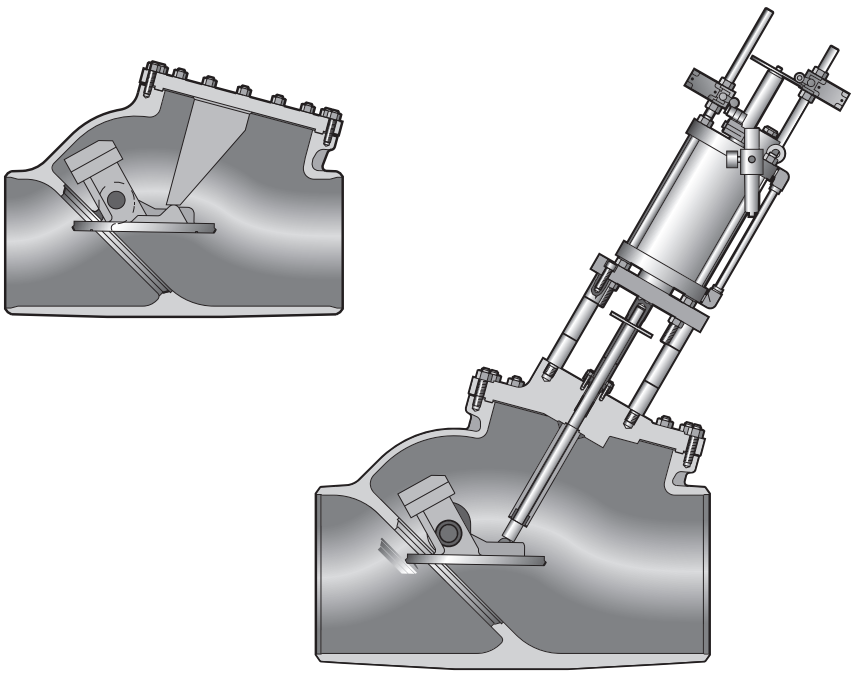
SEMPELL DEWRANCE CHECK VALVES

BLED STEAM



GENERAL APPLICATION

The Dewrance bled steam check valve has been designed specifically for use on power generation steam turbines for extraction and cold reheat applications where reliable non-return protection of critical turbine components from steam and condensate ingress is required.

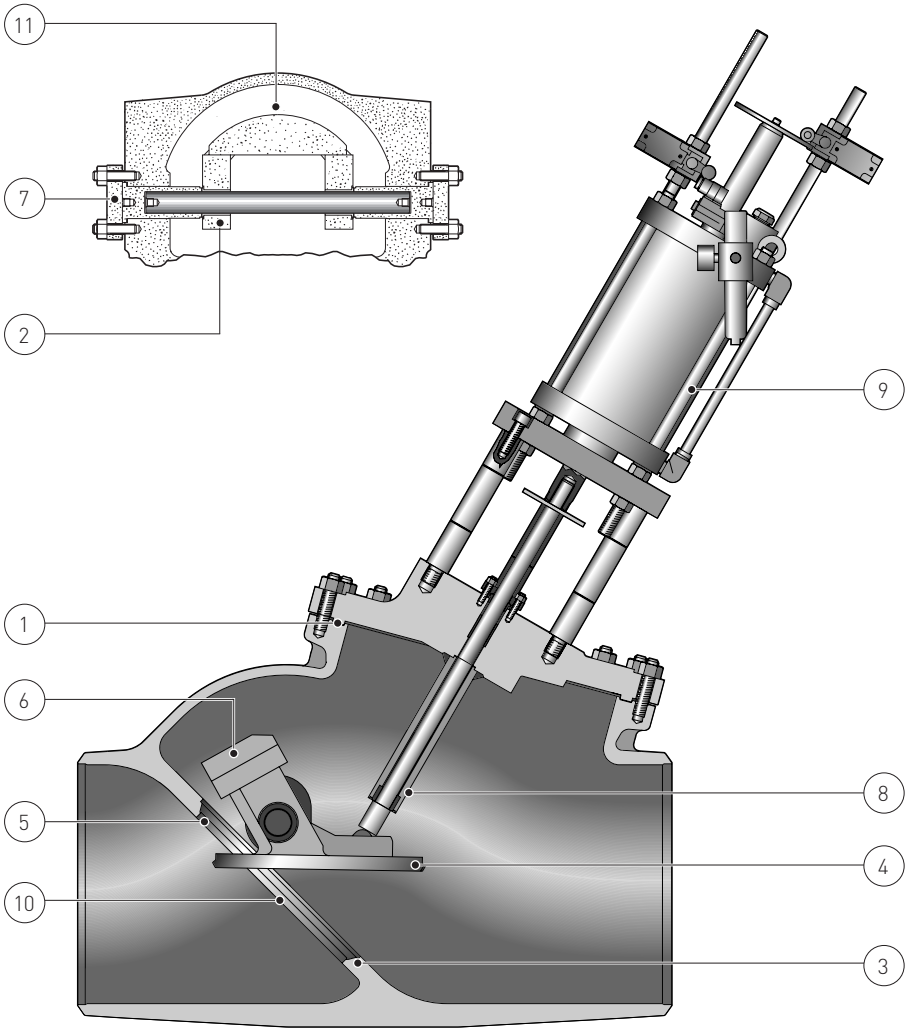
TECHNICAL DATA

Sizes:	NPS 6 - 32 (DN 150 - 800)
ASME:	ASME B16.34
Pressure class:	150, 400, 600

Other sizes/pressure classes available on request (up to NPS 48, DN 1200)

