



Powell Valves: Celebrating over 170 years of innovation

Since its foundation in 1846, The Wm Powell Company (Powell Valves) has stood at the forefront of innovation from pioneering technology in the industrial valve market, providing valves to NASA and being Thomas Edison's valve of choice to being a leader in fugitive emission technology. The company has a rich history of achievements that have resulted in their continued success over the past 170 years. Valve World spoke to Executive Vice President David B. "Brandy" Cowart and Senior Vice President Sales & Marketing Timothy Fries at their headquarters in Cincinnati, Ohio to learn about the company's evolution and growth, the importance of proactivity and their investment in new products and combating fugitive emissions.

By Sarah Bradley

Having endured civil and world wars, dedicating our production for the US military, rebuilding after great floods, surviving the Great Depression and helping to put men on the moon, Powell Valves has proven their ability to evolve and react to customer needs and the changing world market. By providing best-in-class products in design features and quality, at competitive prices with excellent

service, on-time deliveries and flexibility, Powell has continued to maintain its thriving position in the valve world.

"We have integrity in everything we do. We want to do the right thing first, not try to fix it later. We may be a smaller company, but with big company resources, opportunities, possibilities and capabilities. It allows us to be nimble and

take advantage of the opportunities that are presented," Brandy Cowart explained. "Being proactive versus reactive is huge. If you are too entrenched in, then you are forced to be reactive. By being flexible, nimble and quick, we are able to get ahead in meeting our customers' needs." Flexibility and speed in reacting to their customer and industry needs; attributes



which have served them well in the past, still apply today and will continue in the future. As a privately-held, family owned corporation, Powell is able to continue to build on its legacy of innovation and family-style company culture.

Company culture

"Customer First, Positive Energy, Teamwork, Performance, Adaptability & Flexibility and Integrity are our cornerstones of our company culture. As a family-owned business we greatly value our employees and through them we are able to extend our family environment to our customers. It has been like that for a long time - my father, Randy Cowart, is only the ninth CEO & President of the company. Nine presidents in 170 years is pretty unique – we have competitors who have had that many presidents in the last several years. That stability, integrity and family environment throughout the company



means that our employees take a lot of pride in their work and the needs of the customer," said Brandy.

"Everybody here is an entrepreneur from engineering to sales to management. Every job responsibility we perform daily touches a customer. That belief and culture is evident from the CEO all the way throughout the organization. At Powell everybody sees the importance of that in the organization," said Tim Fries. "We are a conservative company, but we have the ability to take risks, because we are financially strong. We have great leadership in this organization. They enable you execute on plans and strategic objectives in order to service the customer and grow our market share. We are a very flat management team without egos; it is all about focusing on taking care of the customer. That is what makes this culture so strong and I think it is what has made us sustainable for 170 years."

As a cornerstone of the company's achievements, the family culture will continue to be a driving force in their success. As the Wm Powell Company continues to thrive in its second century in business, the community of team members that take pride in their work and stand behind the Powell name will continue to grow with the brand. In the last couple of years, our biggest focus has been on the development and

growth of our own people. Powell is a 170 year- old multi-generational company and we are transitioning into the next generation of leadership, which is an exciting time. We have some extremely smart, young talented people coming through the organization who are being mentored and trained by some of the best the valve industry that is the focus of our investment. We target and attract individuals with an entrepreneurial spirit and drive, if they have these qualities then we can teach you Powell valves," said Tim. One of the ways that Powell has been utilizing their strong company culture and employee commitment is through their recent investments in further defining their project management groups and encouraging greater involvement from staff at all levels.

Tim explained: "We have invested heavily into the project management side of our offering and we have put a lot of tools in place focused on proactive communication, all the way through the entire capital project supply chain. Our goal was to make that project management process more transparent from the manufacturing, distributor, EPC and even including the end user. Our Proactive Order Management and Milestone Reporting deliver real-time accurate information that assist with keeping a capital projects on time and on budget.





When a capital project reaches a certain scale we assign an executive sponsor, this executive sponsor role at Powell is to be a resource for the project management team to leverage to remove any contingencies that may surface during a large project. We have received very positive feedback from our customers on our approach."

"The broadening of responsibilities in our sales teams and project teams are geared at customer service and driven by the customer. Powell is able to facilitate not only our customer's daily valve needs but also provide the value added needs for their capital project expenditures. Our structure and flexibility allows us to service daily and project needs quickly and completely. Our investment in our people, product quality and management systems are all driven to the customer's needs," Brandy added.

First in fugitive emissions

Powell's rich history brings unparalleled knowledge and experience. As a pioneer in the industry, the Wm Powell Company has always focused heavily on innovation and being a company of "firsts".

"Powell was one of the first to really jump out there and not only be committed to the control of fugitive emissions, but to also commit to it financially and actually get the products through the individual product testing. There are a lot of folks in the industry that say "me too!" But we always want to be there first and we jumped in there very early with our partnership with Chesterton for packing to make sure we were providing our customers with the best options, before they knew it was necessary," said Brandy. "Investing in fugitive emission technology has been important to Powell. Our head

of engineering was on the committee that helped write the standard and by bringing that information back and a knowledge of the evolution of where it was going in the industry, we were able to really invest in developing our technology early on. We were the first in the industry to get testing done and have inventory of finished goods on the shelf. It has been a significant investment for us and it is all about helping our customers mitigate through the new regulation by having product that exceeds the new API624 standard sooner than later," said Tim.

Over the past several years, despite the issues many have encountered with the economic downturn, Powell's diversity has been the key to continued growth. Powell has recognized the importance of diversification, not only in the products they develop, but in the markets, industries and customer bases they serve.

"I think having a diverse customer base has been one of the big success points of the company. Through the years there have been horrible economic cycles in one industry or another - be it oil, power, chemical or paper. Very rarely are all of those industries on the downward slope economically at the same time. Having a

diverse customer base in so many different industries has allowed us to maintain consistent growth," revealed Brandy.

"A lot of our products are standard and can be tailored for all industries because we have immense engineering support behind it. I think that product diversity, the engineering capabilities and the diversity in our customer base is a big foundation for our success as compared to competitors who focus on one industry - they live and die by the success of that industry."

Completing the package through new product introductions

July of 2017 will mark another milestone in Powell's NextGen Engineering Technology strategy by launching a complete quarter-turn ball valve offering of 1 piece, 2 piece, three piece and flanged with size ranges from ½" through to 12 inclusive of Fire Safe.

"Powell's long term strategy is to continue to layer on products that assist our channel partners at completing the package not only for their day to day MRO customers but for the large capital project," Fries adds. "Future products of quarter-turn automation, resilient seated butterfly valves and cryogenic ball valves will follow shortly behind. We are leveraging 170 years of valve innovation and quality to position Powell and Powell Channel Partners for success with valve end user community."

Commitment to clean room capabilities

Recognizing the changing needs of the industry, Powell Valves has always made strides to ensure that they listen to their customers' needs, look for the upcoming voids in the industry and develop ways to proactively fulfill the requirements before their customers even realize the need is there. Acknowledging the growth in the



industrial gas and LNG markets, Powell has recently made significant investments in cryogenic clean room and testing facilities. "We continue to invest in our manufacturing, testing and machining equipment. Building cryogenic clean rooms at both of our forge steel and cast steel, large and small bore plants in Wenzhou and Yangcheng City, China, was an important investment for our customers," said Brandy. "We have established cryogenic clean rooms in our facilities in China that have been audited and approved. It is something we are able to provide that many of our competitors are not. There is a huge growth in the industrial gases market and we want to be able to properly serve them. Many of the major players in industrial gases have their new construction taking place in China and being there and being able to facilitate that growth allows Powell to be an industry leader." "They are state-of-the-art facilities that supplement what we already have in the United States from a cryogenic cleaning perspective. We now have three global cryogenic clean rooms. We have developed many relationships in the industrial gas sector and they are looking for us to do more for them. There a lot of changes in that industry as far as metallurgy and cleaning requirements and the changing needs of our customers really drove that investment," said Tim.

In addition to manufacturing and modification facilities, Powell continues to maintain a large inventory around the world to ensure that their products are readily available wherever their customers are. "We pride ourselves on being flexible, having speed in delivery and reaction times, but that doesn't mean that we always shoot from the hip. We are very conservative and we want to make the right decision, but once we



The new plant in Yongcheng, China.

make that decision - it is a hundred miles an hour - we are all in. We stand by the belief that you need to choose your suppliers and your customers well, and then be all in," Brandy said.

"We look for channel partners that have a defined strategy. We like to see a good channel infrastructure and we look for competitive brands. We don't want to be secondary or even tertiary to anybody. We want to be primary and we have been fortunate to have developed a great distribution network that partner with us to bring the product closer and help us to be a re- source for the customer. We have many long term distributor relationships that have been in place for many decades," said Tim. "A lot of our customers are using global fabricators now, so having facilities worldwide gets our products closer to the fabricators. We can clean and ship products directly to them which compresses our supply chain."

Global presence

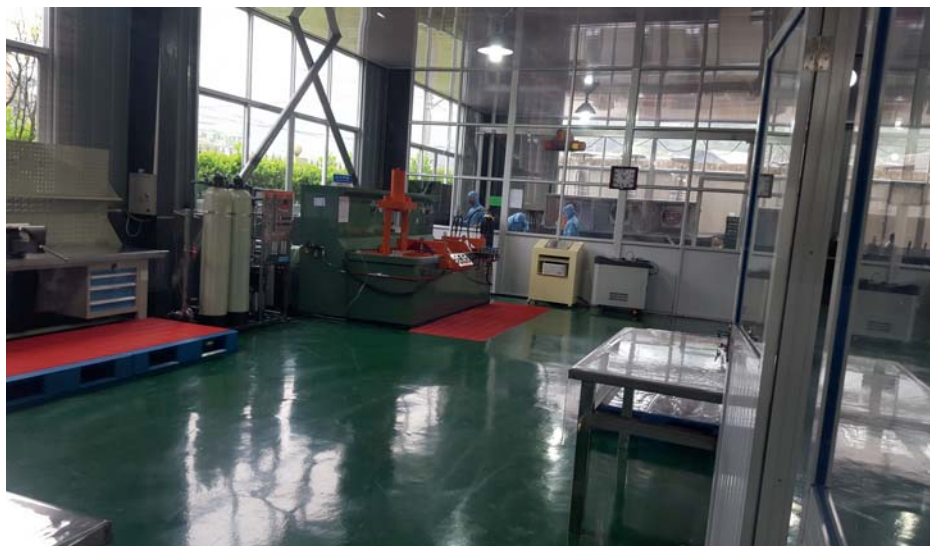
Having that global presence is another way that the company has continued to remain competitive and successful in an industry that is fast-paced with urgent needs to be met worldwide. Powell has continued to invest in growing their reach around the world by establishing manufacturing centers in China to support sales through- out Asia and better service the Middle East. Recognizing the importance of a global infrastructure in

support of their business, Powell has also signed exclusive distribution partnership agreements to support global markets around the world.

By establishing a bricks-and-mortar facility in Houston, Texas in 2014, Powell has positioned itself in the center of the valve industry in order to further support same-day emergency services for its customers and provide another contact point for its clients. "The Houston and Gulf Coast market is really the hotbed of the valve industry. Rather than having our product a day away, we wanted it to be 15 minutes away. We established that facility in Stafford and stocked it up with inventory to really focus on just being more at-hand to our customers out there. That was one of those customer first decisions - listening to our customers and what their needs were. They are going to run into materials that they need this afternoon, today, now and we are in a position to satisfy their needs," expressed Brandy.

That commitment to better serving the customer and striving to be the best solutions-provider for their clients has been a driving factor in all the developments, investments and efforts Powell has made over its lengthy existence.

"Just saying the customer comes first may sound cliché, but really that is the focus of everything that we are doing. Taking risks and making investments is all driving to provide a better service, a better cost base and better quality for the customer- meeting the needs that are out there, that we have picked up on by listening to the customer. We want to be the customer's favorite place to call - I want them to call us first," revealed Brandy. "You think about how simple that philosophy is in our daily lives - I want to go to this store or that store over another because of the service, the company integrity and the personal service they provide to you as an individual customer. That is the kind of attitude and company that we want to be. Being a private company allows us to do that without getting clogged by some corporate initiatives. We come in every day looking for an opportunity to better service our customers and focus on providing something that helps our clients."



The background of the entire page is a technical drawing of various industrial valves and pipe fittings, rendered in a light yellow line-art style. The drawing is dense and covers the entire area, providing a technical context for the product being advertised.

POWELL **VALVES**

DUAL PLATE CHECK VALVES

CARBON AND STAINLESS ALLOYS

WAFER, LUG AND FLANGED BODY

Table of Contents

<u>SUBJECT</u>	<u>PAGE</u>
THE WM. POWELL COMPANY—PROFILE	2-3
HOW TO ORDER	4
DUAL PLATE CHECK VALVES	5-8
ENGINEERING DATA	9-20
TERMS OF SERVICE	21-22

The Wm. Powell Company - Profile

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

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

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

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

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

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

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

Powell's end user customers have to react quickly to the demands that are on them to expand their businesses by implementing increased capacity and introducing new products into the market place at low costs and fast turn around times. Powell has addressed our customer's needs by increasing finished product inventory to over \$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.

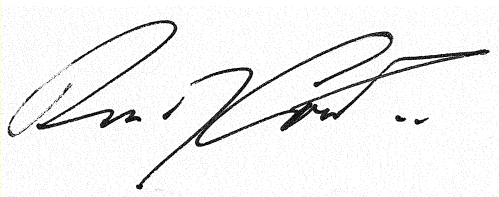
Powell also used its valve knowledge and expertise to construct a modification facility in the U.S.A. to assist customers with their needs, such as, automation, trim changes, end connection changes, additional quality inspections and special service pressure testing requirements, field service, etc...

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,

A handwritten signature in black ink, appearing to read "Randy Cowart", is written over a light gray, textured rectangular background.

Randy Cowart

President, CEO & Chairman

The Wm. Powell Company

How to order Powell Dual Plate Check Valves

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

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

Example Code for 6" Class 150 Dual Plate Check, Wafer Style, A216 WCB Carbon Steel, with API Trim 8

Size Code	
Code	Size
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"
etc.	etc.

Base Figure Number	
No	Class
1570	150
3070	300
6070	600

End Code	
Code	Type
F	Double Flange Style
Q	LUG
Y	Wafer
Z	Special ends

Material Codes	
Code	ASTM
C	A216 WCB
D	A217 WC6
E	A217 WC9
J	A352 LCB
A	A351 CF8 (304)
M	A351 CF8M (316)
P	A351 CG8M (317)
S	A351 CN7M (Alloy 20)
Z	Special Material

Packing/Gasket	
Code	Option
X	None

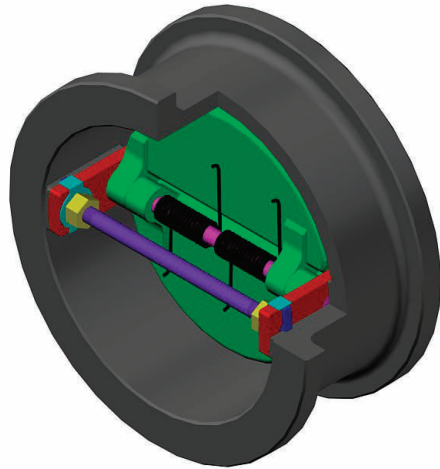
Option Codes	
Code	Option
XXX	No Options
ETH	Threaded Lugs
CNX	Oxygen Clean Non-Ext
NXX	NACE
FA3	PMI

Trim	
Code	Description
0	API Trim 10
2	API Trim 12
3	API Trim 13
5	API Trim 5
6	API Trim 16
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
H	Integral Seat, CF8M Disc
N	API Trim 8 NACE
Z	Special Trim

API 594 DUAL PLATE CHECK VALVES

ASME CLASSES 150 TO 600

CAST CARBON STEEL, STAINLESS STEEL OR ALLOY STEEL
WAFER, LUG, OR DOUBLE FLANGED



Class	Fig. No.
150	1570
300	3070
600	6070

Item	Applicable Specification
Wall Thickness	API 594
Pressure - Temperature Ratings	ASME B16.34
General Valve Design	API 594 & B16.34
End to End Dimensions	API 594
Flange Design	ASME B16.5
Materials	ASTM

PART	COMMON MATERIAL COMBINATIONS				
Body	A216 WCB	A216 WCB	A216 WCB	A351 CF8M	A351 CF8M
Body Seat	Stellite Facing	Stellite Facing	Integral	Integral	Stellite Facing
Disc	A216 WCB+ 13% CR FACED	A351 CF8M	A351 CF8M	A351 CF8M	A351 CF8M
Hinge Pin	410 SST	316 SST	316 SST	316 SST	316 SST
Stop Pin	410 SST	316 SST	316 SST	316 SST	316 SST
Pin Holder	Carbon Steel	316 SST	316 SST	316 SST	316 SST
Key	410 SST	316 SST	316 SST	316 SST	316 SST
Washer	410 SST	316 SST	316 SST	316 SST	316 SST
Set Screw*	Carbon Steel	316 SST	316 SST	316 SST	316 SST
Lock Nut**	Carbon Steel	316 SST	316 SST	316 SST	316 SST
Spring	Inconel X-750	Inconel X-750	Inconel X-750	Inconel X-750	Inconel X-750
Eyebolt	Carbon Steel	Carbon Steel	Carbon Steel	Carbon Steel (Zn plate)	Carbon Steel (Zn plate)

(NOTE) Other materials and trims available.

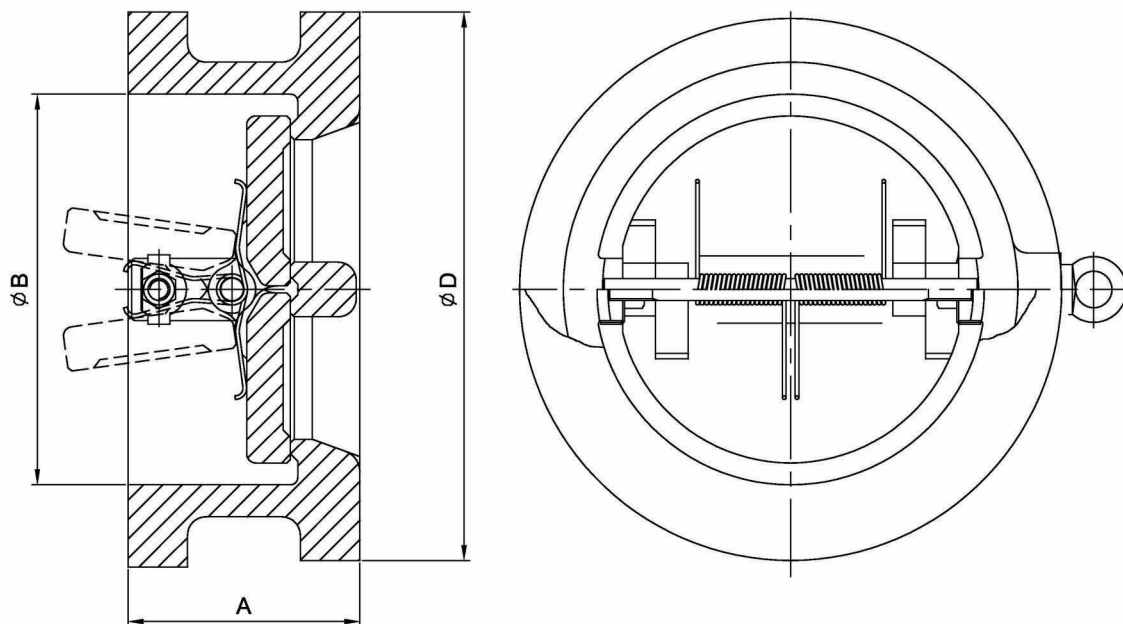
*Sizes 2"-6" only

**Sizes 8" and above only

DESIGN FEATURES:

- **Retainerless body Design** with no external body penetrations eliminating the possibility of outside leakage. Disc assembly secured in place by high strength key.
- **End Gasket Surfaces** are uninterrupted with no screws or lock pins breaking the gasket surface. No gasket restrictions required.
- **Seat faces** lapped for smooth finish and superior sealing
- **High torsion** inconel springs for quick closing
- **Each** valve is shell and seat pressure tested per industry standard API 598
- **Available** in Wafer, Lug and Double Flange styles
- **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
- **Other** available options as follows:
 - Alternate valve materials such as chrome and stainless steel alloys
 - Alternate trim materials.
 - Higher Pressure Classes
 - NACE service.
 - Special cleaning for applications such as oxygen or chlorine.
 - Other options available as specified.

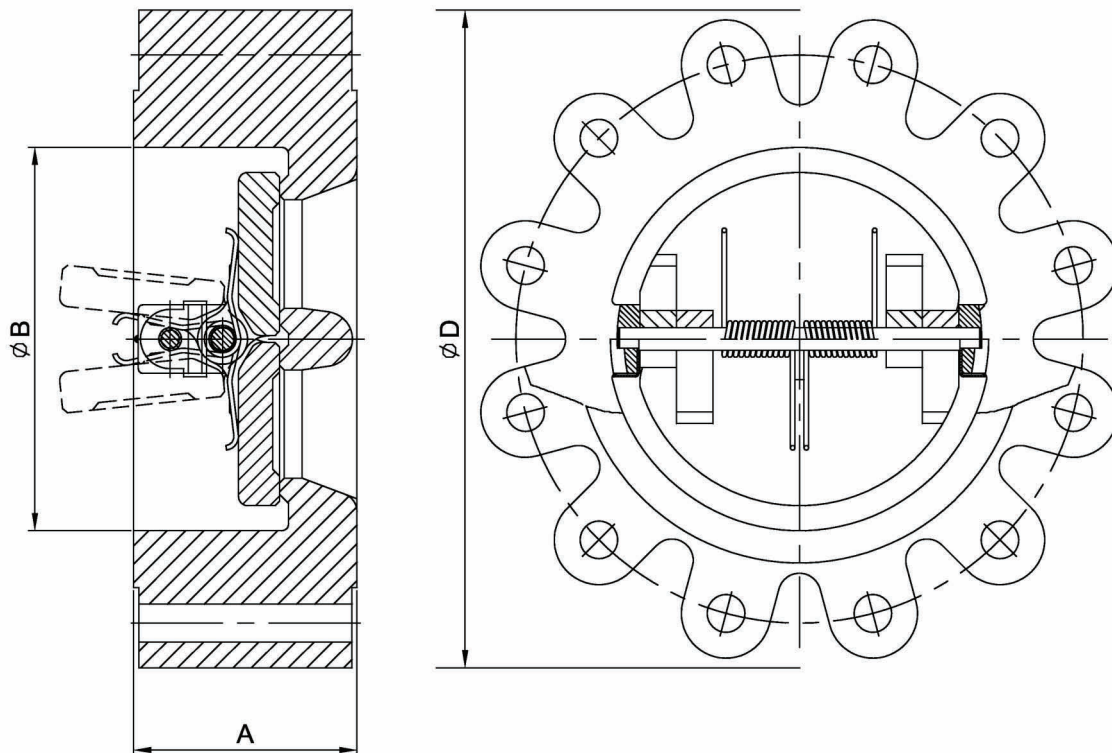
DUAL PLATE CHECK VALVE (WAFFER STYLE) DIMENSIONS (CLASS 150—600).



SIZE	ASME 150					ASME 300					ASME 600				
in	A	B	D	WT	lb	A	B	D	WT	lb	A	B	D	WT	lb
mm	A	B	D	WT	KG	A	B	D	WT	KG	A	B	D	WT	KG
2	2 3/8	2 11/16	4	4.5		2 3/8	2 11/16	4 5/16	5.5		2 3/8	2 11/16	4 5/16	5.5	
25	60	68	103	2		60	68	110	2.5		60	68	110	2.5	
3	2 7/8	3 7/16	5 5/16	8.5		2 7/8	3 7/16	5 13/16	10.8		2 7/8	3 7/16	5 13/16	11.3	
80	73	88	135	3.9		73	88	148	4.9		73	88	148	5.1	
4	2 7/8	4 9/16	6 13/16	14.8		2 7/8	4 9/16	7 1/16	17.5		3 1/8	4 9/16	7 9/16	22	
100	73	116	173	6.7		73	116	180	8		79	116	192	10	
6	3 7/8	6 5/8	8 3/4	28		3 7/8	6 5/8	9 13/16	40		5 3/8	6 5/8	10 3/8	57	
150	98	168	221	12.7		98	168	249	18		136	168	264	26	
8	5	8 7/16	11	55		5	8 7/16	12 1/16	71		6 1/2	8 7/16	12 9/16	106	
200	127	214	278	25		127	214	306	32		165	214	319	48	
10	5 3/4	10 3/8	12 3/4	90		5 3/4	10 3/8	14 3/16	109		8 3/8	10 3/8	15 11/16	202	
250	146	264	324	41		146	264	360	50		213	264	398	92	
12	7 1/8	12 1/8	16	150		7 1/8	12 1/8	16 9/16	177		9	12 1/4	17 15/16	284	
300	181	308	408	68		181	308	420	81		229	311	456	129	
14	7 1/4	13 9/16	17 5/8	190		8 3/4	13 9/16	19 1/16	265		10 3/4	13 5/8	19 5/16	380	
350	184	344	448	86		222	344	484	120		273	346	491	172	
16	7 1/2	15 13/16	20 1/4	254		9 1/8	15 13/16	21 3/16	355		12	15 13/16	22 3/16	545	
400	191	402	514	115		232	402	538	161		305	402	564	247	
18	8	17 13/16	21 5/8	315		10 3/8	17 13/16	23 7/16	470		14 1/4	17 7/8	24 1/16	740	
450	203	452	548	143		264	452	595	213		362	454	611	335	
20	8 5/8	19 3/4	23 7/8	400		11 1/2	19 3/4	25 11/16	610		14 1/2	19 15/16	26 13/16	955	
500	219	502	606	182		292	502	652	277		368	506	681	433	
24	8 3/4	23 15/16	28 1/4	590		12 1/2	23 15/16	30 7/16	910		17 1/4	23 11/16	31 1/16	1500	
600	222	608	716	267		318	608	773	412		438	602	789	680	

ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE UPON REQUEST.

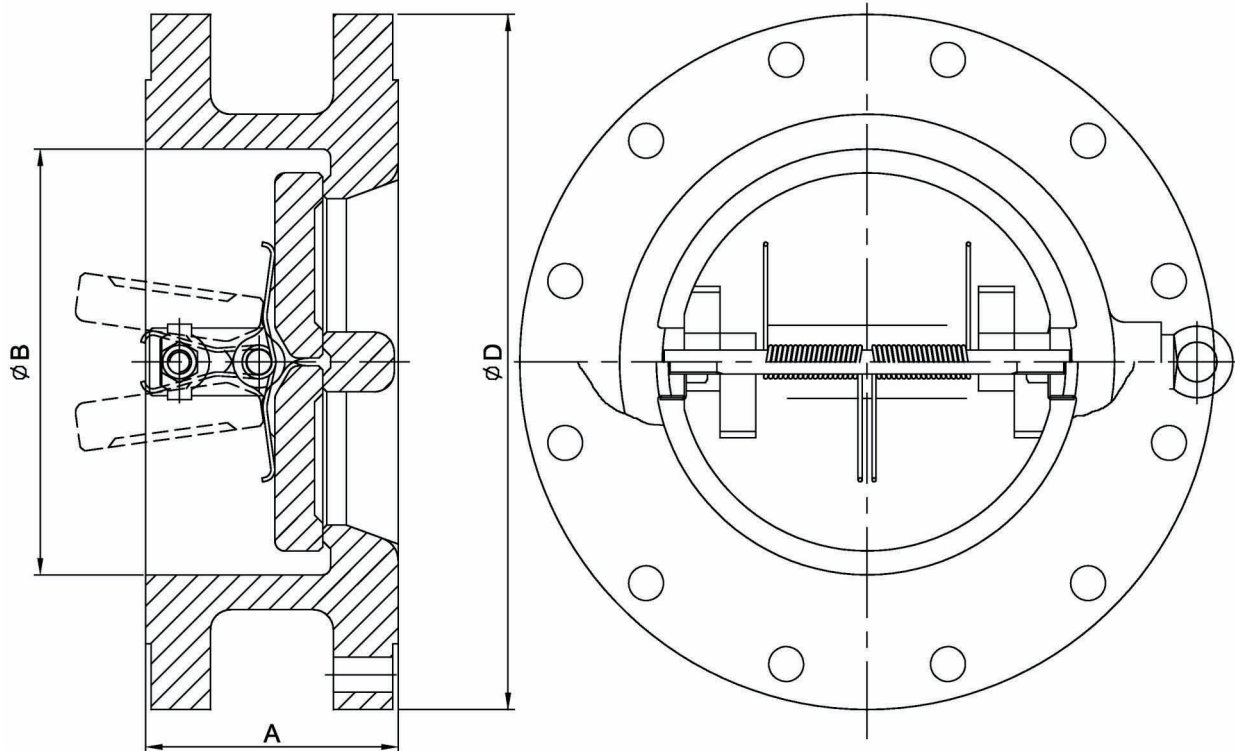
DUAL PLATE CHECK VALVE (LUG STYLE) DIMENSIONS (CLASS 150—600).



SIZE	ASME 150					ASME 300					ASME 600				
in					lb					lb					lb
mm	A	B	D	WT	KG	A	B	D	WT	KG	A	B	D	WT	KG
2	2 3/8	2 11/16	6	7.5		2 3/8	2 11/16	6 1/2	17		2 3/8	2 11/16	6 1/2	17	
25	60	68	150	3.4		60	68	165	7.7		60	68	165	7.7	
3	2 7/8	3 7/16	7 1/2	15.5		2 7/8	3 7/16	8 1/4	30.75		2 7/8	3 7/16	8 1/4	31.3	
80	73	88	190	7.1		73	88	210	14		73	88	210	14.1	
4	2 7/8	4 9/16	9	30		2 7/8	4 9/16	10	54.5		3 1/8	4 9/16	10 3/4	84	
100	73	116	230	13.5		73	116	255	24.8		79	116	275	38	
6	3 7/8	6 5/8	11	50		3 7/8	6 5/8	12 1/2	99		5 3/8	6 5/8	14	160	
150	98	168	280	23		98	168	320	45		136	168	355	73	
8	5	8 7/16	13 1/2	128		5	8 7/16	15	146		6 1/2	8 7/16	16 1/2	302	
200	127	214	345	58		127	214	380	66		165	214	420	137	
10	5 3/4	10 3/8	16	208		5 3/4	10 3/8	17 1/2	232		8 3/8	10 3/8	20	507	
250	146	264	405	95		146	264	445	106		213	264	510	230	
12	7 1/8	12 1/8	19	280		7 1/8	12 1/8	20 1/2	357		9	12 1/4	22	534	
300	181	308	485	127		181	308	520	163		229	311	560	243	

ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE UPON REQUEST.

DUAL PLATE CHECK VALVE (DOUBLE FLANGE STYLE) DIMENSIONS (CLASS 150—600).



SIZE	ASME 150					ASME 300					ASME 600				
in					lb					lb					lb
mm	A	B	D	WT	KG	A	B	D	WT	KG	A	B	D	WT	KG
12	7 1/8	12 1/8	19	289		7 1/8	12 1/8	20 1/2	343		9	12 1/4	22	540	
300	181	308	485	131		181	308	520	157		229	311	560	245	
14	7 1/4	13 9/16	21	509		8 3/4	13 9/16	23	696		10 3/4	13 5/8	23 3/4	988	
350	184	344	535	231		222	344	585	316		273	346	605	447	
16	7 1/2	15 13/16	23 1/2	641		9 1/8	15 13/16	25 1/2	1030		12	15 13/16	27	1580	
400	191	402	595	290		232	402	650	468		305	402	685	716	
18	8	17 13/16	25	775		10 3/8	17 13/16	28	1320		14 1/4	17 7/8	29 1/4	2070	
450	203	452	635	353		264	452	710	599		362	454	745	938	
20	8 5/8	19 3/4	27 1/2	1000		11 1/2	19 3/4	30 1/2	1688		14 1/2	19 15/16	32	2580	
500	219	502	700	455		292	502	775	767		368	506	813	1170	
24	8 3/4	23 15/16	32	1452		12 1/2	23 15/16	36	2875		17 1/4	23 11/16	37	4500	
600	222	608	815	659		318	608	915	1305		438	602	940	2040	

ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE UPON REQUEST.

PAGE

VALVE STANDARDS AND RELATED INFORMATION

10

VALVE PRESSURE/TEMPERATURE RATINGS

11-12

CHEMICAL AND PHYSICAL PROPERTIES

13

TRIM DESCRIPTIONS

14

FLANGE DIMENSIONS

15-16

FLOW DATA

17

CONVERSION DATA

18

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

VALVE STANDARDS AND RELATED INFORMATION

1. Steel and Corrosion Resistant Designs

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

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

- (B) API Standard 594 → Check Valves: Flanged, Lug, Wafer, and Butt-welding

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

- (C) API Standard 598 → Valve Inspection and Testing

This standard is referenced by both ASME B16.34 and API 594 and contains minimum inspection and pressure test requirements.

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

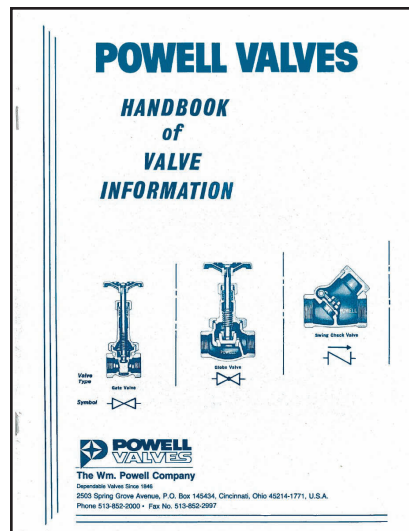
- (E) MSS SP-25 → Standard Marking System for Valves, Fittings, Flanges and Unions

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

2. Powell Publications and Miscellaneous Information

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

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



PRESSURE/TEMPERATURE RATINGS

TABLE 1

ASTM A216 Grade WCB

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

STANDARD CLASS

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

TABLE 2

ASTM A352 Grade LCB

Not to be used over 650° F.

STANDARD CLASS

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

PRESSURE/TEMPERATURE RATINGS

TABLE 5

**ASTM A351 Grade CF3M (1)
ASTM A351 Grade CF8M (2)**

- (1) Not to be used over 850° F.
(2) 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.
(3) For Cryogenic Valves, -20° F rating extends to -423° F.

STANDARD CLASS

Working Pressures by Classes, psig

Temperature, °F	150	200	300	600	900	1500	2500	4500
-20 to 100	275	425	720	1,440	2,160	3,600	6,000	10,800
200	235	365	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	275	480	955	1,435	2,390	3,980	7,165
600	140	245	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	220	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	195	420	845	1,265	2,110	3,520	6,335
850	65	185	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
1000	20	135	365	725	1,090	1,820	3,030	5,450
1050	N/A (a)	135	360	720	1,080	1,800	3,000	5,400
1100	N/A (a)	115	305	610	915	1,525	2,545	4,575
1150	N/A (a)	90	235	475	710	1,185	1,970	3,550
1200	N/A (a)	75	185	370	555	925	1,545	2,775
1250	N/A (a)	60	145	295	440	735	1,230	2,210
1300	N/A (a)	50	115	235	350	585	970	1,750
1350	N/A (a)	45	95	190	290	480	800	1,440
1400	N/A (a)	40	75	150	225	380	630	1,130
1450	N/A (a)	35	60	115	175	290	485	875
1500	N/A (a)	25	40	85	125	205	345	620

NOTE: (a) Flanged end ratings terminate at 1000° F.

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

TABLE 6

ASTM STANDARD GRADE		A216 WCB	A352 LCB ^x	A351 CF3M 316L	A351 CF8M 316
CARBON (C)	(Min)	-	-	-	-
	(Max)	0.30	0.25	0.03	0.08
MANGANESE (Mn)	(Min)	-	-	-	-
	(Max)	1.00**	1.00**	1.50	1.50
PHOSPHOROUS (P)	(Min)	-	-	-	-
	(Max)	0.04	0.04	0.040	0.040
SULFUR (S)	(Min)	-	-	-	-
	(Max)	0.045	0.045	0.040	0.040
SILICON (Si)	(Min)	-	-	-	-
	(Max)	0.60	0.60	1.50	1.50
COPPER (Cu)	(Min)	-	-	-	-
	(Max)	0.30*	0.30*	-	-
NICKEL (Ni)	(Min)	-	-	9.0	9.0
	(Max)	0.50*	0.50*	13.0	12.0
CHROMIUM (Cr)	(Min)	-	-	17.0	18.0
	(Max)	0.50*	0.50*	21.0	21.0
MOLYBDENUM (Mo)	(Min)	-	-	2.0	2.0
	(Max)	0.20*	0.20*	3.0	3.0
VANADIUM (V)	(Min)	-	-	-	-
	(Max)	0.03*	0.03*	-	-
TUNGSTEN (W)	(Min)	-	-	-	-
	(Max)	-	-	-	-
COLUMBIUM (Cb)	(Min)	-	-	-	-
	(Max)	-	-	-	-
TENSILE STRENGTH	(Min)	70 Ksi	65 Ksi	70 Ksi	70 Ksi
	(Max)	95	90		
YIELD STRENGTH	(Min)	36 Ksi	35 Ksi	30 Ksi	30 Ksi
ELONGATION	(Min)	22%	24%	30%	30%
REDUCTION OF AREA	(Min)	35%	35%	-	-
TEMPERATURE	(Min)	-20F	-50F	-425F	-425F
	(Max)	800F	650F	850F	1500F ^F

*RESIDUAL ELEMENTS – Total must not exceed 1.00 maximum.

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

*** For temperatures below –50°F special cryogenic cleaning may be required. See cryogenic catalog for more information.

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

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

NOTE: Chemical Compositions Are In Units Of Percent.

TRIM DESCRIPTIONS

TABLE 7

API Trim No.	Powell Trim Designation	Seat Nominal Designation	Seat Nominal Composition	Nominal Hardness (HB)	Typical Pin Material
1	1	F6	13 Cr	250(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 (13Cr)
8	8	F6 and	13 Cr.	250	TYPE 410 or 420 (13Cr)
		Hardfaced	Co-CrA (b)	350	
9	9	Monel	Ni-Cu Alloy	-	Monel (Ni-Cu)
10	0	316	18 Cr-8Ni	-	TYPE 316 (18Cr-8Ni-Mo)
11	D	Monel and	Ni-Cu Alloy	-	Monel (Ni-Cu)
		Hardfaced	Trim 5 or 5A	350	
12	2	316 And	18Cr-8Ni-Mo	-	TYPE 316 (18Cr-8Ni-Mo)
		Hardfaced	Trim5 or 5A	350	
13	3	Alloy 20	19Cr-29Ni	-	Alloy 20 (19Cr-29Ni)
14	4	Alloy 20 and	19Cr-29Ni	-	Alloy 20 (19Cr-29Ni)
		Hardfaced	Trim5 or 5A	350	
15	R	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)
N/A	H	Equal to Body	316 SST	-	316 SST
Integral ½HF	A	Hardfaced	Equal to Body	-	Equal to Body
Integral Full HF	B	Hardfaced	Hardfaced	-	Equal to Body
Integral	C	Equal to Body	Equal to Body	-	Equal to Body

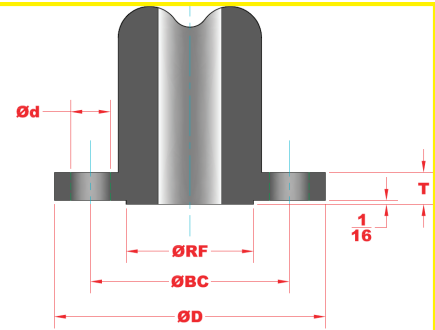
(a) Minimum 50HB differential hardness between mating seating surfaces

(b) Stellite 6 TM or equal.

