POWELL VALVES

CRYOGENIC SERVICE

GATE, GLOBE AND CHECK VALVES

ASME CLASS 150 TO 2500 / 1/4" TO 60"

Catalog: POW-CRYO-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 164 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.

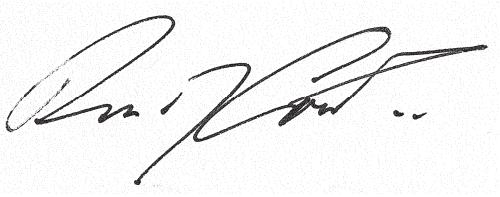
Powell also used its valve knowledge and expertise to construct a modification facility in the U.S.A. to assist customers with their needs, such as, automation, trim changes, end connection changes, additional quality inspections and special service pressure testing requirements, field service, etc…

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

How to order Powell CRYOGENIC 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		
2	.	0		2	4	5	6	F	M	0	M	C	V	6

Above example: 2" Figure 2456, Flanged End, ASTM A351 CF8M Body, API Trim 10, Teflon Packing, Graphite Gasket , 16" Extension, Oxygen Cleaned, Bonnet Vent

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

Base Figure Number
Four digit base figure number. See attached for index

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
Q	LUG
R	RTJ Ends
S	Socket Weld Ends
T	Threaded Ends
U	SW X Thd
V	SBT Ends
W	Sch STANDARD
X	SBP Ends
Y	Wafer
Z	Special ends

Material Codes	
Code	Option
C	A216 WCB
D	A217 WC6
E	A217 WC9
F	A217 C5
G	A217 C12
H	A217 C12A
J	A352 LCB
K	A352 LCC
L	A216 WCC
A	A351 CF8
B	A351 CF3
M	A351 CF8M
N	A351 CF3M
P	A351 CG8M
Q	A351 CG3M
R	A351 CF8C
S	A351 CN7M
T	A494 CZ100
V	A494 M35-1
W	A494 CW6MC
X	A494 CW12MW
Y	A494 CY40
1	A126 Gr. B Iron
2	B61
3	B62
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
K	Std Cryo trim w/ PCTFE disc insert
P	Std Cryo trim
G	Std Cryo trim w/ GF TFE disc insert
Z	Special Trim

Packing/Gasket	
Code	Option
G	Std Graphite
T	Std Teflon
X	None
Z	Special Packing or Gasket
M	Packing Teflon, Gasket Graphite
Y	TFE Packing with bottom Ring GF TFE, Gasket GF TFE

Option Codes	
Code	Option
CNX	Oxygen Clean, Non-Ext
CVX	Oxygen Clean, Non-Ext,Bonnet Vent
C48	X DIM = 12",Oxygen Clean
CV3	X DIM = 13", Oxygen Clean,Bonnet Vent
C52	X DIM = 13",Oxygen Clean
CV4	X DIM = 14", Oxygen Clean,Bonnet Vent
C56	X DIM = 14",Oxygen Clean
CV5	X DIM = 15", Oxygen Clean,Bonnet Vent
C60	X DIM = 15",Oxygen Clean
CV6	X DIM = 16", Oxygen Clean,Bonnet Vent
C64	X DIM = 16",Oxygen Clean
C68	X DIM = 17",Oxygen Clean
CV7	X DIM = 18", Oxygen Clean,Bonnet Vent
C72	X DIM = 18",Oxygen Clean
CV8	X DIM = 19", Oxygen Clean,Bonnet Vent
C76	X DIM = 19",Oxygen Clean
CV9	X DIM = 20", Oxygen Clean,Bonnet Vent
C80	X DIM = 20",Oxygen Clean
C96	X DIM = 24",Oxygen Clean
CB2	X DIM = 28",Oxygen Clean
CC8	X DIM = 32",Oxygen Clean
CE4	X DIM = 36",Oxygen Clean
CAT	All Parts Less Body STD. X DIM No Seat RG
CAU	All Parts Less Body Non-Ext & No Seat RG

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GATE		
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CRYOGENIC DESIGN

Valves in cold service can present an engineering challenge because of the fragility of the packing at continuously low temperatures. To combat this, Powell Valves offers an assortment of cryogenic valves that come standard with an extended bonnet and stem. These extensions help to keep the packing away from the low temperatures of the cryogenic fluid and thus function safely and efficiently.

CLEANING All extended and non-extended valves specified for oxygen or cryogenic service are specially processed and carefully cleaned in our own clean rooms. All parts are cleaned prior to assembly. The valves are assembled, tested, re-cleaned, packaged and sealed in accordance with approved shop procedures.

HANDWHEELS All handwheels are constructed of malleable iron. Bronze valves have a non-heating and non-slip design. Bolted bonnet Stainless Steel valves are furnished with a round rim design. Inside screw Stainless Steel valves are furnished with a non-heating and non-slip design.

GASKETS Bonnet or cap gaskets, where required, are selected for oxygen compatibility and/or any special service required.

PACKING All gate and globe valves are supplied with PTFE packing, unless otherwise specified.

TRIM Special trim materials are available to meet unique service requirements.

IDENTIFICATION Gate and globe valves have an identification plate giving the figure number and valve material. This plate is either under the handwheel nut or fastened to the valve yoke. Additional tagging with unique numbering for installation purposes is also available.

NON-EXTENDED Gate and globe valves are available in non-extended designs.

VALVE ENDS Non-standard pipe ends for most figure numbers are available on special order. A complete description or sketch of ends desired should be submitted for review. Pipe nipple extensions are recommended for soft seat welded end valves. Special butt weld end configurations per specifications are available on special order.

EXTENSIONS Gate and globe valves with other than standard “X” extensions are available on special order. Mounting plates per required specifications can be supplied. Welds are performed by qualified welders.

SEATS All seating surfaces are accurately machined to maintain alignment for the disc. Replacement of threaded-in seat rings is performed using standard parts and tools available from the Wm. Powell Company.

WEDGES Gate valves have guided wedge and “T” head stem connections. Gate valves are available with soft inserts in the wedge for tightest possible shut-off.

DISCS Globe valves have self-centering disc design and are retained with a lock nut. Globe valves are available with soft insert in the disc.

STEMS A one-piece stem design is used to assure positive alignment and strength. The portion of the stem through the packing chamber is “superfinished” to assure packing sealing.

SPECIALS In addition to figure numbers described in this catalog, other designs are available for cryogenic service or with extended bonnets. See pages 39 and 40 for examples.

NOTES

1. Extended bonnet valves are designed to provide an adequate bonnet length to maintain a steady state temperature at the packing. Because of this, special care must be given to the stem orientation when the valve is used in cryogenic liquid service. In order to prevent the liquid from contacting the packing, the stem should be installed to achieve positive drainage to the body, thereby creating a gas trap at the packing. It is recommended that valves be installed with stem in vertical (stem up) position with satisfactory operation also being attained with stem inclined up to 45°.
2. Cryogenic valves used in intermittent service, such as sampling valves, may not require the extended bonnet design. However, Powell recommends that all valves operating below –50° F for continuous service be fitted with an extended bonnet. Doing so protects the packing from extreme temperatures and also prevents ice build up near the handwheel to provide flexibility in operating conditions and long-range safety.

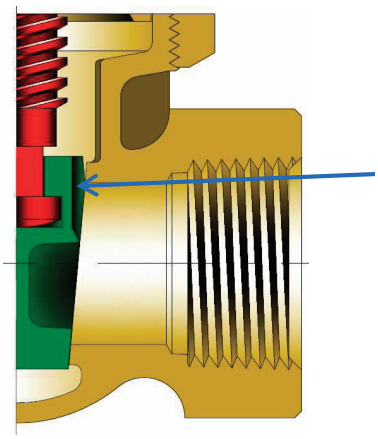
POWELL STANDARD "X" DIMENSIONS
CRYOGENIC GATE & GLOBE VALVES

Valve Size	INSIDE SCREW VALVES (1)				OUTSIDE SCREW & YOKE VALVES (2)			
	GATE		GLOBE		GATE		GLOBE	
	Inches	Valve Code	Inches	Valve Code	Inches	Valve Code	Inches	Valve Code
¼	13	52	12	48	13	52	12	48
⅜	13	52	12	48	13	52	12	48
½	13	52	12	48	13	52	12	48
¾	13	52	12	48	13	52	12	48
1	14	56	13	52	14	56	13	52
1¼	14	56	13	52	14	56	13	52
1½	14	56	13	52	14	56	13	52
2	16	64	14	56	16	64	14	56
2½	18	72	16	64	19	76	14	56
3	20	80	16	64	19	76	14	56
4	20	80	18	72	20	80	16	64
6	See Powell Engineering				24	96	20	80
8					28	B2	24	96
10					32	C8	28	B2
12					36	E4	28	C8
14					See Powell Engineering			
16								
20								

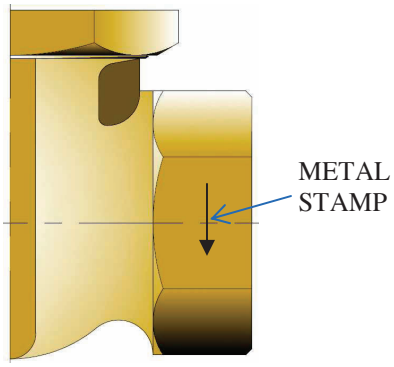
(1) Centerline to top of packing sleeve
(2) Centerline to bottom of yoke

For a coded length over 99 use a letter and a number. Example: 25" = 100 = A0

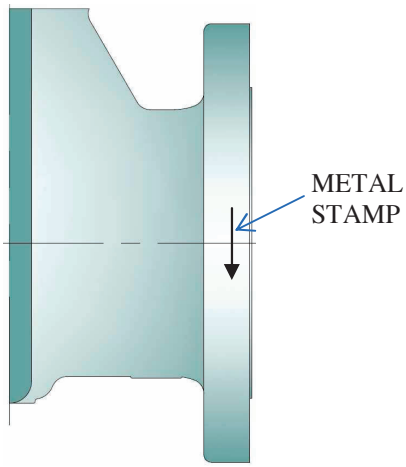
VENTING AND STAMPING GATE VALVES



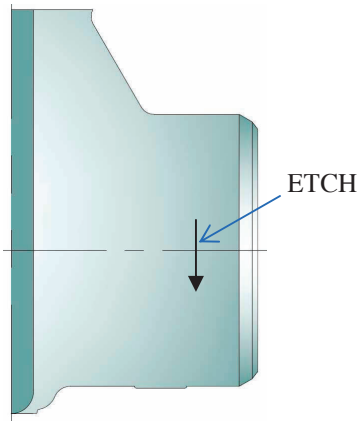
3/32” deep “V” groove radial cut on one face of disc. “V” groove is not practical when an insert is used in disc. Use 1/8” diameter hole method.



THREADED OR
SOCKET WELD



FLANGED



BUTT WELD OR
SILVER BRAZE
TUBING ENDS

ARROW AS INDICATED ABOVE SHALL BE LOCATED ON VENTED END OF VALVE

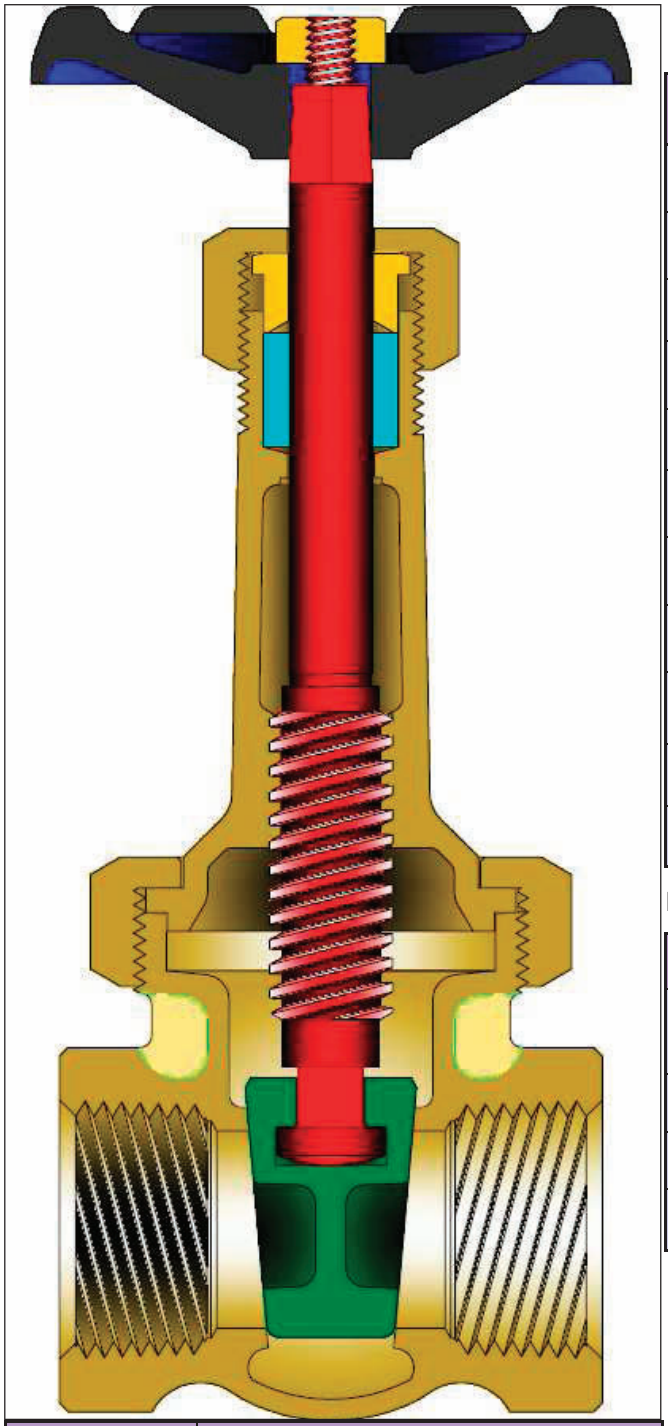
Gate valves have the potential to trap cryogenic liquids in the bonnet cavity between the two sealing faces of the wedge. To prevent excessive pressure build-up due to vaporization of this liquid, consideration must be given to venting the bonnet chamber. The most common way is to cut a 3/32” “V” groove radially across the face of one side of the disc. **IT IS THE RESPONSIBILITY OF THE OWNER OR HIS PIPING DESIGNER TO DEFINE WHEN THIS VENT IS REQUIRED**.

A vertical arrow marking is placed on the vented end, as shown so as not to indicate flow direction. For proper seating, it is recommended that the vent be located on the upstream side of the valve.

CAUTION: Since the wedge on almost all gate vales may be reversed, care must be taken to be sure that the vented wedge is installed with the original orientation.

BRONZE VALVES

MSS SP-80 GATE VALVE
UNION BONNET, THREADED ENDS
¼ TO 3" (6 TO 75mm) CLASSES 150
BRONZE RISING STEM



Class	Fig. No.
150	2714

STANDARD MATERIALS

PART	MATERIALS
Body	B62
Bonnet	B62
Bonnet Ring	B62
Wedge	B62
Stem	B371 C69400
Packing Nut	B62 or B16
Gland	B16
Packing	PTFE
Hand Wheel	Malleable Iron or Steel
Hand Wheel Nut	Brass
Wheel Plate	Aluminum

Design Specifications

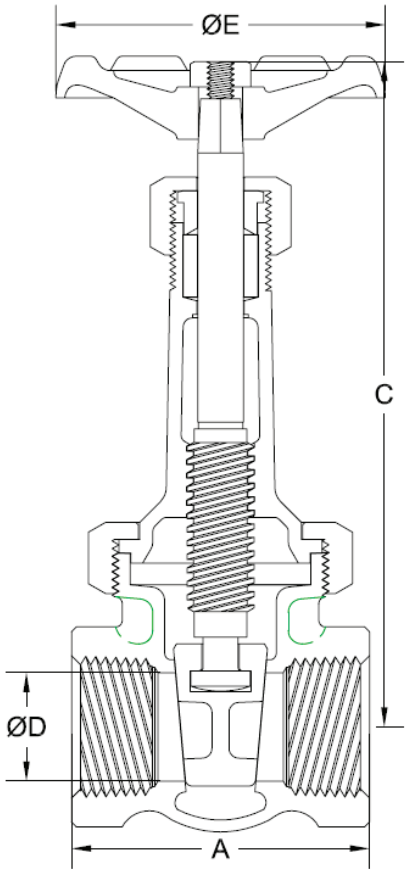
Item	Applicable Specification
Pressure - temperature ratings	MSS SP-80
General valve design	MSS SP-80
Thread design	ASME B1.20.1
Materials	ASTM

DESIGN FEATURES:

- **Renewable** solid wedges.
- **Integral** seats.
- **High-Tensile** bronze alloy stem.
- **Stems** are rotating / rising design.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-80.
- **Valves** are specially cleaned and processed for oxygen or cryogenic service and are then sealed to prevent contamination.
- **Bonnet** chamber ventilation, in order to prevent excess pressure build up caused by trapped cryogenic liquids, is available upon request.

GATE VALVE DIMENSIONS (CLASS 125 AND 150).

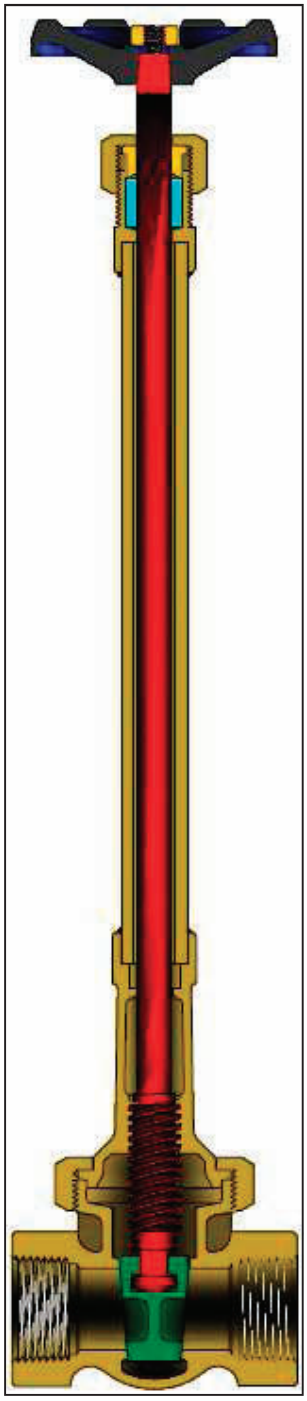
SIZE	FIG 2700 & 2714						
in	A	C	D	E	WT	lb	C_V
mm						kg	
¼	1.75	4.3	0.38	2.1	0.8		3.2
6	44	108	10	54	0.4		
⅜	2.00	4.3	0.38	2.1	0.8		7.1
10	51	108	10	54	0.4		
½	2.38	4.9	0.50	2.5	1.1		12.6
13	60	124	13	64	0.5		
¾	2.44	6.1	0.75	2.8	1.9		30
20	62	156	19	70	0.9		
1	2.75	7.4	1.00	3.0	2.7		55
25	70	187	25	76	1.3		
1¼	3.00	8.6	1.25	3.3	4.0		90
32	76	219	32	83	1.8		
1½	3.38	9.6	1.50	3.6	5.2		130
40	86	244	38	92	2.4		
2	3.50	11.7	2.00	4.1	9.5		240
50	89	297	51	103	4.3		
2½	4.50	14.8	2.50	5.1	16.2		350
65	114	375	64	130	7.3		
3	5.00	17.1	3.00	5.7	23.5		510
75	127	435	76	144	10.7		



C = Center to top open

WT = Weight
C_V = Flow Coefficient

MSS SP-80 GATE VALVE
UNION BONNET, THREADED ENDS
¼ TO 3" (6 TO 75mm) CLASSES 200 AND 300
BRONZE RISING STEM



STANDARD MATERIALS

PART	MATERIALS
Body	B61
Bonnet	B61
Bonnet Ring	B61
Wedge	B61
Retaining Ring (1)	SST 304
Retaining Plate (1)	B371 C69400
Wedge Insert (1)	PCTFE
Stem	SST 303
Packing Nut	B62 or B16
Gland	B16
Packing	PTFE
Packing Sleeve	B371 C69400
Extension Column	SST 304
Hand Wheel	Malleable Iron or Steel
Hand Wheel Nut	Brass
Wheel Plate	Aluminum
Body / Bonnet Stud (2)	A193 Gr. B8
Body / Bonnet Nut (2)	A194 Gr. 8
Gasket (2)	Graphite

(1) On soft seated valves only.
(2) Sizes 2½" and 3" use a bolted bonnet design.