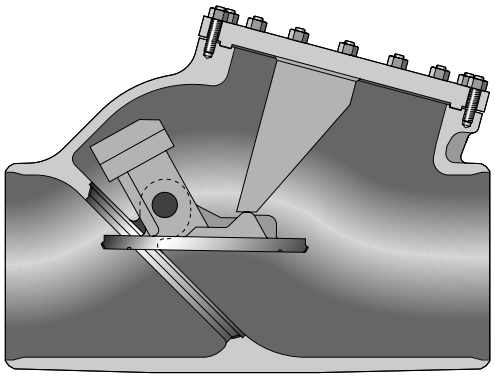
FEATURES

- Excellent reliability
  - internal counterweight to balance disc under low load conditions
  - direct deposited seats
  - tilting disc design for quick closing due to lower center of gravity
  - lightweight disc with minimum travel, for quick closing in less than 1 second
  - optimum performance under all flow conditions
  - self-draining geometry
  - pneumatic power assistance acts directly onto disc, without leakages to inhibit operation
- Low cost maintenance
  - expanded graphite gasket pressure seal design
  - surface treated hinge pin, supported in surface treated bearings, giving a low coefficient of friction and hard wearing surface for maximum performance
  - easy access through cover
  - simplified seat refurbishment, only requires lapping
  - longer seat life due to non-scuffing action of seat to disc geometry
- Improved performance
  - aerodynamic self-aligning tilting disc design for low pressure drop characteristics
  - automatic self-closure on flow reversal
  - inclined seat geometry combined with conical seat and disc for tight seal without scuffing
  - no hinge pin gland to inhibit performance



LEGEND

1. Graphoil gasket/pressure seal bonnet (dependent on) size/pressure.
2. Disc supported in surface treated bearings.
3. Inclined seat and aerodynamic tilting disc gives low pressure drop, and minimum disc travel.
4. Variable seat/disc to suit actual condition for optimum flow characteristics.
5. Hard faced Stellite® or equivalent disc.
6. Internal counterweight to ensure maximum opening position under low flow conditions.
7. No external glands or keyway to inhibit operation.
8. Positive open position stop and aerodynamic disc provides stability over wide range of flow (no flutter).
9. Direct mounted quick closing pneumatic actuator to assist closure, act directly onto disc.
10. Unique seat geometry and seating materials prevent scuffing and ensure leak tight seals.
11. Free swinging tilting disc design, no linkages, keys or pins to inhibit operation.



INTRODUCTION

This range of valves has been specifically designed for installation in bled (extraction) steam lines between steam turbines and feed water heaters but are equally applicable to reheater connections and bleed on pass-out lines in process plants.
Their function is to prevent the reverse flow of stored steam and any water from the heater or its bled steam pipe to the turbine. Installation would be in a horizontal pipe as near to the turbine as possible.
These valves are free acting whereby the disc moves to the closed position when flow in the forward direction ceases. Gravity action on the disc provides a closing moment from the fully open to fully closed position. Where power assistance is required a spring return pneumatic cylinder can easily be accommodated whilst still maintaining the automatic gravity closing feature.
The Dewrance bled steam check valve is the result of evolution from the original vertical seated design, field experience, customers requirements and is based on the Dewrance tilting disc check valve.
All Dewrance tilting disc check valves are based on the same seat geometry of a conical seated disc in a conical body seat, which has been applied over a wide range of conditions from sub-atmospheric bled steam up to ASME 2850 class for steam and water. The seating intensity is high enough to give a good seal and yet low enough not to cause any surface scuffing. The position of the hinge pin ensures that the disc opens and closes without a rubbing action to effect a tight seal over the full range of pressures.
The combination of disc geometry and the body shape produce a seat angle which gives a short disc travel as the flow falls progressively with decreasing flow. This disc will be on the seat when flow ceases and before reversal takes place without SLAMMING. This arrangement gives a low pressure drop and flow under the disc assists in keeping the valve fully open over a wide range of flows.

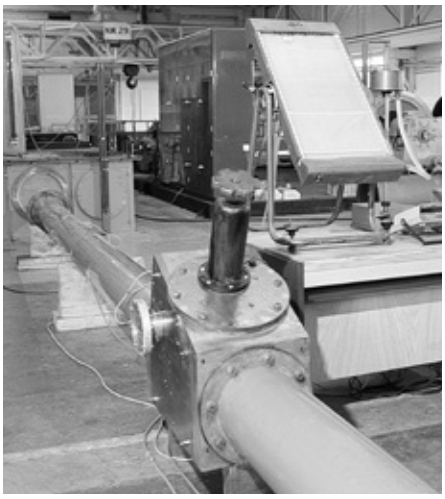
FLOW TESTS

Extensive flow tests have been carried out to establish flow characteristics for these valves.
The tests consisted of:

1. A scale model (230 mm) tested with air to establish the aerodynamic torque on the disc and the flow coefficient at various angles of opening.
   The lowest pressure drop occurs when the disc is in the fully open position.
2. A full size 400 mm valve tested in steam flows up to 300 ft/sec (92 meters/sec) to confirm the disc opening angle and establish the body and disc design shape. These tests confirmed that the Dewrance design is stable under the flow conditions and achieves the fully open position at minimum flow, thus giving low pressure drop. (Details of flow coefficients are available on request).