STEEL VALVE FLANGE DIMENSIONS

All Dimensions in Units of Inches

TABLE 8



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)
1/2	3.50	2.38	0.62	4	0.44	1.38
3/4	3.88	2.75	0.62	4	0.47	1.69
1	4.25	3.12	0.62	4	0.50	2.00
1 1/4	4.62	3.50	0.62	4	0.56	2.50
1 1/2	5.00	3.88	0.62	4	0.62	2.88
2	6.00	4.75	0.75	4	0.68	3.62
2 1/2	7.00	5.50	0.75	4	0.75	4.12
3	7.50	6.00	0.75	4	0.81	5.00
3 1/2	8.50	7.00	0.75	8	0.87	5.50
4	9.00	7.50	0.75	8	1.00	6.19
5	10.00	8.50	0.88	8	0.16	7.31
6	11.00	9.50	0.88	8	1.06	8.50
8	13.50	11.75	0.88	8	1.18	10.62
10	16.00	14.25	1.00	12	1.25	12.75
12	19.00	17.00	1.00	12	1.31	15.00
14	21.00	18.75	1.12	12	1.44	16.25
16	23.50	21.25	1.12	16	1.50	18.50
18	25.00	22.75	1.25	16	1.64	21.00
20	27.50	25.00	1.25	20	1.75	23.00
24	32.00	29.50	1.38	2	1.94	27.25

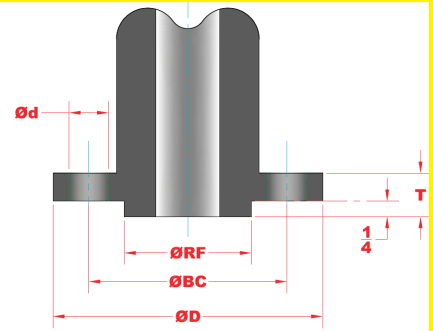
CLASS 300

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)
1/2	3.75	2.62	0.62	4	0.62	1.38
3/4	4.62	3.25	0.75	4	0.68	1.69
1	4.88	3.50	0.75	4	0.75	2.00
1 1/4	5.25	3.88	0.75	4	0.81	2.50
1 1/2	6.12	4.50	0.88	4	0.87	2.88
2	6.50	5.00	0.75	8	0.94	3.62
2 1/2	7.50	5.88	0.88	8	1.06	4.12
3	8.25	6.62	0.88	8	1.18	5.00
3 1/2	9.00	7.25	0.88	8	1.25	5.50
4	10.00	7.88	0.88	8	1.31	6.19
5	11.00	9.25	0.88	8	1.44	7.13
6	12.50	10.62	0.88	12	1.50	8.50
8	15.00	13.00	1.00	12	1.68	10.62
10	17.50	15.25	1.12	16	1.94	12.75
12	20.50	17.75	1.25	16	2.06	15.00
14	23.00	20.25	1.25	20	2.18	16.25
16	25.50	22.50	1.38	20	2.31	18.50
18	28.00	24.75	1.38	24	2.44	21.00
20	30.50	27.00	1.38	24	2.56	23.00
24	36.00	32.00	1.62	24	2.81	27.25

STEEL VALVE FLANGE DIMENSIONS

All Dimensions in Units of Inches

TABLE 9



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)
1/2	3.75	2.62	0.62	4	0.81	1.38
3/4	4.20	3.25	0.75	4	0.87	1.69
1	4.88	3.50	0.75	4	0.94	2.00
1 1/4	5.25	3.88	0.75	4	1.06	2.50
1 1/2	6.12	4.50	0.88	4	1.13	2.88
2	6.50	5.00	0.75	8	1.25	3.62
2 1/2	7.50	5.88	0.88	8	1.37	4.12
3	8.25	6.62	0.88	8	1.50	5.00
3 1/2	9.00	7.25	1.00	8	1.63	5.50
4	10.75	8.50	1.00	8	1.75	6.19
5	13.00	10.50	1.12	8	1.75	6.19
6	14.00	11.50	1.12	12	2.13	8.50
8	16.50	13.75	1.25	12	2.44	10.62
10	20.00	17.00	1.38	16	2.75	12.75
12	22.00	19.25	1.38	20	2.87	15.00
14	23.75	20.75	1.50	20	3.00	16.25
16	27.00	23.75	1.62	20	3.25	18.50
18	29.25	25.75	1.75	20	3.50	21.00
20	32.00	28.50	1.75	24	3.75	23.00
24	37.00	33.00	2.00	24	4.25	27.25

CLASS 900

Nominal Pipe Size	Outside Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Thickness (T)	Raised Face Diameter (RF)
1/2	4.75	3.25	0.88	4	1.13	1.38
3/4	5.12	3.50	0.88	4	1.25	1.69
1	5.88	4.00	1.00	4	1.37	2.00
1 1/4	6.25	4.38	1.00	4	1.37	2.50
1 1/2	7.00	4.88	1.12	4	1.50	2.88
2	8.50	6.50	1.00	8	1.75	3.62
2 1/2	9.62	7.50	1.12	8	1.87	4.12
3	9.50	7.50	1.00	8	1.75	5.00
4	11.50	9.25	1.25	8	2.00	6.19
5	13.75	11.00	1.38	8	2.25	7.13
6	15.00	12.50	1.25	12	2.44	8.50
8	18.50	15.50	1.50	12	2.75	10.62
10	21.50	18.50	1.50	16	3.00	12.75
12	24.00	21.00	1.50	20	3.37	15.00
14	25.25	22.00	1.62	20	3.63	16.25
16	27.75	24.25	1.75	20	3.75	18.50
18	31.00	27.00	2.00	20	4.25	21.00
20	33.75	29.50	1.12	20	4.50	23.00
24	41.00	35.50	2.62	20	5.75	27.25

FLOW DESIGN AND MAINTENANCE RECOMMENDATIONS

- (1) SWING CHECK VALVES- Minimum ½ psi differential pressure across valve to maintain proper “full open position.
- (2) LIFT CHECK AND NON-RETURN VALVES-
Minimum 2 psi differential pressure across valve to maintain proper “full open position”
- (3) Recommended length of straight pipe before and after check 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 seat test allowable limit.
- (5) RECOMMENDED MAXIMUM FLOW VELOCITIES (APPROXIMATE):

<u>VALVE SIZE</u>	<u>WATER</u> (FT/MIN)	<u>SATURATED STEAM</u> (FT/MIN)	<u>SUPERHEATED STEAM</u> (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 services 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 25.**

COMPARISON CHART OF VALVE SIZE/NOMINAL PIPE SIZE

TABLE 10

<u>METRIC NOMINAL SIZE</u> (DN)	<u>ENGLISH NOMINAL SIZE</u> (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): $F = 1.8 \times C + 32$

TO CONVERT FROM FAHRENHEIT (F) TO DEGREES CENTIGRADE (C): $C = 0.556 \times (F - 32)$

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

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.



Established 1846

The background of the entire page is a technical drawing of various industrial valves and components, rendered in a light yellow line-art style against a dark blue background. The drawings show different cross-sections and views of valves, highlighting their complex internal mechanisms and external structures.

POWELL VALVES

2503 SPRING GROVE AVENUE, CINCINNATI, OHIO 45214-1771, U.S.A.

PHONE: 513.852.2000 • FAX NO. 513.852.2997

www.powellvalves.com



POWELL VALVES

CAST CARBON, STAINLESS AND ALLOY STEEL VALVES

GATE, GLOBE AND CHECK VALVES

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

Table of Contents

<u>SUBJECT</u>	<u>PAGE</u>
THE WM. POWELL COMPANY — PROFILE	2-3
POWELL’S STANDARD MATERIAL INSPECTION FLOW	4
HOW TO ORDER	5
FUGITIVE EMISSIONS	6
GATE VALVES	7-9
GLOBE VALVES	10-12
NON-RETURN VALVES	13-14
SWING CHECK VALVES	15-17
TILTING DISC VALVES	18-20
ACCESSORIES	21-24
ENGINEERING DATA	25-54
TERMS AND CONDITIONS	55-57

The Wm. Powell Company - Profile

The Wm. Powell Company is very proud of our achievements and our evolution in the past 165 years. We like to refer to ourselves as 166 years young due to our flexibility in changing quickly to our customer and the industry's needs. Our business strategy is to maintain excellent customer service. We will continue to focus on manufacturing the best of class products both in design features and quality, at competitive prices.

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

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

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

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

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

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

Powell's end user customers have to react quickly to the demands that are on them to expand their businesses by implementing increased capacity and introducing new products into the market place at low costs and fast turn around times. Powell has addressed our customer's needs by increasing finished product inventory to over \$35,000,000 USD in the U.S.A. and with inventory hubs in Asia and Europe. As an additional advantage to our domestic and global customers, The Wm. Powell Company's Manning, SC facility is a Registered Free Trade Zone.

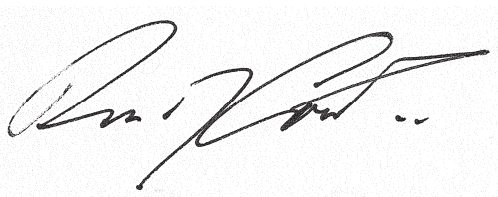
Powell also used its valve knowledge and expertise to construct a modification facility in the U.S.A. to assist customers with their needs, such as, automation, trim changes, end connection changes, additional quality inspections and special service pressure testing requirements, field service, etc...

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

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

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

Sincerely,

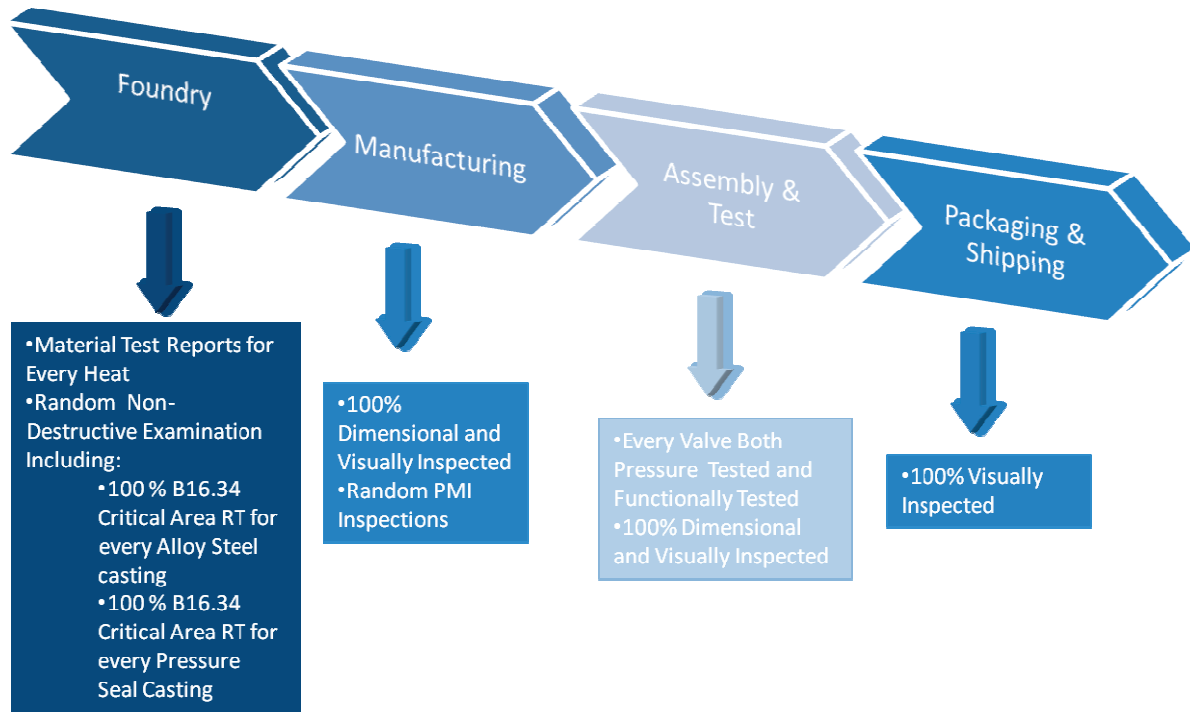
A handwritten signature in black ink, appearing to read "Randy Cowart", is written over a light gray rectangular background.

Randy Cowart

President, CEO & Chairman

The Wm. Powell Company

POWELL'S STANDARD MATERIAL INSPECTION FLOW



How to Order Powell Cast Bolted Bonnet and Pressure Seal Valves

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

advise the detailed description for accurate processing.

Digit

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

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

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

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

Material Codes	
Code	Option
C	A216 WCB
D	A217 WC6
E	A217 WC9
F	A217 C5
G	A217 C12
H	A217 C12A
J	A352 LCB
K	A352 LCC
L	A216 WCC
A	A351 CF8 (304)
B	A351 CF3 (304L)
M	A351 CF8M (316)
N	A351 CF3M (316L)
P	A351 CG8M (317)
Q	A351 CG3M (317L)
R	A351 CF8C (347)
Z	Special Material

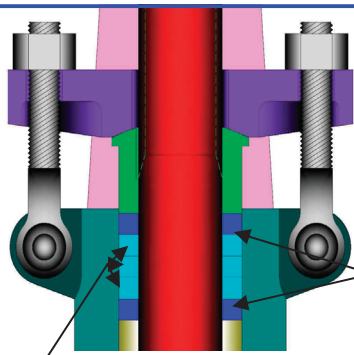
Trim	
Code	Option
0	API Trim 10
1	API Trim 1
2	API Trim 12
3	API Trim 13
5	API Trim 5
6	API Trim 16
7	API Trim 17
8	API Trim 8
9	API Trim 9
A	Integral half HF
B	Integral full HF
C	Integral
D	API Trim 11
E	API Trim 2
N	API Trim 8 NACE
Z	Special Trim

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

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

Examples:

6.0 1503FC8GXXX	6" Figure 1503 Flanged end, WCB, trim 8, graphite
3.0 1503FG8GXXX	3" Figure 1503 Flanged end, C12, trim 8, graphite
3.0 2467JN2TXXX	3" Figure 2467 Sch. 80S, CF3M, trim 12, PTFE
8.0 6003JD5GXXX	8" Figure 6003 Sch. 80, WC6, trim 5, graphite, gear operator

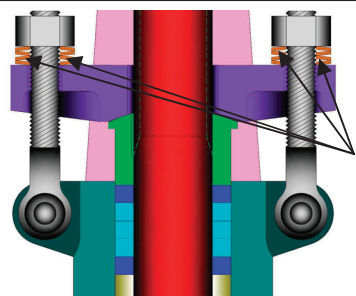


DIE FORMED FLEXIBLE GRAPHITE RIBBON INNER RINGS WITH CORROSION INHIBITOR

BRAIDED CARBON YARN END RINGS WITH CORROSION INHIBITOR

STANDARD PACKING ARRANGEMENT

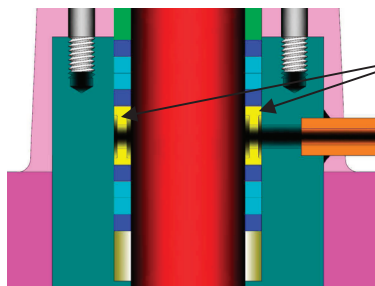
Powell standard design cast steel valves are designed and manufactured to a 100 ppm maximum fugitive emissions level.



BELLEVILLE WASHERS

LIVE LOAD OPTION

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

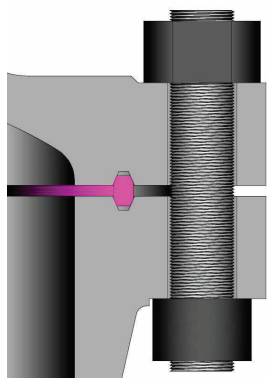


LANTERN RING

LANTERN RING OPTION

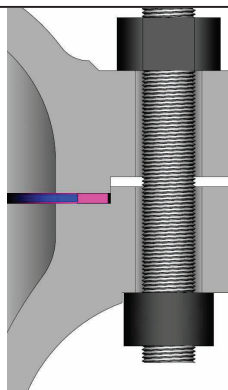
Lantern ring design and other special packing arrangements available. The lantern ring arrangement consists of two packing sets with lantern spacer between the sets. The bonnet connection at the lantern ring location allows monitoring of leakage past packing set.

BODY/BONNET GASKETS



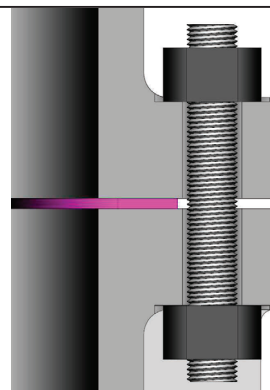
RING JOINT

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



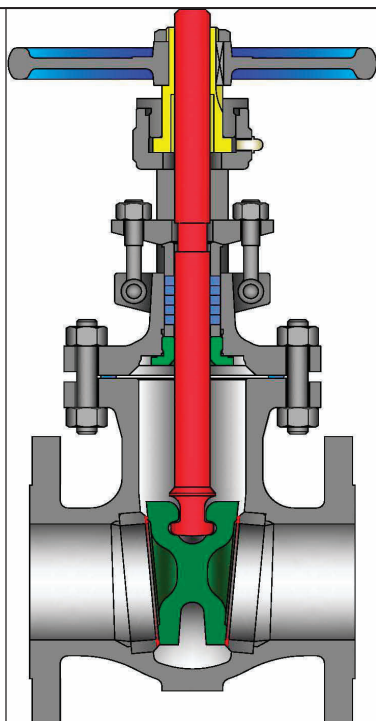
SPIRAL WOUND

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



SHEET

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



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

STANDARD MATERIALS (Other materials available)

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

DESIGN FEATURES:

- **Flexible Wedge** for improved seating and ease of operation, especially in high temperature service. Wedges are accurately guided thru the entire stroke.
- **Standard trim** is API trim 8 for carbon steel valves, API trim 5 for chrome alloy valves, and API trim 10 for CF8M (T316) valves for optimal performance under normal conditions. Other trim materials available on request.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Stems** are non-rotating with surface finish to maximize packing seal for low fugitive emissions.
- **Bonnet and Yoke arms** designed for ease of gear, motor or cylinder actuator adaptation.
- **Each** valve is shell, seat and back-seat pressure tested per industry standard API 598.
- **Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.

(1) Weld end valve body A351 Gr. CF3M

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

Design Specifications

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

- **End Flanges** have the following raised faces per ASME B16.5:
Classes 150-300: 1/16" (2mm).
Classes 600-1500: 1/4" (7mm).
- **Weld ends** are available per ASME B16.25 or per customer's specification.
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test report, inspection report and certificate of conformance.
- **Other** available options as follows:
-Alternate valve materials such as chrome and stainless steel alloys
-Alternate trim materials
-Bypass, drain and other auxiliary connections
-Gear, motor, and cylinder actuators available
-NACE service
-Special cleaning for applications such as oxygen or chlorine
-Other options available as specified

GATE VALVE DIMENSIONS (CLASS 150—1500).

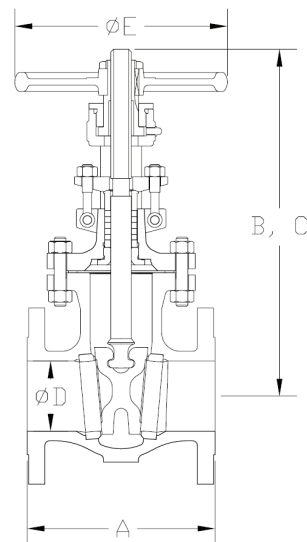
SIZE	ASME 150						ASME 300					ASME 600				
in	A		B(1)	C(1)	D	E	A	B(1)	C(1)	D	E	A	B(1)	C(1)	D	E
mm	FE	WE					WE/FE					WE/FE				
1	5.00	5.00	8.6	9.8	1.00	4	6.50	8.6	9.8	1.00	4	-	-	-	-	-
25	127	127	217	248	25	114	165	217	248	25	114	-	-	-	-	-
1 ½	6.50	6.50	10.7	12.4	1.50	6	7.50	10.7	12.4	1.50	6	-	-	-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

**ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE
UPON REQUEST.**

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

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

WE = Butt weld ends
FE = Flanged ends
B = Center to top closed
C = Center to top open



API 600 GATE VALVES

BOLTED BONNET, ASME CLASSES 150 TO 1500
CAST CARBON, STAINLESS STEEL OR ALLOY STEEL

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

(*) Weld ends are available on request.

FE = Flanged Ends

WE = Weld Ends

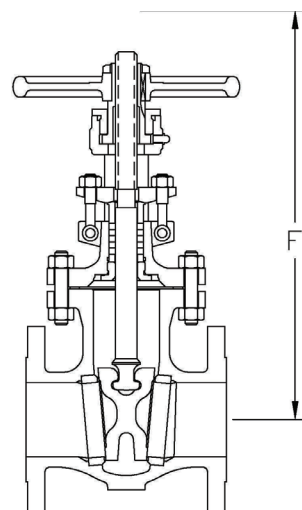
WT = Weight

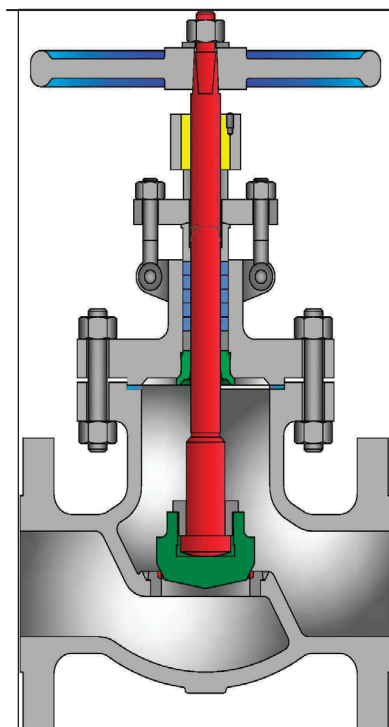
(*) Weld ends are available on request.

FE = Flanged Ends
WE = Weld Ends

WT = Weight
F = Dismantling
Dimension
C_v = Flow Coefficient

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





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

STANDARD MATERIALS (Other materials available)

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

DESIGN FEATURES:

- **Standard trim** is API trim 8 for carbon steel valves, API trim 5 for chrome alloy valves, and API trim 10 for CF8M (T316) valves for optimal performance under normal conditions. Other trim materials available on request.
- **Wall thickness** per heavy wall API 600 requirements.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Swivel** disc for optimal seating and longer seat life.
- **Stems** of hand wheel operated valves are rotating / rising design.
- **Each** valve is shell, seat and backseat pressure tested per industry standard API 598.
- **Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.
- **End Flanges** have the following raised faces per ASME B16.5:
Classes 150-300: 1/16" (2mm)
Classes 600-1500: 1/4" (7mm)

(1) Weld end valve body A351 Gr. CF3M

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

Design Specifications

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

- **Weld ends** are available per ASME B16.25 or per customer's specification.
- **Impactor** hand wheel design standard on the following sizes to assist seating.
8" to 12" class 150
6" to 12" class 300
4" to 10" 600
For larger sizes or pressure classes, gears are standard.
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test, inspection result and certificate of conformance.
- **Other** available options as follows:
-Alternate valve materials such as chrome and stainless steel alloys
-Alternate trim materials
-Bypass, drain and other auxiliary connections
-Gear, motor, and cylinder actuators available
-NACE service
-Special cleaning for applications such as oxygen or chlorine
-Other options available as specified

GLOBE VALVE DIMENSIONS (CLASS 150—1500).

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

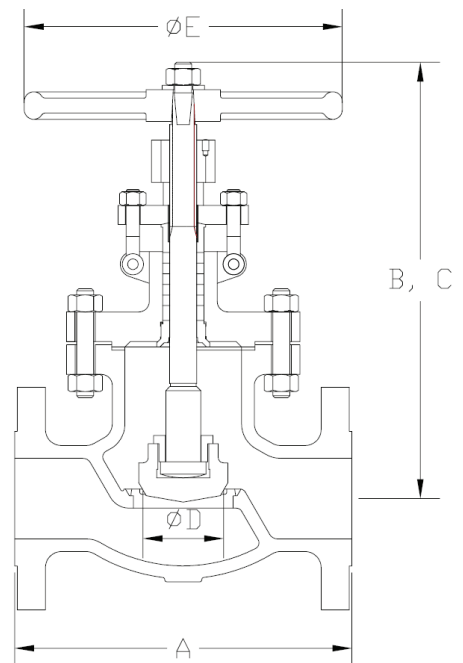
- (1) Gear operators standard for 14" and up classes 150 and 300, 12" and up for class 600, 6" and up for classes 900 and 1500. Height is to top of actuator.

ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE UPON REQUEST.

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

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

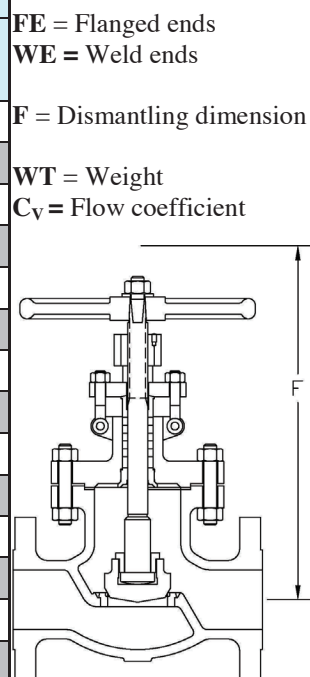
WE = Butt weld ends
FE = Flanged ends

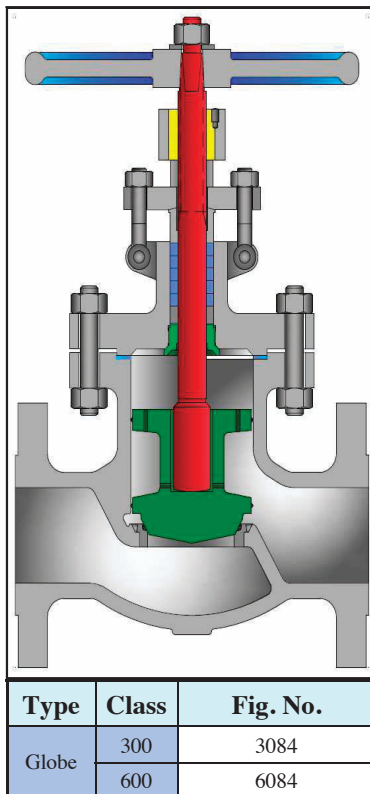


API 600 WALL GLOBE VALVES BOLTED BONNET, ASME CLASS 150 TO 1500 CAST CARBON, STAINLESS STEEL OR ALLOY STEEL

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

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





DESIGN FEATURES:

- **Standard trim** is API trim 8 for class 300 carbon steel valves and API trim 5 for all chrome alloy valves and class 600 carbon steel valves for optimal performance under normal conditions. Other trim materials available on request.
- **Wall thickness** per heavy wall API 600 requirements.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Swivel** disc for optimal seating and longer seat life.
- **Stems** of hand wheel operated valves are rotating / rising design.
- **Each** valve is shell, seat and backseat pressure tested per industry standard API 598.
- **Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.
- **End Flanges** have the following raised faces per ASME B16.5:
Class 300: 1/16" (2mm)
Class 600: 1/4" (7mm)

STANDARD MATERIALS (Other materials available)

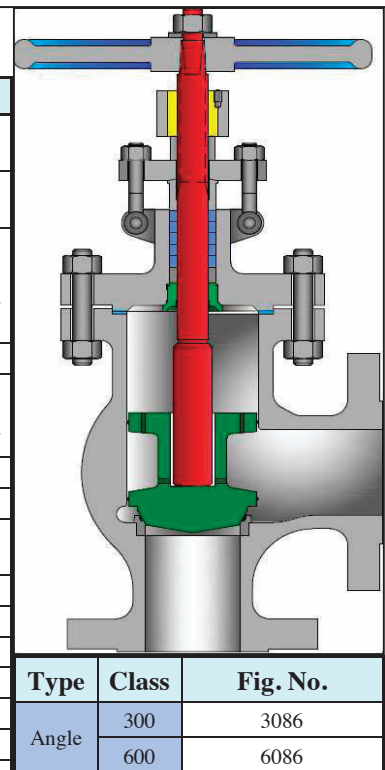
PART	MATERIALS		
Body	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9
Bonnet	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9
Disc	A105 or A216 WCB + 13% Cr Faced (1)	A217 WC6 + Stellite 6 Faced	A217 WC9 + Stellite 6 Faced
Disc Nut	SST 410		
Seat Ring	Carbon Steel + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22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

(1) Class 600 discs have stellite facing.

Design Specifications

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

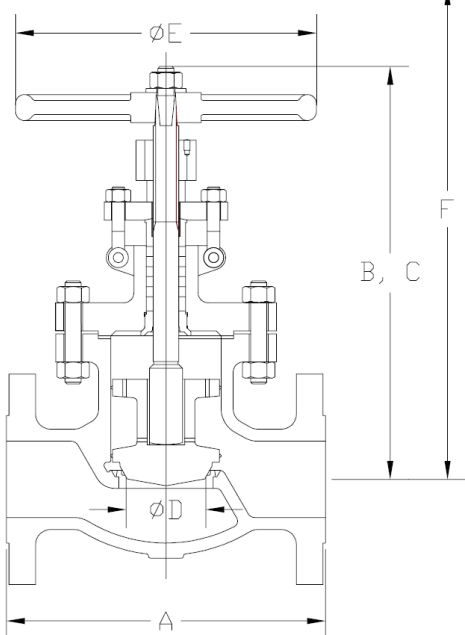
NOTE: See page 52 for flow, safety and maintenance information.



- **Weld ends** are available per ASME B16.25 or per customer's specification.
- **Impactor** hand wheel design standard on the following sizes to assist seating.
6" and larger class 300
4" and larger class 600
- **NON-RETURN** valve discs are fully body guided for smooth operation; internal pressure equalization eliminates need for external equalizer pipe.
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test, inspection result and certificate of conformance.
- **Other** available options as follows:
 - Alternate valve materials such as chrome and stainless steel alloys
 - Alternate trim materials
 - Bypass, drain and other auxiliary connections
 - Gear, motor, and cylinder actuators available
 - NACE service
 - Special cleaning for applications such as oxygen or chlorine
 - Other options available as specified

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

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



FE = Flanged ends

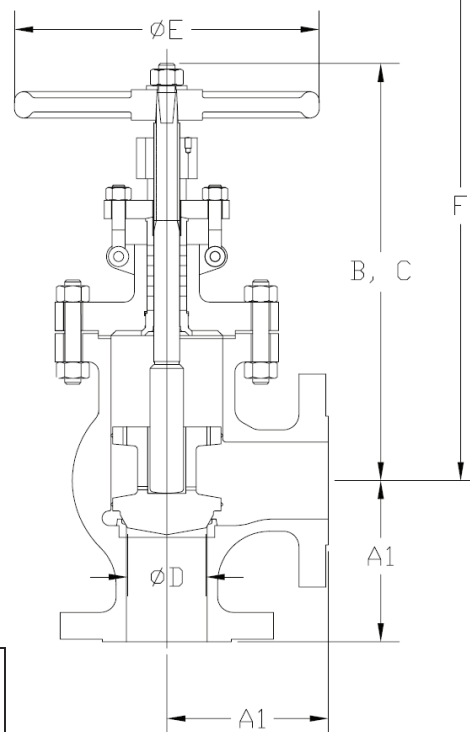
B = Center to top closed

C = Center to top open

F = Dismantling
Dimension

C_v = Flow coefficient

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

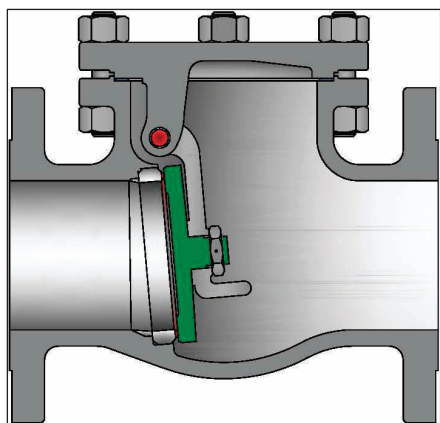


ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE UPON REQUEST.

NON-RETURN TECHNICAL INFORMATION (CLASS 300 AND 600)

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

STANDARD MATERIALS (Other materials available)



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

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

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

DESIGN FEATURES:

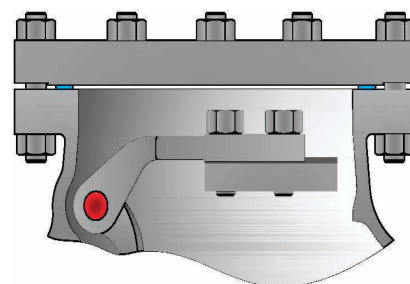
- **Standard trim** is API trim 8 for carbon steel valves, API trim 5 for chrome alloy valves, and API trim 10 for CF8M (T316) valves for optimal performance under normal conditions. Other trim materials available on request.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Wall thickness** per heavy wall API 600 requirements.
- **Swivel disc** for improved seat alignment and longer life.
- **Each** valve is shell and seat pressure tested per industry standard API 598.
- **Check** valves are suitable for service in horizontal line with cap vertical or in a vertical line with flow upward.
- **Carrier Pin** is confined within the body wall and is not accessible from the exterior, thus no side body penetrations, eliminating a common leak path, on classes 150 through 600.
- **End Flanges** have the following raised faces per ASME B16.5:
Classes 150-300: 1/16" (2mm).
Classes 600-1500: 1/4" (7mm).

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

Design Specifications

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

- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test, inspection result and certificate of conformance.
- **Other** available options as follows:
 - Alternate valve materials such as chrome and stainless steel alloys
 - Alternate trim materials
 - Drain and other auxiliary connections
 - NACE service
 - Special cleaning for applications such as oxygen or chlorine
 - Other options available as specified



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

SWING CHECK VALVE DIMENSIONS (CLASS 150—1500).

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

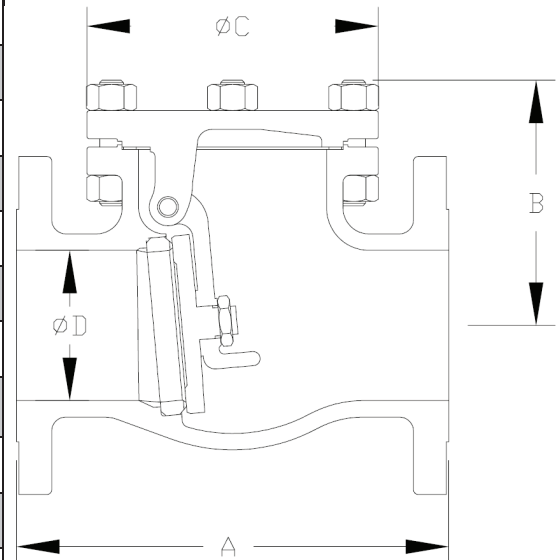
SIZE	ASME 900				ASME 1500			
in	A	B	C	D	A	B	C	D
mm	WE/FE				WE/FE			
2	14.50	9.6	8.9	1.87	14.50	9.6	8.9	1.87
50	368	244	226	47	368	244	226	47
2 ½	16.50	10.2	9.2	2.25	16.50	10.3	9.2	2.25
65	419	260	235	57	419	260	235	57
3	15.00	10.6	10.2	2.87	18.50	12.6	10.4	2.75
80	381	268	258	73	470	319	265	70
4	18.00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

B = Center to top

WE = Butt Weld ends

FE = Flanged ends

ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE UPON REQUEST.



API 600 WALL SWING CHECK VALVES

BOLTED BONNET, ASME CLASSES 150 TO 1500
CAST CARBON, STAINLESS STEEL OR ALLOY STEEL

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

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

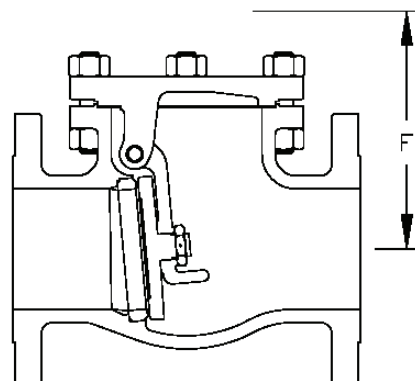
F = Dismantling dimension

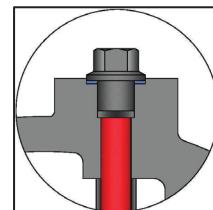
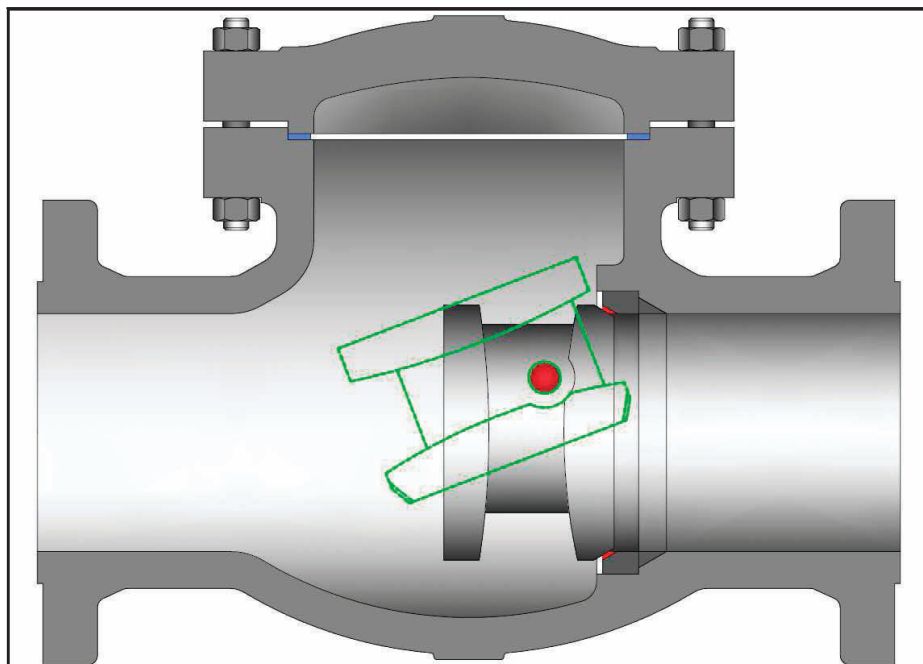
WE = Butt Weld ends

FE = Flanged ends

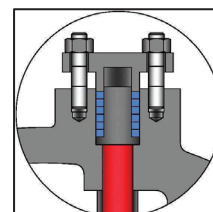
WT = Weight

C_v = Flow coefficient





(1) Side Plug Gasket Design



(2) Side Plug Packing Design

STANDARD MATERIALS (Other materials available)

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

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

DESIGN FEATURES:

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

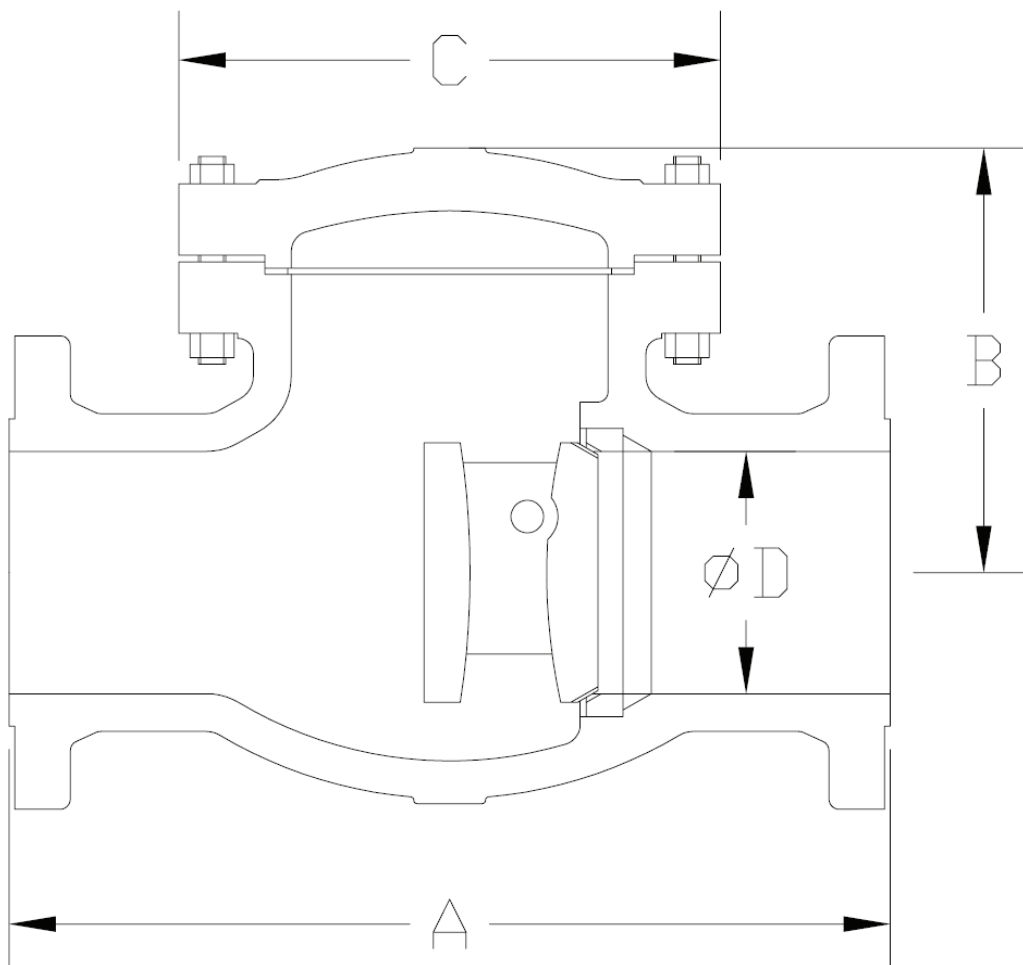
PART	MATERIALS		
Body	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9
Cap	A216 Gr. WCB	A217 Gr. WC6	A217 Gr. WC9
Disc	A105 + 13% CR or A216 WCB + 13% CR Faced	WC6 + Stellite 6 Faced	WC9 + Stellite 6 Faced
Seat Ring	Carbon Steel + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced
Gasket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

Design Specifications

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

TILTING DISC CHECK VALVE DIMENSIONS (CLASS 150—600).

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



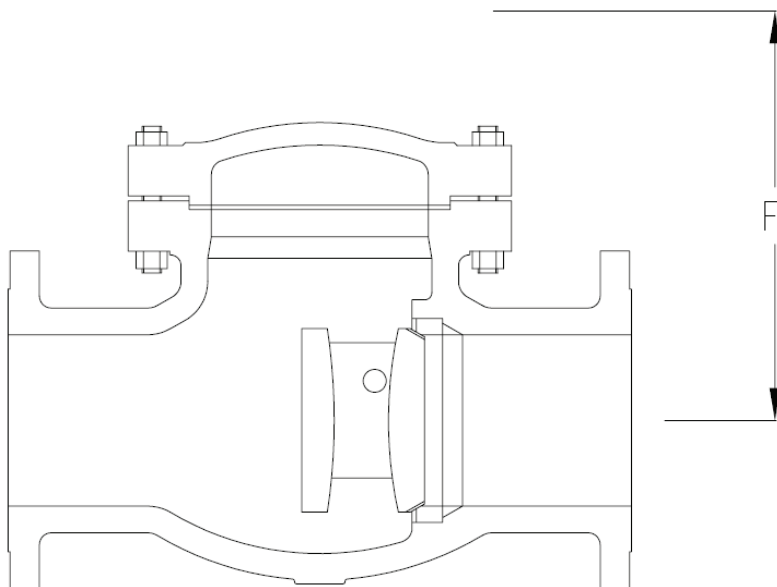
B = Center to top

WE = Butt Weld ends

FE = Flanged ends

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

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



FE = Flanged ends

WE = Weld ends

F = Dismantling dimension

WT = Weight

C_v = Flow coefficient

ACCESSORIES

GEAR ACTUATOR

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



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

Typical Adapto-Gear Installation:

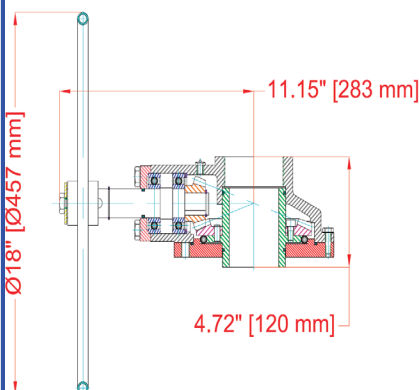
- Remove the handwheel.
- Remove bolts from the yoke, mount the adaptor, replace bolts and tighten.
- Install the sleeve and key on stem bushing.
- Mount gear operator on adaptor and bolt together.
- Conversion is completed.