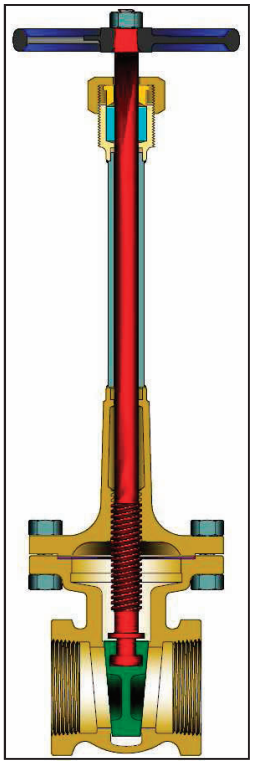
Design Specifications

Item	Applicable Specification
Pressure - temperature ratings	MSS SP-80
General valve design	MSS SP-80
Thread design	ASME B1.20.1
Materials	ASTM

Class	Fig. No.
200	0375
300	0377

DESIGN FEATURES:

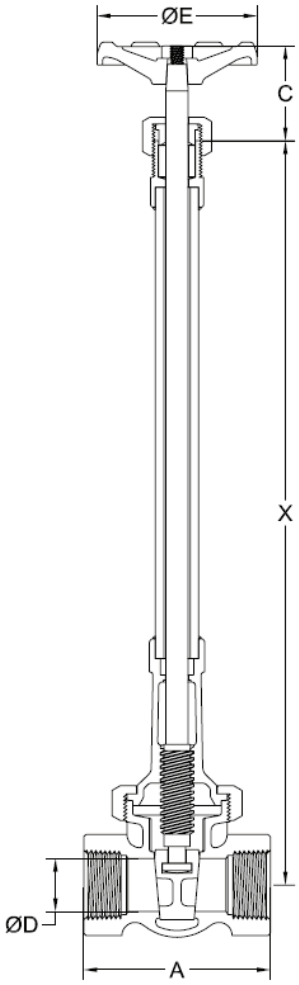
- **Renewable** solid wedges.
- **Integral** seats.
- **Stems** are rotating / rising design.
- **Available** soft-seated for sizes 2", 2½", and 3".
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-80.
- **Valves** are specially cleaned and processed for oxygen or cryogenic service and are then sealed to prevent contamination.
- **Bonnet** chamber ventilation, in order to prevent excess pressure build up caused by trapped cryogenic liquids, is available upon request.
- **Valves** available with non-extended bonnets. See Bronze and Iron Catalog for dimensions and weights of non-extended design.



Bolted Bonnet Design (2)

GATE VALVE DIMENSIONS (CLASSES 200 & 300).

SIZE	FIG 0375								FIG 0377							
in / mm	A	C	D	E	X (1)	WT	lb / kg	C_V	A	C	D	E	X (1)	WT	lb / kg	C_V
¼	1.81	2.0	0.25	2.1	13.0	0.8		3.2	1.94	2.2	0.25	3.0	13.0	1.0		3.2
6	46	51	6	54	330	0.4			49	56	6	76	330	0.5		
⅜	2.06	2.0	0.38	2.1	13.0	0.9		7.1	2.13	2.2	0.38	3.0	13.0	1.1		7.1
10	52	51	10	54	330	0.4			54	56	10	76	330	0.5		
½	2.44	2.2	0.50	2.5	13.0	1.2		12.6	2.44	2.5	0.50	3.3	13.0	1.8		12.6
13	62	56	13	64	330	0.5			62	64	13	83	330	0.8		
¾	2.56	2.6	0.75	2.8	13.0	2.0		30	2.69	3.0	0.75	3.6	13.0	3.0		30
20	65	66	19	70	330	0.9			68	76	19	92	330	1.4		
1	2.94	3.1	1.00	3.0	14.0	2.7		55	3.00	3.4	1.00	4.1	14.0	4.9		55
25	75	79	25	76	356	1.2			76	86	25	105	356	2.2		
1¼	3.13	3.9	1.25	3.3	14.0	4.7		90	3.38	4.3	1.25	4.6	14.0	6.5		90
32	79	99	32	83	356	2.1			86	109	32	117	356	2.9		
1½	3.50	3.9	1.50	3.6	14.0	5.5		130	3.75	4.3	1.50	5.1	14.0	8.9		130
40	89	99	38	92	356	2.5			95	109	38	130	356	4.0		
2	4.00	4.6	2.00	4.1	16.0	9.1		240	4.38	5.0	2.00	5.7	16.0	16.7		240
50	102	117	51	103	406	4.1			111	127	51	144	406	7.6		
2½	4.63	5.8	2.50	4.7	18.0	18.9		350	5.00	5.9	2.50	8.0	18.0	24		350
65	117	147	64	119	457	8.6			127	150	64	203	457	11		
3	5.13	6.4	3.00	5.7	20.0	25		510	5.63	6.6	3.00	9.0	20.0	32		510
75	130	163	76	145	508	11			143	168	76	229	508	15		

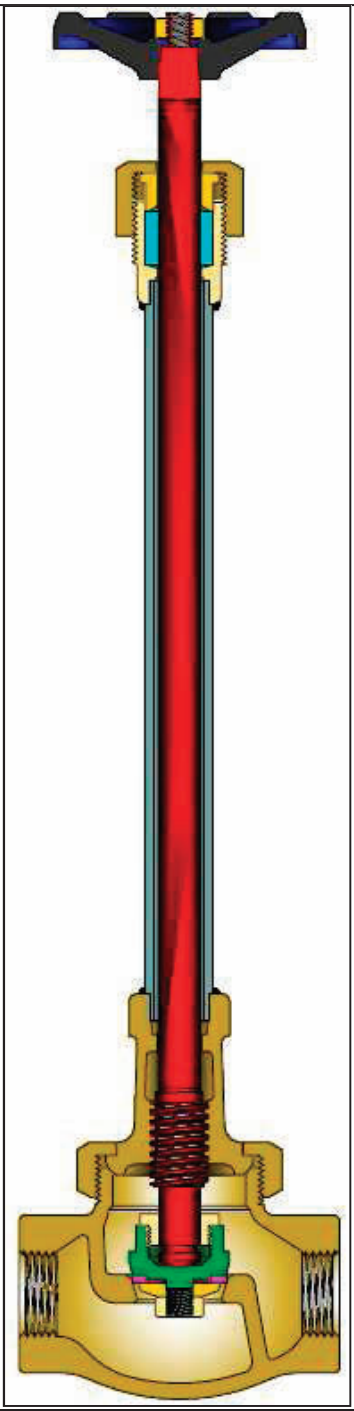


C = Packing sleeve to top open
X = Center to top of stuffing box (Std)

WT = Weight
C_V = Flow Coefficient

(1) Other extensions available. Consult Powell Engineering.

MSS SP-80 GLOBE VALVES
UNION BONNET, THREADED ENDS
¼ TO 3" (6 TO 75mm) CLASS 200
BRONZE



Class	Fig. No.
200	0110

STANDARD MATERIALS

PART	MATERIALS
Body	B61
Bonnet	B61
Bonnet Ring	B61
Extension Column	SST 304
Disc or Disc Holder (2)	B371 C69400
Disc Locknut (2)	B371 C69400
Disc Plate (2)	Brass
Disc Insert (2)	PCTFE (1)
Horseshoe Ring	SST 300 Series
Disc Nut	B371 C69400
Body / Bonnet Stud (3)	A193 Gr. B8
Body / Bonnet Nut (3)	A194 Gr. 8
Gasket (3)	Graphite
Stem	SST 303
Packing Nut	B62 or B16
Stuffing Box	B371 C69400
Gland	B16
Packing	PTFE
Hand Wheel	Malleable Iron or Steel
Hand Wheel Nut	Brass
Wheel Plate	Aluminum

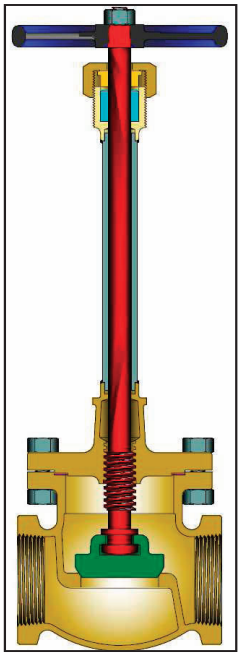
(1) Other insert materials available.
(2) Soft Seat design
(3) Sizes 2½" and 3" use a bolted bonnet design.

Design Specifications

Item	Applicable Specification
Pressure - temperature ratings	MSS SP-80
General valve design	MSS SP-80
Thread design	ASME B1.20.1
Materials	ASTM

DESIGN FEATURES:

- **Plug** type discs are held by a locknut.
- **Integral** seats have openings equal to nominal pipe size of valve.
- **Valves** can be reground without being removed from the line.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-80.
- **Valves** are specially cleaned and processed for oxygen or cryogenic service and are then sealed to prevent contamination.
- **Valves** available with non-extended bonnets. See Bronze and Iron Catalog for dimensions and weights of non-extended design.



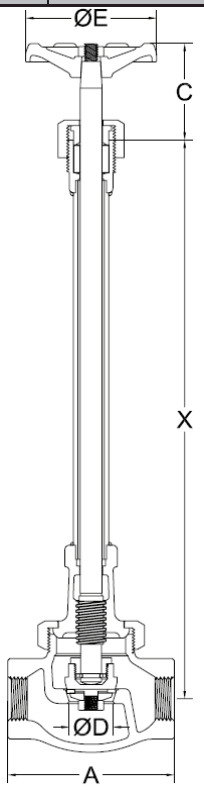
Bolted Bonnet Design (3) with metal seats

GLOBE VALVE DIMENSIONS (CLASS 200).

SIZE	FIG 0110							
in / mm	A	C	D	X (1)	E	WT lb / kg		C_V
¼	2.25	1.8	0.25	12.0	2.5	0.9		0.6
6	57	46	6	305	64	0.4		
⅜	2.38	1.8	0.38	12.0	2.5	1.1		1.4
10	60	46	10	305	64	0.5		
½	2.63	2.1	0.50	12.0	2.8	1.3		2.5
13	67	54	13	305	70	0.6		
¾	3.25	2.4	0.75	12.0	3.3	2.2		5.8
20	83	62	19	305	83	1.0		
1	3.81	2.7	1.00	13.0	3.6	3.4		10.7
25	97	68	25	330	92	1.5		
1¼	4.38	3.2	1.25	13.0	4.1	5.3		17.1
32	111	82	32	330	103	2.4		
1½	4.88	3.2	1.50	13.0	4.8	7.9		25
40	124	82	38	330	121	3.6		
2	6.00	3.4	2.00	14.0	5.7	12.0		50
50	152	86	51	356	144	5.4		
2½	7.00	4.1	2.50	16.0	8.0	18.5		75
65	178	104	64	406	203	8.4		
3	7.88	4.8	3.00	16.0	9.0	26		110
75	200	121	76	406	229	12		

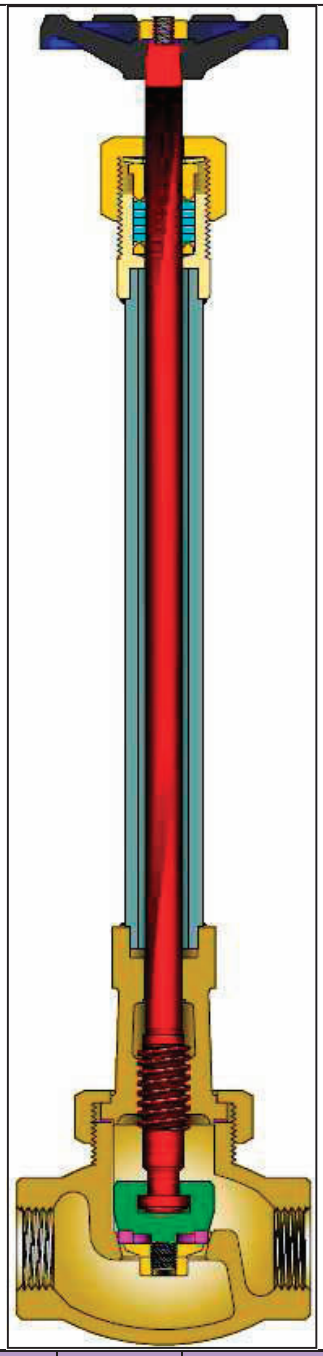
C = Packing sleeve to top open
X = Center to top of stuffing box (Std)

WT = Weight
C_V = Flow Coefficient



(1) Other extensions available. Consult Powell Engineering.

MSS SP-80 GLOBE VALVES
UNION BONNET, THREADED ENDS
¼ TO 2" (6 TO 50mm) CLASS 300
BRONZE



Class	Fig. No.	Ends
300	0174	Threaded Ends
	2874	Silver Brazed Tube Ends
	2875	Silver Brazed Tube Ends Angle Style

STANDARD MATERIALS

PART	MATERIALS
Body	B61
Bonnet	B61
Bonnet Ring	B61
Extension Column	SST 304
Disc or Disc Holder (2)	B371 C69400
Disc Locknut (2)	B371 C69400
Disc Plate (2)	Brass
Disc Insert (2)	PCTFE (1)
Stem	SST 303
Packing Nut	B62 or B16
Packing Collar	Brass
Stuffing Box	B371 C69400
Spring Washer	17-7 PH
Gasket	Glass Filled PTFE
Gland	B16
Packing	PTFE
Hand Wheel	Malleable Iron or Steel
Hand Wheel Nut	Brass
Wheel Plate	Aluminum

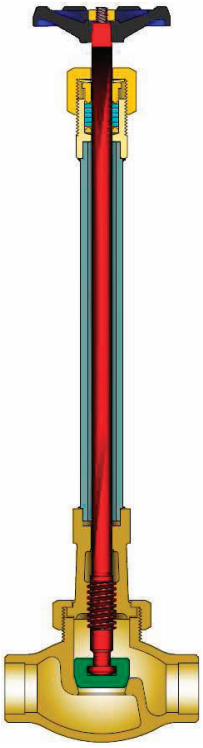
(1) Other insert materials available.
(2) Soft Seat design.

Design Specifications

Item	Applicable Specification
Pressure - temperature ratings	MSS SP-80
General valve design	MSS SP-80
Thread design	ASME B1.20.1
Materials	ASTM

DESIGN FEATURES:

- **Plug** type discs are held by a locknut.
- **Integral** seats have openings equal to nominal pipe size of valve.
- **Valves** can be reground without being removed from the line.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-80.
- **Valves** are specially cleaned and processed for oxygen or cryogenic service and are then sealed to prevent contamination.
- **Valves** available with non-extended bonnets. See Bronze and Iron Catalog for dimensions and weights of non-extended design.



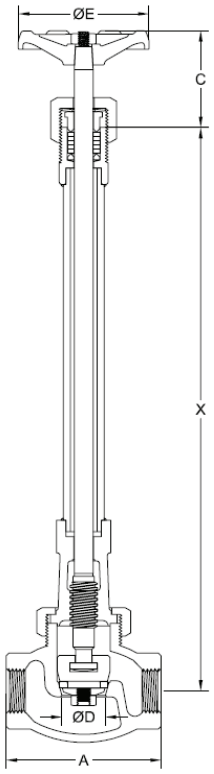
Metal Seat Design with Silver Brazed Tube Ends

GLOBE VALVE DIMENSIONS (CLASS 300).

SIZE	FIG 0174							
in / mm	A	C	D	X (1)	E	WT	lb / kg	C_V
¼	2.13	2.0	0.25	12.0	2.5	1.6		0.6
6	54	51	6	305	64	0.7		
⅜	2.25	2.0	0.38	12.0	2.5	1.1		1.4
10	57	51	10	305	64	0.5		
½	2.50	2.3	0.50	12.0	2.8	2.5		2.5
13	64	58	13	305	70	1.1		
¾	3.00	2.7	0.75	12.0	3.3	2.5		5.8
20	76	68	19	305	83	1.1		
1	3.56	2.7	1.00	13.0	3.3	4.1		10.7
25	90	68	25	330	83	1.9		
1½	4.63	3.4	1.50	13.0	4.1	9.3		25
40	117	86	38	330	103	4.2		
2	5.75	3.6	2.00	14.0	4.8	16.0		50
50	146	92	51	356	121	7.3		

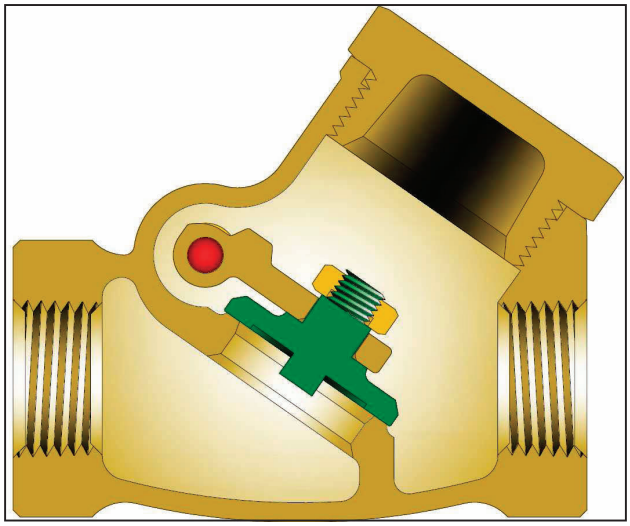
C = Packing sleeve to top open
X = Center to top of stuffing box (Std)

WT = Weight
C_V = Flow Coefficient



(1) Other extensions available. Consult Powell Engineering.

MSS SP-80 SWING CHECK VALVES
THREADED BONNET, THREADED ENDS
¼ TO 3" (6 TO 75mm) CLASS 200 AND 300
BRONZE Y-PATTERN



Class	Fig. No.
200	0560
300	0563

STANDARD MATERIALS

PART	MATERIALS
Body	B61
Cap	B61 (1)
Disc or Disc Holder (2)	B61 or B371 C69400
Disc Nut	B16
Disc Insert (2)	PCTFE (3)
Disc Plate (2)	B16
Screw or Disc Plate Nut (2)	B16
Carrier	B62 or B124 C37700
Carrier Pin	B16
Side Plug	B16

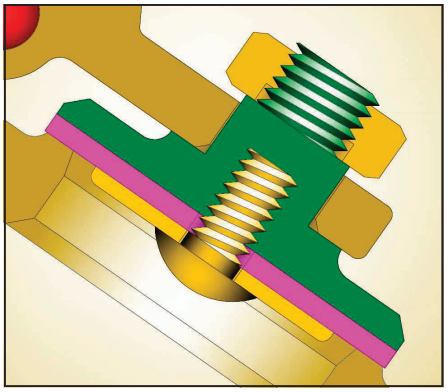
(1) B16 for ¾" and smaller sizes
(2) Soft Seat design
(3) Other insert materials available

Design Specifications

Item	Applicable Specification
Pressure - temperature ratings	MSS SP-80
General valve design	MSS SP-80
Thread design	ASME B1.20.1
Materials	ASTM

DESIGN FEATURES:

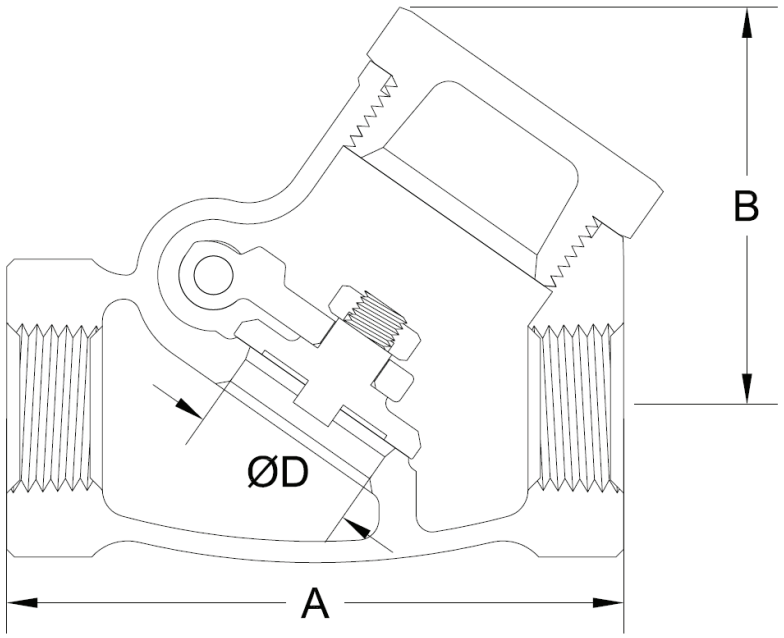
- **By** unscrewing the side plug and removing the cap and carrier pin, the carrier and disc assembly can be easily removed.
- **Renewable** disc is held by a locknut.
- **Integral** seats.
- **Valves** can be used in a horizontal or vertical position; however, when installed in vertical line, flow must be upward with pressure under the disc.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-80.
- **Valves** are specially cleaned and processed for oxygen or cryogenic service and are then sealed to prevent contamination.



