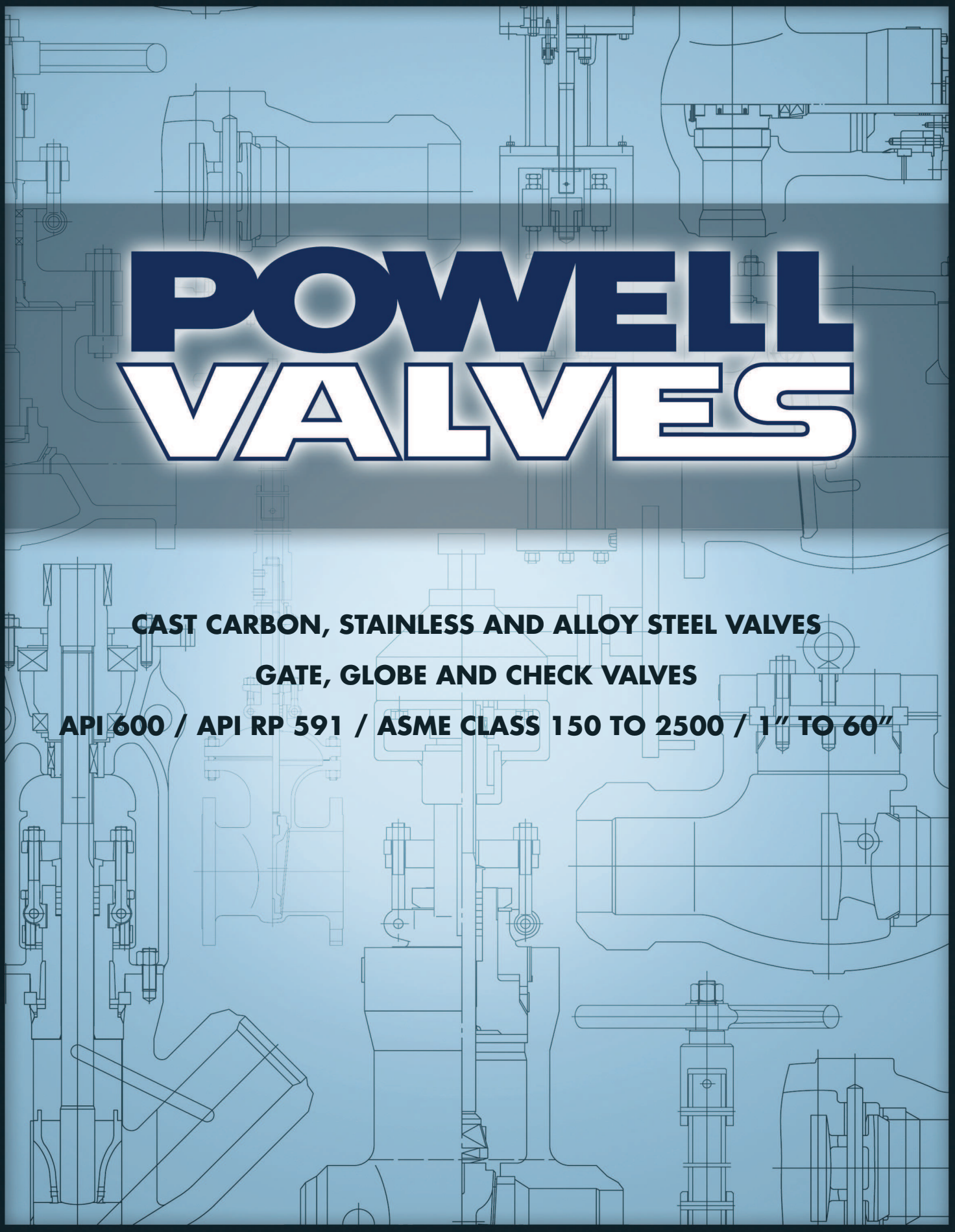

POWELL VALVES

CAST CARBON, STAINLESS AND ALLOY STEEL VALVES

GATE, GLOBE AND CHECK VALVES

API 600 / API RP 591 / ASME CLASS 150 TO 2500 / 1″ TO 60″

Catalog: POW-CS-12-r1

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The Wm. Powell Company - Profile

The Wm. Powell Company is very proud of our achievements and our evolution in the past 165 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 $35,000,000 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.

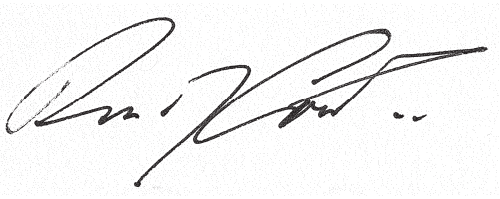
Powell also used its valve knowledge and expertise to construct a modification facility in the U.S.A. to assist customers with their needs, such as, automation, trim changes, end connection changes, additional quality inspections and special service pressure testing requirements, field service, etc…

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,

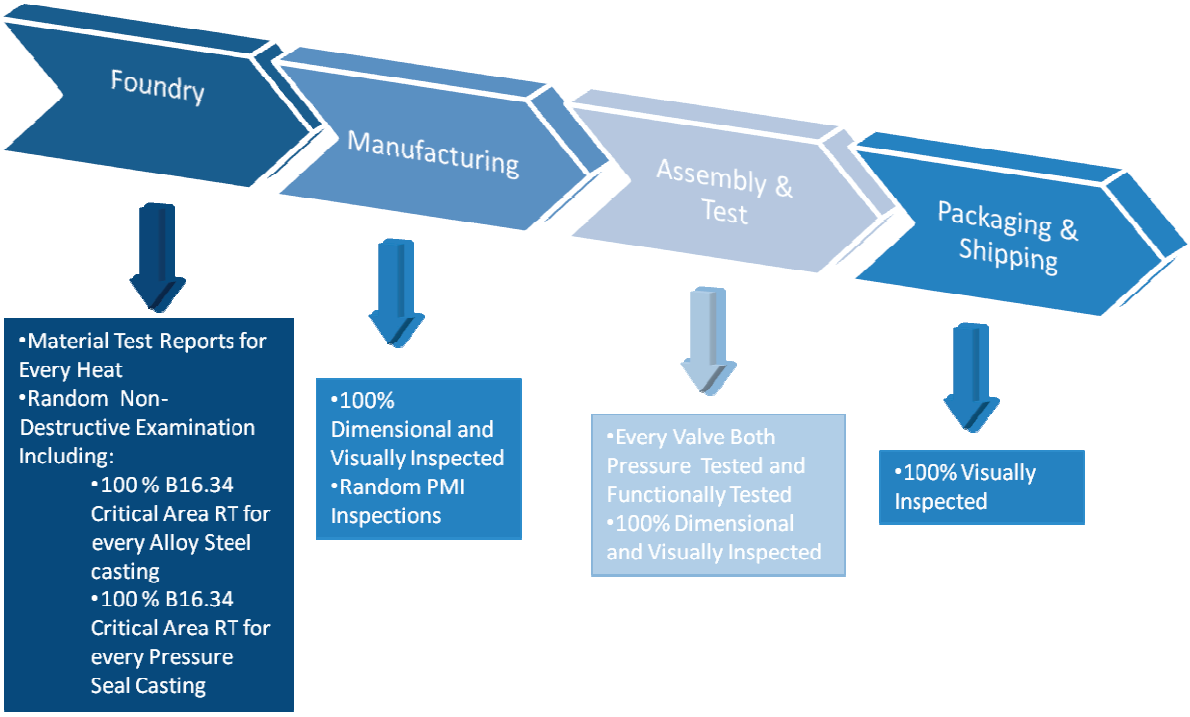


Randy Cowart

President, CEO & Chairman

The Wm. Powell Company

Powell's Standard Material Inspection Flow



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	⅛”
0.2	¼"
0.4	⅜”
0.5	½"
0.8	¾"
1.0	1”
1.2	1¼”
1.5	1½”
2.0	2”
2.5	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 (304)
B	A351 CF3 (304L)
M	A351 CF8M (316)
N	A351 CF3M (316L)
P	A351 CG8M (317)
Q	A351 CG3M (317L)
R	A351 CF8C (347)
Z	Special Material

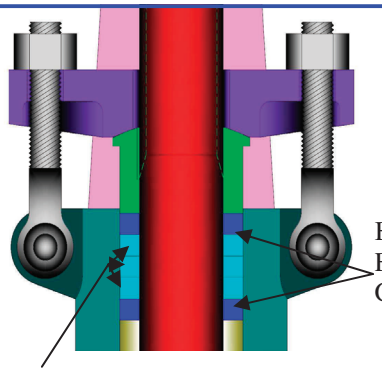
Trim	
Code	Option
0	API Trim 10
1	API Trim 1
2	API Trim 12
3	API Trim 13
5	API Trim 5
6	API Trim 16
7	API Trim 17
8	API Trim 8
9	API Trim 9
A	Integral half HF
B	Integral full HF
C	Integral
D	API Trim 11
E	API Trim 2
N	API Trim 8 NACE
Z	Special Trim

Packing/Gasket	
Code	Option
G	Std Graphite
T	Std PTFE
X	None
Z	Special Packing or Gasket
M	Packing PTFE, 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, Single Valve Bypass
GCA	Gear, Locking Device
GB1	Gear, Postion Ind.
PLL	Live Load
PLR	Lantern Ring
FRT	Radiography
HLD	Locking Device
CNX	Oxygen Clean Non-Ext

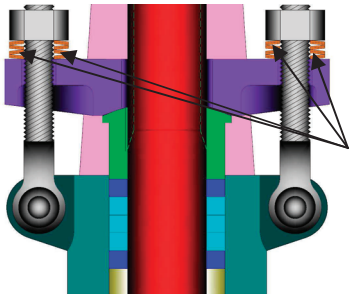
Examples:

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, PTFE
8.0 6003JD5GGXX	8" Figure 6003 Sch. 80, WC6, trim 5, graphite, gear operator



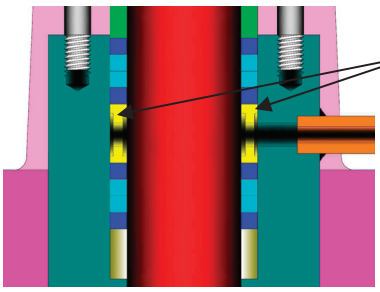
STANDARD PACKING ARRANGEMENT

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



LIVE LOAD OPTION

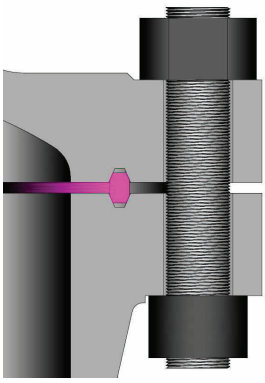
Live load design with standard packing. Live load washers help maintain packing load to reduce frequency of packing adjustment.



LANTERN RING OPTION

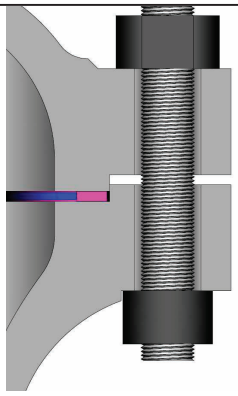
Lantern ring design and other special packing arrangements available. The lantern ring arrangement consists of two packing sets with lantern spacer between the sets. The bonnet connection at the lantern ring location allows monitoring of leakage past packing set.

BODY/BONNET GASKETS



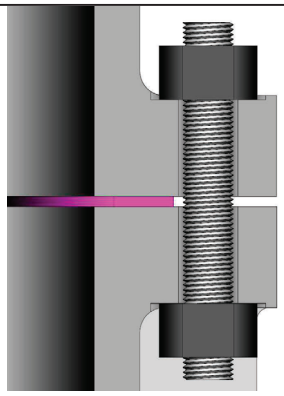
RING JOINT

ASME B16.20 ring joint gasket with material at least equal to body.
Standard gasket arrangement for class 900-1500 valves.
Optionally available on most other valves.



SPIRAL WOUND

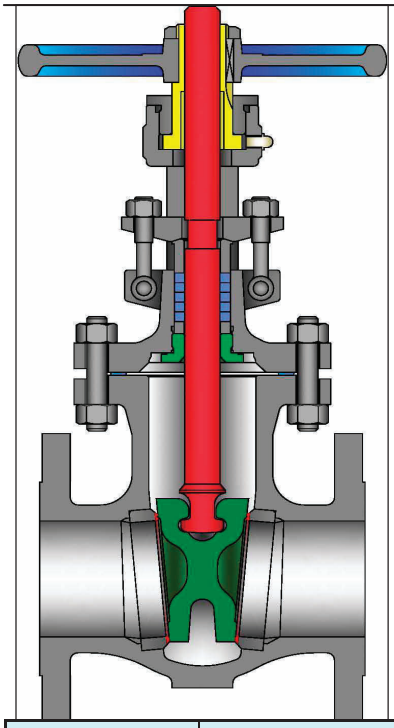
Stainless steel spiral wound gasket with graphite fill and gauge ring for controlled compression.
Standard gasket arrangement for class 300-600 valves.



SHEET

Corrugated 316 stainless steel totally encapsulated with graphite.
Standard gasket arrangement for class 150 valves.

API 600 GATE VALVES
BOLTED BONNET, ASME CLASSES 150 TO 1500
CAST CARBON, STAINLESS STEEL OR ALLOY STEEL



Class	Fig. No.
150	1503
300	3003
600	6003
900	9003
1500	1303

STANDARD MATERIALS (Other materials available)

PART	MATERIALS			
Body	A216 Gr. WCB (STANDARD)	A217 Gr. WC6	A217 Gr. WC9	A351 Gr. CF8M (1)
Bonnet / Yoke arm	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9	A351 Gr. CF8M
Wedge	A217 Gr CA15 or WCB + 13% CR Faced	WC6 + Stellite 6 Faced	WC9 + Stellite 6 Faced	A351 Gr. CF8M
Seat Ring	Carbon Steel + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced	SST 316
Stem	SST 410			SST 316
Stem Bushing	A 439 Ductile NI-Resist Gr. D2			
Stem Bushing Lock Nut	Steel			SST 316
Gland Flange	Carbon Steel			Series 300 SST
Eye Bolt	A193 Gr. B7			A193 Gr. B8
Eye Bolt Nut	A194 Gr. 2H			A194 Gr.8
Groove Pin	Steel			Series 300
Gland	SST 410			SST 316
Packing	Graphite			PTFE
Packing Washer / Packing Spacer	SST 410			SST 316
Gasket	Class 150: Corrugated SST Encapsulated w/ Graphite Class 300 to 600: Spiral Wound SST with Graphite Class 900-1500: RTJ			Class 150: PTFE Class 300-600: Spiral Wound SST with PTFE
Back Seat	SST 410			SST 316
Hand Wheel	Malleable Iron or Steel			
Hand Wheel Nut	Malleable Iron or Steel			
Key	Steel			
Lubricant Fitting	Steel			
Body / Bonnet Stud	A193 Gr. B7	A193 Gr. B16		A193 Gr. B8
Body / Bonnet Nut	A194 Gr. 2H	A194 Gr. 7		A194 Gr.8
Bearing Cap	Carbon Steel			Series 300 SST
Cap Screws	Steel			
Identification Plate	Series 300 SST			

(1) Weld end valve body A351 Gr. CF3M

NOTE: See page 52 for flow, safety and maintenance information.

Design Specifications

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

DESIGN FEATURES:

- **Flexible Wedge** for improved seating and ease of operation, especially in high temperature service. Wedges are accurately guided thru the entire stroke.
- **Standard trim** is API trim 8 for carbon steel valves, API trim 5 for chrome alloy valves, and API trim 10 for CF8M (T316) valves for optimal performance under normal conditions. Other trim materials 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.
- **Bonnet and 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.
- **End Flanges** have the following raised faces per ASME B16.5:
  Classes 150-300: 1/16" (2mm).
  Classes 600-1500: 1/4" (7mm).
- **Weld** ends are available per ASME B16.25 or per customer's specification.
- **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.
- **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 150—1500).

