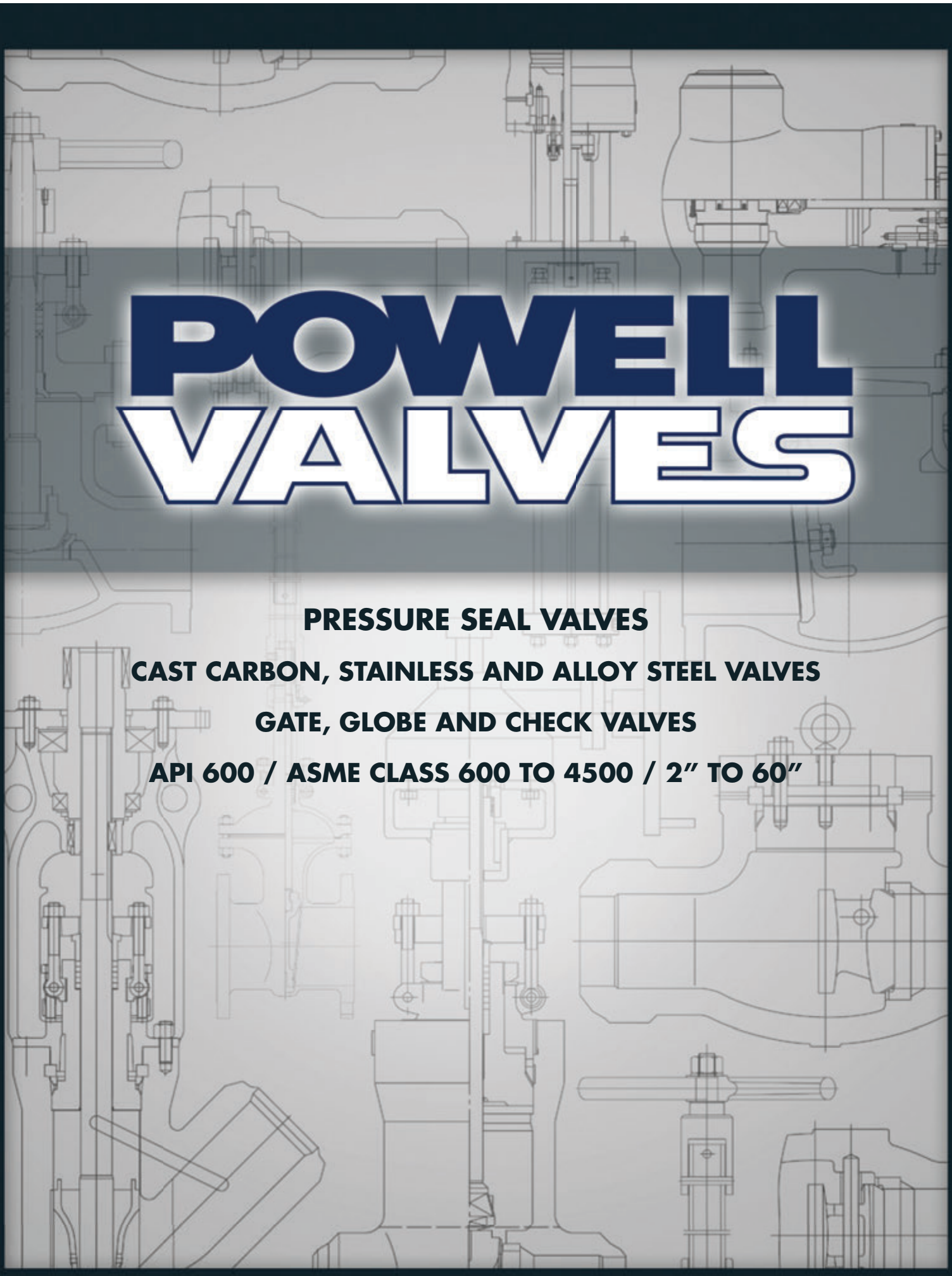


POWELL VALVES

PRESSURE SEAL VALVES

CAST CARBON, STAINLESS AND ALLOY STEEL VALVES

GATE, GLOBE AND CHECK VALVES

API 600 / ASME CLASS 600 TO 4500 / 2" TO 60"

Catalog: POW-PSV-12

Table of Contents

The Wm. Powell Company - Profile

The Wm. Powell Company is very proud of our achievements and our evolution in the past 166 years. We like to refer to ourselves as 166 years young due to our flexibility in changing quickly to our customer and the industry's needs. Our business strategy is to maintain excellent customer service. We will continue to focus on manufacturing the best of class products both in design features and quality, at competitive prices.

The Wm. Powell Company's products include a wide variety of valves in bronze, iron, steel, and corrosion resistant alloys for class 125 to class 4500 pressure service. Our experience as pioneer in the development of industrial valves encompasses over a century and a half of craftsmanship and valve know-how. Through modern engineering, laboratory, research and testing facilities, the Wm. Powell Company has been a leader in changes in our industry. Our on-going program is a long-term commitment to the valve industry and is poised for significant future growth.

Powell Valves has endured a Civil War, World Wars I and II, and the Korean and Vietnam Wars. Powell rebuilt after floods, U.S. economic disaster in the Great Depression, and fierce foreign competition to help put men on the moon. Whether it was the "Manhattan Project", projects on U.S. Nuclear Submarines, Titan or Atlas rockets, in Nuclear Power plants, at Chemical or Petroleum plants, Pulp and Paper mills, or the harshness of cryogenic use, Powell Valve has a long tradition of quality in temperatures from – 425°F to 1500°F and pressures from Class 125 to 4500.

Powell's market base is the Industrial Users: Petrochemical, Industrial Gas, Pulp & Paper, Pharmaceutical, Hydrocarbon processing, Food processing, Mining, Power Generation, Pipeline, Chemical, and Mechanical construction. Powell has formed business partnerships with industrial end-users, contractors, distributors and A&E's in the United States and around the World. Business partnerships formed on competitively priced product, on-time delivery, service and our tradition of product reliability.

Powell's network of support and product availability is unmatched. Powell offers the most complete multi-turn product line from a single source manufacturer. Powell's products are of the highest quality standards, are competitively priced and are produced with modern manufacturing technology and astute materials sourcing, with strategic purchasing & financial ventures in place.

Powell's diverse products and services, industry knowledge, project capabilities and reputation, coupled with our high quality distribution network, create a win-win arrangement where the end-user, contractor, distributor and manufacturer can benefit.

The Wm. Powell Company has made a commitment to our industry to increase growth and market share, with quality competitive products and services and on-time delivery. This is a global commitment.

Powell's end user customers have to react quickly to the demands that are on them to expand their businesses by implementing increased capacity and introducing new products into the market place at low costs and fast turn around times. Powell has addressed our customer's needs by increasing finished product inventory to over $30,000,000 USD in the U.S.A. and with inventory hubs in Asia and Europe. As an additional advantage to our domestic and global customers, The Wm. Powell Company's Manning, SC facility is a Registered Free Trade Zone.

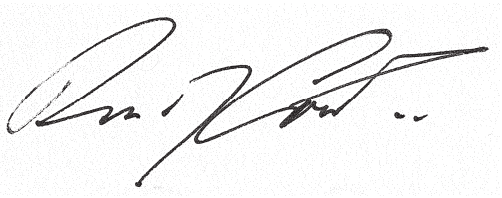
Powell also used its valve knowledge and expertise to construct a modification facility in the U.S.A. to assist customers with their needs, such as, automation, trim changes, end connection changes, additional quality inspections and special service pressure testing requirements, field service, etc…

The Wm. Powell Company is a closely held private corporation that has been in business since 1846. In fact, only nine presidents have led the Company through its 166, plus, years. The fact that we have been a healthy corporation during this period of time, having survived wars, depressions and natural disasters – in a very competitive marketplace – speaks well for itself.

We look forward to further discussing ways that The Wm. Powell Company can capture current and future opportunities together.

Again, The Wm. Powell Company thanks you for your interest in our company, our products and services. Powell looks forward to discussing ways to be your Preferred Valve Supplier. If you should have any questions, or comments, please contact us.

Sincerely,

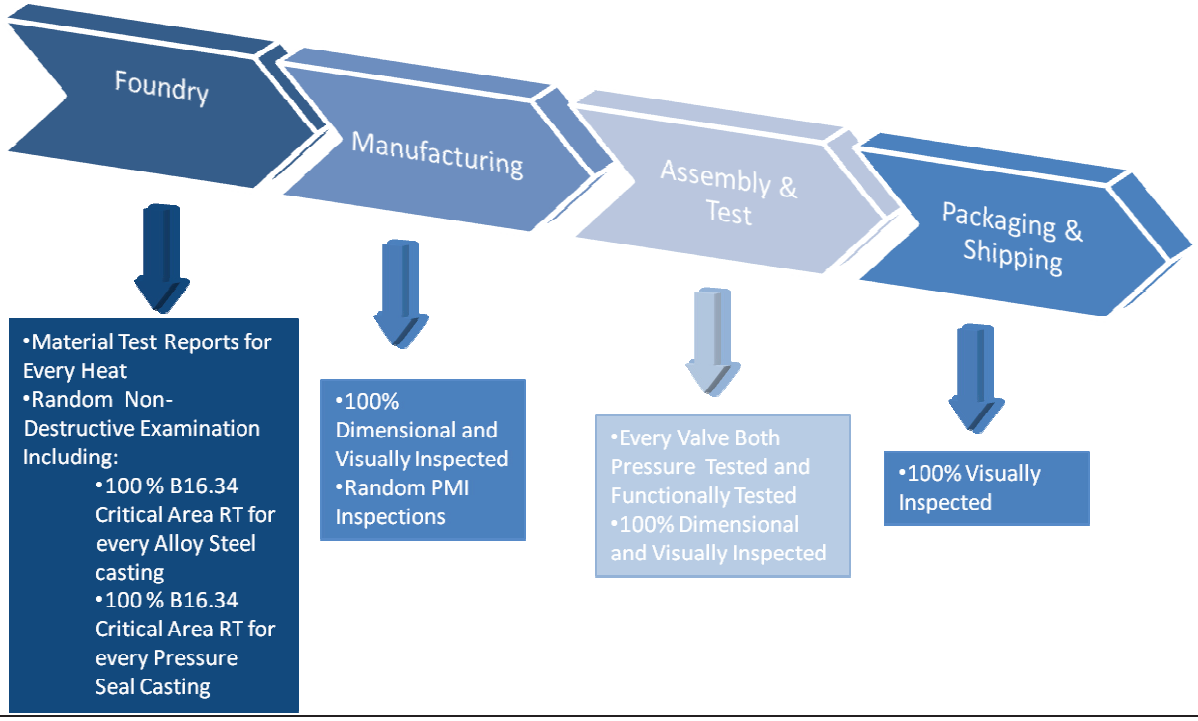


Randy Cowart

President, CEO & Chairman

The Wm. Powell Company

POWELL'S STANDARD MATERIAL INSPECTION FLOW



PRESSURE SEAL VALVE FIGURE NUMBER INDEX

How to order Powell Cast Bolted Bonnet and Pressure Seal Valves

The figure number system outlined below is designed to cover the most common configurations. If special features are required which are not listed below, please advise the detailed description for accurate processing.

Digit

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Size			Blank	Base Figure Number				End Code	Material Code	Trim	Packing/ Gasket	Option Code		
6	.	0		1	5	0	3	F	C	8	G	X	X	X

Size Code	
Code	**Size**
0.1	1/8”
0.2	1/4"
0.4	3/8”
0.5	1/2"
0.8	3/4"
1.0	1”
1.2	1-1/4”
1.5	1-1/2”
2.0	2”
2.5	2-1/2”
3.0	3”
4.0	4”
5.0	5"
6.0	6”
8.0	8”
10.	10”
12.	12”
14.	14"
16.	16"
18.	18"
20.	20"
24.	24"
30.	30"
36.	36"
48.	48"
etc.	etc.

Base Figure Number
Four digit base figure number. See product page for figure number.

End Code	
Code	**Description**
A	Sch.100
B	Sch. 140
C	125 RMS Max
D	B16.47 Series B Flg.
E	Flat Face Flg.
F	Flg. End
G	B16.47 Series A Flg.
H	Sch 10/10S
I	Sch 40/40S
J	Sch 80/80S
K	Sch 120
L	Sch 160
M	Sch XS
N	Sch XXS
P	Sch 60
R	RTJ Ends
W	Sch STANDARD
Z	Special ends

Material Codes	
Code	**Option**
C	A216 WCB
D	A217 WC6
E	A217 WC9
F	A217 C5
G	A217 C12
H	A217 C12A
J	A352 LCB
K	A352 LCC
L	A216 WCC
A	A351 CF8
B	A351 CF3
M	A351 CF8M
N	A351 CF3M
P	A351 CG8M
Q	A351 CG3M
R	A351 CF8C
Z	Special Material

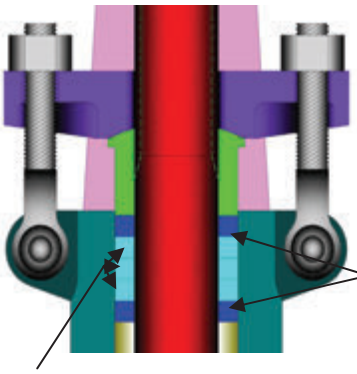
Trim	
Code	Option
0	API Trim 10
1	API Trim 1
2	API Trim 12
3	API Trim 13
5	API Trim 5
6	API Trim 16
7	API Trim 17
8	API Trim 8
9	API Trim 9
A	Integral half HF
B	Integral full HF
C	Integral
D	API Trim 11
E	API Trim 2
N	API Trim 8 NACE
Z	Special Trim

Packing/Gasket	
Code	Option
G	Std Graphite
T	Std Teflon
X	None
Z	Special Packing or Gasket
M	Packing Teflon, Gasket Graphite
R	Std Graphite, Ring Joint Gasket

Option Codes	
Code	Option
XXX	No Options
BXX	Single Valve Bypass
BA1	Two Valve Bypass
BA2	Two Valve Bypass w/Drain Valve
BA3	One Valve Bypass w/Drain Valve
BA4	Drill & Tap @ Position G
BVX	Bonnet Vent
GXX	Gear Operator
GA5	Gear, 1.25" Hex
GBP	Gear, Bypass
GCA	Gear, Locking Device
GB1	Gear, Position Ind.
PLL	Live Load
PLR	Lantern Ring
FRT	Radiography
HLD	Locking Device
CNX	Oxygen Clean Non-Ext
HYX	Y-Pattern

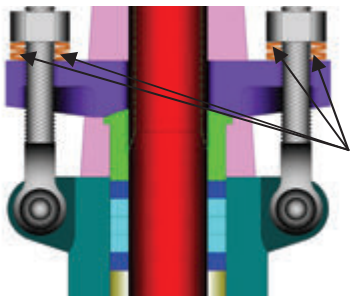
Examples:

6.0 1503FC8GXXX	6" Figure 1503 Flanged end,WCB, trim 8, graphite
3.0 1503FG8GXXX	3" Figure 1503 Flanged end,C12, trim 8, graphite
3.0 2467JN2TXXX	3" Figure 2467 Sch. 80S, CF3M, trim 12, Teflon
8.0 6003JD5GGXX	8" Figure 6003 Sch. 80S, WC6, trim 5, graphite, gear operator



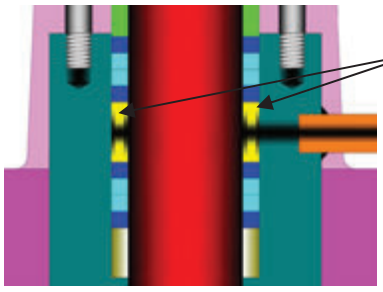
STANDARD PACKING ARRANGEMENT

Powell standard design cast steel valves are designed and manufactured to a 100 ppm maximum fugitive emissions level.



LIVE LOAD OPTION

Live load design with standard packing. Live load washers help maintain packing load to reduce frequency of packing adjustment.

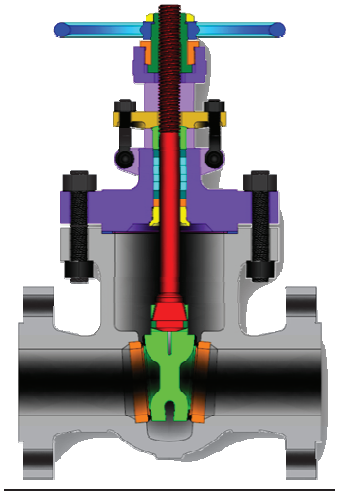


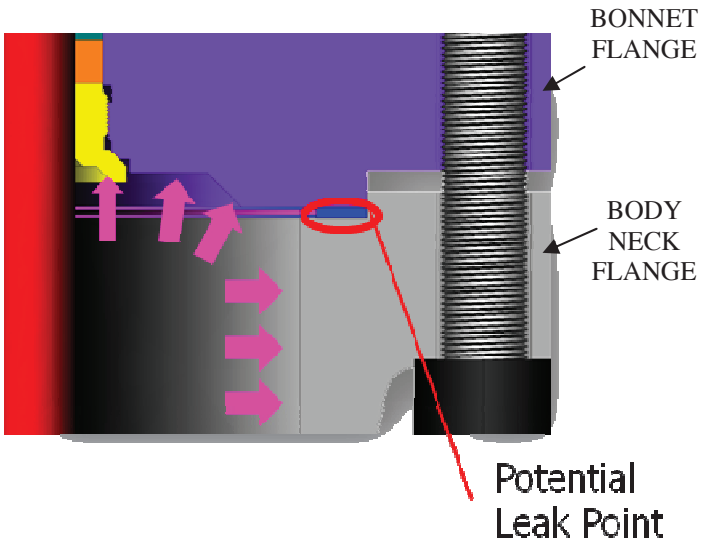
LANTERN RING OPTION

Lantern ring design and other special packing arrangements available. The lantern ring arrangement consists of two packing sets with lantern spacer between the sets. The bonnet connection at the lantern ring location allows monitoring of leakage past packing set.

PRESSURE SEAL GASKET DESIGN

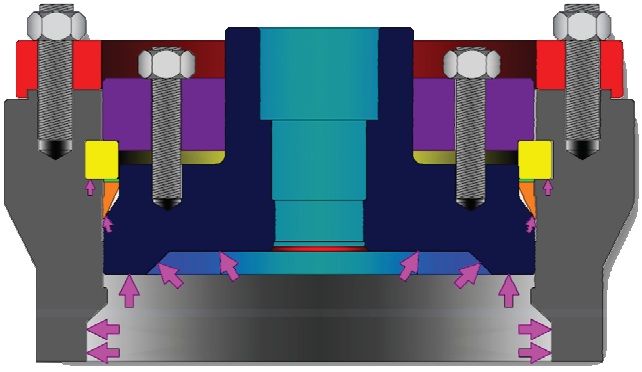
BOLTED BONNET DESIGN

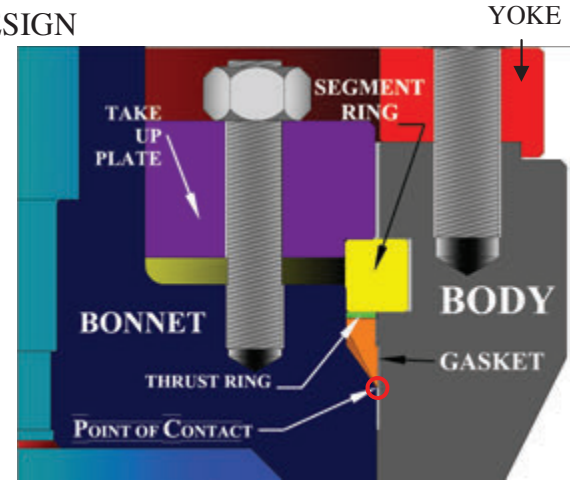




In the bolted bonnet design, increased pressure can lead to a reduction in the gasket sealing force allowing for potential leak points to form.

PRESSURE SEAL DESIGN

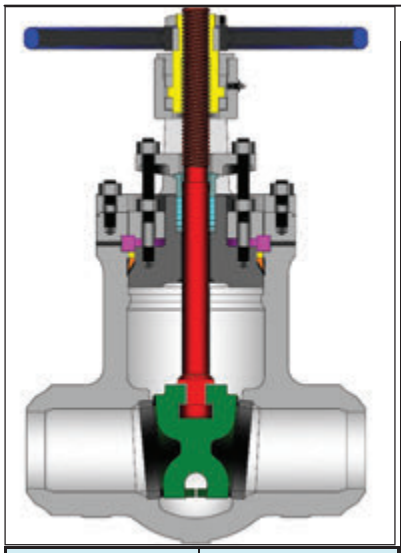




The pressure seal design, originally patented and continually improved upon by Wm. Powell Company, resolves the bolted bonnet potential leak issue by using the fluid pressure to increase the gasket sealing force. Some of the other key features of the Powell pressure seal valve are as follows:

- No pressure retaining body/bonnet flanges or bolting results in lighter weight design compared to bolted bonnet.
- Differential angle between bonnet and gasket, unique to Powell pressure seal valves, concentrates the gasket seal force for a better seal at gasket tip.
- Take-up plate and bolting creates initial gasket seal and ensures seal throughout the entire range of working pressures.
- Take-up plate is separate piece from yokearm which allows removal of yokearm without disturbing pressure seal joint.
- Powell uses a metal gasket in its standard pressure seal design which is a stronger material with a longer lifetime and lower coefficient of thermal expansion compared to softer gaskets.

PRESSURE SEAL GATE VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 24“ (50 TO 600 mm)
ASME CLASSES 600 TO 2500



Class	Fig. No.
600	1603
900	1903
1500	1103
2500	1203

STANDARD MATERIALS (Other materials available)

PART	MATERIALS			
Body	A216 Gr. WCB (STANDARD)	A217 Gr. WC6	A217 Gr. WC9	A217 Gr. C12A
Bonnet	A105	A182 F11	A182 F22	A182 F91
Yokearm	A216 Gr. WCB			
Wedge	A216 WCB + Stellite 6 Faced	A217 WC6 + Stellite 6 Faced	A217 WC9 + Stellite 6 Faced	A217 C12A + Stellite 6 Faced
Seat Ring	Carbon Steel + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced	A182 F91 + Stellite 6 Faced
Stem	A182 F6a			
Stem Bushing	A 439 Ductile NI-Resist Gr. D2			
Stem Bushing Lock Nut	Steel			
Gland Flange	A216 Gr. WCB			
Eye Bolt	A193 Gr. B7			
Eye Bolt Nut	A194 Gr. 2H			
Gland	SST 410			
Packing	Graphite			
Packing Washer / Packing Spacer	SST 410			
Protective Ring	SST 410			
Segmental Thrust Ring	SST 410			
Support Plate	Steel			
Gasket	SST 304L			
Hand Wheel	Malleable Iron or Steel			
Hand Wheel Nut	Steel			
Key	Steel			
Lubricant Fitting	Steel			
Bonnet Takeup / Yoke Stud	A193 Gr. B7	A193 Gr. B16		
Bonnet Takeup / Yoke Nut	A194 Gr. 2H	A194 Gr. 7		

DESIGN FEATURES:

- **Flexible Wedge** for improved seating and ease of operation, especially in high temperature service. Wedges are accurately guided thru the entire stroke.
- **Valves** are full port design per ASME B16.34 Table A-1.
- **Standard trim** is stellite faced seat and disc seat surfaces, and 13% chrome stem (API trim 5). Other trims available on request.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Stems** are non-rotating with surface finish to maximize packing seal for low fugitive emissions.
- **Yoke arms** designed for ease of gear, motor or cylinder actuator adaptation.
- **Each** valve is shell, seat and back-seat pressure tested per industry standard API 598.
- **Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test report, inspection report and certificate of conformance.
- **Valve sizes** 4” and smaller have bonnet take up ring design instead of support plate design.
- **Weld** end valves are B16.10 short pattern design. Flanged end valves are available on request and are B16.10 long-pattern design. Weld end valve dimensions given in table on next page.

Design Specifications

Item	Applicable Specification
Wall thickness	API 600
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Butt Weld design	ASME B16.25
Materials	ASTM

- **Other** available options as follows:
  -Alternate valve materials such as chrome and stainless steel alloys
  -Alternate trim materials
  -Bypass, drain and other auxiliary connections
  -Gear, motor, and cylinder actuators available
  -NACE service
  -Special cleaning for applications such as oxygen or chlorine
  -Other options available as specified

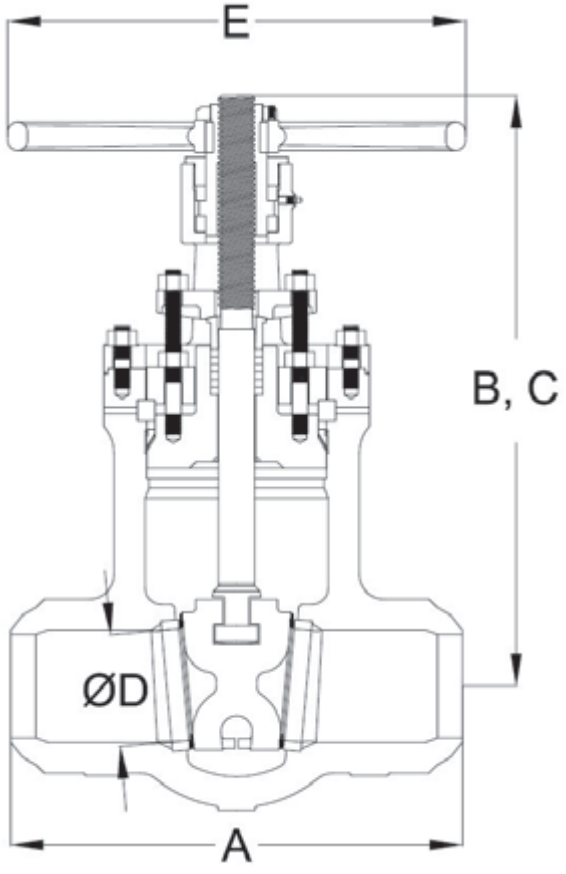
GATE VALVE DIMENSIONS (CLASS 600—2500).

SIZE	ASME 600					ASME 900					ASME 1500				
in / mm	A	B(1)	C(1)	D	E	A	B(1)	C(1)	D	E	A	B(1)	C(1)	D	E
2	7.00	15.7	18.2	2.00	8	8.50	19.7	22.0	1.87	14	8.50	19.7	21.97	1.87	14
50	178	399	462	51	200	216	499	558	48	356	216	499	558	48	356
2½	8.50	19.6	22.6	2.50	12	10.00	21.5	24.1	2.25	14	10.00	21.5	24.25	2.25	14
65	216	498	573	64	305	254	546	612	57	356	254	545	616	57	356
3	10.00	20.3	23.7	3.00	12	12.00	22.8	26.1	2.87	14	12.00	23.7	27.09	2.75	16
80	254	516	602	76	305	305	578	664	73	356	305	603	688	70	406
4	12.00	24.4	29.0	4.00	14	14.00	25.2	29.5	3.87	16	16.00	27.7	31.93	3.62	20
100	305	620	736	102	356	356	640	750	98	406	406	703	811	92	500
6	18.00	27.6	34.1	6.00	20	20.00	28.7	35.1	5.75	20	22.00	30.2	36.34	5.37	22
150	457	700	865	152	508	508	729	892	146	508	559	768	923	136	560
8	23.00	32.6	41.2	7.87	20	26.00	33.6	42.0	7.50	25	28.00	34.8	42.64	7.00	28
200	584	828	1047	200	508	660	854	1066	191	640	711	883	1083	178	720
10	28.00	38.4	49.0	9.75	25	31.00	44.2	53.5	9.37	30	34.00	44.5	53.27	8.75	28
250	711	975	1245	248	640	787	1122	1360	238	762	864	1131	1353	222	710
12	32.00	44.5	56.9	11.75	28	36.00	59.3	70.4	11.12	30	39.00	50.1	60.45	10.37	30
300	813	1129	1445	298	680	914	1505	1788	282	762	991	1272	1535	263	762
14	35.00	56.9	62.1	12.87	30	39.00	66.9	79.2	12.25	30	42.00	63.1	74.50	11.37	36
350	889	1445	1577	327	762	991	1700	2011	311	762	1067	1604	1892	289	914
16	39.00	70.2		14.75	18	43.00	88.3		14.00	24	47.00	76.0		13.00	24
400	991	1784		375	460	1092	2244		356	610	1194	1931		330	610
18	43.00	77.6		16.50	18	48.00	83.7		15.75	24	53.00	84.6		14.62	24
450	1092	1972		419	460	1219	2126		400	610	1346	2149		371	610
20	47.00	88.9		18.25	18	52.00	122		17.50	24	58.00	104		16.37	24
500	1194	2259		464	460	1321	3092		445	610	1473	2626		416	610
24	55.00	114		22.00	18	61.00	157		21.00	24	76.50	138		19.62	24
600	1397	2885		559	460	1549	3990		533	610	1943	3490		498	610

(1) Gear operators standard for 16” and up classes 600 to 1500 and 14” and up for class 2500.