Soft Seat Design (2)

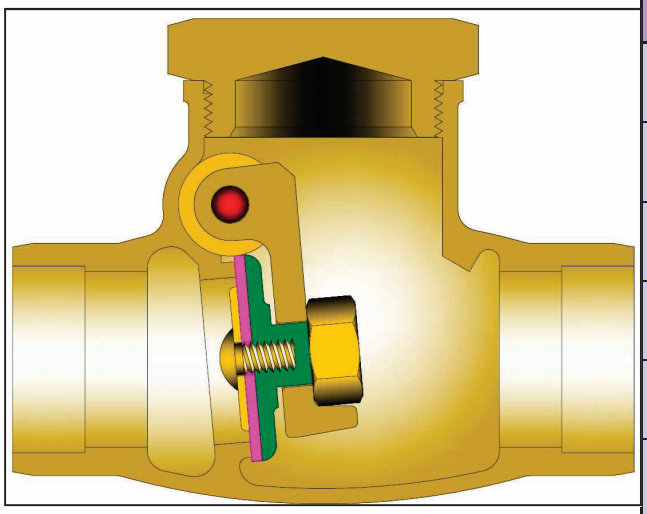
SWING CHECK VALVE DIMENSIONS (CLASS 200 & 300).

SIZE	FIG 560						FIG 563					
in / mm	A	B	D	WT	lb / kg	Cv	A	B	D	WT	lb / kg	Cv
¼	2.25	1.4	0.25	0.6		1	2.38	1.5	0.25	0.7		0.9
6	57	35	6	0.3			60	38	6	0.3		
⅜	2.38	1.4	0.38	0.6		2	2.50	1.5	0.38	0.7		2.4
10	60	35	10	0.3			64	38	10	0.3		
½	2.75	1.7	0.50	0.8		4	2.88	1.8	0.50	1.0		4.1
13	70	43	13	0.4			73	46	13	0.5		
¾	3.13	2.0	0.75	1.3		9	3.25	2.1	0.75	1.6		9.1
20	79	51	19	0.6			83	54	19	0.7		
1	3.63	2.4	1.00	2.0		20	3.75	2.5	1.00	2.3		16.4
25	92	60	25	0.9			95	64	25	1.0		
1¼	4.38	3.0	1.25	3.4		30	4.50	3.1	1.25	4.1		30
32	111	76	32	1.5			114	79	32	1.9		
1½	5.00	3.5	1.50	4.8		40	5.13	3.6	1.50	5.9		40
40	127	89	38	2.2			130	90	38	2.7		
2	6.13	4.3	2.00	8.0		75	6.38	4.4	2.00	10.3		75
50	156	108	51	3.6			162	111	51	4.7		
2½	7.25	5.1	2.50	13.7		120	7.50	5.2	2.50	17.0		120
65	184	129	64	6.2			191	132	64	7.7		
3	8.50	5.9	3.00	20.3		175	8.75	6.0	3.00	25.3		175
75	216	149	76	9.2			222	152	76	11.5		



WT = Weight
C_V = Flow Coefficient

MSS SP-80 SWING CHECK VALVES
THREADED BONNET, SILVER BRAZE TUBING ENDS
½ TO 3" (13 TO 75mm) CLASS 200
BRONZE



Class	Fig. No.
200	2825

STANDARD MATERIALS

PART	MATERIALS
Body	B61
Cap	B61 (1)
Disc or Disc Holder (2)	B62 or B371 C69400 or B16
Disc Nut	B16
Disc Insert (2)	PCTFE (3)
Disc Plate (2)	B16
Screw or Disc Plate Nut (2)	B16
Carrier	B62 or B124 C37700
Carrier Pin	B16
Side Plug	B16

(1) B16 for ¾" and smaller sizes
(2) Soft Seat design
(3) Other insert materials available

Design Specifications

Item	Applicable Specification
Pressure - temperature ratings	MSS SP-80
General valve design	MSS SP-80
Materials	ASTM

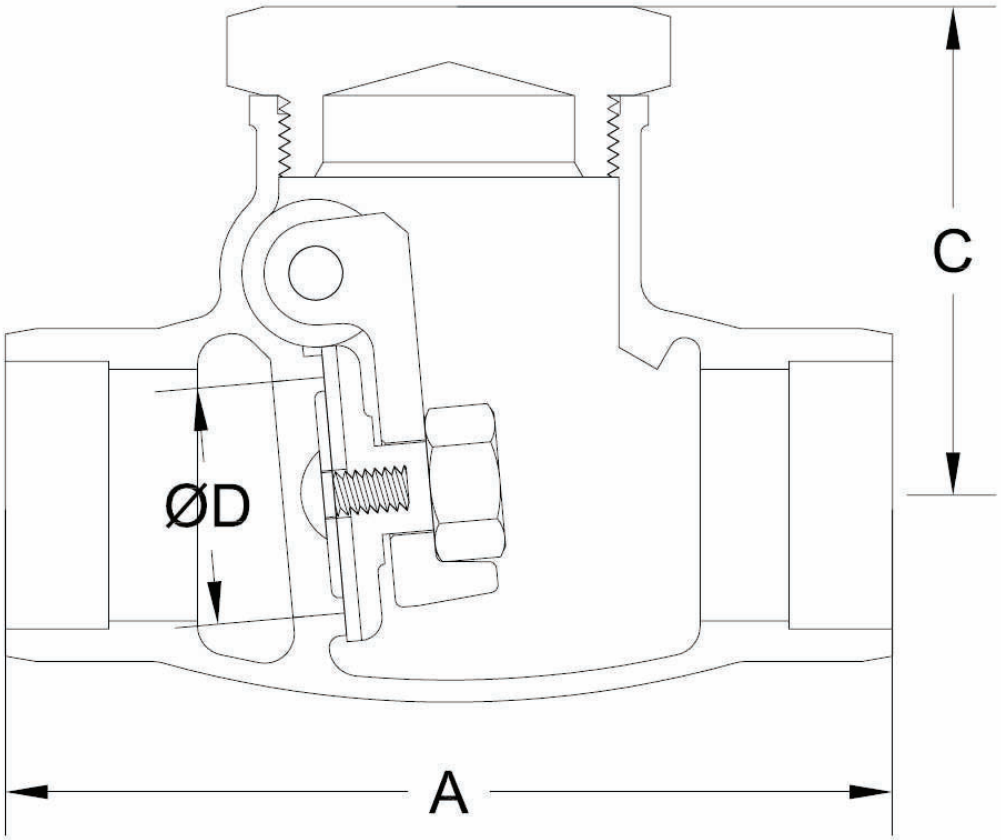
DESIGN FEATURES:

- **By** unscrewing the side plug and removing the cap and carrier pin, the carrier and disc assembly can be easily removed.
- **Renewable** disc is held by a locknut.
- **Integral** seats.
- **Valves** can be used in a horizontal or vertical position; however, when installed in vertical line, flow must be upward with pressure under the disc.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-80.
- **Valves** are specially cleaned and processed for oxygen or cryogenic service and are then sealed to prevent contamination.

Metal Seat Design

SWING CHECK VALVE DIMENSIONS (CLASS 200).

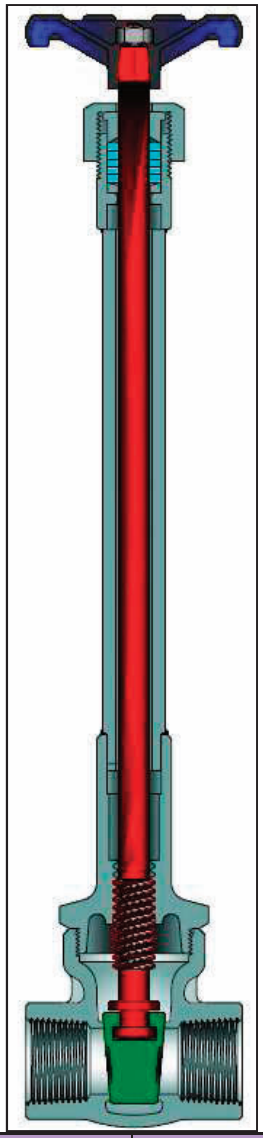
SIZE	FIG 560					
in	A	C	D	WT	lb	Cv
mm					kg	
½	3.00	1.4	0.50	1.0		4
13	76	35	13	0.5		
¾	3.38	1.7	0.75	1.5		9
20	86	43	19	0.7		
1	3.75	2.1	1.00	1.5		20
25	95	52	25	0.7		
1½	4.75	2.9	1.50	3.1		40
40	121	75	38	1.4		
2	5.50	3.3	2.00	5.0		75
50	140	84	51	2.3		
2½	7.25	3.9	2.50	8.3		120
65	184	100	64	3.8		
3	8.38	4.5	3.00	13.0		175
75	213	114	76	5.9		



WT = Weight
C_V = Flow Coefficient


STAINLESS STEEL

GATE VALVES
THREADED BONNET, ASME CLASS 200
¼" to 2" (6 TO 50 mm), THREADED OR SOCKET WELD ENDS
CAST STAINLESS STEEL



Class	Figure Number
200	1832

PART	MATERIALS
Body	A351 Gr. CF8M
Bonnet	A351 Gr. CF8M
Packing Sleeve	SST 316
Extension Column	SST 304
Wedge	A351 Gr. CF8M
Stem	A276 316
Packing Nut	SST 316
Gland	SST 316
Packing	PTFE
Packing Collar	SST 316
Hand Wheel	Malleable Iron or Steel
Hand Wheel Nut	Steel
Identification Plate	Aluminum

Design Specifications

Item	Applicable Specification
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
End threads—NPT	ASME B1.20.1
Socket weld ends	ASME B16.11
Materials	ASTM

DESIGN FEATURES:

- **Fully** guided solid wedge.
- **Socket** weld ends are available.
- **Each** valve is shell and seat pressure tested.
- **Integral** seats are standard.
- **Valves** are specially cleaned and processed for oxygen or cryogenic service and are then sealed to prevent contamination.
- **Bonnet** chamber ventilation, in order to prevent excess pressure build up caused by trapped cryogenic liquids, is available upon request.
- **Valves** available with non-extended bonnets. See Stainless Steel Catalog for dimensions and weights of non-extended design.

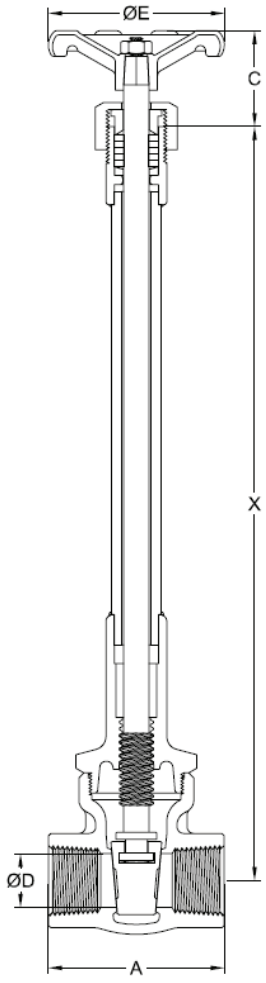
NOTE: Powell reserves the right to convert threaded ends to socket weld. Remnant of threads will exist as pipe stop behind socket bore.

GATE VALVE DIMENSIONS (CLASS 200).

SIZE	FIG 1832							
in	A	C	D	E	X (1)	WT	lb	C_V
mm							kg	
¼	1.75	2.1	0.38	2.5	13.0	1.6		7.1
7	44	54	10	64	330	0.7		
⅜	2.00	2.1	0.38	2.5	13.0	1.6		7.1
10	51	54	10	64	330	0.7		
½	2.25	2.3	0.50	2.8	13.0	2.4		12.6
13	57	60	13	70	330	1.1		
¾	2.50	2.9	0.75	3.0	13.0	3.1		30
20	64	73	19	76	330	1.4		
1	3.25	3.3	1.00	3.3	14.0	4.8		55
25	83	83	25	83	356	2.2		
1 ½	3.75	4.1	1.50	4.1	14.0	8.1		130
38	95	105	38	103	356	3.7		
2	4.00	4.8	2.00	4.8	16.0	12.4		240
50	102	122	51	121	406	5.6		

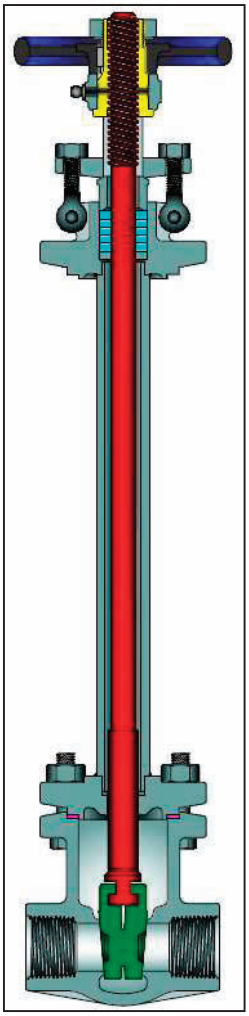
C = Packing sleeve to top open
X = Center to top of stuffing box (Std)

WT = Weight
C_V = Flow coefficient



(1) Other extensions available. Consult Powell Engineering.

ASME B16.34 GATE VALVES
BOLTED BONNET, ASME CLASS 200-600
¼" to 2" (6 TO 50 mm), THREADED OR SOCKET WELD ENDS
CAST STAINLESS STEEL



Class	Figure Number
200	2490
300	2467 (1)
600	1973 (1)

STANDARD MATERIALS (Other materials available)

PART	MATERIALS
Body	A351 Gr. CF3M
Bonnet	A351 Gr. CF8M
Yoke	A351 Gr. CF8M
Wedge	A351 Gr. CF8M
Stem	A276 316
Stem Bushing	A 439 Gr. D2
Gland Flange	A351 Gr. CF8
Eye Bolt	A193 Gr. B8
Eye Bolt Nut	A194 Gr.8
Groove Pin	Series 300
Gland	A276 316
Packing	PTFE
Gasket	Graphite
Extension Column	304 SST
Hand Wheel	Malleable Iron or Steel
Hand Wheel Nut	Malleable Iron or Steel
Key	Steel
Lubricant Fitting	Steel
Body / Bonnet Stud	A193 Gr. B8
Body / Bonnet Nut	A194 Gr.8
Identification Plate	Series 300 SST

1) See pages 27-28 for flanged and buttweld designs.

Design Specifications

Item	Applicable Specification
Wall thickness	ASME B16.34
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
End threads—NPT	ASME B1.20.1
Socket weld ends	ASME B16.11
Materials	ASTM

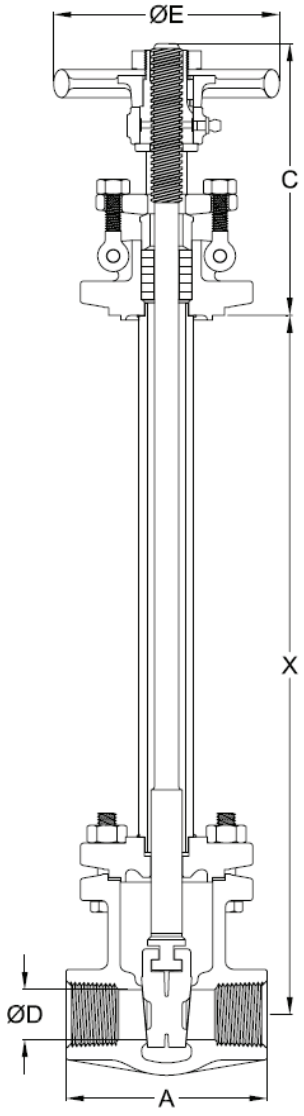
DESIGN FEATURES:

- **Seat face:** Ground and lapped to a smooth finish.
- **Flexible Wedge** with low center stem – wedge contact. Wedge is ground and lapped to a smooth finish and closely guided to prevent dragging and seat damage.
- **Non-rotating stem** with precision ACME threads and burnished finish. Double ACME threads for faster operation.
- **Body and bonnet joint** accurately machined.
- **Each** valve is shell, seat and backseat pressure tested.
- **Valves** are available with socket weld ends.
- **Yoke** bushing can be lubricated to minimize friction and prolong life of the stem.
- **Body and bonnet** castings are precision machined.
- **Gland** has two-piece construction for easy alignment.
- **Valves** are specially cleaned and processed for oxygen or cryogenic service and are then sealed to prevent contamination.
- **Bonnet** chamber ventilation, in order to prevent excess pressure build up caused by trapped cryogenic liquids, is available upon request.
- **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
  -Alternate trim materials
  -Non-extended design
  -Other options available as specified

NOTE: Powell reserves the right to convert threaded ends to socket weld. Remnant of threads will exist as pipe stop behind socket bore.

GATE VALVE DIMENSIONS (CLASSES 200-600)

SIZE	ASME 200								ASME 300							
in / mm	A	C	D	E	X (1)	WT	lb / kg	C_V	A	C	D	E	X (1)	WT	lb / kg	C_V
¼	2.13	5.1	0.38	3.0	13.0	5.4		7.1	2.13	5.1	0.38	3.0	13.0	5.3		7.1
6	54	130	10	76	330	2.4			54	130	10	76	330	2.4		
⅜	2.13	5.1	0.38	3.0	13.0	5.4		7.1	2.13	5.1	0.38	3.0	13.0	5.3		7.1
10	54	130	10	76	330	2.4			54	130	10	76	330	2.4		
½	3.00	5.6	0.50	3.5	13.0	7.5		12.6	3.00	5.6	0.50	3.5	13.0	7.3		12.6
13	76	141	13	89	330	3.4			76	141	13	89	330	3.3		
¾	3.50	6.3	0.75	4.0	13.0	9.6		30	3.50	6.3	0.75	4.0	13.0	9.2		30
19	89	189	19	102	330	4.4			89	189	19	102	330	4.2		
1	4.00	6.8	1.00	4.5	14.0	13.1		55	4.00	6.8	1.00	4.5	14.0	13.2		55
25	102	171	25	114	356	5.9			102	171	25	114	356	6.0		
1½	4.63	8.4	1.50	6.0	14.0	23.8		130	4.63	8.4	1.50	6.0	14.0	23.8		130
38	117	213	38	152	356	10.8			117	213	38	152	356	10.8		
2	5.00	9.7	2.00	7.0	16.0	29.5		240	5.00	9.7	2.00	7.0	16.0	34.5		240
50	127	246	51	178	406	13.4			127	246	51	178	406	15.6		



SIZE	ASME 600							
in / mm	A	C	D	E	X (1)	WT	lb / kg	C_V
¼	2.13	5.1	0.38	3.0	13.0	6.2		7.1
6	54	130	10	76	330	2.8		
⅜	2.13	5.1	0.38	3.0	13.0	6.2		7.1
10	54	130	10	76	330	2.8		
½	3.00	5.6	0.50	3.5	13.0	7.8		12.6
13	76	141	13	89	330	3.5		
¾	3.50	6.3	0.75	4.0	13.0	10.2		30
19	89	189	19	102	330	4.6		
1	4.00	6.8	1.00	5.0	14.0	14.7		55
25	102	171	25	127	356	6.7		
1½	5.00	8.4	1.50	7.0	14.0	27.1		130
38	127	213	38	178	356	12.3		
2	5.75	9.7	2.00	8.0	16.0	37.2		240
50	146	246	51	203	406	16.9		

(1) Other extensions available. Consult Powell Engineering.