FUNCTIONAL TESTS

Every Dewrance valve is hydrostatically tested to prove the shell and ensure the seat is leak tight prior to leaving the factory.
Gravity closing times are checked in still air to ensure the valve closes in one second or less.
Where pneumatic actuators are fitted the complete valve is stroked in free air in addition to the actuator tests described above.



Actual scale model under air test in GEC Aerodynamic Laboratory.

Unique seating geometry

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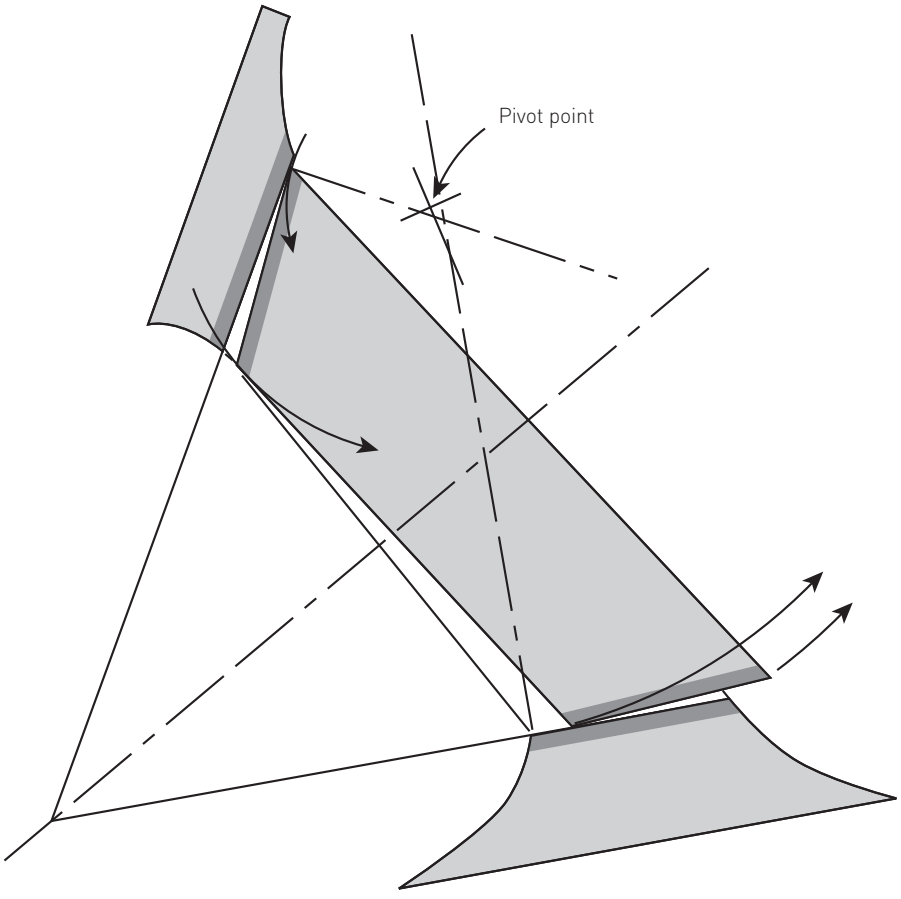


DESIGN FEATURES

1. Proven cone in a cone seating geometry used on our standard bled steam check valve.
2. Non scuffing design ensures disc always leaves seat due to position of pivot.
3. Pressure intensity high enough to seal.
4. Dissimilar seating materials to prevent pick-up.

SEMPELL DEWRANCE CHECK VALVES

PRESSURE/TEMPERATURE RATINGS

IMPERIAL 150 CLASS (ASME B16.34)

Prod. no.	ASTM Body mat. cast		ASME code B16.34	-20° to 100°	Pressure in lbf/sq. in. at temp. °F (for intermediate ratings use linear interpolation)													
					200	300	400	500	600	650	700	750	800*	850	900	950	1000	1050	1100
B21	E	A216	Std.*	285	260	230	200	170	140	125	110	95	80	65	–	–	–	–	–
B21	E	WCB	Spec.**	290	290	285	280	280	280	275	265	245	195	155	–	–	–	–	–
B21	J	A217	Std.*	290	260	230	200	170	140	125	110	95	80	65	50	35	20	20	20
B21	J	WC6	Spec.**	290	290	290	290	290	290	290	280	280	275	260	225	155	105	70	45
B21	L	A217	Std.*	290	260	230	200	170	140	125	110	95	80	65	50	35	20	20	20
B21	L	WC9	Spec.**	290	290	285	280	280	275	275	270	270	270	260	230	180	130	85	55

METRIC 150 CLASS (ASME B16.34)