SIZE	ASME 2500				
in / mm	A	B(1)	C(1)	D	E
2	11.00	18.6	20.5	1.50	12
50	279	473	521	38	300
2½	13.00	22.0	26.1	1.87	18
65	330	558	662	48	457
3	14.50	22.0	26.1	2.25	18
80	368	558	662	57	457
4	18.00	28.2	32.0	2.87	20
100	457	717	812	73	508
6	24.00	31.4	36.5	4.37	24
150	610	798	928	111	610
8	30.00	39.2	47.2	5.75	24
200	762	997	1200	146	610
10	36.00	45.3	52.6	7.25	30
250	914	1151	1335	184	762
12	41.00	52.7	66.7	8.62	36
300	1041	1339	1695	219	914
14	44.00	69.2		9.50	24
350	1118	1758		241	610
16	49.00	77.0		10.87	24
400	1245	1956		276	610
18	55.00	79.9		12.25	32
450	1397	2030		311	800

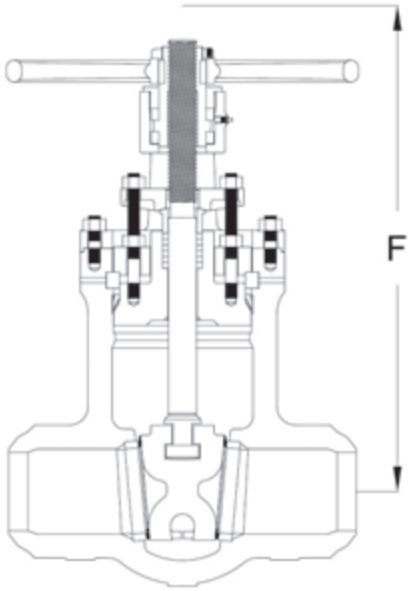
B = Center to top closed
C = Center to top open



PRESSURE SEAL GATE VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 24“ (50 TO 600 mm)
ASME CLASSES 600 TO 2500

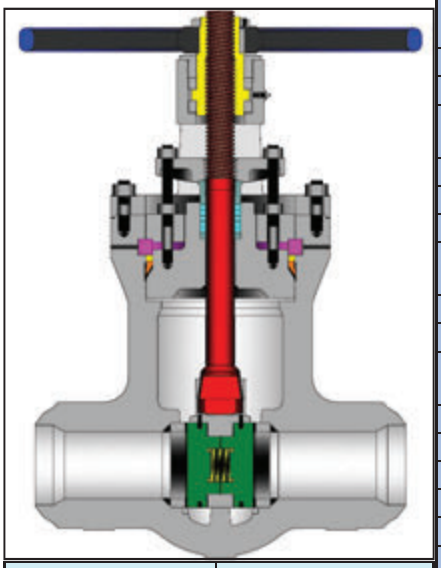
SIZE	ASME 600					ASME 900					ASME 1500					ASME 2500				
in	F	in	WT	lb	C_V	F	in	WT	lb	C_V	F	in	WT	lb	C_V	F	in	WT	lb	C_V
mm		mm		kg			mm		kg			mm		kg			mm		kg	
2	27.5		95		240	30.2		95		210	30.2		95		210	30.6		176		140
50	699		43			766		43			766		43			778		80		
2½	30.2		125		390	30.3		125		310	32.8		135		310	34.6		348		220
65	768		56			769		56			832		61			878		158		
3	32.3		143		560	35.4		154		510	36.9		221		470	34.6		392		310
80	821		65			898		70			937		100			878		178		
4	39.0		181		1000	40.4		229		950	43.9		401		830	43.2		522		520
100	990		82			1025		104			1115		182			1098		237		
6	45.5		364		2400	46.9		518		2200	47.2		760		2000	50.3		772		1300
150	1155		165			1192		235			1199		345			1278		381		
8	54.5		712		4300	56.4		904		3900	57.1		1583		3400	60.2		1852		2300
200	1385		323			1433		410			1449		718			1530		840		
10	65.2		1091		6700	68.2		1820		6200	66.4		2787		5400	72.5		3504		3700
250	1655		495			1733		825			1687		1264			1841		1589		
12	76.6		1616		10000	78.0		2586		9000	78.0		3235		7800	82.6		5420		5400
300	1945		733			1982		1173			1980		1467			2098		2458		
14	84.5		2221		12000	81.5		3421		11000	89.8		5140		9400	94.1		7110		6600
350	2146		1007			2069		1552			2282		2336			2391		3225		
16	94.2		2898		16000	99.4		4291		14000	101.9		6477		12000	111.8		4016		8600
400	2393		1314			2523		1946			2588		2937			2840		4801		
18	105.3		3646		21000	111.5		5164		19000	114.9		7857		16000	114.7		10587		11000
450	2675		1654			2832		2342			2917		3563			2913		4801		
20	116.4		4456		25000	122.3		6005		23000	129.0		9256		20000					
500	2958		2021			3106		2723			3275		4198							
24	141.9		6231		37000	147.5		7463		33000	161.3		11983		29000					
600	3605		2826			3747		3385			4098		5434							

Note: Does not include weight of gear.



WT = Weight
F = Dismantling Dimension
C_V = Flow Coefficient

PRESSURE SEAL PARALLEL SEAT GATE VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 24“ (50 TO 600 mm)
ASME CLASSES 600 TO 2500



Class	Fig. No.
600	1607
900	1907
1500	1107
2500	1207

DESIGN FEATURES:

- **Standard trim** is stellite faced seat and disc seat surfaces, and 13% chrome stem (API trim 5). Other trims available on request.
- **Valves** are full port design per ASME B16.34 Table A-1.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Stems** are non-rotating with surface finish to maximize packing seal for low fugitive emissions.
- **Yoke arms** designed for ease of gear, motor or cylinder actuator adaptation.
- **Each** valve is shell, seat and backseat pressure tested per industry standard API 598.
- **Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.
- **Parallel Discs** are spring supported, offering a more refined seal.
- **Weld** end valves are B16.10 short pattern design. Flanged end valves are available on request and are B16.10 long pattern design. Weld end valve dimensions given in table on next page.

STANDARD MATERIALS (Other materials available)

PART	MATERIALS			
Body	A216 Gr. WCB (STANDARD)	A217 Gr. WC6	A217 Gr. WC9	A217 Gr. C12A
Bonnet	A105	A182 F11	A182 F22	A182 F91
Yokearm	A216 Gr. WCB			
Disc	A105 + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced	A182 F91 + Stellite 6 Faced
Screw	SST 304			
Disc Holder	A105	A182 F11	A182 F22	A182 F91
Spring	Inconel			
Seat Ring	Carbon Steel + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced	A182 F91 + Stellite 6 Faced
Stem	A182 F6a			
Stem Bushing	A 439 Ductile NI-Resist Gr. D2			
Stem Bushing Lock Nut	Steel			
Gland Flange	A216 Gr. WCB			
Eye Bolt	A193 Gr. B7			
Eye Bolt Nut	A194 Gr. 2H			
Gland	SST 410			
Packing	Graphite			
Packing Washer / Packing Spacer	SST 410			
Protective Ring	SST 410			
Segmental Thrust Ring	SST 410			
Support Plate	Steel			
Gasket	SST 304L			
Hand Wheel	Malleable Iron or Steel			
Hand Wheel Nut	Steel			
Key	Steel			
Lubricant Fitting	Steel			
Bonnet Takeup / Yoke Stud	A193 Gr. B7	A193 Gr. B16		
Bonnet Takeup / Yoke Nut	A194 Gr. 2H	A194 Gr. 7		

Design Specifications

Item	Applicable Specification
Wall thickness	API 600
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Butt Weld design	ASME B16.25
Materials	ASTM

- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test report, inspection report and certificate of conformance.
- **Valve sizes** 4” and smaller have bonnet take up ring design instead of support plate design.
- **Other** available options as follows:
  -Alternate valve materials such as chrome and stainless steel alloys
  -Alternate trim materials
  -Bypass, drain and other auxiliary connections
  -Gear, motor, and cylinder actuators available
  -NACE service
  -Special cleaning for applications such as oxygen or chlorine
  -Other options available as specified

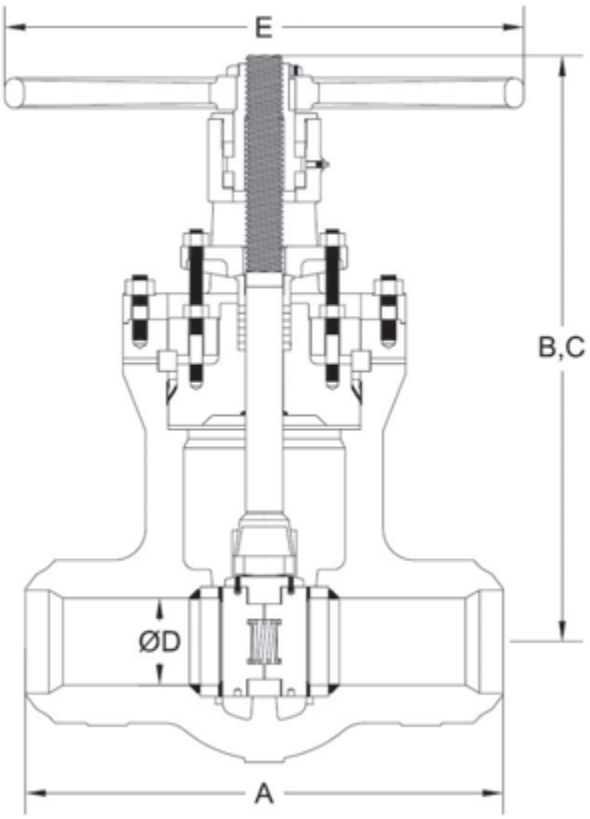
PARALLEL SLIDE GATE VALVE DIMENSIONS (CLASS 600—2500).

SIZE	ASME 600					ASME 900					ASME 1500				
in / mm	A	B(1)	C(1)	D	E	A	B(1)	C(1)	D	E	A	B(1)	C(1)	D	E
2	7.00	16.7	19.2	2.00	8	8.50	20.7	23.0	1.87	14	8.50	21.6	24.0	1.87	14
50	178	424	488	51	200	216	526	584	48	356	216	549	608	48	356
2½	8.50	20.6	23.6	2.50	12	10.00	22.5	25.1	2.25	14	10.00	22.5	25.3	2.25	14
65	216	523	599	64	305	254	572	638	57	356	254	572	643	57	356
3	10.00	21.3	24.7	3.00	12	12.00	23.8	26.1	2.87	14	12.00	24.7	28.1	2.75	16
80	254	541	627	76	305	305	605	663	73	356	305	627	714	70	406
4	12.00	25.4	30.0	4.00	14	14.00	25.2	29.5	3.87	16	16.00	28.7	32.9	3.62	20
100	305	645	762	102	356	356	640	750	98	406	406	729	836	92	500
6	18.00	29.6	36.1	6.00	20	20.00	30.7	37.1	5.75	20	22.00	31.9	38.0	5.37	22
150	457	752	917	152	508	508	780	942	146	508	559	810	965	136	560
8	23.00	34.6	43.2	7.88	20	26.00	35.6	44.0	7.50	25	28.00	36.8	44.6	7.00	28
200	584	879	1097	200	508	660	904	1118	191	640	711	935	1133	178	720
10	28.00	40.4	51.0	9.75	25	31.00	46.2	55.5	9.37	30	34.00	46.5	55.3	8.75	28
250	711	1026	1295	248	640	787	1173	1410	238	762	864	1181	1405	222	710
12	32.00	46.5	58.9	11.75	28	36.00	61.3	72.4	11.12	30	39.00	52.1	62.5	10.37	30
300	813	1181	1496	298	680	914	1557	1839	282	762	991	1323	1588	263	762
14	35.00	59.9	65.1	12.88	30	39.00	69.9	82.2	12.25	30	42.00	66.1	77.5	11.37	36
350	889	1521	1654	327	762	991	1775	2088	311	762	1067	1679	1969	289	914
16	39.00	73.2		14.75	18	43.00	91.3		14.00	24	47.00	79.0		13.00	24
400	991	1859		375	460	1092	2311		356	610	1194	2007		330	610
18	43.00	80.6		16.50	18	48.00	96.7		15.75	24	53.00	87.6		14.62	24
450	1092	2047		419	460	1219	2202		400	610	1346	2225		371	610
20	47.00	91.9		18.25	18	52.00	124.7		17.50	24	58.00	106.4		16.37	24
500	1194	2334		464	460	1321	3167		445	610	1473	2703		416	610
24	55.00	116.6		22.00	18	61.00	160.1		21.00	24	76.50	140.4		19.62	24
600	1397	2962		559	460	1549	4067		533	610	1943	3566		498	610

(1) Gear operators standard for 16” and up classes 600 to 1500 and 14” and up for class 2500.

SIZE	ASME 2500				
in / mm	A	B(1)	C(1)	D	E
2	11.00	19.3	21.4	1.50	12
50	279	490	543	38	300
2½	13.00	23.0	27.1	1.87	18
65	330	584	688	48	457
3	14.50	23.5	26.4	2.25	18
80	368	596	670	57	457
4	18.00	29.2	33.0	2.87	20
100	457	742	838	73	508
6	24.00	31.4	36.5	4.37	24
150	610	798	928	111	610
8	30.00	41.2	49.2	5.75	24
200	762	1069	1250	146	610
10	36.00	47.3	52.6	7.25	30
250	914	1201	1336	184	762
12	41.00	54.7	68.7	8.62	36
300	1041	1389	1745	219	914
14	44.00	72.2		9.50	24
350	1118	1834		241	610
16	49.00	80.0		10.87	24
400	1245	2032		276	610
18	55.00	82.9		12.25	32
450	1397	2106		311	800

B = Center to top closed
C = Center to top open

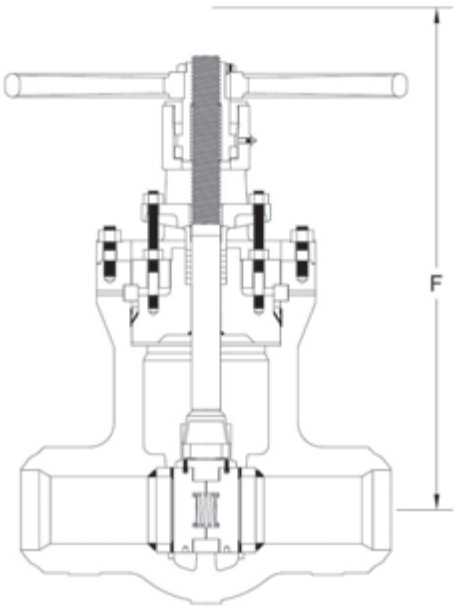


PRESSURE SEAL PARALLEL SEAT GATE VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 24“ (50 TO 600 mm)
ASME CLASSES 600 TO 2500

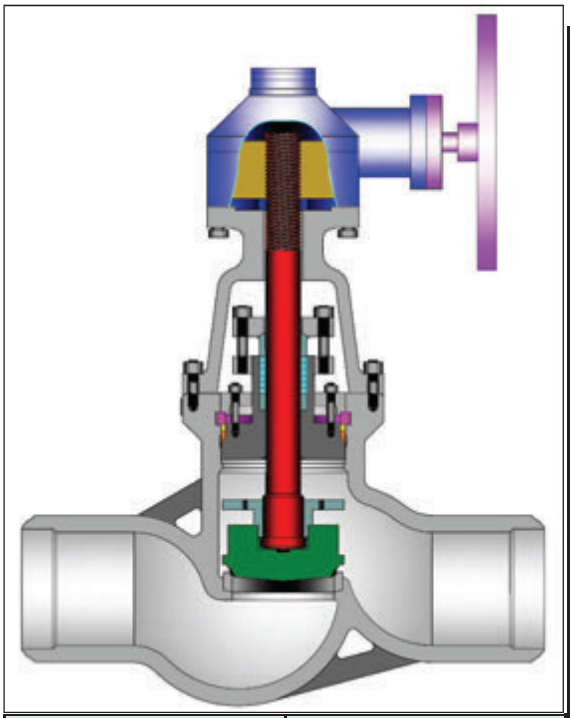
SIZE	ASME 600					ASME 900					ASME 1500					ASME 2500				
in / mm	F	in / mm	WT	lb / kg	C_V	F	in / mm	WT	lb / kg	C_V	F	in / mm	WT	lb / kg	C_V	F	in / mm	WT	lb / kg	C_V
2	28.5		95		240	31.2		95		210	32.2		93		210	32.6		176		140
50	724		43			792		43			817		42			829		80		
2½	31.2		125		390	31.3		125		310	33.8		135		310	35.6		331		220
65	792		56			795		56			859		61			904		150		
3	33.3		143		560	36.4		154		510	37.9		221		470	36.6		331		310
80	846		65			925		70			963		100			929		150		
4	40.0		181		1000	41.4		229		950	44.9		401		830	45.3		522		520
100	1016		82			1052		104			1140		182			1148		237		
6	47.5		364		2400	48.9		518		2200	47.7		760		2000	53.3		840		1300
150	1207		165			1242		235			1212		345			1354		381		
8	56.5		712		4300	58.4		904		3900	59.0		1583		3400	62.2		1852		2300
200	1435		323			1483		410			1499		718			1580		840		
10	67.2		1091		6700	70.2		1820		6200	68.4		2787		5400	74.5		3504		3700
250	1707		495			1783		825			1737		1264			1892		1589		
12	78.6		1616		10000	80.0		2586		9000	80.0		3235		7800	84.6		5420		5400
300	1996		733			2032		1173			2032		1467			2149		2458		
14	87.5		2221		12000	84.5		3421		11000	92.3		5140		9400	98.1		7584		6600
350	2223		1007			2146		1552			2344		2336			2493		3440		
16	97.2		2898		16000	102.4		4291		14000	104.9		6477		12000	114.8		10587		8600
400	2469		1314			2601		1946			2664		2937			2916		4801		
18	108.3		3646		21000	114.5		5164		19000	117.9		7857		16000	117.7		10587		11000
450	2751		1654			2908		2342			2995		3563			2990		4801		
20	119.4		4456		25000	125.3		6005		23000	132.0		9256		20000					
500	3033		2021			3183		2723			3353		4198							
24	144.9		6231		37000	150.5		7463		33000	164.3		11983		29000					
600	3680		2826			3823		3385			4173		5434							

Note: Does not include weight of gear.

WT = Weight
F = Dismantling Dimension
C_V = Flow Coefficient



PRESSURE SEAL GLOBE VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 24“ (50 TO 600 mm)
ASME CLASSES 600 TO 2500



Class	Fig. No.
600	1631
900	1931
1500	1131
2500	1231

STANDARD MATERIALS (Other materials available)

PART	MATERIALS			
Body	A216 Gr. WCB (STANDARD)	A217 Gr. WC6	A217 Gr. WC9	A217 Gr. C12A
Bonnet	A105	A182 F11	A182 F22	A182 F91
Yokearm	A216 Gr. WCB			
Disc	A105 or A216 WCB + Stellite 6 Faced	A182 F11 or A217 WC6 + Stellite 6 Faced	A182 F22 or A217 WC9 + Stellite 6 Faced	A182 F91 or A217 Gr. C12A+ Stellite 6 Faced
Disc Nut	SST 410			
Seat Ring	Carbon Steel + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced	A182 F91 + Stellite 6 Faced
Stem	A182 F6a			
Stem Bushing	A 439 Ductile NI-Resist Gr. D2			
Stem Bushing Set Screw	Steel			
Gland Flange	A216 Gr. WCB			
Eye Bolt	A193 Gr. B7			
Eye Bolt Nut	A194 Gr. 2H			
Groove Pin	Steel			
Gland	SST 410			
Packing	Graphite			
Packing Washer / Packing Spacer	SST 410			
Protective Ring	SST 410			
Segmental Thrust Ring	SST 410			
Support Plate	Steel			
Gasket	SST 304L			
Hand Wheel	Malleable Iron or Steel			
Hand Wheel Nut	Steel			
Body / Bonnet / Yoke Stud	A193 Gr. B7	A193 Gr. B16		
Body / Bonnet / Yoke Nut	A194 Gr. 2H	A194 Gr. 7		

DESIGN FEATURES:

- **Standard trim** is stellite faced seat and disc seat surfaces, and 13% chrome stem (API trim 5). Other trims available on request.
- **Valves** are full port design per ASME B16.34 Table A-1.
- **Wall** thickness per heavy wall API 600 requirements.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Swivel** disc for optimal seating and longer seat life.
- **Each** valve is shell, seat and backseat pressure tested per industry standard API 598.
- **Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.
- **Weld** end valves are B16.10 short pattern design. Flanged end valves are available on request and are B16.10 long -pattern design. Weld end valve dimensions given in table on next page.
- **Valve sizes** 4” and smaller have bonnet take up ring design instead of support plate design.
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test, inspection result and certificate of conformance.
- **Other** available options as follows:
  -Alternate valve materials such as chrome and stainless steel alloys
  -Alternate trim materials
  -Bypass, drain and other auxiliary connections
  -Gear, motor, and cylinder actuators available
  -NACE service
  -Special cleaning for applications such as oxygen or chlorine
  -Other options available as Specified

Design Specifications

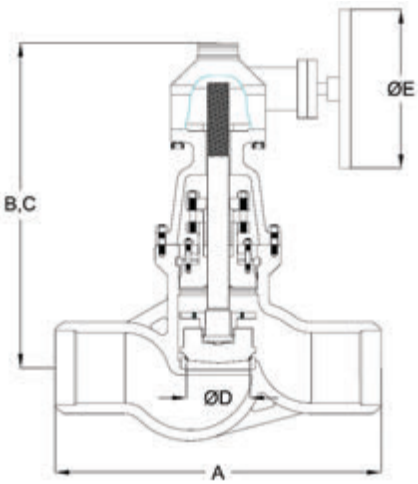
Item	Applicable Specification
Wall thickness	API 600
Pressure - temperature ratings	ASME B16.34
General valve design	B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Butt Weld design	ASME B16.25
Materials	ASTM

GLOBE VALVE DIMENSIONS (CLASS 600—2500).

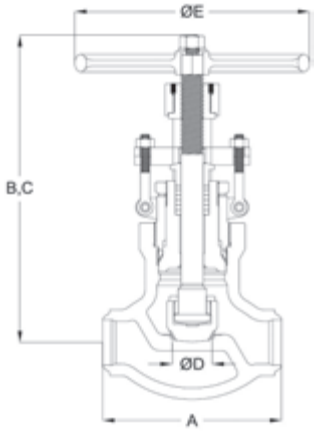
SIZE	ASME 600					ASME 900					ASME 1500				
in / mm	A	B(1)	C(1)	D	E	A	B(1)	C(1)	D	E	A	B(1)	C(1)	D	E
2	7.00	15.9	16.5	2.00	10	8.50	15.9	16.5	1.87	12	8.50	18.0	18.8	1.87	12
50	178	405	420	51	250	216	405	420	48	300	216	460	475	48	300
2½	8.50	17.1	18.0	2.50	12	10.00	17.9	18.8	2.25	14	10.00	19.9	20.8	2.25	18
65	216	435	460	64	300	254	455	475	57	350	254	505	525	57	450
3	10.00	18.5	19.5	3.00	12	12.00	21.0	22.0	2.87	14	12.00	23.3	24.3	2.87	22
80	254	470	495	76	300	305	535	560	73	350	305	590	615	70	550
4	12.00	22.1	23.5	4.00	18	14.00	25.1	26.5	3.87	18	16.00	29.3		3.62	18
100	305	560	600	102	450	356	640	675	98	450	406	745		92	460
6	18.00	28.0	30.0	6.00	20	20.00	36.5		5.75	24	22.00	40.3		5.37	24
150	457	710	760	152	500	508	925		146	610	559	1025		136	610
8	23.00	40.0	42.8	7.87	24	26.00	52.5		7.50	24	28.00	55.0		7.00	24
200	584	1015	1085	200	610	660	1335		191	610	711	1400		178	610
10	28.00	50.0		9.75	24	31.00	56.5		9.37	24	34.00	62.5		8.75	24
250	711	1270		248	610	787	1435		238	610	864	1590		222	610
12	32.00	55.5		11.75	24	36.00	59.3		11.12	24	39.00	70.0		10.37	32
300	813	1410		298	610	914	1505		282	610	991	1780		263	800

(1) Gear operators standard for 10” and up for class 600, 6” and up for class 900, and 4” and up for class 1500 and 2500.

SIZE	ASME 2500				
in / mm	A	B(1)	C(1)	D	E
2	11.00	19.0	19.8	1.50	22
50	279	485	500	38	550
2½	13.00	22.0	22.8	1.87	24
65	330	560	580	48	600
3	14.50	23.8	24.8	2.25	24
80	368	605	630	57	600
4	18.00	31.0		2.87	18
100	457	790		73	460
6	24.00	47.3		4.37	24
150	610	1200		111	610
8	30.00	61.8		5.75	24
200	762	1570		146	610
10	36.00	69.5		7.25	24
250	914	1765		184	610
12	41.00	80.0		8.62	32
300	1041	2030		219	800

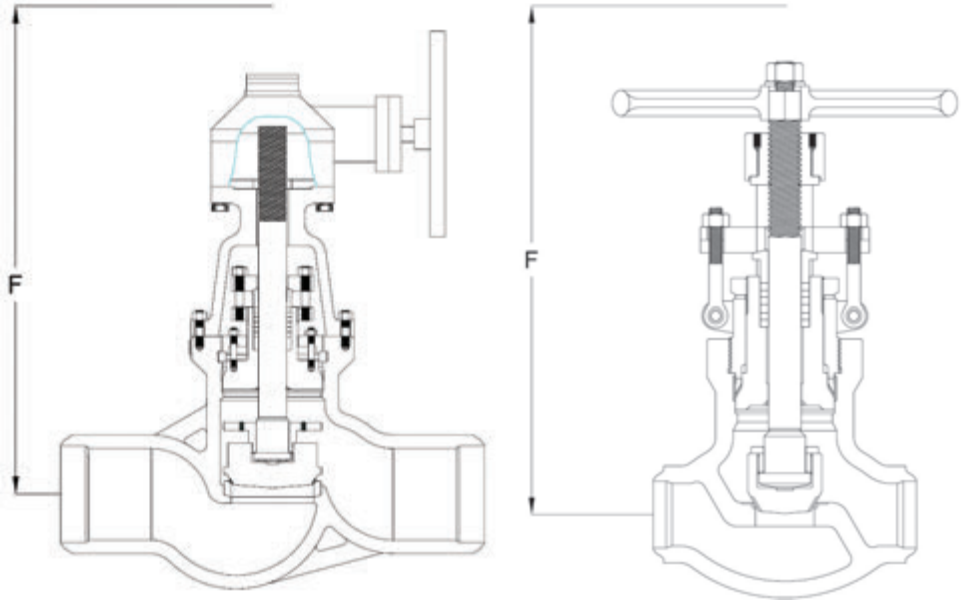


B = Center to top closed
C = Center to top open



PRESSURE SEAL GLOBE VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 24“ (50 TO 600 mm)
ASME CLASSES 600 TO 2500

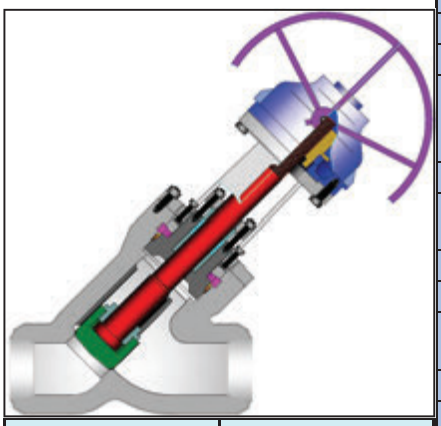
SIZE	ASME 600					ASME 900					ASME 1500					ASME 2500				
in	F	in	WT	lb	C_V	F	in	WT	lb	C_V	F	in	WT	lb	C_V	F	in	WT	lb	C_V
mm		mm		kg			mm		kg			mm		kg			mm		kg	
2	25.4		46		50	26.7		80		40	27.7		85		40	30.3		111		25
50	645		21			678		36			700		39			770		50		
2½	25.4		83		75	26.7		120		60	29.6		136		60	31.0		169		40
65	645		38			678		54			746		62			787		77		
3	27.7		106		110	30.9		187		100	32.3		199		90	33.8		261		60
80	704		48			784		85			820		90			859		118		
4	32.0		182		200	36.0		288		190	40.0		430		160	41.5		567		100
100	814		83			916		131			1017		195			1057		257		
6	38.9		359		480	45.9		624		440	49.1		922		380	59.9		1240		250
150	987		163			1164		283			1248		418			1522		562		
8	51.5		581		850	62.6		1042		770	65.6		1521		670	70.8		2056		450
200	1306		263			1592		473			1668		690			1799		932		
10	61.6		843		1300	67.8		1576		1200	72.9		2468		1000	88.2		3378		720
250	1562		382			1722		715			1854		1119			2239		1532		
12	68.8		1144		2000	71.8		2210		1800	83.2		3613		1500	97.9		4056		1100
300	1746		519			1824		1002			2114		1639			2487		1839		



F = Dismantling dimension

WT = Weight
C_V = Flow coefficient

PRESSURE SEAL Y-PATTERN GLOBE VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 12“ (50 TO 300 mm)
ASME CLASSES 600 TO 2500



Class	Fig. No. (1)
600	1631
900	1931
1500	1131
2500	1231

(1) An option code is needed to specify a y-pattern. See page 7 for more details.