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

ADVANTAGES

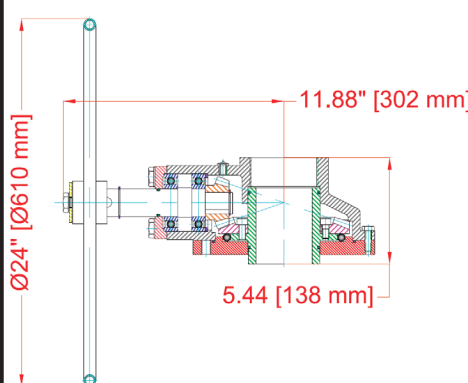
- Anti-friction bearings permits ease of operation.
- Housing protects gears from dirt, dust, and other foreign materials. Also good as a safety factor to protect operating personnel.
- Housing has provision for plug or pipe stem protector when required. Sealed housing retains the lubricant and protects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

MODEL AA-18 ACTUATOR



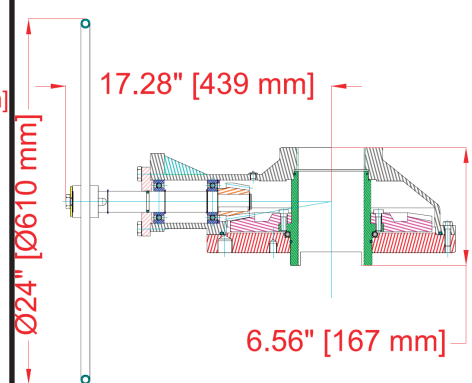
Max Torque: 996 ft-lb [1350 Nm]
Gear Ratio: 2.92:1

MODEL B-24 ACTUATOR



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

MODEL C-24 ACTUATOR

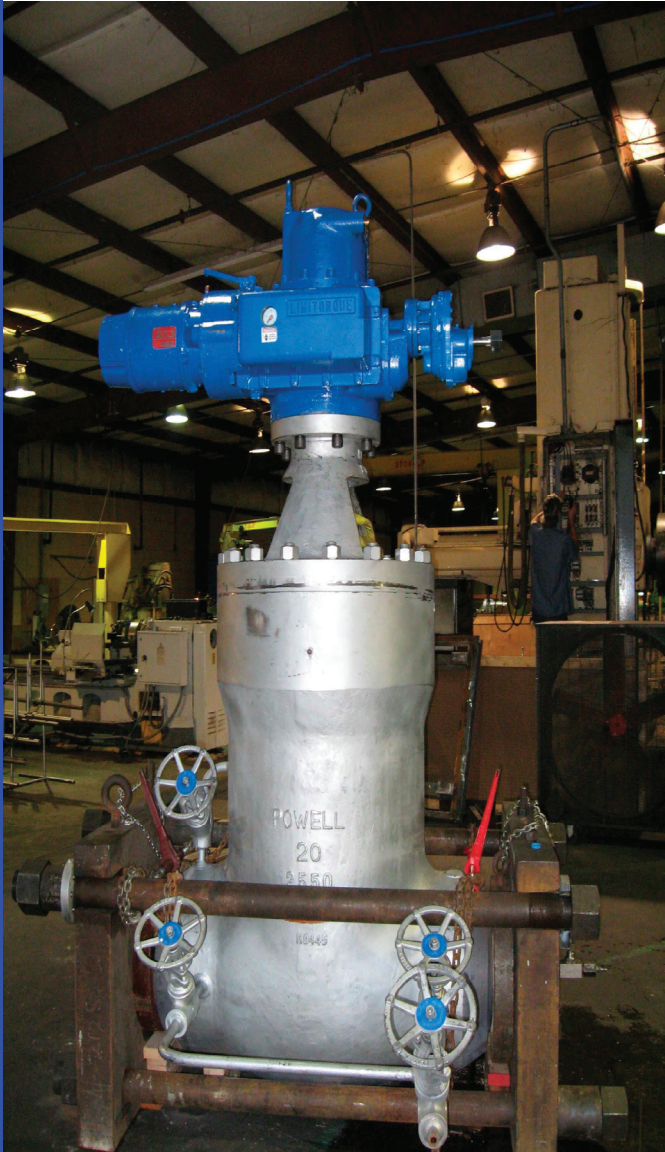


Max Torque: 3980 ft-lb [5400 Nm]
Gear Ratio: 6:1

ACCESSORIES cont...

MOTOR ACTUATOR

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

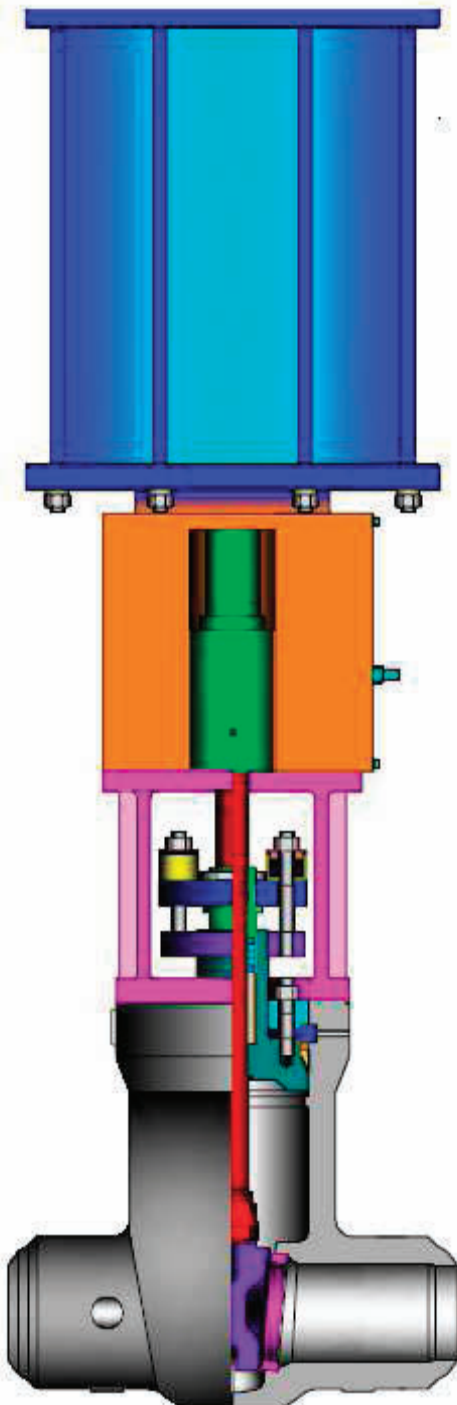


To enable Powell to quote accurately on Motor Actuated Valves, please provide the following complete information:

- A. Valve Size and Figure Number
- B. Media
- C. Media Pressure and Temperature
- D. Differential Pressure against which the valve must open and close and Line Pressure if different from differential pressure.
- E. Opening or Closing Time Requirements. Unless specified - gate valve stem speed is 12" per minute (approx.) and globe valve stem speed is 4" per minute (approx.).
- F. Voltage, Frequency and Number of Phases
- G. Special Features (e.g. control station requirements, special enclosure types, etc.)

ACCESSORIES cont...

HYDRAULIC OR PNEUMATIC ACTUATOR



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

When ordering such valves, please provide the following information:

- A. Valve Size and Figure Number
- B. Media
- C. Media Pressure and Temperature
- D. Differential Pressure against which the valve must open and close and Line Pressure if different from differential pressure.
- E. Opening or Closing Time Requirements
- F. Actuator Media Pressure - Min./Max.
- G. Failure Position (open, close, or as is)
- H. Special Features (e.g. limit switches, manual override, etc.)
- I. Environmental Temperature Range - Min./Max.

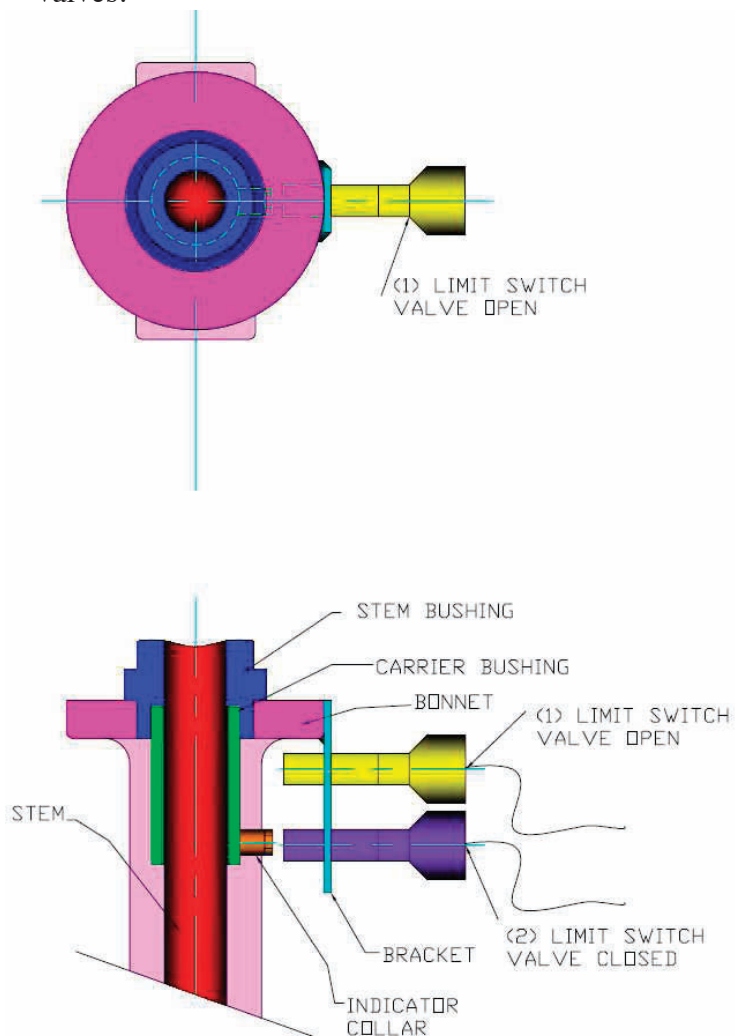
ACCESSORIES cont...

LIMIT SWITCH

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

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

Typical installation on handwheel operated valves.



	PAGE
VALVE STANDARDS AND RELATED INFORMATION	26
PRESSURE/TEMPERATURE RATINGS	27-34
CHEMICAL AND PHYSICAL PROPERTIES	35
TRIM DESCRIPTIONS	36
DIMENSIONS OF WROUGHT STEEL PIPE AND WELD END CONFIGURATIONS	37-42
STEEL VALVE FLANGE DIMENSIONS	43-49
METHOD OF DESIGNATING LOCATION OF AUXILIARY CONNECTIONS	50
BYPASS DIMENSIONS	51
FLOW DESIGN AND MAINTENANCE RECOMMENDATIONS	52
CONVERSION DATA AND EQUIVALENTS	53-54

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

VALVE STANDARDS AND RELATED INFORMATION

1. Steel and Corrosion Resistant Designs

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

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

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

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

- (C) API Standard 598 → Valve Inspection and Testing

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

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

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

- (F) ASME B16.25 → Buttwelding Ends

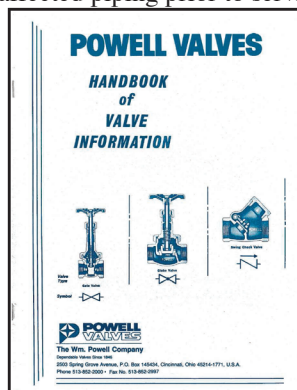
- (G) MSS SP-25 → Standard Marking System for Valves, Fittings, Flanges and Unions

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

2. Powell Publications and Miscellaneous Information

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

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



PRESSURE/TEMPERATURE RATINGS

TABLE 1

ASTM A216 Grade WCB

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

STANDARD CLASS

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

SPECIAL CLASS

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

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

PRESSURE/TEMPERATURE RATINGS

TABLE 2

ASTM A352 Grade LCB

Not to be used over 650° F.

STANDARD CLASS

Working Pressures by Classes, psig

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

SPECIAL CLASS

Working Pressures by Classes, psig

Temperature, °F	150	300	600	900	1500	2500	4500
-50 to 100	290	695	1,395	2,090	3,480	5,805	10,445
200	290	695	1,395	2,090	3,480	5,805	10,445
300	290	695	1,395	2,090	3,480	5,805	10,445
400	290	695	1,395	2,090	3,480	5,805	10,445
500	290	695	1,395	2,090	3,480	5,805	10,445
600	290	695	1,395	2,090	3,480	5,805	10,445
650	290	695	1,390	2,080	3,470	5,780	10,405

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

PRESSURE/TEMPERATURE RATINGS

TABLE 3

ASTM A217 Grade WC6

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

STANDARD CLASS

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

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

SPECIAL CLASS

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

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

PRESSURE/TEMPERATURE RATINGS

TABLE 4

ASTM A217 Grade WC9

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

STANDARD CLASS

Working Pressures by Classes, psig

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

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

SPECIAL CLASS

Working Pressures by Classes, psig

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

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

PRESSURE/TEMPERATURE RATINGS

TABLE 5

ASTM A217 Grade C5

Use normalized and tempered material only.

STANDARD CLASS

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

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

SPECIAL CLASS

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

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

PRESSURE/TEMPERATURE RATINGS

TABLE 6

ASTM A217 Grade C12

Use normalized and tempered material only.

STANDARD CLASS

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

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

SPECIAL CLASS

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

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

PRESSURE/TEMPERATURE RATINGS

TABLE 7

ASTM A217 Grade C12A

STANDARD CLASS

Working Pressures by Classes, psig							
Temperature °F	150	300	600	900	1500	2500	4500
-20 to 100	290	750	1,500	2,250	3,750	6,250	11,250
200	260	750	1,500	2,250	3,750	6,250	11,250
300	230	730	1,455	2,185	3,640	6,070	10,925
400	200	705	1,410	2,115	3,530	5,880	10,585
500	170	665	1,330	1,995	3,325	5,540	9,965
600	140	605	1,210	1,815	3,025	5,040	9,070
650	125	590	1,175	1,765	2,940	4,905	8,825
700	110	570	1,135	1,705	2,840	4,730	8,515
750	95	530	1,065	1,595	2,660	4,430	7,970
800	80	510	1,015	1,525	2,540	4,230	7,610
850	65	485	975	1,460	2,435	4,060	7,305
900	50	450	900	1,350	2,245	3,745	6,740
950	35	385	775	1,160	1,930	3,220	5,795
1000	20	365	725	1090	1,820	3,030	5,450
1050	20(1)	360	720	1080	1,800	3,000	5,400
1100	20(1)	300	605	905	1,510	2,515	4,525
1150	20(1)	225	445	670	1,115	1,855	3,345
1200	20(1)	145	290	430	720	1,200	2,160

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

SPECIAL CLASS

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

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

PRESSURE/TEMPERATURE RATINGS

TABLE 8

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

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

STANDARD CLASS

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

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

SPECIAL CLASS

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

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

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

TABLE 9

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

*RESIDUAL ELEMENTS-Total must not exceed 1.00 maximum.

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

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

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

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

NOTE: Chemical Compositions Are In Units Of Percent.

TRIM DESCRIPTIONS

TABLE 10

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

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

(b) Stellite 6 TM or equal.

DIMENSIONS OF WROUGHT STEEL PIPE AND WELD END CONFIGURATIONS

TABLE 11

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

*SEE SKETCHES 1 AND 2

DIMENSIONS OF WROUGHT STEEL PIPE AND WELD END CONFIGURATIONS

TABLE 11 (cont.)

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

*SEE SKETCHES 1 AND 2

DIMENSIONS OF WROUGHT STEEL PIPE AND WELD END CONFIGURATIONS

TABLE 11 (cont.)

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

*SEE SKETCHES 1 AND 2

DIMENSIONS OF WROUGHT STEEL PIPE AND WELD END CONFIGURATIONS

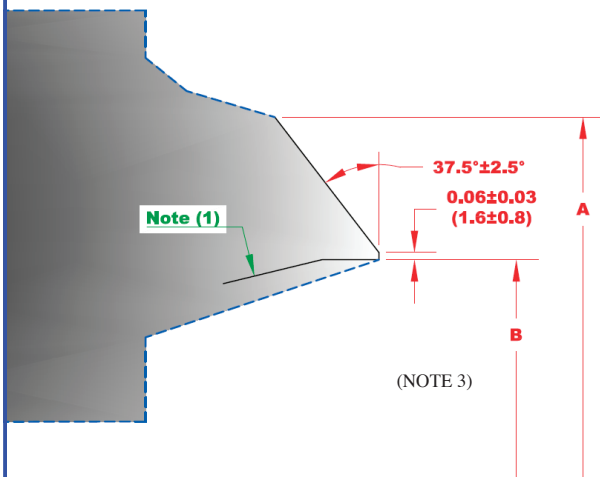
TABLE 11 (cont.)

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

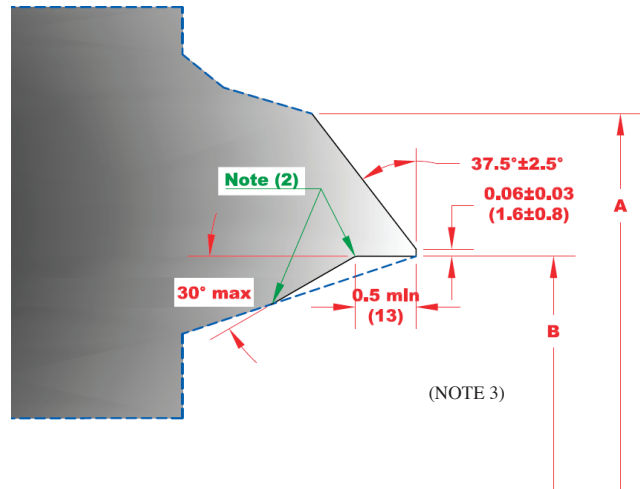
*SEE SKETCHES 1 AND 2

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

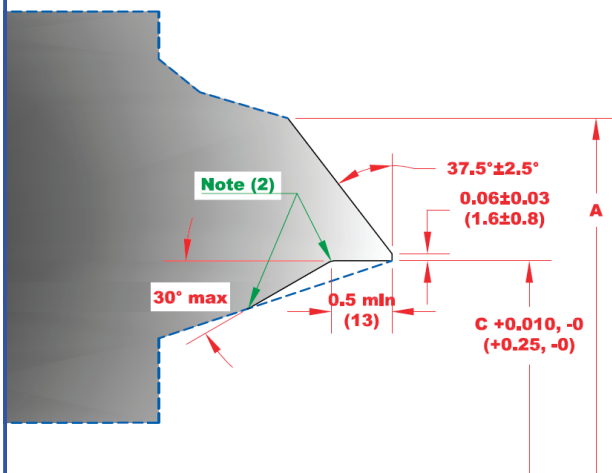
REFER TO ASME 16.25 FIG 2.



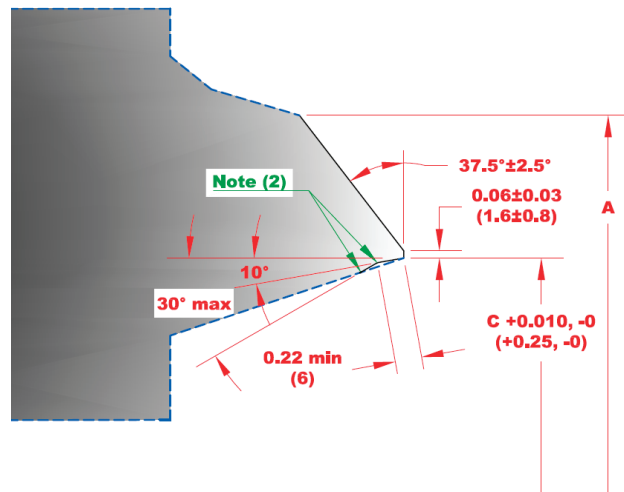
(a) Welding End Detail for Joint without Backing Ring



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



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



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

GENERAL NOTES:

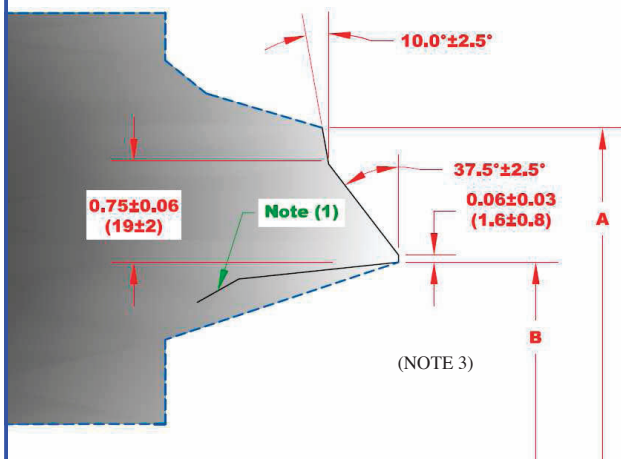
- Broken lines denote maximum envelope for transition from welding bevel and root face into body of component. Refer to Figure 1 of ASME B16.25 for details.
- Purchase order must specify contour of any backing ring to be used.
- Linear dimensions are in inches with millimeter values in parentheses.

NOTES:

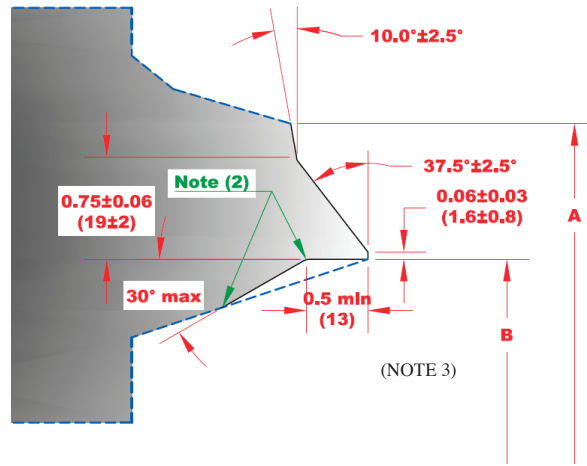
- Internal surface may be as-formed or machined for dimension B at root face.
- Intersections should be slightly rounded.
- Tolerances for "B" dimension on valve weld ends:
 - ±0.03" (±1.0 mm) for NPS ≤ 10
 - ±0.06" (±2.0 mm) for 12 ≤ NPS ≤ 18
 - +0.12", -0.06" (+3.0 mm, -2.0 mm) for NPS ≥ 20

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

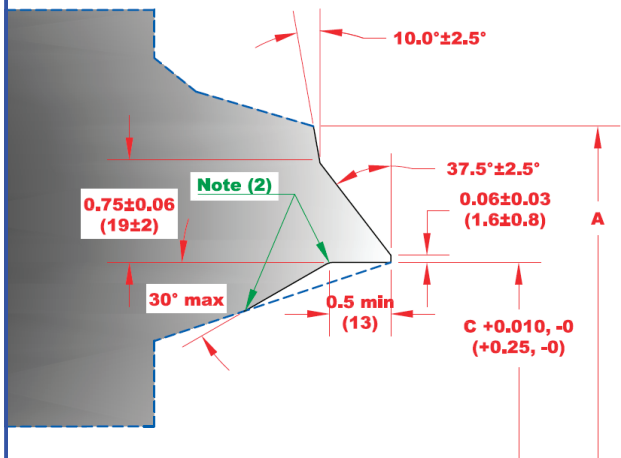
REFER TO ASME 16.25 FIG 3.



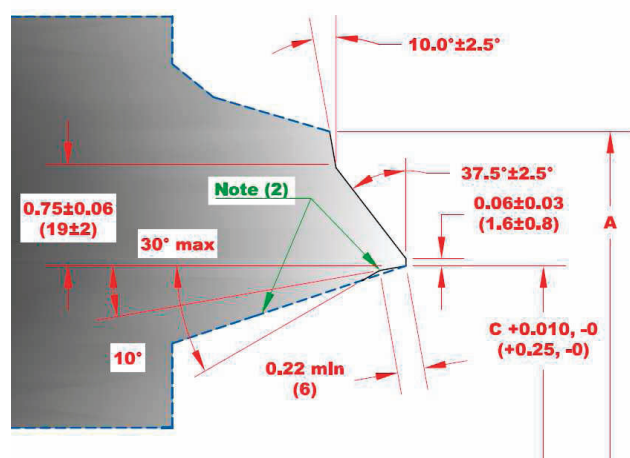
(a) Welding End Detail for Joint without Backing Ring



(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:

- 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.
- Purchase order must specify contour of any backing ring to be used.
- Linear dimensions are in inches with millimeter values in parentheses.

NOTES:

- Internal surface may be as-formed or machined for dimension B at root face.
- Intersections should be slightly rounded.
- Tolerances for "B" dimension on valve weld ends:
 - ± 0.03 " (± 1.0 mm) for $NPS \leq 10$
 - ± 0.06 " (± 2.0 mm) for $12 \leq NPS \leq 18$
 - $+0.12$ ", -0.06 " ($+3.0$ mm, -2.0 mm) for $NPS \geq 20$

STEEL VALVE FLANGE DIMENSIONS

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

- (1) ASME B16.47 Series A (equivalent to MSS SP-44)
- or (2) ASME B16.47 Series B (equivalent to API 605)

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

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

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

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

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

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

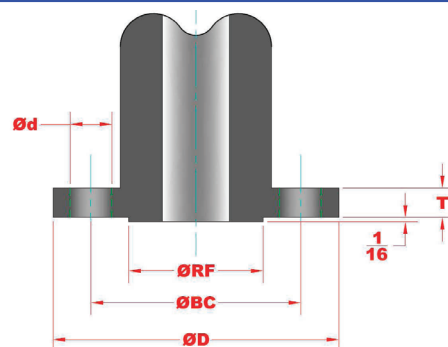
TABLE 17: ASME B16.47 SERIES B, CLASS 300, Sizes 26" through 60"

STEEL VALVE FLANGE FITTING DIMENSIONS

All Dimensions in Units of Inches

TABLE 12

CLASS 150



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

CLASS 300

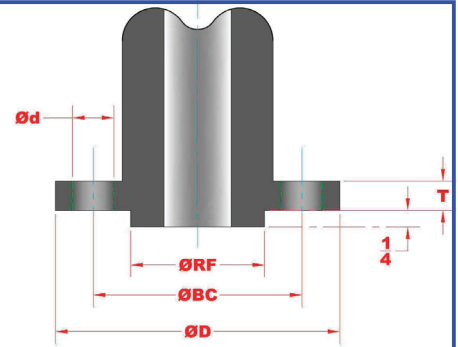
Nominal Pipe Size	Outside Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Thickness (T)	Raised Face Diameter (RF)
½	3.75	2.62	0.62	4	0.50	1.38
¾	4.62	3.25	0.75	4	0.56	1.69
1	4.88	3.50	0.75	4	0.62	2.00
1 ¼	5.25	3.88	0.75	4	0.69	2.50
1 ½	6.12	4.50	0.88	4	0.75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

STEEL VALVE FLANGE DIMENSIONS

All Dimensions in Units of Inches

TABLE 13

CLASS 600



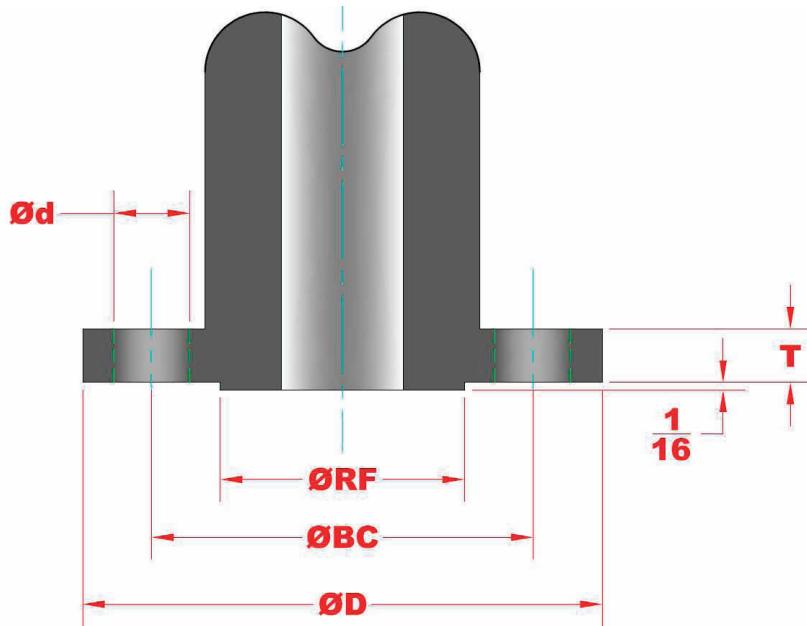
Nominal Pipe Size	Outside Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Thickness (T)	Raised Face Diameter (RF)
½	3.75	2.62	0.62	4	0.56	1.38
¾	4.62	3.25	0.75	4	0.62	1.69
1	4.88	3.50	0.75	4	0.69	2.00
1 ¼	5.25	3.88	0.75	4	0.81	2.50
1 ½	6.12	4.50	0.88	4	0.88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

CLASS 900

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

DIMENSIONS OF CLASS 150 SERIES A FLANGES

TABLE 14

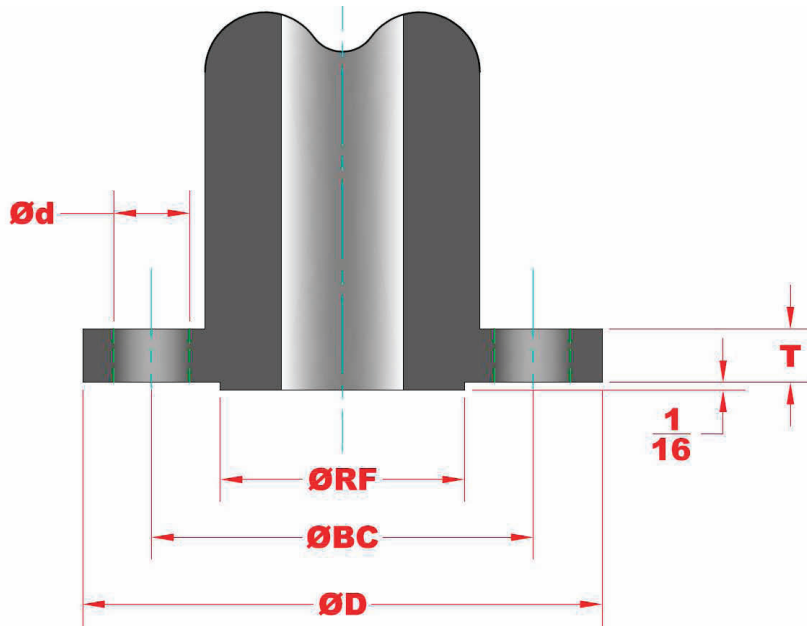


Nominal Pipe Size	Outside Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Thickness (T)	Raised Face Diameter (RF)
26	34.25	31.75	1.38	24	2.63	29.50
28	36.50	34.00	1.38	28	2.75	31.50
30	38.75	36.00	1.38	28	2.88	33.75
32	41.75	38.50	1.62	28	3.13	36.00
34	43.75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

All Dimensions in Units of Inches

DIMENSIONS OF CLASS 300 SERIES A FLANGES

TABLE 15

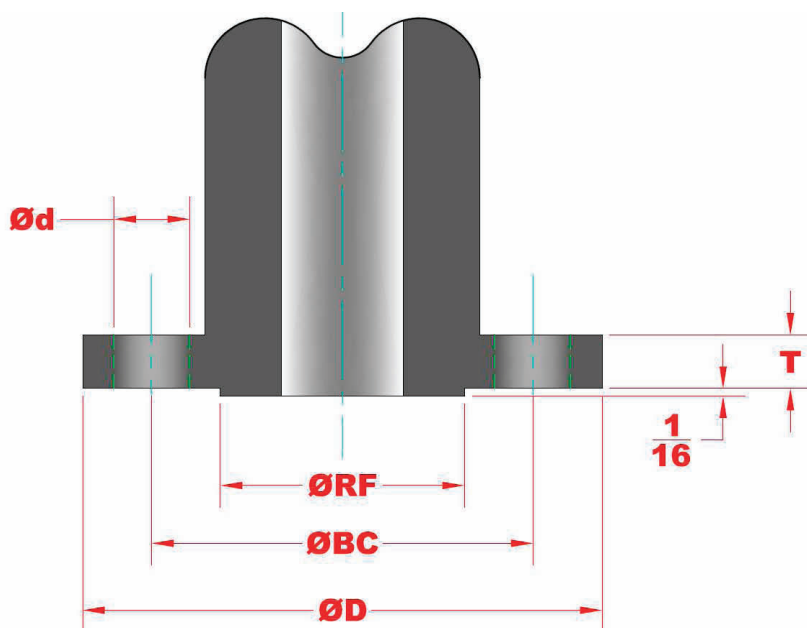


Nominal Pipe Size	Outside Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Thickness (T)	Raised Face Diameter (RF)
26	38.25	34.50	1.75	28	3.07	29.50
28	40.75	37.00	1.75	28	3.32	31.50
30	43.00	39.25	1.88	28	3.57	33.75
32	45.25	41.50	2.00	28	3.82	36.00
34	47.50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

All Dimensions in Units of Inches

DIMENSIONS OF CLASS 150 SERIES B FLANGES

TABLE 16

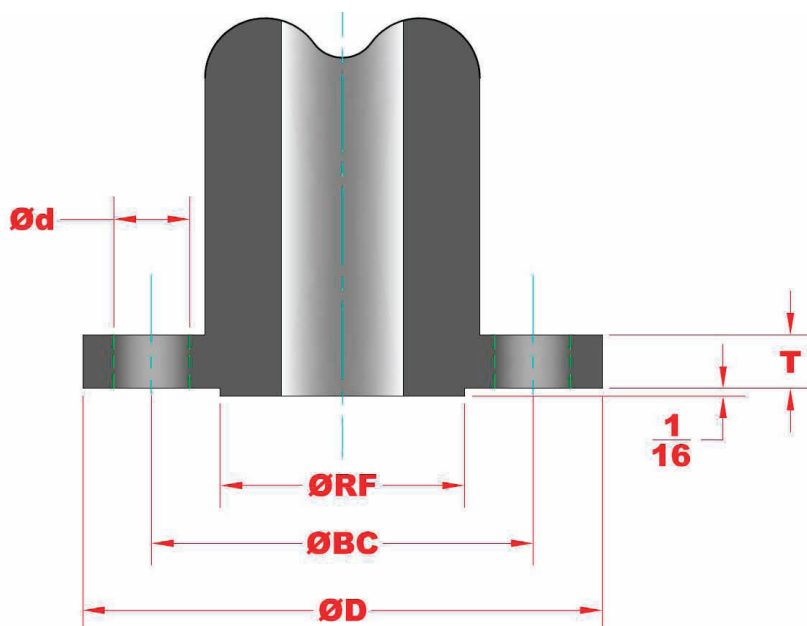


Nominal Pipe Size	Outside Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Thickness (T)	Raised Face Diameter (RF)
26	30.94	29.31	0.88	36	1.57	28.00
28	32.94	31.31	0.88	40	1.69	30.00
30	34.94	33.31	0.88	44	1.69	32.00
32	37.06	35.44	0.88	48	1.75	34.00
34	39.56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

All Dimensions in Units of Inches

DIMENSIONS OF CLASS 300 SERIES B FLANGES

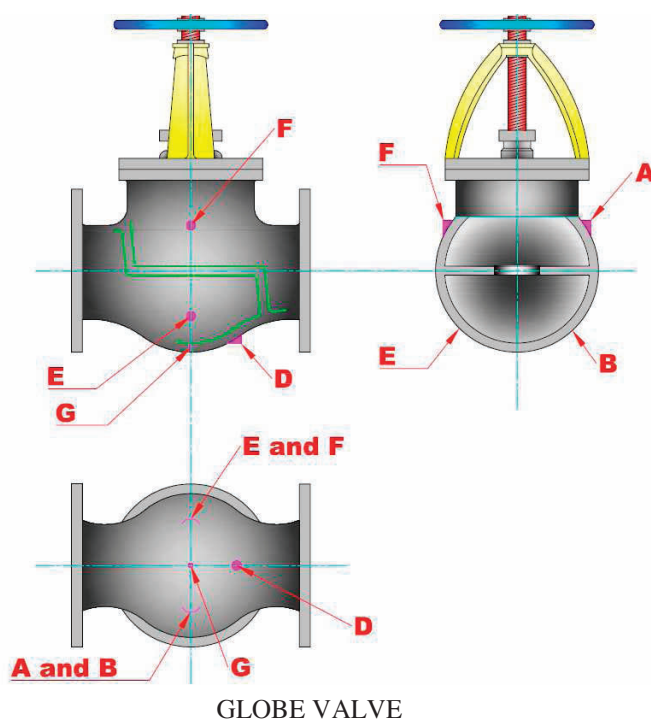
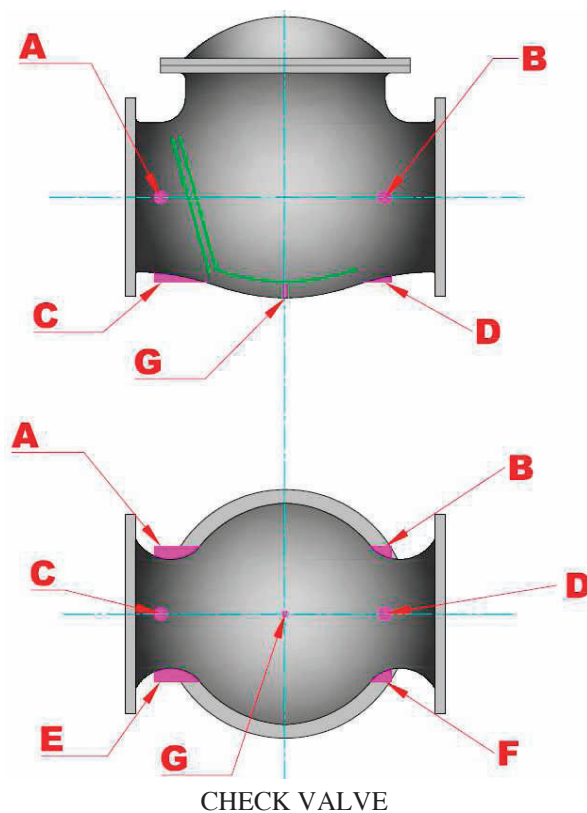
TABLE 17



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

All Dimensions in Units of Inches

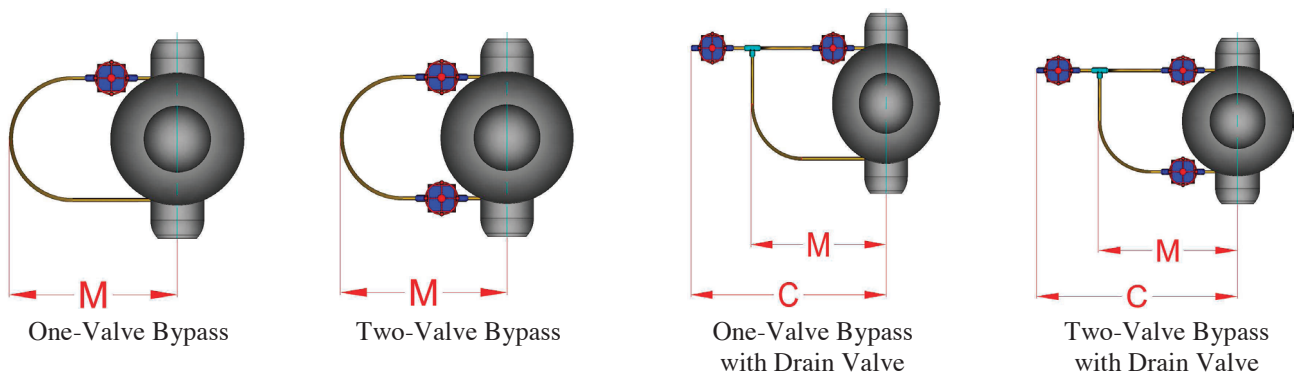
FIGURE 1



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

FIGURE 2

BYPASS DIMENSIONS
CAST STEEL VALVES
CLASS 150 THROUGH 1500



BY-PASS SIZES AND CLEARANCE DIMENSIONS-BOLTED BONNET (in)

Size of Valve			4	6	8	10	12	14	16	18	20	24
Size of By-Pass			1/2	3/4	3/4	1	1	1	1	1	1	1
Bypass Clearance Dimensions, Approximate, (in)	Class 150	M - F.E.	-	-	17 1/2	19 13/16	21 1/8	23 1/8	23 3/4	25 1/8	25 1/2	28 3/4
		M - W.E.	-	-	18 7/8	20 7/8	21 13/16	24 1/2	25 9/16	25 13/16	26 7/8	30
		C - F.E.	-	-	23 3/8	26 11/16	28	30	30 5/8	32	32 3/8	35 5/8
		C - W.E.	-	-	24 3/4	27 3/4	28 11/16	31 3/8	32 7/16	32 11/16	33 3/4	36 7/8
	Class 300	M	-	-	18 13/16	20 13/16	22 1/8	24 3/4	25 3/4	27 1/4	28 1/2	31 1/8
		C	-	-	24 11/16	27 11/16	29	31 5/8	32 5/8	34 1/8	35 3/8	38
	Class 600	M	16 7/8	19 3/8	20 1/2	24 1/4	25 1/4	26	26 7/8	30 3/4	30 3/4	-
		C	22	25 3/8	26 1/2	31	32	32 3/4	33 5/8	37 1/2	37 1/2	-
	Class 900	M	16 7/8	19 1/2	20 5/8	24 1/4	25 3/8	26 1/8	27 1/4	30 1/8	-	-
		C	22 1/8	25 1/2	26 5/8	31	32 1/8	32 7/8	34	36 7/8	-	-
	Class 1500	M	17	19 5/8	20 3/4	24 1/4	25 3/8	-	-	-	-	-
		C	22 3/8	25 3/4	26 7/8	31 1/8	32 3/8	-	-	-	-	-

FLOW DESIGN AND MAINTENANCE RECOMMENDATIONS

- (1) SWING CHECK VALVES- Minimum $\frac{1}{2}$ psi differential pressure across valve to maintain proper “full open” position.
- (2) LIFT CHECK AND NON-RETURN VALVES- Minimum 2 psi differential pressure across valve to maintain proper “full open” position
- (3) Recommended length of straight pipe before and after check and non-return valves to be 10 times pipe diameter to avoid flow turbulence at valve.
- (4) For metal seated check valves at low pressure applications (approximately 50 psi or less), seat leakage may be significantly greater than the normal high pressure seat test allowable limit.
- (5) RECOMMENDED MAXIMUM FLOW VELOCITIES (APPROXIMATE):

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

- (6) GATE VALVES — Not to be used in throttling services. Open and closed service only.
- (7) GLOBE VALVES — Not to be throttled under 20% open.