Prod. no.	ASTM Body mat. cast		ASME code B16.34	-30° to 38°	Pressure in bar at temp. °C (for intermediate ratings use linear interpolation)														
					50	100	150	200	250	300	325	350	375	400	425*	450	475	500	538	550	575
B21	E	A216	Std.*	19.6	19.2	17.7	15.8	13.8	12.1	10.2	9.3	8.4	7.4	6.5	5.5	–	–	–	–	–	–
B21	E	WCB	Spec.**	19.8	19.8	19.8	19.6	19.4	19.4	19.4	19.2	18.7	18.1	16.6	13.8	–	–	–	–	–	–
B21	J	A217	Std.*	19.8	19.5	17.7	15.8	13.8	12.1	10.2	9.3	8.4	7.4	6.5	5.5	4.6	3.7	2.8	1.4	1.4	1.4
B21	J	WC6	Spec.**	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.3	19.3	19.0	18.1	16.4	12.3	7.1	6.1	4.2
B21	L	A217	Std.*	19.8	19.5	17.7	15.8	13.8	12.1	10.2	9.3	8.4	7.4	6.5	5.5	4.6	3.7	2.8	1.4	1.4	1.4
B21	L	WC9	Spec.**	19.8	19.8	19.8	19.5	19.3	19.2	19.1	19.0	18.9	18.7	18.7	18.7	18.1	16.4	13.7	8.8	7.5	5.0

IMPERIAL 400 INT CLASS (ASME B16.34)

Prod. no.	ASTM Body mat. cast		ASME code B16.34	-20° to 100°	Pressure in lbf/sq. in. at temp. °F (for intermediate ratings use linear interpolation)													
					200	300	400	500	600	650	700	750	800*	850	900	950	1000	1050	1100
B43	E	A216	Std.*	987	910	872	843	802	756	732	707	672	549	425	–	–	–	–	–
B43	E	WCB	Spec.**	1000	998	987	978	977	972	951	916	842	686	532	–	–	–	–	–
B43	J	A217	Std.*	1000	996	962	925	882	810	784	755	709	677	646	579	442	289	198	132
B43	J	WC6	Spec.**	1000	1000	1000	1000	1000	1000	996	980	973	956	898	768	553	361	248	165
B43	L	A217	Std.*	1000	996	972	936	882	811	784	755	709	677	646	593	496	357	241	152
B43	L	WC9	Spec.**	1000	998	986	970	966	960	953	944	943	941	898	787	625	446	301	190

METRIC 400 INT CLASS (ASME B16.34)

Prod. no.	ASTM Body mat. cast		ASME code B16.34	-30° to 38°	Pressure in bar at temp. °C (for intermediate ratings use linear interpolation)														
					50	100	150	200	250	300	325	350	375	400	425*	450	475	500	538	550	575
B43	E	A216	Std.*	68.1	66.8	62.1	60.1	58.4	55.9	53.1	51.6	50.1	48.5	46.3	38.4	–	–	–	–	–	–
B43	E	WCB	Spec.**	68.9	68.9	68.8	68.0	67.4	67.4	67.4	66.8	65.2	62.8	57.9	48.0	–	–	–	–	–	–
B43	J	A217	Std.*	68.9	68.9	68.7	66.3	64.0	61.8	57.2	55.1	53.7	51.8	48.8	46.8	45	42.3	34.3	19.9	16.9	11.7
B43	J	WC6	Spec.**	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.6	67.4	67.1	66.2	63	57.0	42.9	24.8	21.2	14.7
B43	L	A217	Std.*	68.9	68.9	68.7	67.0	64.8	61.8	57.2	55.1	53.7	51.8	48.8	46.8	45	42.3	37.6	24.6	20.8	14.0
B43	L	WC9	Spec.**	68.9	68.9	68.8	68.0	66.9	66.7	66.4	66.1	65.6	65.0	65.0	65.0	63	57.0	47.6	30.7	26.0	17.6

IMPERIAL 600 CLASS (ASME B16.34)

Prod. no.	ASTM Body mat. cast		ASME code B16.34	-20° to 100°	Pressure in lbf/sq. in. at temp. °F (for intermediate ratings use linear interpolation)													
					200	300	400	500	600	650	700	750	800*	850	900	950	1000	1050	1100
B51	E	A216	Std.*	1480	1360	1310	1265	1205	1135	1100	1060	1015	825	640	–	–	–	–	–
B51	E	WCB	Spec.**	1500	1500	1480	1465	1465	1465	1430	1380	1270	1030	795	–	–	–	–	–
B51	J	A217	Std.*	1500	1500	1445	1385	1330	1210	1175	1135	1065	1015	975	900	640	430	290	190
B51	J	WC6	Spec.**	1500	1500	1500	1500	1500	1500	1500	1465	1460	1440	1355	1175	795	540	360	240
B51	L	A217	Std.*	1500	1500	1455	1410	1330	1210	1175	1135	1065	1015	975	900	755	535	350	220
B51	L	WC9	Spec.**	1500	1500	1480	1455	1450	1440	1430	1415	1415	1415	1355	1200	945	670	435	275

METRIC 600 CLASS (ASME B16.34)

