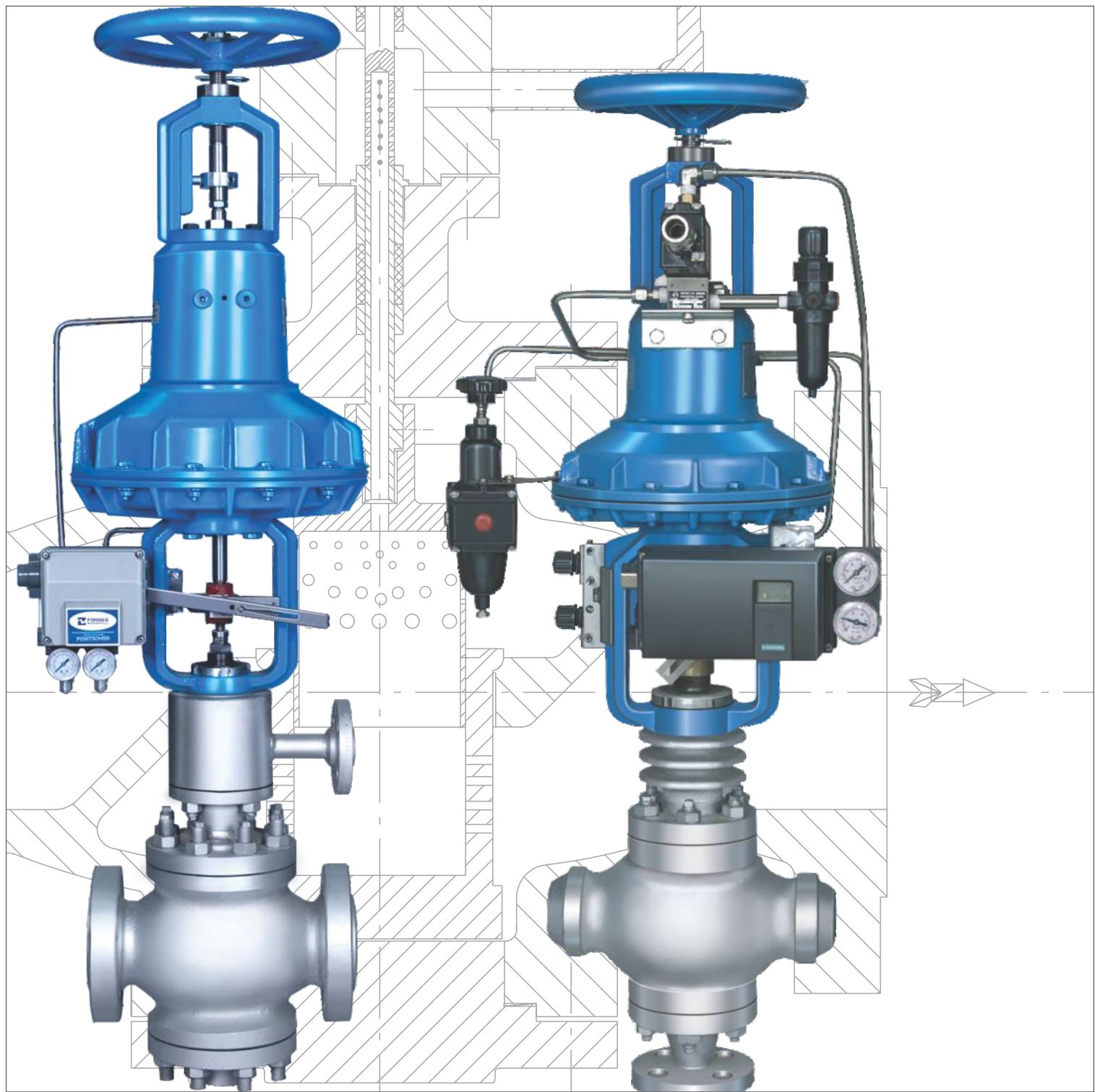


# Pressure Reducing and Desuperheating Valves

Solutions for Steam Conditioning Applications

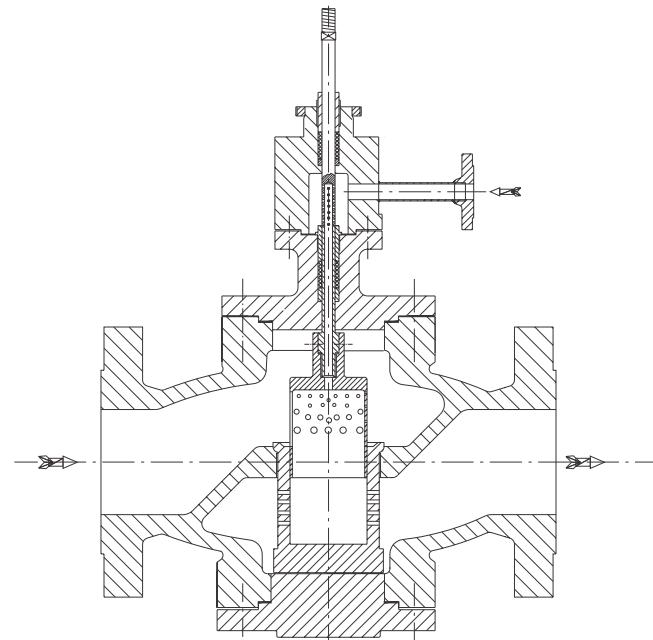


# Pressure Reducing and Desuperheating Valves

The conventional method of pressure reducing and desuperheating steam calls 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
- Condenser 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 pressure [bar(g)]

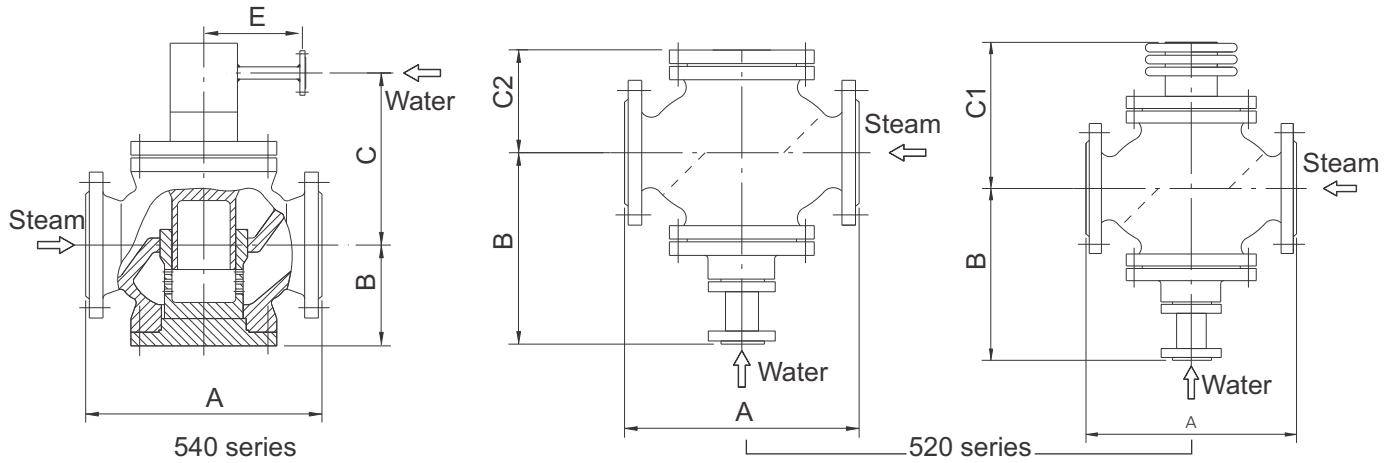
Inlet temperature (°C)

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	1/4" 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

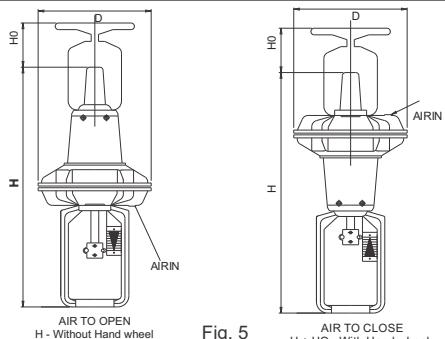


Fig. 5

	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 Open

### 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)	Weight	
	From	To			With Handwheel	Without Handwheel
UI-20.n	0.2	1	320	60	19	42
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	720	125	49	108
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		140		
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	1440	845	105.6	233
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	1440	280	105.6	233
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	1440	280	105.6	233
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
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
UV-120.n	0.4	1.5		650		
UV-120.v	0.6	3		840		

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

## 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 Sliencer 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

### 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  
 $Cv = 1.17 \times Kv$  is available only in 1" and 2" sizes.

