Forbes Marshall

TÜV CERT ISO 9001:2000 Certificate: 04100 94 0422-E3 TÜV NORD

Pressure Reducing and Desuperheating Valve

A Solution to every PRDS problem

ARCA

Specialists in Process Efficiency and Energy Conservation

Forbes Marshall Arca ranks amongst the world's leading suppliers of Combined PRDS valves. We specialize in designing and manufacturing such equipment for power, process and co-generation plants. Forbes Marshall Arca has supplied more than 6000 combined PRDS's since 1990.

How is it different from conventional pressure reducing and desuperheating?

Conventional method for pressure reducing and desuperheating of steam calls for pressure reducing valve followed with desuperheater.

Forbes Marshall Arca brings the most advanced method to reduce pressure and temperature of steam in a single unit called 'Combined PRDS'. During the process of pressure reduction in the valve water is being injected simultaneously into a highly turbulent zone called the 'Vena Contracta' zone. This causes instantaneous evaporation of water for complete desuperheating.

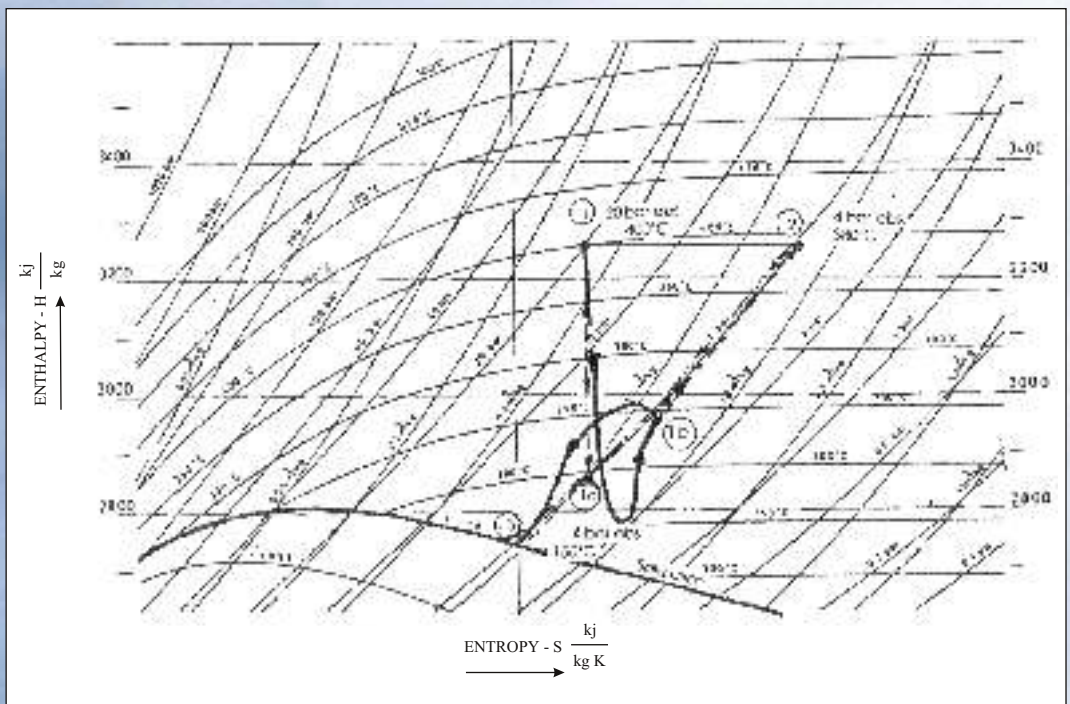
PRDS Valve Series

- Water entry from top of PRDS (540 series): For high steam pressure drop and high spray water quantity requirement.
- Water entry from bottom of PRDS (520 series):
  a. Through stem : For low steam pressure drop and high or low spray water quantity requirement.
  b. Through nozzle: For high steam pressure drop and low water quantity requirement (Available only in valve sizes 1" and 2").

Features

- Pressure reduction and desuperheating in a single valve
- Compact unit
- Immediate response to flow changes
- No waterhammer
- No water carryover problems
- Efficient mixing of spray water
- Compact design.
- Reduces need for separate desuperheater which simplifies your system.
- 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.