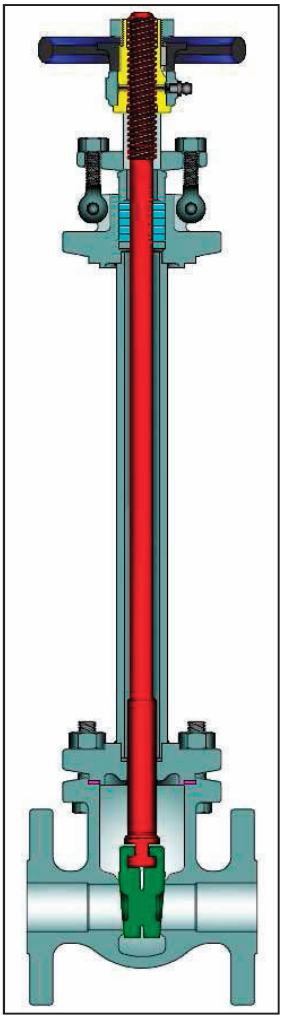
C = Bottom of yoke flange to top open

X = Center to bottom of yoke flange (Std)

WT = Weight

C_V = Flow coefficient

ASME B16.34 GATE VALVES
BOLTED BONNET, ASME CLASS 150-600
½" TO 6" (13 TO 150 mm), FLANGED OR BUTTWELD ENDS
CAST STAINLESS STEEL



Class	Figure Number
150	2456
300	2467 (2)
600	1973 (2)

STANDARD MATERIALS (Other materials available)

PART	MATERIALS
Body	A351 Gr. CF8M (1)
Bonnet	A351 Gr. CF8M
Yoke	A351 Gr. CF8M
Wedge	A351 Gr. CF8M
Stem	A276 316
Stem Bushing	A 439 Gr. D2
Gland Flange	A351 Gr. CF8
Eye Bolt	A193 Gr. B8
Eye Bolt Nut	A194 Gr.8
Groove Pin	Series 300
Gland	A276 316
Packing	PTFE
Gasket	Graphite
Extension Column	304 SST
Hand Wheel	Malleable Iron or Steel
Hand Wheel Nut	Malleable Iron or Steel
Key	Steel
Lubricant Fitting	Steel
Body / Bonnet Stud	A193 Gr. B8
Body / Bonnet Nut	A194 Gr.8
Identification Plate	Series 300 SST

1) CF3M for weld end bodies.
2) See pages 25-26 for threaded and socketweld designs.

Design Specifications

Item	Applicable Specification
Wall thickness	ASME B16.34
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
Flanged ends	ASME B16.5
Buttweld ends	ASME B16.25
Materials	ASTM

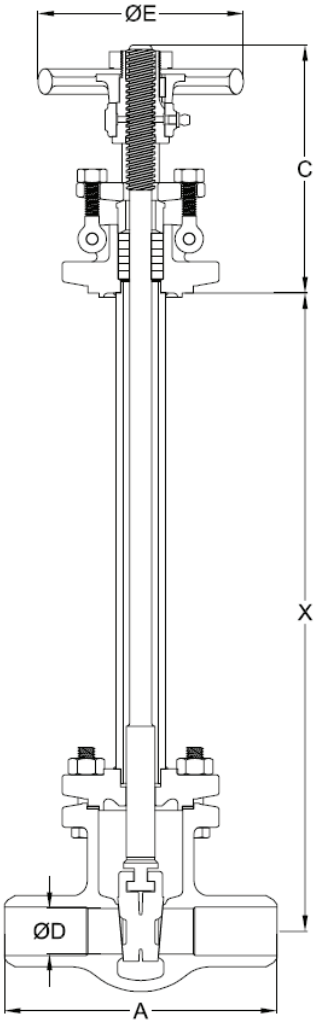
DESIGN FEATURES:

- **Seat face:** Ground and lapped to a smooth finish.
- **Flexible Wedge** with low center stem – wedge contact. Wedge is ground and lapped to a smooth finish and closely guided to prevent dragging and seat damage.
- **Non-rotating stem** with precision ACME threads and burnished finish. Double ACME threads for faster operation.
- **Body and bonnet joint** accurately machined.
- **Each** valve is shell, seat and backseat pressure tested.
- **Yoke** bushing can be lubricated to minimize friction and prolong life of the stem.
- **Body and bonnet** castings are precision machined.
- **Gland** has two-piece construction for easy alignment.
- **Valves** are specially cleaned and processed for oxygen or cryogenic service and are then sealed to prevent contamination.
- **Bonnet** chamber ventilation, in order to prevent excess pressure build up caused by trapped cryogenic liquids, is available upon request.
- **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
  -Alternate trim materials
  -Non-extended design
  -Other options available as specified

NOTE: Powell reserves the right to convert threaded ends to socket weld. Remnant of threads will exist as pipe stop behind socket bore.

GATE VALVE DIMENSIONS (CLASSES 150-600)

SIZE	ASME 150											ASME 300									
in	A		C	D	E	X (1)	WT	lb	WT	lb	C_V	A	C	D	E	X (1)	WT	lb	WT	lb	C_V
mm	FE	WE					FE	kg	WE	kg							FE	kg	WE	kg	
½	4.25		5.6	0.50	3.5	13.0	8.7		7.5		12.6	5.50	5.6	0.50	3.5	13.0	10.0		7.3		12.6
13	108		141	13	89	330	3.9		3.4			140	141	13	89	330	4.5		3.3		
¾	4.62		6.3	0.75	4.0	13.0	11.5		9.6		30	6.00	6.3	0.75	4.0	13.0	14.3		9.2		30
19	117		189	19	102	330	5.2		4.4			152	189	19	102	330	6.5		4.2		
1	5.00		6.8	1.00	4.5	14.0	16.6		13.1		55	6.50	6.8	1.00	4.5	14.0	19.5		13.2		55
25	127		171	25	114	356	7.5		5.9			165	171	25	114	356	8.8		6.0		
1½	6.50		8.4	1.50	6.0	14.0	29.7		23.8		130	7.50	8.4	1.50	6.0	14.0	38.9		23.8		130
38	165		213	38	152	356	13.5		10.8			190	213	38	152	356	17.6		10.8		
2	7.00	8.50	9.7	2.00	7.0	16.0	34.2		29.5		240	8.50	9.7	2.00	7.0	16.0	42.6		33.6		240
50	178	216	246	51	178	406	15.5		13.4			216	246	51	178	406	19.3		15.2		
2½	7.50	9.50	10.4	2.50	7.0	19.0	56		50		390	9.50	10.4	2.50	7.0	19.0	63		49		390
65	190	241	264	64	178	483	25		23			241	264	64	178	483	29		22		
3	8.00	11.12	11.3	3.00	7.0	19.0	68		63		560	11.12	11.3	3.00	9.0	19.0	72		67		560
80	203	282	286	76	178	483	31		29			282	286	76	229	483	33		30		
4	9.00	12.00	13.6	4.00	9.0	20.0	110		99		1020	12.00	13.6	4.00	10.0	20.0	148		130		1020
100	229	305	344	102	229	508	50		45			305	344	102	254	508	67		59		
6	10.50	15.88	18.4	6.00	11.0	24.0	175		165		2440	15.88	18.9	6.00	14.0	24.0	278		225		2440
150	267	403	467	152	279	610	79		75			403	479	152	356	610	126		102		



Weld End Design

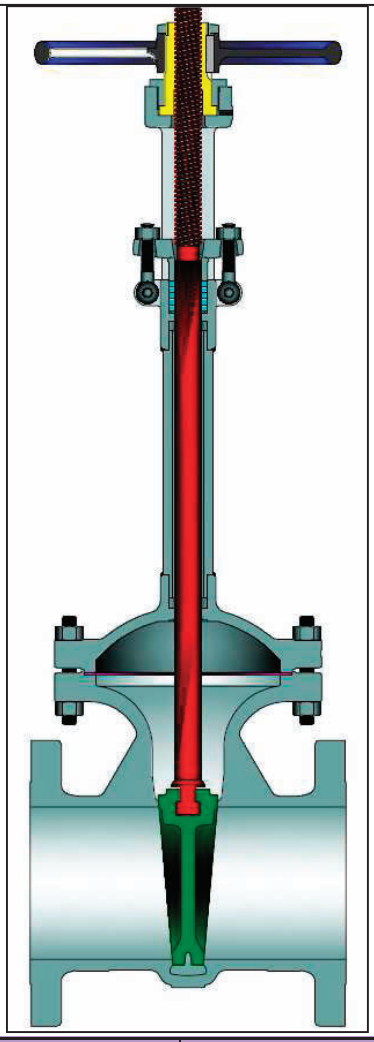
SIZE	ASME 600									
in	A	C	D	E	X (1)	WT	lb	WT	lb	C_V
mm						FE	kg	WE	kg	
½	6.50	5.6	0.50	3.5	13.0	11.0		7.8		12.6
13	165	141	13	89	330	5.0		3.5		
¾	7.50	6.3	0.75	4.0	13.0	18.1		10.2		30
19	190	189	19	102	330	8.2		4.6		
1	8.50	6.8	1.00	5.0	14.0	25.0		14.7		55
25	216	171	25	127	356	11.3		6.7		
1½	9.50	8.4	1.50	7.0	14.0	43.9		27.1		130
38	241	213	38	178	356	19.9		12.3		
2	11.50	9.7	2.00	8.0	16.0	82.2		62.2		240
50	292	246	51	203	406	37.3		28.2		

(1) Other extensions available. Consult Powell Engineering.

C = Bottom of yoke flange to top open
X = Center to bottom of yoke flange (Std)

FE = Flanged ends
WE = Buttweld ends
WT = Weight
C_V = Flow coefficient

ASME B16.34 GATE VALVES
BOLTED BONNET, ASME CLASS 150-300
8" TO 12" (200 TO 300 mm), FLANGED OR BUTTWELD ENDS
CAST STAINLESS STEEL



Class	Figure Number
150	2456
300	2467

STANDARD MATERIALS (Other materials available)

PART	MATERIALS
Body	A351 Gr. CF8M (1)
Bonnet	A351 Gr. CF8M
Wedge	A351 Gr. CF8M
Stem	A276 316
Stem Bushing	A 439 Gr. D2
Gland Flange	A351 Gr. CF8
Eye Bolt	A193 Gr. B8
Eye Bolt Nut	A194 Gr.8
Groove Pin	Series 300
Gland	A276 316
Packing	PTFE
Gasket	Graphite
Hand Wheel	Malleable Iron or Steel
Hand Wheel Nut	Malleable Iron or Steel
Key	Steel
Lubricant Fitting	Steel
Body / Bonnet Stud	A193 Gr. B8
Body / Bonnet Nut	A194 Gr.8
Identification Plate	Series 300 SST

1) CF3M for weld end bodies.

Design Specifications

Item	Applicable Specification
Wall thickness	ASME B16.34
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
Flanged ends	ASME B16.5
Buttweld ends	ASME B16.25
Materials	ASTM

DESIGN FEATURES:

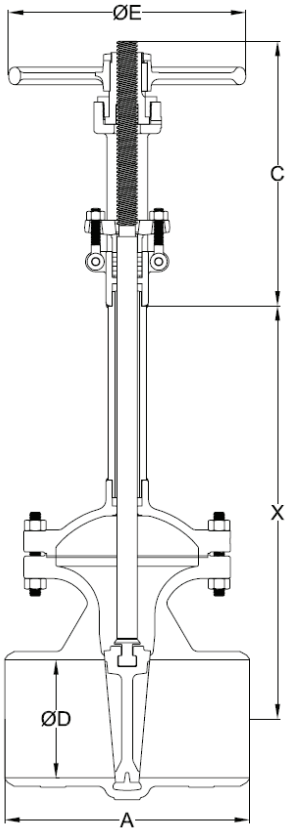
- **Seat face:** Ground and lapped to a smooth finish.
- **Flexible Wedge** with low center stem – wedge contact. Wedge is ground and lapped to a smooth finish and closely guided to prevent dragging and seat damage.
- **Non-rotating stem** with precision ACME threads and burnished finish. Double ACME threads for faster operation.
- **Body and bonnet joint** accurately machined.
- **Each** valve is shell, seat and backseat pressure tested.
- **Valves** are specially cleaned and processed for oxygen or cryogenic service and are then sealed to prevent contamination.
- **Bonnet** chamber ventilation, in order to prevent excess pressure build up caused by trapped cryogenic liquids, is available upon request.
- **Yoke** bushing can be lubricated to minimize friction and prolong life of the stem.
- **Body and bonnet** castings are precision machined.
- **Gland** has two-piece construction for easy alignment.
- **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
  -Alternate trim materials
  -Non-extended design
  -Other options available as specified

NOTE: Powell reserves the right to convert threaded ends to socket weld. Remnant of threads will exist as pipe stop behind socket bore.

GATE VALVE DIMENSIONS (CLASSES 150-300)

SIZE	ASME 150											ASME 300									
in	A		C	D	E	X (1)	WT	lb	WT	lb	C_V	A	C	D	E	X (1)	WT	lb	WT	lb	C_V
mm	FE	WE					FE	kg	WE	kg							FE	kg	WE	kg	
8	11.50	16.50	25.1	8.00	14.0	28.0	266		225		4490	16.50	27.0	8.00	16.0	28.0	427		394		4490
200	292	419	638	203	356	711	121		102			419	686	203	406	711	194		179		
10	13.00	18.00	30.6	10.00	16.0	32.0	433		362		7000	18.00	31.9	10.00	20.0	32.0	687		631		7000
250	330	457	778	254	406	813	196		164			457	810	254	508	813	312		286		
12	14.00	19.75	37.3	12.00	18.0	36.0	575		560		10500	19.75	37.3	12.00	20.0	36.0	981		941		10500
300	356	502	946	305	457	914	261		254			502	946	305	508	914	445		427		

(1) Other extensions available.
Consult Powell Engineering.

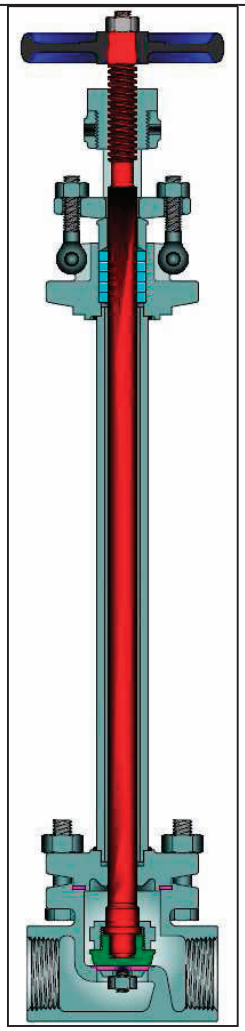


Weld End Design

C = Bottom of yoke flange to top open
X = Center to bottom of yoke flange (Std)

FE = Flanged ends
WE = Buttweld ends
WT = Weight
C_V = Flow coefficient

ASME B16.34 GLOBE VALVES
BOLTED BONNET, ASME CLASS 200-600
¼" to 2" (6 TO 50 mm), THREADED OR SOCKET WELD ENDS
CAST STAINLESS STEEL



STANDARD MATERIALS (Other materials available)

PART	MATERIALS
Body	A351 Gr. CF3M
Bonnet	A351 Gr. CF8M
Yoke	A351 Gr. CF8M
Disc or Disc Holder (2)	A276 316
Disc Insert (2)	PCTFE
Disc Washer (2)	SST 316
Disc Insert Nut (2)	A194 Gr. 8
Disc Locknut	A276 316
Stem	A276 316
Gland Flange	A351 Gr. CF8
Eye Bolt	A193 Gr. B8
Eye Bolt Nut	A194 Gr. 8
Gland	A276 316
Packing	PTFE
Gasket	Graphite
Extension Column	SST 304
Hand Wheel	Malleable Iron or Steel
Hand Wheel Nut	Steel
Stem Bushing	A582 416
Body / Bonnet Bolt	A193 Gr. B8
Body / Bonnet Nut	A194 Gr.8
Set Screw	Steel
Identification Plate	Series 300 SST

1) See pages 33-34 for flanged and buttweld designs.
2) Soft seat design.

Class	Figure Number
150	2474
300	2447 (1)
600	1983 (1)

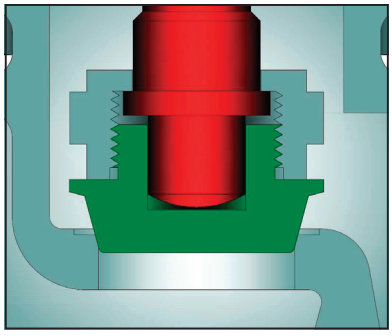
Design Specifications

Item	Applicable Specification
Wall thickness	ASME B16.34
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
End Threads-NPT	ASME B1.20.1
Socket Weld Ends	ASME B16.11
Materials	ASTM

DESIGN FEATURES:

- **Seat face:** Ground and lapped to a smooth finish.
- **Body and bonnet joint** accurately machined.
- **Swivel** disc for optimal seating and longer seat life .
- **Stems** are rotating / rising design.
- **Each** valve is shell, seat and backseat pressure tested.
- **Body and bonnet** castings are precision machined.
- **Gland** has two-piece construction for easy alignment.
- **Valves** are specially cleaned and processed for oxygen or cryogenic service and are then sealed to prevent contamination.
- **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
  -Alternate trim materials
  -Non-extended design
  -Other options available as specified

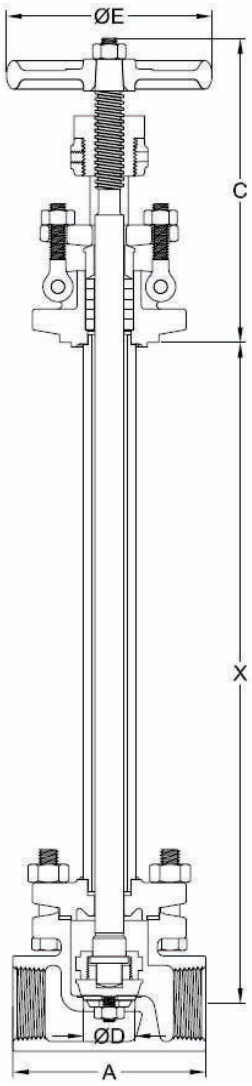
NOTE: Powell reserves the right to convert threaded ends to socket weld when needed, which will result in thread remnants as pipe stop.