**FOR MAINTENANCE AND SAFETY INFORMATION, SEE THE POWELL
HANDBOOK OF VALVE INFORMATION, AS DESCRIBED ON PAGE 26.**

COMPARISON CHART OF VALVE SIZE/NOMINAL PIPE SIZE

TABLE 18

<u>METRIC NOMINAL SIZE</u> (DN)	<u>ENGLISH NOMINAL SIZE</u> (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): $F = 1.8 \times C + 32$

TO CONVERT FROM DEGREES FAHRENHEIT (F) TO DEGREES CENTIGRADE (C): $C = 0.556 \times (F - 32)$

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

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

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

MEASUREMENT EQUIVALENTS

TABLE 19

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

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

March, 2011 THE WILLIAM POWELL COMPANY
GENERAL TERMS AND CONDITIONS OF SALE

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The logo for Powell Valves features the word "POWELL" in a bold, solid blue, sans-serif font. Below it, the word "VALVES" is written in a large, blue-outlined, sans-serif font. A thick blue horizontal line is positioned directly beneath the word "VALVES".

Established 1846



POWELL VALVES

2503 SPRING GROVE AVENUE, CINCINNATI, OHIO 45214-1771, U.S.A.

PHONE: 513.852.2000 • FAX NO. 513.852.2997

www.powellvalves.com



POWELL **VALVES**

PRESSURE SEAL VALVES

CAST CARBON, STAINLESS AND ALLOY STEEL VALVES

GATE, GLOBE AND CHECK VALVES

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

Table of Contents

<u>SUBJECT</u>	<u>PAGE</u>
THE WM. POWELL COMPANY — PROFILE	2-3
POWELL’S STANDARD MATERIAL INSPECTION FLOW	4
HOW TO ORDER	5
FUGITIVE EMISSIONS	6
PRESSURE SEAL GASKET DESIGN	7
GATE VALVES	8-13
GLOBE VALVES	14-19
NON-RETURN VALVES	20-25
SWING CHECK VALVES	26-28
TILTING DISC VALVES	29-31
LIFT CHECK VALVES	32-37
ACCESSORIES	38-41
ENGINEERING DATA	42-64
TERMS OF SERVICE	65-67

The Wm. Powell Company - Profile

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

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

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

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

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

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

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

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

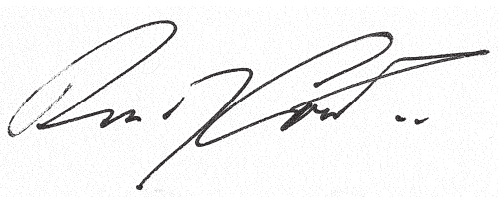
Powell also used its valve knowledge and expertise to construct a modification facility in the U.S.A. to assist customers with their needs, such as, automation, trim changes, end connection changes, additional quality inspections and special service pressure testing requirements, field service, etc...

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

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

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

Sincerely,

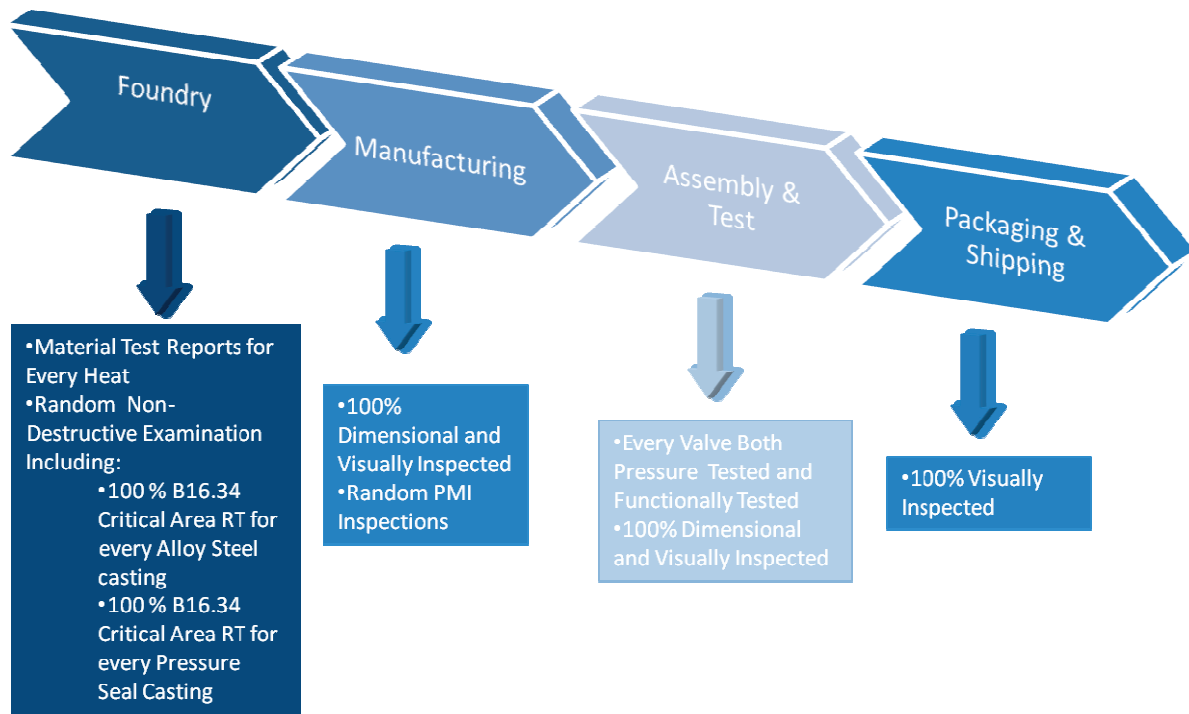
A handwritten signature in black ink, appearing to read "Randy Cowart", is written over a light gray rectangular background.

Randy Cowart

President, CEO & Chairman

The Wm. Powell Company

POWELL'S STANDARD MATERIAL INSPECTION FLOW



PRESSURE SEAL VALVE FIGURE NUMBER INDEX

<u>Base Figure Number</u>	<u>Page(s)</u>
1603, 1903, 1103, 1203	8-10
1607, 1907, 1107, 1207	11-13
1631, 1931, 1131, 1231	14-16
1631, 1931, 1131, 1231 Y-Pattern	17-19
1684, 1984, 1184, 1284	20-22
1684, 1984, 1184, 1284 Y-Pattern	23-25
1661, 1961, 1161, 1261	26-28
1695, 1995, 1195, 1295	29-31
1665, 1965, 1165, 1265	32-34
1665, 1965, 1165, 1265 Y-Pattern	35-37

How to order Powell Cast Bolted Bonnet and Pressure Seal Valves

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

Digit

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

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

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

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

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

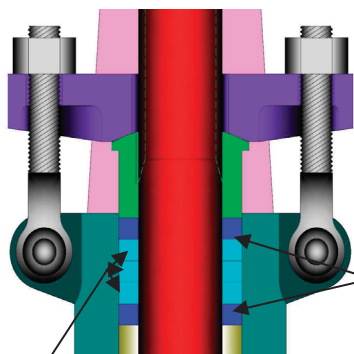
Trim	
Code	Option
0	API Trim 10
1	API Trim 1
2	API Trim 12
3	API Trim 13
5	API Trim 5
6	API Trim 16
7	API Trim 17
8	API Trim 8
9	API Trim 9
A	Integral half HF
B	Integral full HF
C	Integral
D	API Trim 11
E	API Trim 2
N	API Trim 8 NACE
Z	Special Trim

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

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

Examples:

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

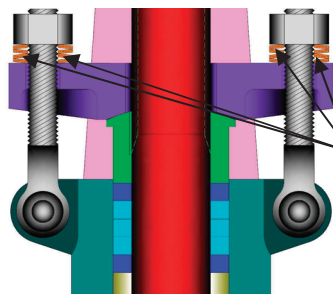


DIE FORMED FLEXIBLE GRAPHITE RIBBON INNER RINGS WITH CORROSION INHIBITOR

BRAIDED CARBON YARN
END RINGS WITH
CORROSION INHIBITOR

STANDARD PACKING ARRANGEMENT

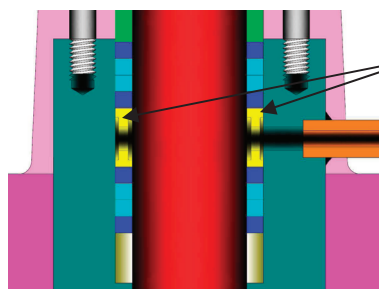
Powell standard design cast steel valves are designed and manufactured to a 100 ppm maximum fugitive emissions level.



BELLEVILLE WASHERS

LIVE LOAD OPTION

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



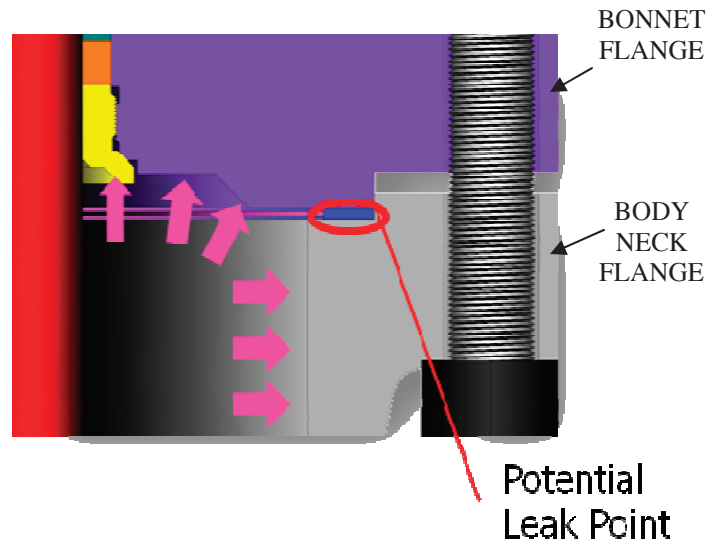
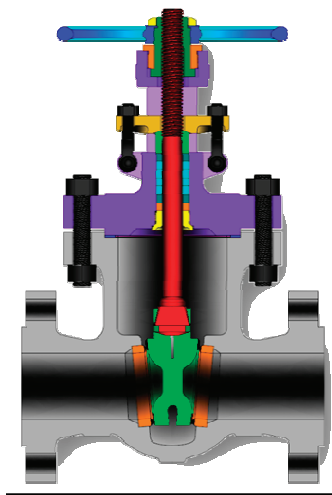
LANTERN RING

LANTERN RING OPTION

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

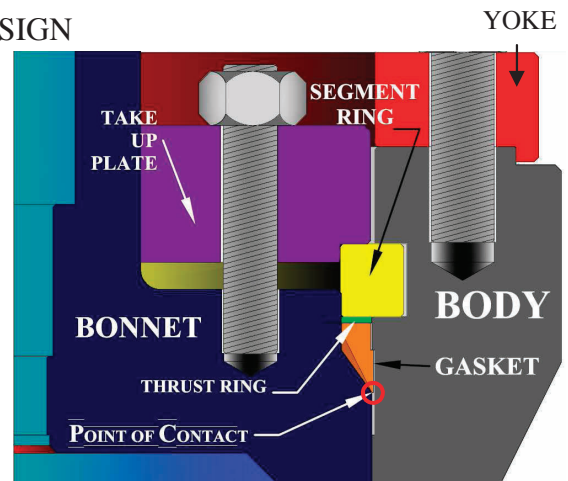
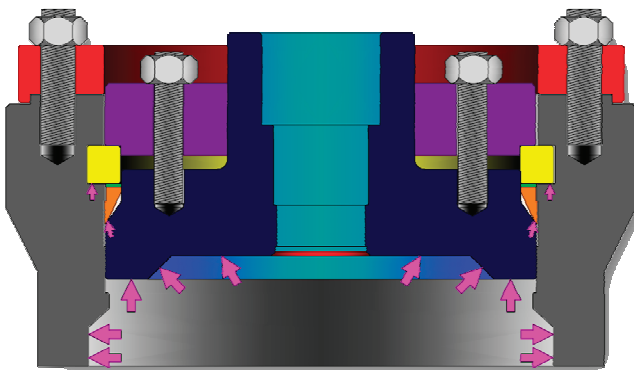
PRESSURE SEAL GASKET DESIGN

BOLTED BONNET DESIGN



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

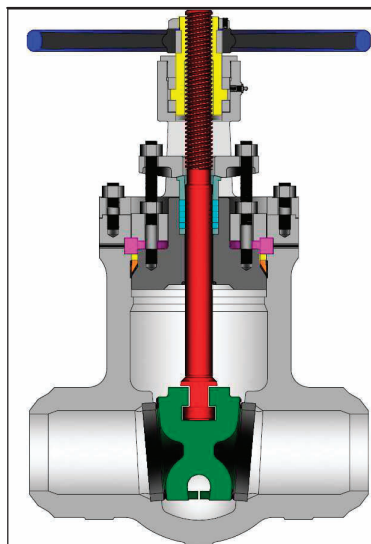
PRESSURE SEAL DESIGN



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

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

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



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

STANDARD MATERIALS (Other materials available)

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

DESIGN FEATURES:

- **Flexible Wedge** for improved seating and ease of operation, especially in high temperature service. Wedges are accurately guided thru the entire stroke.
- **Valves** are full port design per ASME B16.34 Table A-1.
- **Standard trim** is stellite faced seat and disc seat surfaces, and 13% chrome stem (API trim 5). Other trims available on request.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Stems** are non-rotating with surface finish to maximize packing seal for low fugitive emissions.
- **Yoke arms** designed for ease of gear, motor or cylinder actuator adaptation.

- **Each** valve is shell, seat and back-seat pressure tested per industry standard API 598.
- **Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test report, inspection report and certificate of conformance.
- **Valve sizes** 4" and smaller have bonnet take up ring design instead of support plate design.
- **Weld** end valves are B16.10 short pattern design. Flanged end valves are available on request and are B16.10 long-pattern design. Weld end valve dimensions given in table on next page.

Design Specifications

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

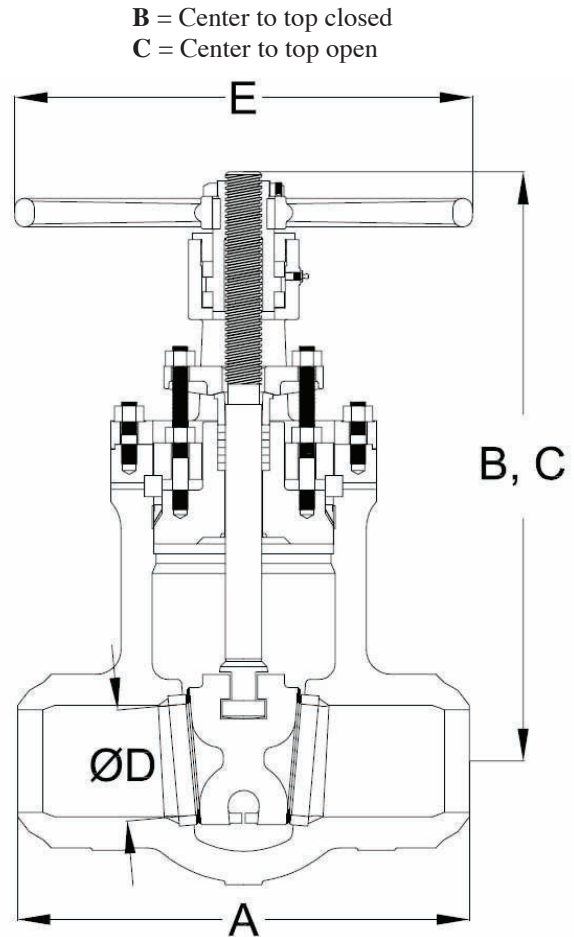
- **Other** available options as follows:
 - Alternate valve materials such as chrome and stainless steel alloys
 - Alternate trim materials
 - Bypass, drain and other auxiliary connections
 - Gear, motor, and cylinder actuators available
 - NACE service
 - Special cleaning for applications such as oxygen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

GATE VALVE DIMENSIONS (CLASS 600—2500).

SIZE	ASME 600					ASME 900					ASME 1500				
in	A	B(1)	C(1)	D	E	A	B(1)	C(1)	D	E	A	B(1)	C(1)	D	E
mm															
2	7.00	15.7	18.2	2.00	8	8.50	19.7	22.0	1.87	14	8.50	19.7	22.0	1.87	14
50	178	399	462	51	200	216	499	558	48	356	216	499	558	48	356
2½	8.50	19.6	22.6	2.50	12	10.00	21.5	24.1	2.25	14	10.00	21.5	24.3	2.25	14
65	216	498	573	64	305	254	546	612	57	356	254	545	616	57	356
3	10.00	20.3	23.7	3.00	12	12.00	22.8	26.1	2.87	14	12.00	23.7	27.1	2.75	16
80	254	516	602	76	305	305	578	664	73	356	305	603	688	70	406
4	12.00	24.4	29.0	4.00	14	14.00	25.2	29.5	3.87	16	16.00	27.7	31.9	3.62	20
100	305	620	736	102	356	356	640	750	98	406	406	703	811	92	500
6	18.00	27.6	34.1	6.00	20	20.00	28.7	35.1	5.75	20	22.00	30.2	36.3	5.37	22
150	457	700	865	152	508	508	729	892	146	508	559	768	923	136	560
8	23.00	32.6	41.2	7.87	20	26.00	33.6	42.0	7.50	25	28.00	34.8	42.6	7.00	28
200	584	828	1047	200	508	660	854	1066	191	640	711	883	1083	178	720
10	28.00	38.4	49.0	9.75	25	31.00	44.2	53.5	9.37	30	34.00	44.5	53.3	8.75	28
250	711	975	1245	248	640	787	1122	1360	238	762	864	1131	1353	222	710
12	32.00	44.5	56.9	11.75	28	36.00	59.3	70.4	11.12	30	39.00	50.1	60.5	10.37	30
300	813	1129	1445	298	680	914	1505	1788	282	762	991	1272	1535	263	762
14	35.00	56.9	62.1	12.87	30	39.00	66.9	79.2	12.25	30	42.00	63.1	74.5	11.37	36
350	889	1445	1577	327	762	991	1700	2011	311	762	1067	1604	1892	289	914
16	39.00	74.9		14.75	18	43.00	76.1		14.00	24	47.00	76.1		13.00	24
400	991	1903		375	460	1092	1933		356	610	1194	1933		330	610
18	43.00	84.9		16.50	18	48.00	88.7		15.75	24	53.00	84.6		14.62	24
450	1092	2157		419	460	1219	2255		400	610	1346	2149		371	610
20	47.00	86.6		18.25	18	52.00	92.2		17.50	24	58.00	104		16.37	24
500	1194	2200		464	460	1321	2342		445	610	1473	2626		416	610
24	55.00	90.4		22.00	18	61.00	106		21.00	24	76.50	138		19.62	24
600	1397	2295		559	460	1549	2680		533	610	1943	3490		498	610

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

SIZE	ASME 2500				
in	A	B(1)	C(1)	D	E
mm					
2	11.00	18.6	20.5	1.50	12
50	279	473	521	38	300
2½	13.00	22.0	26.1	1.87	18
65	330	558	662	48	457
3	14.50	22.0	26.1	2.25	18
80	368	558	662	57	457
4	18.00	28.2	32.0	2.87	20
100	457	717	812	73	508
6	24.00	31.4	36.5	4.37	24
150	610	798	928	111	610
8	30.00	39.2	47.2	5.75	24
200	762	997	1200	146	610
10	36.00	45.3	52.6	7.25	30
250	914	1151	1335	184	762
12	41.00	52.7	66.7	8.62	36
300	1041	1339	1695	219	914
14	44.00	74.2		9.50	24
350	1118	1885		241	610
16	49.00	77.0		10.87	24
400	1245	1956		276	610
18	55.00	79.9		12.25	32
450	1397	2030		311	800

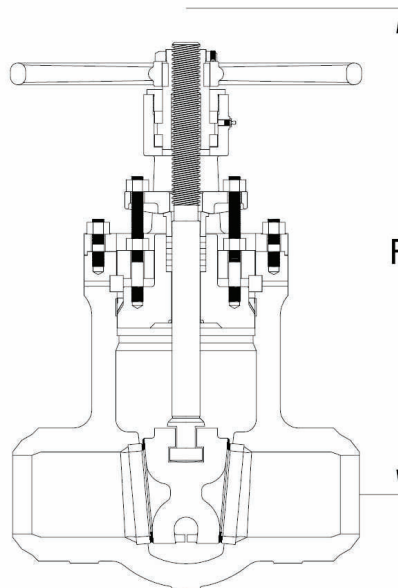


PRESSURE SEAL GATE VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 24" (50 TO 600 mm)
ASME CLASSES 600 TO 2500

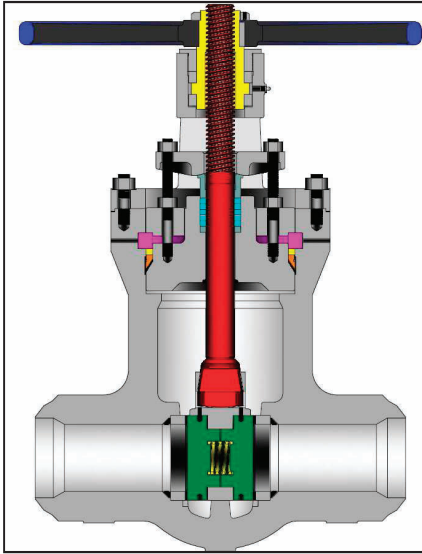
SIZE	ASME 600					ASME 900					ASME 1500					ASME 2500				
in mm	F	in mm	WT	lb kg	C _v	F	in mm	WT	lb kg	C _v	F	in mm	WT	lb kg	C _v	F	in mm	WT	lb kg	C _v
2	27.5		95		240	30.2		95		210	30.2		95		210	30.6		176		140
50	699		43			766		43			766		43			778		80		
2½	30.2		125		390	30.3		125		310	32.8		135		310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

Note: Does not include weight of gear.

WT = Weight
F = Dismantling Dimension
C_v = Flow Coefficient



STANDARD MATERIALS (Other materials available)



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

DESIGN FEATURES:

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

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

Design Specifications

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

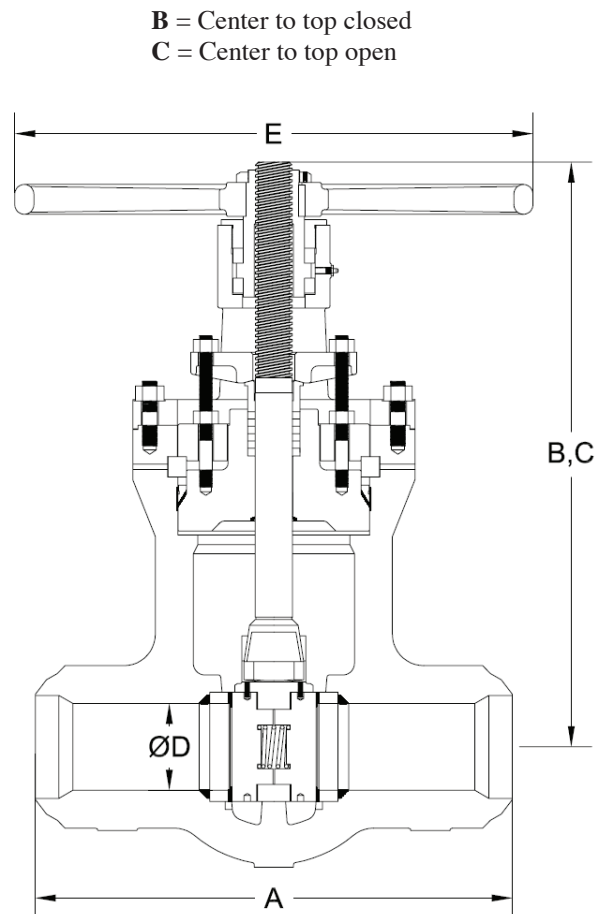
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test report, inspection report and certificate of conformance.
- **Valve sizes** 4" and smaller have bonnet take up ring design instead of support plate design.
- **Other**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

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

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

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

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

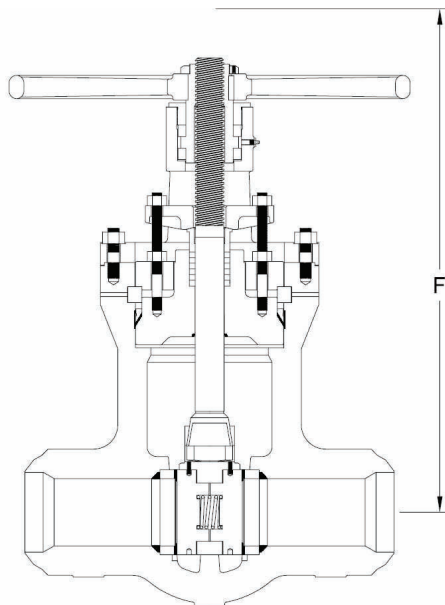


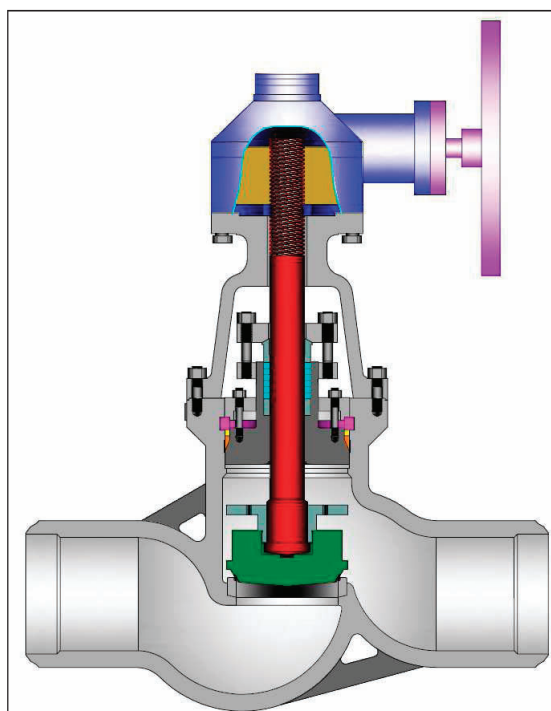
PRESSURE SEAL PARALLEL SEAT GATE VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 24" (50 TO 600 mm)
ASME CLASSES 600 TO 2500

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

Note: Does not include weight of gear.

WT = Weight
F = Dismantling Dimension
C_v = Flow Coefficient





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

STANDARD MATERIALS (Other materials available)

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

DESIGN FEATURES:

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

Design Specifications

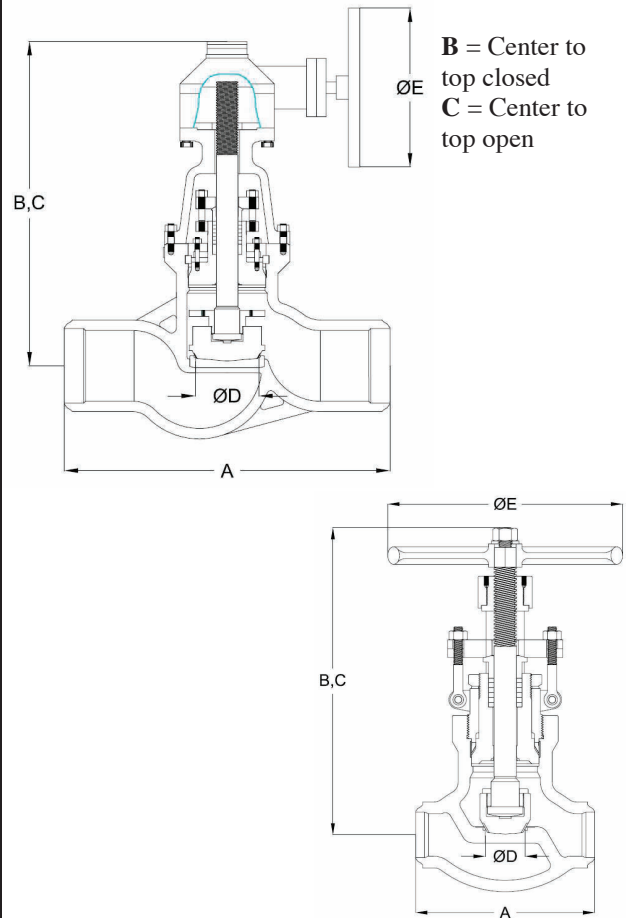
Item	Applicable Specification
Wall thickness	API 600
Pressure - temperature ratings	ASME B16.34
General valve design	B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Butt Weld design	ASME B16.25
Materials	ASTM

GLOBE VALVE DIMENSIONS (CLASS 600—2500).

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

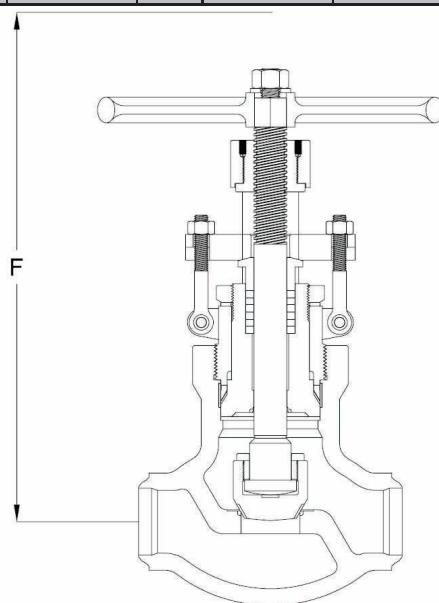
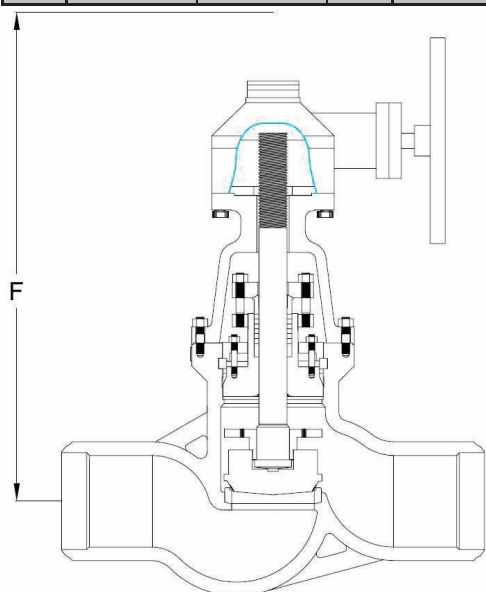
(1) Gear operators standard for 10" and up for class 600, 6" and up for class 900, and 4" and up for class 1500 and 2500.

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



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

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

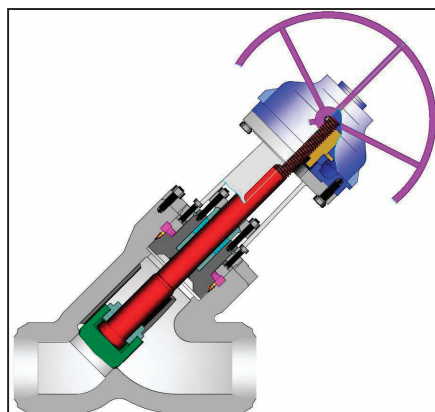


F = Dismantling dimension

WT = Weight

C_v = Flow coefficient

STANDARD MATERIALS (Other materials available)



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

(1) An option code is needed to specify a y-pattern. See page 5 for more details.

DESIGN FEATURES:

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

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

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

Design Specifications

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

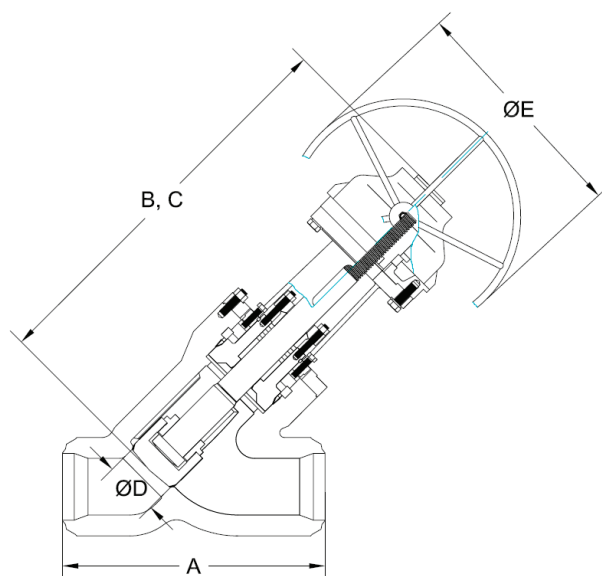
GLOBE VALVE DIMENSIONS (CLASS 600—2500).

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

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

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

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



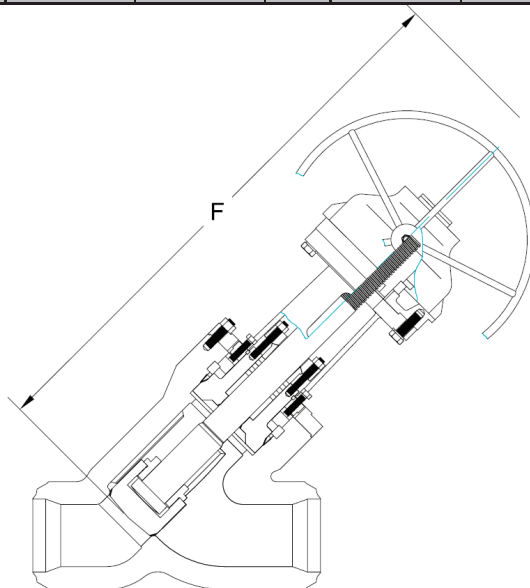
PRESSURE SEAL Y-PATTERN GLOBE VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 12" (50 TO 300 mm)
ASME CLASSES 600 TO 2500

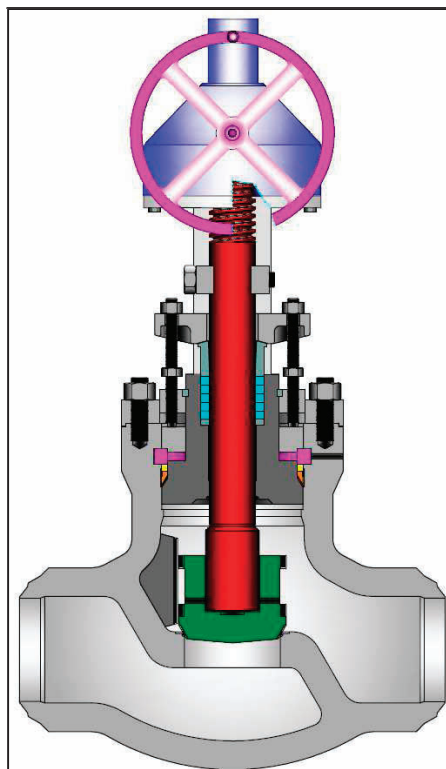
SIZE	ASME 600					ASME 900					ASME 1500					ASME 2500				
in	F	in	WT	lb	C _v	F	in	WT	lb	C _v	F	in	WT	lb	C _v	F	in	WT	lb	C _v
mm		mm		kg			mm		kg			mm		kg			mm		kg	
2	26.4		49	100		27.7		84	90		28.7		89	90		31.3		117	60	
50	671		22			704		38			729		40			795		53		
2½	26.4		87	170		27.7		126	130		30.6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

F = Dismantling dimension

WT = Weight

C_v = Flow coefficient





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

STANDARD MATERIALS (Other materials available)

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

DESIGN FEATURES:

- **Standard trim** is stellite faced seat and disc seat surfaces, and 13% chrome stem (API trim 5). Other trims available on request.
- **Valves** are full port design per ASME B16.34 Table A-1.
- **Wall thickness** per heavy wall API 600 requirements.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Each** valve is shell, seat and back-seat pressure tested per industry standard API 598.
- **Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.
- **Weld end valves** are B16.10 short pattern design. Flanged end valves are B16.10 long-pattern design. Weld end valve dimensions given in table on next page.

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

Design Specifications

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

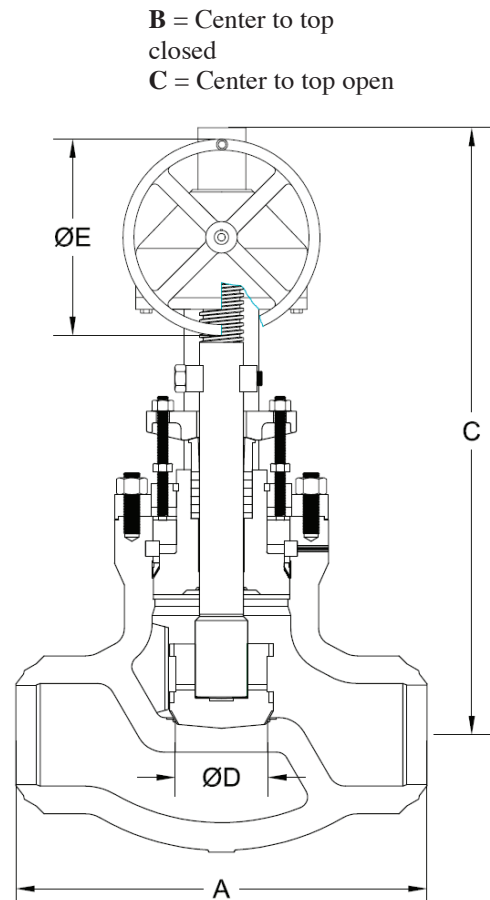
Note: Angle pattern available on request.

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

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

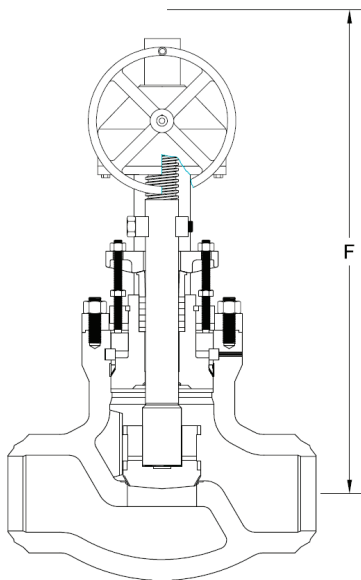
(1) Gear operators standard for 10" and up for class 600, 6" and up for class 900, and 4" and up for class 1500 and 2500.

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



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

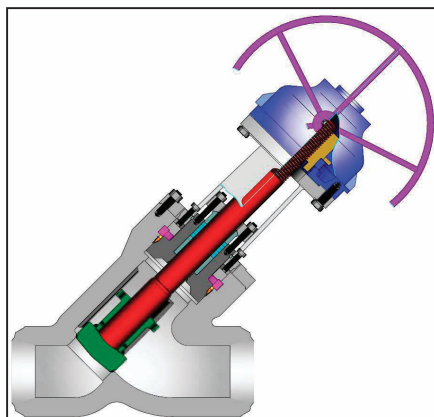
SIZE	ASME 600					ASME 900					ASME 1500					ASME 2500				
in	F	in	WT	lb	C _v	F	in	WT	lb	C _v	F	in	WT	lb	C _v	F	in	WT	lb	C _v
mm		mm		kg			mm		kg			mm		kg			mm		kg	
2	25.4		46		50	26.7		80		40	27.7		85		40	30.3		111		25
50	645		21			678		36			700		39			770		50		
2½	25.4		83		75	26.7		120		60	29.6		136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



F = Dismantling dimension

WT = Weight

C_v = Flow coefficient



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

(1) An option code is needed to specify a y-pattern. See page 5 for more details.