DESIGN FEATURES:

- **Standard trim** is stellite faced seat and disc seat surfaces, and 13% chrome stem (API trim 5). Other trims available on request.
- **Valves** are full port design per ASME B16.34 Table A-1.
- **Wall** thickness per heavy wall API 600 requirements.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Swivel** disc for optimal seating and longer seat life.
- **Each** valve is shell, seat and backseat pressure tested per industry standard API 598.
- **Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test, inspection result and certificate of conformance.

STANDARD MATERIALS (Other materials available)

PART	MATERIALS			
Body	A216 Gr. WCB (STANDARD)	A217 Gr. WC6	A217 Gr. WC9	A217 Gr. C12A
Bonnet	A105	A182 F11	A182 F22	A182 F91
Yokearm	A216 Gr. WCB			
Disc	A105 or A216 WCB + Stellite 6 Faced	A182 F11 or A217 WC6 + Stellite 6 Faced	A182 F22 or A217 WC9 + Stellite 6 Faced	A182 F91 or A217 Gr. C12A + Stellite 6 Faced
Disc Nut	SST 410			
Seat Ring	Carbon Steel + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced	A182 F91 + Stellite 6 Faced
Stem	A182 F6a			
Stem Bushing	A 439 Ductile NI-Resist Gr. D2			
Stem Bushing Set Screw	Steel			
Gland Flange	A216 Gr. WCB			
Eye Bolt	A193 Gr. B7			
Eye Bolt Nut	A194 Gr. 2H			
Groove Pin	Steel			
Gland	SST 410			
Packing	Graphite			
Packing Washer / Packing Spacer	SST 410			
Protective Ring	SST 410			
Segmental Thrust Ring	SST 410			
Support Plate	Steel			
Gasket	SST 304L			
Hand Wheel	Malleable Iron or Steel			
Hand Wheel Nut	Steel			
Body / Bonnet / Yoke Stud	A193 Gr. B7	A193 Gr. B16		
Body / Bonnet / Yoke Nut	A194 Gr. 2H	A194 Gr. 7		

- **Valve sizes** 4” and smaller have bonnet take up ring design instead of support plate design.
- **Weld** end valves are B16.10 short pattern design. Flanged end valves are available on request and are B16.10 long-pattern design. Weld end valve dimensions given in table on next page.
- **Other** available options as follows:
  -Alternate valve materials such as chrome and stainless steel alloys
  -Alternate trim materials
  -Bypass, drain and other auxiliary connections
  -Gear, motor, and cylinder actuators available
  -NACE service
  -Special cleaning for applications such as oxygen or chlorine
  -Other options available as specified

Design Specifications

Item	Applicable Specification
Wall thickness	API 600
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Butt Weld design	ASME B16.25
Materials	ASTM

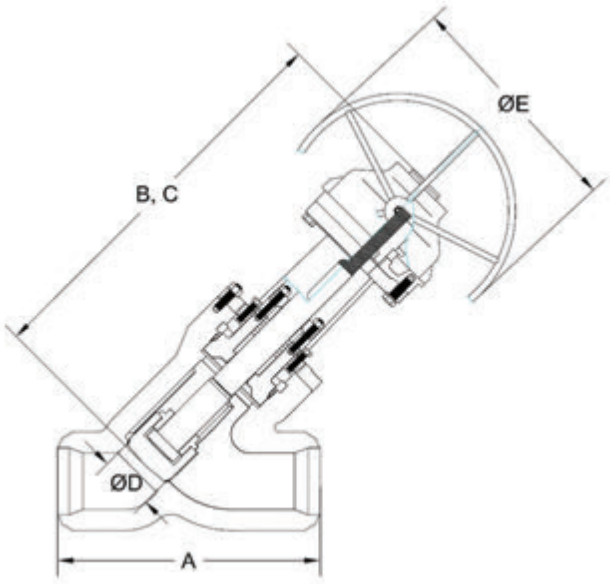
GLOBE VALVE DIMENSIONS (CLASS 600—2500).

SIZE	ASME 600					ASME 900					ASME 1500				
in / mm	A	B(1)	C(1)	D	E	A	B(1)	C(1)	D	E	A	B(1)	C(1)	D	E
2	7.00	16.9	17.5	2.00	10	8.50	16.9	17.5	1.87	12	8.50	19.0	19.8	1.87	12
50	178	430	445	51	250	216	430	445	48	300	216	483	503	48	300
2½	8.50	18.1	19.0	2.50	12	10.00	18.9	19.8	2.25	14	10.00	21.9	21.8	2.25	18
65	216	460	485	64	300	254	480	503	57	350	254	556	554	57	450
3	10.00	19.5	20.5	3.00	12	12.00	22.0	23.0	2.87	14	12.00	24.3	25.3	2.75	22
80	254	495	520	76	300	305	559	584	73	350	305	617	643	70	550
4	12.00	24.1	25.5	4.00	18	14.00	27.1	28.5	3.87	18	16.00	31.3		3.62	18
100	305	611	651	102	450	356	688	724	98	450	406	795		92	460
6	18.00	30.0	32.0	6.00	20	20.00	38.5		5.75	24	22.00	42.3		5.37	24
150	457	762	813	152	500	508	978		146	610	559	1074		136	610
8	23.00	42.0	44.8	7.87	24	26.00	54.5		7.50	24	28.00	57.0		7.00	24
200	584	1067	1138	200	610	660	1384		191	610	711	1448		178	610
10	28.00	53.0		9.75	24	31.00	59.5		9.37	24	34.00	65.5		8.75	24
250	711	1346		248	610	787	1511		238	610	864	1664		222	610
12	32.00	58.5		11.75	24	36.00	62.3		11.12	24	39.00	73.0		10.37	32
300	813	1486		298	610	914	1582		282	610	991	1854		263	800

(1) Gear operators standard for 10” and up for class 600, 6” and up for class 900, and 4” and up for class 1500 and 2500.

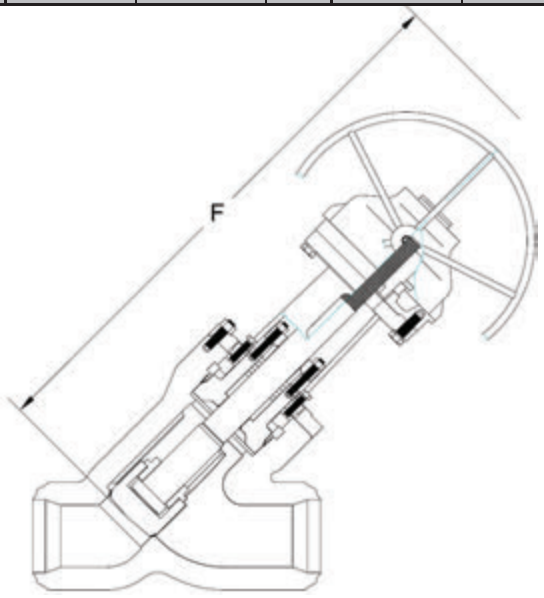
SIZE	ASME 2500				
in / mm	A	B(1)	C(1)	D	E
2	11.00	20.0	20.8	1.50	22
50	279	508	528	38	550
2½	13.00	53.0	53.8	1.87	24
65	330	584	1367	48	600
3	14.50	24.8	25.8	2.25	24
80	368	630	655	57	600
4	18.00	33.0		2.87	18
100	457	838		73	460
6	24.00	49.3		4.37	24
150	610	1252		111	610
8	30.00	63.8		5.75	24
200	762	1621		146	610
10	36.00	72.5		7.25	24
250	914	1842		184	610
12	41.00	83.0		8.62	32
300	1041	2108		219	800

B = Center to top closed
C = Center to top open



PRESSURE SEAL Y-PATTERN GLOBE VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 12“ (50 TO 300 mm)
ASME CLASSES 600 TO 2500

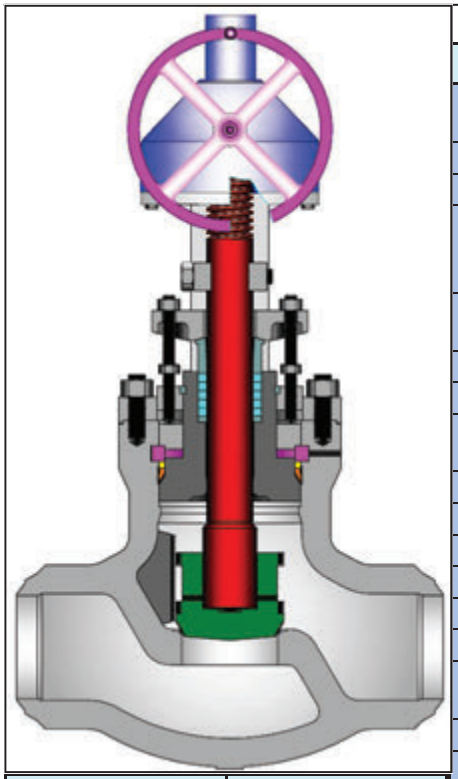
SIZE	ASME 600					ASME 900					ASME 1500					ASME 2500				
in	F	in	WT	lb	C_v	F	in	WT	lb	C_v	F	in	WT	lb	C_v	F	in	WT	lb	C_v
mm		mm		kg			mm		kg			mm		kg			mm		kg	
2	26.4		49		100	27.7		84		90	28.7		89		90	31.3		117		60
50	671		22			704		38			729		40			795		53		
2½	26.4		87		170	27.7		126		130	30.6		143		130	32.0		177		95
65	671		40			704		57			777		65			813		80		
3	28.7		111		240	31.9		197		220	33.3		211		200	34.8		277		130
80	729		50			810		89			846		96			884		125		
4	34.0		191		440	38.0		305		410	42.0		456		360	43.5		601		230
100	864		87			965		138			1067		207			1105		273		
6	40.9		381		1050	47.9		661		960	51.1		986		840	61.9		1327		560
150	1039		173			1217		300			1298		447			1572		602		
8	53.5		616		1870	64.6		1105		1700	67.6		1628		1500	72.8		2200		1000
200	1359		279			1641		501			1717		738			1949		998		
10	64.6		894		2900	70.8		1671		2700	75.9		2641		2300	91.2		3648		1600
250	1641		405			1798		758			1928		1198			2316		1655		
12	71.8		1213		4300	74.8		2365		3900	86.2		3902		3400	100.9		4380		2300
300	1824		550			1900		1072			2189		1770			2563		1987		



F = Dismantling dimension

WT = Weight
C_V = Flow coefficient

PRESSURE SEAL NON-RETURN VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 12“ (50 TO 300 mm)
ASME CLASSES 600 TO 2500



Class	Fig. No.
600	1684
900	1984
1500	1184
2500	1284

STANDARD MATERIALS (Other materials available)

PART	MATERIALS			
Body	A216 Gr. WCB (STANDARD)	A217 Gr. WC6	A217 Gr. WC9	A217 Gr. C12A
Bonnet	A105	A182 F11	A182 F22	A182 F91
Yokearm	A216 Gr. WCB			
Disc	A105 or A216 WCB + Stellite 6 Faced	A182 F11 or A217 WC6 + Stellite 6 Faced	A182 F22 or A217 WC9 + Stellite 6 Faced	A182 F91 or A217 Gr. C12A + Stellite 6
Seat Ring	Carbon Steel + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced	A182 F91 + Stellite 6 Faced
Stem	A182 F6a			
Stem Bushing	A 439 Ductile NI-Resist Gr. D2			
Stem Bushing Set Screw	Steel			
Gland Flange	A216 Gr. WCB			
Eye Bolt	A193 Gr. B7			
Eye Bolt Nut	A194 Gr. 2H			
Groove Pin	Steel			
Gland	SST 410			
Packing	Graphite			
Packing Washer / Packing Spacer	SST 410			
Protective Ring	SST 410			
Segmental Thrust Ring	SST 410			
Support Plate	Steel			
Gasket	SST 304L			
Hand Wheel	Malleable Iron or Steel			
Hand Wheel Nut	Steel			
Body / Bonnet / Yoke Stud	A193 Gr. B7	A193 Gr. B16		
Body / Bonnet / Yoke Nut	A194 Gr. 2H	A194 Gr. 7		

DESIGN FEATURES:

- **Standard trim** is stellite faced seat and disc seat surfaces, and 13% chrome stem (API trim 5). Other trims available on request.
- **Valves** are full port design per ASME B16.34 Table A-1.
- **Wall** thickness per heavy wall API 600 requirements.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Each** valve is shell, seat and back-seat pressure tested per industry standard API 598.
- **Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.
- **Weld** end valves are B16.10 short pattern design. Flanged end valves are B16.10 long-pattern design. Weld end valve dimensions given in table on next page.
- **Valve sizes** 4” and smaller have bonnet take up ring design instead of support plate design.
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test, inspection result and certificate of conformance.
- **Other** available options as follows:
  -Alternate valve materials such as chrome and stainless steel alloys
  -Alternate trim materials
  -Bypass, drain and other auxiliary connections
  -Gear, motor, and cylinder actuators available
  -NACE service
  -Special cleaning for applications such as oxygen or chlorine
  -Other options available as Specified

Design Specifications

Item	Applicable Specification
Wall thickness	API 600
Pressure - temperature ratings	ASME B16.34
General valve design	B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Butt Weld design	ASME B16.25
Materials	ASTM

Note: Angle pattern available on request.

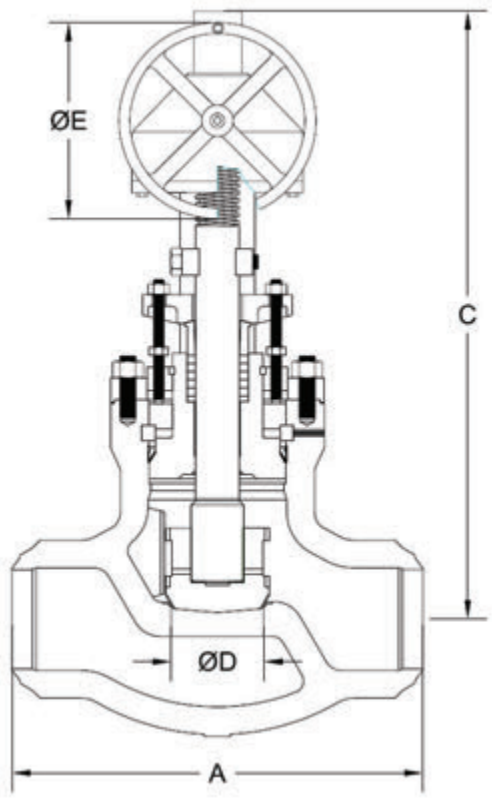
NON-RETURN VALVE DIMENSIONS (CLASS 600—2500).

SIZE	ASME 600					ASME 900					ASME 1500				
in / mm	A	B(1)	C(1)	D	E	A	B(1)	C(1)	D	E	A	B(1)	C(1)	D	E
2	7.00	15.9	16.5	2.00	10	8.50	15.9	16.5	1.87	12	8.50	18.0	18.8	1.87	12
50	178	405	420	51	250	216	405	420	48	300	216	460	475	48	300
2½	8.50	17.1	18.0	2.50	12	10.00	17.9	18.8	2.25	14	10.00	19.9	20.8	2.25	18
65	216	435	460	64	300	254	455	475	57	350	254	505	525	57	450
3	10.00	18.5	19.5	3.00	12	12.00	21.0	22.0	2.87	14	12.00	23.3	24.3	2.75	22
80	254	470	495	76	300	305	535	560	73	350	305	590	615	70	550
4	12.00	22.1	23.5	4.00	18	14.00	25.1	26.5	3.87	18	16.00	29.3		3.62	18
100	305	560	600	102	450	356	640	675	98	450	406	745		92	460
6	18.00	28.0	30.0	6.00	20	20.00	36.5		5.75	24	22.00	40.3		5.37	24
150	457	710	760	152	500	508	925		146	610	559	1025		136	610
8	23.00	40.0	42.8	7.87	24	26.00	52.5		7.50	24	28.00	55.0		7.00	24
200	584	1015	1085	200	600	660	1335		191	610	711	1400		178	610
10	28.00	50.0		9.75	24	31.00	56.5		9.37	24	34.00	62.5		8.75	24
250	711	1270		248	610	787	1435		238	610	864	1590		222	610
12	32.00	55.5		11.75	24	36.00	59.3		11.12	24	39.00	70.0		10.37	32
300	813	1410		298	610	914	1505		282	610	991	1780		263	800

(1) Gear operators standard for 10” and up for class 600, 6” and up for class 900, and 4” and up for class 1500 and 2500.

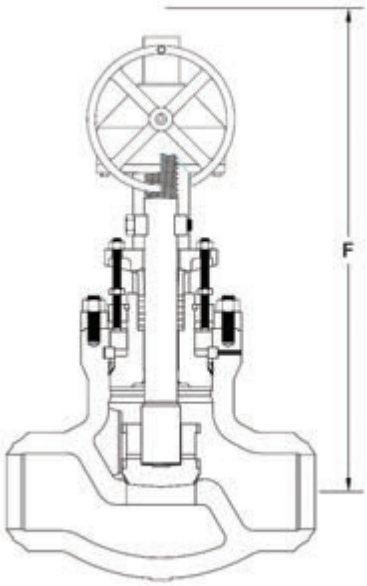
SIZE	ASME 2500				
in / mm	A	B(1)	C(1)	D	E
2	11.00	19.0	19.8	1.50	22
50	279	485	500	38	550
2½	13.00	22.0	22.8	1.87	24
65	330	560	580	48	600
3	14.50	23.8	24.8	2.25	24
80	368	605	630	57	600
4	18.00	31.0		2.87	18
100	457	790		73	460
6	24.00	47.3		4.37	24
150	610	1200		111	610
8	30.00	61.8		5.75	24
200	762	1570		146	610
10	36.00	69.5		7.25	24
250	914	1765		184	610
12	41.00	80.0		8.62	32
300	1041	2030		219	800

B = Center to top closed
C = Center to top open



PRESSURE SEAL NON-RETURN VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 12“ (50 TO 300 mm)
ASME CLASSES 600 TO 2500

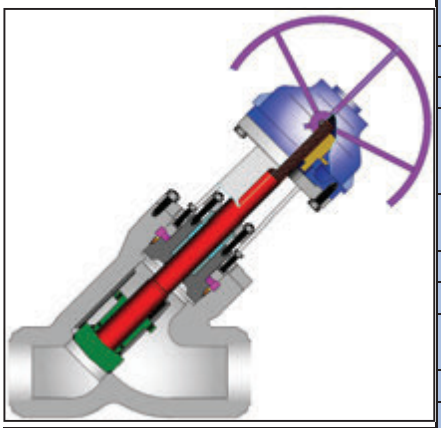
SIZE	ASME 600					ASME 900					ASME 1500					ASME 2500				
in / mm	F	in / mm	WT	lb / kg	C_V	F	in / mm	WT	lb / kg	C_V	F	in / mm	WT	lb / kg	C_V	F	in / mm	WT	lb / kg	C_V
2	25.4		46		50	26.7		80		40	27.7		85		40	30.3		111		25
50	645		21			678		36			700		39			770		50		
2½	25.4		83		75	26.7		120		60	29.6		136		60	31.0		169		40
65	645		38			678		54			746		62			787		77		
3	27.7		106		110	30.9		187		100	32.3		199		90	33.8		261		60
80	704		48			784		85			820		90			859		118		
4	32.0		182		200	36.0		288		190	40.0		430		160	41.5		567		100
100	814		83			916		131			1017		195			1057		257		
6	38.9		359		480	45.9		624		440	49.1		922		380	59.9		1240		250
150	987		163			1164		283			1248		418			1522		562		
8	51.5		581		850	62.6		1042		770	65.6		1521		670	70.8		2056		450
200	1306		263			1592		473			1668		690			1799		932		
10	61.6		843		1300	67.8		1576		1200	72.9		2468		1000	88.2		3378		720
250	1562		382			1722		715			1854		1119			2239		1532		
12	68.8		1144		2000	71.8		2210		1800	83.2		3613		1500	97.9		4056		1100
300	1746		519			1824		1002			2114		1639			2487		1839		



F = Dismantling dimension

WT = Weight
C_V = Flow coefficient

PRESSURE SEAL Y-PATTERN NON-RETURN VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 12“ (50 TO 300 mm)
ASME CLASSES 600 TO 2500



Class	Fig. No. (1)
600	1684
900	1984
1500	1184
2500	1284

(1) An option code is needed to specify a y-pattern. See page 7 for more details.

STANDARD MATERIALS (Other materials available)

PART	MATERIALS			
Body	A216 Gr. WCB (STANDARD)	A217 Gr. WC6	A217 Gr. WC9	A217 Gr. C12A
Bonnet	A105	A182 F11	A182 F22	A182 F91
Yokearm	A216 Gr. WCB			
Disc	A105 or A216 WCB + Stellite 6 Faced	A182 F11 or A217 WC6 + Stellite 6 Faced	A182 F22 or A217 WC9 + Stellite 6 Faced	A182 F91 or A217 Gr. C12A + Stellite 6 Faced
Seat Ring	Carbon Steel + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced	A182 F91 + Stellite 6 Faced
Stem	A182 F6a			
Stem Bushing	A 439 Ductile NI-Resist Gr. D2			
Stem Bushing Set Screw	Steel			
Gland Flange	A216 Gr. WCB			
Eye Bolt	A193 Gr. B7			
Eye Bolt Nut	A194 Gr. 2H			
Groove Pin	Steel			
Gland	SST 410			
Packing	Graphite			
Packing Washer / Packing Spacer	SST 410			
Protective Ring	SST 410			
Segmental Thrust Ring	SST 410			
Support Plate	Steel			
Gasket	SST 304L			
Hand Wheel	Malleable Iron or Steel			
Hand Wheel Nut	Steel			
Body / Bonnet / Yoke Stud	A193 Gr. B7	A193 Gr. B16		
Body / Bonnet / Yoke Nut	A194 Gr. 2H	A194 Gr. 7		

DESIGN FEATURES:

- **Standard trim** is stellite faced seat and disc seat surfaces, and 13% chrome stem (API trim 5). Other trims available on request.
- **Valves** are full port design per ASME B16.34 Table A-1.
- **Wall** thickness per heavy wall API 600 requirements.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Each** valve is shell, seat and backseat pressure tested per industry standard API 598.
- **Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test, inspection result and certificate of conformance.
- **Valve sizes** 4” and smaller have bonnet take up ring design instead of support plate design.
- **Weld** end valves are B16.10 short pattern design. Flanged end valves are available on request and are B16.10 long-pattern design. Weld end valve dimensions given in table on next page.
- **Other** available options as follows:
  -Alternate valve materials such as chrome and stainless steel alloys
  -Alternate trim materials
  -Bypass, drain and other auxiliary connections
  -Gear, motor, and cylinder actuators available
  -NACE service
  -Special cleaning for applications such as oxygen or chlorine
  -Other options available as specified

Design Specifications

Item	Applicable Specification
Wall thickness	API 600
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Butt Weld design	ASME B16.25
Materials	ASTM

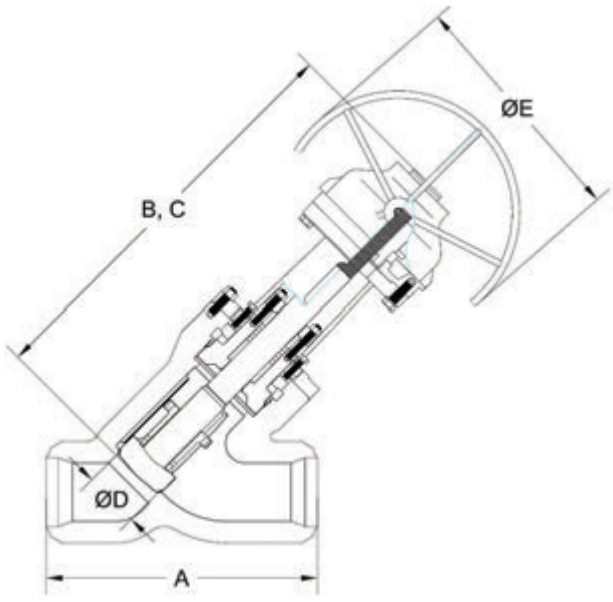
NON-RETURN VALVE DIMENSIONS (CLASS 600—2500).

SIZE	ASME 600					ASME 900					ASME 1500				
in / mm	A	B(1)	C(1)	D	E	A	B(1)	C(1)	D	E	A	B(1)	C(1)	D	E
2	11.50	16.9	17.5	2.00	10	8.50	16.9	17.5	1.87	12	8.50	19.0	19.8	1.87	12
50	178	430	445	51	250	216	430	445	48	300	216	483	503	48	300
2½	13.00	18.1	19.0	2.50	12	10.00	18.9	19.8	2.25	14	10.00	21.9	21.8	2.25	18
65	216	460	485	64	300	254	480	503	57	350	254	556	554	57	450
3	10.00	19.5	20.5	3.00	12	12.00	22.0	23.0	2.87	14	12.00	24.3	25.3	2.75	22
80	254	495	520	76	300	305	559	584	73	350	305	617	643	70	550
4	12.00	24.1	25.5	4.00	18	14.00	27.1	28.5	3.87	18	16.00	31.3		3.62	18
100	305	611	651	102	450	356	688	724	98	450	406	795		92	460
6	18.00	30.0	32.0	6.00	20	20.00	38.5		5.75	24	22.00	42.3		5.37	24
150	457	762	813	152	500	508	978		146	610	559	1074		136	610
8	23.00	42.0	44.8	7.87	24	26.00	54.5		7.50	24	28.00	57.0		7.00	24
200	584	1067	1138	200	600	660	1384		191	610	711	1448		178	610
10	28.00	53.0		9.75	24	31.00	59.5		9.37	24	34.00	65.5		8.75	24
250	711	1346		248	610	787	1511		238	610	864	1664		222	610
12	32.00	58.5		11.75	24	36.00	62.3		11.12	24	39.00	73.0		10.37	32
300	813	1486		298	610	914	1582		282	610	991	1854		263	800

(1) Gear operators standard for 10” and up for class 600, 6” and up for class 900, and 4” and up for class 1500 and 2500.