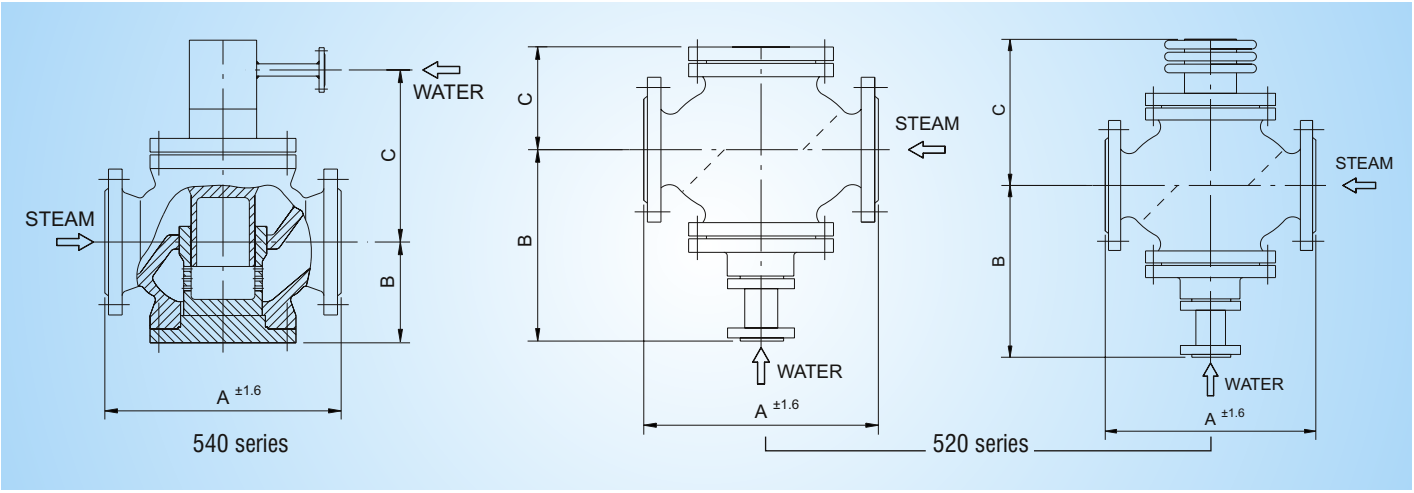
PRDS Process (Enthalpy - Entropy Chart)



Separate Pressure Reduction and Desuperheating
Pressure Reduction 1—1a—2
Desuperheating 2———3

Combined Pressure Reduction and Desuperheating
1—1a—1b—3

Dimensions and Weight of Combined PRDS Valve



Combined PRDS Valve - water entry through top

Sr	Ansi Class →	#150				#300				#600				#900				#1500			
	Valve Size (mm) ↓	A	B	C	WT	A	B	C	WT	A	B	C	WT	A	B	C	WT	A	B	C	WT
1	15NB	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	25NB	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	40NB	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	50NB	—	—	—	—	267	235	120	38	286	134	235	52	375	89	235	59	—	—	—	—
5	80NB	—	—	—	—	317	154	278	58	337	182	266	90	381	182	266	105	470	157	283	129
6	100NB	—	—	—	—	368	164	280	81	394	219	285	161	457	179	285	191	—	—	—	—
7	150NB	—	—	—	—	473	209	375	144	508	240	400	327	610	220	437	380	787	280	437	395
8	200NB	—	—	—	—	568	250	375	215	610	337	447	545	—	—	—	—	—	—	—	—
9	250NB	—	—	—	—	708	315	510	468	787	304	672	1080	—	—	—	—	—	—	—	—
10	300NB	—	—	—	—	775	374	610	728	—	—	—	—	—	—	—	—	—	—	—	—
11	350NB	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
12	400NB	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Combined PRDS Valve - water entry through bottom