STANDARD MATERIALS (Other materials available)

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

DESIGN FEATURES:

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

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

Design Specifications

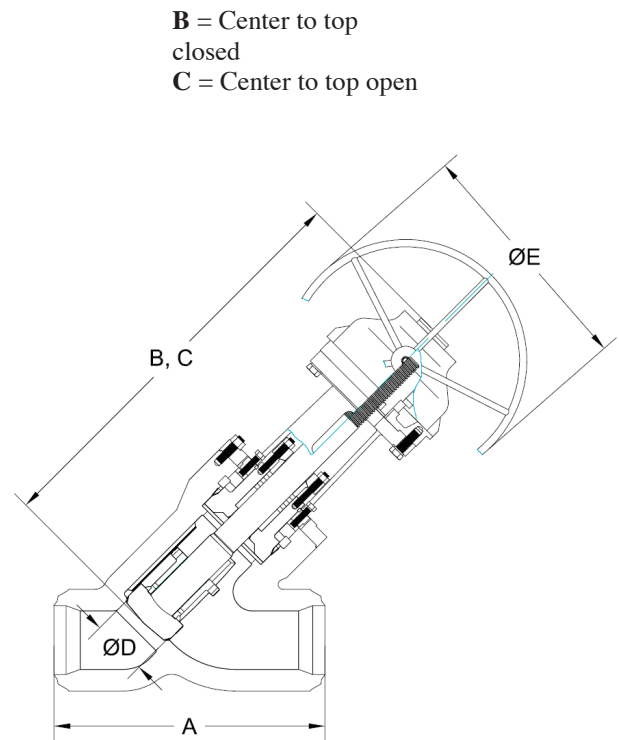
Item	Applicable Specification
Wall thickness	API 600
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Butt Weld design	ASME B16.25
Materials	ASTM

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

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

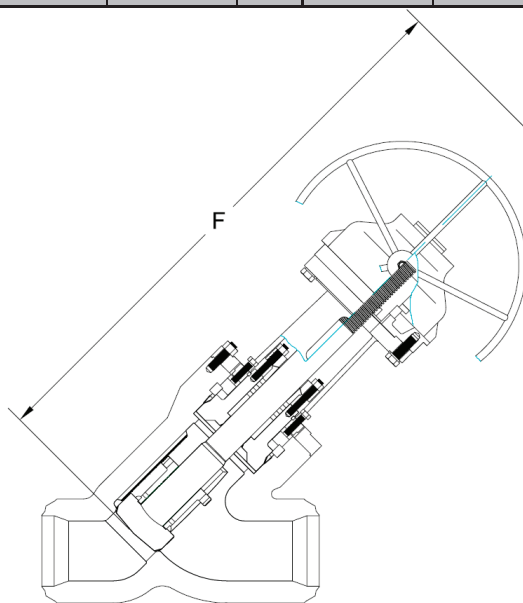
(1) Gear operators standard for 10” and up for class 600, 6” and up for class 900, and 4” and up for class 1500 and 2500.

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



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

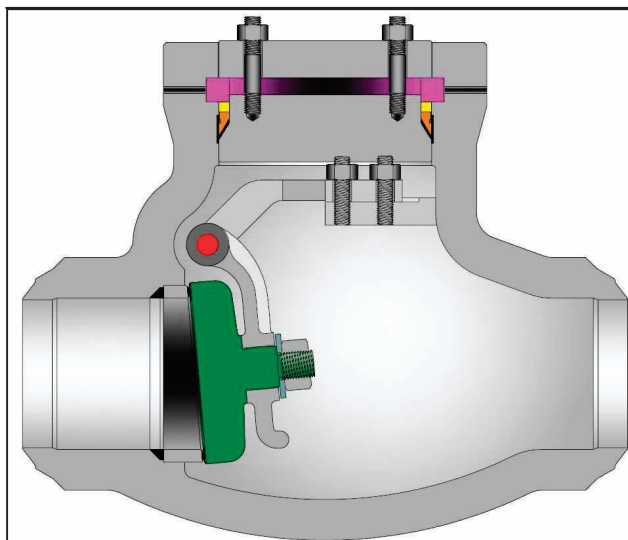
SIZE	ASME 600					ASME 900					ASME 1500					ASME 2500				
in	F	in	WT	lb	C _v	F	in	WT	lb	C _v	F	in	WT	lb	C _v	F	in	WT	lb	C _v
mm		mm		kg			mm		kg			mm		kg			mm		kg	
2	26.4		49		100	27.7		84		90	28.7		89		90	31.3		117		60
50	671		22			704		38			729		40			795		53		
2½	26.4		87		170	27.7		126		130	30.6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



F = Dismantling dimension

WT = Weight

C_v = Flow coefficient



Class	Figure Number
600	1661
900	1961
1500	1161
2500	1261

Design Specifications

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

STANDARD MATERIALS (Other materials available)

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

DESIGN FEATURES:

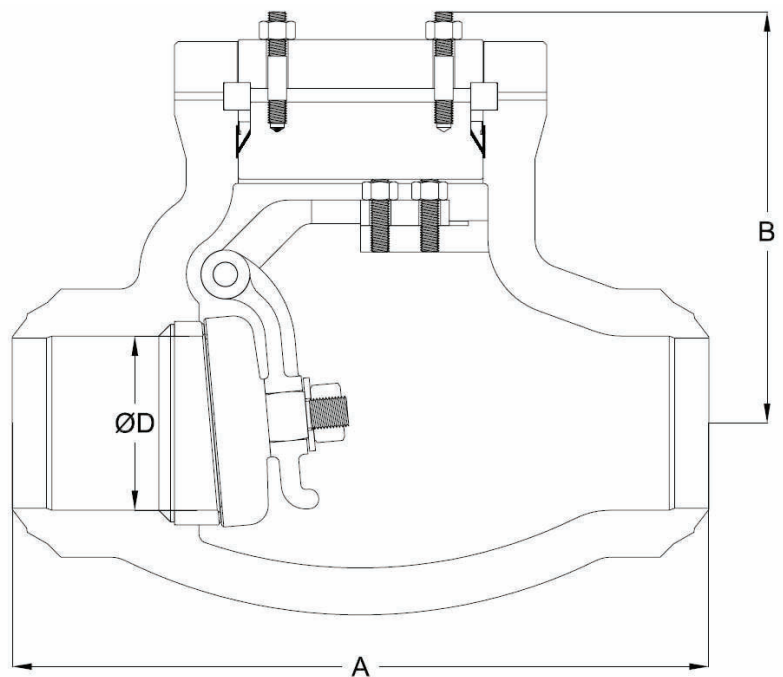
- **Standard trim** is stellite faced seat and disc seat surfaces, and 13% chrome carrier pin (API trim 5). Other trims available on request.
- **Valves** are full port design per ASME B16.34 table A-1.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Wall thickness** per heavy wall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

SWING CHECK VALVE DIMENSIONS (CLASS 600—2500).

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

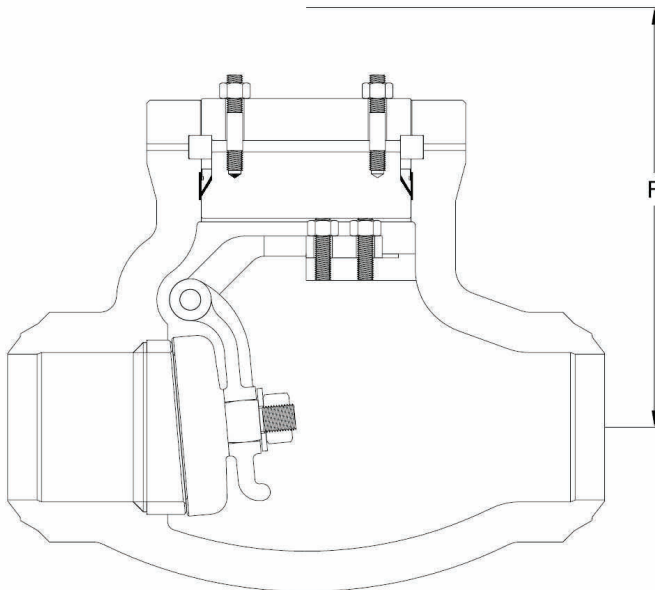
SIZE	ASME 2500		
in	A	B	D
mm			
2	11.00	9.6	1.50
50	279	244	38
3	14.50	12.4	2.25
80	368	316	57
4	18.00	14.5	2.87
100	457	367	73
6	24.00	16.0	4.37
150	610	408	111
8	30.00	20.1	5.75
200	762	510	146
10	36.00	23.2	7.25
250	914	588	184
12	41.00	26.5	8.62
300	1041	672	219

B = Center to top



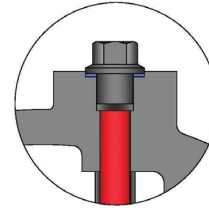
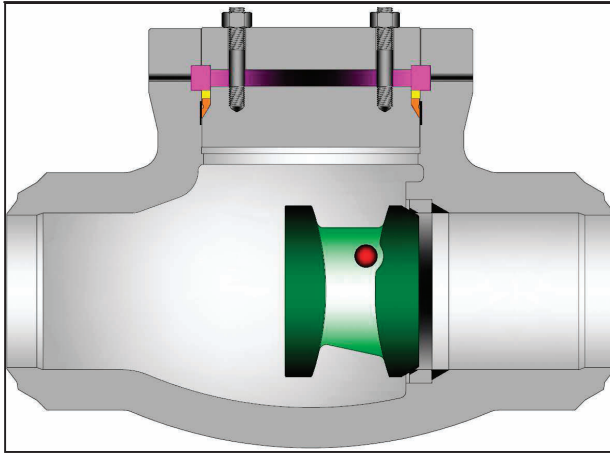
PRESSURE SEAL SWING CHECK VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
2 TO 24" (50 TO 600 mm)
ASME CLASSES 600 TO 2500

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



F = Dismantling dimension
WT = Weight
C_v = Flow coefficient

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



Side Plug Configuration

STANDARD MATERIALS (Other materials available)

Class	Figure Number
600	1695
900	1995
1500	1195
2500	1295

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

DESIGN FEATURES:

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

Design Specifications

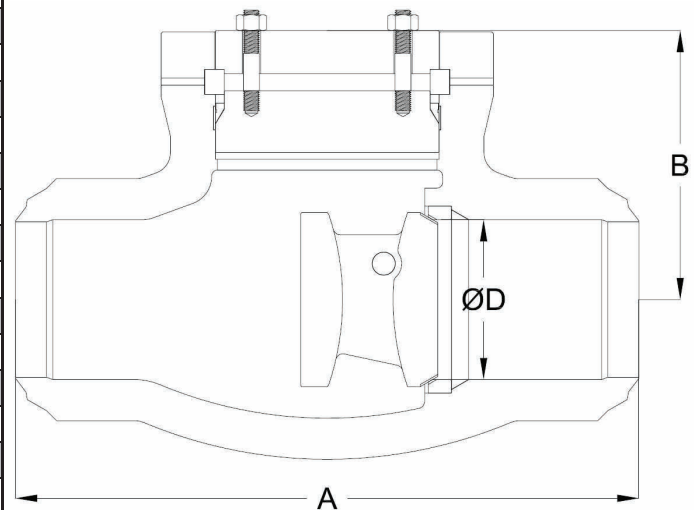
Item	Applicable Specification
Wall thickness	API 600
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Butt Weld design	ASME B16.25
Materials	ASTM

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

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

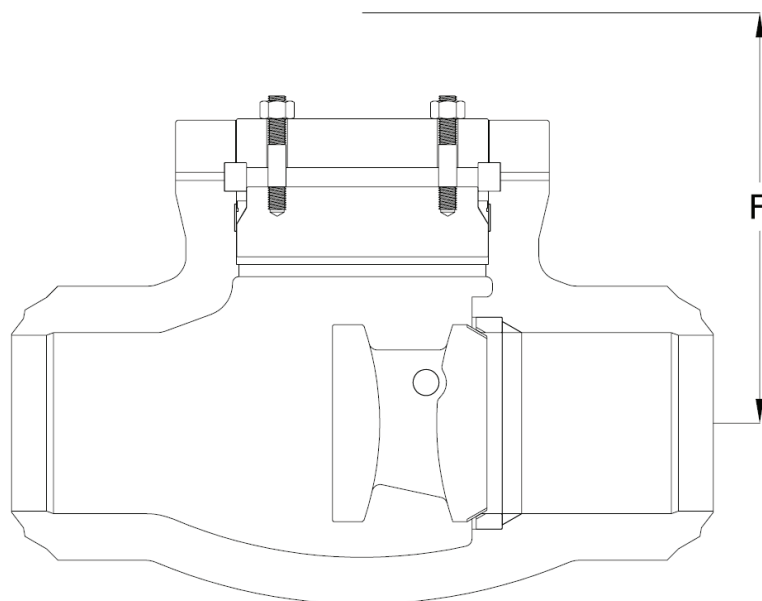
SIZE	ASME 2500		
in	A	B	D
mm			
2	11.00	7.3	1.50
50	279	184	38
2½	13.00	7.9	1.87
65	330	200	48
3	14.50	9.4	2.25
80	368	238	57
4	18.00	9.9	2.87
100	457	251	73
6	24.00	11.8	4.37
150	610	298	111
8	30.00	14.6	5.75
200	762	371	146
10	36.00	16.6	7.25
250	914	422	184
12	41.00	21.3	8.62
300	1041	540	219
14	44.00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

B = Center to top



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

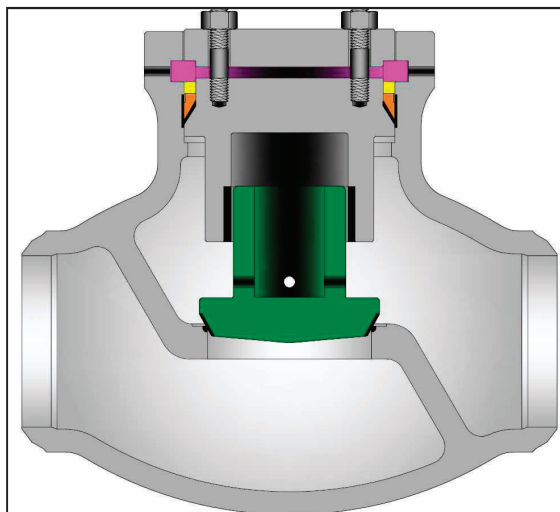
SIZE	ASME 600					ASME 900					ASME 1500					ASME 2500				
in mm	F	in mm	WT	lb kg	C _v	F	in mm	WT	lb kg	C _v	F	in mm	WT	lb kg	C _v	F	in mm	WT	lb kg	C _v
2	10.0		90		90	8.2		120		80	10.2		140		80	10.4		200		50
50	254		41			208		54			259		63			264		91		
2½	11.2		90		145	11.1		120		115	11.4		140		115	11.2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



F = Dismantling dimension

WT = Weight

C_v = Flow coefficient



Class	Figure Number
600	1665
900	1965
1500	1165
2500	1265

DESIGN FEATURES:

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

STANDARD MATERIALS (Other materials available)

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

Design Specifications

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

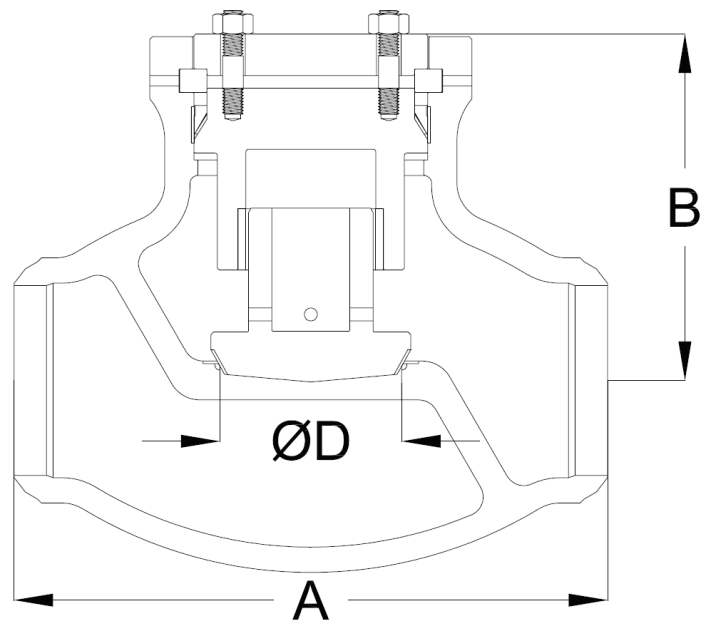
- **Weld** end valves are B16.10 short pattern design. Flanged end valves are available on request and are B16.10 long-pattern design. Weld end valve dimensions given in table on next page.
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes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

LIFT CHECK VALVE DIMENSIONS (CLASS 600—2500).

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

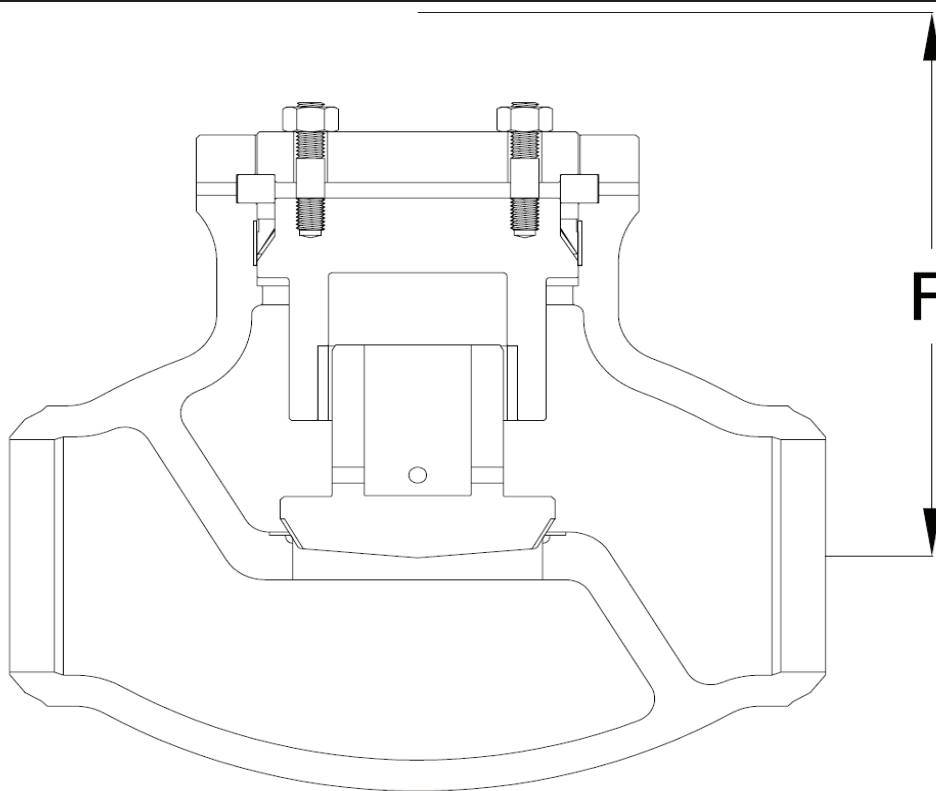
SIZE	ASME 2500		
in	A	B	D
mm			
3	14.50	12.5	2.25
80	368	318	57
4	18.00	15.0	2.87
100	457	381	73
6	24.00	18.3	4.37
150	610	465	111
8	30.00	22.5	5.75
200	762	572	146
10	36.00	25.5	7.25
250	914	648	184
12	41.00	30.0	8.62
300	1041	762	219

B = Center to top

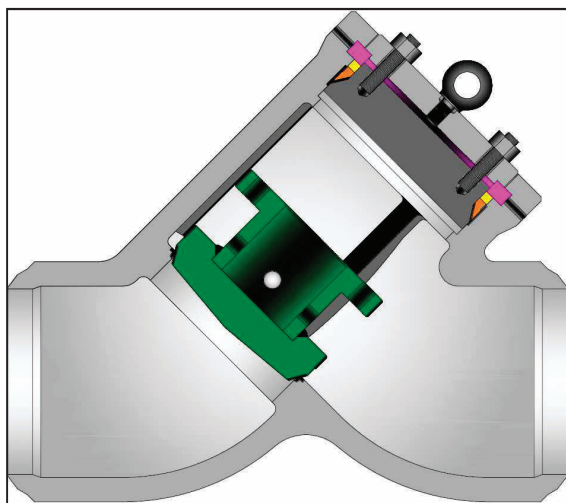


PRESSURE SEAL LIFT CHECK VALVES
CAST CARBON , STAINLESS STEEL OR ALLOY STEEL
3 TO 12" (50 TO 300 mm)
ASME CLASSES 600 TO 2500

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



F F = Dismantling dimension
WT = Weight
C_v = Flow coefficient



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

(1) An option code is needed to specify a y-pattern. See page 5 for more details.

DESIGN FEATURES:

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

STANDARD MATERIALS (Other materials available)

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

Design Specifications

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

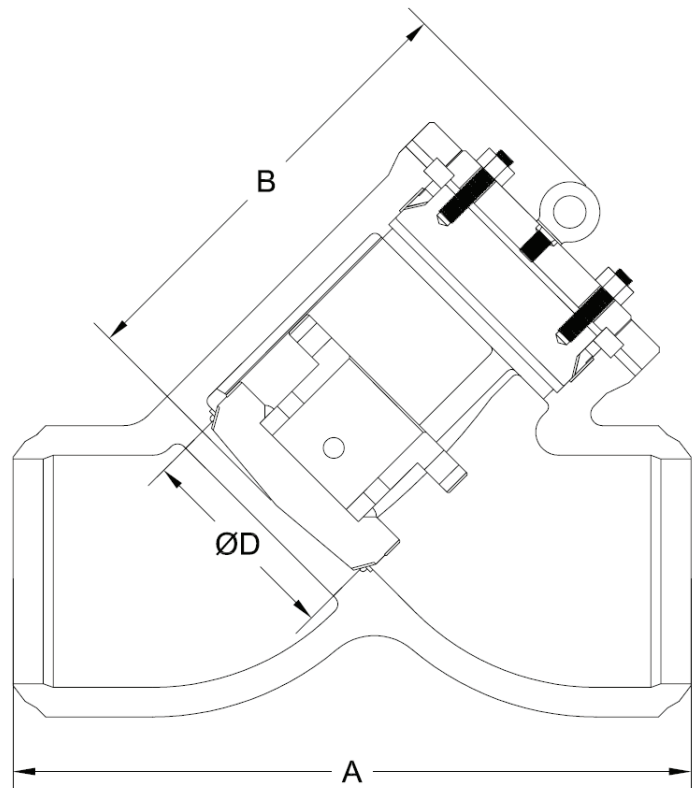
- **Weld end valves** are B16.10 short pattern design. Flanged end valves are available on request and are B16.10 long-pattern design. Weld end valve dimensions given in table on next page.
- **Each valve** has a unique certification number that is traceable to the valve certification sheet which includes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

LIFT CHECK VALVE DIMENSIONS (CLASS 600—2500).

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

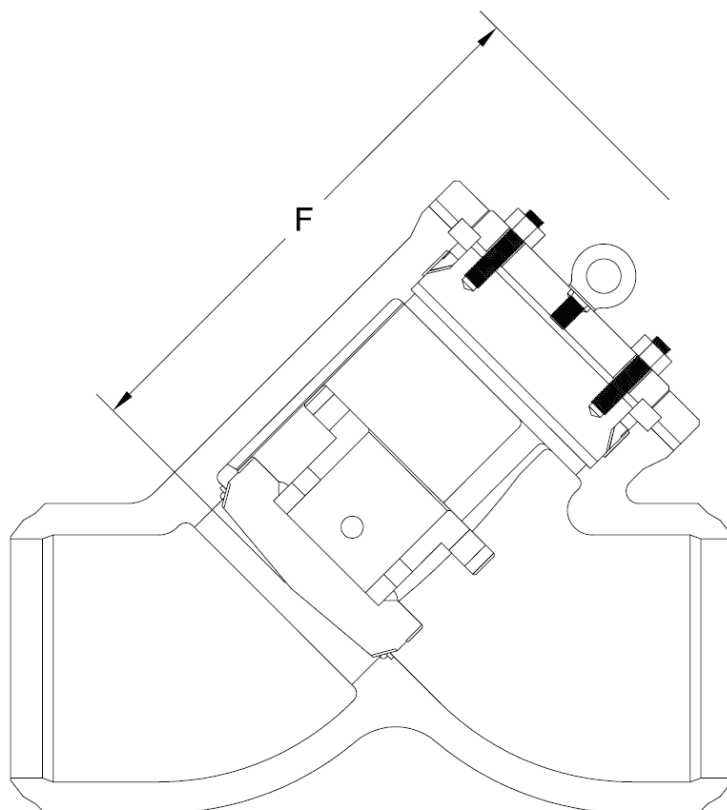
SIZE	ASME 2500		
in	A	B	D
mm			
3	14.50	13.0	2.25
80	368	330	57
4	18.00	16.0	2.87
100	457	405	73
6	24.00	19.3	4.37
150	610	490	111
8	30.00	24.0	5.75
200	762	610	146
10	36.00	27.0	7.25
250	914	685	184
12	41.00	32.0	8.62
300	1041	815	219

B = Center to top



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

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



F = Dismantling dimension

WT = Weight

C_v = Flow coefficient

ACCESSORIES

GEAR ACTUATOR

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



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

Typical Adpto-Gear Installation:

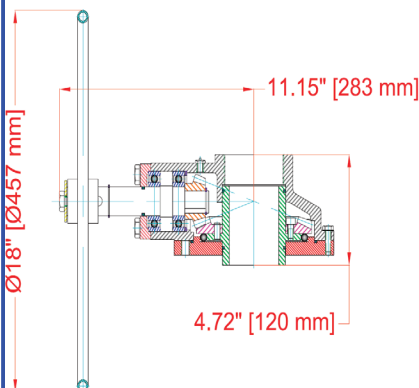
- Remove the handwheel.
- Remove bolts from the yoke, mount the adaptor, replace bolts and tighten.
- Install the sleeve and key on stem bushing.
- Mount gear operator on adaptor and bolt together.
- Conversion is completed.

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

ADVANTAGES

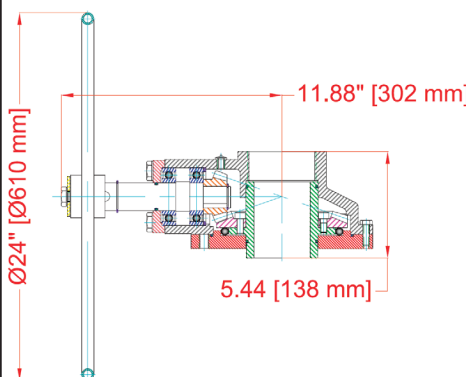
- Anti-friction bearings permits ease of operation.
- Housing protects gears from dirt, dust, and other foreign materials. Also a good as a safety factor to protecting operating personnel.
- Housing has provision for plug or pipe stem protector when required. Sealed housing retains the lubricant and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

MODEL AA-18 ACTUATOR



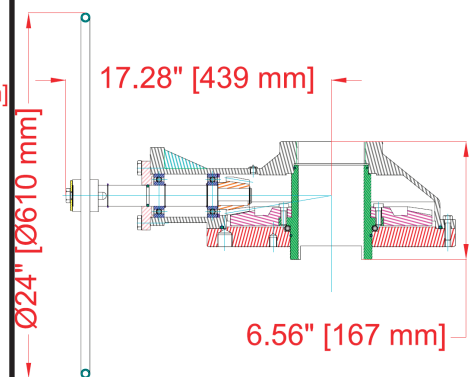
Max Torque: 996 ft-lb [1350 Nm]
Gear Ratio: 2.92:1

MODEL B-24 ACTUATOR



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

MODEL C-24 ACTUATOR

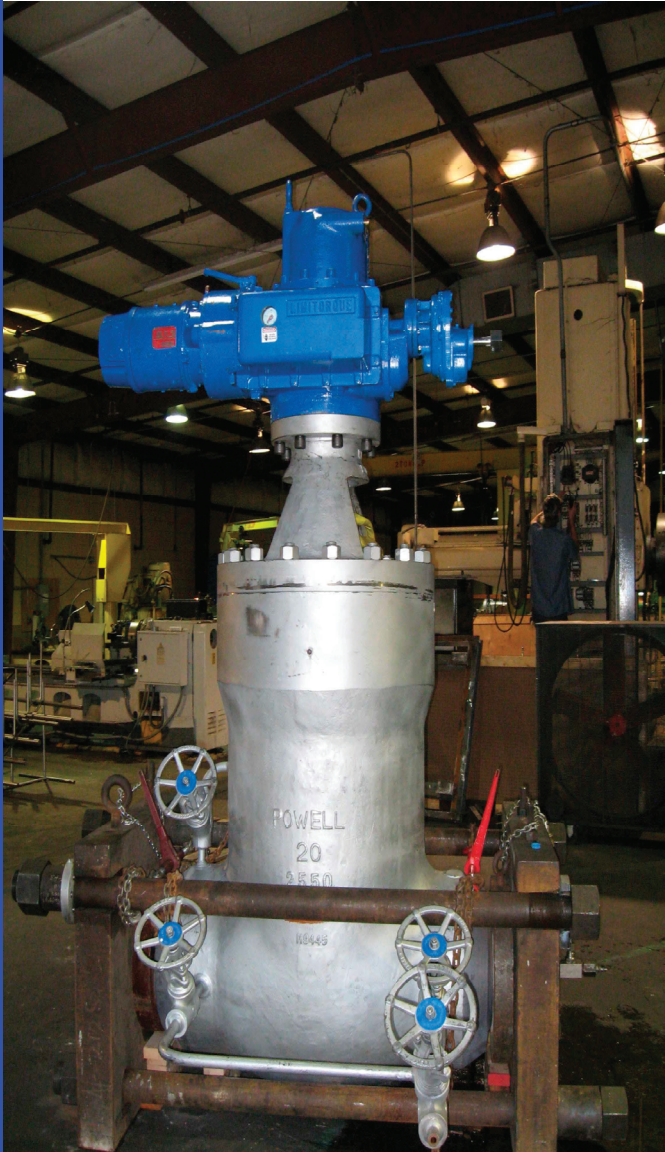


Max Torque: 3980 ft-lb [5400 Nm]
Gear Ratio: 6:1

ACCESSORIES cont...

MOTOR ACTUATOR

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

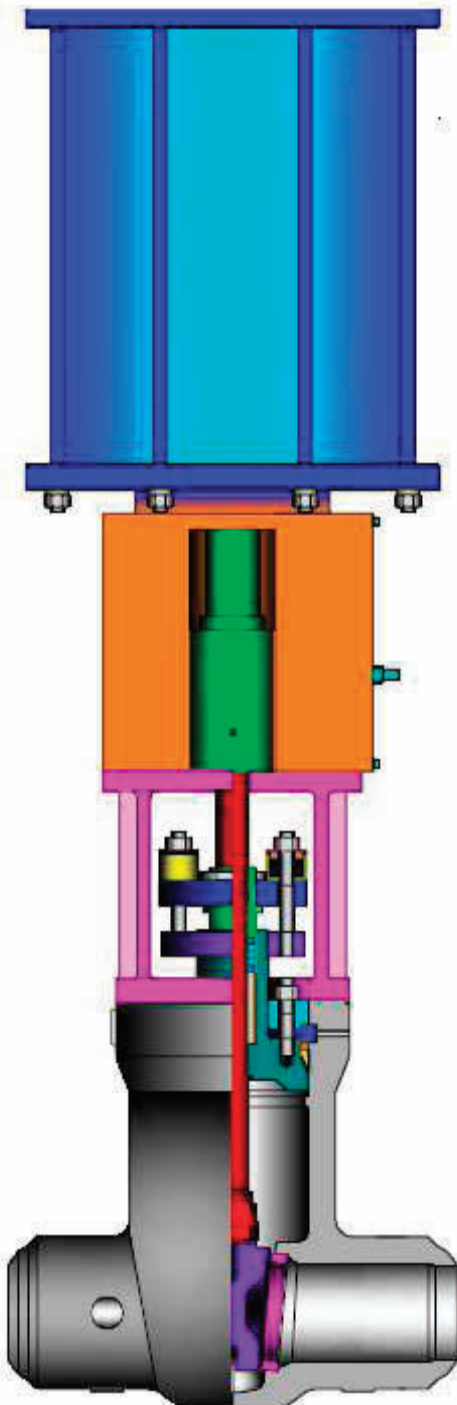


To enable Powell to quote accurately on Motor Actuated Valves, please provide the following complete information:

- A. Valve Size and Figure Number
- B. Media
- C. Media Pressure and Temperature
- D. Differential Pressure against which the valve must open and close and Line Pressure if different from differential pressure.
- E. Opening or Closing Time Requirements. Unless specified - gate valve stem speed is 12" per minute (approx.) and globe valve stem speed is 4" per minute (approx.).
- F. Voltage, Frequency and Number of Phases
- G. Special Features (e.g. control station requirements, special enclosure types, etc.)

ACCESSORIES cont...

HYDRAULIC OR PNEUMATIC ACTUATOR



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

When ordering such valves, please provide the following information:

- A. Valve Size and Figure Number
- B. Media
- C. Media Pressure and Temperature
- D. Differential Pressure against which the valve must open and close and Line Pressure if different from differential pressure.
- E. Opening or Closing Time Requirements
- F. Actuator Media Pressure - Min./Max.
- G. Failure Position (open, close, or as is)
- H. Special Features (e.g. limit switches, manual override, etc.)
- I. Environmental Temperature Range - Min./Max.

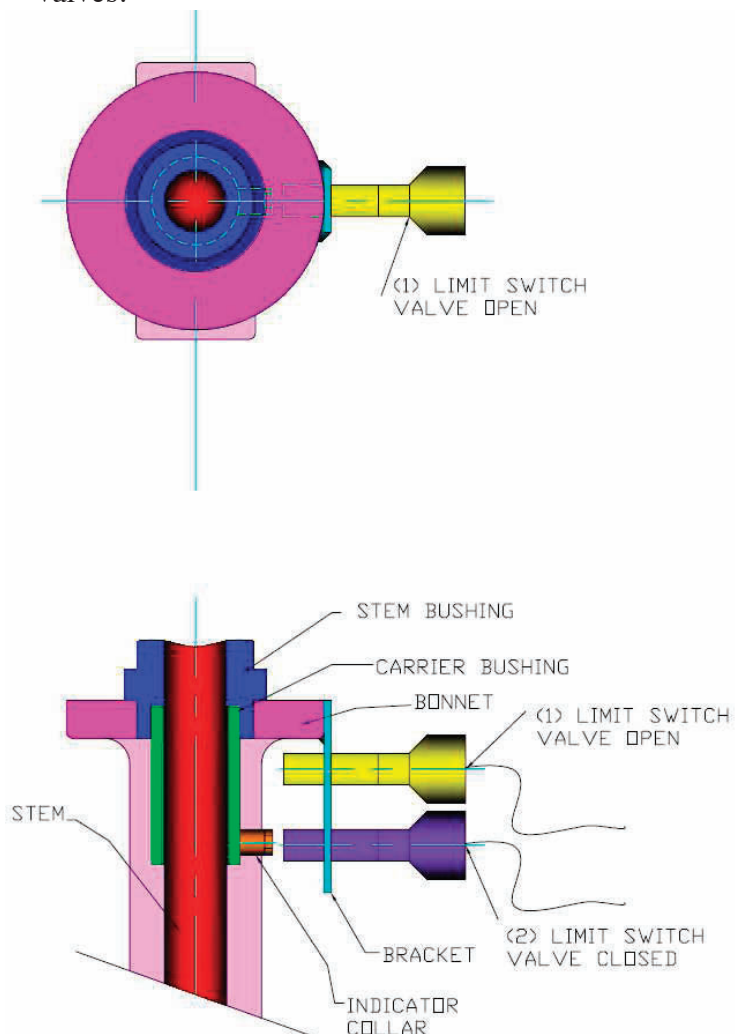
ACCESSORIES cont...

LIMIT SWITCH

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

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

Typical installation on handwheel operated valves.



	PAGE
VALVE STANDARDS AND RELATED INFORMATION	43
VALVE PRESSURE/TEMPERATURE RATINGS	44-51
CHEMICAL AND PHYSICAL PROPERTIES	52
TRIM DESCRIPTIONS	53
DIMENSIONS OF WROUGHT STEEL PIPE AND WELD END CONFIGURATION	54-59
METHOD OF DESIGNATING LOCATION OF AUXILIARY CONNECTIONS	60
BYPASS DIMENSIONS	61
FLOW DESIGN AND MAINTENANCE RECOMMENDATIONS	62
CONVERSION DATA AND EQUIVALENTS	63-64

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

VALVE STANDARDS AND RELATED INFORMATION

1. Steel and Corrosion Resistant Designs

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

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

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

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

- (C) API Standard 598 → Valve Inspection and Testing

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

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

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

- (F) ASME B16.25 → Buttwelded Ends

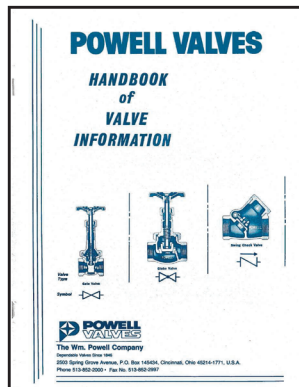
- (G) MSS SP-25 → Standard Marking System for Valves, Fittings, Flanges and Unions

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

2. Powell Publications and Miscellaneous Information

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

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



PRESSURE/TEMPERATURE RATINGS

TABLE 1

ASTM A216 Grade WCB

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

STANDARD CLASS

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

SPECIAL CLASS

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

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

PRESSURE/TEMPERATURE RATINGS

TABLE 2

ASTM A352 Grade LCB

Not to be used over 650° F.

STANDARD CLASS

Working Pressures by Classes, psig

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

SPECIAL CLASS

Working Pressures by Classes, psig

Temperature, °F	150	300	600	900	1500	2500	4500
-50 to 100	290	695	1,395	2,090	3,480	5,805	10,445
200	290	695	1,395	2,090	3,480	5,805	10,445
300	290	695	1,395	2,090	3,480	5,805	10,445
400	290	695	1,395	2,090	3,480	5,805	10,445
500	290	695	1,395	2,090	3,480	5,805	10,445
600	290	695	1,395	2,090	3,480	5,805	10,445
650	290	695	1,390	2,080	3,470	5,780	10,405

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

PRESSURE/TEMPERATURE RATINGS

TABLE 3

ASTM A217 Grade WC6

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

STANDARD CLASS

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

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

SPECIAL CLASS

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

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

PRESSURE/TEMPERATURE RATINGS

TABLE 4

ASTM A217 Grade WC9

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

STANDARD CLASS

Working Pressures by Classes, psig

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

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

SPECIAL CLASS

Working Pressures by Classes, psig

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

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

PRESSURE/TEMPERATURE RATINGS

TABLE 5

ASTM A217 Grade C5

Use normalized and tempered material only.

STANDARD CLASS

Working Pressures by Classes, psig

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

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

SPECIAL CLASS

Working Pressures by Classes, psig

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

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

PRESSURE/TEMPERATURE RATINGS

TABLE 6

ASTM A217 Grade C12

Use normalized and tempered material only.

STANDARD CLASS

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

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

SPECIAL CLASS

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

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

PRESSURE/TEMPERATURE RATINGS

TABLE 7

ASTM A217 Grade C12A

STANDARD CLASS

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

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

SPECIAL CLASS

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

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

PRESSURE/TEMPERATURE RATINGS

TABLE 8

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

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

STANDARD CLASS

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

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

SPECIAL CLASS

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

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

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

TABLE 9

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

*RESIDUAL ELEMENTS-Total must not exceed 1.00 maximum.

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

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

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

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

NOTE: Chemical Compositions Are In Units Of Percent.

TRIM DESCRIPTIONS

TABLE 10

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

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

(b) Stellite 6 TM or equal.

DIMENSIONS OF WROUGHT STEEL PIPE AND WELD END CONFIGURATIONS

TABLE 11

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

*SEE SKETCHES 1 AND 2

DIMENSIONS OF WROUGHT STEEL PIPE AND WELD END CONFIGURATIONS

TABLE 11 (cont.)

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

*SEE SKETCHES 1 AND 2

DIMENSIONS OF WROUGHT STEEL PIPE AND WELD END CONFIGURATIONS

TABLE 11 (cont.)

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

*SEE SKETCHES 1 AND 2

DIMENSIONS OF WROUGHT STEEL PIPE AND WELD END CONFIGURATIONS

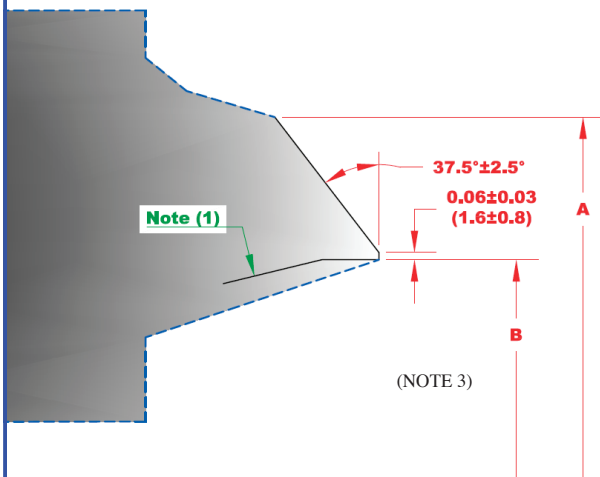
TABLE 11 (cont.)

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

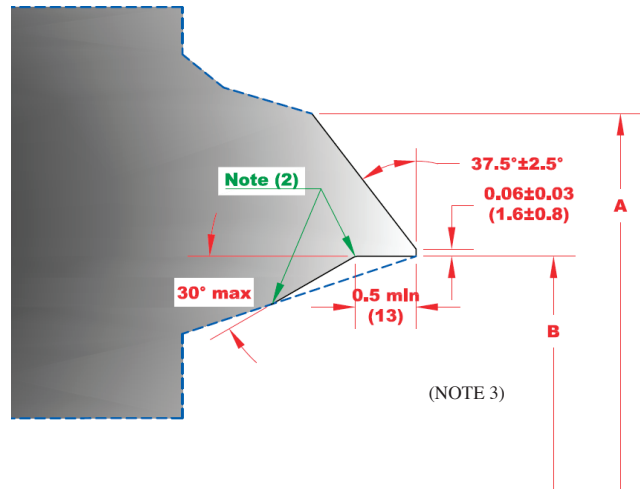
*SEE SKETCHES 1 AND 2

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

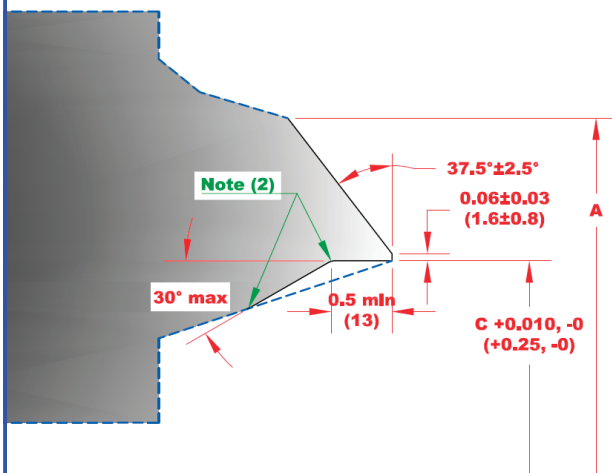
REFER TO ASME 16.25 FIG 2.