SIZE	ASME 150						ASME 300					ASME 600				
in	A		B(1)	C(1)	D	E	A	B(1)	C(1)	D	E	A	B(1)	C(1)	D	E
mm	FE	WE					WE/FE					WE/FE				
1	5.00	5.00	8.6	9.8	1.00	4	6.50	8.6	9.8	1.00	4	-	-	-	-	-
25	127	127	217	248	25	114	165	217	248	25	114	-	-	-	-	-
1 ½	6.50	6.50	10.7	12.4	1.50	6	7.50	10.7	12.4	1.50	6	-	-	-	-	-
40	165	165	271	314	38	152	190	271	314	38	152	-	-	-	-	-
2	7.00	8.50	12.3	14.6	2.00	7	8.50	12.3	14.6	2.00	7	11.50	13.5	15.7	2.00	8
50	178	216	313	372	51	178	216	313	372	51	178	292	342	400	51	203
2 ½	7.50	9.50	12.8	15.6	2.50	7	9.50	12.8	15.6	2.50	7	13.00	18.1	21.9	2.50	12
65	190	241	324	395	64	178	241	324	395	64	178	330	461	555	64	305
3	8.00	11.12	14.8	18.1	3.00	9	11.12	15.9	19.3	3.00	9	14.00	19.2	22.8	3.00	12
80	203	282	375	459	76	230	282	405	490	76	230	356	487	580	76	305
4	9.00	12.00	17.7	22.1	4.00	10	12.00	19.0	23.3	4.00	10	17.00	23.0	27.5	4.00	14
100	229	305	450	561	102	254	305	482	593	102	254	432	585	698	102	356
5	10.00	15.00	24.4	31.1	5.00	12	15.00	26.5	33.1	5.00	14	-	-	-	-	-
125	254	381	620	789	127	305	381	674	842	127	356	-	-	-	-	-
6	10.50	15.88	24.4	31.1	6.00	12	15.88	26.5	33.1	6.00	14	22.00	32.5	39.1	6.00	20
150	267	403	620	789	152	305	403	674	842	152	356	559	825	993	152	508
8	11.50	16.50	30.7	39.2	8.00	14	16.50	32.8	41.4	8.00	16	26.00	35.0	45.4	7.87	22
200	292	419	780	996	203	356	419	833	1051	203	406	660	890	1154	200	560
10	13.00	18.00	36.4	47.2	10.00	16	18.00	39.4	50.3	10.00	20	31.00	41.9	52.4	9.75	24
250	330	457	925	1198	254	406	457	1002	1277	254	508	787	1065	1332	248	610
12	14.00	19.75	42.7	55.6	12.00	20	19.75	44.8	57.7	12.00	20	33.00	47.3	59.9	11.75	28
300	356	502	1084	1412	305	508	502	1139	1466	305	508	838	1202	1521	298	710
14	15.00	22.50	47.5	61.5	13.25	20	30.00	49.1	63.4	13.25	22	35.00	67.4 (1)		12.87	28
350	381	572	1207	1562	337	508	762	1248	1611	337	560	889	1712		327	710
16	16.00	24.00	51.7	67.8	15.25	22	33.00	54.5	70.7	15.25	24	39.00	75.2 (1)		14.75	36
400	406	610	1313	1722	387	560	838	1384	1796	387	610	991	1910		375	915
18	17.00	26.00	58.1	76.4	17.25	24	36.00	79.2 (1)		17.00	28	43.00	81.1 (1)		16.50	36
450	432	660	1477	1940	438	610	914	2012		432	710	1092	2060		419	915
20	18.00	28.00	63.3	83.3	19.25	28	39.00	87.3 (1)		19.00	28	47.00	87.3 (1)		18.25	28
500	457	711	1615	2123	489	710	991	2217		483	710	1194	2217		464	710
24	20.00	32.00	76.7	101.1	23.25	28	45.00	102.9 (1)		23.00	36	55.00	104.3 (1)		22.00	32
600	508	813	1948	2568	591	710	1143	2614		584	915	1397	2649		559	810
30	24.00	36.00	91.9	123.0	29.25	24	55.00	130.0 (1)		29.00	24					
750	610	914	2334	3125	743	610	1397	3302		737	610					
36	28.00	40.00	107.4	143.1	34.50	24										
900	711	1016	2729	3635	876	610										
42	31.00	44.00	131.7	173.8	40.25	24										
1050	787	1118	3345	4415	1022	610										

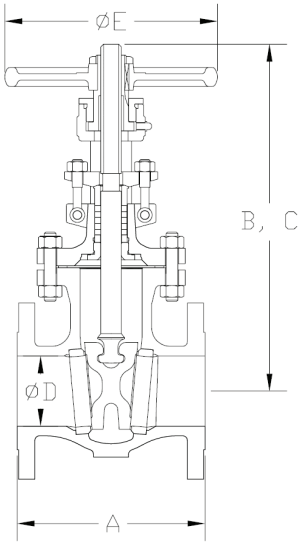
ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE UPON REQUEST.

SIZE	ASME 900					ASME 1500				
in	A	B(1)	C(1)	D	E	A	B(1)	C(1)	D	E
mm	WE/FE					WE/FE				
2	14.50	15.8	18.5	1.87	10	14.50	15.8	18.5	1.87	10
50	368	402	470	48	254	368	402	470	48	254
2 ½	16.50	18.7	22.1	2.25	12	16.50	18.7	22.1	2.25	12
65	419	475	561	57	305	419	475	561	57	305
3	15.00	19.5	23.1	2.87	14	18.50	20.4	24.1	2.75	16
80	381	495	588	73	350	470	518	613	70	400
4	18.00	21.4	25.8	3.87	14	21.50	22.1	26.5	3.62	16
100	457	543	655	98	350	546	561	674	92	400
6	24.00	30.4	37.3	5.75	22	27.75	32.9	40.2	5.37	24
150	610	773	948	146	560	705	836	1021	136	610
8	29.00	34.7	43.4	7.50	24	32.75	48.0	56.5	7.00	26
200	737	882	1102	191	610	832	1219	1435	178	660
10	33.00	40.6	51.2	9.37	30	39.00	57.8	68.2	8.75	30
250	838	1030	1300	238	762	991	1467	1734	224	762

(1) Gear operators standard for 18” and up class 300 and 14” and up class 600. Height is to top of actuator.

WE = Butt weld ends
FE = Flanged ends

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



API 600 GATE VALVES
BOLTED BONNET, ASME CLASSES 150 TO 1500
CAST CARBON, STAINLESS STEEL OR ALLOY STEEL

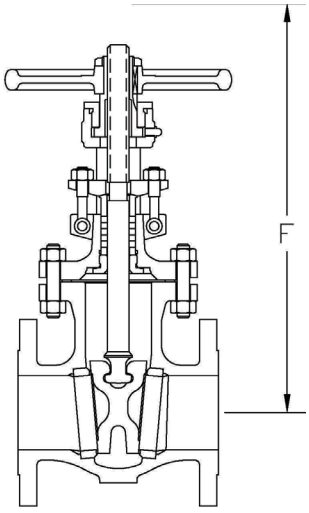
SIZE	ASME 150							ASME 300							ASME 600						
in / mm	F	in / mm	WT FE	lb / kg	WT WE	lb / kg	C_v	F	in / mm	WT FE	lb / kg	WT WE	lb / kg	C_v	F	in / mm	WT FE	lb / kg	WT WE	lb / kg	C_v
1	12.0		14		12		90	12.0		19		15		90	-		-		-		-
25	305		6		5			305		9		7			-		-		-		-
1 ½	15.5		25		22		190	15.5		34		25		190	-		-		-		-
40	390		11		10			390		15		11			-		-		-		-
2	19.0		35		33		240	19.0		42		33		240	20.0		77		57		240
50	475		16		15			475		19		15			505		35		26		
2 ½	19.5		49		44		390	19.5		55		44		390	26.0		148		126		390
65	500		22		20			500		25		20			655		67		57		
3	22.0		72		62		560	24.0		112		73		560	28.0		174		143		560
80	565		33		28			610		51		33			710		79		65		
4	26.5		112		97		1000	29.0		176		135		1000	33.5		315		251		1000
100	675		51		44			735		80		61			850		143		114		
5	36.0		142		-		1600	39.0		225		-		1600	-		-		-		-
125	915		64		-			990		102		-			-		-		-		-
6	36.0		203		190		2400	39.0		346		273		2400	46.5		677		573		2400
150	915		92		86			990		157		124			1185		307		260		
8	45.5		320		287		4500	48.5		540		430		4500	54.5		1096		942		4300
200	1155		145		130			1230		245		195			1380		497		427		
10	53.0		507		465		7000	58.5		838		692		7000	62.0		1574		1334		6700
250	1350		230		211			1480		380		314			1580		714		605		
12	63.0		721		662		10000	67.0		1162		955		10000	71.0		2000		1702		10000
300	1600		327		300			1705		527		433			1805		907		772		
14	70.5		988		966		13000	74.0		1555		1277		13000	76.0		2761		2373		12000
350	1795		448		438			1875		705		579			1935		1252		1076		
16	78.0		1191		1111		17000	82.0		1949		1663		17000	85.0		3616		3098		16000
400	1985		540		504			2080		884		754			2150		1640		1405		
18	85.0		1433		1299		23000	89.5		3790		2196		22000	91.5		4507		3861		21000
450	2150		650		589			2270		1720		996			2325		2044		1751		
20	95.0		1744		1678		28000	98.0		4230		2745		27000	100.0		4507		4279		25000
500	2415		791		761			2505		1918		1245			2520		2044		1941		
24	112.5		2580		2481		41000	116.0		6850		4500		40000	116.5		7949		7621		37000
600	2860		1170		1125			2945		3100		2040			2960		3605		3457		
30	133.5		5510		*		65000	132.5		7932		*		64000							
750	3395		2500		*			3365		3600		*									
36	155.5		7453		*		90000														
900	3950		3380		*																
42	192.0		11687		*		120000														
1050	4875		5300		*																

(*) Weld ends are available on request.

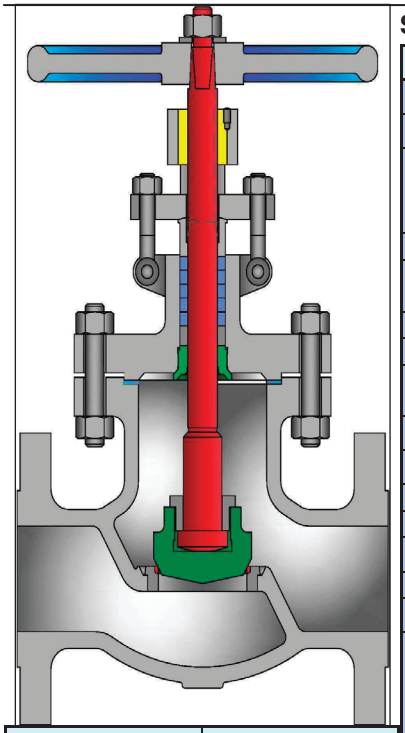
SIZE	ASME 900							ASME 1500						
in / mm	F	in / mm	WT FE	lb / kg	WT WE	lb / kg	C_v	F	in / mm	WT FE	lb / kg	WT WE	lb / kg	C_v
2	23.5		176		141		210	23.5		176		141		210
50	595		80		64			595		80		64		
2 ½	29.0		210		176		310	29.5		386		316		310
65	735		95		80			745		175		143		
3	29.0		210		176		510	29.5		387		316		470
80	735		95		80			745		175		143		
4	32.5		324		239		950	33.0		536		446		830
100	825		147		108			830		243		202		
6	46.0		794		644		2200	49.0		1365		1230		2000
150	1170		360		292			1235		619		558		
8	53.5		1320		1100		3900	57.0		2500		2200		3400
200	1355		599		499			1455		1134		998		
10	63.5		2340		2190		6200	69.0		5200		5000		5400
250	1615		1061		993			1745		2267		2313		

FE = Flanged Ends
WE = Weld Ends

WT = Weight
F = Dismantling Dimension
C_V = Flow Coefficient



API 600 WALL GLOBE VALVES
BOLTED BONNET, ASME CLASS 150 TO 1500
CAST CARBON, STAINLESS STEEL OR ALLOY STEEL



Class	Fig. No.
150	1531
300	3031
600	6031
900	9031
1500	1331

STANDARD MATERIALS (Other materials available)

PART	MATERIALS			
Body	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9	A351 Gr. CF8M (1)
Bonnet	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9	A351 Gr. CF8M
Disc	A105 or A216 WCB + 13% Cr Faced	A217 WC6 + Stellite 6 Faced	A217 WC9 + Stellite 6 Faced	SST 316
Disc Nut	SST 410			SST 316
Seat Ring	A105 or A216 WCB + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced	A351 Gr.CF8M
Stem	SST 410			SST 316
Stem Bushing	A 439 Ductile NI-Resist Gr. D2			
Stem Bushing Set Screw	Steel			Series 300 SST
Gland Flange	Carbon Steel			A351 Gr. CF8M
Eye Bolt	A193 Gr. B7			Series 300 SST
Eye Bolt Nut	A194 Gr. 2H			A194 Gr.8
Groove Pin	Steel			Series 300 SST
Gland	SST 410			SST 316
Packing	Graphite			PTFE
Packing Washer	SST 410			SST 316
Gasket	Class 150: Corrugated SST Encapsulated w/ Graphite Class 300 to 600: Spiral Wound SST with Graphite Class 900 to 1500: RTJ			Class 150: PTFE Class 300-600: Spiral Wound SST with PTFE
Back Seat	SST 410			SST 316
Hand Wheel	Malleable Iron or Steel			
Hand Wheel Nut	Malleable Iron or Steel			
Body / Bonnet Stud	A193 Gr. B7	A193 Gr. B16		A193 Gr. B8
Body / Bonnet Nut	A194 Gr. 2H	A194 Gr. 7		A194 Gr.8
Identification Plate	Series 300 SST			

(1) Weld end valve body A351 Gr. CF3M

DESIGN FEATURES:

- **Standard trim** is API trim 8 for carbon steel valves, API trim 5 for chrome alloy valves, and API trim 10 for CF8M (T316) valves for optimal performance under normal conditions. Other trim materials available on request.
- **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.
- **Stems** of hand wheel operated valves are rotating / rising design.
- **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.
- **End Flanges** have the following raised faces per ASME B16.5:
  Classes 150-300: 1/16" (2mm)
  Classes 600-1500: 1/4" (7mm)
- **Weld** ends are available per ASME B16.25 or per customer's specification.
- **Impactor** hand wheel design standard on the following sizes to assist seating.
  8" to 12" class 150
  6" to 12" class 300
  4" to 10" 600
  For larger sizes or pressure classes, gears are standard.
- **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

NOTE: See page 52 for flow, safety and maintenance information.

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 150—1500).