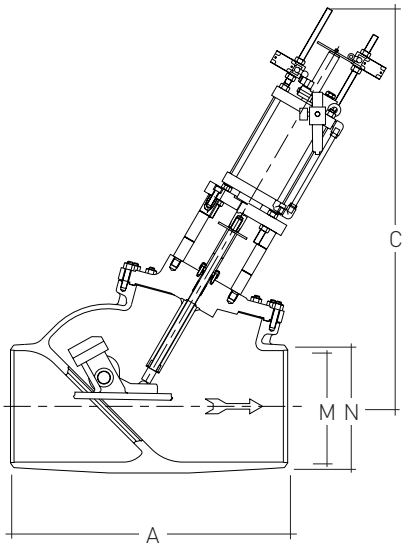
Prod. no.	ASTM Body mat. cast		ASME code B16.34	-30° to 38°	Pressure in bar at temp. °C (for intermediate ratings use linear interpolation)														
					50	100	150	200	250	300	325	350	375	400	425*	450	475	500	538	550	575
B51	E	A216	Std.*	102.1	100.2	93.2	90.2	87.6	83.9	79.6	77.4	75.1	72.7	69.4	57.5	–	–	–	–	–	–
B51	E	WCB	Spec.**	103.4	103.4	103.3	102.1	101.1	101.1	101.1	100.2	97.8	94.2	86.8	71.9	–	–	–	–	–	–
B51	J	A217	Std.*	103.4	103.4	103.0	99.5	95.9	92.7	85.7	82.6	80.4	77.6	73.3	70.0	67.7	63.4	51.5	29.8	25.4	17.6
B51	J	WC6	Spec.**	103.4	103.4	103.4	103.4	103.4	103.4	103.4	103.4	102.8	101.0	100.6	99.3	94.4	85.5	64.3	37.2	31.8	22.0
B51	L	A217	Std.*	103.4	103.4	103.0	100.3	97.2	92.7	85.7	82.6	80.4	77.6	73.3	70.0	67.7	63.4	56.5	36.9	31.3	21.1
B51	L	WC9	Spec.**	103.4	103.4	103.2	101.9	100.4	100.0	99.6	99.2	98.4	97.5	97.5	97.5	94.4	85.5	71.5	46.1	39.1	26.3

* WCB material permissible but not recommended for prolonged usage above 800°F (425°C). Std.* = Standard Spec.** = Special

SIZES NPS 8 - 32 (DN 200 - 800) ASME B16.34 150 CLASS

MAIN COMPONENT MATERIALS

Description	Carbon steel	Alloy steel
Body	A216 Gr. WCB	A217 Gr. WC9
Cover	A216 Gr. WCB	A217 Gr. WC9
Gasket	Aluminium reinforced expanded graphite	Aluminium reinforced expanded graphite
Disc	A216 Gr. WCB	A217 Gr. WC9
Hinge pin	ASTM A565 XM32	ASTM A565 XM32



HYDROSTATIC SHELL AND SEAT LEAK TEST PRESSURES

	Material			
	ASTM A-216 WCB		ASTM A-217 WC9	
Press. class	Shell psi (bar)	Seat psi (bar)	Shell psi (bar)	Seat psi (bar)
150	450 (30)	325 (22)	450 (30)	325 (22)

DIMENSIONS (imperial)

						Product numbers		
Size NPS	A	C	M	N	Weight lb	Carbon steel WCB	Alloy steel WC6	Alloy steel WC9
8	23.00	47.00	8.07	8.63	695	B21EN200-	B21JN200-	B21LN200-
10	28.00	48.82	10.13	10.75	864	B21EN250-	B21JN250-	B21LN250-
12	31.00	52.00	12.09	12.75	1184	B21EN300-	B21JN300-	B21LN300-
14	33.00	53.15	13.25	14.00	1730	B21EN350-	B21JN350-	B21LN350-
16	37.00	54.33	15.25	16.00	1845	B21EN400-	B21JN400-	B21LN400-
18	42.52	63.00	17.13	18.00	2612	B21EN450-	B21JN450-	B21LN450-
20	47.00	65.75	19.00	20.00	2742	B21EN500-	B21JN500-	B21LN500-
22	50.00	68.11	21.06	22.00	3670	B21EN550-	B21JN550-	B21LN550-
24	54.72	72.05	22.87	24.00	4608	B21EN600-	B21JN600-	B21LN600-
28	61.00	76.77	26.81	28.00	5688	B21EN700-	B21JN700-	B21LN700-
32	77.00	82.44	30.67	32.00	7269	B21EN800-	B21JN800-	B21LN800-

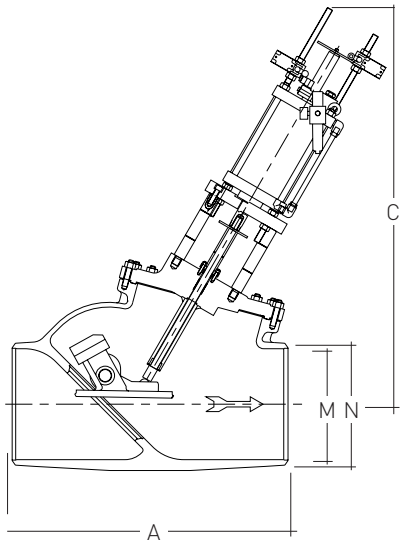
DIMENSIONS (metric)

						Product numbers		
Size DN	A	C	M	N	Weight kg	Carbon steel WCB	Alloy steel WC6	Alloy steel WC9
200	584	1195	205.0	219.1	315	B21EN200-	B21JN200-	B21LN200-
250	711	1240	257.4	273.0	392	B21EN250-	B21JN250-	B21LN250-
300	787	1320	307.0	323.8	537	B21EN300-	B21JN300-	B21LN300-
350	838	1350	336.6	355.6	785	B21EN350-	B21JN350-	B21LN350-
400	940	1380	387.4	406.4	837	B21EN400-	B21JN400-	B21LN400-
450	1080	1600	435.0	457.2	1185	B21EN450-	B21JN450-	B21LN450-
500	1194	1670	482.6	508.0	1244	B21EN500-	B21JN500-	B21LN500-
550	1270	1730	535.0	558.8	1665	B21EN550-	B21JN550-	B21LN550-
600	1390	1830	581.0	609.6	2090	B21EN600-	B21JN600-	B21LN600-
700	1550	1950	681.0	711.2	2580	B21EN700-	B21JN700-	B21LN700-
800	1956	2094	779.0	812.8	3297	B21EN800-	B21JN800-	B21LN800-

NOTES

Sizes greater than NPS 32 (DN 800) are available on application.