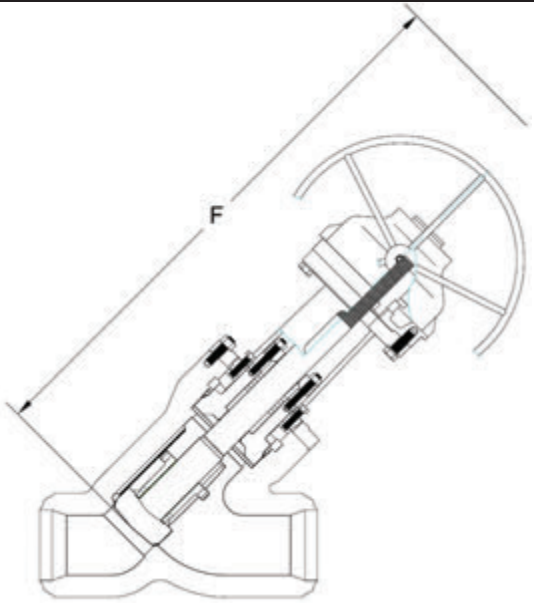
SIZE	ASME 2500				
in / mm	A	B(1)	C(1)	D	E
2	11.00	20.0	20.8	1.50	22
50	279	508	528	38	550
2½	13.00	53.0	53.8	1.87	24
65	330	584	1367	48	600
3	14.50	24.8	25.8	2.25	24
80	368	630	655	57	600
4	18.00	33.0		2.87	18
100	457	838		73	460
6	24.00	49.3		4.37	24
150	610	1252		111	610
8	30.00	63.8		5.75	24
200	762	1621		146	610
10	36.00	72.5		7.25	24
250	914	1842		184	610
12	41.00	83.0		8.62	32
300	1041	2108		219	800

B = Center to top closed
C = Center to top open



PRESSURE SEAL Y-PATTERN NON-RETURN VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 12“ (50 TO 300 mm)
ASME CLASSES 600 TO 2500

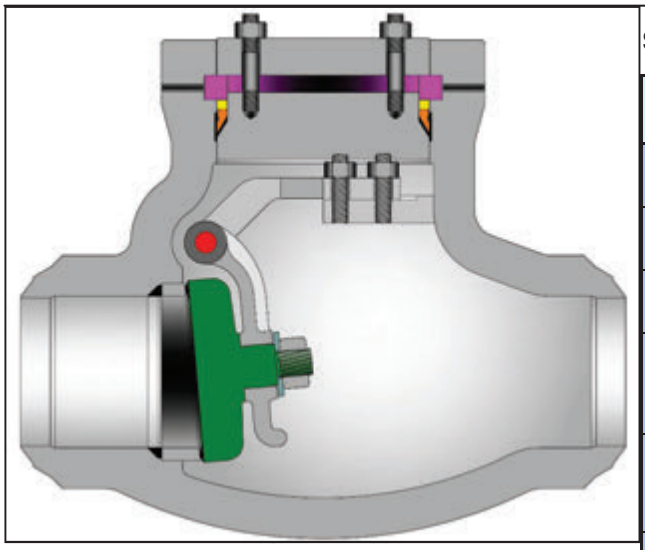
SIZE	ASME 600					ASME 900					ASME 1500					ASME 2500				
in	F	in	WT	lb	C_V	F	in	WT	lb	C_V	F	in	WT	lb	C_V	F	in	WT	lb	C_V
mm		mm		kg			mm		kg			mm		kg			mm		kg	
2	26.4		49		100	27.7		84		90	28.7		89		90	31.3		117		60
50	671		22			704		38			729		40			795		53		
2½	26.4		87		170	27.7		126		130	30.6		143		130	32.0		177		95
65	671		40			704		57			777		65			813		80		
3	28.7		111		240	31.9		197		220	33.3		211		200	34.8		277		130
80	729		50			810		89			846		96			884		125		
4	34.0		191		440	38.0		305		410	42.0		456		360	43.5		601		230
100	864		87			965		138			1067		207			1105		273		
6	40.9		381		1050	47.9		661		960	51.1		986		840	61.9		1327		560
150	1039		173			1217		300			1298		447			1572		602		
8	53.5		616		1900	64.6		1105		1700	67.6		1628		1500	72.8		2200		1000
200	1359		279			1641		501			1717		738			1949		998		
10	64.6		894		2900	70.8		1671		2700	75.9		2641		2300	91.2		3648		1600
250	1641		405			1798		758			1928		1198			2316		1655		
12	71.8		1213		4300	74.8		2365		3900	86.2		3902		3400	100.9		4380		2300
300	1824		550			1900		1072			2189		1770			2563		1987		



F = Dismantling dimension

WT = Weight
C_V = Flow coefficient

PRESSURE SEAL SWING CHECK VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 24“ (50 TO 600 mm)
ASME CLASSES 600 TO 2500



Class	Figure Number
600	1661
900	1961
1500	1161
2500	1261

Design Specifications

Item	Applicable Specification
Wall thickness	API 600
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Butt Weld design	ASME B16.25
Materials	ASTM

STANDARD MATERIALS (Other materials available)

PART	MATERIALS			
Body	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9	A217 Gr. C12A
Bonnet	A105	A182 F11	A182 F22	A182 F91
Cap	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9	A217 Gr. C12A
Disc	A105 or A216 WCB + Stellite 6 Faced	A182 F11 or A217 WC6 + Stellite 6 Faced	A182 F22 or A217 WC9 + Stellite 6 Faced	A182 F91 or A217 Gr. C12A + Stellite 6 Faced
Seat Ring	Carbon Steel + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced	A182 F91 + Stellite 6 Faced
Protective Ring	SST 410			
Segmental Thrust Ring	SST 410			
Gasket	SST 304L			
Carrier	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9	A217 Gr. C12A
Carrier Pin	SST 410			
Disc Nut	Series 300 SST			
Disc Carrier Hanger	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9	A217 Gr. C12A
Disc Carrier Hanger Bolts	A193 Gr. B7	A193 Gr. B16		
Body / Cap Stud	A193 Gr. B7	A193 Gr. B16		
Body / Cap Nut	A194 Gr. 2H	A194 Gr. 7		

DESIGN FEATURES:

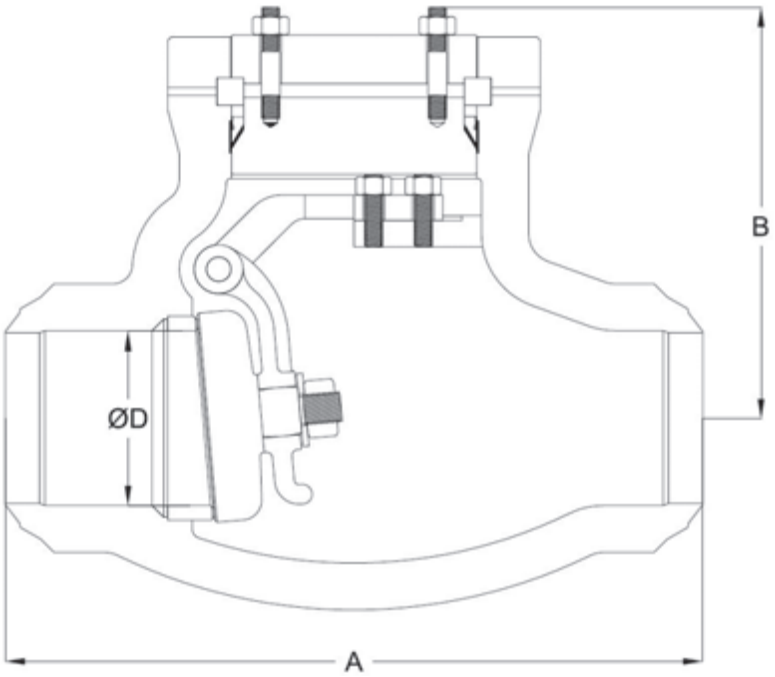
- **Standard trim** is stellite faced seat and disc seat surfaces, and 13% chrome carrier pin (API trim 5). Other trims available on request.
- **Valves** are full port design per ASME B16.34 table A-1.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Wall** thickness per heavy wall API 600 requirements.
- **Swivel disc** for improved seat alignment and longer life.
- **Each** valve is shell and seat pressure tested per industry standard API 598.
- **Check** valves are suitable for service in horizontal line with cap vertical or in a vertical line with flow upward.
- **Carrier Pin** is confined within the body wall and is not accessible from the exterior, thus no side body penetrations, eliminating a common leak path.
- **Weld** end valves are B16.10 short pattern design. Flanged end valves are available on request and are B16.10 long-pattern design. Weld end valve dimensions given in table on next page.
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test, inspection result and certificate of conformance.
- **Other** available options as follows:
  -Alternate valve materials such as chrome and stainless steel alloys
  -Alternate trim materials
  -Drain and other auxiliary connections
  -NACE service
  -Special cleaning for applications such as oxygen or chlorine
  -Other options available as specified

SWING CHECK VALVE DIMENSIONS (CLASS 600—2500).

SIZE	ASME 600			ASME 900			ASME 1500		
in / mm	A	B	D	A	B	D	A	B	D
2	7.00	6.8	2.00	8.50	8.6	1.87	8.50	8.7	1.87
50	178	172	51	216	218	48	216	221	48
3	10.00	8.8	3.00	12.00	10.2	2.87	12.00	10.2	2.75
80	254	224	76	305	259	73	305	259	70
4	12.00	11.1	4.00	14.00	11.7	3.87	16.00	12.2	3.62
100	305	282	102	356	297	98	406	310	92
6	18.00	13.0	6.00	20.00	14.3	5.75	22.00	14.5	5.37
150	457	330	152	508	363	146	559	367	136
8	23.00	14.6	7.87	26.00	16.6	7.50	28.00	18.9	7.00
200	584	370	200	660	422	191	711	480	178
10	28.00	16.6	9.75	31.00	19.4	9.37	34.00	22.1	8.75
250	711	422	248	787	493	238	864	561	222
12	32.00	18.2	11.75	36.00	21.7	11.12	39.00	26.3	10.37
300	813	462	299	914	551	282	991	669	263

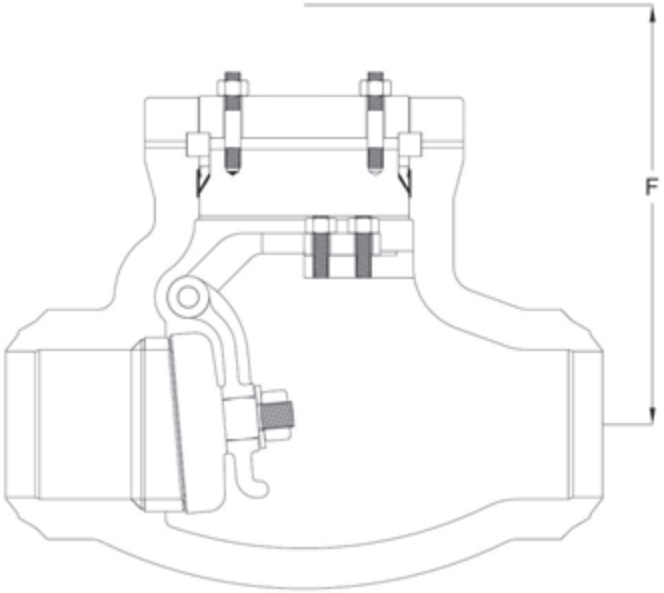
SIZE	ASME 2500		
in / mm	A	B	D
2	11.00	9.6	1.50
50	279	244	38
3	14.50	12.4	2.25
80	368	316	57
4	18.00	14.5	2.87
100	457	367	73
6	24.00	16.0	4.37
150	610	408	111
8	30.00	20.1	5.75
200	762	510	146
10	36.00	23.2	7.25
250	914	588	184
12	41.00	26.5	8.62
300	1041	672	219

B = Center to top



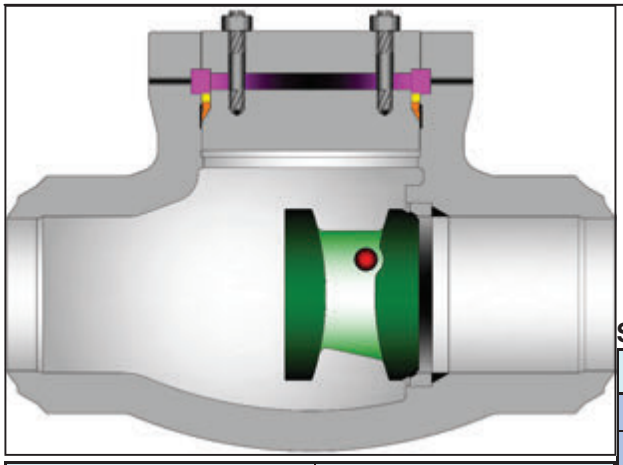
PRESSURE SEAL SWING CHECK VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 24“ (50 TO 600 mm)
ASME CLASSES 600 TO 2500

SIZE	ASME 600					ASME 900					ASME 1500					ASME 2500				
in / mm	F	in / mm	WT	lb / kg	C_V	F	in / mm	WT	lb / kg	C_V	F	in / mm	WT	lb / kg	C_V	F	in / mm	WT	lb / kg	C_V
2	8.8		40		75	10.6		46		65	10.7		46		65	11.6		117		40
50	224		18			269		21			272		21			295		53		
3	10.8		71		175	12.2		75		160	12.2		93		145	14.4		196		100
80	274		32			310		34			310		42			366		89		
4	13.1		121		315	14.7		150		300	15.2		163		260	17.5		313		165
100	333		55			373		68			386		74			445		142		
6	16.0		287		755	17.3		370		700	17.5		514		610	19.0		628		400
150	406		130			439		168			445		233			483		285		
8	17.6		573		1350	19.6		1019		1220	22.9		1111		1070	24.1		1319		720
200	447		260			498		462			582		504			612		598		
10	20.6		816		2070	23.4		1599		1910	26.1		1713		1670	27.2		1727		1140
250	523		370			594		725			663		777			691		783		
12	22.2		1080		3120	25.7		2362		2790	30.3		2547		2430	31.5		3334		1680
300	564		490			653		1071			770		1155			800		1512		



F = Dismantling dimension
WT = Weight
C_V = Flow coefficient

PRESSURE SEAL TILTING DISC CHECK VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 24“ (50 TO 600 mm)
ASME CLASSES 600 TO 2500



Side Plug Configuration

Class	Figure Number
600	1695
900	1995
1500	1195
2500	1295

DESIGN FEATURES:

- **Standard trim** is stellite faced seat and disc seat surfaces, and 13% chrome disc pin (API trim 5). Other trims available on request.
- **Valves** are full port design per ASME B16.34 Table A-1.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Wall** thickness per heavy wall API 600 requirements.
- **Body and cap joint** accurately machined. Gasket details on page 6.
- **Each** valve is shell and seat pressure tested per industry standard API 598.
- **Check** valves are suitable for service in horizontal line with cap vertical or in a vertical line with flow upward.
- **Weld** end valves are B16.10 short pattern design. Flanged end valves are available on request and are B16.10 long-pattern design. Weld end valve dimensions given in table on next page.
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test, inspection result and certificate of conformance.
- **Other** available options as follows:
  - -Alternate valve materials such as chrome and stainless steel alloys
  - -Alternate trim materials
  - -Drain and other auxiliary connections
  - -NACE service
  - -Special cleaning for applications such as oxygen or chlorine
  - -Other options available as Specified

STANDARD MATERIALS (Other materials available)

PART	MATERIALS			
Body	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9	A217 Gr. C12A
Bonnet	A105	A182 F11	A182 F22	A182 F91
Cap	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9	A217 Gr. C12A
Disc	A105 or A216 WCB + Stellite 6 Faced	A182 F11 or A217 WC6 + Stellite 6 Faced	A182 F22 or A217 WC9 + Stellite 6 Faced	A182 F91 or A217 Gr. C12A + Stellite 6 Faced
Seat Ring	Carbon Steel + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced	A182 F91 + Stellite 6 Faced
Protective Ring	SST 410			
Segmental Thrust Ring	SST 410			
Support Plate	Steel			
Gasket	SST 304L			
Disc Pin	SST 410			
Disc Nut	Series 300 SST			
Pin Plug Bolts	A193 Gr. B7	A193 Gr. B16		
Pin Plug Nuts	A194 Gr. 2H	A194 Gr. 7		
Pin Plug Gasket	Graphite Coated SST			
Bonnet Stud	A193 Gr. B7	A193 Gr. B16		
Bonnet Nut	A194 Gr. 2H	A194 Gr. 7		

Design Specifications

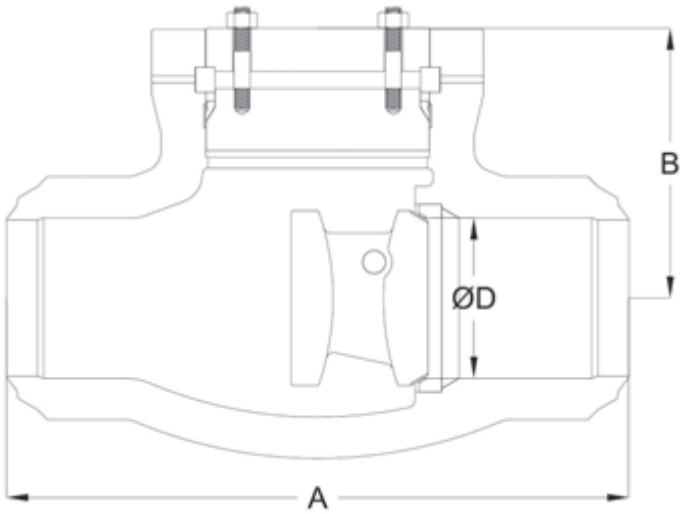
Item	Applicable Specification
Wall thickness	API 600
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Butt Weld design	ASME B16.25
Materials	ASTM

TILTING DISC CHECK VALVE DIMENSIONS (CLASS 600—2500).

SIZE	ASME 600			ASME 900			ASME 1500		
in / mm	A	B	D	A	B	D	A	B	D
2	7.00	7.5	2.00	8.50	5.6	1.87	8.50	7.6	1.87
50	178	191	51	216	143	48	216	194	48
2½	8.50	7.9	2.50	10.00	8.0	2.25	10.00	8.1	2.25
65	216	200	64	254	203	57	254	206	57
3	10.00	8.3	3.00	12.00	9.0	2.87	12.00	9.0	2.75
80	254	210	76	305	229	73	305	229	70
4	12.00	9.4	4.00	14.00	9.9	3.87	16.00	9.9	3.62
100	305	238	102	356	251	98	406	251	92
6	18.00	10.6	6.00	20.00	11.6	5.75	22.00	10.3	5.37
150	457	270	152	508	295	146	559	260	136
8	23.00	12.0	7.87	26.00	13.1	7.50	28.00	11.8	7.00
200	584	305	200	660	333	191	711	298	178
10	28.00	13.6	9.75	31.00	15.1	9.37	34.00	15.9	8.75
250	711	346	248	787	384	238	864	403	222
12	32.00	16.1	11.75	36.00	18.1	11.12	39.00	19.0	10.37
300	813	410	298	914	460	282	991	483	263
14	35.00	17.8	12.87	39.00	19.5	12.25	42.00	20.1	11.37
350	889	451	327	991	495	311	1067	511	289
16	39.00	20.1	14.75	43.00	21.9	14.00	47.00	22.3	13.00
400	991	511	375	1092	556	356	1194	565	330
18	43.00	21.8	16.50	48.00	22.9	15.75	60.50	23.3	14.62
450	1092	552	419	1219	581	400	1537	591	371
20	47.00	23.3	18.25	52.00	24.4	17.50	65.50	24.4	16.37
500	1194	591	464	1321	619	445	1664	619	416
24	55.00	25.4	22.00	61.00	27.4	21.00	76.50	28.9	19.62
600	1397	645	559	1549	695	533	1943	733	498

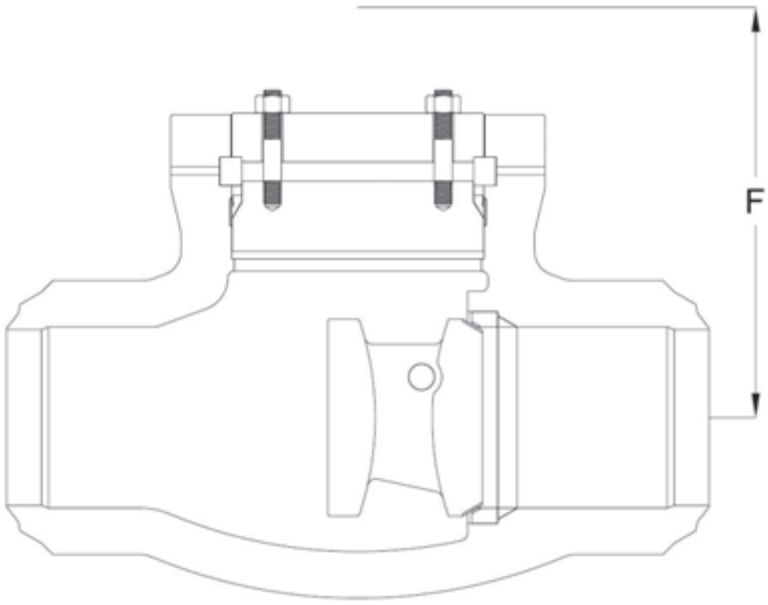
SIZE	ASME 2500		
in / mm	A	B	D
2	11.00	7.3	1.50
50	279	184	38
2½	13.00	7.9	1.87
65	330	200	48
3	14.50	9.4	2.25
80	368	238	57
4	18.00	9.9	2.87
100	457	251	73
6	24.00	11.8	4.37
150	610	298	111
8	30.00	14.6	5.75
200	762	371	146
10	36.00	16.6	7.25
250	914	422	184
12	41.00	21.3	8.62
300	1041	540	219
14	44.00	22.9	9.50
350	1118	581	241
16	49.00	20.5	10.87
400	1245	521	276
18	55.00	24.8	12.25
450	1397	629	311

B = Center to top



PRESSURE SEAL TILTING DISC CHECK VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 24“ (50 TO 600 mm)
ASME CLASSES 600 TO 2500

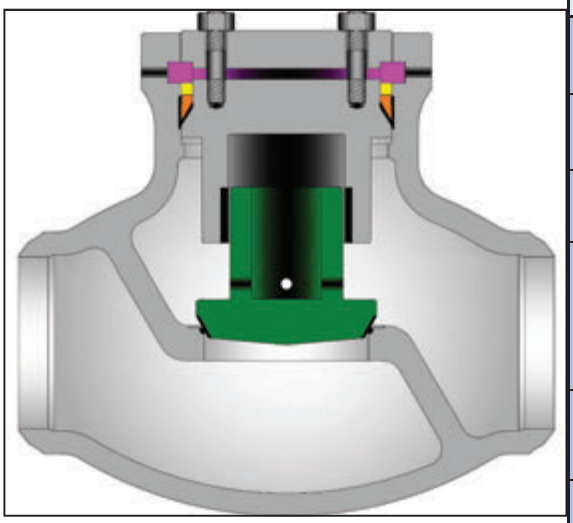
SIZE	ASME 600					ASME 900					ASME 1500					ASME 2500				
in	F	in	WT	lb	C_V	F	in	WT	lb	C_V	F	in	WT	lb	C_V	F	in	WT	lb	C_V
mm		mm		kg			mm		kg			mm		kg			mm		kg	
2	10.0		90		90	8.2		120		80	10.2		140		80	10.4		200		50
50	254		41			208		54			259		63			264		91		
2½	11.2		90		145	11.1		120		115	11.4		140		115	11.2		200		80
65	284		41			282		54			290		63			284		91		
3	12.1		150		205	12.5		180		190	12.8		210		175	13.0		240		115
80	307		68			318		82			325		95			330		42		
4	14.5		180		375	14.6		210		350	14.9		245		310	14.8		400		200
100	368		82			371		95			378		111			376		100		
6	17.9		245		900	18.4		400		830	17.7		440		720	17.6		560		480
150	455		111			467		181			450		200			448		235		
8	21.3		460		1600	21.9		505		1450	22.1		555		1270	21.9		970		860
200	541		209			556		229			561		252			557		440		
10	25.4		1100		2500	26.5		1160		2300	26.7		1545		2000	26.6		1655		1400
250	645		499			673		526			678		701			676		751		
12	30.1		1735		3700	31.3		1815		3300	32.2		1980		2900	31.9		2840		2000
300	765		787			795		823			818		898			810		1290		
14	33.9		2365		4500	34.2		2470		4000	33.8		3350		3500	34.8		4230		2400
350	861		1073			869		1120			859		1519			884		1918		
16	38.0		2990		5900	38.7		3125		5300	38.5		4720		4500	36.1		5170		3200
400	965		1356			983		1417			978		2141			917		2345		
18	41.2		3620		7600	42.8		3780		6900	42.3		5475		6000	41.5		6990		4200
450	1046		1642			1087		1714			1074		2483			1054		3170		
20	44.6		4250		9300	45.2		4435		8600	45.6		6500		7500					
500	1133		1927			1148		2011			1158		2948							
24	50.7		5880		14000	52.0		6500		12300	52.4		8900		10800					
600	1288		2667			1321		2948			1331		4036							



F = Dismantling dimension

WT = Weight
C_V = Flow coefficient

PRESSURE SEAL LIFT CHECK VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
3 TO 12“ (80 TO 300 mm)
ASME CLASSES 600 TO 2500



Class	Figure Number
600	1665
900	1965
1500	1165
2500	1265

DESIGN FEATURES:

- **Standard trim** is stellite faced seat and disc seat surfaces (API trim 5). Other trims available on request.
- **Valves** are full port design per ASME B16.34 table A-1.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Wall** thickness per heavy wall API 600 requirements.
- **Body and cap joint** accurately machined. Gasket details on page 6.
- **Each** valve is shell and seat pressure tested per industry standard API 598.
- **Application:** These valves can be used in horizontal line with cap vertical only.

STANDARD MATERIALS (Other materials available)

PART	MATERIALS			
Body	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9	A217 Gr. C12A
Bonnet	A105	A182 F11	A182 F22	A182 F91
Cap	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9	A217 Gr. C12A
Disc	A105 or A216 WCB + Stellite 6 Faced	A182 F11 or A217 WC6 + Stellite 6 Faced	A182 F22 or A217 WC9 + Stellite 6 Faced	A182 F91 or A217 Gr. C12A + Stellite 6 Faced
Seat Ring	Carbon Steel + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced	A182 F91 + Stellite 6 Faced
Protective Ring	SST 410			
Segmental Thrust Ring	SST 410			
Gasket	SST 304L			
Bonnet Stud	A193 Gr. B7	A193 Gr. B16		
Bonnet Nut	A194 Gr. 2H	A194 Gr. 7		

Design Specifications

Item	Applicable Specification
Wall thickness	API 600
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Butt Weld design	ASME B16.25
Materials	ASTM

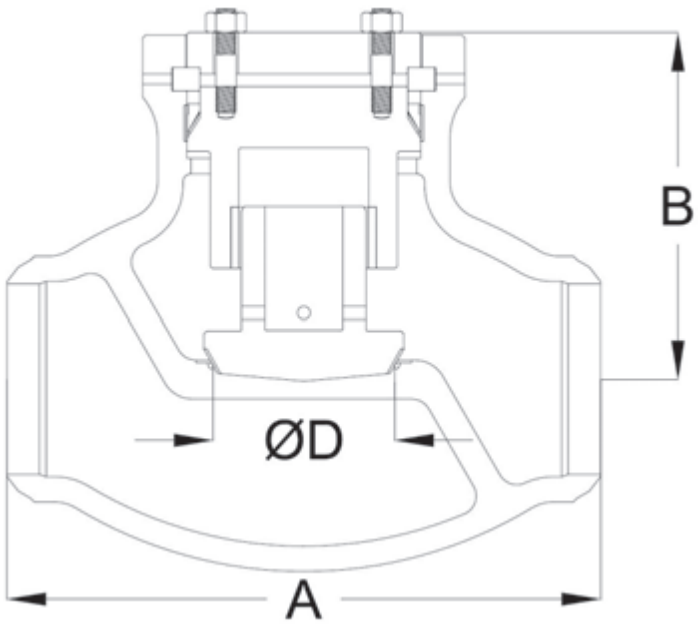
- **Weld** end valves are B16.10 short pattern design. Flanged end valves are available on request and are B16.10 long-pattern design. Weld end valve dimensions given in table on next page.
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test, inspection result and certificate of conformance.
- **Other** available options as follows:
  - -Alternate valve materials such as chrome and stainless steel alloys
  - -Alternate trim materials
  - -Drain and other auxiliary connections
  - -NACE service
  - -Special cleaning for applications such as oxygen or chlorine
  - -Other options available as Specified

LIFT CHECK VALVE DIMENSIONS (CLASS 600—2500).