SIZE	ASME 150					ASME 300					ASME 600				
in	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
mm	WE/FE					WE/FE					WE/FE				
2	8.00	11.9	12.9	2.00	8	10.50	11.9	13.1	2.00	8	11.50	13.6	14.7	2.00	10
50	203	302	327	51	200	267	302	332	51	200	292	346	374	51	250
2 ½	8.50	14.9	16.4	2.50	8	11.50	12.9	14.5	2.50	10	13.00	16.4	17.6	2.50	12
65	216	378	416	64	200	292	328	369	64	250	330	416	448	64	300
3	9.50	14.1	15.4	3.00	10	12.50	14.1	15.4	3.00	12	14.00	17.2	18.7	3.00	14
80	241	357	390	76	250	318	357	390	76	300	356	438	475	76	350
4	11.50	16.5	18.0	4.00	12	14.00	16.7	18.0	4.00	14	17.00	20.2	21.7	4.00	18
100	292	419	457	102	300	356	423	458	102	350	432	514	552	102	450
6	16.00	17.6	19.7	6.00	14	17.50	21.0	23.2	6.00	18	22.00	25.7	27.9	6.00	20
150	406	446	499	152	350	444	534	589	152	450	559	653	709	152	500
8	19.50	20.1	22.6	8.00	18	22.00	23.9	26.3	8.00	18	26.00	29.1	31.6	7.87	22
200	495	511	574	203	450	559	606	669	203	450	660	739	803	200	560
10	24.50	29.5	33.6	10.00	18	24.50	29.7	35.1	10.00	22	31.00	32.7	38.9	9.75	28
250	622	750	853	254	450	622	753	892	254	560	787	830	988	248	710
12	27.50	31.9	36.7	12.00	20	28.00	34.2	41.2	12.00	26	33.00	47.8 (1)		11.75	28
300	698	810	932	305	500	711	868	1047	305	650	838	1215		298	710
14	31.00	42.5 (1)		13.25	24	33.00	45.9 (1)		13.25	24	35.00	51.2 (1)		12.87	32
350	787	1080		337	610	838	1165		337	610	889	1401		327	810
16	36.00	45.1 (1)		15.25	24	34.00	51.4 (1)		15.25	24	39.00	56.4 (1)		14.75	40
400	914	1146		387	610	864	1305		387	610	991	1630		375	1000
18	38.50	50.1 (1)		17.25	28	38.50	57.2 (1)		17.00	24	43.00	61.7 (1)		16.50	40
450	978	1450		438	710	978	1453		432	610	1092	1567		419	1000
20	38.50	55.9 (1)		19.25	28	40.00	62.2 (1)		19.00	40	47.00	67.3 (1)		18.25	40
500	978	1420		489	710	1016	1579		483	1000	1194	1710		464	1000
24	51.00	67.7 (1)		23.25	32	53.00	72.9 (1)		23.00	40	55.00	78.9 (1)		22.00	60
600	1295	1720		591	810	1346	1852		584	1000	1397	2004		559	1500

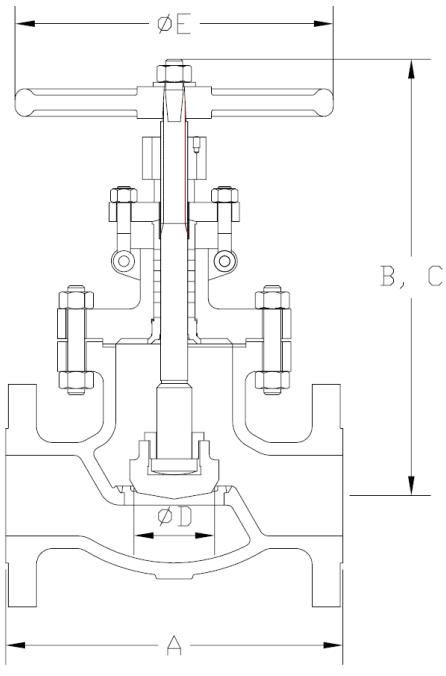
(1) Gear operators standard for 14” and up classes 150 and 300, 12” and up for class 600, 6” and up for classes 900 and 1500. Height is to top of actuator.

ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE UPON REQUEST.

SIZE	ASME 900					ASME 1500				
in	A	B	C	D	E	A	B	C	D	E
mm	WE/FE					WE/FE				
2	14.50	19.0	20.6	1.87	14	14.50	19.0	20.6	1.87	14
50	368	483	523	48	350	368	483	523	48	350
2 ½	16.50	19.0	20.6	2.25	14	16.50	19.0	20.6	2.25	16
65	419	483	523	57	350	419	483	523	57	400
3	15.00	23.8	25.5	2.87	18	18.50	27.9	28.9	2.75	18
80	381	605	648	73	450	470	702	735	70	450
4	18.00	26.0	28.2	3.87	18	21.50	28.0	30.2	3.62	18
100	457	661	716	98	450	546	712	767	92	450
6	24.00	33.6 (1)		5.75	24	27.75	39.2 (1)		5.37	28
150	610	853		146	610	705	996		136	710
8	29.00	43.5 (1)		7.50	28	32.75	47.1 (1)		7.00	32
200	737	1105		191	710	832	1196		178	810
10	33.00	52.4 (1)		9.37	32	39.00	56.2 (1)		8.75	32
250	838	1331		238	810	991	1427		224	810

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

WE = Butt weld ends
FE = Flanged ends



API 600 WALL GLOBE VALVES
BOLTED BONNET, ASME CLASS 150 TO 1500
CAST CARBON, STAINLESS STEEL OR ALLOY STEEL

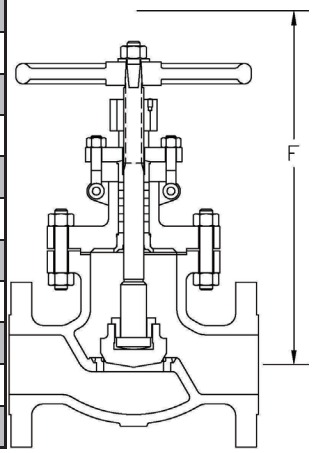
SIZE	ASME 150							ASME 300							ASME 600						
in / mm	F	in / mm	WT FE	lb / kg	WT WE	lb / kg	C_v	F	in / mm	WT FE	lb / kg	WT WE	lb / kg	C_v	F	in / mm	WT FE	lb / kg	WT WE	lb / kg	C_v
2	17.5		38		34		50	18.5		49		40		50	21.0		71		57		50
50	440		17		15			470		22		18			535		32		26		
2 ½	16.5		45		40		75	17.0		71		56		75	21.5		115		90		75
65	425		21		18			435		32		25			545		52		41		
3	20.5		77		66		110	21.5		104		84		110	24.0		148		121		110
80	520		35		30			545		47		38			610		67		55		
4	24.0		121		104		200	26.5		165		142		200	29.5		260		227		200
100	615		55		47			670		75		65			745		118		103		
6	28.5		205		175		480	31.5		280		232		480	38.0		585		584		480
150	720		93		79			795		127		105			960		265		265		
8	31.0		353		300		880	41.0		565		408		880	44.0		1010		904		850
200	785		160		136			1035		256		185			1115		458		410		
10	35.0		567		481		1370	43.0		830		672		1370	47.0		1450		1279		1300
250	895		257		218			1085		376		305			1190		658		580		
12	45.0		800		679		2050	50.5		1120		772		2050	56.5		2359		1920		2000
300	1145		363		308			1280		508		350			1435		1070		870		
14	47.0		1279		1080		2500	52.5		1786		1455		2500	60.0		4409		3629		2400
350	1200		580		490			1330		810		660			1530		2000		1646		
16	52.0		1742		1477		3300	56.0		2491		2028		3300	63.0		4982		4079		3100
400	1320		790		670			1420		1130		920			1605		2260		1850		
18	55.0		1874		1587		4400	64.5		3527		2866		4300	73.0		6812		5578		4000
450	1400		850		720			1640		1600		1300			1855		3090		2530		
20	60.0		1984		1676		5500	70.5		5710		3417		5300	79.5		8664		7099		4900
500	1525		900		760			1790		2590		1550			2015		3930		3220		
24	68.0		3307		2756		8000	82.0		10141		6107		7800	92.0		13161		10869		7200
600	1725		1500		1250			2080		4600		2770			2340		5970		4930		

SIZE	ASME 900							ASME 1500						
in / mm	F	in / mm	WT FE	lb / kg	WT WE	lb / kg	C_v	F	in / mm	WT FE	lb / kg	WT WE	lb / kg	C_v
2	23.5		185		150		40	23.5		201		154		40
50	595		84		68			595		91		70		
2 ½	24.5		254		198		60	27.5		331		232		60
65	625		115		90			695		150		105		
3	26.5		290		238		100	30.0		452		364		90
80	675		132		108			765		205		165		
4	31.5		487		397		190	34.0		597		465		160
100	805		221		180			865		271		211		
6	42.0		891		728		440	46.0		1111		882		380
150	1065		404		330			1175		504		400		
8	45.0		1592		1323		770	57.5		2668		2161		670
200	1145		722		600			1460		1210		980		
10	55.0		2646		2094		1200	62.0		4850		3858		1050
250	1390		1200		950			1580		2200		1750		

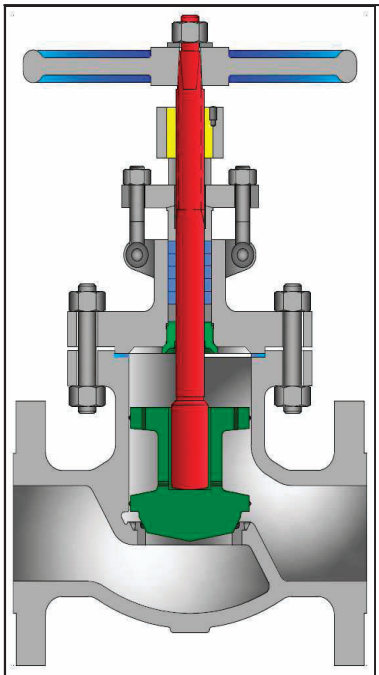
FE = Flanged ends
WE = Weld ends

F = Dismantling dimension

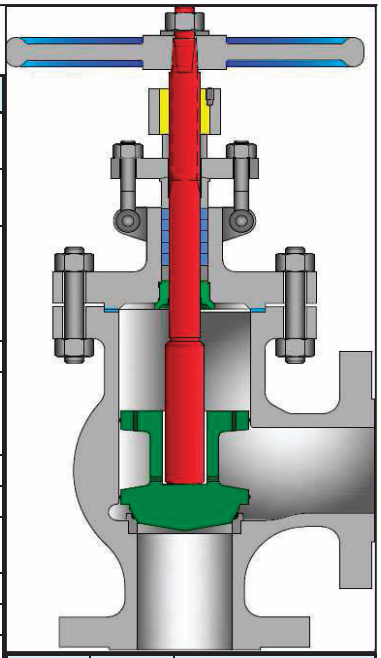
WT = Weight
C_V = Flow coefficient



API 600 WALL UPRIGHT AND ANGLE NON-RETURN VALVES
BOLTED BONNET, ASME CLASSES 300 AND 600
CAST CARBON OR ALLOY STEEL



Type	Class	Fig. No.
Globe	300	3084
	600	6084



Type	Class	Fig. No.
Angle	300	3086
	600	6086

STANDARD MATERIALS
(Other materials available)

PART	MATERIALS		
Body	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9
Bonnet	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9
Disc	A105 or A216 WCB + 13% Cr Faced (1)	A217 WC6 + Stellite 6 Faced	A217 WC9 + Stellite 6 Faced
Disc Nut	SST 410		
Seat Ring	Carbon Steel + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced
Stem	SST 410		
Stem Bushing	A 439 Ductile NI-Resist Gr. D2		
Stem Bushing Set Screw	Steel		
Gland Flange	Carbon Steel		
Eye Bolt	A193 Gr. B7		
Eye Bolt Nut	A194 Gr. 2H		
Groove Pin	Steel		
Gland	SST 410		
Packing	Graphite		
Packing Washer	SST 410		
Gasket	Spiral Wound SST with Graphite		
Back Seat	SST 410		
Hand Wheel	Malleable Iron or Steel		
Hand Wheel Nut	Malleable Iron or Steel		
Body / Bonnet Stud	A193 Gr. B7	A193 Gr. B16	
Body / Bonnet Nut	A194 Gr. 2H	A194 Gr. 7	
Identification Plate	Series 300 SST		

(1) Class 600 discs have stellite facing.

DESIGN FEATURES:

- **Standard trim** is API trim 8 for class 300 carbon steel valves and API trim 5 for all chrome alloy valves and class 600 carbon steel valves for optimal performance under normal conditions. Other trim materials available on request.
- **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.
- **Stems** of hand wheel operated valves are rotating / rising design.
- **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.
- **End Flanges** have the following raised faces per ASME B16.5:
  Class 300: 1/16" (2mm)
  Class 600: 1/4" (7mm)
- **Weld** ends are available per ASME B16.25 or per customer's specification.
- **Impactor** hand wheel design standard on the following sizes to assist seating.
  6" and larger class 300
  4" and larger class 600
- **NON-RETURN** valve discs are fully body guided for smooth operation; internal pressure equalization eliminates need for external equalizer pipe.
- **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

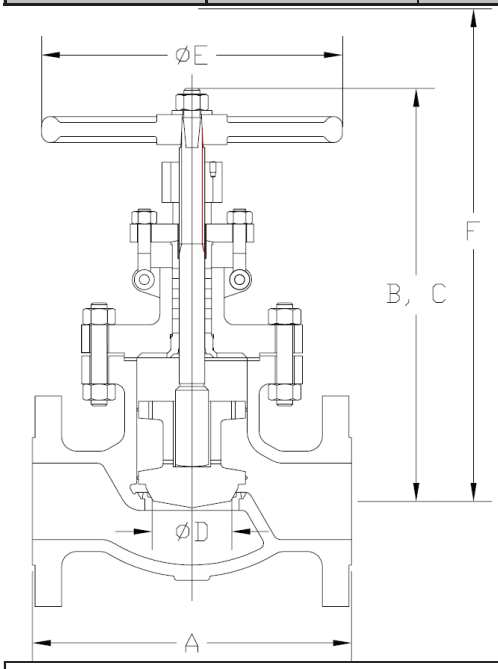
Design Specifications

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: See page 52 for flow, safety and maintenance information.

NON-RETURN VALVE DIMENSIONS (CLASS 300 AND 600).

SIZE	ASME 300					ASME 600				
in	A (1)	B	C	D	E	A (1)	B	C	D	E
mm	FE					FE				
4	14.00	16.7	18.0	4.00	14	17.00	20.2	21.7	4.00	18
100	356	423	458	102	356	432	514	552	102	450
6	17.50	21.0	23.2	6.00	18	22.00	25.7	27.9	6.00	24
150	445	534	589	152	450	559	653	709	152	610
8	22.00	23.9	26.3	8.00	22	26.00	29.1	31.6	7.87	28
200	559	606	669	203	560	660	739	803	200	710
10	24.50	29.7	35.1	10.00	24	31.00	32.7	38.9	9.75	28
250	622	753	892	254	610	787	830	988	248	710
12	28.00	34.2	41.2	12.00	28	33.00	47.8 (2)		11.75	32
300	711	868	1047	305	710	838	1215 (2)		298	800



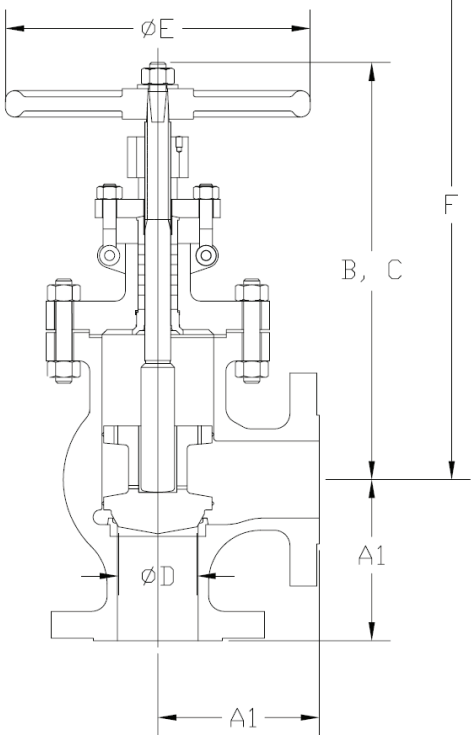
FE = Flanged ends

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

F = Dismantling Dimension

C_V = Flow coefficient

(1) The center to end length, A1, is half of the end to end length, A.
(2) Gear operators standard on 12" class 600 valves. Height is to top of actuator.
(3) NOTE: Weld ends are available upon request.