SIZES NPS 6 - 32 (DN 150 - 800) ASME B16.34 400 INT CLASS



MAIN COMPONENT MATERIALS

Description	Carbon steel	Alloy steel
Body	A216 Gr. WCB	A217 Gr. WC9
Cover	A216 Gr. WCB	A217 Gr. WC9
Gasket	Aluminium reinforced expanded graphite	Aluminium reinforced expanded graphite
Disc	A216 Gr. WCB	A217 Gr. WC9
Hinge pin	ASTM A565 XM32	ASTM A565 XM32

HYDROSTATIC SHELL AND SEAT LEAK TEST PRESSURES

	Material			
	ASTM A-216 WCB		ASTM A-217 WC9	
Press. class	Shell psi (bar)	Seat psi (bar)	Shell psi (bar)	Seat psi (bar)
400	1500 (104)	1100 (76)	1500 (104)	1100 (76)

DIMENSIONS (imperial)

						Product numbers		
Size NPS	A	C	M	N	Weight lb	Carbon steel WCB	Alloy steel WC6	Alloy steel WC9
6	20.00	34.09	5.76	6.63	540	B43EN150-	B43JN150-	B43LN150-
8	26.00	49.21	7.63	8.63	926	B43EN200-	B43JN200-	B43LN200-
10	31.00	51.18	9.56	10.75	1118	B43EN250-	B43JN250-	B43LN250-
12	35.43	54.33	11.38	12.75	1433	B43EN300-	B43JN300-	B43LN300-
14	37.00	58.07	12.50	14.00	2524	B43EN350-	B43JN350-	B43LN350-
16	41.00	59.45	14.31	16.00	3097	B43EN400-	B43JN400-	B43LN400-
18	46.00	61.02	16.13	18.00	3659	B43EN450-	B43JN450-	B43LN450-
20	51.00	63.78	17.94	20.00	3828	B43EN500-	B43JN500-	B43LN500-
22	56.00	73.23	19.76	22.00	4595	B43EN550-	B43JN550-	B43LN550-
24	60.00	77.95	21.57	24.00	5371	B43EN600-	B43JN600-	B43LN600-
28	74.25	83.11	25.16	28.00	8452	B43EN700-	B43JN700-	B43LN700-
32	85.00	85.55	28.78	32.00	12644	B43EN800-	B43JN800-	B43LN800-

DIMENSIONS (metric)

						Product numbers		
Size DN	A	C	M	N	Weight kg	Carbon steel WCB	Alloy steel WC6	Alloy steel WC9
150	508	866	146.3	168.3	245	B43EN150-	B43JN150-	B43LN150-
200	660	1250	193.7	219.1	420	B43EN200-	B43JN200-	B43LN200-
250	787	1300	242.8	273.0	507	B43EN250-	B43JN250-	B43LN250-
300	900	1380	289.0	323.8	650	B43EN300-	B43JN300-	B43LN300-
350	940	1475	317.6	355.6	1145	B43EN350-	B43JN350-	B43LN350-
400	1041	1510	363.6	406.4	1405	B43EN400-	B43JN400-	B43LN400-
450	1169	1550	409.6	457.2	1660	B43EN450-	B43JN450-	B43LN450-
500	1295	1620	455.6	508.0	1737	B43EN500-	B43JN500-	B43LN500-
550	1422	1860	502.0	558.8	2085	B43EN550-	B43JN550-	B43LN550-
600	1524	1980	547.8	609.6	2437	B43EN600-	B43JN600-	B43LN600-
700	1886	2111	639.0	711.2	3834	B43EN700-	B43JN700-	B43LN700-
800	2159	2173	731.0	812.8	5735	B43EN800-	B43JN800-	B43LN800-

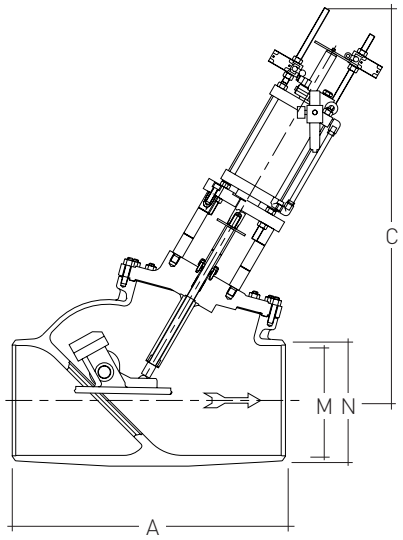
NOTES

Sizes greater than NPS 32 (DN 800) are available on application.