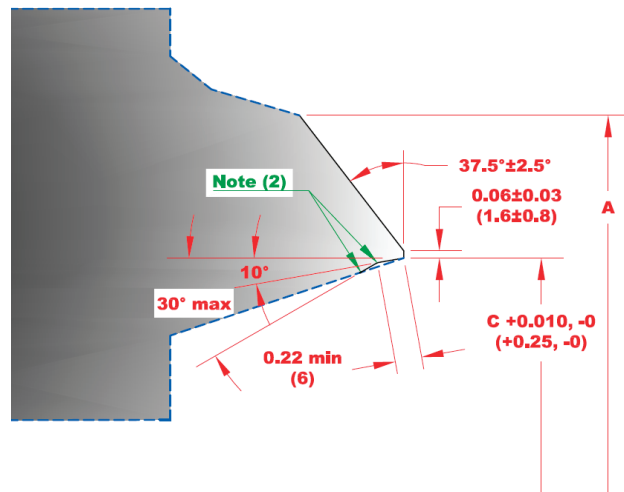
(a) Welding End Detail for Joint without Backing Ring



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



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



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

GENERAL NOTES:

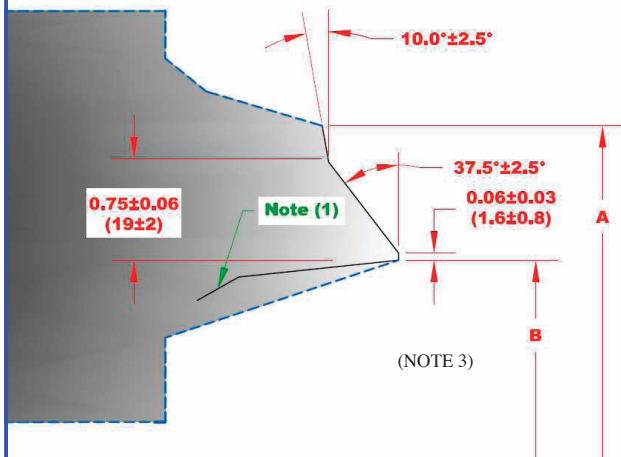
- Broken lines denote maximum envelope for transition from welding bevel and root face into body of component. Refer to Figure 1 of ASME B16.25 for details.
- Purchase order must specify contour of any backing ring to be used.
- Linear dimensions are in inches with millimeter values in parentheses.

NOTES:

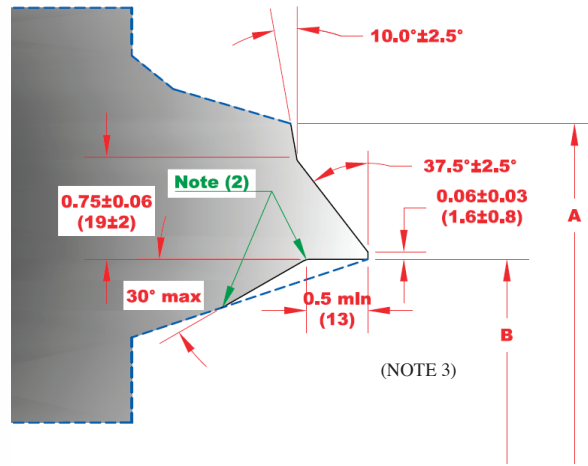
- Internal surface may be as-formed or machined for dimension B at root face.
- Intersections should be slightly rounded.
- Tolerances for "B" dimension on valve weld ends:
 - ±0.03" (±1.0 mm) for NPS ≤ 10
 - ±0.06" (±2.0 mm) for 12 ≤ NPS ≤ 18
 - +0.12", -0.06" (+3.0 mm, -2.0 mm) for NPS ≥ 20

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

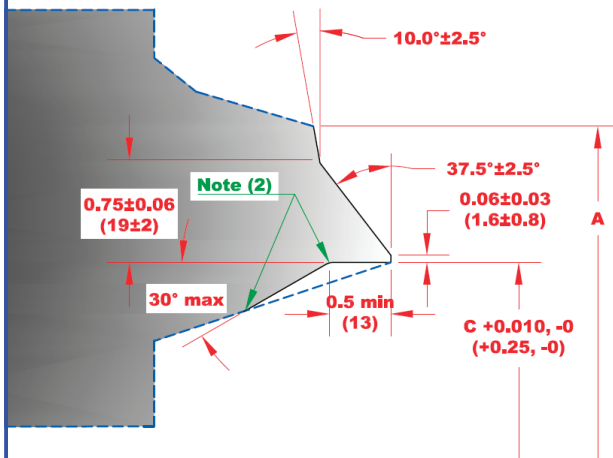
REFER TO ASME 16.25 FIG 3.



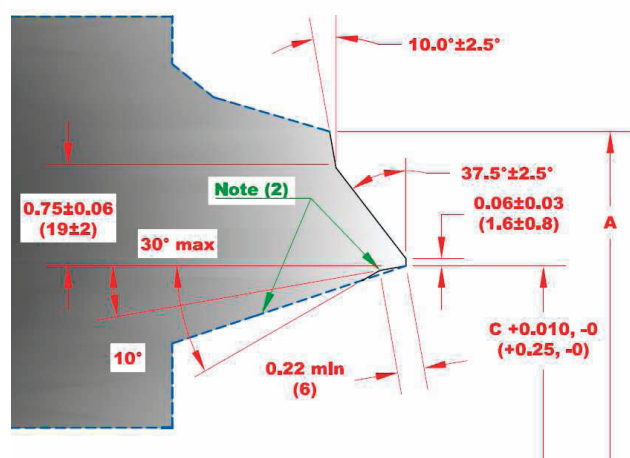
(a) Welding End Detail for Joint without Backing Ring



(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:

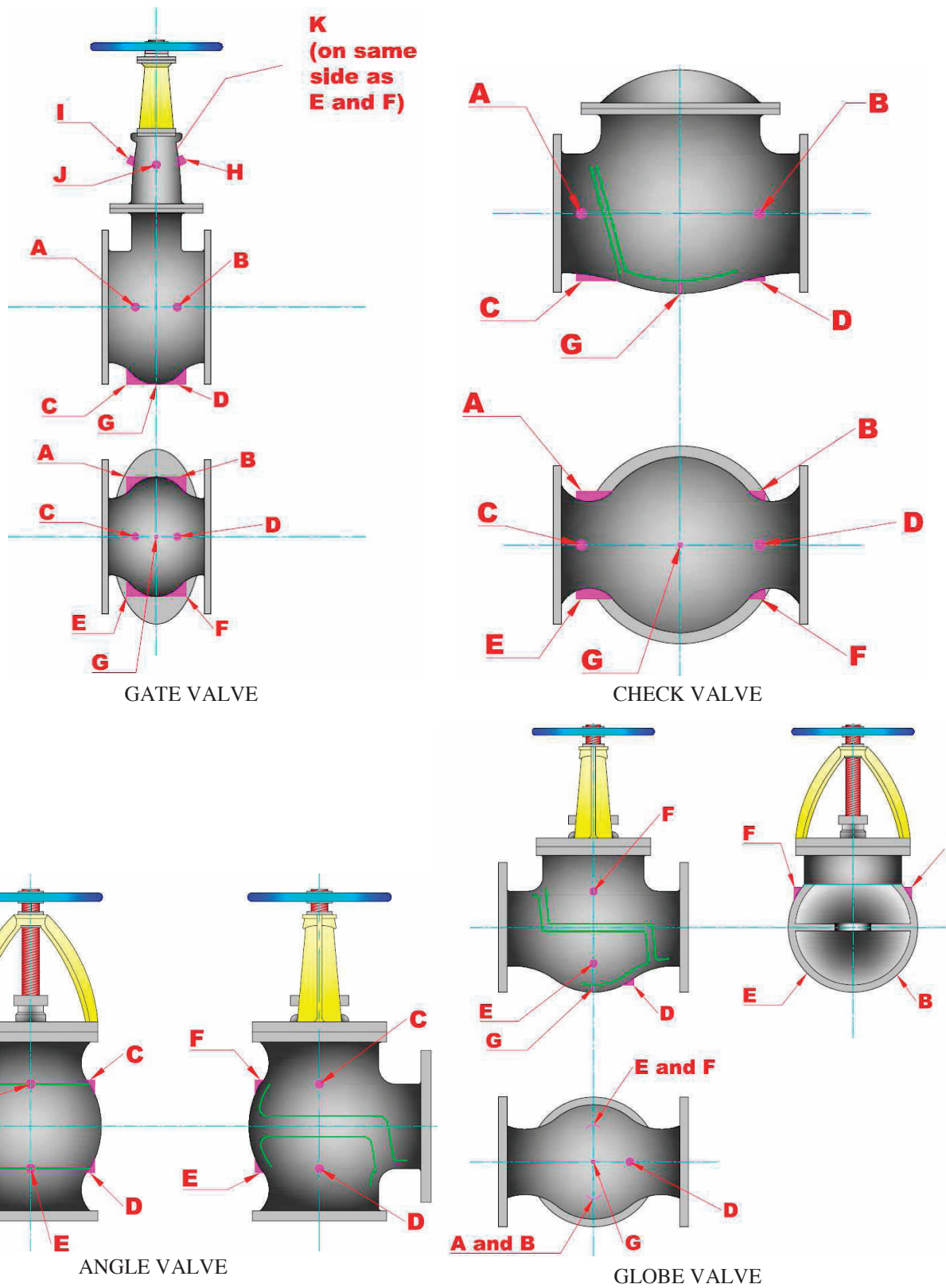
- Broken lines denote maximum envelope for transition from welding bevel and root face into body of component. Refer to Figure 1 of ASME B16.25 for details.
- Purchase order must specify contour of any backing ring to be used.
- Linear dimensions are in inches with millimeter values in parentheses.

NOTES:

- Internal surface may be as-formed or machined for dimension B at root face.
- Intersections should be slightly rounded.
- Tolerances for "B" dimension on valve weld ends:
 - ± 0.03 " (± 1.0 mm) for $NPS \leq 10$
 - ± 0.06 " (± 2.0 mm) for $12 \leq NPS \leq 18$
 - $+0.12$ ", -0.06 " ($+3.0$ mm, -2.0 mm) for $NPS \geq 20$

**METHOD OF DESIGNATING LOCATION OF AUXILIARY
CONNECTIONS WHEN SPECIFIED**

FIGURE 1

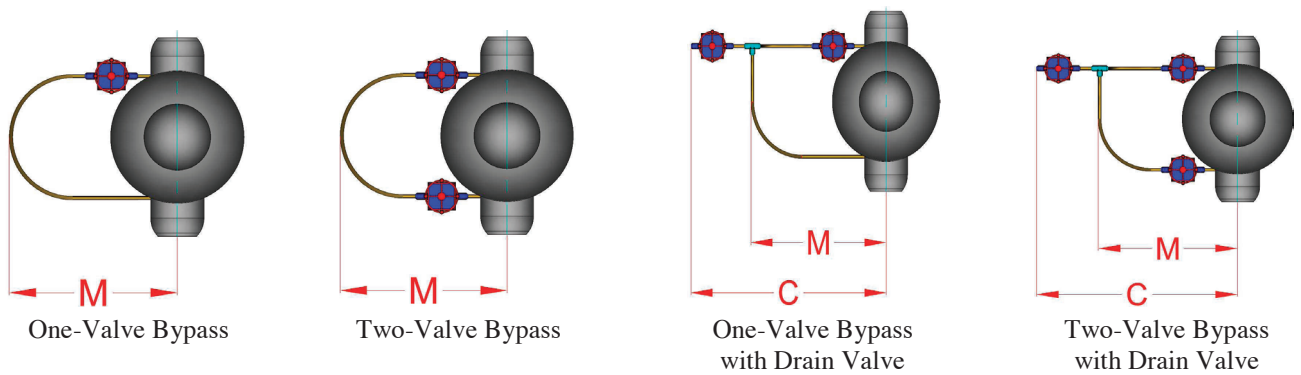


GENERAL NOTE:

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

FIGURE 2

BYPASS DIMENSIONS
CAST STEEL VALVES
CLASS 600 THROUGH 2500



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

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

FLOW DESIGN AND MAINTENANCE RECOMMENDATIONS

- (1) SWING CHECK VALVES- Minimum $\frac{1}{2}$ 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):

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

- (6) GATE VALVES — Not to be used in throttling services. Open and closed service only.
- (7) GLOBE VALVES — Not to be throttled under 20% open.

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

COMPARISON CHART OF VALVE SIZE/NOMINAL PIPE SIZE

TABLE 12

<u>METRIC NOMINAL SIZE</u> (DN)	<u>ENGLISH NOMINAL SIZE</u> (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): $F = 1.8 \times C + 32$

TO CONVERT FROM DEGREES FAHRENHEIT (F) TO DEGREES CENTIGRADE (C): $C = 0.556 \times (F - 32)$

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

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

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

MEASUREMENT EQUIVALENTS

TABLE 13

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

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

March, 2011 THE WILLIAM POWELL COMPANY

GENERAL TERMS AND CONDITIONS OF SALE

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The logo for Powell Valves features the word "POWELL" in a bold, solid blue, sans-serif font. Below it, the word "VALVES" is written in a large, blue-outlined, sans-serif font. A thick blue horizontal line is positioned directly beneath the word "VALVES".

Established 1846



POWELL VALVES

2503 SPRING GROVE AVENUE, CINCINNATI, OHIO 45214-1771, U.S.A.

PHONE 513.852.2000 • FAX NO. 513.852.2997

www.powellvalves.com



POWELL
VALVES

BALL VALVES

CARBON, STAINLESS AND BRASS
THREADED, SOCKET WELD, FLANGED
ONE, TWO & THREE PIECE DESIGNS
SOFT SEAT / FIRE SAFE



Protect Tomorrow. Today
Powell Valves
NextGen Engineering

Powell Valves NextGen Engineering

For decades, Powell Valves has provided reliable and trusted products that not only meets, but exceeds customer confidence and expectations.

Expect 100% Customer Satisfaction

Quality performance is at the heart of every product we sell. We are proud of our long-standing reputation for excellence in our industry and will continue to anticipate and meet the growing needs of consumers.



SINCE 1846

TABLE OF CONTENTS

THE WM. POWELL COMPANY - PROFILE	6
HOW TO ORDER	7
ONE PIECE BALL VALVES	8 - 9
TWO PIECE BALL VALVES	10 - 14
HIGH PRESSURE BALL VALVES	15 - 17
THREE PIECE BALL VALVES	18 - 27
ONE PIECE FLANGED BALL VALVES	28 - 29
TWO PIECE FLANGED BALL VALVES	30 - 37
MATERIAL SEAT SELECTION	38
ACCESSORIES & STANDARDS	39 - 41
PRESSURE & TEMPERATURE	42
TERMS & CONDITIONS	43 - 45

THE WM. POWELL COMPANY - PROFILE

The Wm. Powell Company is very proud of our achievements and our evolution in the past 171 years. We like to refer to ourselves as 171 years young due to our flexibility in changing quickly to our customer's 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 Valves 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 an additional inventory hub in Asia. 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 170, 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 QUARTER TURN VALVES

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

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Size			Blank	Design	Body/ Port	Class		End Code	Material Code	Trim (Ball/ Seat)	Packing/ Gasket	Option Code		

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"
10.0	10"
12.0	12"
14.0	14"
16.0	16"
18.0	18"
20.0	20"
24.0	24"
etc.	etc.

Design	
Code	Description
B	Ball Valve

Body / Port	
Code	Description
1	1-Pc. Reduced Port
5	1-Pc. Reduced Port, Direct Mount, Fire Safe
2	2-Pc. Full Port
4	2-Pc. Full Port, Direct Mount
6	2-Pc. Full Port, Direct Mount, Fire Safe
8	2-Pc. Full Port, Seal Welded, Nace, Fire Safe
3	3-Pc. Full Port
7	3-Pc. Full Port, Direct Mount
9	3-Pc. Full Port, Enclosed Bolt, Fire Safe
L	Ball 3-Way L Port
T	Ball 3-Way T Port

Class	
Code	Description
01	Class 150
03	Class 300
10	1000 WOG
20	2000 WOG
36	3600 WOG
60	6000 WOG

End Code	
Code	Description
T	Threaded Ends
S	Socket Weld Ends
X	SWE x Threaded
F	Flanged End
Z	Special ends

Material Codes	
Code	Option
M	A351 CF8M
C	A216 Gr. WCB
Z	Special Material

Trim (Ball/Seat)	
Code	Option
P	316SS Ball / PTFE Seat
R	316SS Ball / RTFE Seat
K	316SS Ball / PEEK Seat
M	316SS Ball / TFM 1600 Seat

Packing/Gasket	
Code	Option
G	Std Graphite
T	Std Teflon
X	None
Z	Special Packing or Gasket

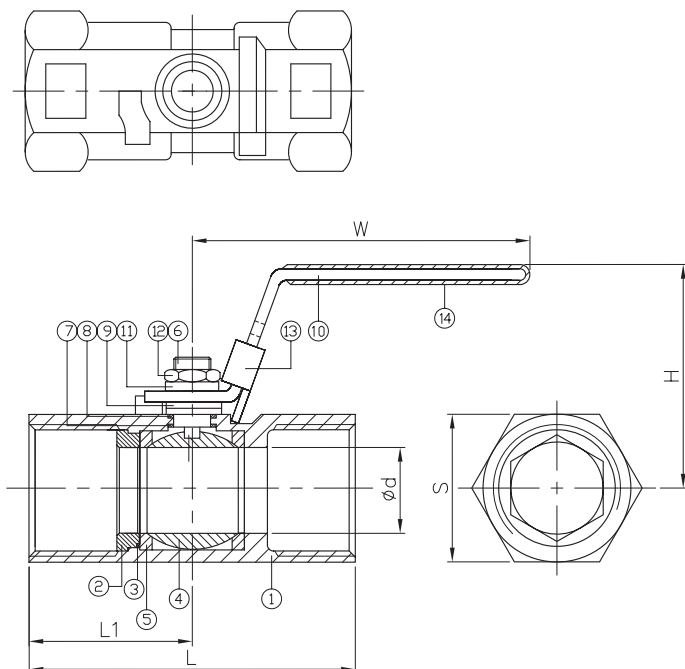
Option Codes	
Code	Option
XXX	No Options
GLV	Lever on Direct Mount Threaded and SWE valves
GXX	Gear Operator
NXX	Nace
GCA	Gear, Locking Device
HEL	Oval Handle
	Tee Handle
	Actuator - Electric
	Actuator - Single Acting
	Actuator - Double Acting



SERIES: B110TM - STAINLESS STEEL 1-PC. SCREWED END BALL VALVE (1/4" - 2")

DESIGN FEATURES:

- Reduced port, 1/4"~2" (DN8~DN80)
- **W.P. : 1000 WOG (PN63)**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Silicone Free
- Locking device
- Thread type:
 - » ASME B1.20.1 (NPT)
 - » DIN2999 & BS21
 - » ISO7/1 & EN10226



ITEM	PARTS	MATERIAL
		B110TMRXXX
1	BODY	ASTM A351-CF8M
2	RETAINER	AISI 316
3	BODY SEAL (1)	PTFE
4	BALL	AISI 316
5	SEAT	PTFE
6	STEM	AISI 316
7	THRUST WASHER	PTFE
8	PACKING	
9	GLAND WASHER	
10	HANDLE	
11	SPRING WASHER	AISI 304
12	NUT	
13	LOCKING DEVICE	
14	HANDLE SLEEVE	PVC

(1) 1-1/4" - 2" size only

DN	d	L	L1	H	W	S	Torque (N-M)	Weight (kg)
8	5.0	39.0	20.0	38.0	67.0	17.0	0.8	0.1
10	7.0	44.0	23.5	39.4	75.5	21.0	1.3	0.1
15	9.2	55.5	28.5	51.0	90.0	24.5	1.9	0.2
20	12.5	59.0	29.0	51.5	90.0	32.0	2.6	0.3
25	16.0	71.0	36.0	53.5	101.5	38.0	4.5	0.4
32	20.0	78.0	40.0	61.5	101.5	49.0	7.0	0.7
40	25.0	83.0	42.5	65.4	132.0	53.0	8.9	0.9
50	32.0	100.0	51.0	71.0	132.0	65.0	9.6	1.4

unit: mm

NPS	d	L	L1	H	W	S	Torque (in-lb)	Weight (lb)
1/4"	0.20	1.54	0.79	1.50	2.64	0.67	6.7	0.2
3/8"	0.28	1.73	0.93	1.55	2.97	0.83	11.2	0.2
1/2"	0.36	2.19	1.12	2.01	3.54	0.96	16.9	0.4
3/4"	0.49	2.32	1.14	2.03	3.54	1.26	22.6	0.6
1"	0.63	2.80	1.42	2.11	4.00	1.50	39.5	0.9
1-1/4"	0.79	3.07	1.57	2.42	4.00	1.93	62.0	1.6
1-1/2"	0.98	3.27	1.67	2.57	5.20	2.09	78.9	1.9
2"	1.26	3.94	2.01	2.80	5.20	2.56	84.6	3.0

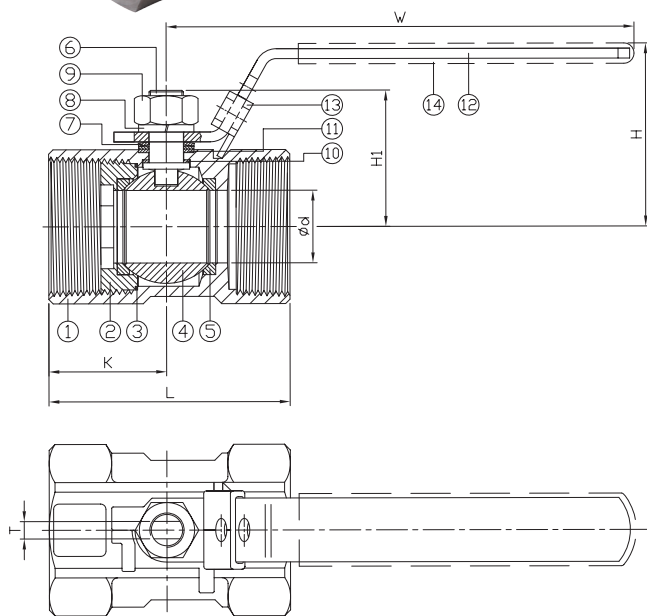
unit: in



SERIES: B110TC - CARBON STEEL 1-PC. SCREWED END BALL VALVE (1/4" - 2")

DESIGN FEATURES:

- Reduced port, 1/4"~2" (DN8~DN80)
- **W.P. : 1000 WOG (PN63)**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Anti-Static Device
- Silicone Free
- Locking device
- Thread type:
 - » ASME B1.20.1 (NPT)
 - » DIN2999 & BS21
 - » ISO7/1 & EN10226



ITEM	PARTS	MATERIAL
		B110TCPTXXX
1	BODY	ASTM A216-WCB
2	RETAINER	
3	BODY SEAL (1)	PTFE
4	BALL	ASTM A351-CF8M
5	BALL SEAT	PTFE
6	STEM	ASTM A276-316
7	FLAT WASHER	AISI 304
8	SPRING WASHER	
9	STEM NUT	
10	THRUST WASHER	PTFE
11	PACKING	
12	HANDLE	STAINLESS STEEL
13	LATCH LOCK	AISI 304
14	HANDLE SLEEVE	PVC

(1) 1-1/4" - 2" size only

DN	d	L	H	H1	T	W	K	Torque (N-m)	Weight (kg)
8	5.0	39.0	38.0	17.0	3.0	61.7	20.0	0.8	0.1
10	7.0	44.0	41.1	21.4	4.0	73.5	23.0	1.0	0.1
15	9.0	56.5	40.6	26.1	5.0	94.7	29.0	1.2	0.2
20	12.5	59.0	44.1	28.8	5.0	94.7	29.0	1.8	0.3
25	15.0	71.0	56.5	36.5	6.0	111.5	35.0	3.0	0.4
32	20.0	78.0	62.0	40.5	112.5	113.0	38.0	4.9	0.7
40	25.0	83.0	63.2	46.5	160.0	141.0	40.5	7.4	0.9
50	32.0	100.0	68.5	51.0	160.5	141.0	49.0	8.8	1.4

unit: mm

NPS	d	L	H	H1	T	W	K	Torque (in-lb)	Weight (lb)
1/4"	0.20	1.54	1.50	0.67	0.12	2.43	0.79	7.1	0.2
3/8"	0.28	1.73	1.62	0.84	0.16	2.89	0.91	8.9	0.2
1/2"	0.35	2.22	1.60	1.03	0.20	3.73	1.14	10.6	0.4
3/4"	0.49	2.32	1.74	1.13	0.20	3.73	1.14	15.9	0.7
1"	0.59	2.80	2.22	1.44	0.24	4.39	1.38	25.7	0.9
1-1/4"	0.79	3.07	2.44	1.59	4.43	4.45	1.50	43.4	1.5
1-1/2"	0.98	3.27	2.49	1.83	6.30	5.55	1.59	65.1	2.0
2"	1.26	3.94	2.70	2.01	6.32	5.55	1.93	78.1	3.1

unit: in

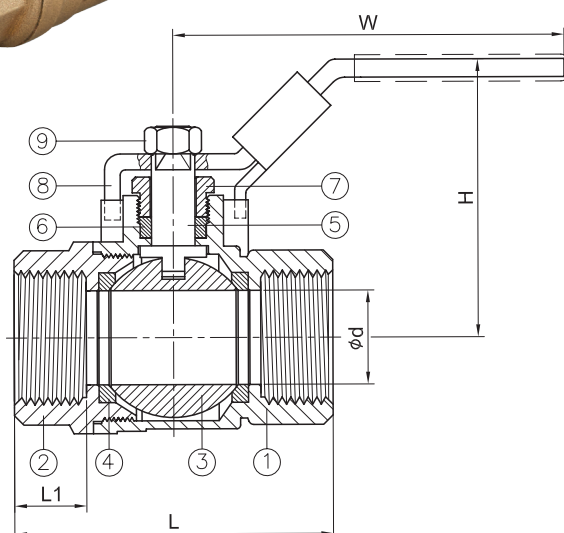


SERIES: B200T (1/4" - 4")

2-PC. SCREWED END BALL VALVE Brass

DESIGN FEATURES:

- Full port, 1/4"~4" (DN8-DN100)
- **W.P. :**
 - » 1/4" - 2": **600 WOG**
 - » 2-1/2" - 4": **400 WOG**
- U.L. Listed
- Solid Ball
- NSF/ANSI 61-8
- CSA-ANSI Z21.15
- CGA9.1, ASME B16.44, CGA CR91-002
- Thread type:
 - » ASME B1.20.1 (NPT)
 - » DIN2999 & BS21
 - » ISO7/1 & EN10226
- Blow-out proof stem
- Locking device (1/4 - 2" only)



ITEM	PARTS	MATERIAL
		B200T
1	BODY	BRASS
2	CAP	
3	BALL	
4	SEAT	PTFE
5	STEM	BRASS
6	PACKING	PTFE
7	GLAND	BRASS
8	HANDLE	NICKEL PLATING STEEL
9	STEM NUT	BRASS PLATING STEEL

DN	d	L	L1	H	W	NPT THREAD	Weight (kg)
8	10.0	44.6	11.6	47.8	90.0	1/4"	0.4
10	10.0	44.6	11.6	47.8	90.0	3/8"	0.4
15	14.8	52.0	13.2	53.1	90.0	1/2"	0.4
20	19.0	60.0	14.3	56.8	96.0	3/4"	0.7
25	24.0	70.0	16.0	67.8	115.0	1"	1.1
32	32.0	84.0	18.0	77.50	115.0	1-1/4"	1.6
40	40.0	93.0	18.2	88.5	140.0	1-1/2"	2.4
50	50.0	106.2	19.0	97.5	140.0	2"	3.4
65	64.0	136.6	26.0	121.0	220.0	2-1/2"	9.0
80	74.0	153.4	28.0	129.0	220.0	3"	12.0
100	99.0	187.6	31.0	149.0	244.0	4"	18.0

unit: mm

NPS	d	L	L1	H	W	NPT THREAD	Weight (lb)
1/4"	0.39	1.76	0.46	1.88	3.54	1/4"	0.7
3/8"	0.39	1.76	0.46	1.88	3.54	3/8"	0.7
1/2"	0.58	2.05	0.52	2.09	3.54	1/2"	1.0
3/4"	0.75	2.36	0.56	2.24	3.78	3/4"	1.5
1"	0.95	2.76	0.63	2.67	4.53	1"	2.4
1-1/4"	1.26	3.31	0.71	3.05	4.53	1-1/4"	3.5
1-1/2"	1.58	3.66	0.72	3.48	5.51	1-1/2"	5.3
2"	1.97	4.18	0.75	3.84	5.51	2"	7.4
2-1/2"	2.52	5.38	1.02	4.76	8.66	2-1/2"	19.8
3"	2.91	6.04	1.10	5.08	8.66	3"	26.0
4"	3.90	7.39	1.22	5.87	9.61	4"	40.0

unit: in



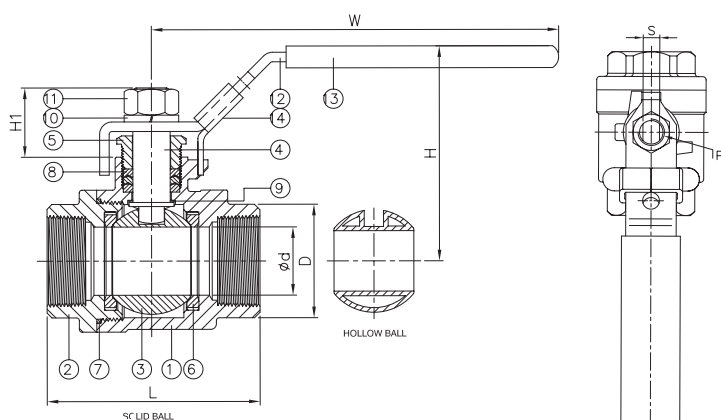
SERIES: B210TM - B210TC (1/4" - 4")

2-PC. SCREWED END BALL VALVE

Stainless / Carbon Steel

DESIGN FEATURES:

- Full port, 1/4" - 4" (DN8-DN80)
- **W.P. : 1000 WOG (PN63)**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Silicone Free
- Anti-Static Device
- Locking device
- Tapped & drilled mounting pad (option)
- Thread type:
 - » ASME B1.20.1 (NPT)
 - » DIN2999 & BS21
 - » ISO7/1 & EN10226



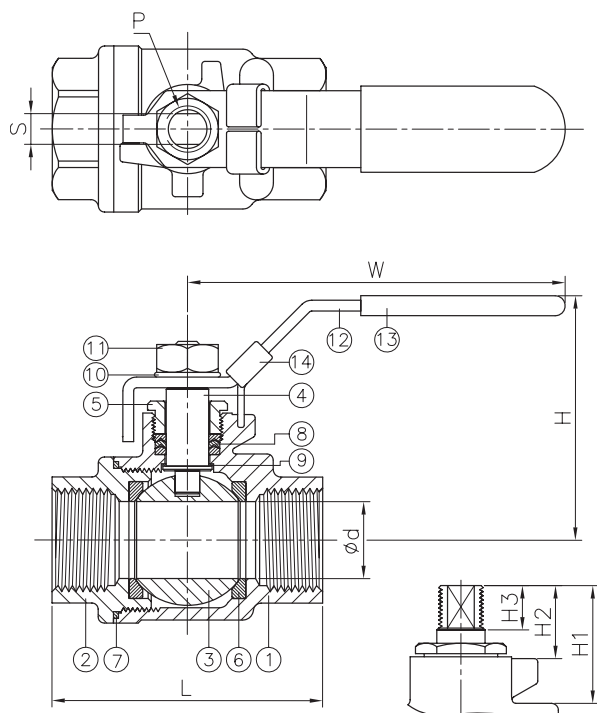
ITEM	PARTS	MATERIAL	
		B210TMRTXXX	B210TCRTXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	SOLID BALL	ASTM A351-CF8M	
	HOLLOW BALL	ASTM A240-316	
4	STEM	ASTM A276-316	
5	GLAND	AISI 304	
6	SEAT	RTFE	
7	SEAL	PTFE	
8	PACKING		
9	THRUST WASHER		
10	SPRING WASHER	AISI 304	
11	NUT		
12	HANDLE	STAINLESS STEEL	
13	HANDLE SLEEVE	PVC	
14	LOCK DEVICE	STAINLESS STEEL	

DN	d	D	L	H	H1	W	S	P	Torque (N-M)	Weight (kg)
										SOLID BALL
8	11.6	19.0	50.8	58.5	18.5	99.5	5.0	3/8"-24UNF	3.5	0.2
10	12.5	22.5	50.8	58.5	18.5	99.5	5.0	3/8"-24UNF	4.0	0.2
15	15.0	26.0	58.0	60.5	18.8	99.5	5.0	3/8"-24UNF	5.5	0.3
20	20.0	32.0	65.6	63.0	23.4	123.0	6.5	7/16"-20UNF	7.5	0.5
25	25.0	38.0	78.7	79.5	26.2	149.0	8.0	7/16"-20UNF	11.0	0.8
32	32.0	48.0	90.0	86.0	23.6	149.0	8.0	7/16"-20UNF	15.0	1.1
40	38.0	54.8	105.0	101.7	28.2	190.0	10.0	1/2"-20UNF	20.0	1.8
50	50.0	67.0	124.0	109.3	23.4	190.0	10.0	1/2"-20UNF	40.0	2.7
65	63.0	85.0	146.0	140.0	39.4	247.0	12.0	3/4"-10UNF	60.0	5.6
80	76.0	100.0	163.2	148.5	39.4	247.0	12.0	3/4"-10UNF	85.0	7.5
100	100.0	126.0	240.0	175.0	43.0	300.0	15.0	3/4"-10UNF	90.0	13.9

unit: mm

NPS	d	D	L	H	H1	W	S	P	Torque (in-lb)	Weight (lb)
										SOLID BALL
1/4"	0.46	0.75	2.00	2.30	0.73	3.92	0.20	3/8"-24UNF	31.0	0.5
3/8"	0.49	0.89	2.00	2.30	0.73	3.92	0.20	3/8"-24UNF	35.4	0.5
1/2"	0.59	1.02	2.28	2.38	0.74	3.92	0.20	3/8"-24UNF	48.7	0.7
3/4"	0.79	1.26	2.58	2.48	0.92	4.84	0.26	7/16"-20UNF	66.4	1.0
1"	0.98	1.50	3.10	3.13	1.03	5.87	0.31	7/16"-20UNF	97.4	1.7
1-1/4"	1.26	1.89	3.54	3.39	0.93	5.87	0.31	7/16"-20UNF	132.8	2.5
1-1/2"	1.50	2.16	4.13	4.00	1.11	7.48	0.39	1/2"-20UNF	177.0	3.9
2"	1.97	2.64	4.88	4.30	0.92	7.48	0.39	1/2"-20UNF	354.0	5.9
2-1/2"	2.48	3.35	5.75	5.51	1.55	9.72	0.47	3/4"-10UNF	531.0	12.4
3"	2.99	3.94	6.43	5.85	1.55	9.72	0.47	3/4"-10UNF	752.3	16.5
4"	3.94	4.96	9.45	6.89	1.69	11.81	0.59	3/4"-10UNF	796.6	30.6

unit: in



SERIES: B220TM - B220TC (1/4" - 2")

2-PC. SCREWED END BALL VALVE

Stainless / Carbon Steel

DESIGN FEATURES:

- Full port
- **W.P. :**
 - » 1/4"~1" - 2000 WOG (PN150)
 - » 1-1/4"~2" - 1500 WOG (PN100)
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Silicone Free
- Blow-out proof stem
- Anti-static device
- Locking device
- Thread type :
 - » ASME B1.20.1 (NPT)
 - » DIN2999 & BS21
 - » ISO7/1 & EN10226

ITEM	PARTS	MATERIAL	
		B220TMRTXXX	B220TCRTXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL	ASTM A351-CF8M	
4	STEM	ASTM A276-316	
5	GLAND NUT	AISI 304	
6	BALL SEAT	RTFE	
7	BODY SEAL	PTFE	
8	PACKING		
9	THRUST WASHER		
10	SPRING WASHER	AISI 304	
11	NUT		
12	HANDLE	STAINLESS STEEL	
13	HANDLE SLEEVE	PVC	
14	LOCK DEVICE	STAINLESS STEEL	

DN	D	L	H	H1	H2	H3	W	S	P	TORQUE (N-M)	WEIGHT (KG)
8	11.6	60.5	54.1	25.0	17.1	11.0	103	5.0	5/16"W	4.1	0.3
10	13.0	60.5	54.1	25.0	17.1	11.0	103	5.0	5/16"W	4.1	0.3
15	15.0	64.0	56.7	26.0	17.7	11.0	103	5.0	5/16"W	4.4	0.3
20	20.0	77.0	63.7	31.7	22.7	13.5	126	6.5	3/8"W	5.9	0.6
25	25.0	90.0	76.7	37.3	26.1	15.7	164	8.0	7/16"W	7.4	0.8
32	32.0	100.0	82.7	37.7	24.9	15.7	164	8.0	7/16"W	8.8	1.3
40	38.0	118.0	95.5	42.1	27.2	17.0	190	9.0	1/2"W	13.2	2.0
50	50.8	138.0	105.3	43.3	28.3	17.0	190	9.0	1/2"W	16.2	3.1

unit: mm

NPS	D	L	H	H1	H2	H3	W	S	P	TORQUE (IN-LB)	WEIGHT (LB)
1/4"	0.46	2.38	2.13	0.98	0.67	0.43	4.06	0.20	5/16"W	36.0	0.6
3/8"	0.51	2.38	2.13	0.98	0.67	0.43	4.06	0.20	5/16"W	36.0	0.6
1/2"	0.59	2.52	2.23	1.02	0.70	0.43	4.06	0.20	5/16"W	39.0	0.7
3/4"	0.79	3.03	2.51	1.25	0.89	0.53	4.96	0.26	3/8"W	52.0	1.2
1"	0.98	3.54	3.02	1.47	1.03	0.62	6.46	0.31	7/16"W	65.1	1.9
1-1/4"	1.26	3.94	3.26	1.48	0.98	0.62	6.46	0.31	7/16"W	78.1	2.8
1-1/2"	1.50	4.65	3.76	1.66	1.07	0.67	7.48	0.35	1/2"W	116.8	4.4
2"	2.00	5.43	4.15	1.70	1.11	0.67	7.48	0.35	1/2"W	143.4	6.9

unit: in



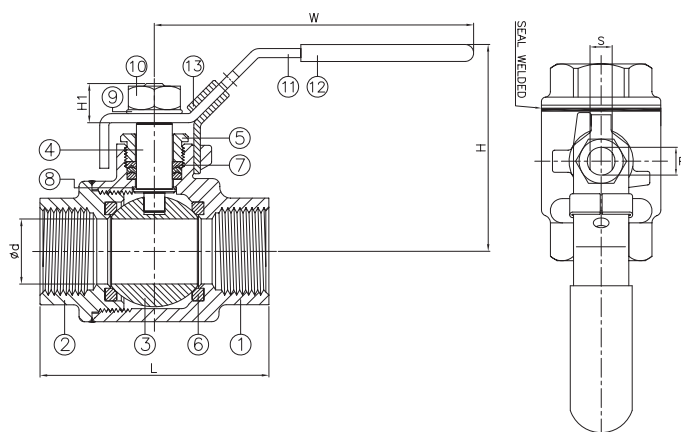
SERIES: B820TM - B820TC (1/4" - 4")

2-PC. SCREWED END BALL VALVE

SEAL WELDED

DESIGN FEATURES:

- Full port
- **W.P. :**
 - » 1/4"~1" - 2000 WOG(PN150)
 - » 1-1/4"~2" - 1500 WOG(PN100)
 - » 2-1/2"~4" - 1000 WOG(PN63)
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Anti-static device
- Silicone Free
- Locking device
- **API 607 Fire safe approved**
- ASME B16.34 Wall thickness
- API 608 Design
- **NACE MR0103**
- Seal welded ends
- Thread type :
 - » ASME B1.20.1 (NPT)
 - » DIN2999 & BS21
 - » ISO7/1 & EN10226



ITEM	PARTS	MATERIAL	
		B820TMRGNXX	B820TCRGNXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL	316 ASTM CF8M	
4	STEM	ASTM A276-316	
5	GLAND NUT	AISI 304	
6	SEAT	RTFE	
7	PACKING	GRAPHITE	
8	THRUST WASHER	CTFE	
9	SPRING WASHER	AISI 304	
10	NUT		
11	HANDLE	STAINLESS STEEL	
12	HANDLE SLEEVE	PVC	
13	LOCK DEVICE	STAINLESS STEEL	