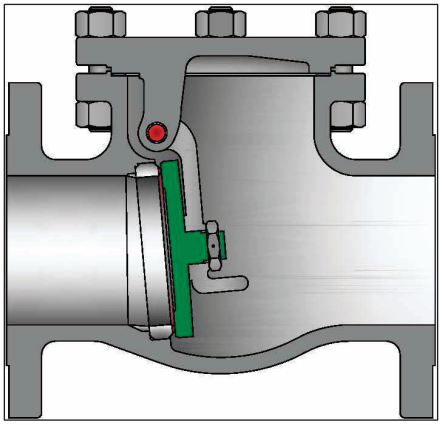


ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE UPON REQUEST.

NON–RETURN TECHNICAL INFORMATION (CLASS 300 AND 600)

SIZE	ASME 300										ASME 600									
	F				WT				C_V		F				WT				C_V	
in	Globe	in	Angle	in	Globe	lb	Angle	lb			Globe	in	Angle	in	Globe	lb	Angle	lb		
mm		mm		mm		kg		kg	Globe	Angle		mm		mm		kg		kg	Globe	Angle
4	21.0		23.0		170		165		200	300	25.0		27.0		280		255		200	300
100	535		580		77		75				630		685		127		116			
6	27.5		30.5		295		275		480	730	32.0		35.0		580		570		480	730
150	690		770		134		125				815		895		263		259			
8	30.5		34.5		580		540		880	1300	36.5		40.5		985		945		850	1300
200	770		880		263		245				925		1030		447		429			
10	34.0		39.5		875		810		1400	2100	41.0		46.5		1425		1390		1300	2000
250	870		1005		397		367				1045		1180		646		630			
12	40.0		46.0		1160		1090		2000	3100	47.0		51.5		1900		1860		2000	3000
300	1010		1165		526		494				1190		1300		862		844			

API 600 WALL SWING CHECK VALVES
BOLTED BONNET, ASME CLASSES 150 TO 1500
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL



Class	Figure Number
150	1561
300	3061
600	6061
900	9061
1500	1361

STANDARD MATERIALS (Other materials available)

PART	MATERIALS			
Body	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9	A351 Gr. CF8M (2)
Cap	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9	A351 Gr. CF8M
Disc	A105+13% CR Faced or WCB+13% CR Faced	WC6+Stellite 6 Faced	WC9+Stellite 6 Faced	A351 Gr. CF8M
Seat Ring	Carbon Steel + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced	316 SST
Gasket	Class 150: Corrugated SST Encapsulated w/ Graphite Class 300 to 600: Spiral Wound SST with Graphite Class 900-1500: RTJ			Class 150: PTFE Class 300-600: Spiral Wound SST with Graphite
Carrier	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9	A351 Gr. CF8M
Carrier Pin	SST 410			316 SST
Disc Nut	Series 300 SST			A193 Gr. B8M
Disc Carrier Hanger (1)	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9	A351 Gr. CF8M
Disc Carrier Hanger Bolts (1)	A193 Gr. B7	A193 Gr. B16		A193 Gr. B8M
Body / Cap Stud	A193 Gr. B7	A193 Gr. B16		A193 Gr. B8
Body / Cap Nut	A194 Gr. 2H	A194 Gr. 7		A194 Gr.8
Identification Plate	Series 300 SST			

(1) 8” Valve size and up. (2) CF3M used for weld end valves.

DESIGN FEATURES:

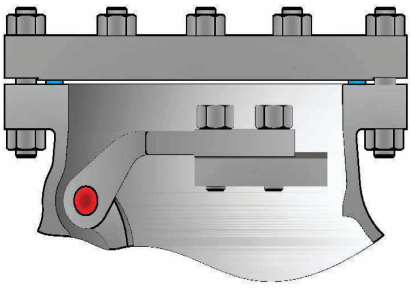
- **Standard trim** is API trim 8 for carbon steel valves, API trim 5 for chrome alloy valves, and API trim 10 for CF8M (T316) valves for optimal performance under normal conditions. Other trim materials available on request.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Wall** 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, on classes 150 through 600.
- **End Flanges** have the following raised faces per ASME B16.5:
  Classes 150-300: 1/16” (2mm).
  Classes 600-1500: 1/4” (7mm).

NOTE: See page 52 for flow, safety and maintenance information.

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

- **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



Valve design for valve sizes 8” and above all pressure classes.

SWING CHECK VALVE DIMENSIONS (CLASS 150—1500).

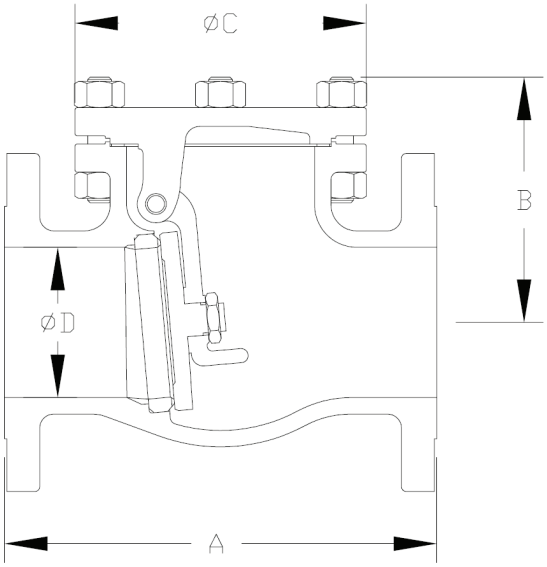
SIZE	ASME 150				ASME 300				ASME 600			
in	A	B	C	D	A	B	C	D	A	B	C	D
mm	WE/FE				WE/FE				WE/FE			
2	8.00	4.9	4.6	2.00	10.50	5.0	4.6	2.00	11.50	6.9	7.3	2.00
50	203	126	118	51	267	126	118	51	292	176	185	51
2 ½	8.50	5.6	6.8	2.50	11.50	5.6	6.8	2.50	13.00	7.4	7.9	2.50
65	216	142	172	64	292	142	172	64	330	189	200	64
3	9.50	5.9	7.7	3.00	12.50	5.9	7.7	3.00	14.00	8.3	8.5	3.00
80	241	149	195	76	318	149	195	76	356	212	215	76
4	11.50	6.5	9.1	4.00	14.00	6.5	9.1	4.00	17.00	10.3	10.6	4.00
100	292	166	230	101	356	166	230	102	432	262	270	102
6	14.00	8.2	10.8	6.00	17.50	8.6	11.8	6.00	22.00	14.0	13.5	6.00
150	356	208	273	152	444	219	298	152	559	356	342	152
8	19.50	11.9	15.1	8.00	21.00	13.3	15.6	8.00	26.00	18.5	17.1	7.87
200	495	302	384	203	533	338	397	203	660	469	435	200
10	24.50	14.2	17.8	10.00	24.50	15.3	18.5	10.00	31.00	21.2	20.1	9.75
250	622	360	450	254	622	389	470	254	787	539	510	248
12	27.50	15.7	21.6	12.00	28.00	17.9	22.3	12.00	33.00	23.4	22.6	11.75
300	698	399	549	305	711	455	565	305	838	594	575	298
14	31.00	22.2	20.9	13.25	33.00	23.4	21.7	13.25	35.00	25.4	23.5	12.87
350	787	565	532	337	838	595	550	337	889	645	598	327
16	34.00	23.6	25.3	15.25	34.00	24.9	27.4	15.25	39.00	28.6	27.6	14.75
400	864	599	642	387	864	632	695	387	991	727	700	375
18	38.50	27.9	29.6	17.25	38.50	28.5	30.4	17.00	43.00	32.5	29.1	16.50
450	978	709	752	438	978	723	772	432	1092	826	740	419
20	38.50	26.7	27.0	19.25	40.00	24.9	29.1	19.00	47.00	31.6	32.3	18.25
500	978	679	685	489	1016	632	738	483	1194	802	820	464
24	51.00	33.5	36.0	23.25	53.00	34.8	37.6	23.00	55.00	40.2	39.4	22.00
600	1295	852	915	591	1346	884	955	584	1397	1020	1000	559

SIZE	ASME 900				ASME 1500			
in	A	B	C	D	A	B	C	D
mm	WE/FE				WE/FE			
2	14.50	9.6	8.9	1.87	14.50	9.6	8.9	1.87
50	368	244	226	47	368	244	226	47
2 ½	16.50	10.2	9.2	2.25	16.50	10.3	9.2	2.25
65	419	260	235	57	419	260	235	57
3	15.00	10.6	10.2	2.87	18.50	12.6	10.4	2.75
80	381	268	258	73	470	319	265	70
4	18.00	12.9	11.6	3.87	21.50	15.8	15.4	3.62
100	457	328	295	98	546	400	390	92
6	24.00	17	15.8	5.75	27.75	18.4	17.2	5.37
150	610	433	400	146	705	468	435	136
8	29.00	23.6	17.5	7.50	32.75	23.8	20.3	7.00
200	737	600	445	191	832	604	515	178
10	33.00	24.4	22.6	9.37	39.00	25.6	22.4	8.75
250	838	620	575	238	991	650	570	222

B = Center to top

WE = Butt Weld ends
FE = Flanged ends

ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE UPON REQUEST.



API 600 WALL SWING CHECK VALVES
BOLTED BONNET, ASME CLASSES 150 TO 1500
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL

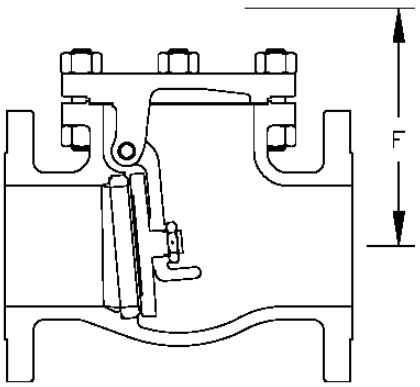
SIZE	ASME 150							ASME 300							ASME 600						
in / mm	F	in / mm	WT FE	lb kg	WT WE	lb kg	C_v	F	in / mm	WT FE	lb kg	WT WE	lb kg	C_v	F	in / mm	WT FE	lb kg	WT WE	lb kg	C_v
2	6.0		27		23		75	6.0		34		29		75	8.0		62		49		75
50	155		12		10			155		15		13			205		28		22		
2 ½	7.0		40		35		120	7.0		53		45		120	8.5		79		62		120
65	175		18		16			175		24		21			220		36		28		
3	7.5		53		41		170	7.5		68		58		170	10.0		110		79		170
80	190		24		19			190		31		27			250		50		36		
4	8.5		79		57		320	8.5		110		94		320	12.5		215		168		320
100	215		36		26			220		50		42			315		98		76		
6	11.0		132		113		760	11.5		212		182		760	17.0		439		335		760
150	285		60		51			295		96		82			435		199		152		
8	16.0		337		293		1400	17.5		507		437		1400	22.5		811		633		1300
200	405		153		133			440		230		198			570		368		287		
10	19.0		567		483		2200	20.5		858		728		2200	26.0		1343		1047		2100
250	490		257		219			515		389		330			665		609		475		
12	22.0		873		758		3300	24.0		1160		1077		3300	29.5		1702		1363		3100
300	555		396		344			610		526		488			745		772		618		
14	29.0		979		834		4000	30.0		1411		1241		4000	32.0		1958		1585		3700
350	735		444		378			765		640		563			810		888		719		
16	31.0		1438		1250		5200	32.5		1764		1550		5200	36.0		2994		2364		4900
400	795		652		567			825		800		703			915		1358		1072		
18	36.5		1927		1656		7000	37.0		2578		2192		6800	35.5		3449		2932		6400
450	930		874		751			940		1169		994			900		1564		1330		
20	36.5		1771		1522		8700	34.5		2913		2505		8500	36.5		4792		4121		7800
500	925		803		690			875		1321		1136			925		2174		1869		
24	45.0		3559		3062		13000	46.5		5204		4428		12000	45.0		7608		6467		11000
600	1150		1614		1388			1175		2360		2008			1145		3451		2933		

SIZE	ASME 900							ASME 1500						
in / mm	F	in / mm	WT FE	lb kg	WT WE	lb kg	C_v	F	in / mm	WT FE	lb kg	WT WE	lb kg	C_v
2	10.5		165		132		65	10.5		165		132		65
50	270		75		60			270		75		60		
2 ½	11.5		265		183		100	11.5		265		183		100
65	290		120		83			290		120		83		
3	12.0		209		154		160	14.0		375		271		150
80	305		95		70			355		170		123		
4	15.0		375		271		300	17.5		963		463		260
100	380		170		123			445		437		210		
6	20.0		716		518		700	21.0		1235		1036		600
150	505		325		235			535		560		470		
8	27.5		1257		877		1200	27.5		2271		1907		1100
200	700		570		398			695		1030		865		
10	29.0		1808		1437		1900	30.0		3483		2888		1700
250	740		820		652			760		1580		1310		

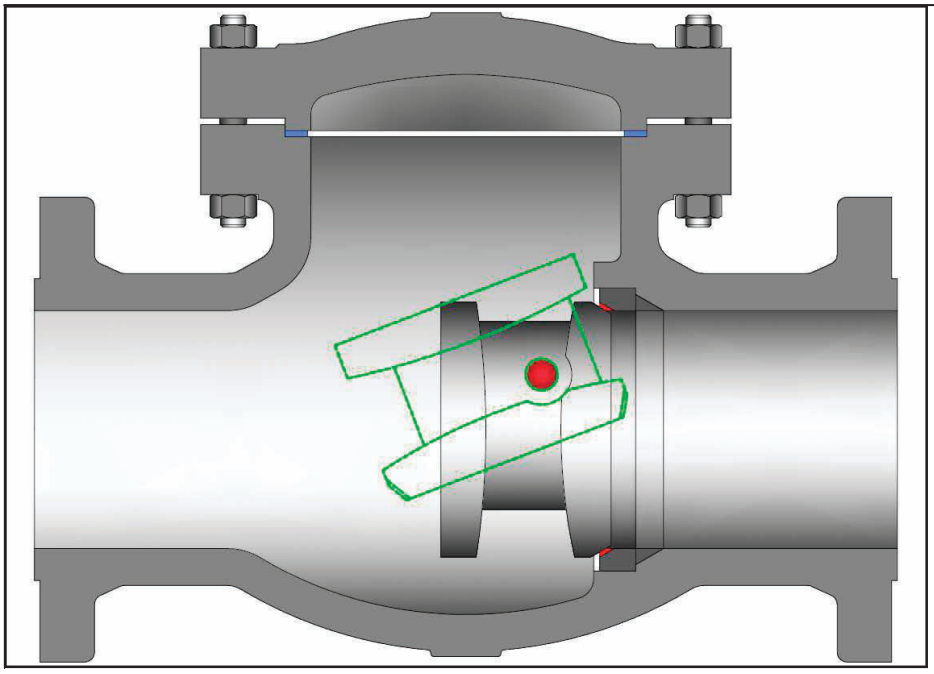
F = Dismantling dimension

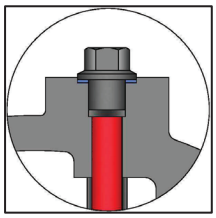
WE = Butt Weld ends
FE = Flanged ends

WT = Weight
C_V = Flow coefficient

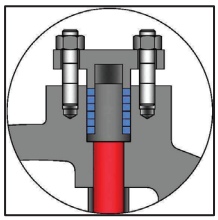


API 600 WALL TILTING DISC CHECK VALVES
BOLTED BONNET, ASME CLASSES 150 TO 1500
CAST CARBON OR ALLOY STEEL





(1) Side Plug Gasket Design



(2) Side Plug Packing Design

Class	Figure Number
150	1595
300	3095
600	6095
900	9095
1500	1395

NOTE: See page 52 for flow, safety and maintenance information.