SIZE	ASME 600			ASME 900			ASME 1500		
in / mm	A	B	D	A	B	D	A	B	D
3	10.00	8.3	3.00	12.00	8.3	2.87	12.00	8.5	2.75
80	254	211	76	305	211	73	305	216	70
4	12.00	10.3	4.00	14.00	11.3	3.87	16.00	11.3	3.62
100	305	262	102	356	287	98	406	287	92
6	18.00	17.3	6.00	20.00	17.3	5.75	22.00	17.5	5.37
150	457	439	152	508	439	146	559	445	136
8	23.00	18.8	7.87	26.00	20.0	7.50	28.00	21.0	7.00
200	584	478	200	660	508	191	711	533	178
10	28.00	23.3	9.75	31.00	24.5	9.37	34.00	25.0	8.75
250	711	592	248	787	622	238	864	635	222
12	32.00	28.0	11.75	36.00	28.0	11.12	39.00	29.0	10.37
300	813	711	298	914	711	282	991	737	263

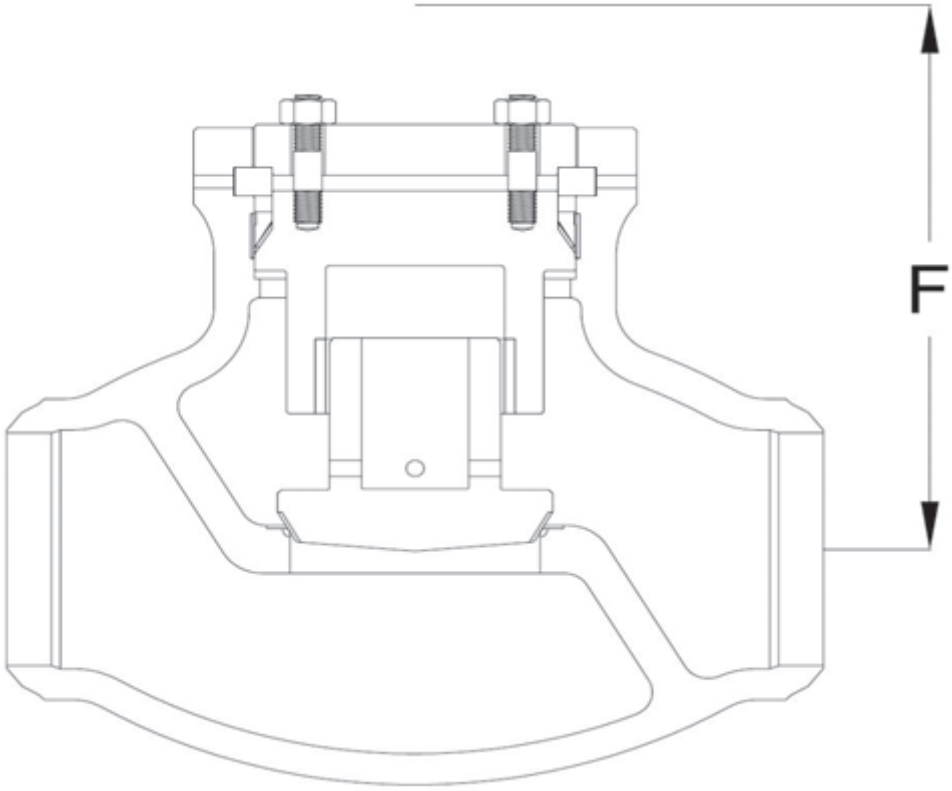
SIZE	ASME 2500		
in / mm	A	B	D
3	14.50	12.5	2.25
80	368	318	57
4	18.00	15.0	2.87
100	457	381	73
6	24.00	18.3	4.37
150	610	465	111
8	30.00	22.5	5.75
200	762	572	146
10	36.00	25.5	7.25
250	914	648	184
12	41.00	30.0	8.62
300	1041	762	219

B = Center to top



PRESSURE SEAL LIFT CHECK VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
3 TO 12“ (50 TO 300 mm)
ASME CLASSES 600 TO 2500

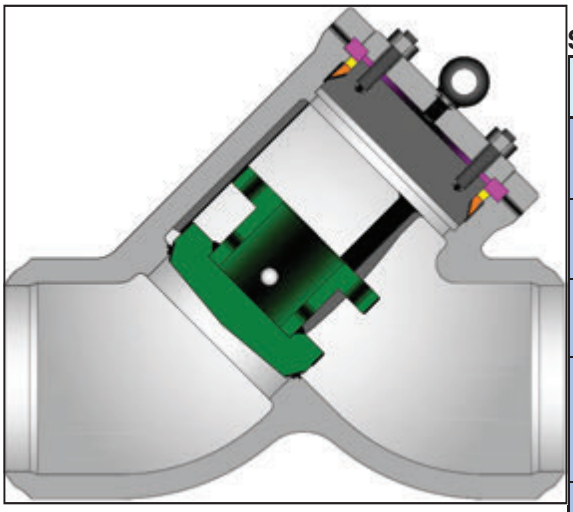
SIZE	ASME 600					ASME 900					ASME 1500					ASME 2500				
in	F	in	WT	lb	C_v	F	in	WT	lb	C_v	F	in	WT	lb	C_v	F	in	WT	lb	C_v
mm		mm		kg			mm		kg			mm		kg			mm		kg	
3	12.7		86		110	12.7		93		100	13.0		166		90	19.0		294		60
80	323		39			323		42			330		75			483		133		
4	15.7		109		200	17.2		138		190	17.2		241		160	23.0		483		100
100	399		49			437		62			437		109			584		219		
6	26.2		273		480	26.5		518		440	26.8		760		380	28.0		926		250
150	665		124			673		235			681		345			711		420		
8	28.7		641		850	30.5		814		770	32.0		1994		670	34.5		2778		450
200	729		291			775		369			813		904			876		1260		
10	35.7		1091		1300	37.3		1820		1200	39.0		3154		1000	41.0		3512		720
250	907		495			947		825			991		1430			1041		1593		
12	42.8		1495		2000	42.8		2392		1800	46.0		4076		1500	47.0		4878		1100
300	1087		678			1087		1085			1168		1849			1194		2212		



F = Dismantling dimension

WT = Weight
C_V = Flow coefficient

PRESSURE SEAL Y-PATTERN LIFT CHECK VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
3 TO 12“ (50 TO 300 mm)
ASME CLASSES 600 TO 2500



Class	Fig. Number (1)
600	1665
900	1965
1500	1165
2500	1265

(1) An option code is needed to specify a y-pattern. See page 7 for more details.

STANDARD MATERIALS (Other materials available)

PART	MATERIALS			
Body	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9	A217 Gr. C12A
Bonnet	A105	A182 F11	A182 F22	A182 F91
Cap	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9	A217 Gr. C12A
Disc	A105 or A216 WCB + Stellite 6 Faced	A182 F11 or A217 WC6 + Stellite 6 Faced	A182 F22 or A217 WC9 + Stellite 6 Faced	A182 F91 or A217 Gr. C12A + Stellite 6 Faced
Seat Ring	Carbon Steel + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced	A182 F91 + Stellite 6 Faced
Protective Ring	SST 410			
Segmental Thrust Ring	SST 410			
Gasket	SST 304L			
Bonnet Stud	A193 Gr. B7	A193 Gr. B16		
Bonnet Nut	A194 Gr. 2H	A194 Gr. 7		

Design Specifications

Item	Applicable Specification
Wall thickness	ASME B16.34
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Butt Weld design	ASME B16.25
Materials	ASTM

DESIGN FEATURES:

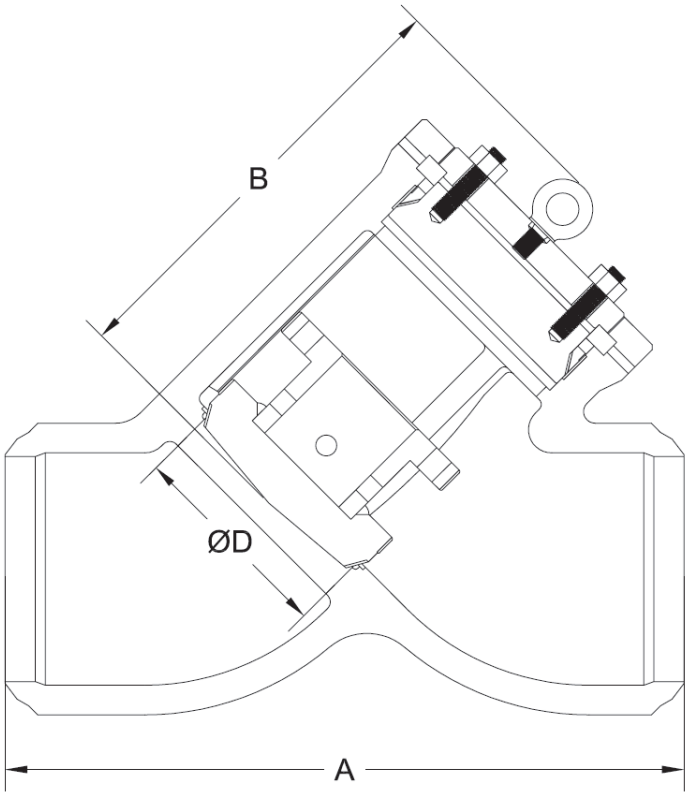
- **Standard trim** is stellite faced seat and disc seat surfaces (API trim 5). Other trims available on request.
- **Valves** are full port design per ASME B16.34 table A-1.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Wall** thickness per heavy wall API 600 requirements.
- **Body and cap joint** accurately machined. Gasket details on page 6.
- **Each** valve is shell and seat pressure tested per industry standard API 598.
- **Application:** These valves can be used in horizontal line with cap vertical only.
- **Weld** end valves are B16.10 short pattern design. Flanged end valves are available on request and are B16.10 long-pattern design. Weld end valve dimensions given in table on next page.
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test, inspection result and certificate of conformance.
- **Other** available options as follows:
  - -Alternate valve materials such as chrome and stainless steel alloys
  - -Alternate trim materials
  - -Drain and other auxiliary connections
  - -NACE service
  - -Special cleaning for applications such as oxygen or chlorine
  - -Other options available as Specified

LIFT CHECK VALVE DIMENSIONS (CLASS 600—2500).

SIZE	ASME 600			ASME 900			ASME 1500		
in / mm	A	B	D	A	B	D	A	B	D
3	10.00	8.8	3.00	12.00	8.8	2.87	12.00	9.0	2.75
80	254	220	76	305	220	73	305	230	70
4	12.00	10.8	4.00	14.00	11.8	3.87	16.00	11.8	3.62
100	305	275	102	356	300	98	406	300	92
6	18.00	17.8	6.00	20.00	18.3	5.75	22.00	18.5	5.37
150	457	450	152	508	465	146	559	470	136
8	23.00	19.8	7.87	26.00	21.0	7.50	28.00	22.0	7.00
200	584	500	200	660	535	191	711	560	178
10	28.00	24.8	9.75	31.00	25.5	9.37	34.00	26.0	8.75
250	711	625	248	787	650	238	864	660	222
12	32.00	29.5	11.75	36.00	29.5	11.12	39.00	30.0	10.37
300	813	750	298	914	750	282	991	760	263

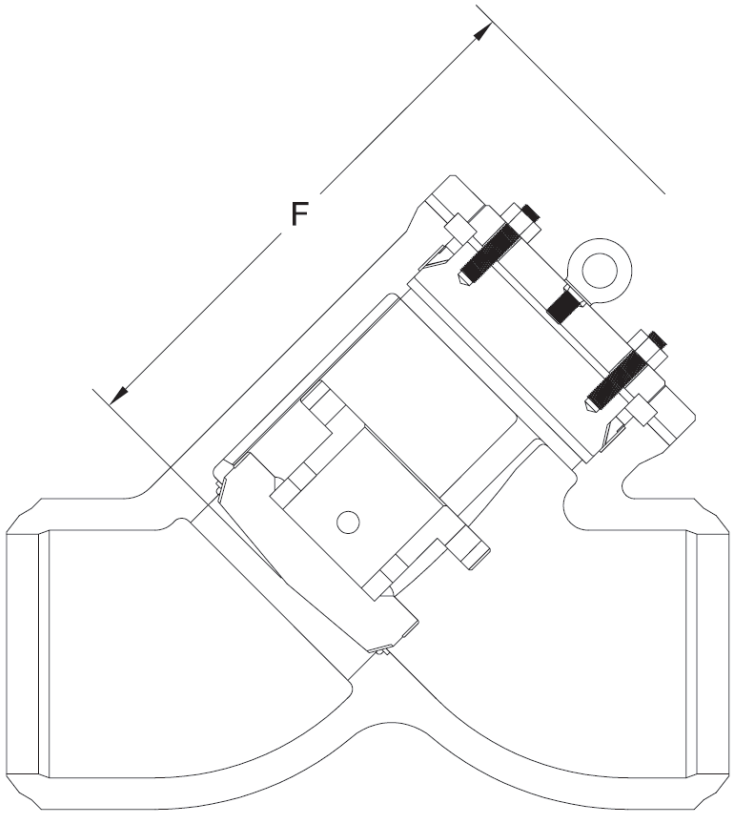
SIZE	ASME 2500		
in / mm	A	B	D
3	14.50	13.0	2.25
80	368	330	57
4	18.00	16.0	2.87
100	457	405	73
6	24.00	19.3	4.37
150	610	490	111
8	30.00	24.0	5.75
200	762	610	146
10	36.00	27.0	7.25
250	914	685	184
12	41.00	32.0	8.62
300	1041	815	219

B = Center to top



PRESSURE SEAL LIFT CHECK VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
3 TO 12“ (50 TO 300 mm)
ASME CLASSES 600 TO 2500

SIZE	ASME 600					ASME 900					ASME 1500					ASME 2500				
in	F	in	WT	lb	C_v	F	in	WT	lb	C_v	F	in	WT	lb	C_v	F	in	WT	lb	C_v
mm		mm		kg			mm		kg			mm		kg			mm		kg	
3	13.2		90		240	13.2		98		220	13.5		174		200	19.5		309		130
80	330		41			330		44			345		79			495		140		
4	16.2		114		440	17.7		145		410	17.7		253		360	24.0		512		230
100	413		52			450		66			450		115			608		232		
6	26.7		287		1050	27.5		549		960	27.8		806		840	29.0		982		560
150	675		130			698		249			705		365			735		445		
8	29.7		679		1900	31.5		863		1700	33.0		2094		1500	36.0		2972		1000
200	750		308			876		391			840		950			915		1348		
10	37.2		1156		2900	38.3		1929		2700	40.5		3758		2300	42.0		3375		1600
250	938		525			975		875			1028		1705			1067		1531		
12	44.3		1585		4300	44.3		2559		3900	48.0		4361		3400	48.0		5268		2300
300	1125		719			1125		1161			1220		1978			1223		2390		



F = Dismantling dimension

WT = Weight
C_V = Flow coefficient

ACCESSORIES

GEAR ACTUATOR

Most Powell Multi-Turn Valves can be supplied with Adapto Gears. For installed Powell valves, gear units with adaptor parts are available. Adapto Gear units are also available separately for any Multi-Turn valve application.

Powell Adapto Gear Actuators are fully enclosed, light weight, maintenance free Bevel Gear units for valves which require gearing to facilitate operation. The actuators mount quickly and easily as installation does not require special complicated parts. The manual valve actuators, Type AA, B, and C, have been designed for simplicity, high efficiency and ease of adaptability to make them ideal for use on both small and large valves. The input shaft is mounted on antifriction bearings and the bevel gear drive sleeve is supported by and integral bearing arrangement. The actuator does not take any of the valve stem thrust since the thrust is absorbed in the valve stem bushing.

Typical Adapto-Gear Installation:

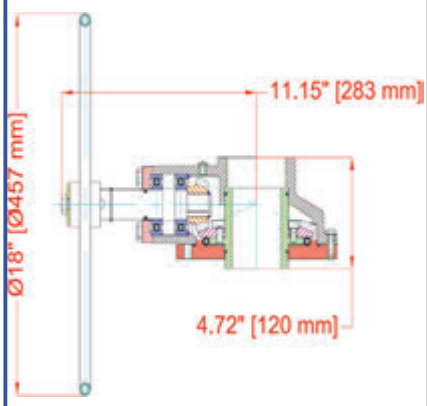
a. Remove the handwheel.
b. Remove bolts from the yoke, mount the adaptor, replace bolts and tighten.
c. Install the sleeve and key on stem bushing.
d. Mount gear operator on adaptor and bolt together.
e. Conversion is completed.

For installed valves, adaptors are provided so that new stem bushings or bonnets are not necessary. Field conversion can be completed without removing the valve from service.

ADVANTAGES

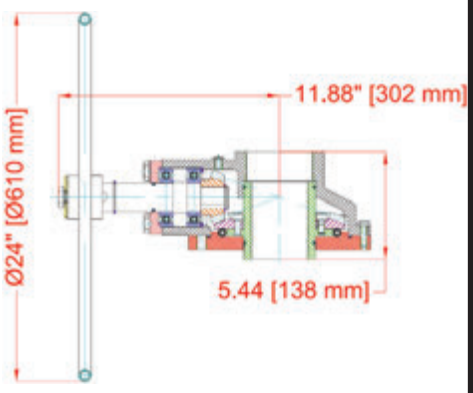
- Anti-friction bearings permits ease of operation.
- Housing protects gears from dirt, dust, and other foreign materials. Also a good as a safety factor to protecting operating personnel.
- Housing has provision for plug or pipe stem protector when required. Sealed housing retains the lubricant and protects the moving parts.
- Adaptors for air wrench operation can be supplied on order.

MODEL AA-18 ACTUATOR



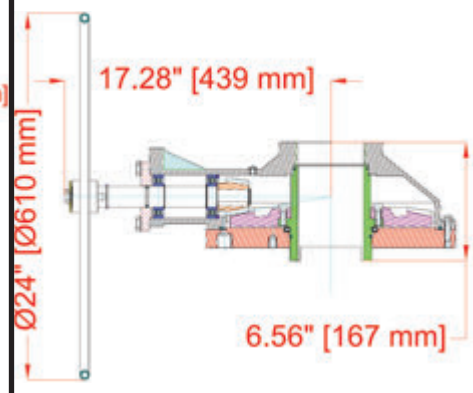
Max Torque: 996 ft-lb [1350 Nm]
Gear Ratio: 2.92:1

MODEL B-24 ACTUATOR



Max Torque: 1990 ft-lb [2700 Nm]
Gear Ratio: 4.07:1

MODEL C-24 ACTUATOR



Max Torque: 3980 ft-lb [5400 Nm]
Gear Ratio: 6:1

ACCESSORIES cont...

MOTOR ACTUATOR

Most Powell Valves can be furnished with electric motor actuators. This type of equipment gives fast, safe, efficient operation of any valve by means of a push button locally or from a remote point or automatically from a limit switch, pressure switch or other similar device.

To enable Powell to quote accurately on Motor Actuated Valves, please provide the following complete information:

A. Valve Size and Figure Number

B. Media

C. Media Pressure and Temperature

D. Differential Pressure against which the valve must open and close and Line Pressure if different from differential pressure.

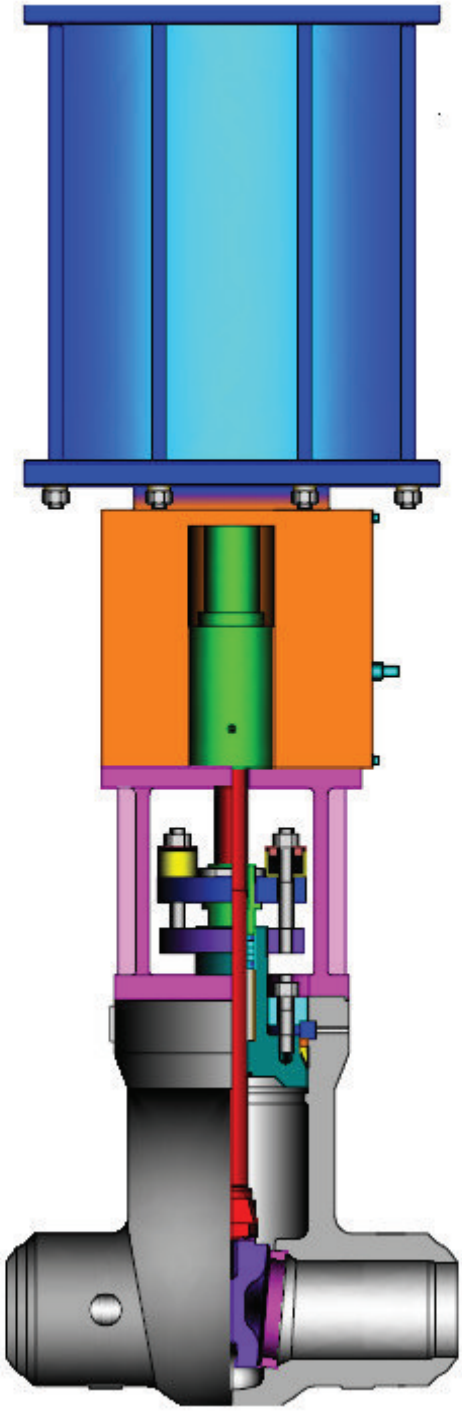
E. Opening or Closing Time Requirements. Unless specified - gate valve stem speed is 12" per minute (approx.) and globe valve stem speed is 4" per minute (approx.).

F. Voltage, Frequency and Number of Phases

G. Special Features (e.g. control station requirements, special enclosure types, etc.)

ACCESSORIES cont...

HYDRAULIC OR PNEUMATIC ACTUATOR



Most Powell Valves can be equipped with Hydraulic or Pneumatic Actuators for automatic remote opening and closing.

When ordering such valves, please provide the following information:

A. Valve Size and Figure Number

B. Media

C. Media Pressure and Temperature

D. Differential Pressure against which the valve must open and close and Line Pressure if different from differential pressure.

E. Opening or Closing Time Requirements

F. Actuator Media Pressure - Min./Max.

G. Failure Position (open, close, or as is)

H. Special Features (e.g. limit switches, manual override, etc.)

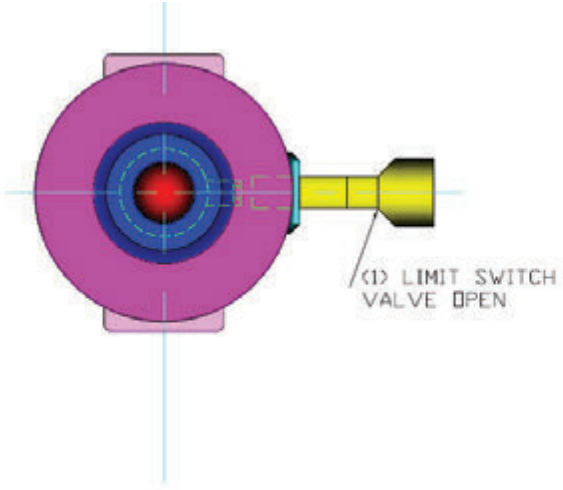
I. Environmental Temperature Range - Min./Max.

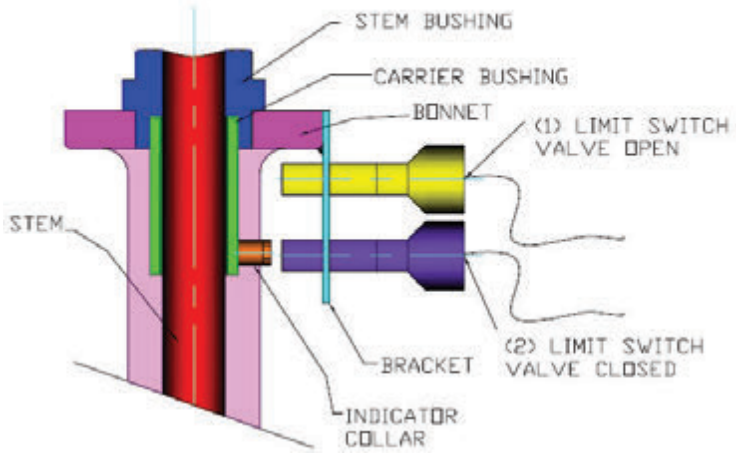
ACCESSORIES cont...

LIMIT SWITCH

Powell Valves can be equipped with Limit Switches to inform users when the valve is in the fully open and fully closed position. This can help reduce extraneous wear caused by forcing the wedge or disc farther into the seat rings or back seat after the valve is already in the fully open or fully closed position. Limit Switches can also be used for fully automated valve operation in conjunction with motor, hydraulic, or pneumatic actuators.

NOTE: The installation of a limit switch may require further machining or more parts added to the valve.
Typical installation on handwheel operated valves.





ENGINEERING DATA INDEX

NOTE: DATA PROVIDED IN THIS SECTION IS FOR REFERENCE PURPOSES AND IS SUBJECT TO CHANGE. CONSULT CURRENT STANDARDS AND SPECIFICATIONS FOR THE LATEST DATA AND FOR SPECIFIC DETAILS WHICH MAY BE BEYOND THE SCOPE OF THIS CATALOG.

VALVE STANDARDS AND RELATED INFORMATION

1. Steel and Corrosion Resistant Designs

(A) ASME B16.34 → Valves – Flanged, Threaded, and Welded End

This is the basic ASME valve standard for steel and corrosion resistant alloys. This standard contains requirements such as minimum shell wall thickness, pressure/temperature ratings, and pressure testing requirements.

(B) API Standard 600 → Steel Gate Valve Flanged and Butt Welded Ends, Bolted and Pressure Seal Bonnets

This is the basic API Gate valve standard and contains wall thicknesses that are heavier than ASME B16.34 for bolted bonnet steel and alloy steel valves. This standard refers to B16.34 for pressure/temperature ratings.

(C) API Standard 598 → Valve Inspection and Testing

This standard is referenced by both ASME B16.34 and API 600 and contains minimum inspection and pressure test requirements.

(D) ASME B16.10 → Face to Face and End to End Dimensions of Valves

(E) ASME B16.5 → Pipe Flanges and Flange Fittings

(F) ASME B16.25 → Buttwelded Ends

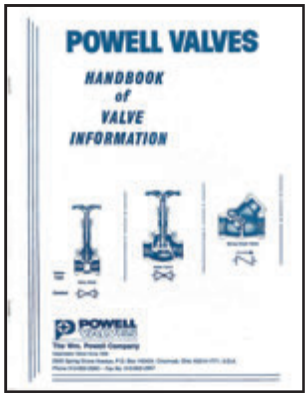
(G) MSS SP-25 → Standard Marking System for Valves, Fittings, Flanges and Unions

(H) MSS SP-55 → Quality Standard for Steel Castings for Valves, Flanges, Fittings, and Other Piping Components

2. Powell Publications and Miscellaneous Information

The *Handbook of Valve Information* contains valve selection, storage, installation, operation, and maintenance information for all Powell Valves.

NOTE: Prior to any installation or maintenance, appropriate precautions must be followed. For example, all pressure must be relieved from the valve and affected piping prior to servicing and proper protective clothing and equipment must be worn.



PRESSURE/TEMPERATURE RATINGS

TABLE 1

ASTM A216 Grade WCB

Upon prolonged exposure to temperatures above 800º F, the carbide phase of steel may be converted to graphite. Permissible, but not recommended for prolonged use above 800º F.

STANDARD CLASS

Working Pressures by Classes, psig							
Temperature. ºF	150	300	600	900	1500	2500	4500
-20 to 100	285	740	1,480	2,220	3,705	6,170	11,110
200	260	680	1,360	2,035	3,395	5,655	10,185
300	230	655	1,310	1,965	3,270	5,450	9,815
400	200	635	1,265	1,900	3,170	5,280	9,505
500	170	605	1,205	1,810	3,015	5,025	9,040
600	140	570	1,135	1,705	2,840	4,730	8,515
650	125	550	1,100	1,650	2,745	4,575	8,240
700	110	530	1,060	1,590	2,665	4,425	7,960
750	95	505	1,015	1,520	2,535	4,230	7,610
800	80	410	825	1,235	2,055	3,430	6,170

SPECIAL CLASS

Working Pressures by Classes, psig							
Temperature. ºF	150	300	600	900	1500	2500	4500
-20 to 100	290	750	1,500	2,250	3,750	6,250	11,250
200	290	750	1,500	2,250	3,750	6,250	11,250
300	285	740	1,480	2,220	3,700	6,170	11,105
400	280	735	1,465	2,200	3,665	6,105	10,995
500	280	735	1,465	2,200	3,665	6,105	10,995
600	280	735	1,465	2,200	3,665	6,105	10,995
650	275	715	1,430	2,145	3,575	5,960	10,730
700	265	690	1,380	2,075	3,455	5,760	10,365
750	245	635	1,270	1,905	3,170	5,285	9,515
800	195	515	1,030	1,545	2,570	4,285	7,715

NOTE: Special Class Ratings apply to Threaded and Weld End Valves only and require upgrading per paragraph 8 of ASME B16.34

PRESSURE/TEMPERATURE RATINGS

TABLE 2

ASTM A352 Grade LCB

Not to be used over 650° F.

