-Sectional Drawings of Combined PRDS



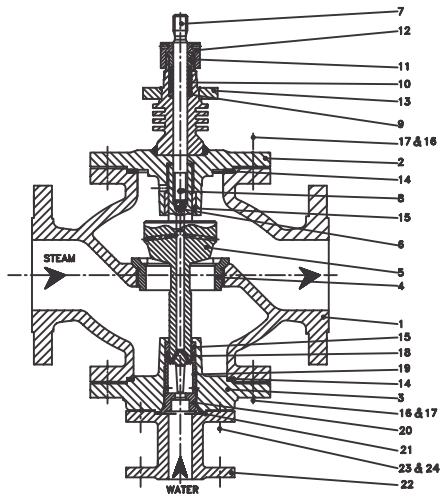
Top Entry PRDS Valve (L2 Trim Design)

L. No.	Part Name	13	Nut
1	Valve Body	14	Stud
2	Bottom Flange	15	Gasket
3	Seat	16	Cooling Water Seat
4	Plug	17	Packing Set
5	Guide Bush	18	Guide Bush
6	Spindle	19	Lock Screw
7	Gland Nut	20	Intermediate Flange
8	Packing Set	21	Gasket
9	Slotted Nut	22	Water Chamber
10	Gasket	23	Water Inlet Pipe
11	Bolt	24	Flange S/W
12	Nut		



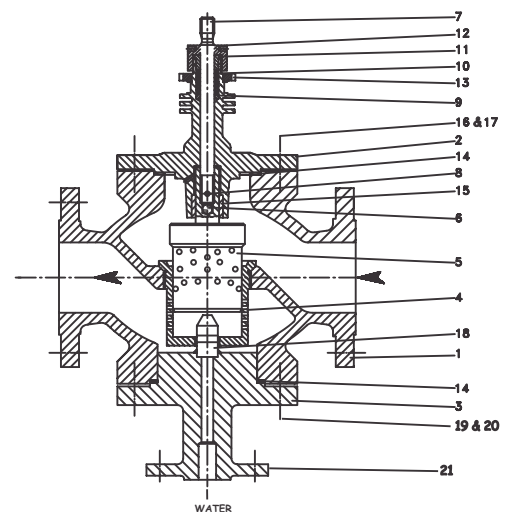
Top Entry PRDS Valve (L3 Trim Design)

L. No.	Part Name	13	Nut
1	Valve Body	14	Stud
2	Bottom Flange	15	Gasket
3	Seat	16	Cooling Water Seat
4	Plug	17	Packing Set
5	Guide Bush	18	Guide Bush
6	Spindle	19	Lock Screw
7	Gland Nut	20	Intermediate Flange
8	Packing Set	21	Gasket
9	Slotted Nut	22	Water Chamber
10	Gasket	23	Water Inlet Pipe
11	Bolt	24	Flange S/W
12	Nut	25	Sleeve



Bottom Entry through Stem PRDS Valve (Parabolic Trim Design)

L. No.	Part Name	13	Slotted Nut
1	Valve Body	14	Gasket
2	Ext. Top flange	15	Guide Bush
3	Bottom flange	16	Bits
4	Seat	17	Nuts
5	Plug	18	Gland Packing Rings
6	Ball	19	Sleeve
7	Spindle	20	Cooling Water Seat
8	Spring Dowell Pin	21	Gasket
9	Bottom Ring	22	Cooling Water Flange
10	Gland Packing Rings	23	Bolts
11	Gland Follower	24	Nuts
12	Gland Nut		



Bottom Entry through Nozzle PRDS Valve (L2 Trim Design)

L. No.	Part Name	11	Gland Follower
1	Valve Body	12	Gland Nut
2	Ext. Top Flange	13	Slotted Nut
3	Bottom Flange	14	Gasket
4	Seat	15	Guide Bush
5	Plug	16	Nut
6	Ball	17	Stud
7	Spindle	18	Nozzle
8	Spring Dowell Pin	19	Bolts
9	Bottom Ring	20	Nuts
10	Gland Packing Rings	21	Cooling water flange

Minimum Water Pressure Requirement for Combined PRDS

Top entry	:	$P_w = [(P_1 + P_2) / 2] + 7 \text{ BAR}$
Bottom entry through stem	:	$P_w = P_2 + 7$
Bottom entry through nozzle	:	$P_w = [P_1 / 2] + 7 \text{ BAR}$

Recommendations for Efficient Working of PRDS

Minimum straight length at outlet should be 4 mtrs.

Minimum distance of temperature sensor from the point of water injection should be 10 to 12 mtrs.

Minimum distance of Pressure Sensor from PRDS Valve should be 1.5 mtrs.

It is recommended to install a strainer of 0.8 mm mesh before water control valve

Spray water should be very clean (equivalent to boiler feedwater)

Instrument quality air is required

Notes

Minimum controllable temperature is Saturation Temperature + 7°C

The above are based on a specific set of parameters. These guidelines may change.



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