DESIGN FEATURES:

- **Standard trim** is API trim 8 for carbon steel valves, API trim 5 for chrome alloy valves, and API trim 10 for CF8M (T316) valves for optimal performance under normal conditions. Other trim materials available on request.
- **Seat face:** Stellited, ground and lapped to a smooth finish.
- **Body and cap joint** accurately machined.
- **Flanges:**
  Classes 150-300: 1/16" raised face.
  Class 600 and up: 1/4" raised face.
  Finish 125-250 AARH for all valves.
- **Check** valves are suitable for service in horizontal line with cap vertical or in a vertical line with flow upward.

STANDARD MATERIALS (Other materials available)

PART	MATERIALS		
Body	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9
Cap	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9
Disc	A105 + 13% CR or A216 WCB + 13% CR Faced	WC6 + Stellite 6 Faced	WC9 + Stellite 6 Faced
Seat Ring	Carbon Steel + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced
Gasket	Class 150: Corrugated SST Encapsulated w/ Graphite		
	Class 300 to 600: Spiral Wound SST w/ Graphite		
	Class 900 to 1500: RTJ		
Pin	SST 410		
Bushing	SST 410		
Pin Plug (1)	SST 410		
Pin Plug Gasket (1)	Graphite coated SST		
Body / Cap Stud	A193 Gr. B7	A193 Gr. B16	
Body / Cap Nut	A194 Gr. 2H	A194 Gr. 7	
Gland Flange (2)	A216 WCB	A217 WC6	A217 WC9
Gland (2)	SST 410		
Packing (2)	Graphite		
Gland Flange Stud (2)	A193 Gr. B7	A193 Gr. B16	
Gland Flange Nut (2)	A194 Gr. 2H	A194 Gr. 7	
Identification Plate	Series 300 SST		

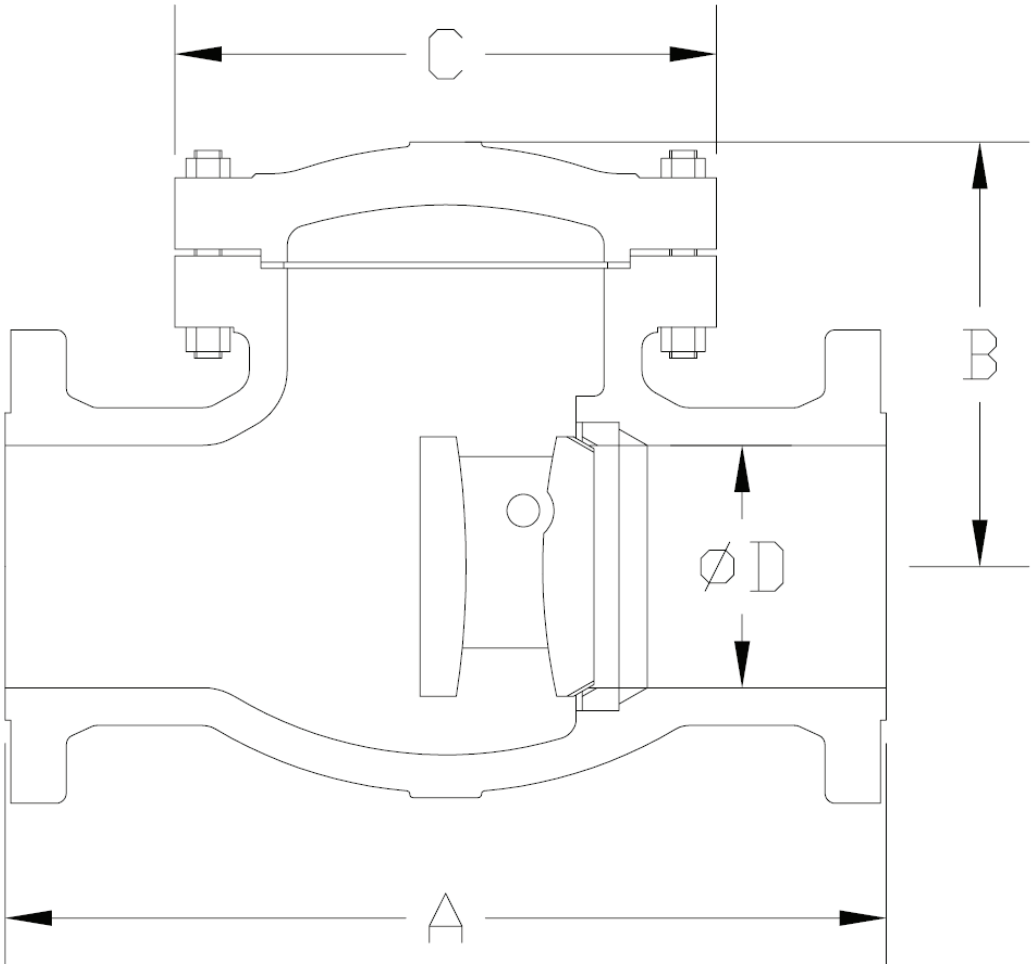
Design Specifications

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 150—600).

SIZE	ASME 150				ASME 300				ASME 600			
in	A	B	C	D	A	B	C	D	A	B	C	D
mm	WE/FE				WE/FE				WE/FE			
2 ½	8.50	6.3	7.1	2.50	11.50	7.5	8.1	2.50	13.00	9.5	8.0	2.50
65	216	160	180	64	292	190	205	64	330	242	203	64
3	9.50	6.8	7.7	3.00	12.50	9.1	6.7	3.00	14.00	9.9	8.9	3.00
80	241	172	195	76	318	231	170	76	356	252	225	76
4	11.50	7.6	8.9	4.00	14.00	10.6	9.5	4.00	17.00	10.6	9.7	4.00
100	292	193	225	102	356	268	240	102	432	269	245	102
6	14.00	10.9	11.0	6.00	17.50	12.8	11.6	6.00	22.00	12.8	12.9	6.00
150	356	277	280	152	444	325	295	152	559	324	328	152
8	19.50	12.7	14.4	8.00	21.00	15.5	14.8	8.00	26.00	15.1	15.8	7.88
200	495	324	365	203	533	394	375	203	660	384	402	200
10	24.50	13.2	19.9	10.00	24.50	17.4	18.3	10.00	31.00	19.3	19.5	9.75
250	622	336	506	254	622	442	465	254	787	490	495	248
12	27.50	18.6	20.3	12.00	28.00	20.3	21.5	12.00	33.00	21.1	21.6	11.75
300	698	472	515	305	711	516	545	305	838	537	549	298
14	31.00	19.1	22.1	13.25	33.00	20.6	22.8	13.25	35.00	23.7	24.4	12.88
350	787	485	560	337	838	524	578	337	889	602	620	327
16	34.00	21.6	25.0	15.25	34.00	22.4	26.2	15.25	39.00	26.5	27.2	14.75
400	864	548	635	387	864	570	665	387	991	673	690	375
18	38.50	24.3	28.0	17.25	38.50	28.1	28.7	17.00				
450	978	617	710	438	978	713	730	432				
20	38.50	26.1	29.5	19.25	40.00	35.0	31.9	19.00				
500	978	674	750	489	1016	889	809	483				
24	51.00	27.3	33.9	23.25	53.00	42.8	37.5	23.00				
600	1295	694	860	591	1346	1082	953	584				

ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE UPON REQUEST.

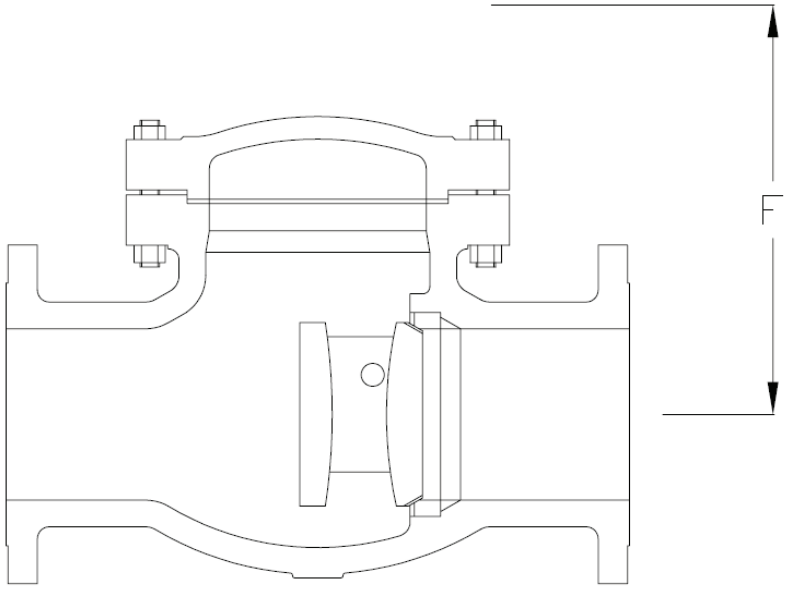


B = Center to top

WE = Butt Weld ends
FE = Flanged ends

API 600 TILTING DISC CHECK VALVES
BOLTED BONNET, ASME CLASSES 150 TO 1500
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL

SIZE	ASME 150							ASME 300							ASME 600						
in / mm	F	in / mm	WT FE	lb kg	WT WE	lb kg	C_v	F	in / mm	WT FE	lb kg	WT WE	lb kg	C_v	F	in / mm	WT FE	lb kg	WT WE	lb kg	C_v
2 ½	9.0		20		17		150	10.0		35		30		150	12.0		40		34		150
65	225		9		8			255		16		14			305		18		15		
3	10.0		29		25		200	12.0		46		40		200	13.0		51		43		200
80	250		13		11			305		21		18			330		23		20		
4	11.5		49		42		360	14.5		58		50		360	14.5		75		65		360
100	295		22		19			370		26		23			370		34		29		
6	17.0		92		80		790	19.0		138		120		790	19.0		185		159		790
150	430		42		36			475		63		54			475		84		72		
8	20.5		161		140		1400	23.5		240		208		1400	23.0		335		289		1400
200	530		73		64			600		109		94			585		152		131		
10	23.5		262		229		2100	27.5		385		334		2100	29.0		700		600		2100
250	590		119		104			695		175		152			740		318		272		
12	30.5		380		330		3000	32.5		520		450		3000	33.0		774		672		3000
300	780		172		150			820		236		204			835		351		305		
14	32.5		517		450		3700	34.0		750		650		3700	36.5		980		850		3500
350	825		235		204			860		340		295			930		445		386		
16	37.0		713		620		4900	38.0		1050		900		4900	41.5		1300		1124		4600
400	935		323		281			960		476		408			1050		590		510		
18	41.5		829		720		6200	45.0		1126		980		6200							
450	1055		376		327			1145		511		445									
20	45.5		938		815		7700	54.0		1422		1231		7700							
500	1165		426		370			1375		645		558									
24	50.5		1325		1152		11000	66.0		2004		1735		11000							
600	1285		601		523			1670		909		787									



FE = Flanged ends
WE = Weld ends

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 an 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:

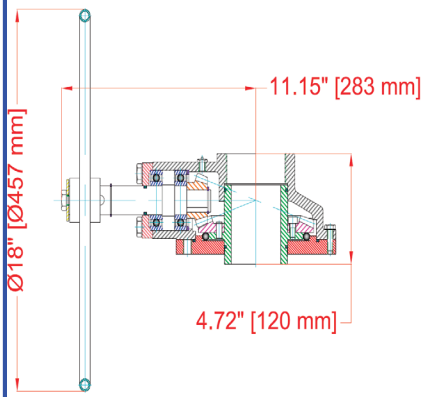
a. Remove the handwheel.
b. Remove bolts from the yoke, mount the adaptor, replace bolts and tighten.
c. Install the sleeve and key on stem bushing.
d. Mount gear operator on adaptor and bolt together.
e. Conversion is completed.

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

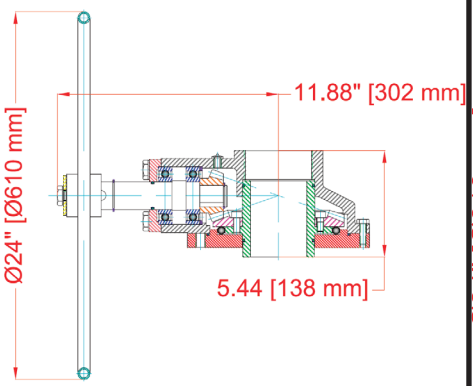
- Anti-friction bearings permits ease of operation.
- Housing protects gears from dirt, dust, and other foreign materials. Also good as a safety factor to protect operating personnel.
- Housing has provision for plug or pipe stem protector when required. Sealed housing retains the lubricant and protects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

MODEL AA-18 ACTUATOR



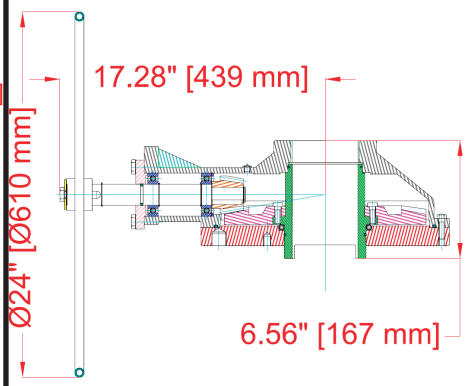
Max Torque: 996 ft-lb [1350 Nm]
Gear Ratio: 2.92:1

MODEL B-24 ACTUATOR



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

MODEL C-24 ACTUATOR

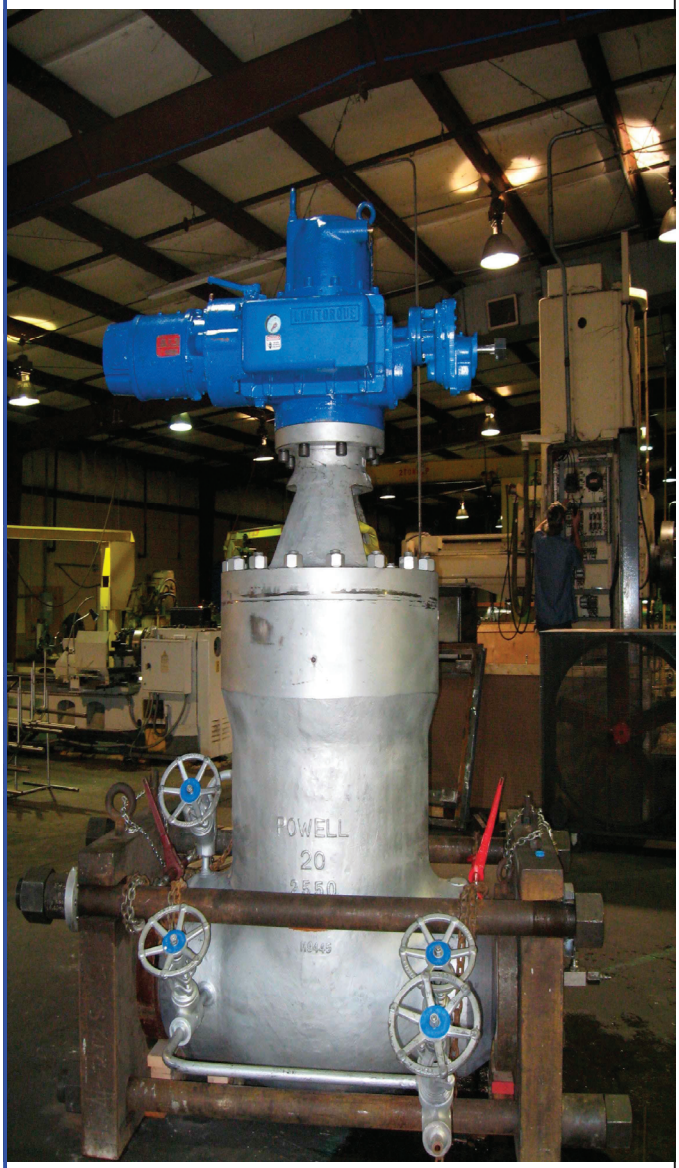


Max Torque: 3980 ft-lb [5400 Nm]
Gear Ratio: 6:1

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.