STANDARD CLASS

Working Pressures by Classes, psig							
Temperature. ºF	150	300	600	900	1500	2500	4500
-50 to 100	265	695	1,395	2,090	3,480	5,805	10,445
200	255	660	1,320	1,980	3,300	5,505	9,905
300	230	640	1,275	1,915	3,190	5,315	9,565
400	200	615	1,230	1,845	3,075	5,125	9,225
500	170	585	1,175	1,760	2,930	4,885	8,795
600	140	550	1,105	1,655	2,755	4,595	8,270
650	125	535	1,065	1,600	2,665	4,440	7,990

SPECIAL CLASS

Working Pressures by Classes, psig							
Temperature. ºF	150	300	600	900	1500	2500	4500
-50 to 100	290	695	1,395	2,090	3,480	5,805	10,445
200	290	695	1,395	2,090	3,480	5,805	10,445
300	290	695	1,395	2,090	3,480	5,805	10,445
400	290	695	1,395	2,090	3,480	5,805	10,445
500	290	695	1,395	2,090	3,480	5,805	10,445
600	290	695	1,395	2,090	3,480	5,805	10,445
650	290	695	1,390	2,080	3,470	5,780	10,405

NOTE: Special Class Ratings apply to Threaded and Weld End Valves only and require upgrading per paragraph 8 of ASME B16.34

PRESSURE/TEMPERATURE RATINGS

TABLE 3

ASTM A217 Grade WC6

Use normalized and tempered material only. Not to be used over 1100º F.

STANDARD CLASS

Working Pressures by Classes, psig							
Temperature. ºF	150	300	600	900	1500	2500	4500
-20 to 100	290	750	1,500	2,250	3,750	6,250	11,250
200	260	750	1,500	2,250	3,750	6,250	11,250
300	230	720	1,445	2,165	3,610	6,015	10,830
400	200	695	1,385	2,080	3,465	5,775	10,400
500	170	665	1,330	1,995	3,325	5,540	9,965
600	140	605	1,210	1,815	3,025	5,040	9,070
650	125	590	1,175	1,765	2,940	4,905	8,825
700	110	570	1,135	1,705	2,840	4,730	8,515
750	95	530	1,065	1,595	2,660	4,430	7,970
800	80	510	1,015	1,525	2,540	4,230	7,610
850	65	485	975	1,460	2,435	4,060	7,305
900	50	450	900	1,350	2,245	3,745	6,740
950	35	320	640	955	1,595	2,655	4,785
1000	20	215	430	650	1,080	1,800	3,240
1050	20(1)	145	290	430	720	1,200	2,160
1100	20(1)	95	190	290	480	800	1,440

NOTE: (1) For welding end valves only. Flanged end ratings terminate at 1000º F.

SPECIAL CLASS

Working Pressures by Classes, psig							
Temperature. ºF	150	300	600	900	1500	2500	4500
-20 to 100	290	750	1,500	2,250	3,750	6,250	11,250
200	290	750	1,500	2,250	3,750	6,250	11,250
300	290	750	1,500	2,250	3,750	6,250	11,250
400	290	750	1,500	2,250	3,750	6,250	11,250
500	290	750	1,500	2,250	3,750	6,250	11,250
600	290	750	1,500	2,250	3,750	6,250	11,250
650	290	750	1,500	2,250	3,750	6,250	11,250
700	280	735	1,465	2,200	3,665	6,110	10,995
750	280	730	1,460	2,185	3,645	6,070	10,930
800	275	720	1,440	2,160	3,600	6,000	10,800
850	260	680	1,355	2,030	3,385	5,645	10,160
900	225	585	1,175	1,760	2,935	4,895	8,805
950	155	400	795	1,195	1,995	3,320	5,980
1000	105	270	540	810	1,350	2,250	4,050
1050	70	180	360	540	900	1,500	2,700
1100	45	120	240	360	600	1,000	1,800

NOTE: Special Class Ratings apply to Threaded and Weld End Valves only and require upgrading per paragraph 8 of ASME B16.34

PRESSURE/TEMPERATURE RATINGS

TABLE 4

ASTM A217 Grade WC9

Use normalized and tempered material only. Not to be used over 1100º F.

STANDARD CLASS

Working Pressures by Classes, psig							
Temperature. ºF	150	300	600	900	1500	2500	4500
-20 to 100	290	750	1,500	2,250	3,750	6,250	11,250
200	260	750	1,500	2,250	3,750	6,250	11,250
300	230	730	1,455	2,185	3,640	6,070	10,925
400	200	705	1,410	2,115	3,530	5,880	10,585
500	170	665	1,330	1,995	3,325	5,540	9,965
600	140	605	1,210	1,815	3,025	5,040	9,070
650	125	590	1,175	1,765	2,940	4,905	8,825
700	110	570	1,135	1,705	2,840	4,730	8,515
750	95	530	1,065	1,595	2,660	4,430	7,970
800	80	510	1,015	1,525	2,540	4,230	7,610
850	65	485	975	1,460	2,435	4,060	7,305
900	50	450	900	1,350	2,245	3,745	6,740
950	35	385	755	1,160	1,930	3,220	5,795
1000	20	265	535	800	1,335	2,230	4,010
1050	20(1)	175	350	525	875	1,455	2,625
1100	20(1)	110	220	330	550	915	1,645

NOTE: (1) For welding end valves only. Flanged end ratings terminate at 1000º F.

SPECIAL CLASS

Working Pressures by Classes, psig							
Temperature. ºF	150	300	600	900	1500	2500	4500
-20 to 100	290	750	1,500	2,250	3,750	6,250	11,250
200	290	750	1,500	2,250	3,750	6,250	11,250
300	285	740	1,480	2,220	3,695	6,160	11,090
400	280	730	1,455	2,185	3,640	6,065	10,915
500	280	725	1,450	2,175	3,620	6,035	10,865
600	275	720	1,440	2,165	3,605	6,010	10,815
650	275	715	1,430	2,145	3,580	5,965	10,735
700	270	705	1,415	2,120	3,535	5,895	10,605
750	270	705	1,415	2,120	3,535	5,895	10,605
800	270	705	1,415	2,120	3,535	5,895	10,605
850	260	680	1,355	2,030	3,385	5,645	10,160
900	230	600	1,200	1,800	3,000	5,000	9,000
950	180	470	945	1,415	2,360	3,930	7,070
1000	130	335	670	1,005	1,670	2,785	5,015
1050	85	220	435	655	1,095	1,820	3,280
1100	55	135	275	410	685	1,145	2,055

NOTE: Special Class Ratings apply to Threaded and Weld End Valves only and require upgrading per paragraph 8 of ASME B16.34

PRESSURE/TEMPERATURE RATINGS

TABLE 5

ASTM A217 Grade C5

Use normalized and tempered material only.

STANDARD CLASS

Working Pressures by Classes, psig							
Temperature ºF	150	300	600	900	1500	2500	4500
-20 to 100	290	750	1,500	2,250	3,750	6,250	11,250
200	260	750	1,500	2,250	3,750	6,250	11,250
300	230	730	1,455	2,185	3,640	6,070	10,925
400	200	705	1,410	2,115	3,530	5,880	10,585
500	170	665	1,330	1,995	3,325	5,540	9,965
600	140	605	1,210	1,815	3,025	5,040	9,070
650	125	590	1,175	1,765	2,940	4,905	8,825
700	110	570	1,135	1,705	2,840	4,730	8,515
750	95	530	1,065	1,595	2,660	4,430	7,970
800	80	510	1,015	1,525	2,540	4,230	7,610
850	65	485	975	1,460	2,435	4,060	7,305
900	50	375	745	1,120	1,870	3,115	5,605
950	35	275	550	825	1,370	2,285	4,115
1000	20	200	400	595	995	1,655	2,985
1050	20(1)	145	290	430	720	1,200	2,160
1100	20(1)	100	200	300	495	830	1,490
1150	20(1)	60	125	185	310	515	925
1200	15(1)	35	70	105	170	285	515

NOTE: (1) For welding end valves only. Flanged end ratings terminate at 1000º F.

SPECIAL CLASS

Working Pressures by Classes, psig							
Temperature ºF	150	300	600	900	1500	2500	4500
-20 to 100	290	750	1,500	2,250	3,750	6,250	11,250
200	290	750	1,500	2,250	3,750	6,250	11,250
300	290	750	1,500	2,250	3,750	6,250	11,250
400	290	750	1,500	2,250	3,750	6,250	11,250
500	290	750	1,500	2,250	3,750	6,250	11,250
600	290	750	1,500	2,250	3,750	6,250	11,250
650	290	750	1,500	2,250	3,750	6,250	11,250
700	280	735	1,465	2,200	3,665	6,110	10,995
750	280	730	1,460	2,185	3,645	6,070	10,930
800	275	720	1,440	2,160	3,600	6,000	10,800
850	260	615	1,225	1,840	3,065	5,105	9,195
900	230	465	935	1,400	2,335	3,895	7,005
950	170	345	685	1,030	1,715	2,855	5,145
1000	125	250	495	745	1,245	2,070	3,730
1050	90	180	360	540	900	1,500	2,700
1100	60	125	250	375	620	1,035	1,865
1150	40	75	155	230	385	645	1,155
1200	20	45	85	130	215	355	645

NOTE: Special Class Ratings apply to Threaded and Weld End Valves only and require upgrading per paragraph 8 of ASME B16.34

PRESSURE/TEMPERATURE RATINGS

TABLE 6

ASTM A217 Grade C12

Use normalized and tempered material only.

STANDARD CLASS

Working Pressures by Classes, psig							
Temperature °F	150	300	600	900	1500	2500	4500
-20 to 100	290	750	1,500	2,250	3,750	6,250	11,250
200	260	750	1,500	2,250	3,750	6,250	11,250
300	230	730	1,455	2,185	3,640	6,070	10,925
400	200	705	1,410	2,115	3,530	5,880	10,585
500	170	665	1,330	1,995	3,325	5,540	9,965
600	140	605	1,210	1,815	3,025	5,040	9,070
650	125	590	1,175	1,765	2,940	4,905	8,825
700	110	570	1,135	1,705	2,840	4,730	8,515
750	95	530	1,065	1,595	2,660	4,430	7,970
800	80	510	1,015	1,525	2,540	4,230	7,610
850	65	485	975	1,460	2,435	4,060	7,305
900	50	450	900	1,350	2,245	3,745	6,740
950	35	375	755	1,130	1,885	3,145	5,655
1000	20	255	505	760	1,270	2,115	3,805
1050	20(1)	170	345	515	855	1,430	2,570
1100	20(1)	115	225	340	565	945	1,695
1150	20(1)	75	150	225	375	630	1,130
1200	20(1)	50	105	155	255	430	770

NOTE: (1) For welding end valves only. Flanged end ratings terminate at 1000° F.

SPECIAL CLASS

Working Pressures by Classes, psig							
Temperature °F	150	300	600	900	1500	2500	4500
-20 to 100	290	750	1,500	2,250	3,750	6,250	11,250
200	290	750	1,500	2,250	3,750	6,250	11,250
300	290	750	1,500	2,250	3,750	6,250	11,250
400	290	750	1,500	2,250	3,750	6,250	11,250
500	290	750	1,500	2,250	3,750	6,250	11,250
600	290	750	1,500	2,250	3,750	6,250	11,250
650	290	750	1,500	2,250	3,750	6,250	11,250
700	280	735	1,465	2,200	3,665	6,110	10,995
750	280	730	1,460	2,185	3,645	6,070	10,930
800	275	720	1,440	2,160	3,600	6,000	10,800
850	260	680	1,355	2,030	3,385	5,645	10,160
900	230	600	1,200	1,800	3,000	5,000	9,000
950	180	470	945	1,415	2,355	3,930	7,070
1000	120	315	635	950	1,585	2,645	4,755
1050	80	215	430	645	1,070	1,785	3,215
1100	55	140	285	425	705	1,180	2,120
1150	35	95	190	285	470	785	1,415
1200	25	65	130	195	320	535	965

NOTE: Special Class Ratings apply to Threaded and Weld End Valves only and require upgrading per paragraph 8 of ASME B16.34

PRESSURE/TEMPERATURE RATINGS

TABLE 7

ASTM A217 Grade C12A

STANDARD CLASS

Working Pressures by Classes, psig							
Temperature °F	150	300	600	900	1500	2500	4500
-20 to 100	290	750	1,500	2,250	3,750	6,250	11,250
200	260	750	1,500	2,250	3,750	6,250	11,250
300	230	730	1,455	2,185	3,640	6,070	10,925
400	200	705	1,410	2,115	3,530	5,880	10,585
500	170	665	1,330	1,995	3,325	5,540	9,965
600	140	605	1,210	1,815	3,025	5,040	9,070
650	125	590	1,175	1,765	2,940	4,905	8,825
700	110	570	1,135	1,705	2,840	4,730	8,515
750	95	530	1,065	1,595	2,660	4,430	7,970
800	80	510	1,015	1,525	2,540	4,230	7,610
850	65	485	975	1,460	2,435	4,060	7,305
900	50	450	900	1,350	2,245	3,745	6,740
950	35	385	775	1,160	1,930	3,220	5,795
1000	20	365	725	1,090	1,820	3,030	5,450
1050	20(1)	360	720	1,080	1,800	3,000	5,400
1100	20(1)	300	605	905	1,510	2,515	4,525
1150	20(1)	225	445	670	1,115	1,855	3,345
1200	20(1)	145	290	430	720	1,200	2,160

NOTE: (1) For welding end valves only. Flanged end ratings terminate at 1000° F.

SPECIAL CLASS

Working Pressures by Classes, psig							
Temperature °F	150	300	600	900	1500	2500	4500
-20 to 100	290	750	1,500	2,250	3,750	6,250	11,250
200	290	750	1,500	2,250	3,750	6,250	11,250
300	290	750	1,500	2,250	3,750	6,250	11,250
400	290	750	1,500	2,250	3,750	6,250	11,250
500	290	750	1,500	2,250	3,750	6,250	11,250
600	290	750	1,500	2,250	3,750	6,250	11,250
650	290	750	1,500	2,250	3,750	6,250	11,250
700	280	735	1,465	2,200	3,665	6,110	10,995
750	280	730	1,460	2,185	3,645	6,070	10,930
800	275	720	1,440	2,160	3,600	6,000	10,800
850	260	680	1,355	2,030	3,385	5,645	10,160
900	230	600	1,200	1,800	3,000	5,000	9,000
950	180	470	945	1,415	2,360	3,930	7,070
1000	160	420	840	1,260	2,105	3,505	6,310
1050	160	420	840	1,260	2,105	3,505	6,310
1100	145	375	755	1,130	1,885	3,145	5,655
1150	105	280	555	835	1,395	2,320	4,180
1200	70	180	360	540	900	1,500	2,700

NOTE: Special Class Ratings apply to Threaded and Weld End Valves only and require upgrading per paragraph 8 of ASME B16.34

PRESSURE/TEMPERATURE RATINGS

TABLE 8

ASTM A351 Grade CF3M (a)
ASTM A351 Grade CF8M (b)

(a) Not to be used over 850° F.
(b) At temperatures over 1000° F, use only when the carbon content is 0.04% or higher. This requirement must be specified by customer when applicable.

STANDARD CLASS

Working Pressures by Classes, psig							
Temperature, °F	150	300	600	900	1500	2500	4500
-20 to 100 (1)	275	720	1,440	2,160	3,600	6,000	10,800
200	235	620	1,240	1,860	3,095	5,160	9,290
300	215	560	1,120	1,680	2,795	4,660	8,390
400	195	515	1,025	1,540	2,570	4,280	7,705
500	170	480	955	1,435	2,390	3,980	7,165
600	140	450	900	1,355	2,255	3,760	6,770
650	125	440	885	1,325	2,210	3,680	6,625
700	110	435	870	1,305	2,170	3,620	6,515
750	95	425	855	1,280	2,135	3,560	6,410
800	80	420	845	1,265	2,110	3,520	6,335
850	65	420	835	1,255	2,090	3,480	6,265
900	50	415	830	1,245	2,075	3,460	6,230
950	35	385	775	1,160	1,930	3,220	5,795
1000	20	365	725	1,090	1,820	3,030	5,450
1050	20(2)	360	720	1,080	1,800	3,000	5,400
1100	20(2)	305	610	915	1,525	2,545	4,575
1150	20(2)	235	475	710	1,185	1,970	3,550
1200	20(2)	185	370	555	925	1,545	2,775
1250	20(2)	145	295	440	735	1,230	2,210
1300	20(2)	115	235	350	585	970	1,750
1350	20(2)	95	190	290	480	800	1,440
1400	20(2)	75	150	225	380	630	1,130
1450	20(2)	60	115	175	290	485	875
1500	15(2)	40	85	125	205	345	620

NOTE: (1) For Cryogenic Valves, -20° F rating extends to -423° F.
(2) For welded end valves only. Flanged end ratings terminate at 1000° F.

SPECIAL CLASS

Working Pressures by Classes, psig							
Temperature, °F	150	300	600	900	1500	2500	4500
-20 to 100 (1)	290	750	1,500	2,250	3,750	6,250	11,250
200	265	690	1,380	2,075	3,455	5,760	10,365
300	240	625	1,250	1,870	3,120	5,200	9,360
400	220	575	1,145	1,720	2,865	4,775	8,600
500	205	535	1,065	1,600	2,665	4,440	7,995
600	195	505	1,005	1,510	2,520	4,195	7,555
650	190	495	985	1,480	2,465	4,105	7,395
700	185	485	970	1,455	2,425	4,040	7,270
750	185	475	955	1,430	2,385	3,975	7,150
800	180	470	945	1,415	2,355	3,930	7,070
850	180	465	930	1,400	2,330	3,885	6,990
900	180	465	925	1,390	2,315	3,860	6,950
950	175	460	915	1,375	2,290	3,815	6,870
1000	160	420	840	1,260	2,105	3,505	6,310
1050	160	420	840	1,260	2,105	3,505	6,310
1100	145	380	765	1,145	1,905	3,180	5,720
1150	115	295	590	885	1,480	2,465	4,435
1200	90	230	465	695	1,155	1,930	3,470
1250	70	185	370	555	920	1,535	2,765
1300	55	145	290	435	730	1,215	2,185
1350	45	120	240	360	600	1,000	1,800
1400	35	95	190	285	470	785	1,415
1450	30	75	145	220	365	605	1,095
1500	20	50	105	155	260	430	770

NOTE: Special Class Ratings apply to Threaded and Weld End Valves only and require upgrading per paragraph 8 of ASME B16.34

CHEMICAL AND PHYSICAL PROPERTIES
CAST CARBON, ALLOY STEELS, AND STAINLESS STEEL

TABLE 9

ASTM STANDARD GRADE		A216 WCB	A217 WC6	A217 WC9	A217 C5	A217 C12	A217 C12A**	A352 LCB×	A351 CF3M (316L)	A351 CF8M (316)
CARBON (C)	(Min)	-	0.05	0.05	-	-	0.08	-	-	-
	(Max)	0.30	0.20	0.18	0.20	0.20	0.12	0.30	0.03	0.08
MANGANESE (Mn)	(Min)	-	0.50	0.40	0.40	0.35	0.30	-	-	-
	(Max)	1.00***	0.80	0.70	0.70	0.65	0.60	1.00***	1.50	1.50
PHOSPHOROUS (P)	(Min)	-	-	-	-	-	-	-	-	-
	(Max)	0.04	0.04	0.04	0.04	0.04	0.030	0.04	0.040	0.040
SULFUR (S)	(Min)	-	-	-	-	-	-	-	-	-
	(Max)	0.045	0.045	0.045	0.045	0.045	0.010	0.045	0.040	0.040
SILICON (Si)	(Min)	-	-	-	-	-	0.20	-	-	-
	(Max)	0.60	0.60	0.60	0.75	1.00	0.50	0.60	1.50	1.50
COPPER (Cu)	(Min)	-	-	-	-	-	-	-	-	-
	(Max)	0.30*	0.50*	0.50*	0.50*	0.50*	-	0.30*	-	-
NICKEL (Ni)	(Min)	-	-	-	-	-	-	-	9.0	9.0
	(Max)	0.50*	0.50*	0.50*	0.50*	0.50*	0.40	0.50*	13.0	12.0
CHROMIUM (Cr)	(Min)	-	1.00	2.00	4.00	8.00	8.0	-	17.0	18.0
	(Max)	0.50*	1.50	2.75	6.50	10.00	9.5	0.50*	21.0	21.0
MOLYBDENUM (Mo)	(Min)	-	0.45	0.90	0.45	0.90	0.85	-	2.0	2.0
	(Max)	0.20*	0.65	1.20	0.65	1.20	1.05	0.20*	3.0	3.0
VANADIUM (V)	(Min)	-	-	-	-	-	0.18	-	-	-
	(Max)	0.03*	-	-	-	0.06	0.25	0.03*	-	-
TUNGSTEN (W)	(Min)	-	-	-	-	-	-	-	-	-
	(Max)	-	0.10*	0.10*	0.10*	0.10*	-	-	-	-
COLUMBIUM (Cb)	(Min)	-	-	-	-	-	0.060	-	-	-
	(Max)	-	-	-	-	0.03	0.10	-	-	-
TENSILE STRENGTH	(Min)	70 Ksi	70 Ksi	70 Ksi	90 Ksi	90	85 Ksi	65 Ksi	70 Ksi	70 Ksi
	(Max)	95	95	95	115	115	110	90		
YIELD STRENGTH	(Min)	36 Ksi	40 Ksi	40 Ksi	60 Ksi	60 Ksi	60 Ksi	35 Ksi	30 Ksi	30 Ksi
ELONGATION	(Min)	22%	20%	20%	18%	18%	18%	24%	30%	30%
REDUCTION OF AREA	(Min)	35%	35%	35%	35%	35%	45%	35%	-	-
TEMPERATURE	(Min)	-20F	-20F	-20F	-20F	-20F	-20F	-50F	-425F	-425F
	(Max)	800F	1100F	1100F	1200F	1200F	1200F	650F	850F	1500F[T]

*RESIDUAL ELEMENTS-Total must not exceed 1.00 maximum.

**NITROGEN range is 0.030 to 0.070; ALUMINUM is 0.02 Max; TITANIUM is 0.01 max.

***The maximum MANGANESE may increase 0.04%, up to 1.28% maximum, for each reduction of 0.01% below the specified maximum CARBON content.

×Impact tests required at –50° F. Minimum 13 ft-lb for two specimens and average of three. Minimum single specimen is 10 ft-lbs

[T] For temperatures over 1000° F, minimum CARBON is 0.04. Customer must specify if temperature is over 1000° F and this minimum CARBON is required.

NOTE: Chemical Compositions Are In Units Of Percent.

TRIM DESCRIPTIONS

TABLE 10

API Trim No.	Powell Trim Designation	Seat Nominal Description	Seat Nominal Composition	Nominal Hardness (HB)	Typical Stem/ Backseat Material
1	1	F6	13 Cr	250 min (a)	TYPE 410 or 420 (13Cr)
2	E	304	18Cr-8Ni	-	TYPE 304 (18Cr-8Ni)
5	5	Hardfaced	Co-CrA (b)	350	TYPE 410 or 420 (13 Cr)
8	8	F6 and	13 Cr.	250	TYPE 410 or 420 (13 Cr)
		Hardfaced	Co-CrA (b)	350	
9	9	Monel	Ni-Cu Alloy	-	Monel (Ni-Cu)
10	0	316	18 Cr-8Ni-Mo	-	TYPE 316 (18Cr-8Ni-Mo)
11	D	Monel and	Ni-Cu Alloy	-	Monel (Ni-Cu)
		Hardfaced	Co-CrA (b)	350	
12	2	316 And	18Cr-8Ni-Mo	-	TYPE 316 (18Cr-8Ni-Mo)
		Hardfaced	Co-CrA (b)	350	
13	3	Alloy 20	19Cr-29Ni	-	Alloy 20 (19Cr-29Ni)
14	4	Alloy 20 and	19Cr-29Ni	-	Alloy 20 (19Cr-29Ni)
		Hardfaced	Co-CrA (b)	350	
15	R	Hardfaced	Co-CrA (b)	350	TYPE 304 (18Cr-8Ni)
16	6	Hardfaced	Co-CrA (b)	350	TYPE 316 (18Cr-8Ni-Mo)
17	7	Hardfaced	Co-CrA (b)	350	TYPE 347 (18Cr-10Ni-Cb)
18	J	Hardfaced	Co-CrA (b)	350	Alloy 20 (19Cr-29Ni)
Integral ½HF	A	Equal to Body	Equal to Body	-	Equal to Body
		Hardfaced	Co-CrA (b)	-	
Integral Full HF	B	Hardfaced	Co-CrA (b)	-	Equal to Body
Integral	C	Equal to Body	Equal to Body	-	Equal to Body

(a) Minimum 50HB differential hardness between mating seating surfaces

(b) Stellite 6 ™ or equal.

DIMENSIONS OF WROUGHT STEEL PIPE AND WELD END CONFIGURATIONS

TABLE 11

PIPE DIMENSIONS			IDENTIFICATION		WELD END DIMENSIONS*		
INCH NOMINAL SIZE	OUTSIDE DIAMETER IN.	WALL THICKNESS IN.	SCHEDULE		VALVE OD A IN.	PIPE ID B IN.	C IN.
¼	0.540	0.065	….	10/10S		0.410	
	0.540	0.088	STD	40/40S		0.364	
	0.540	0.119	XS	80/80S		0.302	
⅜	0.675	0.065	….	10/10S		0.545	
	0.675	0.091	STD	40/40S		0.493	
	0.675	0.126	XS	80/80S		0.423	
½	0.840	0.083	….	10/10S		0.674	
	0.840	0.109	STD	40/40S		0.622	
	0.840	0.147	XS	80/80S		0.546	
¾	1.050	0.083	….	10/10S		0.884	
	1.050	0.113	STD	40/40S		0.824	
	1.050	0.154	XS	80/80S		0.742	
1	1.315	0.109	….	10/10S		1.097	
	1.315	0.133	STD	40/40S		1.049	
	1.315	0.179	XS	80/80S		0.957	
1¼	1.660	0.109	…	10/10S		1.442	
	1.660	0.140	STD	40/40S		1.380	
	1.660	0.191	XS	80/80S		1.278	
1½	1.900	0.109	….	10/10S		1.682	
	1.900	0.145	STD	40/40S		1.610	
	1.900	0.200	XS	80/80S		1.500	
2	2.375	0.109	….	10/10S		2.157	
	2.375	0.154	STD	40/40S		2.067	
	2.375	0.218	XS	80/80S		1.939	
2½	2.875	0.120	….	10/10S	2.96	2.635	
	2.875	0.203	STD	40/40S	2.96	2.469	2.479
	2.875	0.276	XS	80/80S	2.96	2.323	2.351
	2.875	0.375	….	160	2.96	2.125	2.178
	2.875	0.552	XXS	….	2.96	1.771	1.868
3	3.500	0.120	….	10/10S	3.59	3.260	
	3.500	0.216	STD	40/40S	3.59	3.068	3.081
	3.500	0.300	XS	80/80S	3.59	2.900	2.934
	3.500	0.438	….	160	3.59	2.624	2.692
	3.500	0.600	XXS	….	3.59	2.300	2.409

*SEE SKETCHES 1 AND 2

DIMENSIONS OF WROUGHT STEEL PIPE AND WELD END CONFIGURATIONS

TABLE 11 (cont.)