### 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
80	30	48	25	40	23.5	-
	30	62	36	60	30.6	18.2
100	30	71	42	70	35.3	-
	60	90	52	85	47.1	-
150	60	71	90	105	67.5	67
	60	90	125	160	103	88
200	60	113	159	240	132	107
	60	143	200	320	1/1	-
250	60	172	250	400	209	-
	100	143	333	420	270	-
300	100	172	485	560	395	-
	100	265	-	-	560	-
400	100	400	-	2500	-	-

### Notes

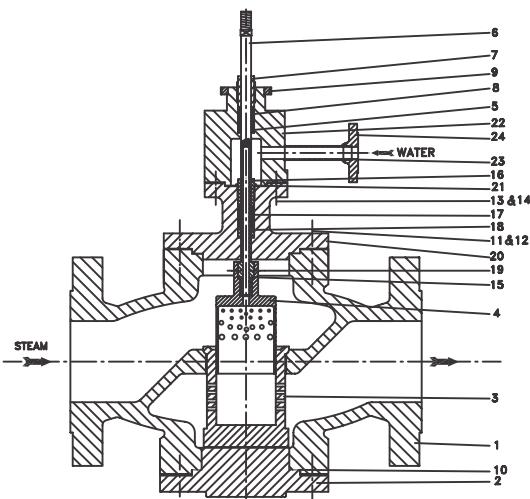
For calculations and selection of summary Kv values, it is necessary to apply the correct Cv values in the calculation

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

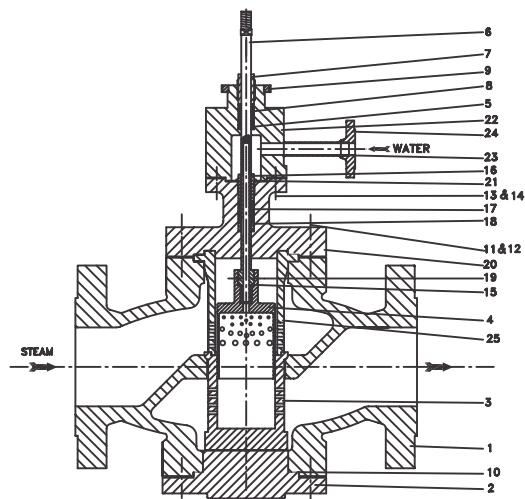
To get Cv values use following formula  $Cv = 1.17 \times Kv$

## Cross-Sectional Drawings of Combined PRDS



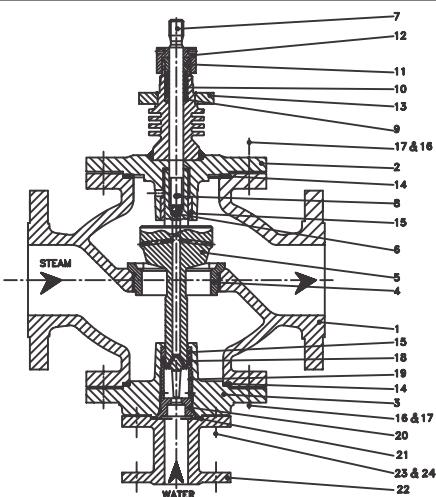
Top Entry PRDS Valve (L2 Trim Design)

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



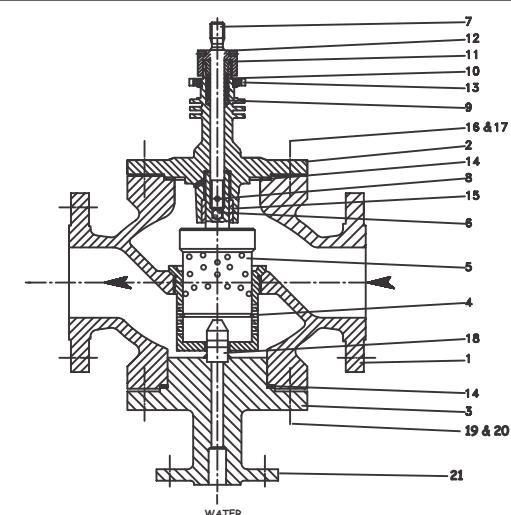
Top Entry PRDS Valve (L3 Trim Design)

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



Bottom Entry through Stem PRDS Valve (Parabolic Trim Design)

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



Bottom Entry through Nozzle PRDS Valve (L2 Trim Design)

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