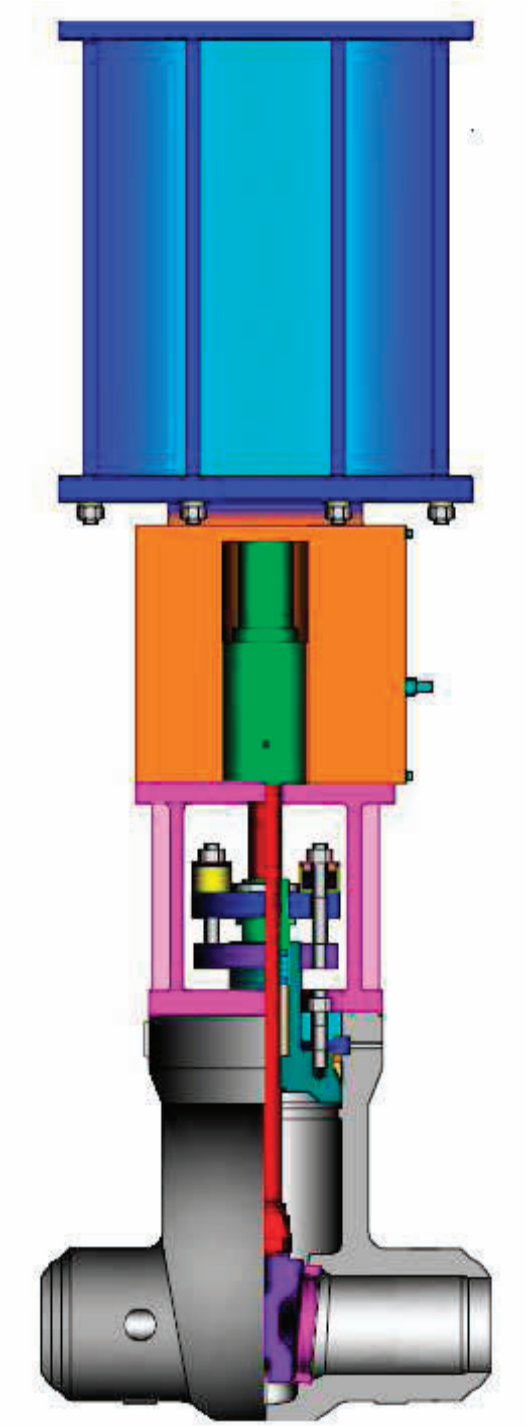
E. Opening or Closing Time Requirements. Unless specified - gate valve stem speed is 12" per minute (approx.) and globe valve stem speed is 4" per minute (approx.).

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 or 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.)

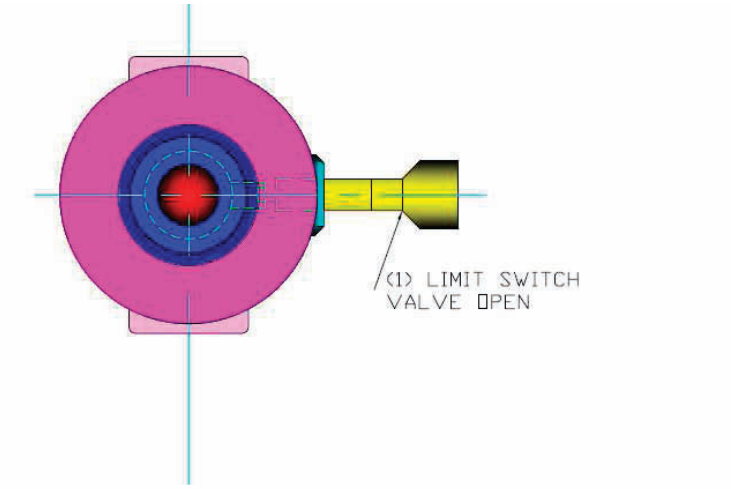
I. Environmental Temperature Range - Min./Max.

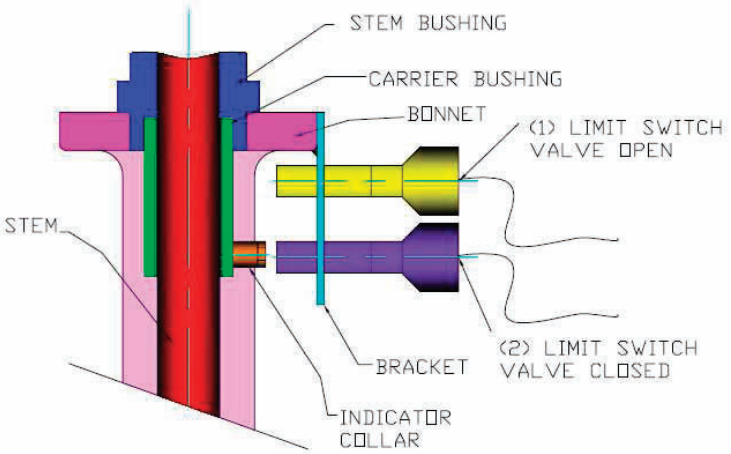
ACCESSORIES cont...

LIMIT SWITCH

Powell Valves can be equipped with Limit Switches to signal 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

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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 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 Flanged Fittings

(F) ASME B16.25 → Buttwelding Ends

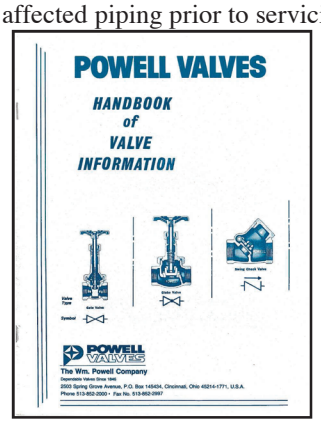
(G) MSS SP-25 → Standard Marking System for Valves, Fittings, Flanges and Unions

(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. °F	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. °F	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 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	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 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	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 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	775	1,160	1,930	3,220	5,795
1000	20	365	725	1090	1,820	3,030	5,450
1050	20(1)	360	720	1080	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 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	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 1000º 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, ºF	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, ºF	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	(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	U	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

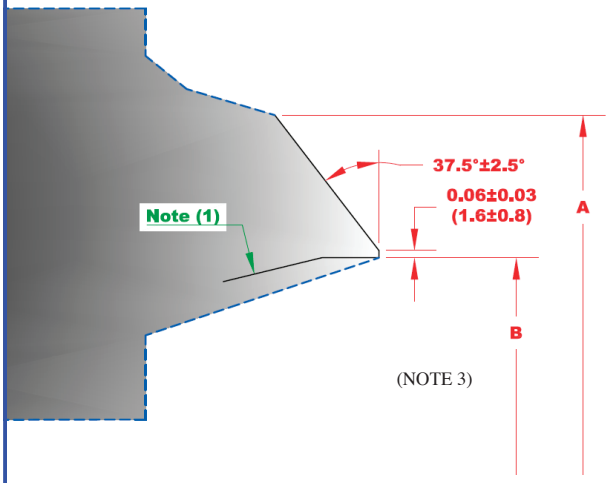
TABLE 11 (cont.)

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

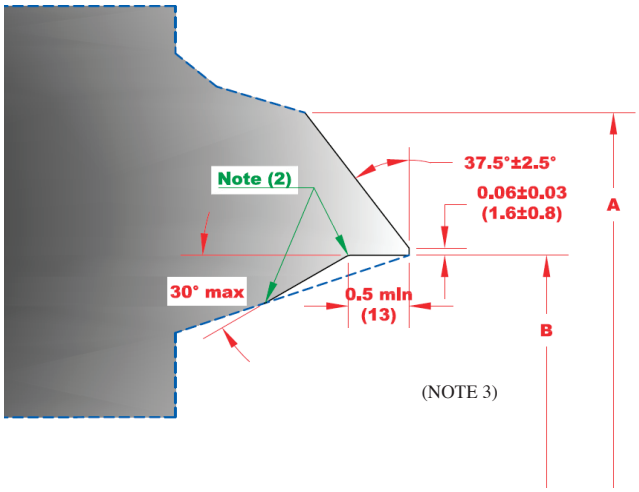
*SEE SKETCHES 1 AND 2

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

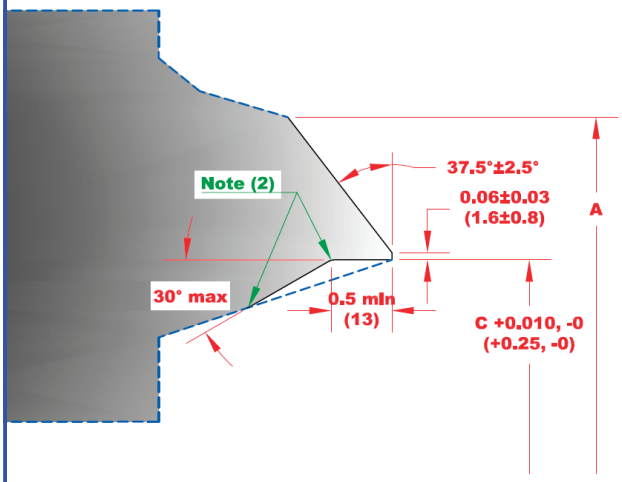
REFER TO ASME 16.25 FIG 2.



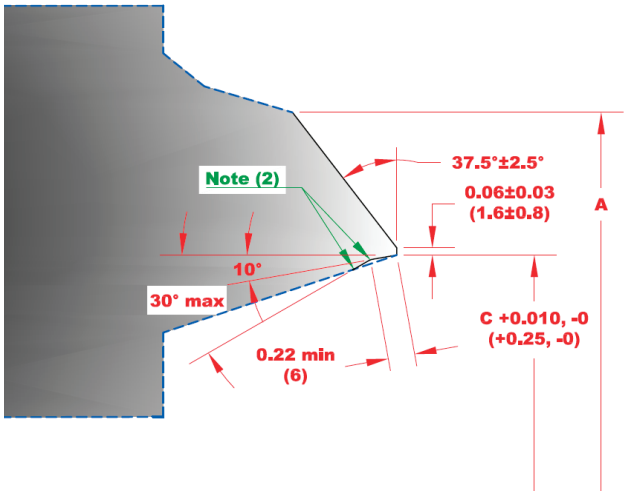
(a) Welding End Detail for Joint without Backing Ring



(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.

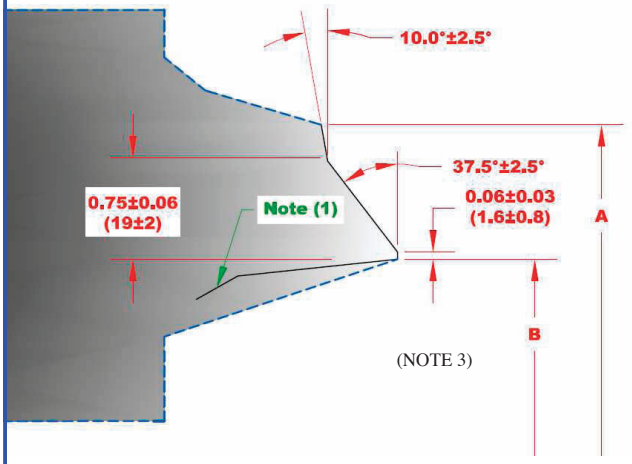
(2) Intersections should be slightly rounded.

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

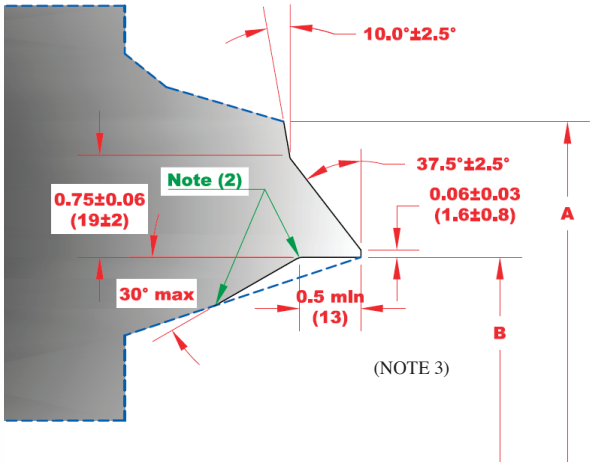
- ±0.03" (±1.0 mm) for NPS ≤ 10
- ±0.06" (±2.0 mm) for 12 ≤ NPS ≤ 18
- +0.12", -0.06" (+3.0 mm, -2.0 mm) for NPS ≥ 20

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

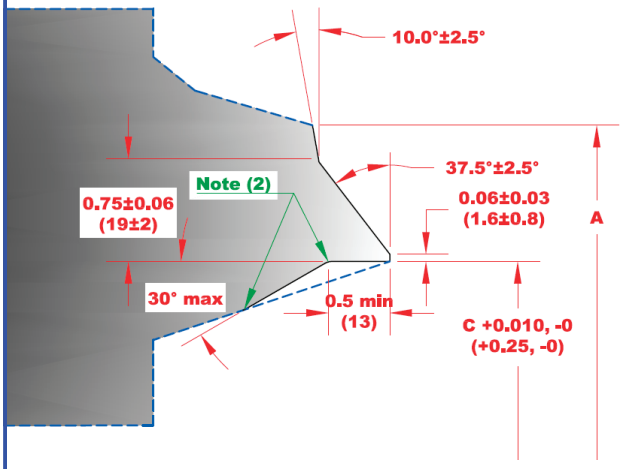
REFER TO ASME 16.25 FIG 3.