PIPE DIMENSIONS			IDENTIFICATION		WELD END DIMENSIONS*		
INCH NOMINAL SIZE	OUTSIDE DIAMETER IN.	WALL THICKNESS IN.	SCHEDULE		VALVE OD A IN.	PIPE ID B IN.	C IN.
4	4.500	0.120	....	10/10S	4.62	4.260	
	4.500	0.237	STD	40/40S	4.62	4.026	4.044
	4.500	0.337	XS	80/80S	4.62	3.826	3.869
	4.500	0.438	....	120	4.62	3.624	3.692
	4.500	0.531	....	160	4.62	3.438	3.530
	4.500	0.674	XXS	....	4.62	3.152	3.279
6	6.625	0.134	....	10/10S	6.78	6.357	
	6.625	0.280	STD	40/40S	6.78	6.065	6.094
	6.625	0.432	XS	80/80S	6.78	5.761	5.828
	6.625	0.562	....	120	6.78	5.501	5.600
	6.625	0.719	....	160	6.78	5.187	5.326
	6.625	0.864	XXS	....	6.78	4.897	5.072
8	8.625	0.148	....	10/10S	8.78	8.329	
	8.625	0.250	....	20	8.78	8.125	8.146
	8.625	0.322	STD	40/40S	8.78	7.981	8.020
	8.625	0.406	....	60	8.78	7.813	7.873
	8.625	0.500	XS	80/80S	8.78	7.625	7.709
	8.625	0.594	....	100	8.78	7.437	7.544
	8.625	0.719	....	120	8.78	7.187	7.326
	8.625	0.812	....	140	8.78	7.001	7.163
	8.625	0.875	XXS	....	8.78	6.875	7.053
	8.625	0.906	....	160	8.78	6.813	6.998
10	10.750	0.165	....	10/10S	10.94	10.420	
	10.750	0.250	....	20/20S	10.94	10.250	10.272
	10.750	0.365	STD	40/40S	10.94	10.020	10.070
	10.750	0.500	XS	60/80S	10.94	9.750	9.834
	10.750	0.594	....	80	10.94	9.562	9.670
	10.750	0.719	....	100	10.94	9.312	9.451
	10.750	0.844	....	120	10.94	9.062	9.232
	10.750	1.000	XXS	140	10.94	8.750	8.959
	10.750	1.125	....	160	10.94	8.500	8.740
12	12.750	0.180	....	10/10S	12.97	12.390	
	12.750	0.250	....	20	12.97	12.250	12.272
	12.750	0.375	STD	40S	12.97	12.000	12.053
	12.750	0.406	....	40	12.97	11.938	11.999
	12.750	0.500	XS	80S	12.97	11.750	11.834
	12.750	0.562	....	60	12.97	11.626	11.725
	12.750	0.688	....	80	12.97	11.374	11.505
	12.750	0.844	....	100	12.97	11.062	11.232
	12.750	1.000	XXS	120	12.97	10.750	10.959
	12.750	1.125	....	140	12.97	10.500	10.740
	12.750	1.312	....	160	12.97	10.126	10.413

*SEE SKETCHES 1 AND 2

DIMENSIONS OF WROUGHT STEEL PIPE AND WELD END CONFIGURATIONS

TABLE 11 (cont.)

PIPE DIMENSIONS			IDENTIFICATION		WELD END DIMENSIONS*		
INCH NOMINAL SIZE	OUTSIDE DIAMETER IN.	WALL THICKNESS IN.	SCHEDULE		VALVE OD A IN.	PIPE ID B IN.	C IN.
14	14	0.188	....	10S	14.25	13.624	
	14	0.250	....	10	14.25	13.500	
	14	0.312	....	20	14.25	13.376	13.413
	14	0.375	STD	30	14.25	13.250	13.303
	14	0.438	....	40	14.25	13.124	13.192
	14	0.500	XS	....	14.25	13.000	13.084
	14	0.594	....	60	14.25	12.812	12.920
	14	0.750	....	80	14.25	12.500	12.646
	14	0.938	....	100	14.25	12.124	12.318
	14	1.094	....	120	14.25	11.812	12.044
	14	1.250	....	140	14.25	11.500	11.771
	14	1.406	....	160	14.25	11.188	11.498
16	16	0.188	....	10S	16.25	15.624	
	16	0.250	....	10	16.25	15.500	
	16	0.312	....	20	16.25	15.376	15.413
	16	0.375	STD	30	16.25	15.250	15.303
	16	0.500	XS	40	16.25	15.000	15.084
	16	0.656	....	60	16.25	14.688	14.811
	16	0.844	....	80	16.25	14.312	14.482
	16	1.031	....	100	16.25	13.938	14.155
	16	1.219	....	120	16.25	13.562	13.826
	16	1.438	....	140	16.25	13.124	13.442
	16	1.594	....	160	16.25	12.812	13.170
18	18	0.188	....	10S	18.28	17.624	
	18	0.250	....	10	18.28	17.500	
	18	0.312	....	20	18.28	17.376	17.413
	18	0.375	STD	....	18.28	17.250	17.303
	18	0.500	XS	....	18.28	17.000	17.084
	18	0.562	....	40	18.28	16.876	16.975
	18	0.750	....	60	18.28	16.500	16.646
	18	0.938	....	80	18.28	16.124	16.318
	18	1.156	....	100	18.28	16.688	15.936
	18	1.375	....	120	18.28	15.250	15.553
	18	1.562	....	140	18.28	14.876	15.225
	18	1.781	....	160	18.28	14.438	14.842
20	20	0.218	....	10S	20.31	19.564	
	20	0.250	....	10	20.31	19.500	
	20	0.375	STD	20	20.31	19.250	19.303
	20	0.500	XS	30	20.31	19.000	19.084
	20	0.594	....	40	20.31	18.812	18.920

*SEE SKETCHES 1 AND 2

DIMENSIONS OF WROUGHT STEEL PIPE AND WELD END CONFIGURATIONS

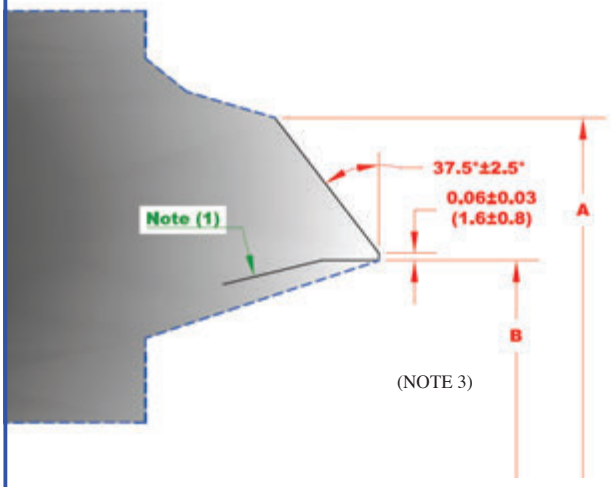
TABLE 11 (cont.)

PIPE DIMENSIONS			IDENTIFICATION		WELD END DIMENSIONS*		
INCH NOMINAL SIZE	OUTSIDE DIAMETER IN.	WALL THICKNESS IN.	SCHEDULE		VALVE OD A IN.	PIPE ID B IN.	C IN.
	20	0.812	....	60	20.31	18.376	18.538
	20	1.031	....	80	20.31	17.938	18.155
	20	1.281	....	100	20.31	17.438	17.717
	20	1.500	....	120	20.31	17.000	17.334
	20	1.750	....	140	20.31	16.500	16.896
	20	1.969	....	160	20.31	16.062	16.513
24	24	0.250	....	10/10S	24.38	23.500	
	24	0.375	STD	20	24.38	23.250	23.303
	24	0.500	XS	....	24.38	23.000	23.084
	24	0.562	....	30	24.38	22.876	22.975
	24	0.688	....	40	24.38	22.624	22.755
	24	0.969	....	60	24.38	22.062	22.263
	24	1.219	....	80	24.38	21.562	21.826
	24	1.531	....	100	24.38	20.938	21.280
	24	1.812	....	120	24.38	20.376	20.788
	24	2.062	....	140	24.38	19.876	20.350
	24	2.344	....	160	24.38	19.312	19.857
30	30	0.312	....	10/10S	30.38	29.376	29.413
	30	0.375	STD	....	30.38	29.250	29.303
	30	0.500	XS	20	30.38	29.000	29.084
	30	0.625	....	30	30.38	28.750	28.865
36	36	0.312	....	10	36.50	35.376	35.413
	36	0.375	STD	....	36.50	35.250	35.303
	36	0.500	XS	20	36.50	35.000	35.084
	36	0.625	....	30	36.50	34.750	34.865
	36	0.750	....	40	36.50	34.500	34.646
42	42	0.375	STD	....	42.50	41.250	41.303
	42	0.500	XS	....	42.50	41.000	41.084

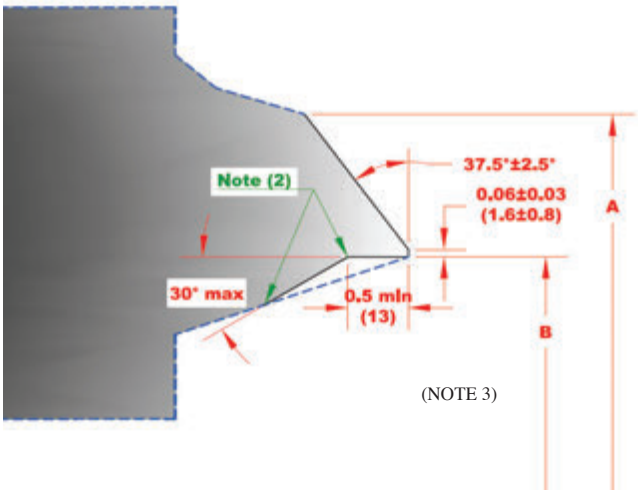
*SEE SKETCHES 1 AND 2

SKETCH 1 TYPICAL WELD BEVEL DETAILS FOR WALL THICKNESS NOT OVER 0.88 in. (22 mm)

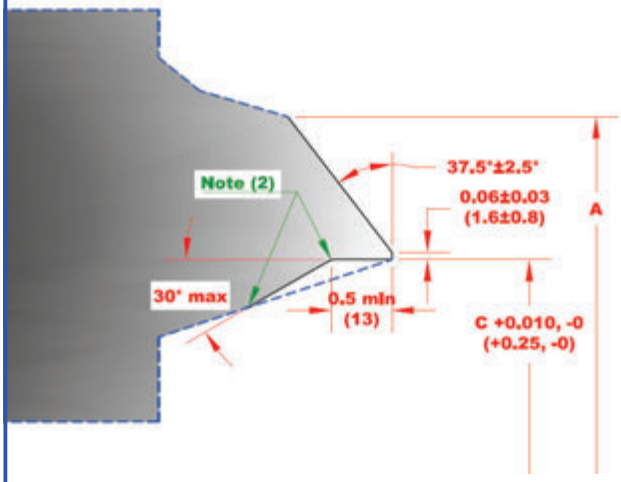
REFER TO ASME 16.25 FIG 2.



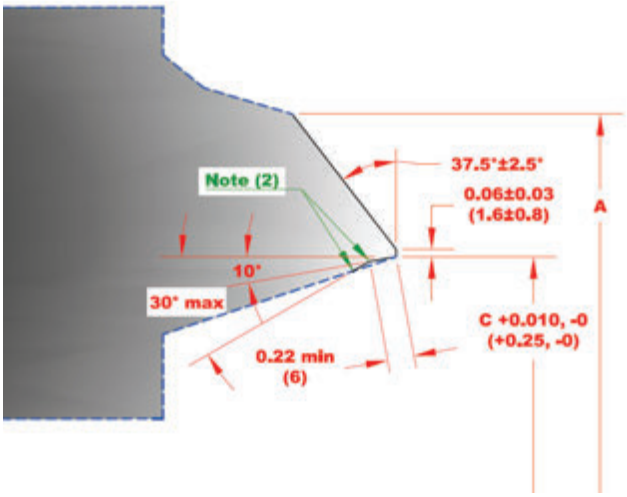
(a) Welding End Detail for Joint without Backing Ring



(b) Welding End Detail for Joint Using Split Rectangular Backing Ring



(c) Welding End Detail for Joint Using Continuous Rectangular Backing Ring



(d) Welding End Detail for Joint Using Continuous Tapered Backing Ring

GENERAL NOTES:

(a) Broken lines denote maximum envelope for transition from welding bevel and root face into body of component. Refer to Figure 1 of ASME B16.25 for details.

(b) Purchase order must specify contour of any backing ring to be used.

(c) Linear dimensions are in inches with millimeter values in parentheses.

NOTES:

(1) Internal surface may be as-formed or machined for dimension B at root face.

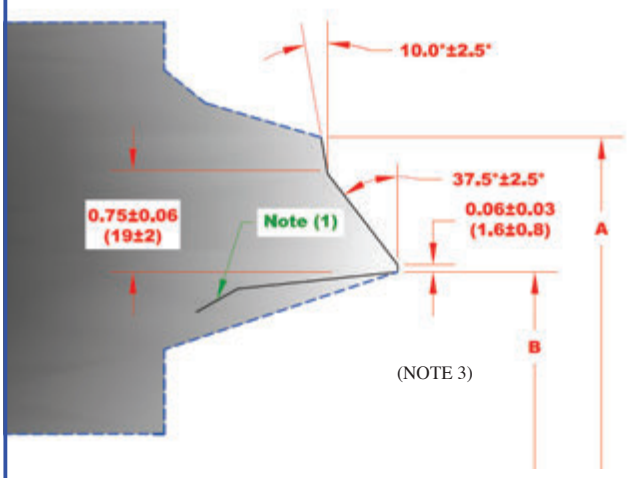
(2) Intersections should be slightly rounded.

(3) Tolerances for "B" dimension on valve weld ends:

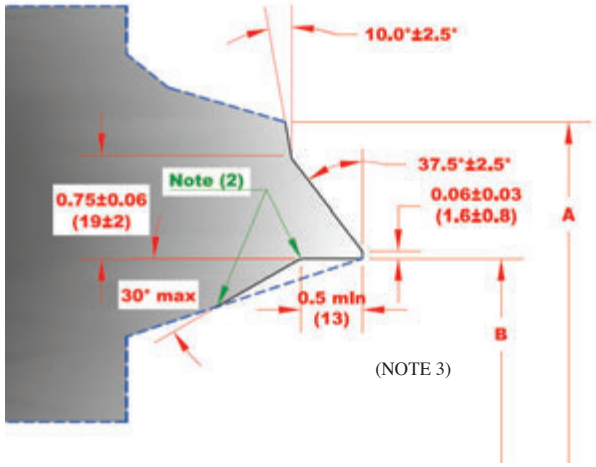
- ±0.03" (±1.0 mm) for NPS ≤ 10
- ±0.06" (±2.0 mm) for 12 ≤ NPS ≤ 18
- +0.12", -0.06" (+3.0 mm, -2.0 mm) for NPS ≥ 20

SKETCH 2 TYPICAL WELD BEVEL DETAILS FOR WALL THICKNESS OVER 22 mm (0.88 in.)

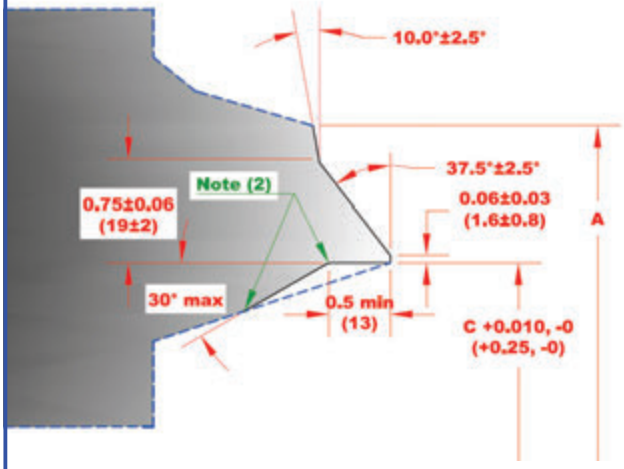
REFER TO ASME 16.25 FIG 3.



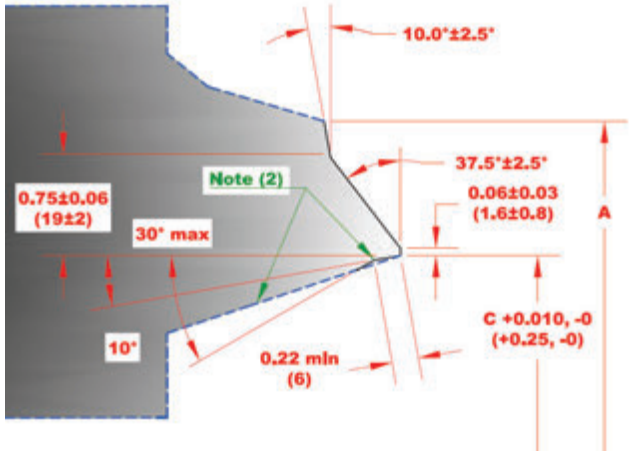
(a) Welding End Detail for Joint without Backing Ring



(b) Welding End Detail for Joint Using Split Rectangular Backing Ring



(c) Welding End Detail for Joint Using Continuous Rectangular Backing Ring



(d) Welding End Detail for Joint Using Continuous Tapered Backing Ring

GENERAL NOTES:

(a) Broken lines denote maximum envelope for transition from welding bevel and root face into body of component. Refer to Figure 1 of ASME B16.25 for details.

(b) Purchase order must specify contour of any backing ring to be used.

(c) Linear dimensions are in inches with millimeter values in parentheses.

NOTES:

(1) Internal surface may be as-formed or machined for dimension B at root face.

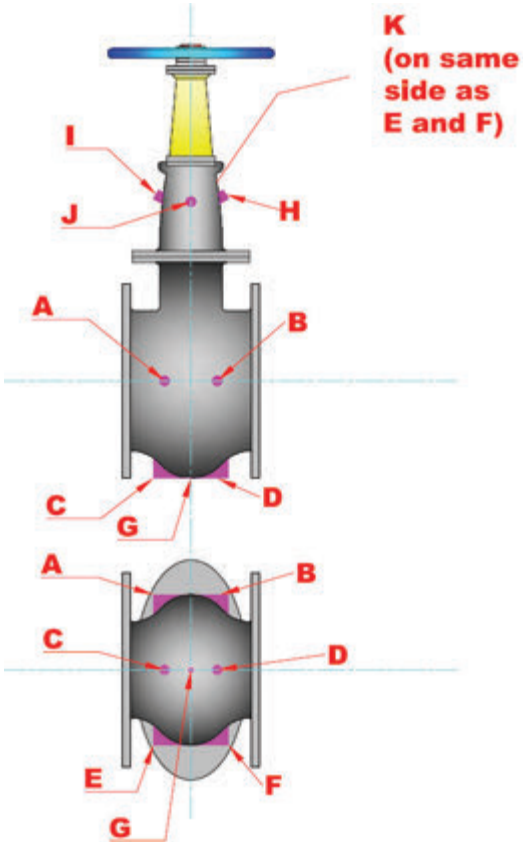
(2) Intersections should be slightly rounded.

(3) Tolerances for “B” dimension on valve weld ends:

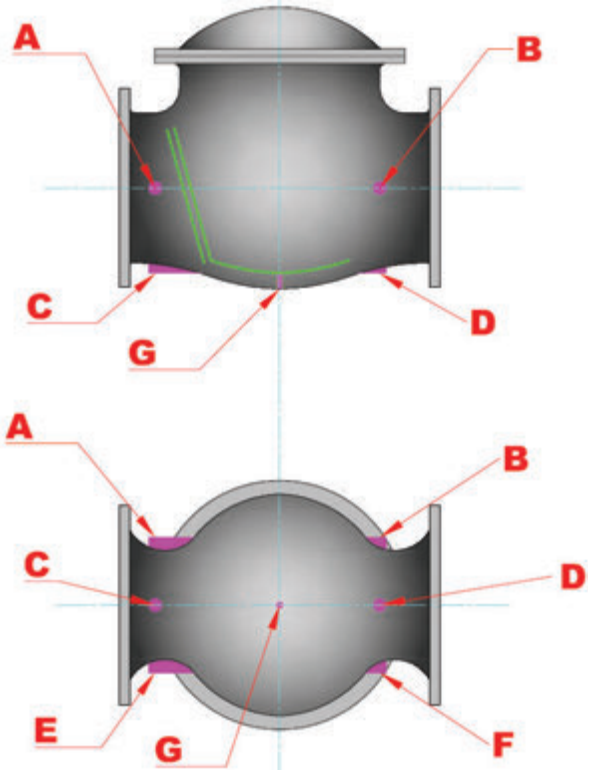
- ±0.03” (±1.0 mm) for NPS ≤ 10
- ±0.06” (±2.0 mm) for 12 ≤ NPS ≤ 18
- +0.12”, -0.06” (+3.0 mm, -2.0 mm) for NPS ≥ 20

METHOD OF DESIGNATING LOCATION OF AUXILIARY CONNECTIONS WHEN SPECIFIED

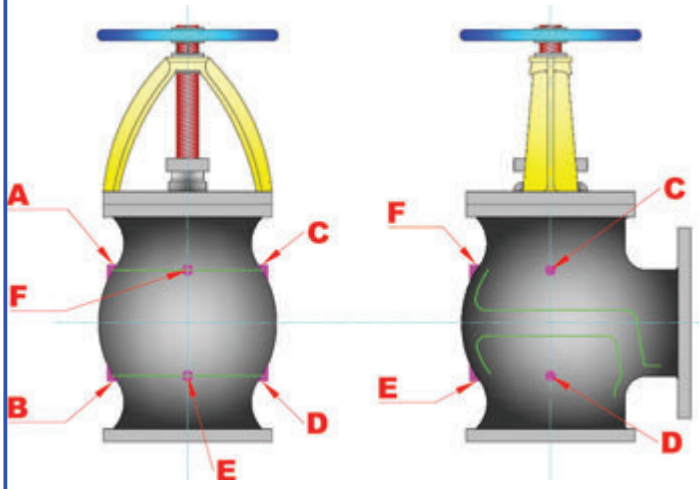
FIGURE 1



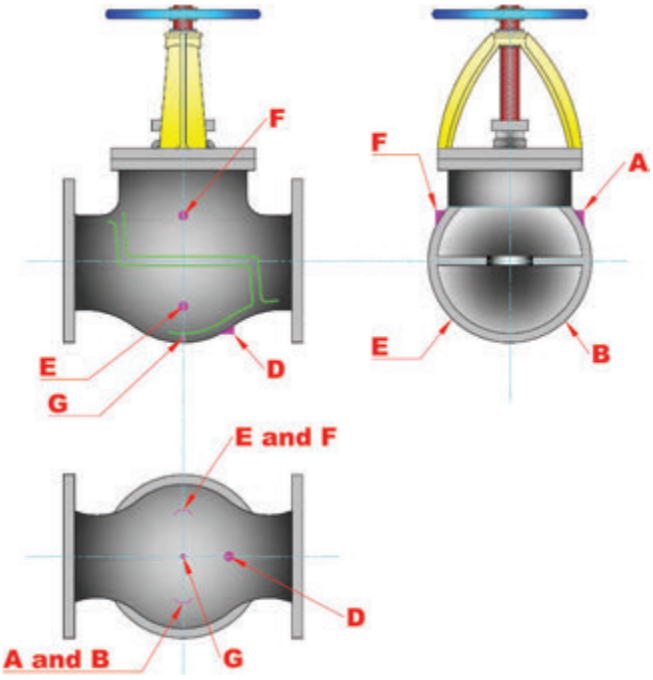
GATE VALVE



CHECK VALVE



ANGLE VALVE

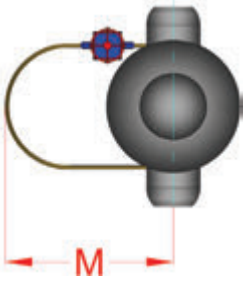


GLOBE VALVE

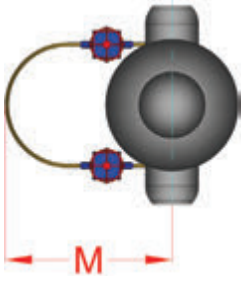
GENERAL NOTE:
The above sketches represent valves with symmetrical shapes. Sketches are illustrative only and do not imply design.

FIGURE 2

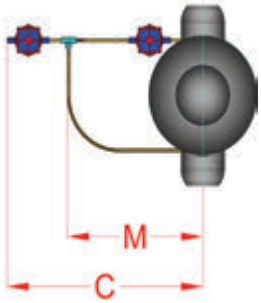
BYPASS DIMENSIONS
CAST STEEL VALVES
CLASS 600 THROUGH 2500



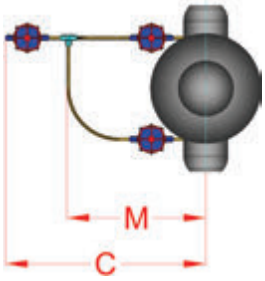
One-Valve Bypass



Two-Valve Bypass



One-Valve Bypass with Drain Valve



Two-Valve Bypass with Drain Valve

BY-PASS SIZES AND CLEARANCE DIMENSIONS-PRESSURE SEAL BONNET (In)

Size of Valve			4	6	8	10	12	14	16	18	20	24
Size of By-Pass			1/2	3/4	3/4	1	1	1	1	1	1	1
Bypass Clearance Dimensions, Approximate, (in)	**Class 600**	M	16 7/8	19 3/8	20 1/2	24 1/4	25 1/4	26	26 7/8	30 3/4	30 3/4	-
		C	22	25 3/8	26 1/2	31	32	32 3/4	33 5/8	37 1/2	37 1/2	-
	Class 900	M	16 7/8	19 1/2	20 5/8	24 1/4	25 3/8	26 1/8	27 1/4	30 1/8	-	-
		C	22 1/8	25 1/2	26 5/8	31	32 1/8	32 7/8	34	36 7/8	-	-
	Class 1500	M	17	19 5/8	20 3/4	24 1/4	25 3/8	-	-	-	-	-
		C	22 3/8	25 3/4	26 7/8	31 1/8	32 3/8	-	-	-	-	-
	Class 2500	M	Dimensions on Request									
		C										

FLOW DESIGN AND MAINTENANCE RECOMMENDATIONS

(1) SWING CHECK VALVES- Minimum ½ psi differential pressure across valve to maintain proper "full open" position.

(2) LIFT CHECK AND NON-RETURN VALVES- Minimum 2 psi differential pressure across valve to maintain proper "full open" position

(3) Recommended length of straight pipe before and after check and non-return valves to be 10 times pipe diameter to avoid flow turbulence at valve.

(4) For metal seated check valves at low pressure applications (approximately 50 psi or less), seat leakage may be significantly greater than normal high pressure seat test allowable limit.

(5) RECOMMENDED MAXIMUM FLOW VELOCITIES (APPROXIMATE):

VALVE SIZE	WATER (FT/MIN)	SATURATED STEAM (FT/MIN)	SUPERHEATED STEAM (FT/MIN)
3" and UNDER	1200	7200	9000
4	1200	8800	11000
6	1620	10400	13000
8	1860	12000	15000
10	2100	14400	18000
12	2220	15200	19000
14	2400	16000	20000
16	2400	17600	22000
18	2400	19200	24000
20" and LARGER	2400	20800	26000

(6) GATE VALVES — Not to be used in throttling services. Open and closed service only.

(7) GLOBE VALVES— Not to be throttled under 20% open.

FOR MAINTENANCE AND SAFETY INFORMATION, SEE THE POWELL *HANDBOOK OF VALVE INFORMATION*, AS DESCRIBED ON PAGE 43.

COMPARISON CHART OF VALVE SIZE/NOMINAL PIPE SIZE

TABLE 12

METRIC NOMINAL SIZE (DN)	ENGLISH NOMINAL SIZE (NPS)
8	1/4
10	3/8
15	1/2
20	3/4
25	1
32	1-1/4
40	1-1/2
50	2
65	2-1/2
80	3
100	4
150	6
200	8
250	10
300	12
350	14
400	16
450	18
500	20
600	24

CONVERSION FACTORS

	TO CONVERT FROM	TO	MULTIPLY BY
LENGTH	INCHES (IN)	MILLIMETERS (MM)	25.4
	INCHES (IN)	CENTIMETERS (CM)	2.54
	FEET (FT)	INCHES (IN)	12
WEIGHT	POUNDS (LB)	KILOGRAMS (KG)	0.4536
	POUNDS (LB)	NEWTONS (N)	4.448
PRESSURE*	PSI	KILOGRAMS/M^2	703
	PSI	KILOGRAMS/CM^2	0.0703
	PSI	KILOGRAMS/MM^2	0.000703
	PSI	BAR	0.0689
	PSI	ATMOSPHERE	0.068
	PSI	KILOPASCAL	6.895
	PSI	MEGAPASCAL	0.006895
	PSI	NEWTON/MM^2	0.006895
	PSI	IN. WATER**	27.68
	PSI	FT. WATER**	2.307
	PSI	IN. MERCURY**	2.036
	PSI	PSF	144
AREA	SQ. INCH(IN^2)	SQ. CENTIMETERS(CM^2)	6.452

TEMPERATURE

TO CONVERT FROM DEGREES CENTIGRADE (C) TO DEGREES FAHRENHEIT (F): F=1.8*C+32

TO CONVERT FROM DEGREES FAHRENHEIT (F) TO DEGREES CENTIGRADE (C): C=0.556* (F-32)

NOTE: MOST FACTORS ARE ROUNDED OFF AND NOT EXACT CONVERSIONS.