Sr	Ansi Class →	#150				#300				#600				#900				#1500			
	Valve Size (mm) ↓	A	B	C	WT	A	B	C	WT	A	B	C	WT	A	B	C	WT	A	B	C	WT
1	15NB	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	25NB	—	—	—	—	197	220	82	14	210	185	144	24	273	190	144	34	273	190	144	38
3	40NB	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	50NB	—	—	—	—	267	252	120	37	286	260	132	51	375	194	132	62	—	—	—	—
5	80NB	—	—	—	—	317	262	141	58	337	255	196	91	—	—	—	—	—	—	—	—
6	100NB	—	—	—	—	368	273	151	79	394	335	228	161	—	—	—	—	—	—	—	—
7	150NB	—	—	—	—	473	361	203	144	508	348	275	330	—	—	—	—	—	—	—	—
8	200NB	—	—	—	—	568	355	240	217	—	—	—	—	—	—	—	—	—	—	—	—
9	250NB	—	—	—	—	708	425	313	467	—	—	—	—	—	—	—	—	—	—	—	—
10	300NB	—	—	—	—	775	555	390	867	—	—	—	—	—	—	—	—	—	—	—	—
11	350NB	—	—	—	—	928	633	457	1030	—	—	—	—	—	—	—	—	—	—	—	—
12	400NB	—	—	—	—	1057	672	508	1860	—	—	—	—	—	—	—	—	—	—	—	—

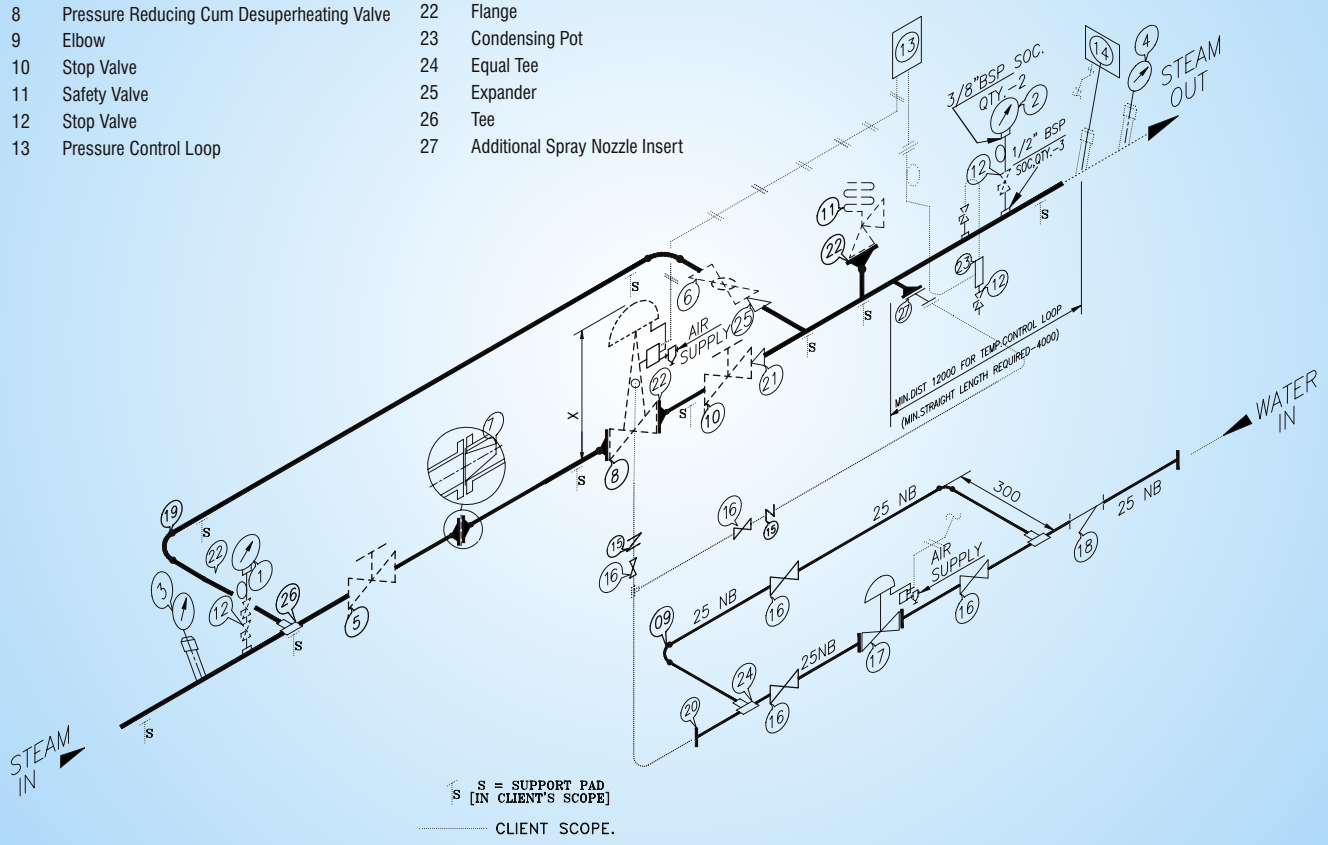
Notes:

- Dimensions are in mm.
- Weight is in kgs.
- Mentioned weight is of subassembly of PRDS. To calculate total weight please add actuator's weight from 'Actuator Catalog'.
- Bottom entry through nozzle design is available only in 1" and 2" sizes.

Pressure Reducing and Desuperheating Stations

We supply flange to flange Pressure Reducing and Desuperheating Stations with pressure control and temperature control instrumentation loop.

Pos.	Part Name
1	Pressure Gauge
2	Pressure Gauge
3	Dial Thermometer
4	Dial Thermometer
5	Stop Valve
6	Bypass Valve
7	Strainer
8	Pressure Reducing Cum Desuperheating Valve
9	Elbow
10	Stop Valve
11	Safety Valve
12	Stop Valve
13	Pressure Control Loop
14	Temperature Control Loop
15	Non-Return Valve (Loose Supply)
16	Stop Valve
17	Water Flow Control Valve
18	Strainer
19	Elbow
20	Flange
21	Expander
22	Flange
23	Condensing Pot
24	Equal Tee
25	Expander
26	Tee
27	Additional Spray Nozzle Insert



Total PRDS System along with Control Loop

Recommendations for efficient working of PRDS Valves

- 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 1.5mtrs.
- 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

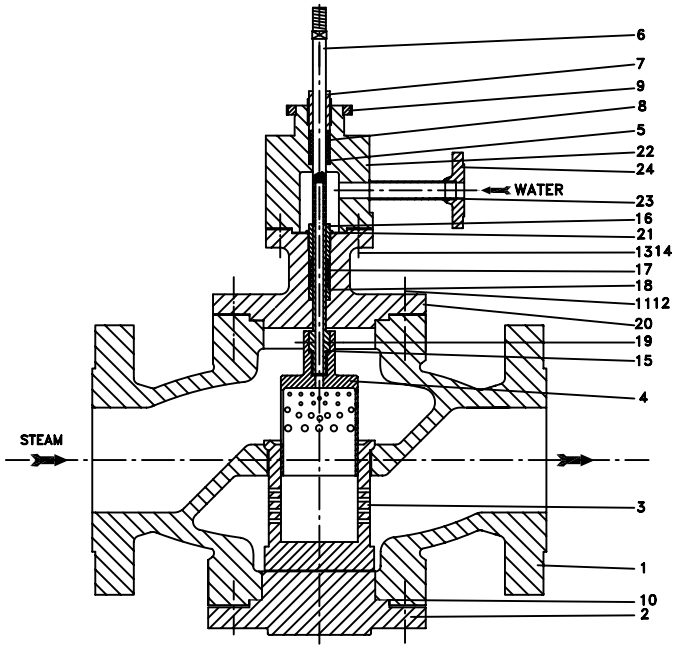
1 Minimum controllable temperature is Saturation Temperature + 7°C.

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

Minimum water pressure requirement for Combined PRDS:

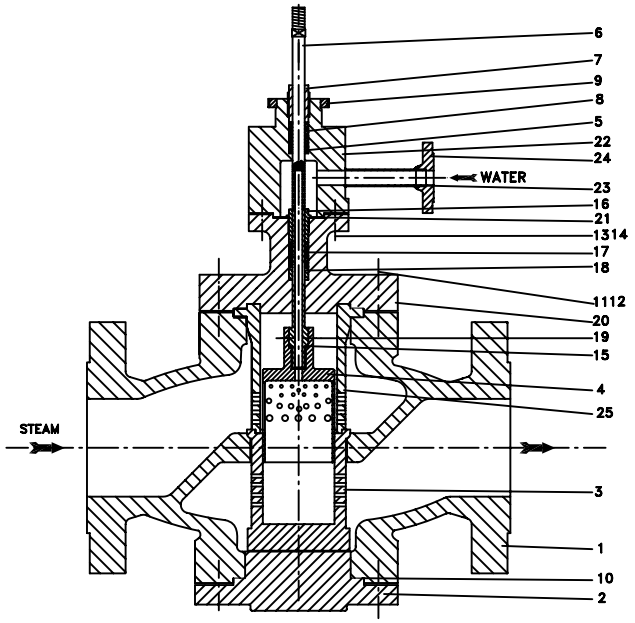
- Top entry : $Pw = [(P1+P2)/2] + 7$ BAR
- Bottom entry through stem: $Pw = P2 + 7$
- Bottom entry through nozzle: $Pw = [P1 / 2] + 7$ BAR