SIZES NPS 6 - 14 (DN 150 - 350) ASME B16.34 600 CLASS

MAIN COMPONENT MATERIALS

Description	Carbon steel	Alloy steel
Body	A216 Gr. WCB	A217 Gr. WC9
Cover	A216 Gr. WCB	A217 Gr. WC9
Gasket	Aluminium reinforced expanded graphite	Aluminium reinforced expanded graphite
Disc	A216 Gr. WCB	A217 Gr. WC9
Hinge pin	ASTM A565 XM32	ASTM A565 XM32



HYDROSTATIC SHELL AND SEAT LEAK TEST PRESSURES

	Material			
	ASTM A-216 WCB		ASTM A-217 WC9	
Press. class	Shell psi (bar)	Seat psi (bar)	Shell psi (bar)	Seat psi (bar)
600	2250 (156)	1650 (114)	2250 (156)	1650 (114)

DIMENSIONS (imperial)

						Product numbers		
Size NPS	A	C	M	N	Weight lb	Carbon steel WCB	Alloy steel WC6	Alloy steel WC9
6	20	36.22	5.76	6.63	760	B51EN150-	B51JN150-	B51LN150-
8	26	49.61	7.63	8.63	1058	B51EN200-	B51JN200-	B51LN200-
10	33	53.15	9.56	10.75	1355	B51EN250-	B51JN250-	B51LN250-
14	40	56.34	12.50	14.00	2557	B51EN350-	B51JN350-	B51LN350-

DIMENSIONS (metric)

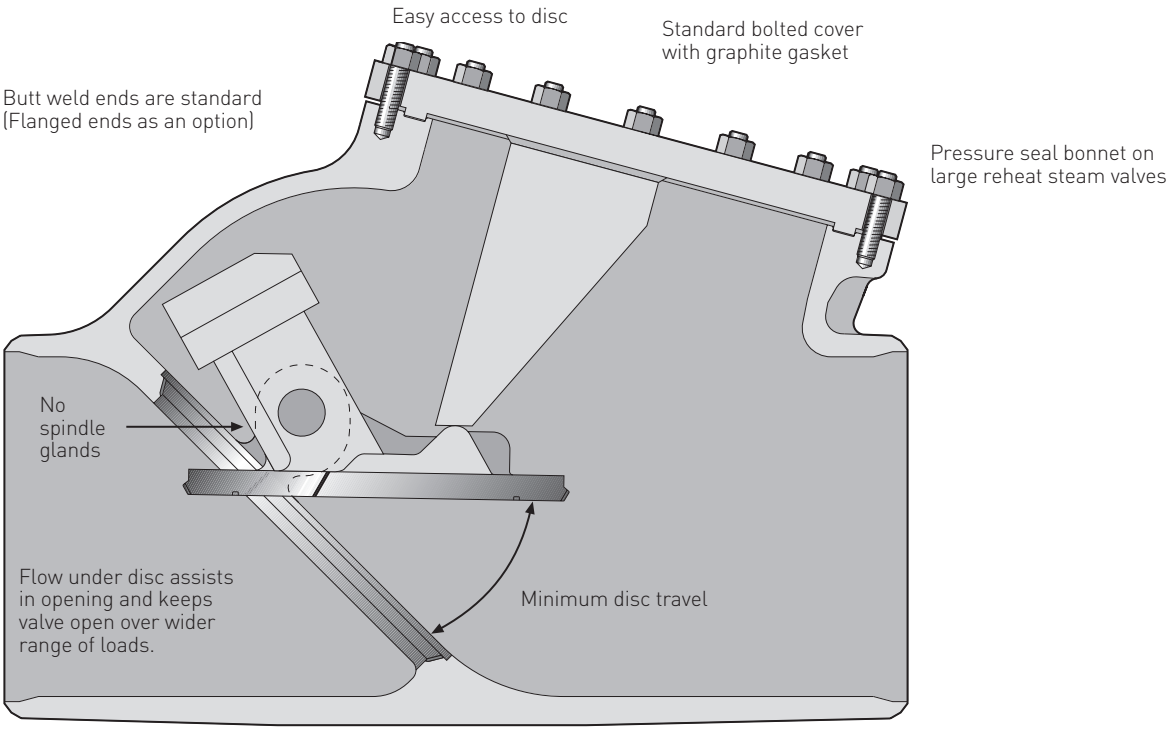
						Product numbers		
Size DN	A	C	M	N	Weight kg	Carbon steel WCB	Alloy steel WC6	Alloy steel WC9
150	508	920	146.3	168.3	345	B51EN150-	B51JN150-	B51LN150-
200	660	1260	193.7	219.1	480	B51EN200-	B51JN200-	B51LN200-
250	838	1350	242.8	273.0	616	B51EN250-	B51JN250-	B51LN250-
350	1016	1431	317.6	355.6	1160	B51EN350-	B51JN350-	B51LN350-

NOTES

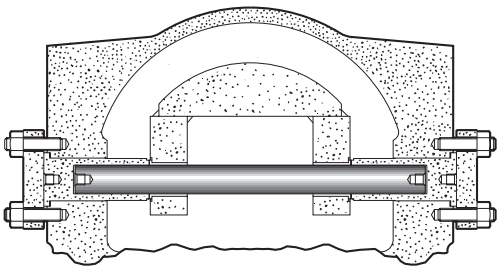
Sizes greater than NPS 14 (DN 350) are available on application.