DN	d	L	H	H1	W	S	P	Torque (N-M)		Weight (kg)
								Action	Breakaway	
8	11.6	60.5	53.6	10.5	102	5.0	5/16"	3.6	5.1	0.4
10	12.8	60.5	53.6	10.5	102	5.0	5/16"	3.8	6.4	0.4
15	15.0	62.5	57.0	10.5	102	5.0	5/16"	3.8	6.4	0.4
20	20.2	77.0	62.1	13.5	124	6.5	3/8"	3.8	6.4	0.7
25	25.6	90.0	80.0	15.7	165	8.0	7/16"	7.7	11.4	1.3
32	32.0	100.0	83.7	15.7	165	8.0	7/16"	19.5	28.6	2.0
40	38.0	118.0	99.0	17.0	188	9.0	1/2"	19.5	32.5	2.5
50	50.8	138.0	107.0	17.0	188	9.0	1/2"	20.8	44.2	4.1
65	65.5	167.0	142.0	27.5	250	12.0	3/4"	33.0	55.0	6.4
80	80.0	193.0	153.0	27.5	250	12.0	3/4"	42.0	70.0	10.9
100	100.0	258.0	180.0	34.0	324	16.0	1"	54.0	90.0	21.0

unit: mm

NPS	d	L	H	H1	W	S	P	Torque (in-lb)		Weight (lb)
								Action	Breakaway	
1/4"	0.46	2.38	2.11	0.41	4.02	0.20	5/16"	31.9	45.1	0.9
3/8"	0.50	2.38	2.11	0.41	4.02	0.20	5/16"	33.6	56.6	0.9
1/2"	0.59	2.46	2.24	0.41	4.02	0.20	5/16"	33.6	56.6	0.9
3/4"	0.80	3.03	2.44	0.53	4.88	0.26	3/8"	33.6	56.6	1.5
1"	1.01	3.54	3.15	0.62	6.50	0.31	7/16"	68.2	100.9	2.9
1-1/4"	1.26	3.94	3.30	0.62	6.50	0.31	7/16"	172.6	253.1	4.4
1-1/2"	1.50	4.65	3.90	0.67	7.40	0.35	1/2"	172.6	287.6	5.5
2"	2.00	5.43	4.21	0.67	7.40	0.35	1/2"	184.1	391.2	9.0
2-1/2"	2.58	6.57	5.59	1.08	9.84	0.47	3/4"	292.1	486.8	14.1
3"	3.15	7.60	6.02	1.08	9.84	0.47	3/4"	371.7	619.5	24.0
4"	3.94	10.16	7.09	1.34	12.76	0.63	1"	477.9	796.6	46.3

unit: in



SERIES: B410TM - B410TC (1/4" - 3")

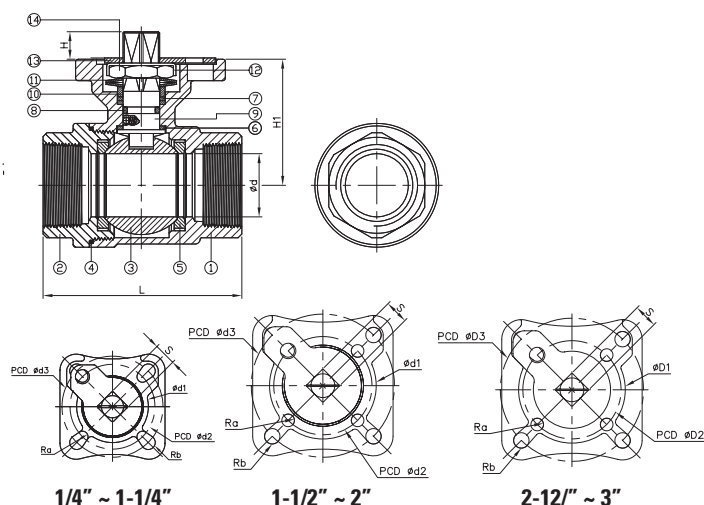
2-PC. SCREWED END BALL VALVE

Stainless / Carbon Steel

DIRECT MOUNT

DESIGN FEATURES:

- Full port, 1/4" ~ 3" (DN8~DN50)
- **W.P. : 1000 WOG (PN63)**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Live-loading design
- Anti-static device
- Supplied with level handle
- Silicone Free
- Locking device
- **Direct Mounting pad ISO 5211**
- Thread type :
 - » ASME B1.20.1 (NPT)
 - » DIN2999 & BS21
 - » ISO7/1 & EN10226



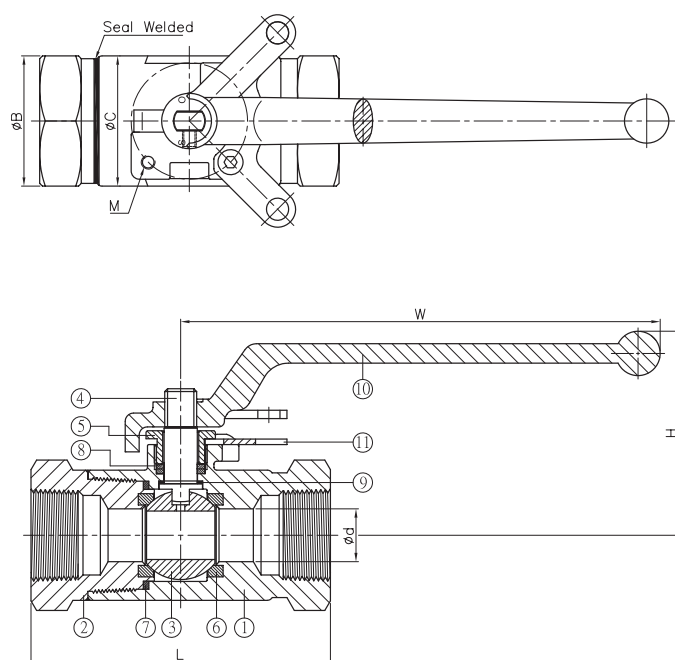
ITEM	PARTS	MATERIAL	
		B410TMMTXXX	B410TCMTXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL	ASTM A351-CF8M	
4	SEAL	PTFE	
5	SEAT	TFM 1600	
6	THRUST WASHER	PTFE	
7	PACKING		
8	O-RING	VITON	
9	STEM	ASTM A276-316	
10	GLAND RING	AISI 304	
11	BELLEVILLE WASHER	AISI 301	
12	LOCK WASHER	AISI 304	
13	STOPPER		
14	STEM NUT		

DN	d	L	H	H1	S	d1	d2	d3	Ra	Rb	ISO 5211	Torque (N-m)	Weight (kg)
8	11.6	58.0	8.0	36.4	9	31.0	36	42	2.8	2.8	F03 / F04	5.5	0.5
10	12.7	58.0	8.0	36.4	9	31.0	36	42	2.8	2.8	F03 / F04	5.5	0.5
15	15	58.0	8.0	36.4	9	31.0	36	42	2.8	2.8	F03 / F04	5.5	0.5
20	20	65.6	9.0	39.2	9	31.0	36	42	2.8	2.8	F03 / F04	7.5	0.5
25	25	78.7	11.0	48.7	11	35.5	42	50	2.8	3.5	F04 / F05	11.0	0.8
32	32	90.0	11.0	54.2	11	35.5	42	50	2.8	3.5	F04 / F05	15.0	1.2
40	38	105.0	11.5	65.7	14	56.0	50	70	3.5	4.5	F05 / F07	20.0	2.0
50	50	124.0	11.5	75.5	14	56.0	50	70	3.5	4.5	F05 / F07	40.0	2.9
65	63	146.2	20.5	91.5	17	76.0	70	102	4.5	5.5	F07 / F10	60.0	5.3
80	76	163.7	20.5	100.8	17	76.0	70	102	4.5	5.5	F07 / F10	85.0	7.2

unit: mm

NPS	d	L	H	H1	S	d1	d2	d3	Ra	Rb	ISO 5211	Torque (in-lb)	Weight (lb)
1/4"	0.46	2.28	0.31	1.43	0.35	1.22	1.42	1.65	0.11	0.11	F03 / F04	48.7	1.0
3/8"	0.50	2.28	0.31	1.43	0.35	1.22	1.42	1.65	0.11	0.11	F03 / F04	48.7	1.0
1/2"	0.59	2.28	0.31	1.43	0.35	1.22	1.42	1.65	0.11	0.11	F03 / F04	48.7	1.0
3/4"	0.79	2.58	0.35	1.54	0.35	1.22	1.42	1.65	0.11	0.11	F03 / F04	66.4	1.0
1"	0.98	3.10	0.43	1.92	0.43	1.40	1.65	1.97	0.11	0.14	F04 / F05	97.4	1.8
1-1/4"	1.26	3.54	0.43	2.13	0.43	1.40	1.65	1.97	0.11	0.14	F04 / F05	132.8	2.6
1-1/2"	1.50	4.13	0.45	2.59	0.55	2.20	1.97	2.76	0.14	0.18	F05 / F07	177.0	4.4
2"	1.97	4.88	0.45	2.97	0.55	2.20	1.97	2.76	0.14	0.18	F05 / F07	354.0	6.4
2-1/2"	2.48	5.76	0.81	3.60	0.67	3.0	2.76	4.02	0.18	0.22	F07 / F10	531.0	11.7
3"	2.99	6.44	0.81	3.97	0.67	3.0	2.76	4.02	0.18	0.22	F07 / F10	752.0	15.8

unit: in



SERIES: B836TM - B836TC (1/4" - 2")

HIGH PRESSURE THREADED BALL VALVE

Stainless / Carbon Steel

SEAL WELDED • FIRE SAFE

DESIGN FEATURES:

- 1/4"~2" (DN8~DN50)
- **W.P. : 3600 WOG (PN250)**
- W.T. : -20°C~260°C (-4°F~500°F)
- Investment casting
- Blow-out proof stem
- Anti-static device (option)
- Locking device
- **Mounting pad ISO 5211**
- Silicone Free
- **Seal welded ends**
- ASME B16.34 Wall thickness
- **NACE MR0103**
- **API 607 Fire safe approved**
- Thread type:
 - » ASME B1.20.1 (NPT)
 - » DIN2999 & BS21
 - » ISO7/1 & EN10226

ITEM	PARTS	MATERIAL	
		B836TMKGNXX	B836TCKGNXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL	17-4PH	
4	STEM	ASTM A564-630 H900	
5	GLAND NUT	AISI 304	
6	SEAT	PEEK	
7	SEAL	GRAPHITE	
8	PACKING		
9	THRUST WASHER	CTFE	
10	HANDLE	AISI 304	
11	LOCK PAD		

PN 250	DN	d	B	C	L	H	W	M	ISO 5211	Torque (N-M)	Weight (kg)
	8 F	6.4	32	39	76.2	56.6	142.0	M5*P0.80	F03	9.5	0.7
	10 S	6.4	32	39	76.2	56.6	142.0	M5*P0.80	F03	9.5	0.7
	15 F	12.7	32	39	101.6	56.6	142.0	M5*P0.80	F03	9.5	0.8
	20 F	19.0	47	47	108.0	76.1	173.0	M5*P0.80	F04	28.0	1.3
	25 S	19.0	47	47	108.0	76.1	173.0	M5*P0.80	F04	28.0	1.3
	40 F	38.1	77	86	134.0	117.0	247.5	M8*P1.25	F07	53.0	4.9
	50 S	38.1	82	86	158.1	117.0	247.5	M8*P1.25	F07	53.0	5.4

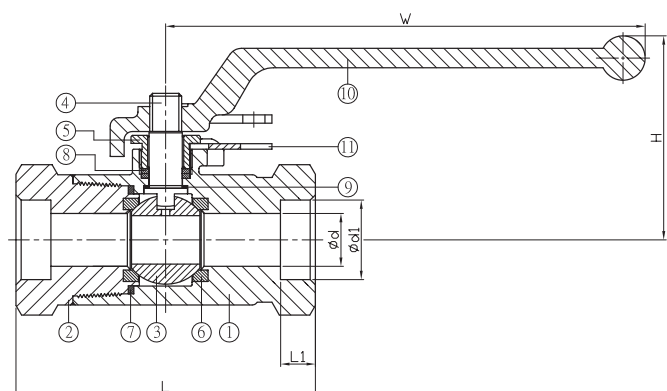
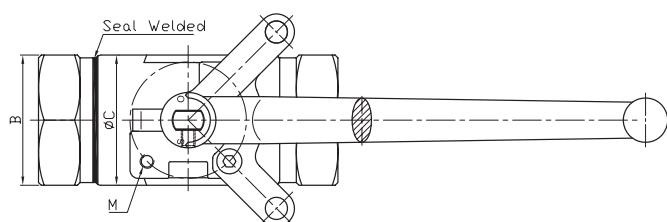
F: Full Port S: Standard Port

unit: mm

3600 WOG	NPS	d	B	C	L	H	W	M	ISO 5211	Torque (in-lb)	Weight (lb)
	1/4" F	0.25	1.26	1.54	3.00	2.23	5.59	M5*P0.80	F03	84.1	1.5
	3/8" S	0.25	1.26	1.54	3.00	2.23	5.59	M5*P0.80	F03	84.1	1.5
	1/2" F	0.50	1.26	1.54	4.00	2.23	5.59	M5*P0.80	F03	84.1	1.7
	3/4" F	0.75	1.85	1.85	4.25	3.00	6.81	M5*P0.80	F04	247.8	2.9
	1" S	0.75	1.85	1.85	4.25	3.00	6.81	M5*P0.80	F04	247.8	2.9
	1-1/2" F	1.50	3.03	3.39	5.28	4.61	9.74	M8*P1.25	F07	469.1	10.8
	2" S	1.50	3.23	3.39	6.22	4.61	9.74	M8*P1.25	F07	469.1	11.8

F: Full Port S: Standard Port

unit: in



SERIES: B836SM - B836SC (1/4" - 2")

HIGH PRESSURE SOCKET WELD BALL VALVE

Stainless / Carbon Steel

SEAL WELDED • FIRE SAFE

DESIGN FEATURES:

- 1/4"~2" (DN8~DN50)
- **W.P. : 3600 WOG (PN250)**
- W.T. : -20°C~260°C (-4°F~500°F)
- Investment casting
- Blow-out proof stem
- Anti-static device (option)
- Locking device
- **Mounting pad ISO 5211**
- Silicone Free
- **Seal welded ends**
- ASME B16.34 Wall thickness
- **NACE MR0103**
- **API 607 Fire safe approved**
- Socket Weld Ends:
 - » ASME B16.34 / 1.20.1
 - » DIN2999 & BS21
 - » ISO7/1 & EN10226

ITEM	PARTS	MATERIAL	
		B836SMKGNXX	B836SCKGNXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL	17-4PH	
4	STEM	ASTM A564-630 H900	
5	GLAND NUT	AISI 304	
6	SEAT	PEEK	
7	SEAL	GRAPHITE	
8	PACKING		
9	THRUST WASHER	CTFE	
10	HANDLE	AISI 304	
11	LOCK PAD		

	DN	d	B	C	L	H	W	M	ISO 5211	Torque (N-M)	Weight (kg)
PN 250	8 F	6.4	32	39	76.2	56.6	142.0	M5*P0.80	F03	9.5	0.7
	10 S	6.4	32	39	76.2	56.6	142.0	M5*P0.80	F03	9.5	0.7
	15 F	12.0	32	39	101.6	56.6	142.0	M5*P0.80	F03	9.5	0.8
	20 F	19.0	47	47	108.0	76.1	173.0	M5*P0.80	F04	28.0	1.3
	25 S	19.0	47	47	108.0	76.1	173.0	M5*P0.80	F04	28.0	1.3
	40 F	38.1	77	86	134.0	117.0	247.5	M8*P1.25	F07	53.0	4.9
	50 S	38.1	82	86	158.1	117.0	247.5	M8*P1.25	F07	53.0	5.4

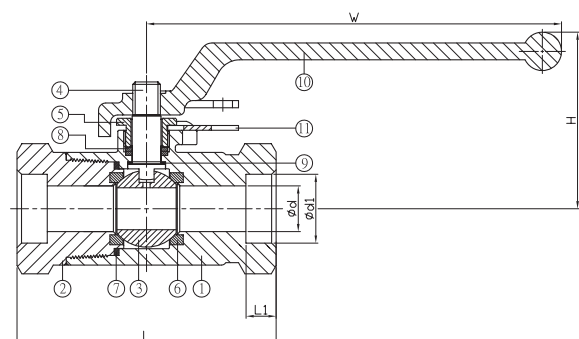
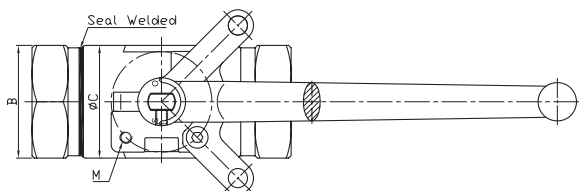
F: Full Port S: Standard Port

unit: mm

	NPS	d	B	C	L	H	W	M	ISO 5211	Torque (in-lb)	Weight (lb)
3600 WOG	1/4" F	0.25	1.26	1.54	3.00	2.23	5.59	M5*P0.80	F03	84.1	1.5
	3/8" S	0.25	1.26	1.54	3.00	2.23	5.59	M5*P0.80	F03	84.1	1.5
	1/2" F	0.50	1.26	1.54	4.00	2.23	5.59	M5*P0.80	F03	84.1	1.7
	3/4" F	0.75	1.85	1.85	4.25	3.00	6.81	M5*P0.80	F04	247.8	2.9
	1" S	0.75	1.85	1.85	4.25	3.00	6.81	M5*P0.80	F04	247.8	2.9
	1-1/2" F	1.50	3.03	3.39	5.28	4.61	9.74	M8*P1.25	F07	469.1	10.8
	2" S	1.50	3.23	3.39	6.22	4.61	9.74	M8*P1.25	F07	469.1	11.8

F: Full Port S: Standard Port

unit: in



SERIES: B860SM - B860SC (1/4" - 2")

HIGH PRESSURE BALL VALVE

Stainless / Carbon Steel

SEAL WELDED • FIRE SAFE

DESIGN FEATURES:

- 1/4"~2" (DN8~DN50)
- **W.P. : 6000 WOG (PN420)**
- W.T. : -20°C~260°C (-4°F~500°F)
- Investment casting
- Blow-out proof stem
- Anti-static device
- Locking device
- **Mounting pad ISO 5211**
- Silicone Free
- **Seal welded ends**
- ASME B16.34 Wall thickness
- **NACE MR0103**
- **API 607 Fire safe approved**
 - » Socket Weld:
 - » ASME 16.34 / 16.11
 - » DIN2999 & BS21
 - » ISO7/1 & EN10226

ITEM	PARTS	MATERIAL	
		B860SMKGNXX	B860SCKGNXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL	17-4PH	
4	STEM	ASTM A564-630 H900	
5	GLAND NUT	AISI 304	
6	SEAT	PEEK	
7	SEAL	GRAPHITE	
8	PACKING		
9	THRUST WASHER	CTFE	
10	HANDLE	AISI 304	
11	LOCK PAD		

PN 420	DN	d	B	C	L	H	W	M	ISO 5211	Torque (N-M)	Weight (kg)
	8 F	6.4	32	39	76.2	56.6	142.0	M5*P0.80	F03	9.5	0.7
	10 S	6.4	32	39	76.2	56.6	142.0	M5*P0.80	F03	9.5	0.7
	15 F	12.7	38	39	101.6	56.6	142.0	M5*P0.80	F03	9.5	0.9
	20 F	19.0	47	52	108.0	76.1	173.0	M5*P0.80	F04	28.0	1.6
	25 S	19.0	55	55	108.0	76.1	173.0	M5*P0.80	F04	28.0	1.8
	25 F	25.4	55	68	122.0	83.1	173.0	M6*P1.00	F05	33.3	2.7
	40 F	38.1	77	97	134.0	117	247.5	M8*P1.25	F07	53.0	6.1
	50 S	38.1	92	97	158.1	117	247.5	M8*P1.25	F07	53.0	7.4

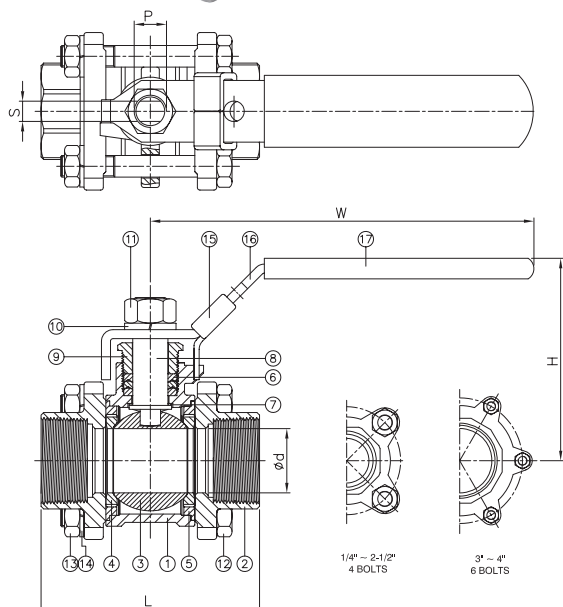
F:Full Port S:Standard Port

unit: mm

6000 WOG	NPS	d	B	C	L	H	W	M	ISO 5211	Torque (in-lb)	Weight (lb)
	1/4" F	0.25	1.26	1.54	3.00	2.23	5.59	M5*P0.8	F03	84.1	1.5
	3/8" S	0.25	1.26	1.54	3.00	2.23	5.59	M5*P0.8	F03	84.1	1.5
	1/2" F	0.50	1.50	1.54	4.00	2.23	5.59	M5*P0.8	F03	84.1	2.0
	3/4" F	0.75	1.85	2.05	4.25	3.00	6.81	M5*P0.8	F04	247.8	3.4
	1" S	0.75	2.17	2.17	4.25	3.00	6.81	M5*P0.8	F04	247.8	5.9
	1-1/2" F	1.50	3.03	3.82	5.28	4.61	9.74	M8*P1.25	F07	469.1	13.4
	2" S	1.50	3.62	3.82	6.22	4.61	9.74	M8*P1.25	F07	469.1	16.3

F:Full Port S:Standard Port

unit: in



SERIES: B310TM - B310TC (1/4" - 4")

3-PC. SCREWED END BALL VALVE

Stainless / Carbon Steel

DESIGN FEATURES:

- Full port, 1/4"~4" (DN8~DN100)
- **W.P. : 1000 WOG (PN63)**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Silicone Free
- Anti-Static
- Locking device
- Thread type :
 - » ASME B1.20.1 (NPT)
 - » DIN2999 & BS21
 - » ISO7/1 & EN10226

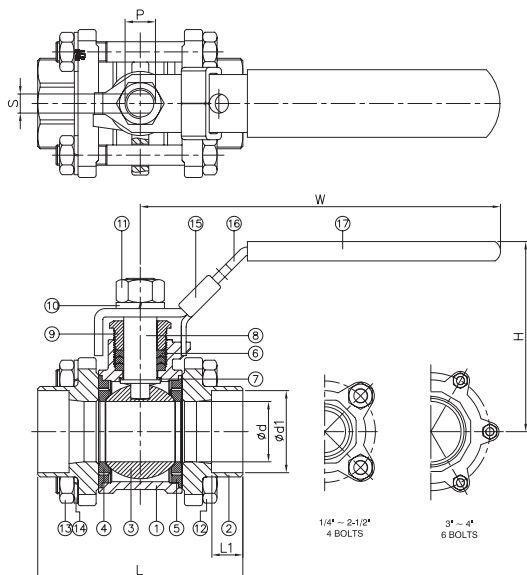
ITEM	PARTS	MATERIAL	
		B310TMRTXXX	B310TCRTXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL	ASTM A351-CF8M	
4	SEAT	RTFE	
5	SEAL	PTFE	
6	PACKING		
7	THRUST WASHER		
8	STEM	ASTM A276-316	
9	GLAND	AISI 304	
10	SPRING WASHER		
11	STEM NUT		
12	BOLT		
13	NUT		
14	SPRING WASHER	STAINLESS STEEL	
15	LOCKING DEVICE		
16	HANDLE	PVC	
17	HANDLE SLEEVE		

DN	d	L	H	W	S	P	Torque (N-m)	Weight (kg)
8	11.6	65	60.2	98	5.0	3/8"-24UNF	3.5	0.4
10	12.5	65	60.2	98	5.0	3/8"-24UNF	4.0	0.4
15	15.0	65	62.2	98	5.0	3/8"-24UNF	5.5	0.5
20	20.0	75	64.6	121	6.5	7/16"-20UNF	7.5	0.7
25	25.0	85	80.1	147	8.0	7/16"-20UNF	11.0	1.1
32	32.0	101	85.1	147	8.0	7/16"-20UNF	15.0	1.6
40	38.0	112	103.3	188	10.0	1/2"-20UNF	20.0	2.4
50	50.0	130	110.8	188	10.0	1/2"-20UNF	40.0	3.1
65	63.0	162	141.7	245	12.0	3/4"-10UNC	60.0	6.5
80	76.0	188	150.4	245	12.0	3/4"-10UNC	85.0	9.5
100	96.0	224	181.7	316	16.0	1"-8UNC	150.0	19.0

unit: mm

NPS	d	L	H	W	S	P	Torque (in-lb)	Weight (lb)
1/4"	0.46	2.56	2.37	3.86	0.20	3/8"-24UNF	31.0	0.8
3/8"	0.49	2.56	2.37	3.86	0.20	3/8"-24UNF	35.4	0.8
1/2"	0.59	2.56	2.45	3.86	0.20	3/8"-24UNF	48.7	1.1
3/4"	0.79	2.95	2.54	4.76	0.26	7/16"-20UNF	66.4	1.5
1"	0.98	3.35	3.15	5.79	0.31	7/16"-20UNF	97.4	2.3
1-1/4"	1.26	3.98	3.35	5.79	0.31	7/16"-20UNF	132.8	3.5
1-1/2"	1.50	4.41	4.07	7.40	0.39	1/2"-20UNF	177.0	5.3
2"	1.97	5.12	4.36	7.40	0.39	1/2"-20UNF	354.0	6.8
2-1/2"	2.48	6.38	5.58	9.65	0.47	3/4"-10UNC	531.0	14.3
3"	2.99	7.40	5.92	9.65	0.47	3/4"-10UNC	752.3	20.9
4"	3.78	8.82	7.15	12.44	0.63	1"-8UNC	1327.6	41.9

unit: in



SERIES: B310SM - B310SC (1/4" - 4")

3-PC. SOCKET WELD END BALL VALVE

Stainless / Carbon Steel

DESIGN FEATURES:

- Full port, 1/4"~4" (DN8~DN100)
- **W.P. : 1000 WOG (PN63)**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Silicone Free
- Anti-Static Device
- Locking device
- Socket weld ends:
 - » ASME B16.11
 - » DIN3239
 - » ISO7/1 & EN10226

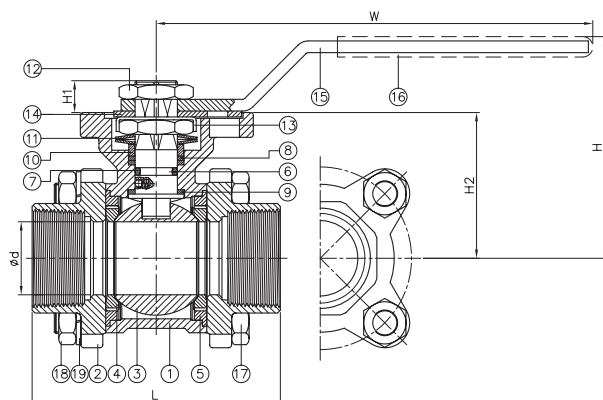
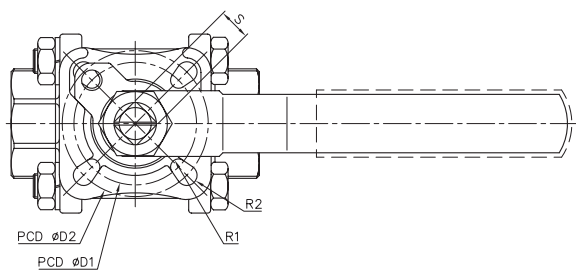
ITEM	PARTS	MATERIAL	
		B310SMRTXXX	B310SCRTXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL	ASTM A351-CF8M	
4	SEAT	RTFE	
5	SEAL	PTFE	
6	PACKING		
7	THRUST WASHER		
8	STEM	ASTM A276-316	
9	GLAND	AISI 304	
10	SPRING WASHER		
11	STEM NUT		
12	BOLT		
13	NUT		
14	SPRING WASHER	STAINLESS STEEL	
15	LOCKING DEVICE		
16	HANDLE		
17	HANDLE SLEEVE	PVC	

DN	d	d1	L	L1	H	W	S	P	Torque (N-m)	Weight (kg)
8	11.6	14.5	65	10	60.2	98	5.0	3/8"-24UNF	3.5	0.4
10	12.5	18.0	65	10	60.2	98	5.0	3/8"-24UNF	4.0	0.4
15	15.0	22.0	65	10	62.2	98	5.0	3/8"-24UNF	5.5	0.5
20	20.0	27.5	75	13	64.6	121	6.5	7/16"-20UNF	7.5	0.7
25	25.0	34.0	85	13	80.1	147	8.0	7/16"-20UNF	11.0	1.1
32	32.0	43.0	101	13	85.1	147	8.0	7/16"-20UNF	15.0	1.6
40	38.0	49.0	112	13	103.0	188	10.0	1/2"-20UNF	20.0	2.4
50	50.0	61.0	130	16	111.0	188	10.0	1/2"-20UNF	40.0	3.1
65	63.0	74.0	162	16	142.0	245	12.0	3/4"-10UNC	60.0	6.5
80	76.0	90.0	188	16	150.0	245	12.0	3/4"-10UNC	85.0	9.5
100	96.0	115.5	224	20	182.0	316	16.0	1"-8UNC	150.0	19.0

unit: mm

NPS	d	d1	L	L1	H	W	S	P	Torque (in-lb)	Weight (lb)
1/4"	0.46	0.57	2.56	0.39	2.37	3.86	0.20	3/8"-24UNF	31.0	0.8
3/8"	0.49	0.71	2.56	0.39	2.37	3.86	0.20	3/8"-24UNF	35.4	0.8
1/2"	0.59	0.87	2.56	0.39	2.45	3.86	0.20	3/8"-24UNF	48.7	1.1
3/4"	0.79	1.08	2.95	0.51	2.54	4.76	0.26	7/16"-20UNF	66.4	1.5
1"	0.98	1.34	3.35	0.51	3.15	5.79	0.31	7/16"-20UNF	97.4	2.3
1-1/4"	1.26	1.69	3.98	0.51	3.35	5.79	0.31	7/16"-20UNF	132.8	3.5
1-1/2"	1.50	1.93	4.41	0.51	4.06	7.40	0.39	1/2"-20UNF	177.0	5.3
2"	1.97	2.40	5.12	0.63	4.37	7.40	0.39	1/2"-20UNF	354.0	6.8
2-1/2"	2.48	2.91	6.38	0.63	5.59	9.65	0.47	3/4"-10UNC	531.0	14.3
3"	2.99	3.54	7.40	0.63	5.91	9.65	0.47	3/4"-10UNC	752.3	20.9
4"	3.78	4.55	8.82	0.79	7.17	12.44	0.63	1"-8UNC	1327.6	41.9

unit: in



SERIES: B710TM - B710TC (1/4" - 2")

3-PC THREADED BALL VALVE

Stainless / Carbon Steel

DESIGN FEATURES:

- Full port, 1/4" ~ 2" (DN8~DN50)
- **W.P. : 1000 WOG (PN63)**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Live-loading design
- Locking device
- Silicone Free
- Supplied with lever handle
- Anti-static device
- **Direct mounting pad ISO 5211**
- Automation accessories (option)
- Thread type :
 - » ASME B1.20.1 (NPT)
 - » DIN2999 & BS21
 - » ISO7/1 & EN10226

ITEM	PARTS	MATERIAL	
		B710TMMTXXX	B710TCMTXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL	ASTM A351-CF8M	
4	SEAT	TFM 1600	
5	SEAL	PTFE	
6	STEM	ASTM A276-316	
7	O-RING	VITON	
8	PACKING	PTFE	
9	THRUST WASHER		
10	GLAND RING	AISI 304	
11	BELLEVILLE WASHER	AISI 301	
12	STEM NUT	AISI 304	
13	LOCK WASHER		
14	LOCKING DEVICE		
15	HANDLE	STAINLESS STEEL	
16	HANDLE SLEEVE	PVC	
17	BOLT	AISI 304	
18	NUT		
19	SPRING WASHER		

DN	d	d1	L	L1	H	H1	H2	W	S	D1	D2	R1	R2	ISO 5211	Torque (N-M)		Weight (kg)
															Breakaway	Action	
8	11.6	14.5	65	10	61.0	7.5	35.3	114.5	9	36	42	2.8	2.8	F03/F04	7	4	0.6
10	12.5	18.0	65	10	61.0	7.5	35.3	114.5	9	36	42	2.8	2.8	F03/F04	7	4	0.6
15	15.0	22.0	65	10	62.7	7.1	36.4	114.5	9	36	42	2.8	2.8	F03/F04	7	4	0.6
20	20.0	27.5	75	13	65.1	7.3	39.5	114.5	9	36	42	2.8	2.8	F03/F04	9	5	0.7
25	25.0	34.0	85	13	76.5	11.0	49.0	140.0	11	42	50	2.8	3.5	F04/F05	15	9	1.1
32	32.0	43.0	101	13	82.0	9.5	54.2	140.0	11	42	50	2.8	3.5	F04/F05	18	11	1.7
40	38.0	49.0	112	13	102.0	12.4	64.6	172.0	14	50	70	3.5	4.5	F05/F07	25	15	2.6
50	50.0	61.0	130	16	110.1	13.6	72.5	172.0	14	50	70	3.5	4.5	F05/F07	35	21	3.7

unit: mm

NPS	d	d1	L	L1	H	H1	H2	W	S	D1	D2	R1	R2	ISO 5211	Torque (in-lb)		Weight (lb)
															Breakaway	Action	
1/4"	0.46	0.57	2.56	0.39	2.40	0.30	1.39	4.51	0.35	1.42	1.65	0.11	0.11	F03/F04	62.0	35.4	1.2
3/8"	0.49	0.71	2.56	0.39	2.40	0.30	1.39	4.51	0.35	1.42	1.65	0.11	0.11	F03/F04	62.0	35.4	1.2
1/2"	0.59	0.87	2.56	0.39	2.47	0.28	1.43	4.51	0.35	1.42	1.65	0.11	0.11	F03/F04	62.0	35.4	1.2
3/4"	0.79	1.08	2.95	0.51	2.56	0.29	1.56	4.51	0.35	1.42	1.65	0.11	0.11	F03/F04	79.7	44.3	1.6
1"	0.98	1.34	3.35	0.51	3.01	0.43	1.93	5.51	0.43	1.65	1.97	0.11	0.14	F04/F05	132.8	79.7	2.4
1-1/4"	1.26	1.69	3.98	0.51	3.23	0.37	2.13	5.51	0.43	1.65	1.97	0.11	0.14	F04/F05	159.3	97.4	3.7
1-1/2"	1.50	1.93	4.41	0.51	4.02	0.49	2.54	6.77	0.55	1.97	2.76	0.14	0.18	F05/F07	221.3	132.8	5.8
2"	1.97	2.40	5.12	0.63	4.33	0.54	2.85	6.77	0.55	1.97	2.76	0.14	0.18	F05/F07	309.8	185.9	8.1

unit: in

FOR ADDITIONAL SIZES SEE NEXT PAGE



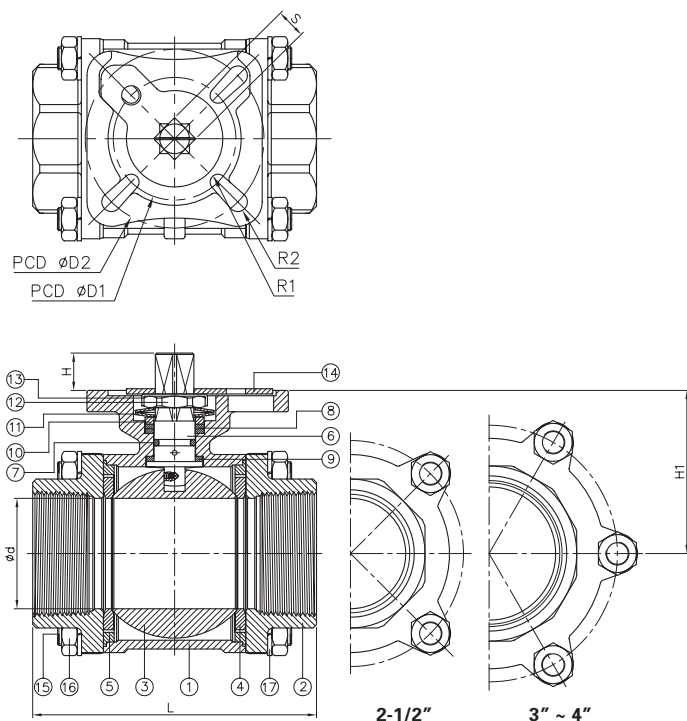
SERIES: B710TM - B710TC (2-1/2" - 4")

3-PC THREADED BALL VALVE

Stainless / Carbon Steel

DESIGN FEATURES:

- Full port, 2-1/2" ~ 4" (DN65 ~ DN100)
- **W.P. : 1000 WOG (PN63)**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Live-loading design
- Locking device
- Silicone Free
- Supplied with lever handle
- Anti-static device
- **Direct mounting pad ISO 5211**
- Automation accessories (option)
- Thread type :
 - » ASME B1.20.1 (NPT)
 - » DIN2999 & BS21
 - » ISO7/1 & EN10226



ITEM	PARTS	MATERIAL	
		B710TMMTXXX	B710TCMTXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL		
4	SEAT	TFM 1600	
5	SEAL	PTFE	
6	STEM	ASTM A276-316	
7	O-RING	VITON	
8	PACKING	PTFE	
9	THRUST WASHER		
10	GLAND RING	AISI 304	
11	BELLEVILLE WASHER	AISI 301	
12	STEM NUT	AISI 304	
13	LOCK WASHER		
14	LOCKING DEVICE		
15	HANDLE		
16	BOLT		
17	NUT		
18	SPRING WASHER		
19	BOLT		
20	NUT		

DN	d	d1	L	L1	H	H1	H2	W	S	D1	D2	R1	R2	ISO 5211	Torque (N-M)		Weight (kg)
															Breakaway	Action	
65	63	74.0	162	16	127.3	16.3	92	325	17	70	102	4.5	5.5	F07/F10	55	33	7.4
80	76	90.0	188	16	136.3	16.3	100	325	17	70	102	4.5	5.5	F07/F10	70	42	10.3
100	96	115.5	224	20	142.5	20.5	130	325	22	102	125	5.5	6.5	F10/F12	90	54	19.9

unit: mm

NPS	d	d1	L	L1	H	H1	H2	W	S	D1	D2	R1	R2	ISO 5211	Torque (in-lb)		Weight (lb)
															Breakaway	Action	
2-1/2"	2.48	2.91	6.38	0.63	5.01	0.64	3.62	12.8	0.67	2.76	4.02	0.18	0.22	F07/F10	486.8	292.1	16.3
3"	2.99	3.54	7.40	0.63	5.37	0.64	3.94	12.8	0.67	2.76	4.02	0.18	0.22	F07/F10	619.5	371.7	22.7
4"	3.78	4.55	8.82	0.79	5.61	0.81	5.12	12.8	0.87	4.02	4.92	0.22	0.26	F10/F12	796.6	477.9	43.9

unit: in



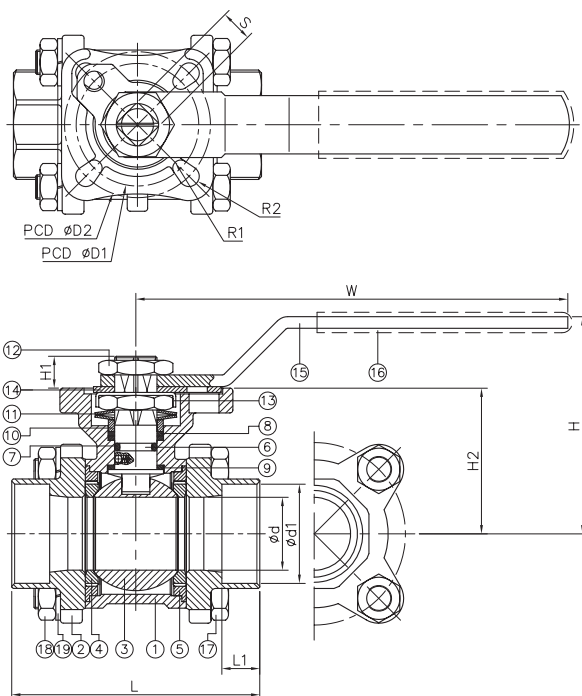
SERIES: B710SM - B710SC (1/4" - 2")

3-PC SOCKET WELD BALL VALVE

Stainless / Carbon Steel

DESIGN FEATURES:

- Full port, 1/4"~ 2" (DN8~DN50)
- **W.P. : 1000 WOG (PN63)**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Live-loading design
- Locking device
- Silicone Free
- Anti-static device
- **Direct mounting pad ISO 5211**
- Automation accessories (option)
 - » ASME B16.11
 - » DIN3239
 - » ISO7/1 & EN10226



ITEM	PARTS	MATERIAL	
		B710SMMTXXX	B710SCMTXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL	ASTM A351-CF8M	
4	SEAT	TFM 1600	
5	SEAL	PTFE	
6	STEM	ASTM A276-316	
7	O-RING	VITON	
8	PACKING	PTFE	
9	THRUST WASHER		
10	GLAND RING	AISI 304	
11	BELLEVILLE WASHER	AISI 301	
12	STEM NUT	AISI 304	
13	LOCK WASHER		
14	LOCKING DEVICE		
15	HANDLE	STAINLESS STEEL	
16	HANDLE SLEEVE	PVC	
17	BOLT	AISI 304	
18	NUT		
19	SPRING WASHER		