Metal Disc

GLOBE VALVE DIMENSIONS (CLASSES 200-600)

SIZE	ASME 200								ASME 300							
in / mm	A	C	D	E	X (1)	WT	lb / kg	C_V	A	C	D	E	X (1)	WT	lb / kg	C_V
¼	2.88	5.5	0.50	3.0	12.0	5.3		2.5	2.88	5.5	0.50	3.0	12.0	5.4		2.5
7	73	140	13	76	305	2.4			73	140	13	76	305	2.4		
⅜	2.88	5.5	0.50	3.0	12.0	5.3		2.5	2.88	5.5	0.50	3.0	12.0	5.4		2.5
10	73	140	13	76	305	2.4			73	140	13	76	305	2.4		
½	2.88	5.5	0.50	3.0	12.0	5.3		2.5	2.88	5.5	0.50	3.0	12.0	5.6		2.5
13	73	140	13	76	305	2.4			73	140	13	76	305	2.5		
¾	3.25	5.9	0.75	3.5	12.0	6.1		5.8	3.25	5.9	0.75	3.5	12.0	6.2		5.8
20	83	149	19	89	305	2.8			83	149	19	89	305	2.8		
1	3.75	6.5	1.00	4.0	13.0	9.8		10.7	3.75	6.5	1.00	4.0	13.0	10.2		10.7
25	95	165	25	102	330	4.4			95	165	25	102	330	4.6		
1½	5.50	7.6	1.50	5.0	13.0	18.3		25	5.50	7.6	1.50	5.0	13.0	23.7		25
38	140	194	38	127	330	8.3			140	194	38	127	330	10.8		
2	6.00	8.2	2.00	6.0	14.0	25.9		50	6.00	8.2	2.00	6.0	14.0	31.9		50
50	152	208	51	152	356	11.7			152	208	51	152	356	14.5		



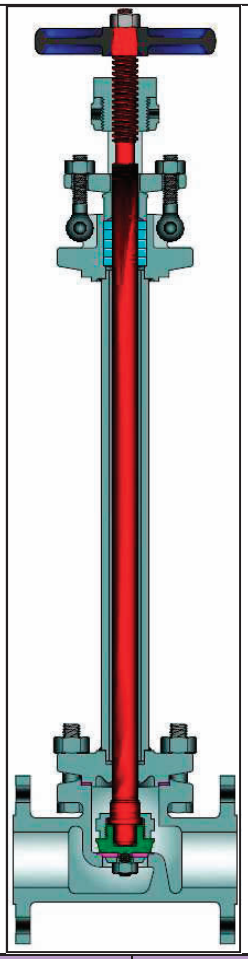
SIZE	ASME 600							
in / mm	A	C	D	E	X (1)	WT	lb / kg	C_V
½	2.88	5.5	0.50	3.0	12.0	5.5		2.5
13	73	140	13	76	305	2.5		
¾	3.25	5.9	0.75	3.5	12.0	6.4		5.8
20	83	149	19	89	305	2.9		
1	3.75	6.6	1.00	5.0	13.0	10.5		10.7
25	95	167	25	127	330	4.8		
1½	5.63	8.1	1.50	7.0	13.0	27.1		25
38	143	206	38	178	330	12.3		
2	6.25	9.1	2.00`	8.0	14.0	54.4		50
50	159	232	51	203	356	24.7		

(1) Other extensions available. Consult Powell Engineering.

C = Bottom of yoke flange to top open
X = Center to bottom of yoke flange (Std)

WT = Weight
C_V = Flow coefficient

ASME B16.34 GLOBE VALVES
BOLTED BONNET, ASME CLASS 150-600
½" TO 4" (13 TO 100 mm), FLANGED OR BUTTWELD ENDS
CAST STAINLESS STEEL



Class	Figure Number
150	2475
300	2447 (3)
600	1983 (3)

STANDARD MATERIALS (Other materials available)

PART	MATERIALS
Body	A351 Gr. CF8M (1)
Bonnet	A351 Gr. CF8M
Yoke	A351 Gr. CF8M
Disc or Disc Holder (2)	A276 316
Disc Insert (2)	PCTFE
Disc Washer (2)	SST 316
Disc Insert Nut (2)	SST 316
Disc Locknut	A276 316
Stem	A276 316
Gland Flange	A351 Gr. CF8M
Eye Bolt	A193 Gr. B8
Eye Bolt Nut	A194 Gr. 8
Gland	A276 316
Packing	PTFE
Gasket	Graphite
Extension Column	SST 304
Hand Wheel	Malleable Iron or Steel
Hand Wheel Nut	Steel
Stem Bushing	A582 416
Body / Bonnet Bolt	A193 Gr. B8
Body / Bonnet Nut	A194 Gr.8
Set Screw	Steel
Identification Plate	Series 300 SST

1) CF3M for weld end bodies.
2) Soft seat design.
3) See pages 31-32 for threaded and socketweld designs.

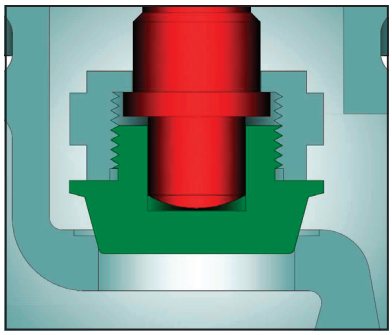
Design Specifications

Item	Applicable Specification
Wall thickness	ASME B16.34
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
Flanged ends	ASME B16.5
Buttweld ends	ASME B16.25
Materials	ASTM

DESIGN FEATURES:

- **Seat face:** Ground and lapped to a smooth finish.
- **Body and bonnet joint** accurately machined.
- **Swivel** disc for optimal seating and longer seat life .
- **Stems** are rotating / rising design.
- **Each** valve is shell, seat and backseat pressure tested.
- **Body and bonnet** castings are precision machined.
- **Gland** has two-piece construction for easy alignment.
- **Valves** are specially cleaned and processed for oxygen or cryogenic service and are then sealed to prevent contamination.
- **Weld** ends are available per ASME B16.25 or per customer's specification.
- **Flanges:**
  Classes 150-300: 1/16" raised face.
  Class 600: 1/4" raised face.
  Finish 125-250 AARH for all valves.
- **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
  -Alternate trim materials
  -Non-extended design.
  -Other options available as specified

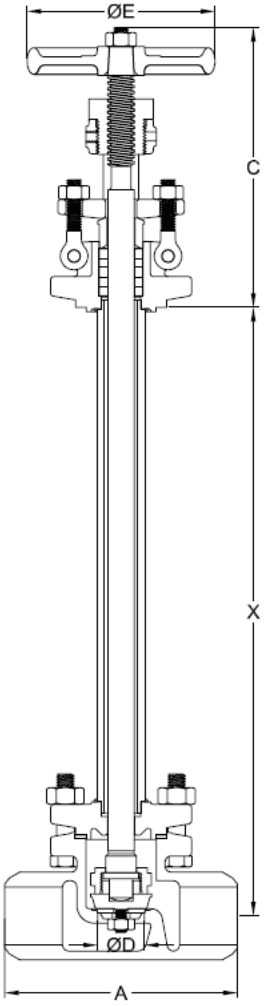
NOTE: Powell reserves the right to convert threaded ends to socket weld when needed, which will result in thread remnants as pipe stop.



Metal Disc

GLOBE VALVE DIMENSIONS (CLASSES 150-600)

SIZE	ASME 150										ASME 300									
in / mm	A	C	D	E	X (1)	WT FE	lb kg	WT WE	lb kg	C_V	A	C	D	E	X (1)	WT FE	lb kg	WT WE	lb kg	C_V
½	4.25	5.5	0.50	3.5	12.0	6.8		5.3		2.5	6.00	5.5	0.50	3.5	12.0	8.3		5.6		2.5
13	108	140	13	89	305	3.1		2.4			152	140	13	89	305	3.8		2.5		
¾	4.62	5.9	0.75	4.0	12.0	8.1		6.1		5.8	7.00	5.9	0.75	4.0	12.0	12.9		6.2		5.8
19	117	149	19	102	305	3.7		2.8			178	149	19	102	305	5.9		2.8		
1	5.00	6.5	1.00	4.5	13.0	12.4		9.8		10.7	8.00	6.5	1.00	4.5	13.0	16.2		10.2		10.7
25	127	165	25	114	330	5.6		4.4			203	165	25	114	330	7.3		4.6		
1½	6.50	7.6	1.50	6.0	13.0	24.6		18.3		25	9.00	7.6	1.50	6.0	13.0	29.9		23.7		25
38	165	194	38	152	330	11.2		8.3			229	194	38	152	330	13.6		10.8		
2	8.00	8.2	2.00	7.0	14.0	35.6		25.9		50	10.50	8.2	2.00	7.0	14.0	40.2		31.9		50
50	203	208	51	178	356	16.1		11.7			267	208	51	178	356	18.2		14.5		
2½	8.50	9.1	2.50	7.0	14.0	53		45		75	11.50	9.1	2.50	7.0	14.0	78		64		75
65	216	232	64	178	356	24		20			292	232	64	178	356	35		29		
3	9.50	10.3	3.00	7.0	14.0	98		82		110	12.50	10.3	3.00	9.0	14.0	128		106		110
80	241	262	76	178	356	44		37			318	262	76	229	356	58		48		
4	11.50	13.7	4.00	9.0	16.0	143		116		200	14.00	14.4	4.00	10.0	16.0	173		140		200
100	292	348	102	229	406	65		53			356	365	102	254	406	78		64		



Weld End Design

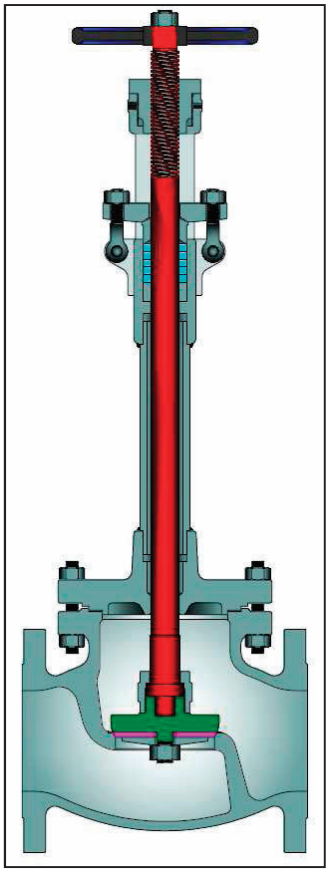
SIZE	ASME 600									
in / mm	A	C	D	E	X (1)	WT FE	lb kg	WT WE	lb kg	C_V
½	6.50	5.5	0.50	3.5	12.0	9.9		5.6		2.5
13	165	140	13	89	305	4.5		2.5		
¾	7.50	5.9	0.75	4.0	12.0	14.4		6.4		5.8
19	190	149	19	102	305	6.5		2.9		
1	8.50	6.6	1.00	5.0	13.0	19.6		10.5		10.7
25	216	167	25	127	330	8.9		4.8		
1½	9.50	8.1	1.50	7.0	13.0	41.9		27.1		25
38	241	206	38	178	330	19.0		12.3		
2	11.50	9.1	2.00	8.0	14.0	72.4		54.4		50
50	292	232	51	203	356	32.8		24.7		

(1) Other extensions available. Consult Powell Engineering.

C = Bottom of yoke flange to top open
X = Center to bottom of yoke flange (Std)

FE = Flanged ends
WE = Buttweld ends
WT = Weight
C_V = Flow coefficient

ASME B16.34 GLOBE VALVES
BOLTED BONNET, ASME CLASS 150-300
6" to 12" (150 TO 300 mm), FLANGED OR BUTTWELD ENDS
CAST STAINLESS STEEL



Class	Figure Number
150	2475
300	2447

DESIGN FEATURES:

- **Seat face:** Ground and lapped to a smooth finish.
- **Body and bonnet joint** accurately machined.
- **Swivel** disc for optimal seating and longer seat life.
- **Stems** of hand wheel operated design are rotating / rising design.
- **Each** valve is shell, seat and backseat pressure tested.
- **Integral** seats are standard. Renewable seat rings available on special order
- **Gland** has two-piece construction for easy alignment.
- **Weld** ends are available per ASME B16.25 or per customer's specification.
- **Flanges:**
  Classes 150-300: 1/16" raised face.
  Finish 125-250 AARH for all valves.

STANDARD MATERIALS (Other materials available)

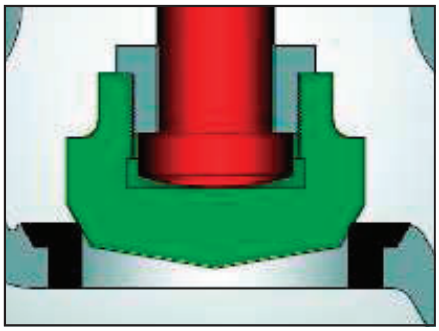
PART	MATERIALS
Body	A351 Gr. CF8M (1)
Bonnet	A351 Gr. CF8M
Yoke	A351 Gr. CF8M
Disc or Disc Holder (2)	A276 316
Disc Insert (2)	PCTFE
Disc Washer (2)	SST 316
Disc Insert Nut (2)	A194 Gr. 8
Disc Locknut	A276 316
Stem	A276 316
Stem Bushing	A439 D-2
Gland Flange	A351 Gr. CF8
Eye Bolt	A193 Gr. B8
Eye Bolt Nut	A194 Gr.8
Gland	A276 316
Packing	PTFE
Packing Washer / Packing Spacer	A276 316
Gasket	Graphite
Extension Column	SST 304
Hand Wheel	Malleable Iron or Steel
Hand Wheel Nut	Steel
Body / Bonnet Stud	A193 Gr. B8
Body / Bonnet Nut	A194 Gr.8
Identification Plate	Series 300 SST

1) CF3M for weld end bodies.
2) Soft seat design.

Design Specifications

Item	Applicable Specification
Wall thickness	ASME B16.34
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

- **Valves** are specially cleaned and processed for oxygen or cryogenic service and are then sealed to prevent contamination.
- **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.
- **Heavier** walled API 600 design available.
- **Other** available options as follows:
  -Alternate valve materials
  -Alternate trim materials
  -Non-extended design
  -Other options available as specified

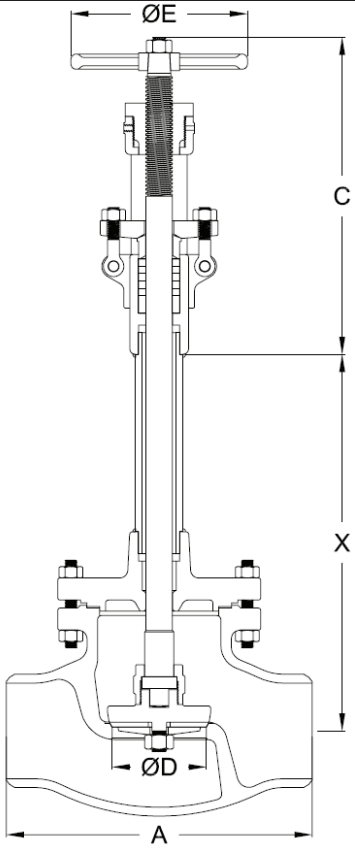


Metal Disc

GLOBE VALVE DIMENSIONS (CLASSES 150-300)

SIZE	ASME 150										ASME 300									
in mm	A	C	D	E	X (1)	WT FE	lb kg	WT WE	lb kg	C_V	A	C	D	E	X (1)	WT FE	lb kg	WT WE	lb kg	C_V
6	16.00	18.5	6.00	15.8	20.0	241		197		480	17.50	18.5	6.00	17.7	20.0	352		283		480
150	406	470	152	400	508	109		89			445	470	152	450	508	160		128		
8	19.50	18.5	8.00	17.7	24.0	266		225		880	See Powell Engineering for More Information									
200	495	470	203	450	610	121		102												
10	24.50	19.5	10.00	21.7	28.0	433		362		1370										
250	622	495	254	550	711	196		164												
12	27.50	25.6	12.00	23.6	28.0	575		560		2050										
300	699	650	305	600	711	261		254												

(1) Other extensions available.
Consult Powell Engineering.

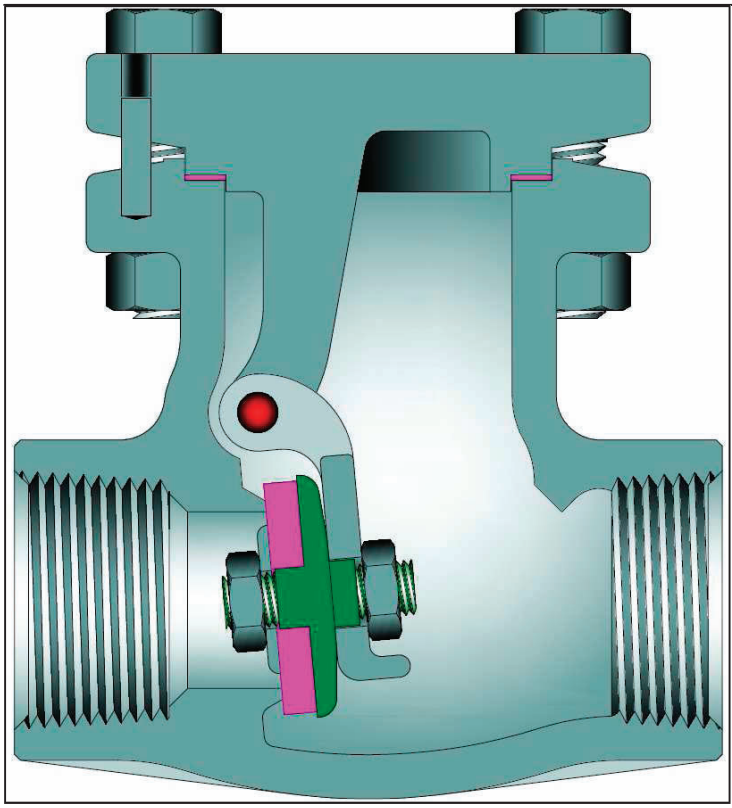


C = Bottom of yoke flange to top open
X = Center to bottom of yoke flange (Std)

FE = Flanged ends
WE = Buttweld ends
WT = Weight
C_V = Flow coefficient

Weld End Design

ASME B16.34 WALL SWING CHECK VALVES
BOLTED BONNET, CLASS 200-600
¼ to 2" (6 TO 50 mm), THREADED OR SOCKET WELD ENDS
CAST STAINLESS STEEL



STANDARD MATERIALS
(Other materials available)

PART	MATERIALS
Body	A351 Gr. CF3M
Cap	A351 Gr. CF8M
Disc or Disc Holder (2)	A276 316 or A351 CF8M
Disc Insert (2)	PCTFE
Disc Washer (2)	SST 316
Disc Insert Nut (2)	SST 316
Gasket	Graphite
Carrier	A351 Gr. CF8M
Carrier Pin	A276 316
Disc Nut	SST 316
Body / Cap Stud	A193 Gr. B8
Body / Cap Nut	A194 Gr.8
Locating Pin	SST
Identification Plate	Series 300 SST

Class	Figure Number
200	2341
300	2346 (1)
600	2350 (1)

1) See pages 39-40 for flanged and butt weld designs.
2) Soft seat design.

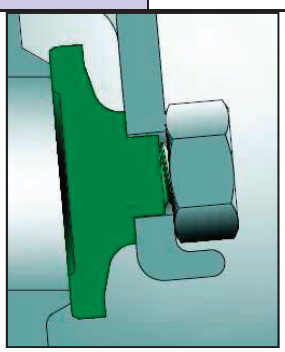
DESIGN FEATURES:

- **Integral Seats**
- **Swivel disc** for improved seat alignment and longer life.
- **Each** valve is shell and seat pressure tested.
- **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. This eliminates potential leak path with side plug design.
- **Disc** suspended from valve cap and without side plugs.
- **Cap** has a male and female joint.
- **Valves** are specially cleaned and processed for oxygen or cryogenic service and are then sealed to prevent contamination.
- **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
  -Alternate trim materials
  -Special cleaning for applications such as oxygen or chlorine

NOTE: Powell reserves the right to convert threaded ends to socket weld, which will result in thread remnants as pipe stop.