Cross-sectional drawings of Combined PRDS



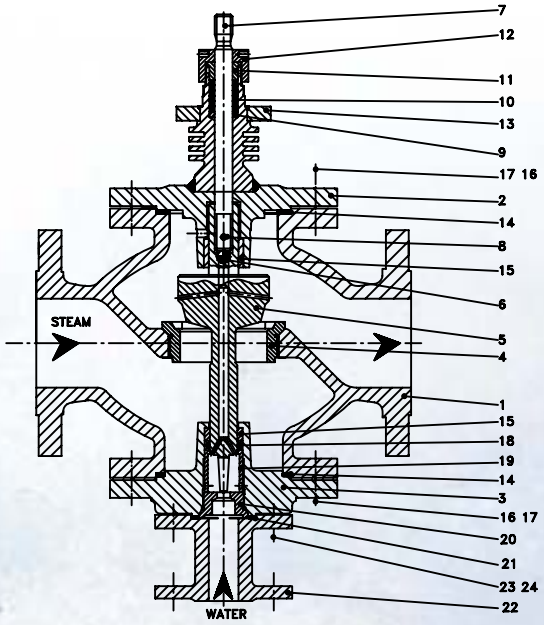
Top Entry PRDS Valve (L2 Trim Design)

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	Pipe
12	Nut	24	Flange S/W



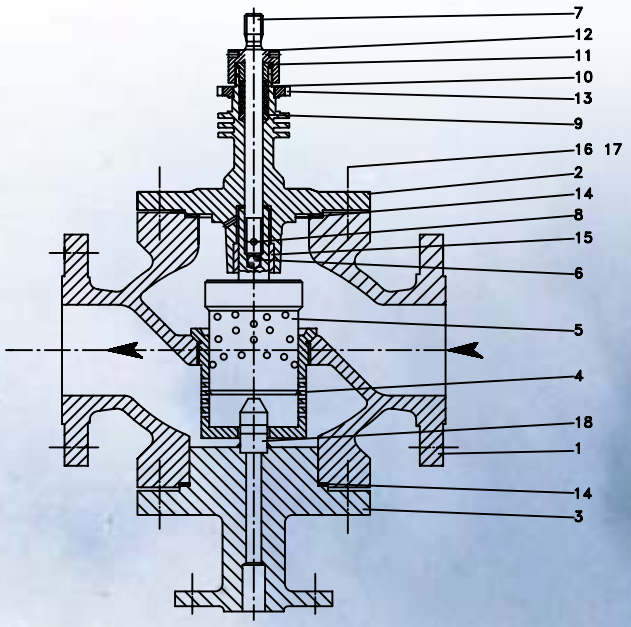
Top Entry PRDS Valve (L3 Trim Design)

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	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	Bilts
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	10	Gland Packing Rings
2	Ext. Top Flange	11	Gland Follower
3	Bottom Flange	12	Gland Nut
4	Seat	13	Slotted Nut
5	Plug	14	Gasket
6	Ball	15	Guide Bush
7	Spindle	16	Nut
8	Spring Dowell Pin	17	Stud
9	Bottom Ring	18	Nozzle

Specifications

Body Material	Carbon steel, Alloy steel, others on request
Trim Material	SS 410 Nitrited, SS 431 Nitrited, SS 321 Nitrited
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

Ordering Information

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)

Typical Applications

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

Reference List

OEMs

BHEL
Isgec John Thompson
Cethar Vessels Private Limited
Thermax Limited
Siemens
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TDPS
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Hydrotesting Rig

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