*- PSI = POUNDS PER SQUARE INCH AND PSF = POUNDS PER SQUARE FOOT.

**- WATER AT 60F. MERCURY AT 32F.

MEASUREMENT EQUIVALENTS

TABLE 13

FRACTION				DECIMAL	MILLIMETERS
			1/64	0.0156	0.3969
		1/32		0.0313	0.7938
				0.0394	1.0000
			3/64	0.0469	1.1906
	1/16			0.0625	1.5875
			5/64	0.0781	1.9844
				0.0787	2.0000
		3/32		0.0938	2.3813
			7/64	0.1094	2.7781
				0.1181	3.0000
1/8				0.1250	3.1750
			9/64	0.1406	3.5719
		5/32		0.1563	3.9688
				0.1575	4.0000
			11/64	0.1719	4.3656
	3/16			0.1875	4.7625
				0.1969	5.0000
			13/64	0.2031	5.1594
		7/32		0.2188	5.5563
			15/64	0.2344	5.9531
				0.2362	6.0000
1/4				0.2500	6.3500
			17/64	0.2656	6.7469
				0.2756	7.0000
		9/32		0.2813	7.1438
			19/64	0.2969	7.5406
	5/16			0.3125	7.9375
				0.3150	8.0000
			21/64	0.3281	8.3344
		11/32		0.3438	8.7313
				0.3543	9.0000
			23/64	0.3594	9.1281
3/8				0.3750	9.5250
			25/64	0.3906	9.9219
				0.3937	10.0000
		13/32		0.4063	10.3188
			27/64	0.4219	10.7156
				0.4331	11.0000
	7/16			0.4375	11.1125
			29/64	0.4531	11.5094
		15/32		0.4688	11.9063
				0.4724	12.0000
			31/64	0.4844	12.3031
1/2				0.5000	12.7000

FRACTION				DECIMAL	MILLIMETERS
				0.5118	13.0000
			33/64	0.5156	13.0969
		17/32		0.5313	13.4938
			35/64	0.5469	13.8906
				0.5512	14.0000
	9/16			0.5625	14.2875
			37/64	0.5781	13.6844
				0.5906	15.0000
		19/32		0.5938	15.0813
			39/64	0.6094	15.4781
5/8				0.6250	15.8750
				0.6299	16.0000
			41/64	0.6406	16.2719
		21/32		0.6563	16.6688
				0.6693	17.0000
			43/64	0.6719	17.0656
	11/16			0.6875	17.4625
			45/64	0.7031	17.8594
				0.7087	18.0000
		23/32		0.7188	18.2563
			47/64	0.7344	18.6531
				0.7480	19.0000
3/4				0.7500	19.0500
			49/64	0.7656	19.4469
		25/32		0.7813	19.8438
				0.7874	20.0000
			51/64	0.7969	20.2406
	13/16			0.8125	20.6375
				0.8268	21.0000
			53/64	0.8281	21.0344
		27/32		0.8438	21.4313
			55/64	0.8594	21.8281
				0.8661	22.0000
7/8				0.8750	22.2250
			57/64	0.8906	22.6219
				0.9055	23.0000
		29/32		0.9063	23.0188
			59/64	0.9219	23.4156
	15/16			0.9375	23.8125
				0.9449	24.0000
			61/64	0.9531	24.2094
		31/32		0.9688	24.6063
				0.9843	25.0000
			63/64	0.9844	25.0031
1				1.0000	25.4000

March, 2011 THE WILLIAM POWELL COMPANY

GENERAL TERMS AND CONDITIONS OF SALE

1. TERMS EXCLUSIVE: The terms and conditions of the purchase order or requisition to which these GENERAL TERMS AND CONDITIONS OF SALE (these "Terms and Conditions") relate or are attached (each, an "Order"), are exclusive and represent the full and final agreement of The William Powell Company, an Ohio corporation ("Powell") and the purchaser ("Purchaser") as they relate to the goods, materials, services or labor covered in the Order (all, whether or not tangible property or goods, the "Products"), and may not be added to, modified, superseded or altered except by written agreement or modification signed by Powell's authorized representative, notwithstanding any additional or other proposals, terms and conditions which may now or in the future appear on Purchaser's Orders or other forms (notification of objection thereto being given hereby), in whatever form transmitted, and notwithstanding any shipment of Products, acceptance of payments or other similar acts of Powell.

2. SALE BY AGENT OR REPRESENTATIVE: These Terms and Conditions shall govern the liability and obligations of Powell in regard to the transaction in Products, whether the sale was procured directly by Powell or indirectly through an authorized sales representative.

3. CONTRACT: Orders may be submitted to Powell in writing (which will include via an electronic transmission) or orally, provided, however, that if Purchaser fails to provide a detailed, formal written Order (a) within ten (10) days of an oral Order or (b) before shipment of the Order, whichever is earlier, then Product descriptions, quantities, specifications, etc., as set forth in Powell's acknowledgement, acceptance and/or invoice, shall be conclusive and binding on both parties, and discrepancies shall be for Purchaser's account. All Orders are subject to credit approval and acceptance by Powell. An Order shall be deemed to have been accepted by Powell upon the first to occur of the following: (i) Powell's first shipment or other tender of the Order or (ii) acceptance thereof by Powell in writing.

4. PERMISSIBLE VARIATIONS: Powell has the right, prior to the delivery of Products to Purchaser and without the giving of notice to Purchaser, to make any changes in the composition, fabrication or design of the Products which, in the opinion of Powell, do not affect the general characteristics or properties of the Products. In addition, Powell may make any change or any variation in the Products, whether of quality or quantity, which is within governmental or professional standards or specifications applicable at the time of manufacture without giving notice to Purchaser. Purchaser will accept any Products which may incorporate any changes in the composition, fabrication or design.

5. PRICES: Prices for Products are quoted and payable in U.S. dollars ("USD"). Prices stated in general price lists are subject to change without prior notice, at Powell's sole discretion. Prices that are provided in a specific quotation will remain firm for thirty (30) days of the issued date of the written quotation. All prices are exclusive of freight costs, taxes and duties. All taxes (including, without limitation, sales, use, stamp, value added and other taxes) duties, fees, charges and assessments by whomsoever levied on or with respect to the Products, and whether levied against Purchaser or Powell, are for Purchaser's account and, unless invoiced, shall be paid by Purchaser directly to the appropriate governmental agency.

6. SHIPPING TERMS: Delivery of Products to Canada, the United States and Mexico shall be F.O.B. (as defined in the Uniform Commercial Code as in effect in the State of Ohio) Powell's plant of manufacture. Delivery of Products outside of Canada, United States and Mexico shall be Ex Works (as defined by INCOTERMS 2000) Powell's plant of manufacture. All transportation expenses, freight and insurance shall be paid by Purchaser, and risk of delay, loss or damage incurred in transit shall be borne by Purchaser, who shall be responsible to file any such claims with the relevant carrier(s) or insurers.

Upon tender of delivery, title shall pass to Purchaser, subject to Powell's right of stoppage in transit and to Powell's security interest in the Products, as set forth in Section 8.

If the Products are held by Powell subject to receiving instructions from Purchaser or in any case where Powell, in its sole discretion, determines any part of the Products should be held for Purchaser's account, Powell may invoice the Products, and Purchaser agrees to make payment in accordance with these Terms and Conditions. Products invoiced and held at any location by Powell will be held at Purchaser's risk, and Powell may charge for (but is not obligated to carry) insurance and storage.

If Purchaser has declared or manifested an intention not to accept delivery in accordance with these Terms and Conditions, no tender will be necessary, but Powell may, at its option, give notice to Purchaser that Powell is ready and willing to deliver and such notice will constitute a valid tender of delivery.

7. INSPECTION AND ACCEPTANCE: Each shipment shall be inspected by Purchaser for observable damage and/or non-conformity at the time of delivery of the Products. Failure to so inspect shall constitute a waiver of Purchaser's rights of inspection and shall constitute an unqualified acceptance of the Products. If, after such inspection, Purchaser attempts to reject any Products, Purchaser shall fully specify all claimed damage or non-conformity in writing in a notice of rejection sent to Powell within five (5) days of delivery of the Products. Purchaser's failure to so specify shall constitute a waiver of that damage or non-conformity. Partial deliveries shall be accepted by Purchaser and paid for according to these Terms and Conditions.

8. PAYMENT TERMS: Payment shall be due net thirty (30) days from the date of invoice. Overdue accounts shall be subject to a carrying charge of one and one-half percent (1.5%) per month or portion of a month on the unpaid balance until paid in full. In the event Purchaser shall default on its obligations hereunder, Purchaser shall be liable for all of Powell's costs and expenses of collection, including reasonable attorneys' fees. Powell may, at its option, cancel and/or sell any unshipped Products should Purchaser fail to fulfill the complete terms of payment. Purchaser will have no right to offset any amounts against any payment or other obligation which Powell may owe to Purchaser. Powell hereby reserves a security interest in the Products to secure Purchaser's payment of the purchase price and any other amounts owed by Purchaser, and Purchaser agrees that Powell may (but is not obligated to) take such action as Powell deems advisable to evidence and perfect such interest and that Purchaser will cooperate with Powell in the taking of such actions.

9. CREDIT APPROVAL: Notwithstanding the provisions of Section 8, Powell may at any time decline to make any shipment or delivery or perform any work except upon receipt of payment or upon terms and conditions or security satisfactory to Powell, including, but not limited to, requiring that Purchaser provide Powell one or more letters of credit.

10. LEAD TIMES: Estimated lead times, if specified, are approximate only and are not guaranteed. Failure to ship on or near the estimated date shall not entitle Purchaser to any remedy or to cancel the Order without charge. Estimated lead times are provided Ex Works Powell's plant in weeks after receipt of Order. Estimated lead times are stated on a net basis and do not include any additional lead time due to scheduled and/or unscheduled plant shutdowns. Scheduled plant shutdowns include a two (2) week shutdown each winter and each summer. Estimated lead times are quoted on the basis of material availability and plant loading at the time of quotation, which are subject to change. Purchaser should confirm any estimated lead times at time of Order.

11. MINIMUM ORDER CHARGE: With respect to any Order that includes spare, replacement or component parts ("Parts") as Products, a minimum Order charge of One Hundred USD ($100) shall apply. With respect to any Order that includes valves ("Valves") as Products, a minimum Order charge of Three Hundred Fifty USD ($350) shall apply.

12. RETURN OF PRODUCTS: No Products shall be returned to Powell without Powell's prior written agreement. Products returned by Purchaser shall be returned in the same condition as when delivery was affected by Powell. Only Products that are new, unused and in a condition suitable for immediate resale shall be considered for return. Powell reserves the right to assess a minimum thirty-five percent (35%) restocking charge for Products returned for reasons other than defects or non-conformity.

13. CANCELLATION/SUSPENSION: Purchaser shall not cancel or suspend an Order without Powell's prior written consent, which such consent Powell shall be under no obligation to provide. In the event of cancellation or suspension of an Order without Powell's prior written consent, in addition to Powell's other rights and remedies available hereunder and under applicable law, Purchaser shall pay cancellation charges as follows: (a) Order entered in Powell's system, but no engineering yet initiated, 5%, (b) Engineering work has begun and orders for casings and/or outside purchased parts have been placed, 25%, (c) Castings poured and/or components made, but not yet received at Powell's location, 75%, (d) Castings poured and/or components made and received at Powell's location, 85%, (e) Manufacturing process started, 95% and (f) Components finished, 100%.

Powell may cancel all or part of an Order immediately upon the happening of any of the following: Purchaser is delinquent on any of its obligations hereunder or under any order or transaction with Powell, insolvency of Purchaser; the appointment of a custodian as that term is defined in Title 11 U.S.C., as amended (the "Bankruptcy Code"), or the commencement of a case under any chapter of the Bankruptcy Code or the bankruptcy, receivership, insolvency or similar laws of any country for, by or against Purchaser; Purchaser's suspension or termination of business or assignment for the benefit of creditors; or any event, whether or not similar to the foregoing, which materially impairs Purchaser's ability to perform hereunder. Powell's rights to cancel or postpone set forth herein may be exercised by Powell without liability.

14. CORRECTIONS: Powell reserves the right to make corrections to price lists, quotations, invoices or other contract documents in the event of clerical or typographical errors.

15. COUNTRY OF ORIGIN: Powell reserves the right to furnish Products from any of its plants at its sole discretion and does not represent that the Products listed

herein originate from any specific country. Any costs affected by country of origin, including, but not limited to, customs duties, are not included in the purchase price and are for Purchaser's account.

16. INFORMATION REGARDING PRODUCTS: Purchaser acknowledges that it has received and is familiar with Powell's and any other manufacturer's labeling and literature concerning the Products and will forward such information to its employees, agents and customers.

17. POWELL PRODUCT WARRANTY: For a period of (a) ninety (90) days from tender of delivery with respect to Parts and (b) the earlier of (i) eighteen (18) months from tender of delivery or (ii) twelve (12) months from installation with respect to Valves, Powell warrants to Purchaser that the Parts and/or Valves, as applicable, of its own manufacture are free of defects in material and workmanship, under normal use and proper operation. If any such Products fail to comply with such warranty, Powell, at Powell's option, shall either: (i) replace such defective Products; (ii) furnish replacement parts for repairing Products (iii) issue written authorization for Purchaser or others to replace or repair, without charge to Purchaser, at costs comparable to Powell's normal manufacturing costs, those parts proven defective; or (iv) refund all monies paid by Purchaser to Powell for such Products and, at the sole discretion of Powell, have the Products returned to Powell at Powell's expense. Finished materials and accessories purchased from other manufacturers are warranted only to the extent of the manufacturer's warranty to Powell (to the extent transferable by Powell to Purchaser). Any alteration in material or design of the Products or component parts thereof by Purchaser or others and/or the undertaking of repairs or replacement by Purchaser or its agents without Powell's written consent shall relieve Powell of all responsibility herewith.

Powell's obligations under this warranty shall be conditioned upon (a) Purchaser's notifying Powell of any alleged defect(s) in a writing that references Purchaser's Order number and provides complete identification of any allegedly defective Products within ten (10) days of the discovery of the damage or defect, and (b) Powell's satisfying itself upon inspection that its warranty has been breached. Purchaser may not bring any action under or arising from an Order or these Terms and Conditions unless such action is commenced within one year after the cause of action accrues.

EXCEPT AS SET FORTH IN THIS SECTION 17, POWELL MAKES NO WARRANTY CONCERNING THE PRODUCTS WHATSOEVER; POWELL DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF NON-INFRINGEMENT AND THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE OBLIGATIONS SET FORTH IN THIS SECTION 17 ARE POWELL'S SOLE OBLIGATIONS AND PURCHASER'S EXCLUSIVE REMEDY. POWELL SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, AND PURCHASER HEREBY WAIVES, FOR ITSELF AND ITS SUCCESSORS AND ASSIGNS, (A) ANY AND ALL CLAIMS FOR PUNITIVE DAMAGES AND (B) ALL CLAIMS OF NEGLIGENCE OR STRICT LIABILITY OR BOTH. WITHOUT LIMITATION TO THE FOREGOING, IN NO EVENT SHALL POWELL BE LIABLE FOR THE LOSS OF USE OF THE PRODUCT OR FOR THE LOSS OF USE OF ANY OTHER PRODUCT, PROCESS, EQUIPMENT, OR FACILITIES OF PURCHASER OR OF THE END-USER, WHETHER PARTIALLY OR WHOLLY DUE TO DEFECTS IN MATERIAL AND/OR WORKMANSHIP AND/OR DESIGN OF POWELL'S PRODUCT, AND IN NO EVENT SHALL POWELL BE LIABLE FOR REMOVAL OF APPURTENANCES OR INCIDENTALS SUCH AS CONNECTIONS, PIPE WORK AND SIMILAR ITEMS OF OBSTRUCTION OR FOR ANY COSTS BROUGHT ABOUT BY NECESSITY OF REMOVING THE PRODUCT FROM ITS POINT OF INSTALLATION.

Purchaser (a) recognizes that the limitations contained in this Section 17 are material factors in Powell's sale of the Products at the price(s) specified, and (b) agrees that any accommodation to Purchaser by Powell, whether for sales policy reasons or otherwise, shall not be taken to establish any liability of Powell or any contract term inconsistent with this Agreement.

Purchaser shall neither make nor purport to make (a) any warranty to any person by or on behalf of Powell or (b) any warranty or representation inconsistent with this Section 17.

18. COMPLIANCE WITH LAWS: Powell certifies that the Products produced by it, if any, were produced in compliance with all applicable requirements of Sections 6, 7 and 12 of the Fair Labor Standards Act of 1938, as amended, and the Regulations and Orders of the Administrator of the Wage and Hour Division issued under Section 14 thereof.

Powell shall endeavor to comply with all applicable Ohio and United States federal laws. Powell is not responsible for compliance with any other laws or regulations, or with any Product standard or specification, whether of general or particular application, unless Purchaser has furnished specific written notice thereof prior to Powell's entry of Purchaser's Order.

All sales of Products are conditioned upon and subject to strict compliance with United States export control laws, rules and regulations, including, without limitation, the Export Administration Act, the Export Administration Regulations, the Arms Control Act, the International Traffic in Arms Regulations, the Trading With the Enemy Act, the International Economic Powers Act and the Foreign Assets Control Regulations, as they may be amended and supplemented from time to time (each, an "Export Law" and collectively, the "Export Laws"). For any sale of Products requiring a license, permit or other approval under any Export Law ("Restricted Products"), Powell shall determine the feasibility of obtaining such license, permit or other approval ("Export Approval") and whether it will fill the order for the Restricted Products in light of required Export Approval. In the event Powell applies for Export Approval for the Restricted Products, it shall do so at Purchaser's cost and expense and Purchaser agrees to reimburse Powell for any cost or expenses (including Powell's reasonable attorneys' fees) incurred by Powell in pursuing Export Approval. Powell shall not be under any obligation to ship any such Restricted Products unless and until such Export Approval is granted, and only in strict compliance with the terms and conditions of such Export Approval. Purchaser shall be responsible for timely obtaining and maintaining any required import license, permit or approval necessary to import any Restricted Products into Purchaser's country and any other required governmental authorization ("Import Approval"). Powell shall not be liable if any Export Approval or Import Approval is delayed, denied, revoked, restricted or not renewed, and Purchaser shall not be relieved thereby of its obligations to pay Powell for the Restricted Products or Powell's costs and expenses of obtaining Export Approval in respect of Restricted Products under the Export Laws.

For Products other than Restricted Products, Purchaser (or its designated export agent) shall be responsible for the timely application for any required export authorization and the payment of any required fees, duties, taxes, tariffs, levies or other charges necessary to export the Products out the United States of America and shall be responsible for timely obtaining and maintaining any required Import Approval and the payment of any required fees, duties, taxes, tariffs, levies or other charges necessary to import the Products into Purchaser's country. Powell shall not be liable if any export authorization or Import Approval is delayed, denied, revoked, restricted or not renewed, and Purchaser shall not be relieved thereby of its obligations to pay Powell for the Products.

Purchaser shall not make any disposition of any Products purchased hereunder, by way of transshipment, reexport, diversion or otherwise, other than in and to the ultimate end user and country of destination specified on Purchaser's order or declared as the ultimate end user and country of ultimate destination on Powell's invoices, except as the Export Laws or Export Approval may expressly permit. Purchaser shall not distribute or resell any Product to or within any country or to any individual, government authority or other entity that is presently or at any time in the future subject to sanctions of the United States government, or is in violation of any Export Laws or other United States federal laws, statutes, codes, Executive Orders, decrees, rules or regulations relating to terrorism, drug trafficking or money laundering, or is designated under any such authority as being subject to sanctions or connected in any way to terrorism, drug trafficking or money laundering, including, without limitation, on the Specially Designated Nationals List and Block Persons List maintained by the Office of Foreign Assets Control (OFAC), United States Department of the Treasury, and the Denied Persons List, the Entity List and the Unverified List maintained by the Bureau of Industry and Security, United States Department of Commerce.

Purchaser shall indemnify and hold harmless Powell from and against any damages, liabilities or expenses of any kind incurred by Powell as a result of Purchaser's direct or indirect breach of any term or condition related to the Export Laws.

19. SAFETY: Purchaser warrants that it will comply with all laws, regulations, standards and requirements which are applicable to the use of the Products and Purchaser's business.

20. CONFIDENTIALITY: Purchaser will not disclose or otherwise disseminate, directly or indirectly, any of the terms of these Terms and Conditions or any other information of Powell given to or received by Purchaser or its associates or agents, unless Purchaser received Powell's written permission or such information is required to be disclosed by law or becomes part of the public domain through no fault of Purchaser, its associates or agents.

21. GOVERNING LAW; JURISDICTION AND VENUE: These Terms and Conditions shall be governed by and construed in accordance with the internal laws of the State of Ohio, without regard to such state's choice of law principles. These Terms and Conditions shall not be governed by or construed in accordance with the United Nations Convention on the International Sale of Goods, 1980, for any purpose. Customer and Powell hereby submit to the jurisdiction and venue of the state and federal courts in Cincinnati, Hamilton County, Ohio over any controversy relating to or arising from these Terms and Conditions. Notwithstanding the foregoing, Powell's right to institute or defend any proceedings in any jurisdiction, in or out of the United State of America, shall not be limited.

22. SEVERABILITY: If any of the provisions of these Terms and Conditions are deemed invalid, illegal or unenforceable, the validity, legality and enforceability of the remaining provisions will in no way be affected or impaired thereby.

23. FORCE MAJEURE: Delivery of all or any part of the Products is contingent upon Powell's ability to obtain supplies, raw materials and services through its regular and usual sources of supply. If by reason of any contingency beyond Powell's reasonable control, including (but not limited to) war, governmental requests, restrictions or regulations, fire, flood, casualty, accident, or other acts of God, strikes or other difficulties with employees, delay or inability to obtain labor, equipment, material and services through Powell's usual sources, failure or refusal of any carrier to transport materials, delay in transport thereof, or any other similar occurrence, Powell is not able to meet anticipated deliveries, Powell shall not be liable therefore and may, in its discretion without prior notice to Purchaser, postpone the delivery date(s) under this document for a time which is reasonable under all the circumstances. If during the occurrence of any of the foregoing contingencies, Powell holds any of the Products, Powell may invoice and hold the same for the account of Purchaser and Purchaser agrees to make payment at the maturity of the invoice so rendered.

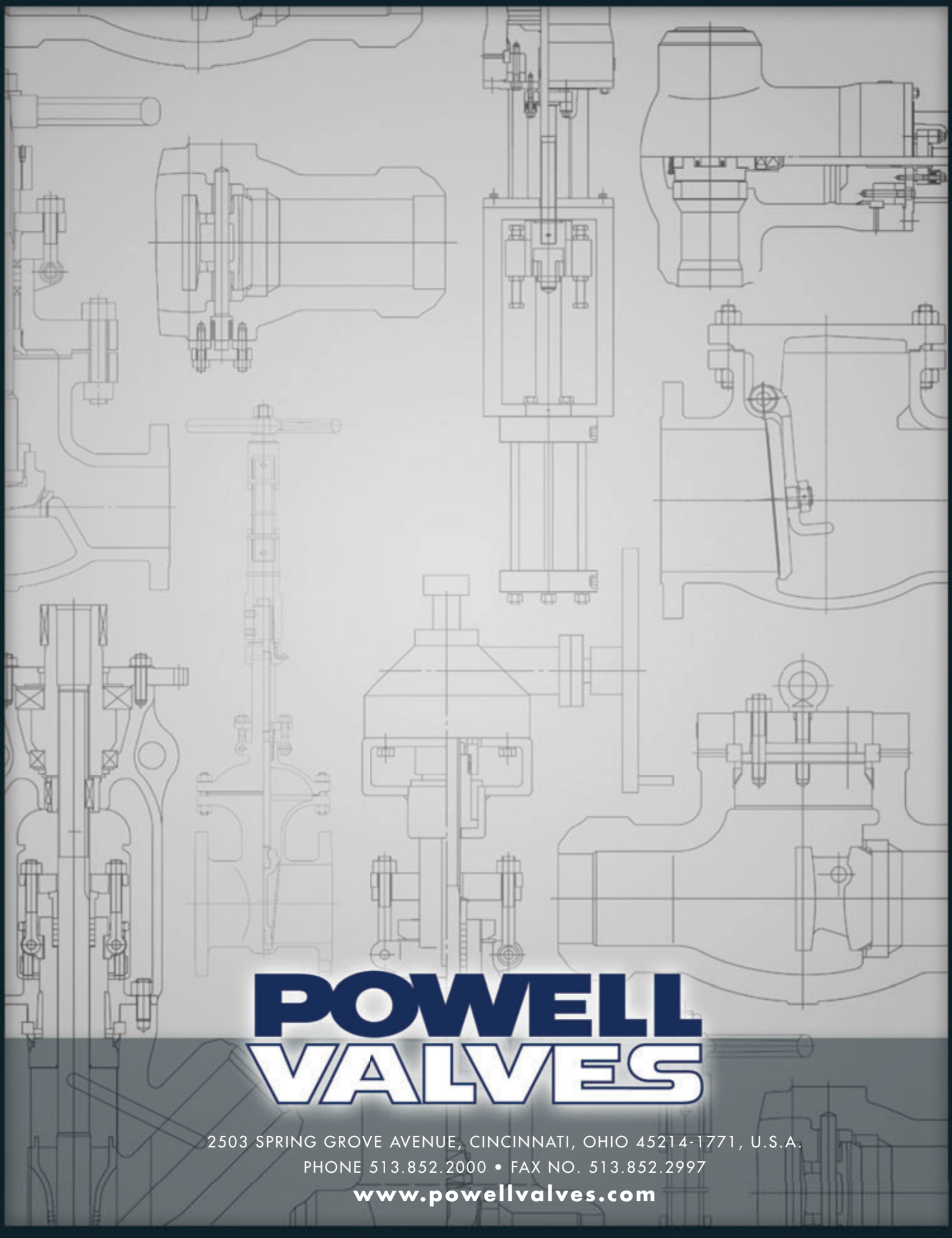
24. ASSIGNMENT: No right or interest in the contract arising from these Terms and Conditions shall be assigned by Purchaser and no delegation of any obligation owed by Purchaser shall be made without the prior written permission of Powell. As used herein, "Purchaser" and "Powell" include the respective heirs, executors, personal representatives, successors and permitted assigns of each.

25. REMEDIES CUMULATIVE; NO WAIVER: The individual rights and remedies of Powell reserved herein shall be cumulative and additional to any other or further remedies provided in law or equity or in this document. Waiver by Powell of performance or breach of any provision hereof by Purchaser, or failure of Powell to enforce any provision hereof which may establish a defense or limitation of liability, shall not be deemed a waiver of future compliance therewith or a course of performance modifying such provision, and such provision shall remain in full force and effect as written.

26. LIMITATION OF LIABILITY: UNDER NO CIRCUMSTANCES SHALL POWELL BE LIABLE TO PURCHASER UNDER OR IN CONNECTION WITH ORDERS FOR PRODUCTS AND THESE TERMS AND CONDITIONS, WHETHER ANY CLAIM FOR RECOVERY IS BASED UPON OR ARISES OUT OF THEORIES OF BREACH OF CONTRACT, BREACH OF WARRANTY, INDEMNIFICATION, NEGLIGENCE, TORT (INCLUDING STRICT LIABILITY) OR OTHERWISE, IN EXCESS OF AN AMOUNT EQUAL TO THE NET CONTRACT VALUE OF THE PRODUCTS PROVIDED BY POWELL TO PURCHASER DURING THE MOST RECENTLY ENDED CALENDAR QUARTER.

POWELL VALVES

Established 1846



POWELL VALVES

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