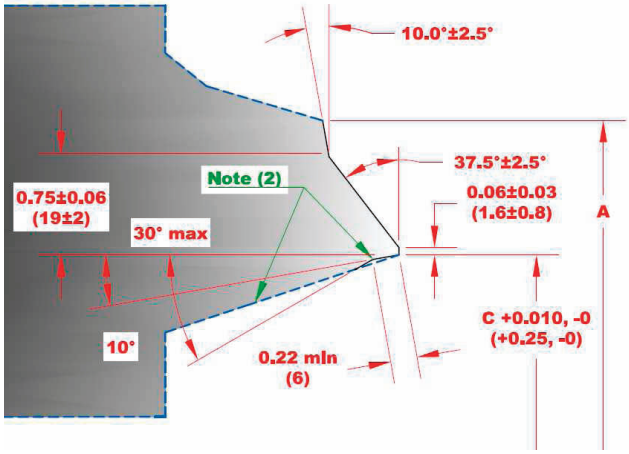
(a) Welding End Detail for Joint without Backing Ring



(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

STEEL VALVE FLANGE DIMENSIONS

For valve sizes through 24", Powell's standard for flange dimensions is ASME B16.5. Classes 150 and 300 valves use flanged fitting dimensions. Classes 600 and higher use flange dimensions. For valve size larger than 24", there are two standards that are available as follows:

(1) ASME B16.47 Series A (equivalent to MSS SP-44)

or (2) ASME B16.47 Series B (equivalent to API 605)

For valve sizes over 24", the flange type required (Series A or Series B) must be clearly specified.
For Reference Purposes the following Tables contain Flange Dimensions as described below:

TABLE 12: ASME B16.5 CLASSES 150 and 300, Sizes ½" through 24"

TABLE 13: ASME B16.5 CLASSES 600 and 900, Sizes ½" through 24"

TABLE 14: ASME B16.47 SERIES A, CLASS 150, Sizes 26: through 60"

TABLE 15: ASME B16.47 SERIES A, CLASS 300, Sizes 26" through 60"

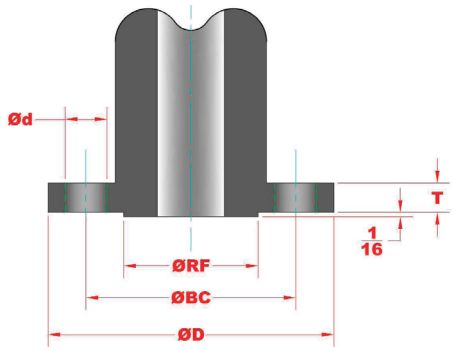
TABLE 16: ASME B16.47 SERIES B, CLASS 150, Sizes 26" through 60"

TABLE 17: ASME B16.47 SERIES B, CLASS 300, Sizes 26" through 60"

STEEL VALVE FLANGE FITTING DIMENSIONS

All Dimensions in Units of Inches

TABLE 12



CLASS 150

Nominal Pipe Size	Outside Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Thickness (T)	Raised Face Diameter (RF)
½	3.50	2.38	0.62	4	0.31	1.38
¾	3.88	2.75	0.62	4	0.34	1.69
1	4.25	3.12	0.62	4	0.38	2.00
1 ¼	4.62	3.50	0.62	4	0.44	2.50
1 ½	5.00	3.88	0.62	4	0.50	2.88
2	6.00	4.75	0.75	4	0.56	3.62
2 ½	7.00	5.50	0.75	4	0.62	4.12
3	7.50	6.00	0.75	4	0.69	5.00
3 ½	8.50	7.00	0.75	8	0.75	5.50
4	9.00	7.50	0.75	8	0.88	6.19
5	10.00	8.50	0.88	8	0.88	7.31
6	11.00	9.50	0.88	8	0.94	8.50
8	13.50	11.75	0.88	8	1.06	10.62
10	16.00	14.25	1.00	12	1.12	12.75
12	19.00	17.00	1.00	12	1.19	15.00
14	21.00	18.75	1.12	12	1.31	16.25
16	23.50	21.25	1.12	16	1.38	18.50
18	25.00	22.75	1.25	16	1.50	21.00
20	27.50	25.00	1.25	20	1.62	23.00
24	32.00	29.50	1.38	20	1.81	27.25

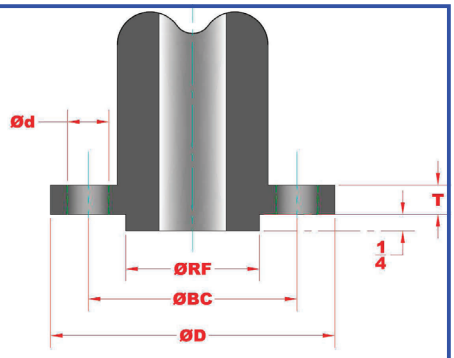
CLASS 300

Nominal Pipe Size	Outside Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Thickness (T)	Raised Face Diameter (RF)
½	3.75	2.62	0.62	4	0.50	1.38
¾	4.62	3.25	0.75	4	0.56	1.69
1	4.88	3.50	0.75	4	0.62	2.00
1 ¼	5.25	3.88	0.75	4	0.69	2.50
1 ½	6.12	4.50	0.88	4	0.75	2.88
2	6.50	5.00	0.75	8	0.81	3.62
2 ½	7.50	5.88	0.88	8	0.94	4.12
3	8.25	6.62	0.88	8	1.06	5.00
3 ½	9.00	7.25	0.88	8	1.12	5.50
4	10.00	7.88	0.88	8	1.19	6.19
5	11.00	9.25	0.88	8	1.31	7.13
6	12.50	10.62	0.88	12	1.38	8.50
8	15.00	13.00	1.00	12	1.56	10.62
10	17.50	15.25	1.12	16	1.81	12.75
12	20.50	17.75	1.25	16	1.94	15.00
14	23.00	20.25	1.25	20	2.06	16.25
16	25.50	22.50	1.38	20	2.19	18.50
18	28.00	24.75	1.38	24	2.31	21.00
20	30.50	27.00	1.38	24	2.44	23.00
24	36.00	32.00	1.62	24	2.69	27.25

STEEL VALVE FLANGE DIMENSIONS

All Dimensions in Units of Inches

TABLE 13



CLASS 600

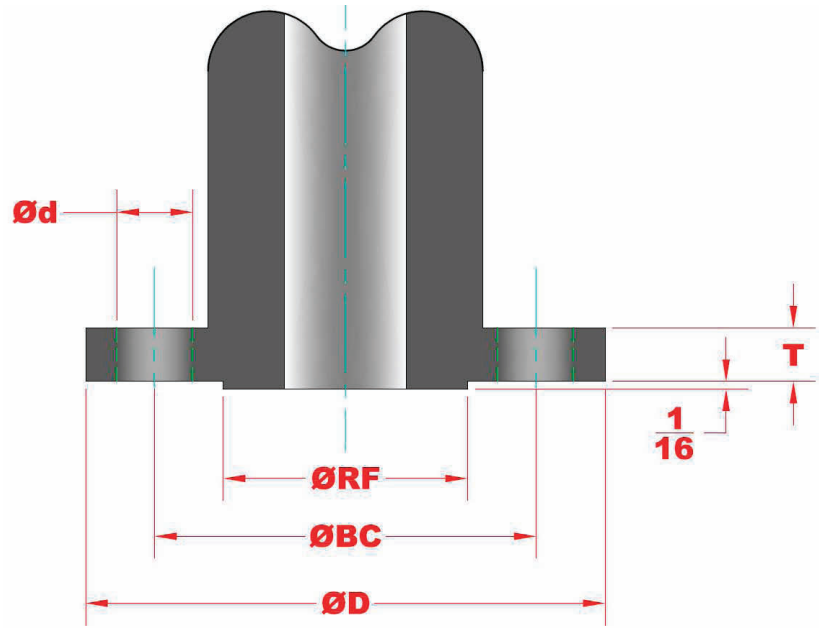
Nominal Pipe Size	Outside Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Thickness (T)	Raised Face Diameter (RF)
½	3.75	2.62	0.62	4	0.56	1.38
¾	4.62	3.25	0.75	4	0.62	1.69
1	4.88	3.50	0.75	4	0.69	2.00
1 ¼	5.25	3.88	0.75	4	0.81	2.50
1 ½	6.12	4.50	0.88	4	0.88	2.88
2	6.50	5.00	0.75	8	1.00	3.62
2 ½	7.50	5.88	0.88	8	1.12	4.12
3	8.25	6.62	0.88	8	1.25	5.00
3 ½	9.00	7.25	1.00	8	1.38	5.50
4	10.75	8.50	1.00	8	1.50	6.19
5	13.00	10.50	1.12	8	1.75	7.31
6	14.00	11.50	1.12	12	1.88	8.50
8	16.50	13.75	1.25	12	2.19	10.62
10	20.00	17.00	1.38	16	2.50	12.75
12	22.00	19.25	1.38	20	2.62	15.00
14	23.75	20.75	1.50	20	2.75	16.25
16	27.00	23.75	1.62	20	3.00	18.50
18	29.25	25.75	1.75	20	3.25	21.00
20	32.00	28.50	1.75	24	3.50	23.00
24	37.00	33.00	2.00	24	4.00	27.25

CLASS 900

Nominal Pipe Size	Outside Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Thickness (T)	Raised Face Diameter (RF)
½	4.75	3.25	0.88	4	0.88	1.38
¾	5.12	3.50	0.88	4	1.00	1.69
1	5.88	4.00	1.00	4	1.12	2.00
1 ¼	6.25	4.38	1.00	4	1.12	2.50
1 ½	7.00	4.88	1.12	4	1.25	2.88
2	8.50	6.50	1.00	8	1.50	3.62
2 ½	9.62	7.50	1.12	8	1.62	4.12
3	9.50	7.50	1.00	8	1.50	5.00
4	11.50	9.25	1.25	8	1.75	6.19
5	13.75	11.00	1.38	8	2.00	7.13
6	15.00	12.50	1.25	12	2.19	8.50
8	18.50	15.50	1.50	12	2.50	10.62
10	21.50	18.50	1.50	16	2.75	12.75
12	24.00	21.00	1.50	20	3.12	15.00
14	25.25	22.00	1.62	20	3.38	16.25
16	27.75	24.25	1.75	20	3.50	18.50
18	31.00	27.00	2.00	20	4.00	21.00
20	33.75	29.50	2.12	20	4.25	23.00
24	41.00	35.50	2.62	20	5.50	27.25

DIMENSIONS OF CLASS 150 SERIES A FLANGES

TABLE 14

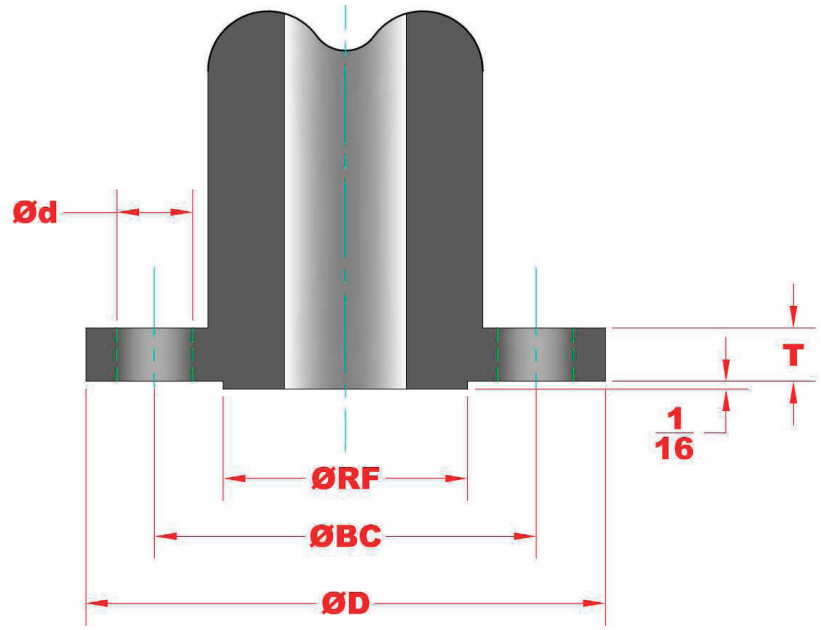


Nominal Pipe Size	Outside Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Thickness (T)	Raised Face Diameter (RF)
26	34.25	31.75	1.38	24	2.63	29.50
28	36.50	34.00	1.38	28	2.75	31.50
30	38.75	36.00	1.38	28	2.88	33.75
32	41.75	38.50	1.62	28	3.13	36.00
34	43.75	40.50	1.62	32	3.19	38.00
36	46.00	42.75	1.62	32	3.50	40.25
38	48.75	45.25	1.62	32	3.38	42.25
40	50.75	47.25	1.62	36	3.50	44.25
42	53.00	49.50	1.62	36	3.75	47.00
44	55.25	51.75	1.62	40	3.94	49.00
46	57.25	53.75	1.62	40	4.00	51.00
48	59.50	56.00	1.62	44	4.19	53.50
50	61.75	58.25	1.88	44	4.32	55.50
52	64.00	60.50	1.88	44	4.50	57.50
54	66.25	62.75	1.88	44	4.69	59.50
56	68.75	65.00	1.88	48	4.82	62.00
58	71.00	67.25	1.88	48	5.00	64.00
60	73.00	69.25	1.88	52	5.13	66.00

All Dimensions in Units of Inches

DIMENSIONS OF CLASS 300 SERIES A FLANGES

TABLE 15

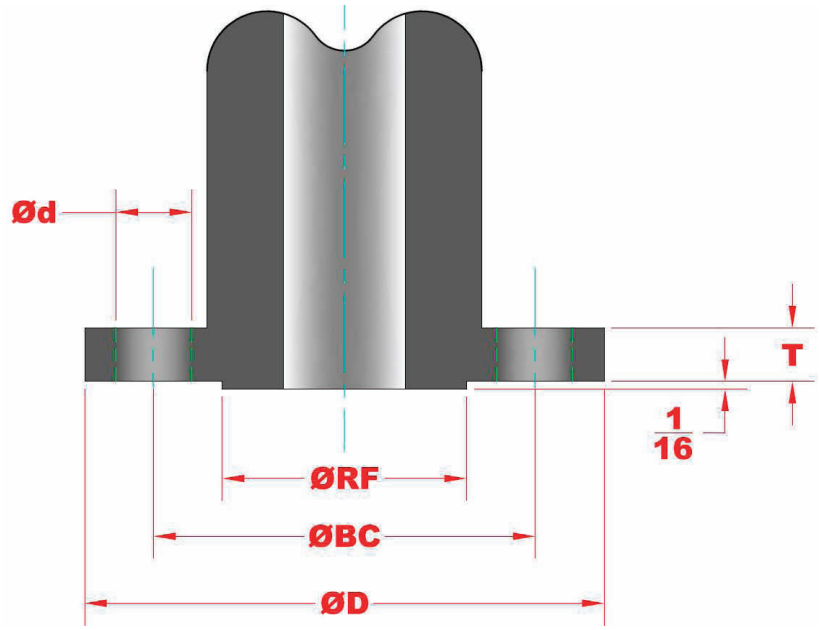


Nominal Pipe Size	Outside Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Thickness (T)	Raised Face Diameter (RF)
26	38.25	34.50	1.75	28	3.07	29.50
28	40.75	37.00	1.75	28	3.32	31.50
30	43.00	39.25	1.88	28	3.57	33.75
32	45.25	41.50	2.00	28	3.82	36.00
34	47.50	43.50	2.00	28	3.94	38.00
36	50.00	46.00	2.12	32	4.07	40.25
38	46.00	43.00	1.62	32	4.19	40.50
40	48.75	45.50	1.75	32	4.44	42.75
42	50.75	47.50	1.75	32	4.63	44.75
44	53.25	49.75	1.88	32	4.82	47.00
46	55.75	52.00	2.00	28	5.00	49.00
48	57.75	54.00	2.00	32	5.19	51.25
50	60.25	56.25	2.12	32	4.44	53.50
52	62.25	58.25	2.12	32	5.63	55.50
54	65.25	61.00	2.38	28	5.94	57.75
56	67.25	63.00	2.38	28	6.00	59.75
58	69.25	65.00	2.38	32	6.19	62.00
60	71.25	67.00	2.38	32	6.38	64.00