Design Specifications

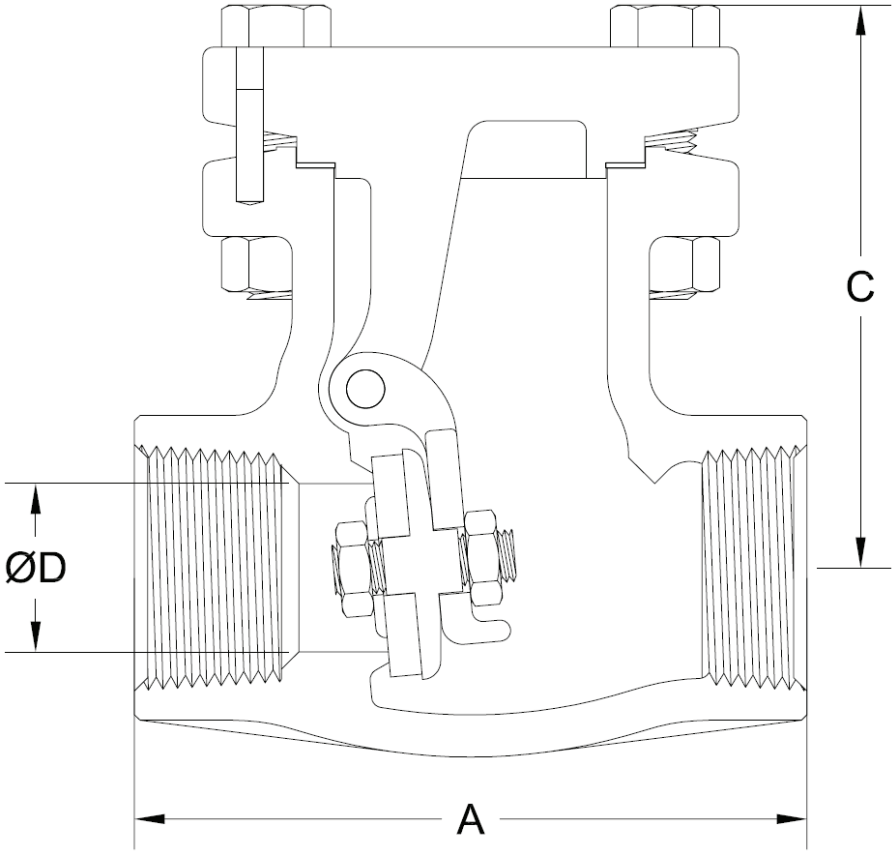
Item	Applicable Specification
Wall thickness	ASME B16.34
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
End Threads-NPT	ASME B1.20.1
Socket Weld Ends	ASME B16.11
Materials	ASTM



Metal Disc

SWING CHECK VALVE DIMENSIONS (CLASS 200-300)

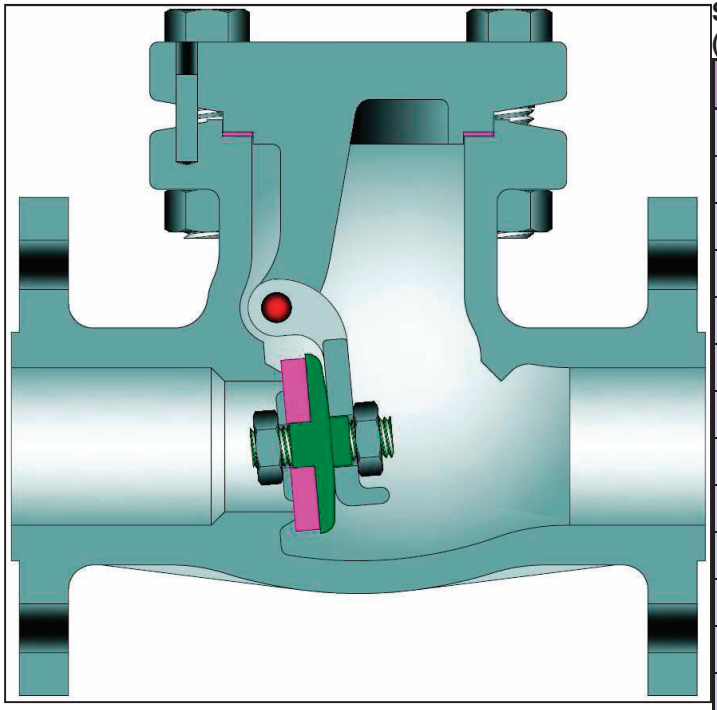
SIZE	ASME 200						ASME 300					
in / mm	A	C	D	WT	lb / kg	C_V	A	C	D	WT	lb / kg	C_V
¼	2.75	2.2	0.44	2.1		3.0	2.75	2.2	0.44	2.1		3.0
6	70	55	11	1.0			70	55	11	1.0		
⅜	2.75	2.2	0.44	2.1		3.0	2.75	2.2	0.44	2.1		3.0
10	70	55	11	1.0			70	55	11	1.0		
½	2.75	2.2	0.44	2.1		3.0	2.75	2.2	0.44	2.1		3.0
13	70	55	11	1.0			70	55	11	1.0		
¾	3.75	3.0	0.75	3.3		9.2	3.75	3.0	0.75	4.4		9.2
19	95	76	19	1.5			95	76	19	2.0		
1	4.00	3.4	1.00	4.9		17	4.00	3.4	1.00	6.1		17
25	102	86	25	2.2			102	86	25	2.8		
1¼	4.75	3.4	1.25	7.3		27	4.75	3.4	1.25	8.5		27
32	121	86	32	3.3			121	86	32	3.9		
1½	5.50	4.1	1.50	10.6		40	5.50	4.1	1.50	10.6		40
38	140	103	38	4.8			140	103	38	4.8		
2	6.00	4.6	2.00	15.5		75	6.00	4.6	2.00	15.5		75
50	152	116	51	7.0			152	116	51	7.0		



C = Center to top

WT = Weight
C_V = Flow coefficient

ASME B16.34 WALL SWING CHECK VALVES
BOLTED BONNET, CLASS 150-300
½" TO 8" (13 TO 200 mm), FLANGED OR BUTTWELD ENDS
CAST STAINLESS STEEL



Class	Figure Number
150	2342
300	2346 (1)

STANDARD MATERIALS
(Other materials available)

PART	MATERIALS
Body	A351 Gr. CF8M (3)
Cap	A351 Gr. CF8M
Disc or Disc Holder (2)	A276 316 or A351 CF8M
Disc Insert (2)	PCTFE
Disc Washer (2)	SST 316
Disc Insert Nut (2)	SST 316
Gasket	Graphite
Carrier	A351 Gr. CF8M
Carrier Pin	A276 316
Disc Nut	SST 316
Body / Cap Stud	A193 Gr. B8
Body / Cap Nut	A194 Gr.8
Locating Pin	SST
Identification Plate	Series 300 SST

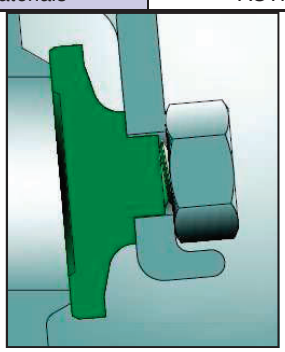
1) See pages 37-38 for threaded and socket weld designs.
2) Soft seat design.
3) CF3M for weld end bodies.

DESIGN FEATURES:

- **Integral Seats**
- **Swivel disc** for improved seat alignment and longer life.
- **Each** valve is shell and seat pressure tested.
- **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. This eliminates potential leak path with side plug design.
- **Disc** suspended from valve cap and without side plugs.
- **Cap** has a male and female joint.
- **Weld** ends are available per ASME B16.25 or per customer's specification.
- **Flanges:**
  Classes 150-300: 1/16" raised face.
  Finish 125-250 AARH for all valves.
- **Valves** are specially cleaned and processed for oxygen or cryogenic service and are then sealed to prevent contamination.
- **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
  -Alternate trim materials
  -Special cleaning for applications such as oxygen or chlorine

Design Specifications

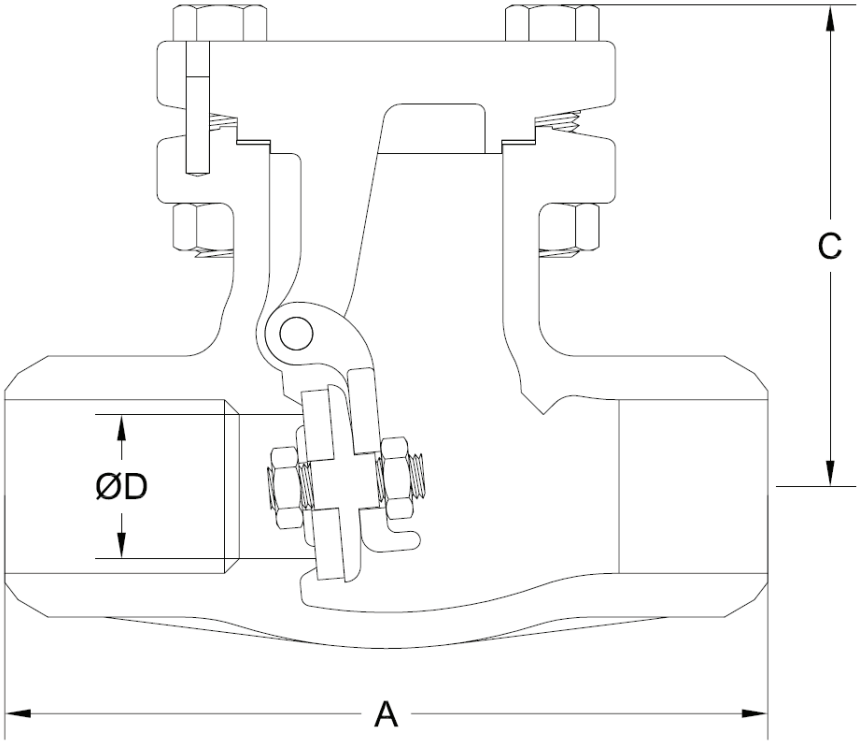
Item	Applicable Specification
Wall thickness	ASME B16.34
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
Flanged ends	ASME B16.5
Buttweld ends	ASME B16.25
Materials	ASTM



Metal Disc

SWING CHECK VALVE DIMENSIONS (CLASS 150-300)

SIZE	ASME 150								ASME 300							
in	A	C	D	WT	lb	WT	lb	C_V	A	C	D	WT	lb	WT	lb	C_V
mm				FE	kg	WE	kg					FE	kg	WE	kg	
½	4.25	2.2	0.50	3.6		2.1		3.9	6.00	2.2	0.50	7.0		2.1		3.9
13	108	55	13	1.6		1.0			152	55	13	3.2		1.0		
¾	4.62	3.0	0.75	5.3		3.3		9.2	7.00	3.0	0.75	12.5		3.3		9.2
20	117	76	19	2.4		1.5			178	76	19	5.7		1.5		
1	5.00	3.4	1.00	7.5		4.9		17	8.50	3.4	1.00	18.0		4.9		17
25	127	86	25	3.4		2.2			216	86	25	8.2		2.2		
1½	6.50	4.1	1.50	14.6		10.6		40	9.50	4.1	1.50	30.0		10.6		40
38	165	103	38	6.6		4.8			241	103	38	13.6		4.8		
2	8.00	4.6	2.00	24.0		15.5		75	10.50	4.6	2.00	39.0		15.5		75
50	203	116	51	10.9		7.0			267	116	51	17.7		7.0		
2½	8.50	5.6	2.50	33		30		120	11.50	5.6	2.50	45		34		120
65	216	142	170	17		15			292	142	170	22		17		
3	9.50	5.8	3.00	38		37		175	12.50	5.8	3.00	73		52		175
80	241	148	192	19		18			318	148	192	36		26		
4	11.50	6.5	4.00	69		51		315	14.00	6.5	4.00	92		69		315
100	292	165	213	34		25			356	164	213	46		34		
6	14.00	8.2	6.00	119		94		760	17.50	8.6	6.00	172		124		760
150	356	208	273	59		46			444	218	299	85		61		
8	19.50	10.1	8.00	229		178		1390								
200	495	257	349	113		88										

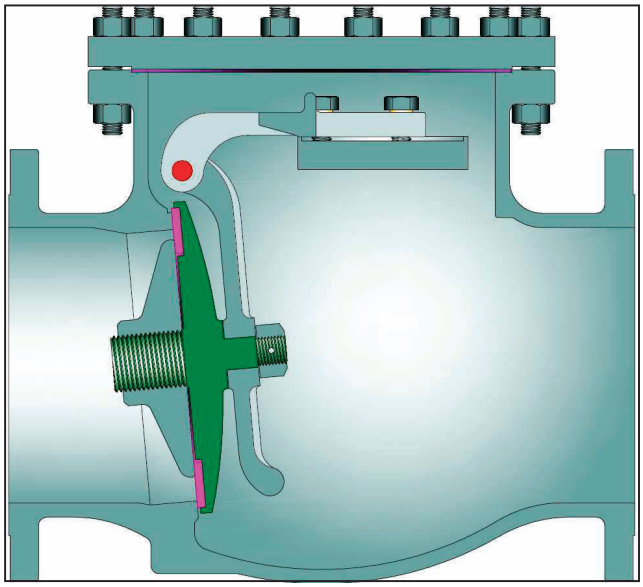


Weld End Design

C = Center to top

FE = Flanged ends
WE = Buttweld ends
WT = Weight
C_V = Flow coefficient

ASME B16.34 WALL SWING CHECK VALVES
BOLTED BONNET, CLASS 150
10" to 12" (250 TO 300 mm), FLANGED OR BUTTWELD ENDS
CAST STAINLESS STEEL



Class	Figure Number
150	2342

DESIGN FEATURES:

- **Integral Seats**
- **Swivel disc** for improved seat alignment and longer life.
- **Each** valve is shell and seat pressure tested.
- **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. This eliminates potential leak path with side plug design.
- **Cap** has a male and female joint.
- **Weld** ends are available per ASME B16.25 or per customer's specification.
- **Flanges:**
  Classes 150-300: 1/16" raised face.
  Finish 125-250 AARH for all valves.
- **Valves** are specially cleaned and processed for oxygen or cryogenic service and are then sealed to prevent contamination.
- **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
  -Alternate trim materials
  -Special cleaning for applications such as oxygen or chlorine

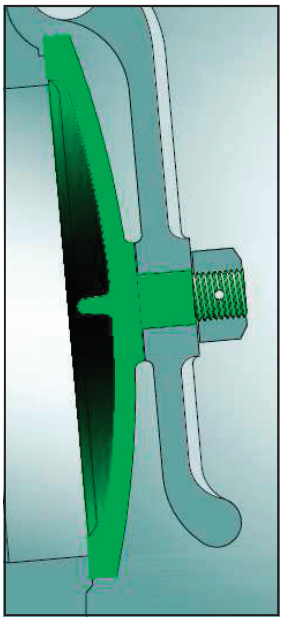
STANDARD MATERIALS (Other materials available)

PART	MATERIALS
Body	A351 Gr. CF8M (1)
Cap	A351 Gr. CF8M
Disc or Disc Holder (2)	A276 316 or A351 CF8M
Gasket	Graphite
Carrier	A351 Gr. CF8M
Carrier Pin	A276 316
Disc Nut	SST 316
Disc Insert (2)	PCTFE
Disc Insert Nut (2)	SST 316
Disc Carrier Hanger	A351 Gr. CF8M
Disc Carrier Hanger Bolts	A193 Gr. B8M
Body / Cap Stud	A193 Gr. B8
Body / Cap Nut	A194 Gr.8
Identification Plate	Series 300 SST

1) CF3M for weld end bodies.
2) Soft seat design.

Design Specifications

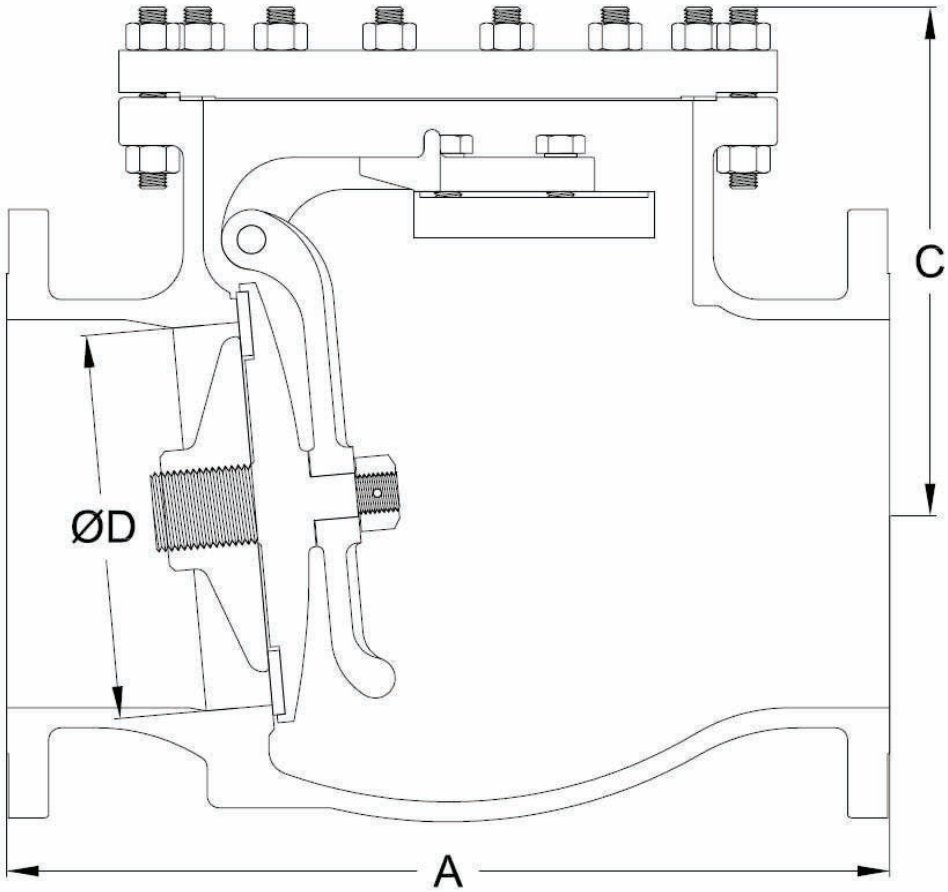
Item	Applicable Specification
Wall thickness	ASME B16.34
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
Flanged ends	ASME B16.5
Buttweld ends	ASME B16.25
Materials	ASTM



Metal Disc

SWING CHECK VALVE DIMENSIONS (CLASS 150)

SIZE	ASME 150							
in mm	A	C	D	WT FE	lb kg	WT WE	lb kg	C_V
10	24.50	14.2	10.00	448		348		2175
250	622	359	451	221		172		
12	27.50	15.6	12.00	648		504		3250
300	698	397	521	320		249		



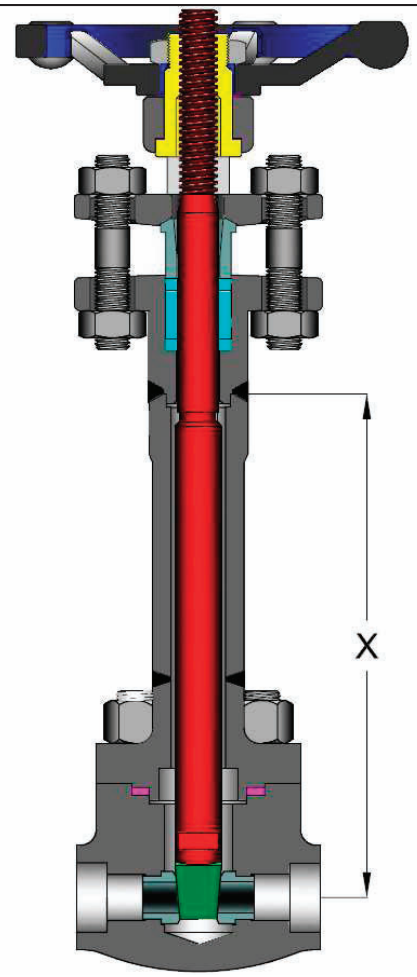
C = Center to top

FE = Flanged ends
WE = Buttweld ends
WT = Weight
C_V = Flow coefficient

Weld End Design

FORGED CRYOGENIC VALVES

Valves in cold service can present an engineering challenge because of the fragility of the packing at continuously low temperatures. To combat this, Powell Valves offers an assortment of cryogenic valves that all come standard with an extended bonnet and stem. These extensions help to keep the packing away from the low temperatures of the cryogenic fluid and thus function safely and efficiently.



Cryogenic Forged Gate Valve

Features:

- ⇒ All cryogenic valves are specially processed and carefully cleaned and degreased in specialized clean areas. They are then sealed to prevent contamination.
- ⇒ Cryogenic valves can serve in temperatures as low as –423° F.
- ⇒ Powell welcomes the development of custom designs needed to accommodate unique customer needs.
- ⇒ Extended bonnets and stems provide an adequate distance for the packing to maintain the safety, integrity and efficiency of the valve.
- ⇒ Powell also provides non-extended cryogenic valves, but recommends their use in only intermittent and non-extreme cold uses.
- ⇒ At the customers' request, Powell also offers gate valve bonnet chamber ventilation in order to prevent excess pressure build up caused by trapped cryogenic liquids.