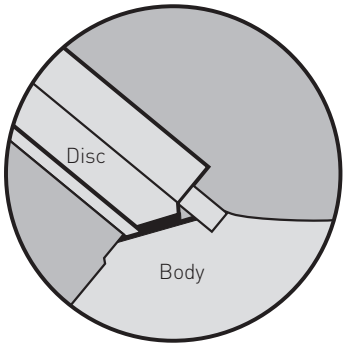
SIMPLE DESIGN FOR MAXIMUM RELIABILITY IN OPERATION

The disc is free to rotate on the hinge pin and the hinge pin is free to rotate on its bearings, thus ensuring freedom of movement and maximum reliability without the use of glands.
Nitride treated hinge pin and bearings give hard wearing surfaces with a low coefficient of friction.
Deposits on sealing surfaces are of different hardness and analysis to prevent 'scuffing'.
In the full open position the valves offer a maximum flow area as will be seen from the illustrations. Standard designs close in less than one second, this time being determined by a test in still air.



Robust cast steel body to resist thrusts and moments from pipework.
Reduces any tendency for valve to 'stick'.





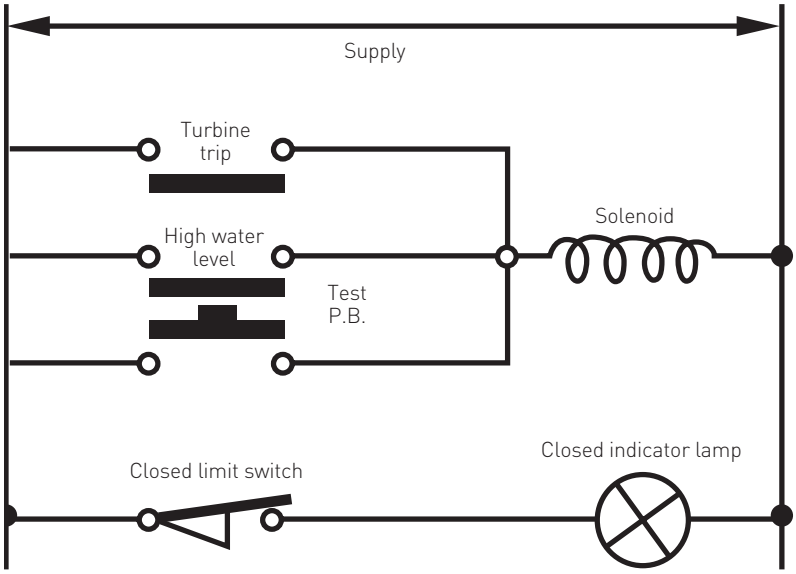
POWER ASSISTED CLOSING

Where power assistance is required an air to open and spring to close pneumatic cylinder can easily be accommodated whilst still maintaining the automatic gravity closing feature. Power assisted valves can close in less than half a second but is dependent on size and pressure.

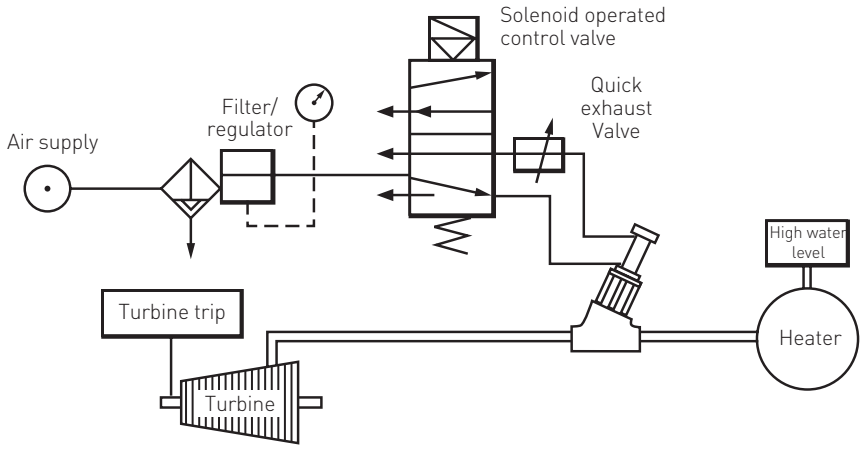
TYPICAL SCHEMATIC AND WIRING DIAGRAM

This is a basic diagram, however, other arrangements can be supplied to suit specific requirements.

TYPICAL WIRING DIAGRAM



TYPICAL SCHEMATIC DIAGRAM



SELECTION GUIDE

Example:	B	21	E	N	200	Q	F	D	A

Valve type

B Bled steam check valve

Pressure class

07	150 class with 6 bar disc	**4S**	425 class with 425 class disc
11	150 class with 12 bar disc	**4T**	450 class with 450 class disc
21	150 class with 150 class disc	**45**	600 class with 500 class disc
2R	400 class with 200 class disc	**51**	600 class with 600 class disc
2T	400 class with 250 class disc	**5V**	1000 class with 800 class disc
31	400 class with 300 class disc	**61**	1000 class with 900 class disc
3T	400 class with 350 class disc	**67**	1000 class with 1000 class disc
43	400 class with 400 class disc		

End Connection

Even number Flanged
Odd number Butt weld

Body material

E ASTM A216 Gr WCB
J ASTM A217 Gr WC6
L ASTM A217 Gr WC9
R ASTM A217 Gr C12A

Valve operation on speciality

D Hydraulic actuator
N Pneumatic actuator
V Special/large ends
Z No external operator

Nominal end size (DN)

Valve design

Q Full port
R Reduced port
S Reduced port
T Reduced port

Ancillary valve arrangement

F No by-pass

By-pass operation

D No by-pass

Minor product variation