All Dimensions in Units of Inches

DIMENSIONS OF CLASS 150 SERIES B FLANGES

TABLE 16

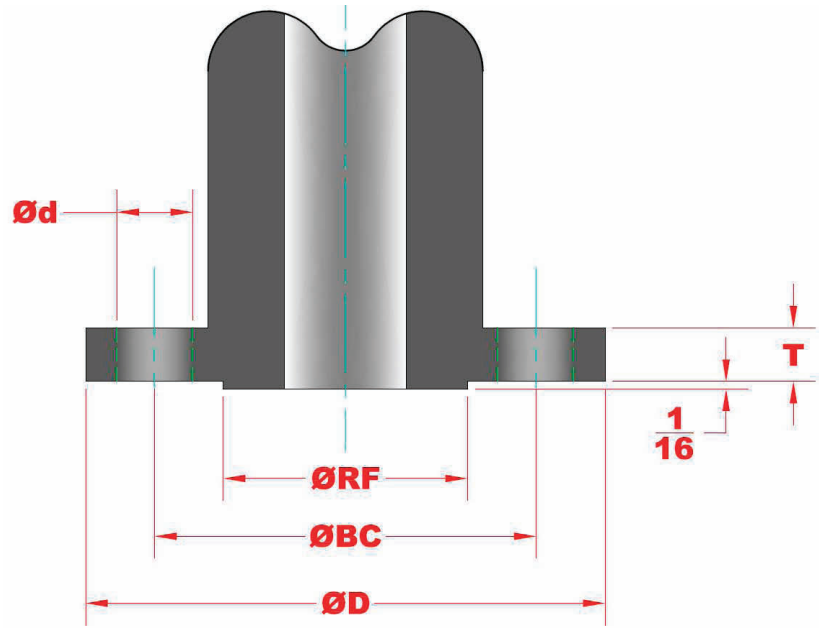


Nominal Pipe Size	Outside Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Thickness (T)	Raised Face Diameter (RF)
26	30.94	29.31	0.88	36	1.57	28.00
28	32.94	31.31	0.88	40	1.69	30.00
30	34.94	33.31	0.88	44	1.69	32.00
32	37.06	35.44	0.88	48	1.75	34.00
34	39.56	37.69	1.00	40	1.88	36.25
36	41.62	39.75	1.00	44	2.00	38.25
38	44.25	42.12	1.12	40	2.07	40.25
40	46.25	44.12	1.12	44	2.13	42.50
42	48.25	46.12	1.12	48	2.25	44.50
44	50.25	48.12	1.12	52	2.32	46.50
46	52.81	50.56	1.25	40	2.38	48.62
48	54.81	52.56	1.25	44	2.50	50.75
50	56.81	54.56	1.25	48	2.63	52.75
52	58.81	56.56	1.25	52	2.69	54.75
54	61.00	58.75	1.25	56	2.75	56.75
56	63.00	60.75	1.25	60	2.82	58.75
58	65.94	63.44	1.38	48	2.88	60.75
60	67.94	65.44	1.38	52	2.94	63.00

All Dimensions in Units of Inches

DIMENSIONS OF CLASS 300 SERIES B FLANGES

TABLE 17

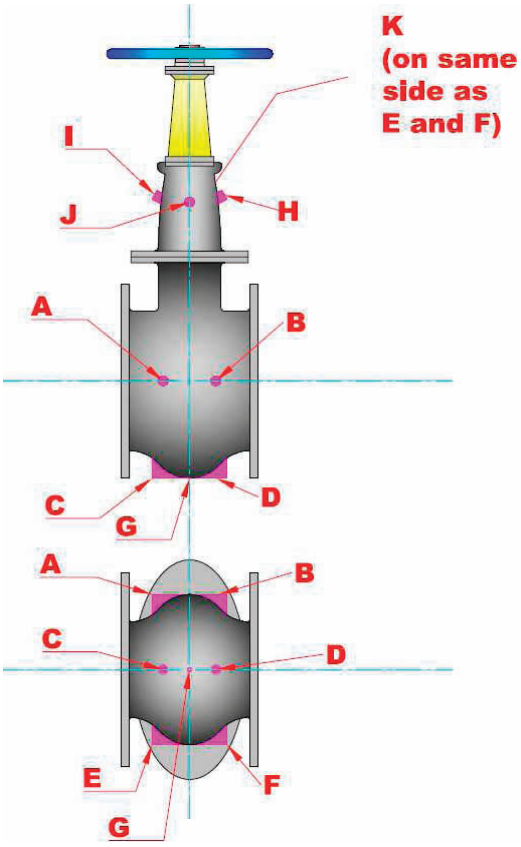


Nominal Pipe Size	Outside Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Thickness (T)	Raised Face Diameter (RF)
26	34.12	31.62	1.38	32	3.44	29.00
28	36.25	33.75	1.38	36	3.44	31.00
30	39.00	36.25	1.50	36	3.63	33.25
32	41.50	38.50	1.62	32	4.00	35.50
34	43.62	40.62	1.62	36	4.00	37.50
36	46.12	42.88	1.75	32	4.00	39.75
38	48.12	44.88	1.75	36	4.31	41.75
40	50.12	46.88	1.75	40	4.50	43.88
42	52.50	49.00	1.88	36	4.63	46.00
44	54.50	51.00	1.88	40	4.94	48.00
46	57.50	53.75	2.00	36	5.00	50.00
48	59.50	55.75	2.00	40	5.00	52.25
50	61.50	57.75	2.00	44	5.38	54.25
52	63.50	59.75	2.00	48	5.56	56.25
54	65.88	62.12	2.00	48	5.32	58.25
56	69.50	65.00	2.38	36	6.00	60.50
58	71.94	67.44	2.38	40	6.00	62.75
60	73.94	69.44	2.38	40	5.88	65.00

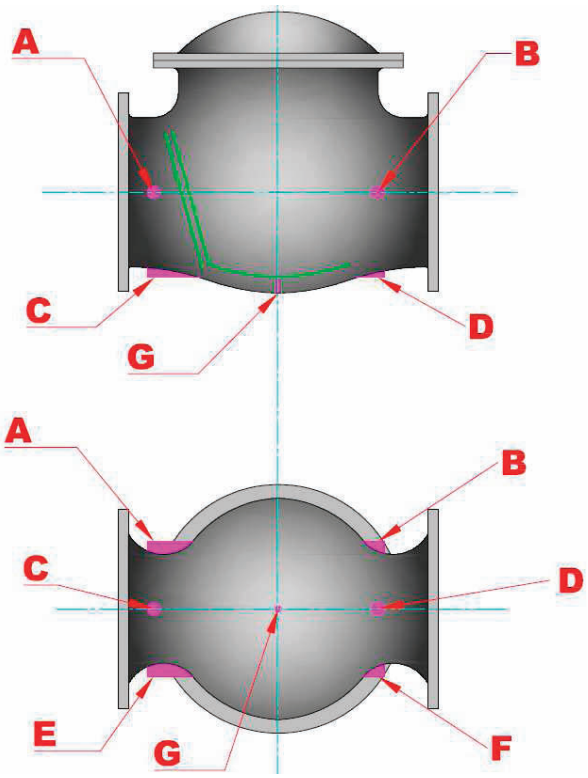
All Dimensions in Units of Inches

METHOD OF DESIGNATING LOCATION OF AUXILIARY CONNECTIONS WHEN SPECIFIED

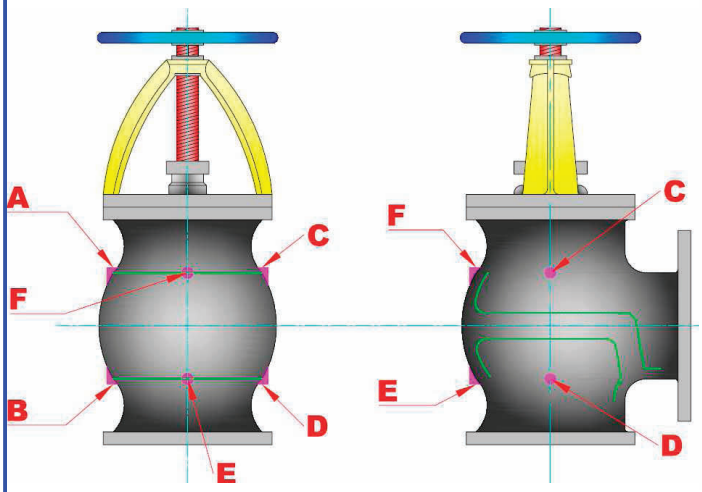
FIGURE 1



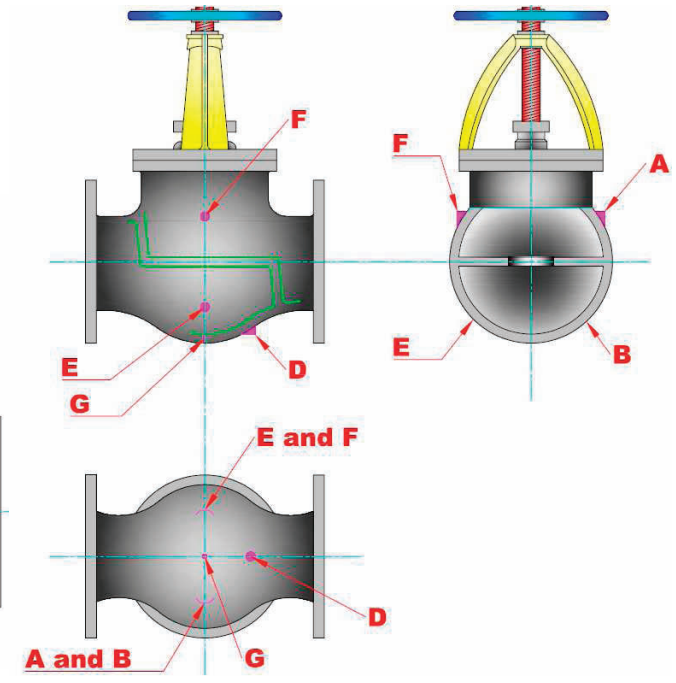
GATE VALVE



CHECK VALVE



ANGLE VALVE

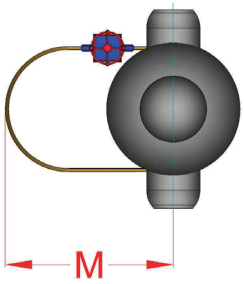


GLOBE VALVE

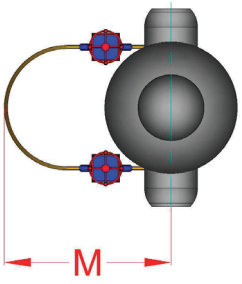
GENERAL NOTE:
The above sketches represent valves with symmetrical shapes. Sketches are illustrative only and do not imply design.

FIGURE 2

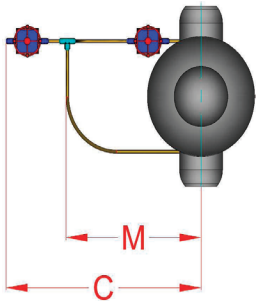
BYPASS DIMENSIONS
CAST STEEL VALVES
CLASS 150 THROUGH 1500



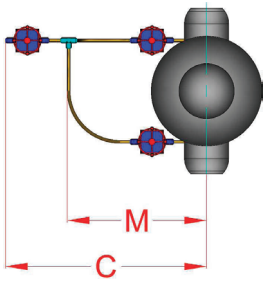
One-Valve Bypass



Two-Valve Bypass



One-Valve Bypass with Drain Valve



Two-Valve Bypass with Drain Valve

BY-PASS SIZES AND CLEARANCE DIMENSIONS-BOLTED 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 150	M - F.E.	-	-	17 1/2	19 13/16	21 1/8	23 1/8	23 3/4	25 1/8	25 1/2	28 3/4
		M - W.E.	-	-	18 7/8	20 7/8	21 13/16	24 1/2	25 9/16	25 13/16	26 7/8	30
		C - F.E.	-	-	23 3/8	26 11/16	28	30	30 5/8	32	32 3/8	35 5/8
		C - W.E.	-	-	24 3/4	27 3/4	28 11/16	31 3/8	32 7/16	32 11/16	33 3/4	36 7/8
	Class 300	M	-	-	18 13/16	20 13/16	22 1/8	24 3/4	25 3/4	27 1/4	28 1/2	31 1/8
		C	-	-	24 11/16	27 11/16	29	31 5/8	32 5/8	34 1/8	35 3/8	38
	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	-	-	-	-	-

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 the 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 26.

COMPARISON CHART OF VALVE SIZE/NOMINAL PIPE SIZE

TABLE 18

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 19

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.

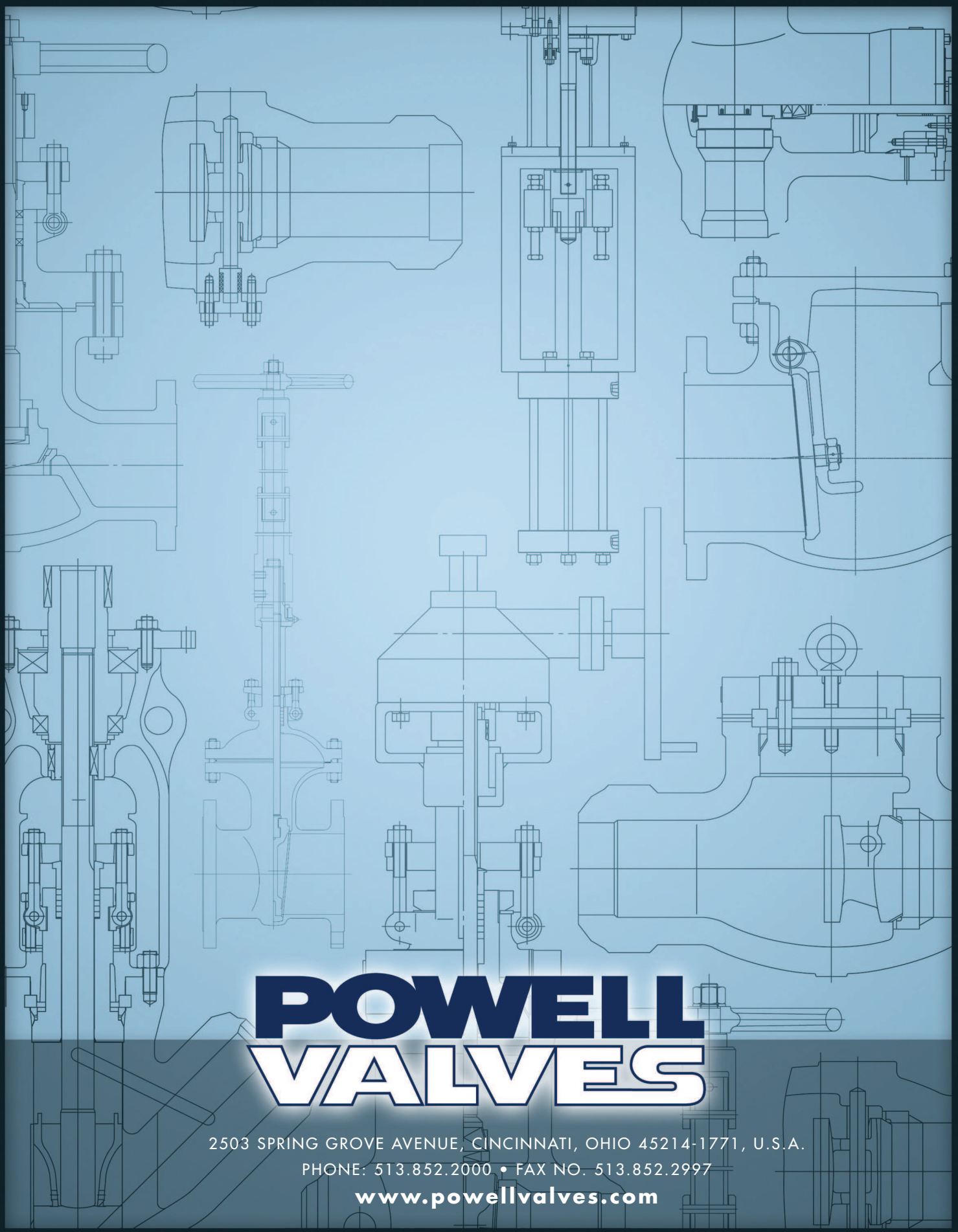
24. ASSIGNMENT: No right or interest in the contract arising from these Terms and Conditions shall be assigned by Purchaser and no delegation of any obligation owed by Purchaser shall be made without the prior written permission of Powell. As used herein, "Purchaser" and "Powell" include the respective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

2503 SPRING GROVE AVENUE, CINCINNATI, OHIO 45214-1771, U.S.A.
PHONE: 513.852.2000 • FAX NO. 513.852.2997
www.powellvalves.com