Extension Lengths (X)														
		GATE VALVES							GLOBE VALVES					
	CLASS	SIZE (IN)							SIZE (IN)					
		¼	⅜	½	¾	1	1 ½	2	¼	⅜	½	¾	1	1 ½	2
English (IN)	150, 300, 600, and 800	13	13	13	13	14	14	16	12	12	12	12	13	13	14
	1500 and 2500	See Powell Engineering							See Powell Engineering						
Metric (MM)	CLASS	SIZE (MM)							SIZE (MM)						
		6	10	13	19	25	38	50	6	10	13	19	25	38	50
	150, 300, 600, and 800	330	330	330	330	356	356	406	305	305	305	305	330	330	356
	1500 and 2500	See Powell Engineering							See Powell Engineering						

The quality and benefits expected of all Powell valves are extended and preserved with its forged line.

For more dimensional information, see Powell Forged Catalog.

CAST STEEL EXTENDED BONNET VALVES

Some situations require the extra height provided by cryogenic valves, without being in low temperature services. Knowing this, Powell Valves offers its cast carbon and low alloy steel gate and globe valves with the option of extended bonnets.

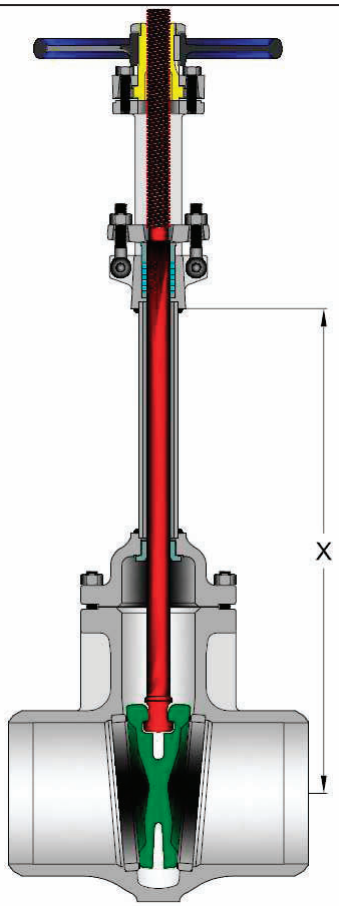
NOTE: Most carbon steels are not rated for service below –20° F, and thus should not be used in cryogenic services.

Features:

⇒ In cases where the valve is required to have extra cleaning for the service, Powell offers valves cleaned in the same manner as cryogenic valves.

⇒ Powell welcomes the development of custom designs needed to accommodate unique customer needs.

⇒ Extended bonnets and stems help to position the handwheel as well as the gland flange to allow easier access for usage and maintenance when the valve is located in hard to reach positions.



Extended Bonnet Cast Steel Gate Valve

Extension Lengths (X)

		GATE VALVES										GLOBE VALVES							
	CLASS	SIZE (IN)										SIZE (IN)							
		1	1½	2	2½	3	4	6	8	10	12	2	2½	3	4	6	8	10	12
English (IN)	150, 300, and	14	14	16	19	19	20	24	28	32	36	14	14	14	16	20	24	28	28
	900 and 1500	See Powell Engineering										See Powell Engineering							
	CLASS	SIZE (MM)										SIZE (MM)							
		25	40	50	65	80	100	150	200	250	300	50	65	80	100	150	200	250	300
Metric (MM)	150, 300, and	356	356	406	483	483	508	610	711	813	914	356	356	356	406	508	610	711	711
	900 and 1500	See Powell Engineering										See Powell Engineering							

Other sizes available on request

For more dimensional information, see Powell Cast Steel Catalog.

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. Corrosion Resistant Steel and Bronze 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) ASME B16.5 → Pipe Flanges and Flanged Fittings

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

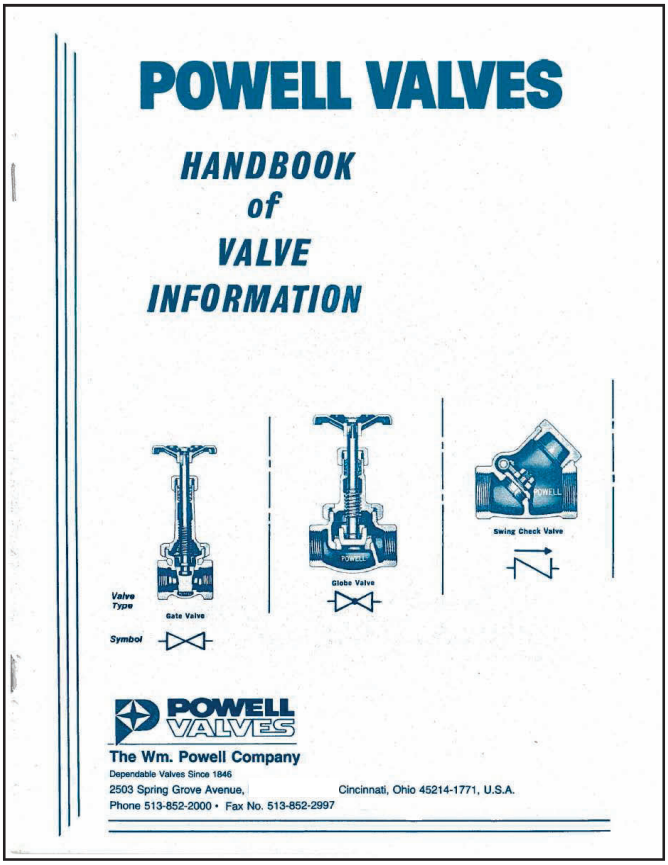
(D) ASME B16.25 → Buttwelding Ends

(E) MSS SP-80 → Bronze Gate, Globe, Angle and Check Valves

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 B61 AND B62 BRONZE

PRESSURE (c) - psig						
	MATERIAL					
	ASTM B-62			ASTM B-61		
PRESS. CLASS	CLASS 125	CLASS 150		CLASS 200	CLASS 300	
END CONN.	THD	THD	FLG (b)	THD	THD (e)	THD
TEMP. (a) °F						
-20 To 150	200	300	225	400	1000	600
200	185	270	210	375	920	560
250	170	240	195	350	830	525
300	155	210	180	325	740	490
350	140	180	165	300	650	450
400	--	--	--	275	560	410
406	125	150	150	--	--	--
450	120 (d)	145(d)	--	250	480	375
500	--	--	--	225	390	340
550	--	--	--	200	300	300

NOTES:

(a) For Bronze Cryogenic Valves, -20 °F ratings extend to –325 °F

(b) Pressure - Temperature Ratings—ASME B16.24

(c) Solder Joint Valve Ratings may be limited by the solder composition. See MSS SP-80 Paragraph 2.4 and Annex A for more information

(d) Some codes (i.e.-ASME BPVC, Section 1) limit the rating temperatures of the indicated material to 406 °F

(e) Alternate Ratings for valves sizes ⅛ - 2” having threaded ends and metal to metal union ring body-bonnet joints

PRESSURE/TEMPERATURE RATINGS

TABLE 2

ASTM A351 Grade CF3M (316L) (a)
ASTM A351 Grade CF8M (316) (b)

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

STANDARD CLASS

Working Pressures by Classes, psig								
Temperature, °F	150	200	300	600	900	1500	2500	4500
-20 to 100 (1)	275	400	720	1,440	2,160	3,600	6,000	10,800
200	235	360	620	1,240	1,860	3,095	5,160	9,290
300	215	330	560	1,120	1,680	2,795	4,660	8,390
400	195	300	515	1,025	1,540	2,570	4,280	7,705
500	170	270	480	955	1,435	2,390	3,980	7,165
600	140	240	450	900	1,355	2,255	3,760	6,770
650	125	230	440	885	1,325	2,210	3,680	6,625
700	110	215	435	870	1,305	2,170	3,620	6,515
750	95	205	425	855	1,280	2,135	3,560	6,410
800	80	190	420	845	1,265	2,110	3,520	6,335
850	65	180	420	835	1,255	2,090	3,480	6,265
900	50	170	415	830	1,245	2,075	3,460	6,230
950	35	150	385	775	1,160	1,930	3,220	5,795
1,000	20	130	365	725	1,090	1,820	3,030	5,450
1,050	20(2)	125	360	720	1,080	1,800	3,000	5,400
1,100	20(2)	115	305	610	915	1,525	2,545	4,575
1,150	20(2)	90	235	475	710	1,185	1,970	3,550
1,200	20(2)	75	185	370	555	925	1,545	2,775
1,250	20(2)	60	145	295	440	735	1,230	2,210
1,300	20(2)	50	115	235	350	585	970	1,750
1,350	20(2)	45	95	190	290	480	800	1,440
1,400	20(2)	35	75	150	225	380	630	1,130
1,450	20(2)	30	60	115	175	290	485	875
1,500	15(2)	25	40	85	125	205	345	620

NOTE: (1) The rating at –20° F extends down to –423° F for cryogenic valves.
(2) For welded end valves only. Flanged end ratings terminate at 1000° F.

SPECIAL CLASS

Working Pressures by Classes, psig							
Temperature, °F	150	300	600	900	1500	2500	4500
-20 to 100 (1)	290	750	1,500	2,250	3,750	6,250	11,250
200	265	690	1,380	2,075	3,455	5,760	10,365
300	240	625	1,250	1,870	3,120	5,200	9,360
400	220	575	1,145	1,720	2,865	4,775	8,600
500	205	535	1,065	1,600	2,665	4,440	7,995
600	195	505	1,005	1,510	2,520	4,195	7,555
650	190	495	985	1,480	2,465	4,105	7,395
700	185	485	970	1,455	2,425	4,040	7,270
750	185	475	955	1,430	2,385	3,975	7,150
800	180	470	945	1,415	2,355	3,930	7,070
850	180	465	930	1,400	2,330	3,885	6,990
900	180	465	925	1,390	2,315	3,860	6,950
950	175	460	915	1,375	2,290	3,815	6,870
1,000	160	420	840	1,260	2,105	3,505	6,310
1,050	160	420	840	1,260	2,105	3,505	6,310
1,100	145	380	765	1,145	1,905	3,180	5,720
1,150	115	295	590	885	1,480	2,465	4,435
1,200	90	230	465	695	1,155	1,930	3,470
1,250	70	185	370	555	920	1,535	2,765
1,300	55	145	290	435	730	1,215	2,185
1,350	45	120	240	360	600	1,000	1,800
1,400	35	95	190	285	470	785	1,415
1,450	30	75	145	220	365	605	1,095
1,500	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

PRESSURE/TEMPERATURE RATINGS

TABLE 3

ASTM A351 Grade CF3 (304L) (a)
ASTM A351 Grade CF8 (304) (b)

(a) Not to be used over 800° 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	275	720	1,440	2,160	3,600	6,000	10,800
200	230	600	1,200	1,800	3,000	5,000	9,000
300	205	540	1,075	1,615	2,690	4,480	8,065
400	190	495	995	1,490	2,485	4,140	7,450
500	170	465	930	1,395	2,330	3,880	6,985
600	140	440	885	1,325	2,210	3,680	6,625
650	125	430	865	1,295	2,160	3,600	6,480
700	110	420	845	1,265	2,110	3,520	6,335
750	95	415	825	1,240	2,065	3,440	6,190
800	80	405	810	1,215	2,030	3,380	6,085
850	65	395	790	1,190	1,980	3,300	5,940
900	50	390	780	1,165	1,945	3,240	5,830
950	35	380	765	1,145	1,910	3,180	5,725
1,000	20	355	710	1,065	1,770	2,950	5,315
1,050	20(1)	325	650	975	1,630	2,715	4,885
1,100	20(1)	255	515	770	1,285	2,145	3,855
1,150	20(1)	205	410	615	1,030	1,715	3,085
1,200	20(1)	165	330	495	825	1,370	2,470
1,250	20(1)	135	265	400	670	1,115	2,005
1,300	20(1)	115	225	340	565	945	1,695
1,350	20(1)	95	185	280	465	770	1,390
1,400	20(1)	75	150	225	380	630	1,130
1,450	20(1)	60	115	175	290	485	875
1,500	15(1)	40	85	125	205	345	620

NOTE: (1) 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	290	750	1,500	2,250	3,750	6,250	11,250
200	255	670	1,340	2,010	3,350	5,580	10,045
300	230	600	1,200	1,800	3,000	5,000	9,000
400	215	555	1,110	1,665	2,770	4,620	8,315
500	200	520	1,040	1,560	2,600	4,330	7,795
600	190	495	985	1,480	2,465	4,105	7,395
650	185	480	965	1,445	2,410	4,020	7,230
700	180	470	945	1,415	2,355	3,930	7,070
750	175	460	920	1,380	2,305	3,840	6,910
800	175	455	905	1,360	2,265	3,770	6,790
850	170	440	885	1,325	2,210	3,685	6,630
900	165	435	870	1,300	2,170	3,615	6,510
950	165	425	850	1,280	2,130	3,550	6,390
1,000	160	415	830	1,245	2,075	3,460	6,230
1,050	155	405	815	1,220	2,035	3,395	6,105
1,100	125	320	645	965	1,605	2,680	4,820
1,150	100	255	515	770	1,285	2,145	3,855
1,200	80	205	410	615	1,030	1,715	3,085
1,250	65	165	335	500	835	1,395	2,505
1,300	55	140	285	425	705	1,180	2,120
1,350	45	115	230	345	580	965	1,735
1,400	35	95	190	285	470	785	1,415
1,450	30	75	145	220	365	610	1,095
1,500	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 STAINLESS STEELS AND BRONZE

TABLE 4

ASTM STANDARD GRADE TYPE		A351 CF3 304L	A351 CF8 304	A351 CF3M 316L	A351 CF8M 316	ASTM B-61	ASTM B-62
CARBON (C)	(Min) (Max)	- 0.03	- 0.08	- 0.03	- 0.08	- -	- -
MANGANESE (Mn)	(Min) (Max)	- 1.50	- 1.50	- 1.50	- 1.50	- -	- -
PHOSPHOROUS (P)	(Min) (Max)	- 0.040	- 0.040	- 0.040	- 0.040	- 0.05	- 0.05
SULFUR (S)	(Min) (Max)	- 0.040	- 0.040	- 0.040	- 0.040	- 0.05	- 0.08
SILICON (Si)	(Min) (Max)	- 2.00	- 2.00	- 1.50	- 1.50	- 0.005	- 0.005
COPPER (Cu)	(Min) (Max)	- -	- -	- -	- -	86.0 90.0	84.0 86.0
NICKEL (Ni)	(Min) (Max)	8.0 12.0	8.0 11.0	9.0 13.0	9.0 12.0	- 1.0	- 1.0
CHROMIUM (Cr)	(Min) (Max)	17.0 21.0	18.0 21.0	17.0 21.0	18.0 21.0	- -	- -
MOLYBDENUM (Mo)	(Min) (Max)	- 0.50	- 0.50	2.0 3.0	2.0 3.0	- -	- -
TIN (Sn)	(Min) (Max)	- -	- -	- -	- -	5.5 6.5	4.0 6.0
ZINC (Zn)	(Min) (Max)	- -	- -	- -	- -	3.0 5.0	4.0 6.0
LEAD (Pb)	(Min) (Max)	- -	- -	- -	- -	1.0 2.0	4.0 6.0
ANTIMONY (Sb)	(Min) (Max)	- -	- -	- -	- -	- 0.25	- 0.25
ALUMINUM (Al)	(Min) (Max)	- -	- -	- -	- -	- 0.005	- 0.005
IRON (Fe)	(Min) (Max)	- -	- -	- -	- -	- 0.25	- 0.30
TENSILE STRENGTH	(Min)	70 Ksi	70 Ksi	70 Ksi	70 Ksi	34 Ksi	30 Ksi
YIELD STRENGTH	(Min)	30 Ksi	30 Ksi	30 Ksi	30 Ksi	16 Ksi	14 Ksi
ELONGATION	(Min)	35%	35%	30%	30%	24%	20%
TEMPERATURE	(Min)** (Max)	-425F 800F	-425F 1500F*	-425F 850F	-425F 1500F*	-325F 550F	-325F 450F

*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.

**For temperature below -50° F Special cryogenic cleaning may be required. For temperatures below -100° F, special cryogenic extensions may be required. See Cryogenic section of catalog for more information.

NOTE: Chemical Compositions Are In Units Of Percent

TRIM DESCRIPTIONS (c)

TABLE 5

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-Cr-A(b)	350	TYPE 304 (18Cr-8Ni)
16	6	Hardfaced	Co-Cr-A(b)	350	TYPE 316 (18Cr-8Ni-Mo)
17	7	Hardfaced	Co-Cr-A(b)	350	TYPE 347(18Cr-10Ni-Cb)
18	J	Hardfaced	Co-Cr-A(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	Hardfaced	-	Equal to Body
Integral	C	Equal to Body	Equal to Body	-	Equal to Body

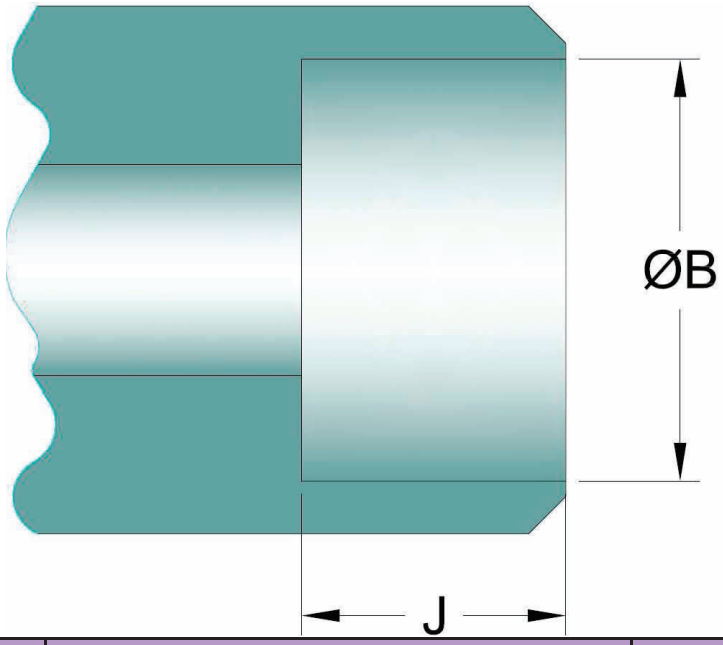
(a) Minimum 50HB differential hardness between mating seating surfaces

(b) Stellite 6 ™ or equal.

(c) Note: Not all trims listed in table are suitable for cryogenic service. Consult Powell engineering if assistance is needed in trim material selections.

SOCKET WELD END DIMENSIONS

TABLE 6



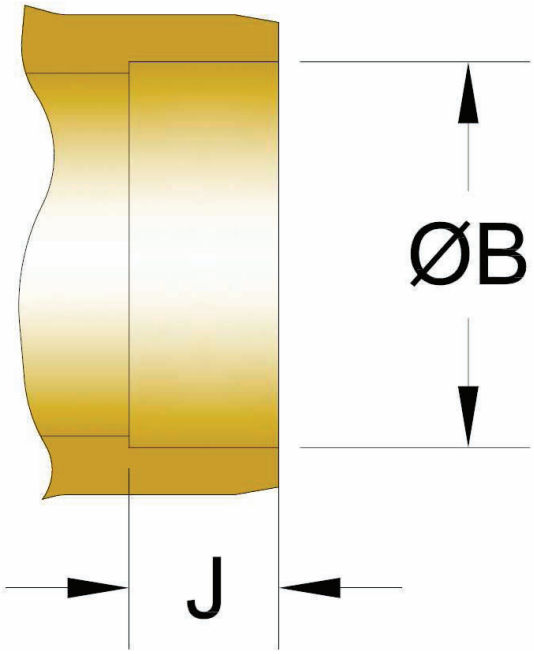
Data taken from tables 1 and I1 in ASME B16.11

Size	English (in)			Metric (mm)		
	Socket Bore Diameter (B)	Max / Min	Depth of Socket (J)	Socket Bore Diameter (B)	Max / Min	Depth of Socket (J)
¼	0.575		0.38	14.6		9.5
	0.555			14.2		
⅜	0.710		0.38	18.0		9.5
	0.690			17.6		
½	0.875		0.38	22.2		9.5
	0.855			21.8		
¾	1.085		0.50	27.6		12.5
	1.065			27.2		
1	1.350		0.50	34.3		12.5
	1.330			33.9		
1¼	1.695		0.50	43.1		12.5
	1.675			42.7		
1½	1.935		0.50	49.2		12.5
	1.915			48.8		
2	2.426		0.62	61.7		16.0
	2.406			61.2		

NOTE: Powell reserves the right to convert threaded ends to socket weld, which will result in thread remnants as pipe stop.

SILVER BRAZE TUBING END DIMENSIONS

TABLE 7



Size	English (in)			Metric (mm)		
	Socket Bore Diameter (B)	Max Min	Depth of Socket (J)	Socket Bore Diameter (B)	Max Min	Depth of Socket (J)
¼	0.381		0.27	9.7		6.9
	0.377			9.6		
⅜	0.506		0.31	12.9		7.9
	0.502			12.8		
½	0.631		0.38	16.0		9.7
	0.627			15.9		
¾	0.881		0.41	22.4		10.4
	0.877			22.3		
1	1.132		0.44	28.8		11.2
	1.128			28.7		
1½	1.633		0.63	41.5		16
	1.628			41.4		
2	2.133		0.66	54.2		16.8
	2.128			54.1		
2½	2.633		0.78	66.9		19.8
	2.628			66.8		
3	3.133		0.83	79.6		21.1
	3.128			79.5		

DIMENSIONS OF WROUGHT STEEL PIPE AND WELD END CONFIGURATIONS

TABLE 8

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 8 (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 8 (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

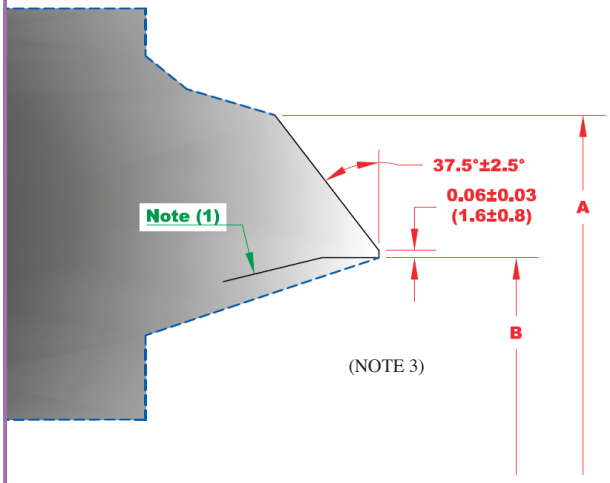
TABLE 8 (cont.)

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

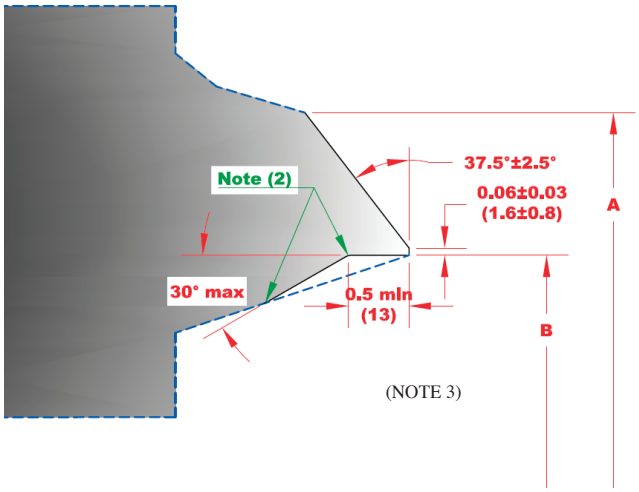
*SEE SKETCHES 1 AND 2

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

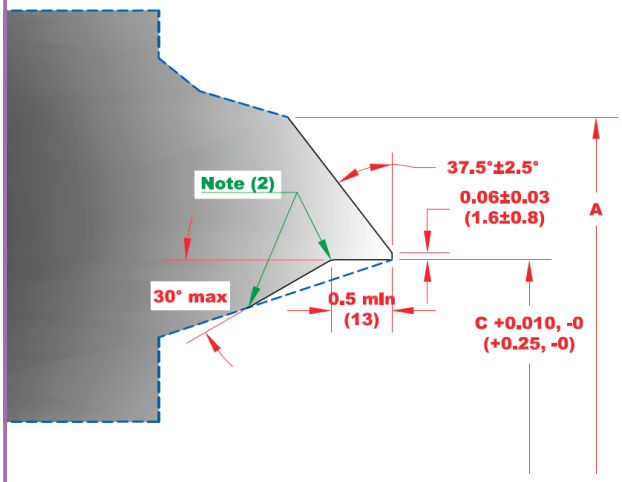
REFER TO ASME 16.25 FIG 2.



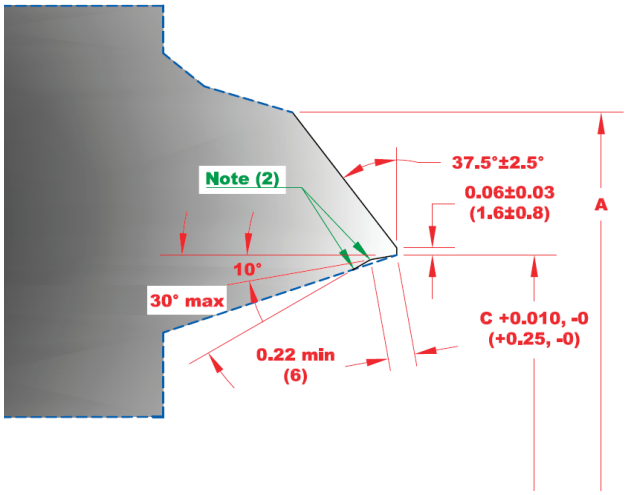
(a) Welding End Detail for Joint without Backing Ring



(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.

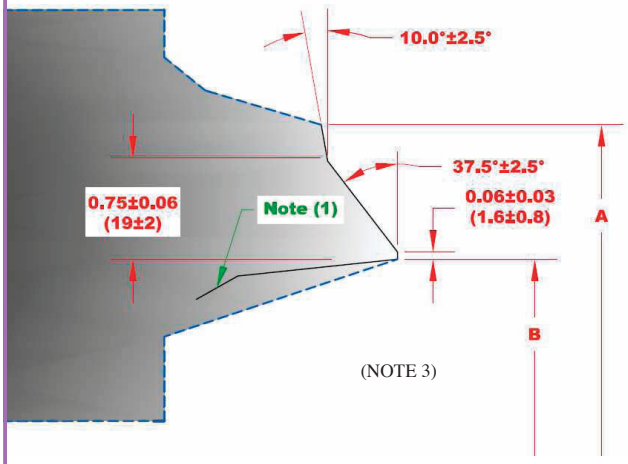
(2) Intersections should be slightly rounded.

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

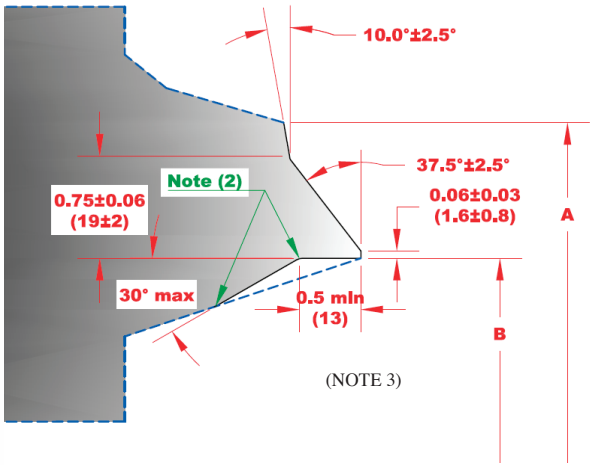
- ±0.03" (±1.0 mm) for NPS ≤ 10
- ±0.06" (±2.0 mm) for 12 ≤ NPS ≤ 18
- +0.12", -0.06" (+3.0 mm, -2.0 mm) for NPS ≥ 20

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

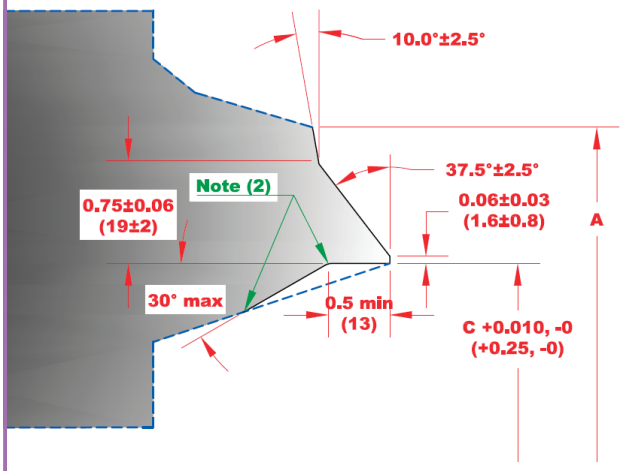
REFER TO ASME 16.25 FIG 3.



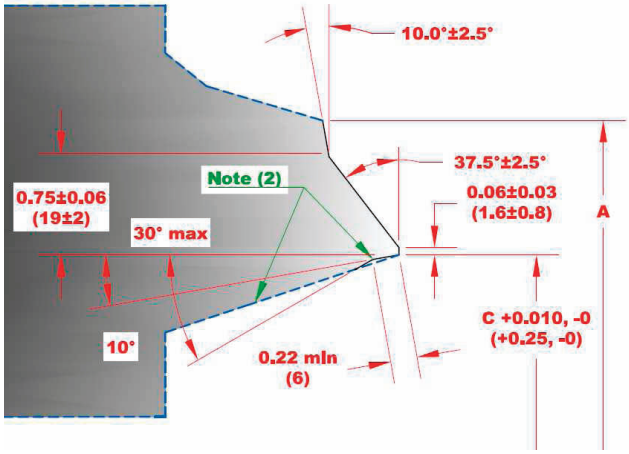
(a) Welding End Detail for Joint without Backing Ring



(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 fittings dimensions. Classes 600 and higher use flange dimensions.

For Reference Purposes the following Tables contain Flange Dimensions as described below:

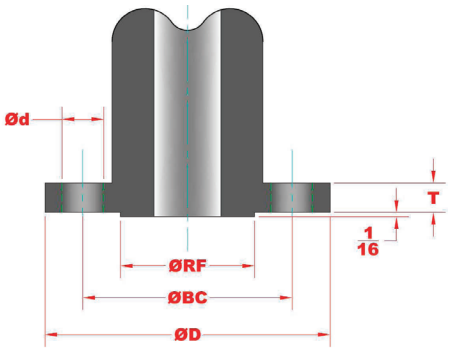
TABLE 9: ASME B16.5 CLASSES 150 and 300, Sizes ½" through 24"

TABLE 10: ASME B16.5 CLASSES 600, Sizes ½" through 24"

STEEL VALVE FLANGE FITTING DIMENSIONS

All Dimensions in Units of Inches

TABLE 9



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

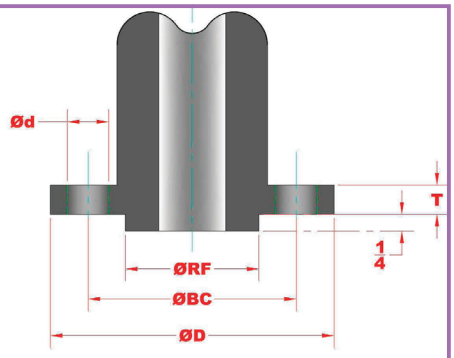
CLASS 300

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 10

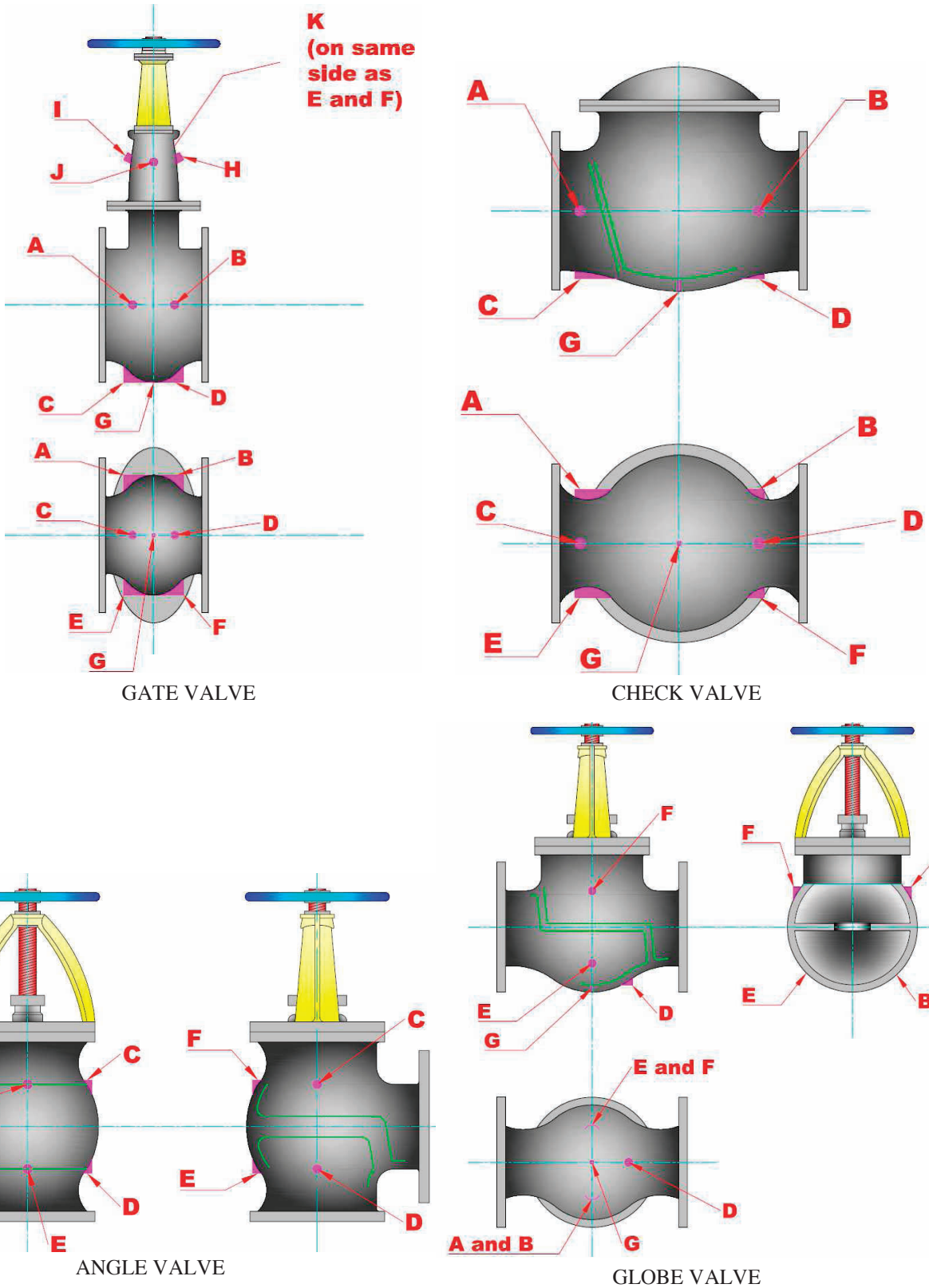


CLASS 600

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

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.

FLOW DESIGN AND MAINTANENCE RECOMMENDATIONS

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

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

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

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

(5) RECOMMENDED MAXIMUM FLOW VELOCITIES (APPROXIMATE):

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

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

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

FOR MAINTENANCE AND SAFETY INFORMATION, SEE THE POWELL *HANDBOOK OF VALVE INFORMATION*, AS DESCRIBED ON PAGE 46.

COMPARISON CHART OF VALVE SIZE/NOMINAL PIPE SIZE

TABLE 11

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 12

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

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

March, 2011 THE WILLIAM POWELL COMPANY

GENERAL TERMS AND CONDITIONS OF SALE

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

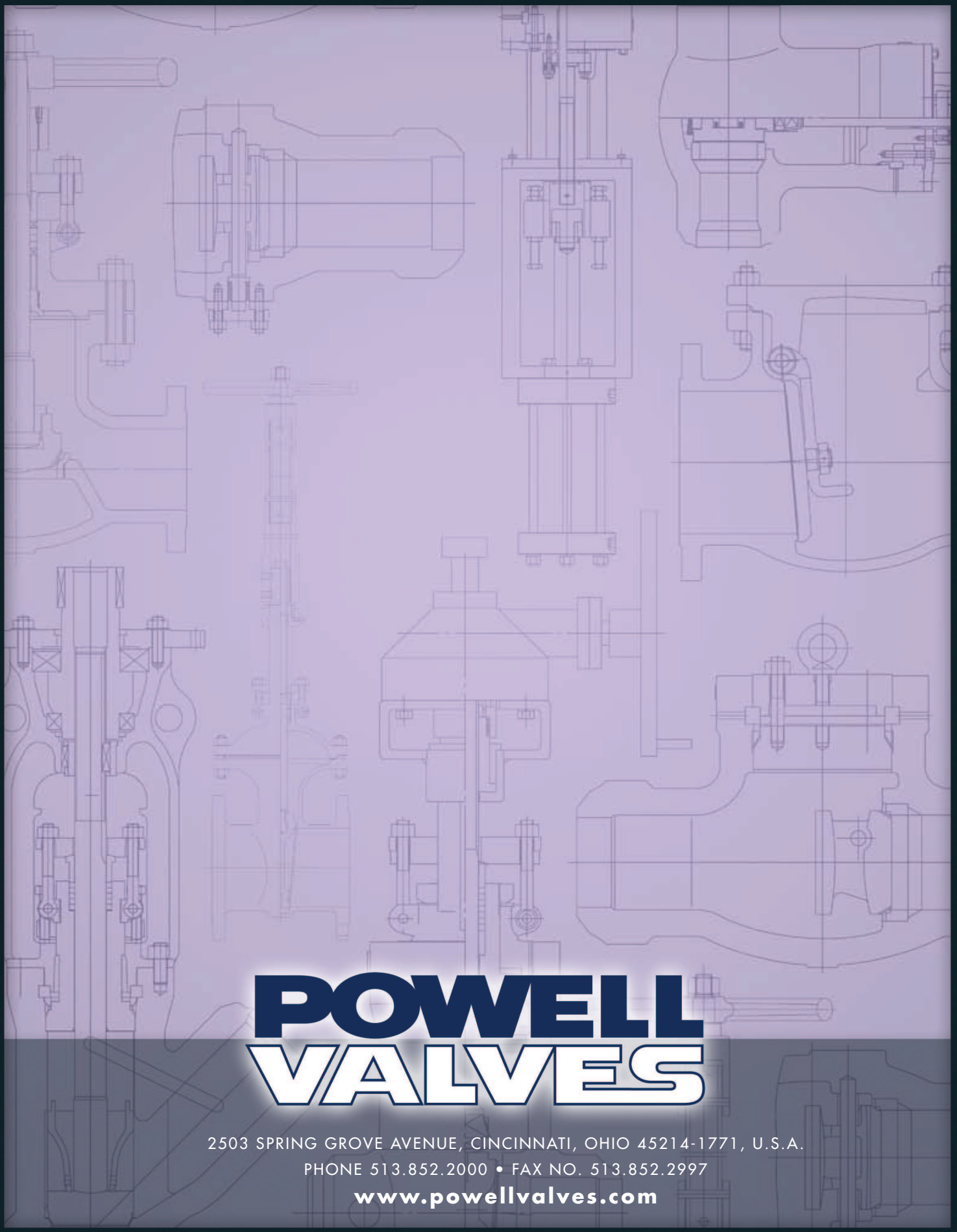
24. ASSIGNMENT: No right or interest in the contract arising from these Terms and Conditions shall be assigned by Purchaser and no delegation of any obligation owed by Purchaser shall be made without the prior written permission of Powell. As used herein, "Purchaser" and "Powell" include the respective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

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

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

POWELL VALVES

Established 1846



POWELL VALVES

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