DN	d	L	H	H1	H2	W	S	D1	D2	R1	R2	ISO 5211	Torque (N-M)		Weight (kg)
													Breakaway	Action	
8	11.6	65	61.0	7.5	35.3	114.5	9	36	42	2.8	2.8	F03/F04	7	4	0.6
10	12.5	65	61.0	7.5	35.3	114.5	9	36	42	2.8	2.8	F03/F04	7	4	0.6
15	15.0	65	62.7	7.1	36.4	114.5	9	36	42	2.8	2.8	F03/F04	7	4	0.6
20	20.0	75	65.1	7.3	39.5	114.5	9	36	42	2.8	2.8	F03/F04	9	5	0.7
25	25.0	85	76.5	11.0	49.0	140.0	11	42	50	2.8	3.5	F04/F05	15	9	1.1
32	32.0	101	82.0	11.5	54.2	140.0	11	42	50	2.8	3.5	F04/F05	18	11	1.7
40	38.0	112	102.0	12.4	64.6	172.0	14	50	70	3.5	4.5	F05/F07	25	15	2.6
50	50.0	130	110.1	13.6	72.5	172.0	14	50	70	3.5	4.5	F05/F07	35	21	3.7

unit: mm

NPS	d	L	H	H1	H2	W	S	D1	D2	R1	R2	ISO 5211	Torque (in-lb)		Weight (lb)
													Breakaway	Action	
1/4"	0.46	2.56	2.40	0.30	1.39	4.51	0.35	1.42	1.65	0.11	0.11	F03/F04	62.0	35.4	1.2
3/8"	0.49	2.56	2.40	0.30	1.39	4.51	0.35	1.42	1.65	0.11	0.11	F03/F04	62.0	35.4	1.2
1/2"	0.59	2.56	2.47	0.28	1.43	4.51	0.35	1.42	1.65	0.11	0.11	F03/F04	62.0	35.4	1.2
3/4"	0.79	2.95	2.56	0.29	1.56	4.51	0.35	1.42	1.65	0.11	0.11	F03/F04	79.7	44.3	1.6
1"	0.98	3.35	3.01	0.43	1.93	5.51	0.43	1.65	1.97	0.11	0.14	F04/F05	132.8	79.7	2.4
1-1/4"	1.26	3.98	3.23	0.45	2.13	5.51	0.43	1.65	1.97	0.11	0.14	F04/F05	159.3	97.4	3.7
1-1/2"	1.50	4.41	4.02	0.49	2.54	6.77	0.55	1.97	2.76	0.14	0.18	F05/F07	221.3	132.8	5.7
2"	1.97	5.12	4.33	0.54	2.85	6.77	0.55	1.97	2.76	0.14	0.18	F05/F07	309.8	185.9	8.2

unit: in

FOR ADDITIONAL SIZES SEE NEXT PAGE



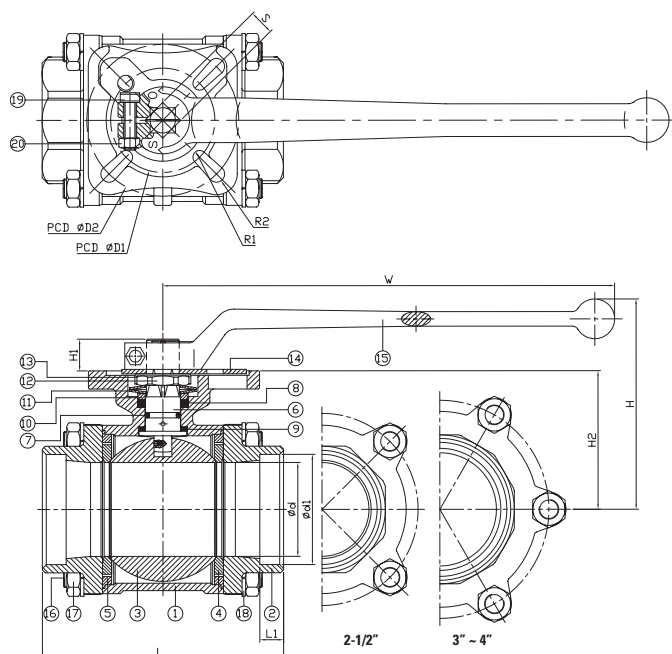
SERIES: B710SM - B710SC (2-1/2" - 4")

3-PC SOCKET WELD BALL VALVE

Stainless / Carbon Steel

DESIGN FEATURES:

- Full port, 2 1/2"~ 4" (DN65~DN100)
- **W.P. : 1000 WOG (PN63)**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Live-loading design
- Locking device
- Silicone Free
- Anti-static device
- **Direct mounting pad ISO 5211**
- Automation accessories (option)
- Socket Weld Ends:
 - » ASME B16.11
 - » DIN3239
 - » ISO7/1 & EN10226



ITEM	PARTS	MATERIAL	
		B710SMMTXXX	B710SCMTXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL		
4	SEAT	TFM 1600	
5	SEAL	PTFE	
6	STEM	ASTM A276-316	
7	O-RING	VITON	
8	PACKING	PTFE	
9	THRUST WASHER		
10	GLAND RING	AISI 304	
11	BELLEVILLE WASHER	AISI 301	
12	STEM NUT	AISI 304	
13	LOCK WASHER		
14	LOCKING DEVICE		
15	BOLT		
16	NUT		
17	SPRING WASHER		

DN	d	L	H	H1	S	D1	D2	R1	R2	ISO 5211	Torque (N-M)		Weight (kg)
											Breakaway	Action	
65	63	162	16.3	92	17	70	102	4.5	5.5	F07/F10	55	33	7.4
80	76	188	16.3	100	17	70	102	4.5	5.5	F07/F10	70	42	10.3
100	96	224	20.5	130	22	102	125	5.5	6.5	F10/F12	90	54	19.9

unit: mm

NPS	d	L	H	H1	S	D1	D2	R1	R2	ISO 5211	Torque (in-lb)		Weight (lb)
											Breakaway	Action	
2-1/2"	2.48	6.38	0.64	3.62	0.67	2.76	4.02	0.18	0.22	F07/F10	486.8	292.1	16.3
3"	2.99	7.40	0.64	3.94	0.67	2.76	4.02	0.18	0.22	F07/F10	619.5	371.7	22.7
4"	3.78	8.82	0.81	5.12	0.87	4.02	4.92	0.22	0.26	F10/F12	796.6	477.9	43.9

unit: in



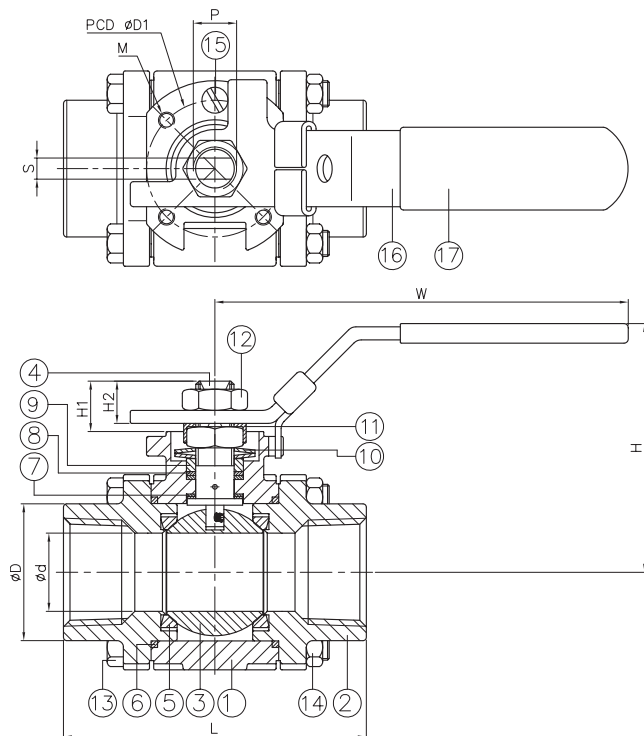
SERIES: B920TM - B910TC (1/4" - 3/4")

3-PC SCREWED END BALL VALVE

Stainless / Carbon Steel

DESIGN FEATURES:

- Full port, 1/4"~ 3/4" (DN8~DN20)
- **W.P. :**
 - » 1/4" ~ 1" - 2000 WOG
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Silicone Free
- Anti-static device
- Locking device
- Thread Type:
 - » ASME B1.20.1 (NPT)
 - » DIN2999 & BS21
 - » ISO7/1 & EN10226
- NACE MR0103
- **API 607 Fire Safe Approved**
- API 608 Design



ITEM	PARTS	MATERIAL	
		B920TMRGXXX	B920TCRGXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP	ASTM A351-CF3M	
3	BALL	ASTM A351-CF8M	
4	STEM	ASTM A276-316	
5	SEAT	RTFE	
6	GASKET	GRAPHITE	
7	THRUST WASHER	CTFE	
8	PACKING	GRAPHITE	
9	GLAND RING	AISI 304	
10	DISC SPRING	AISI 301	
11	LOCK PAD	ASTM A167-304	
12	STEM NUT	ASTM A194-8A	
13	BOLT	ASTM A193-B8A	
14	NUT	ASTM A194-8A	
15	STOP PIN	AISI 304	
16	HANDLE	STAINLESS STEEL	
17	HANDLE SLEEVE	PVC	

DN	d	D	L	H	H1	H2	W	S	D1	M	P	ISO 5211	Torque (N-M)	Weight (kg)
8	8	25.0	65.7	57.0	12.1	9.8	113.5	5.7	36	M5*0.8	3/8"-24UNF	F03	3.8	0.7
10	10	25.0	65.7	57.0	12.1	9.8	113.5	5.7	36	M5*0.8	3/8"-24UNF	F03	3.8	0.7
15	15	30.3	74.8	57.0	12.1	9.8	113.5	5.7	36	M5*0.8	3/8"-24UNF	F03	3.8	0.8
20	20	36.0	80.2	59.7	14.5	10.6	113.5	5.7	36	M5*0.8	3/8"-24UNF	F03	5.1	0.9

unit: mm

NPS	d	D	L	H	H1	H2	W	S	D1	M	P	ISO 5211	Torque (in-lb)	Weight (lb)
1/4"	0.31	0.98	2.59	2.24	0.48	0.39	4.5	0.22	1.42	M5*0.8	3/8"-24UNF	F03	33.8	1.6
3/8"	0.39	0.98	2.59	2.24	0.48	0.39	4.5	0.22	1.42	M5*0.8	3/8"-24UNF	F03	33.8	1.6
1/2"	0.59	1.20	2.94	2.24	0.48	0.39	4.5	0.22	1.42	M5*0.8	3/8"-24UNF	F03	33.8	1.7
3/4"	0.79	1.42	3.16	2.35	0.57	0.42	4.5	0.22	1.42	M5*0.8	3/8"-24UNF	F03	45.1	1.9

unit: in



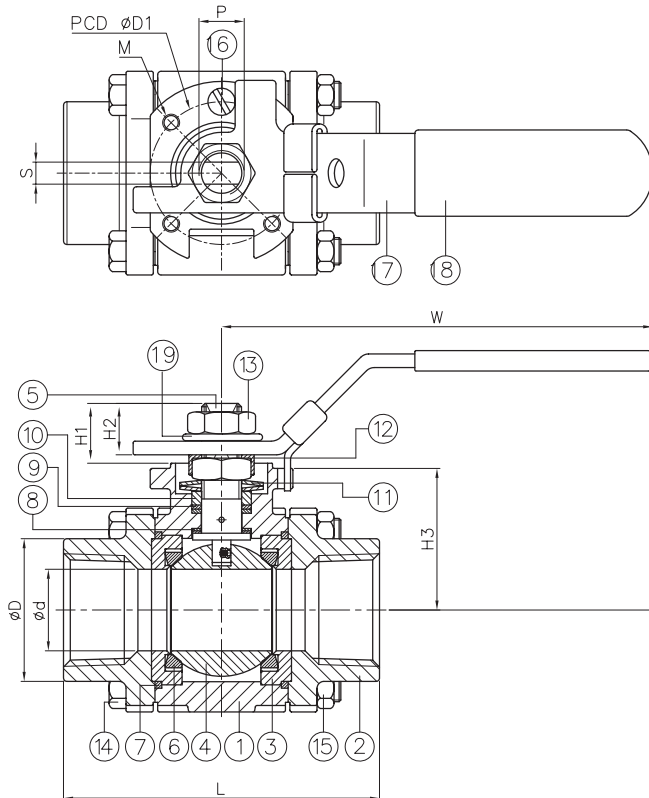
SERIES: B920TM - B920TC (1" - 2")

3-PC SCREWED END BALL VALVE

Stainless / Carbon Steel

DESIGN FEATURES:

- Full port, 1" ~ 2" (DN25~DN50)
- **W.P. :**
 - » 1/4" ~ 1" - **2000 WOG**
 - » 1-1/4" ~ 2" - **1500 WOG**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Silicone Free
- Anti-static device
- Locking device
- Thread Type:
 - » ASME B1.20.1 (NPT)
 - » DIN2999 & BS21
 - » ISO7/1 & EN10226
- NACE MR0103
- **API 607 Fire Safe Approved**
- API 608 Design



ITEM	PARTS	MATERIAL	
		B920TMRGXXX	B920TCRGXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP	ASTM A351-CF3M	
3	RETAINER	ASTM A351-CF8M	
4	BALL		
5	STEM	ASTM A276-316	
6	SEAT	RTFE	
7	GASKET	GRAPHITE	
8	THRUST WASHER	CTFE	
9	PACKING	GRAPHITE	
10	GLAND RING	AISI 304	
11	DISC SPRING	AISI 301	
12	LOCK PAD	ASTM A 167-304	
13	STEM NUT	ASTM A 194-8A	
14	BOLT	ASTM A 193-B8A	
15	NUT	ASTM A 194-8A	
16	STOP PIN	AISI 304	
17	HANDLE	STAINLESS STEEL	
18	HANDLE SLEEVE	PVC	
19	SPRING WASHER	AISI 304	

DN	d	D	L	H	H1	H2	H3	W	S	D1	M	P	ISO 5211	Torque (N-M)	Weight (kg)
25	24	44.8	93.0	81.5	15.5	14.0	42.1	146	7.5	42	M5*0.8	7/16"-24UNF	F04	10.2	1.8
32	30	54.0	110.6	85.9	15.5	15.0	46.1	146	7.5	42	M5*0.8	7/16"-20UNF	F04	15.9	2.7
40	38	62.0	120.0	96.7	27.3	18.7	48.3	180	8.6	50	M6*1.0	9/16"-18UNF	F05	21.0	3.8
50	50	76.0	140.0	104.9	28.1	19.0	56.5	180	8.6	50	M6*1.0	9/16"-18UNF	F05	32.1	6.1

unit: mm

NPS	d	D	L	H	H1	H2	H3	W	S	D1	M	P	ISO 5211	Torque (in-lb)	Weight (lb)
1"	0.94	1.76	3.66	3.21	0.61	0.55	1.66	5.75	0.30	1.65	M5*0.8	7/16"-24UNF	F04	90.2	3.9
1-1/4"	1.18	2.13	4.35	3.38	0.61	0.59	1.81	5.75	0.30	1.65	M5*0.8	7/16"-20UNF	F04	141.0	6.0
1-1/2"	1.50	2.44	4.72	3.81	1.07	0.74	1.90	7.09	0.34	1.97	M6*1.0	9/16"-18UNF	F05	186.0	8.4
2"	1.97	2.99	5.51	4.13	1.11	0.75	2.22	7.09	0.34	1.97	M6*1.0	9/16"-18UNF	F05	284.1	13.5

unit: in



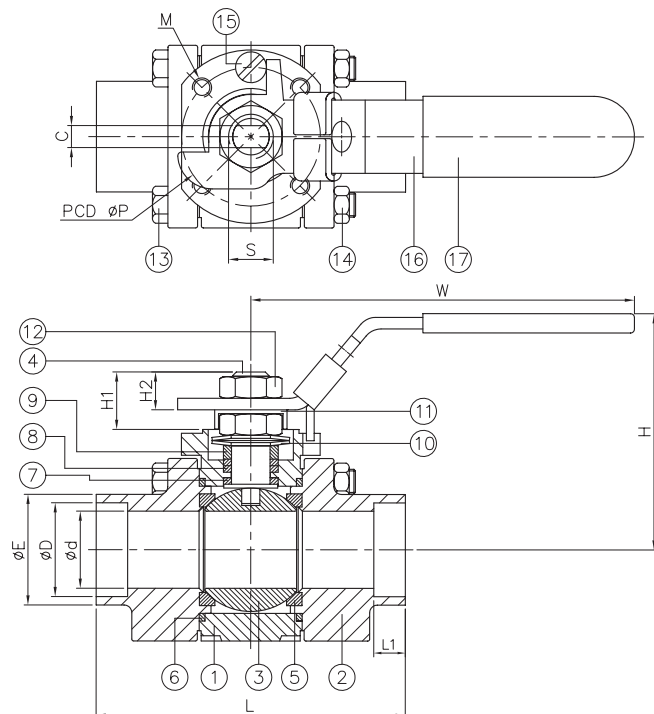
SERIES: B920SM - B920SC (1/4" - 3/4")

3-PC SOCKET WELD END BALL VALVE

Stainless / Carbon Steel

DESIGN FEATURES:

- Full port, 1/4" ~ 3/4" (DN8~DN20)
- **W.P. :**
 - » **1/4" ~ 1" - 2000 WOG**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Silicone Free
- Anti-static device
- Locking device
- Thread Type:
 - » ASME B1.20.1 (NPT)
 - » DIN2999 & BS21
 - » ISO7/1 & EN10226
- NACE MR0103
- **API 607 Fire Safe Approved**
- API 608 Design



ITEM	PARTS	MATERIAL	
		B920SMRGXXX	B920SCRGXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP	ASTM A351-CF3M	
3	BALL	ASTM A351-CF8M	
4	STEM	ASTM A276-316	
5	BALL SEAT	RTFE	
6	GASKET	GRAPHITE	
7	THRUST WASHER	CTFE	
8	PACKING	GRAPHITE	
9	GLAND RING	AISI 304	
10	DISC SPRING	AISI 301	
11	LOCK PAD	ASTM A167-304	
12	STEM NUT	ASTM A194-8A	
13	BOLT	ASTM A193-B8A	
14	NUT	ASTM A194-8A	
15	STOP PIN	AISI 304	
16	HANDLE	STAINLESS STEEL	
17	HANDLE SLEEVE	PVC	

DN	d	D	E	L	L1	H	H1	H2	W	C	P	ISO 5211	M	S	Torque (N-M)	Weight (kg)
8	8	14.0	25.0	65.7	10	57.0	12.1	9.8	113.5	5.7	36	F03	M5*0.8	3/8"-24UNF	3.8	0.7
10	10	18.0	25.0	65.7	10	57.0	12.1	9.8	113.5	5.7	36	F03	M5*0.8	3/8"-24UNF	3.8	0.7
15	15	22.0	30.3	74.8	10	57.0	12.1	9.8	113.5	5.7	36	F03	M5*0.8	3/8"-24UNF	3.8	0.8
20	20	27.5	36.0	80.2	13	59.7	14.5	10.6	113.5	5.7	36	F03	M5*0.8	3/8"-24UNF	5.1	0.9

unit: mm

NPS	d	D	E	L	L1	H	H1	H2	W	C	P	ISO 5211	M	S	Torque (in-lb)	Weight (lb)
1/4"	0.31	0.55	0.98	2.59	0.39	2.24	0.48	0.39	4.47	0.22	1.42	F03	M5*0.8	3/8"-24UNF	33.8	1.6
3/8"	0.39	0.71	0.98	2.59	0.39	2.24	0.48	0.39	4.47	0.22	1.42	F03	M5*0.8	3/8"-24UNF	33.8	1.6
1/2"	0.59	0.87	1.19	2.94	0.39	2.24	0.48	0.39	4.47	0.22	1.42	F03	M5*0.8	3/8"-24UNF	33.8	1.7
3/4"	0.79	1.08	1.42	3.16	0.51	2.35	0.57	0.42	4.47	0.22	1.42	F03	M5*0.8	3/8"-24UNF	45.1	1.9

unit: in



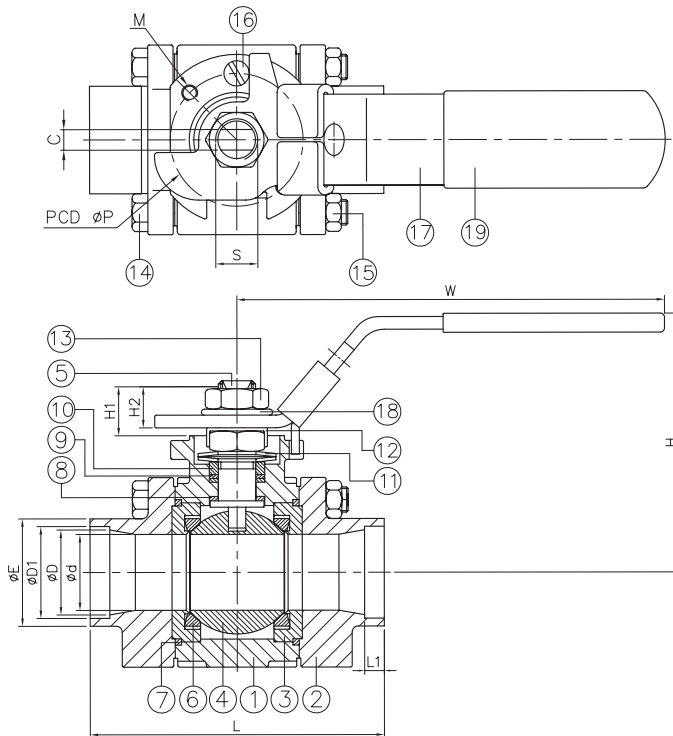
SERIES: B920SM - B920SC (1" - 2")

3-PC SOCKET WELD END BALL VALVE

Stainless / Carbon Steel

DESIGN FEATURES:

- Full port, 1" ~ 2" (DN25~DN50)
- **W.P. :**
 - » 1/4" ~ 1" - 2000 WOG
 - » 1-1/4" ~ 2" - 1500 WOG
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Silicone Free
- Anti-static device
- Locking device
- Thread Type:
 - » ASME B1.20.1 (NPT)
 - » DIN2999 & BS21
 - » ISO7/1 & EN10226
- NACE MR0103
- **API 607 Fire Safe Approved**
- API 608 Design



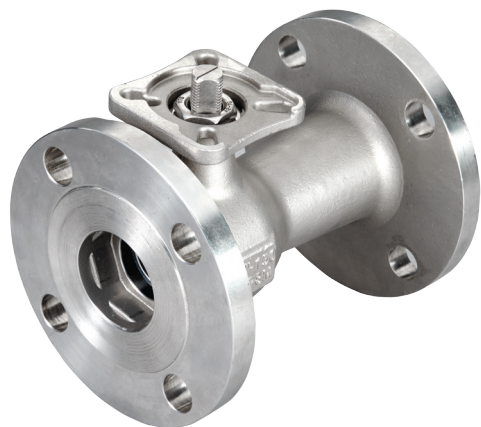
ITEM	PARTS	MATERIAL	
		B920SMRGXXX	B920SCRGXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP	ASTM A351-CF3M	
3	RETAINER	ASTM A351-CF8M	
4	BALL		
5	STEM	ASTM A276-316	
6	BALL SEAT	RTFE	
7	GASKET	GRAPHITE	
8	THRUST WASHER	CTFE	
9	PACKING	GRAPHITE	
10	GLAND RING	AISI 304	
11	DISC SPRING	AISI 301	
12	LOCK PAD	ASTM A167-304	
13	STEM NUT	ASTM A194-8A	
14	BOLT	ASTM A193-B8A	
15	NUT	ASTM A194-8A	
16	STOP PIN	AISI 304	
17	HANDLE	STAINLESS STEEL	
18	SPRING WASHER	AISI 304	
19	HANDLE SLEEVE	PVC	

DN	d	D	D1	E	L	L1	H	H1	H2	W	C	P	ISO 5211	M	S	Torque (N-M)	Weight (kg)
25	24	26.6	34.5	44.8	93.0	13	81.5	15.5	14.0	146	7.5	42	F04	M5*0.8	7/16"-20UNF	10.2	1.7
32	30	35.0	43.0	54.0	110.6	13	85.9	15.5	15.0	146	7.5	42	F04	M5*0.8	7/16"-20UNF	15.9	2.7
40	38	41.0	49.0	62.0	122.6	13	96.7	27.3	18.7	180	8.6	50	F05	M6*1.0	9/16"-18UNF	21.0	3.9
50	50	52.5	61.2	76.0	140.0	16	104.9	28.1	19.0	180	8.6	50	F05	M6*1.0	9/16"-18UNF	32.1	6.2

unit: mm

NPS	d	D	D1	E	L	L1	H	H1	H2	W	C	P	ISO 5211	M	S	Torque (in-lb)	Weight (lb)
1"	0.94	1.05	1.36	1.76	3.66	0.51	3.21	0.61	0.55	5.75	0.30	1.65	F04	M5*0.8	7/16"-20UNF	90.2	3.8
1-1/4"	1.18	1.38	1.69	2.13	4.35	0.51	3.38	0.61	0.59	5.75	0.30	1.65	F04	M5*0.8	7/16"-20UNF	141.0	6.0
1-1/2"	1.5	1.61	1.93	2.44	4.83	0.51	3.81	1.07	0.74	7.09	0.34	1.97	F05	M6*1.0	9/16"-18UNF	186.0	8.5
2"	1.97	2.07	2.41	2.99	5.51	0.63	4.13	1.11	0.75	7.09	0.34	1.97	F05	M6*1.0	9/16"-18UNF	284.1	13.6

unit: in



SERIES: B501FM - B501FC - 150# (1" - 4")

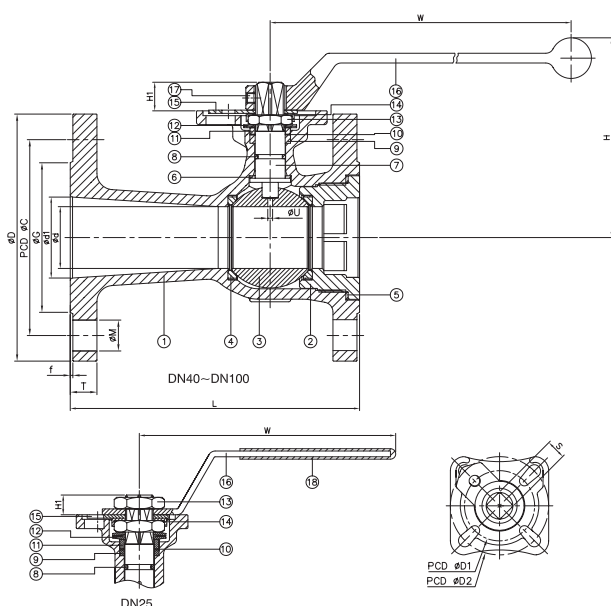
1-PC FLANGED END BALL VALVE

Stainless / Carbon Steel

DIRECT MOUNT • FIRE SAFE

DESIGN FEATURES:

- Standard port, 1"~4" (DN25~DN100)
- **W.P. : CLASS 150**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Live-loading design
- Silicone Free
- Anti-static device
- **Direct mounting pad ISO 5211**
- **API 607 Fire safe approved**
- Wall thickness: ASME B16.34
- Flange dimension: ASME B16.5
- Face to face: ASME B16.10
- Supplied with lever handle



ITEM	PARTS	MATERIAL	
		B501FMMGXXX	B501FCMGXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	RETAINER		
3	BALL	ASTM A351-CF8M	
4	SEAT	TFM 1600	
5	SEAL	GRAPHITE	
6	THRUST WASHER	CTFE	
7	STEM	ASTM A276-316	
8	O-RING	VITON	
9	PACKING A	GRAPHITE	
10	PACKING B	CTFE	
11	GLAND RING	AISI 304	
12	BELLEVILLE WASHER	AISI 301	
13	STEM NUT	AISI 304	
14	LOCKING WASHER		
15	STOPPER		
16	HANDLE	STAINLESS STEEL	
17	SOCKET SET SCREWS	AISI 304	
18	HANDLE SLEEVE	PVC	

DN	d	d1	G	C	D	L	H	H1	W	T	f	S	D1	D2	M	U	ISO 5211	Torque (N-m)		Weight (kg)
																		Break-away	Action	
25	20	25	51	79.5	108.0	127.0	96	8.0	140.0	11.1	1.6	9	36	42	16	3	F03 / F04	9.8	5.9	2.0
40	30	40	73	98.5	127.0	165.0	101	10.5	197.5	14.3	1.6	11	42	50	16	3	F03 / F04	20.8	11.7	4.0
50	38	50	92	120.5	152.0	178.0	123	14.0	247.5	15.8	1.6	14	50	70	19	3	F05 / F07	29.9	20.8	6.8
65	50	64	105	139.5	178.0	190.5	136	15.5	247.5	17.6	1.6	14	50	70	19	3	F05 / F07	37.7	26.0	9.7
80	64	76	127	152.5	190.5	203.0	155	18.5	340.0	19.1	1.6	17	70	102	19	3	F07 / F10	48.1	36.4	15.2
100	76	100	157	190.5	229.0	229.0	170	20.0	340.0	24.0	1.6	17	70	102	19	3	F07 / F10	55.9	45.5	23.0

unit: mm

NPS	d	d1	G	C	D	L	H	H1	W	T	f	S	D1	D2	M	U	ISO 5211	Torque (in-lb)		Weight (lb)
																		Break-away	Action	
1"	0.79	0.98	2.01	3.13	4.25	5.00	3.79	0.31	5.51	0.44	0.06	0.35	1.42	1.65	0.63	0.12	F03 / F04	86.7	52.2	4.4
1-1/2"	1.18	1.57	2.87	3.88	5.00	6.50	3.97	0.41	7.78	0.56	0.06	0.43	1.65	1.97	0.63	0.12	F03 / F04	184.1	103.6	8.8
2"	1.50	1.97	3.62	4.74	5.98	7.01	4.84	0.55	9.74	0.62	0.06	0.55	1.97	2.76	0.75	0.12	F05 / F07	264.6	184.1	15.0
2-1/2"	1.97	2.52	4.13	5.49	7.01	7.50	5.35	0.61	9.74	0.69	0.06	0.55	1.97	2.76	0.75	0.12	F05 / F07	333.7	230.1	21.4
3"	2.52	2.99	5.00	6.00	7.50	7.99	6.11	0.73	13.39	0.75	0.06	0.67	2.76	4.02	0.75	0.12	F07 / F10	425.7	322.2	33.5
4"	2.99	3.94	6.18	7.50	9.02	9.02	6.70	0.79	13.39	0.94	0.06	0.67	2.76	4.02	0.75	0.12	F07 / F10	494.8	402.7	50.7

unit: in

FOR ADDITIONAL SIZES SEE NEXT PAGE



SERIES: B101FM - B101FC - 150# (6")

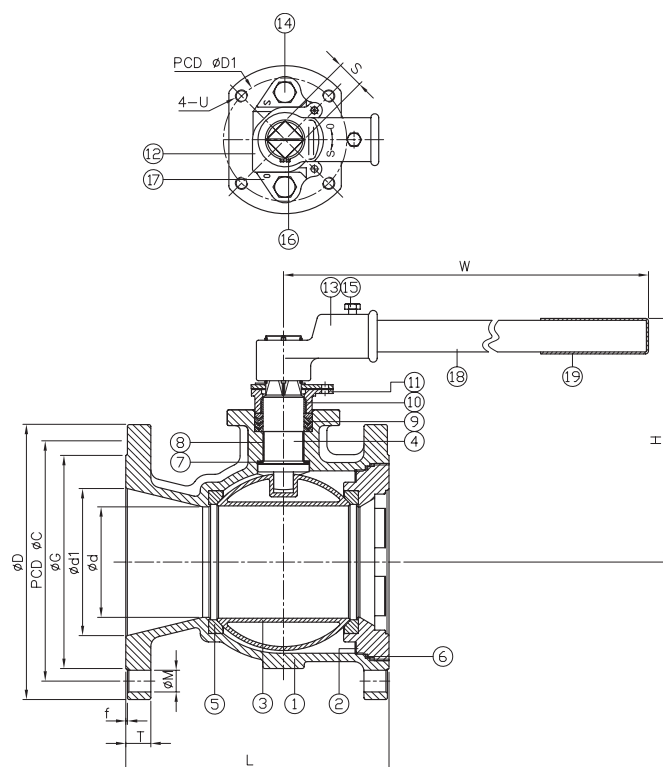
1-PC FLANGED END BALL VALVE

Stainless / Carbon Steel

DIRECT MOUNT

DESIGN FEATURES:

- Standard port, 6" (DN150)
- **W.P. : CLASS 150**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Live-loading design
- Silicone Free
- Anti-static device
- **Mounting pad ISO 5211**
- API 598 Design
- Wall thickness: ASME B16.34
- Flange dimension: ASME B16.5
- Face to face: ASME B16.10
- Supplied with lever handle



ITEM	PARTS	MATERIAL	
		B101FMMTXXX	B101FCMTXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL	ASTM A240-316	
4	STEM	ASTM A276316	
5	BALL SEAT	TFM 1600	
6	BODY SEAL	PTFE	
7	THRUST WASHER A		
8	THRUST WASHER B		
9	PACKING		
10	BUSHING		
11	GLAND	AISI 304	
12	STOPPER		
13	HANDLE HEAD		
14	BOLT		
15	BOLT		
16	CIRCLIPS FOR SHAFTS		
17	STOPPER		
18	STEEL TUBE		
19	HANDLE SLEEVE		

DN	d	d1	G	C	D	L	H	W	T	f	N	M	S	D1	U	ISO 5211	Torque (N-m)	Weight (kg)
150	112	150	216	241.5	279	267	246	745	25.4	1.6	8	22	27	125	1/2" -13UNC	F10 /F12	205	41

unit: mm

NPS	d	d1	G	C	D	L	H	W	T	f	N	M	S	D1	U	ISO 5211	Torque (in-lb)	Weight (lb)
6"	4.41	5.91	8.50	9.51	10.98	10.51	9.69	29.33	1.00	0.06	8.00	0.87	1.06	4.92	1/2" -13UNC	F10 /F12	1814.4	90.4

unit: in



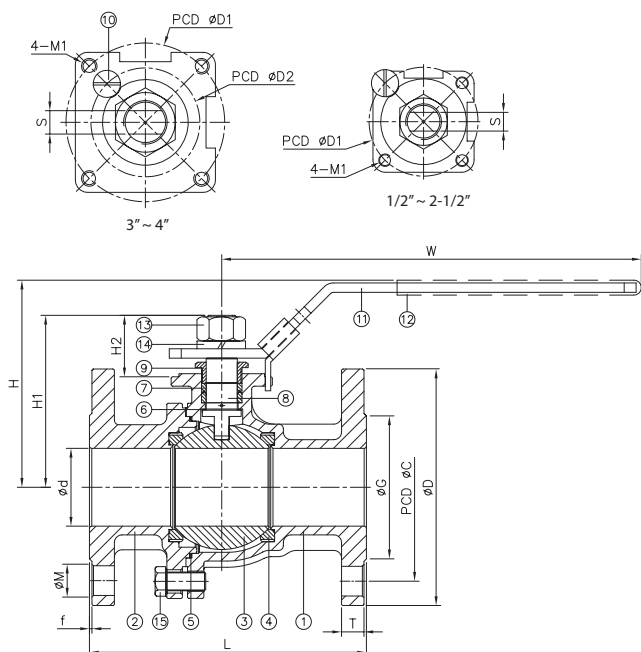
SERIES: B201FM - B201FC - 150#

2-PC FLANGED END BALL VALVE

Stainless / Carbon Steel (1/2" - 4")

DESIGN FEATURES:

- Full port, 1/2"~4" (DN15~DN100)
- **W.P. : CLASS 150**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Silicone Free
- Anti-static device
- Locking device
- **Mounting pad ISO 5211**
- Flange dimension: ASME B16.5
- Face to face: ASME B16.10



ITEM	PARTS	MATERIAL	
		B201FMMTXXX	B201FCMTXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL	ASTM A351-CF8M	
4	SEAT	TFM 1600	
5	SEAL	PTFE	
6	THRUST WASHER		
7	PACKING		
8	STEM	ASTM A276-316	
9	GLAND NUT	AISI 304	
10	STOP PIN		
11	HANDLE	STAINLESS STEEL	
12	HANDLE SLEEVE	PVC	
13	STEM NUT	AISI 304	
14	SPRING WASHER		
15	BOLT		

DN	d	G	C	D	L	H	H1	H2	W	T	f	S	D1	D2	M	M1	Torque (N-M)		Weight (kg)
																	Breakaway	Action	
15	15	35.0	60.5	89	108.0	85.7	57.2	23.7	169	9.6	1.6	8	42	-	16	M5	3.8	3.0	1.7
20	20	43.0	70.0	99	117.0	88.5	60.0	23.5	169	9.6	1.6	8	42	-	16	M5	5.5	4.0	2.1
25	25	51.0	79.0	108	127.0	103.3	73.8	29.0	205	9.7	1.6	10	50	-	16	M6	6.5	4.5	2.9
32	32	63.5	88.9	117	140.0	108.0	78.5	29.0	205	11.1	1.6	10	50	-	16	M6	9.0	7.5	4.0
40	38	73.2	98.6	127	165.0	128.4	102.9	39.4	266	12.7	1.6	12	70	-	16	M8	25.0	20.0	5.7
50	50	92.0	120.7	152	178.0	135.9	110.4	39.4	266	14.4	1.6	12	70	-	19.1	M8	38.0	30.0	8.4
65	65	104.6	139.0	178	190.0	147.6	122.1	38.6	298	16.0	1.6	12	70	-	19.1	M8	45.0	35.0	13.3
80	80	127.0	152.0	190	203.0	167.5	142.0	43.0	390	17.5	1.6	15	102	70	19.1	M10	61.0	50.0	16.4
100	100	157.2	190.5	228	228.5	182.5	157.0	43.0	390	22.4	1.6	15	102	70	19.1	M10	80.0	73.0	27.7

unit: mm

NPS	d	G	C	D	L	H	H1	H2	W	T	f	S	D1	D2	M	M1	Torque (lb-in)		Weight (lb)
																	Breakaway	Action	
1/2"	0.59	1.38	2.38	3.50	4.25	3.37	2.25	0.93	6.65	0.38	0.06	0.31	1.65	-	0.63	M5	33.6	26.6	3.8
3/4"	0.79	1.69	2.76	3.90	4.61	3.48	2.36	0.93	6.65	0.38	0.06	0.31	1.65	-	0.63	M5	48.7	35.4	4.5
1"	0.98	2.01	3.11	4.25	5.00	4.07	2.91	1.14	8.07	0.38	0.06	0.39	1.97	-	0.63	M6	57.5	39.8	6.4
1-1/4"	1.26	2.50	3.50	4.61	5.51	4.25	3.09	1.14	8.07	0.44	0.06	0.39	1.97	-	0.63	M6	79.7	66.4	8.8
1-1/2"	1.50	2.88	3.88	5.00	6.50	5.06	4.05	1.55	10.47	0.50	0.06	0.47	2.76	-	0.63	M8	221.3	177.0	12.5
2"	1.97	3.62	4.75	5.98	7.01	5.35	4.35	1.55	10.47	0.57	0.06	0.47	2.76	-	0.75	M8	336.3	265.5	18.5
2-1/2"	2.56	4.12	5.47	7.01	7.48	5.81	4.81	1.52	11.73	0.63	0.06	0.47	2.76	-	0.75	M8	398.3	309.8	29.3
3"	3.15	5.00	5.98	7.48	7.99	6.59	5.59	1.69	15.35	0.69	0.06	0.59	4.02	2.76	0.75	M10	539.9	442.5	36.1
4"	3.94	6.19	7.50	8.98	9.00	7.19	6.18	1.69	15.35	0.88	0.06	0.59	4.02	2.76	0.75	M10	708.1	646.1	61.0

unit: in



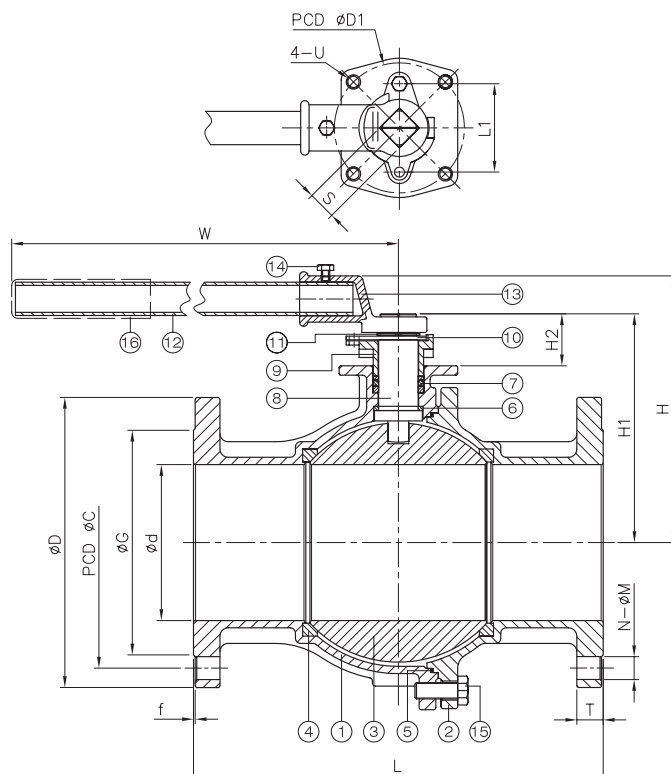
SERIES: B201FM - B201FC - 150#

2-PC FLANGED END BALL VALVE

Stainless / Carbon Steel (5" - 10")

DESIGN FEATURES:

- Full port, 5" ~ 10" (DN125~DN250)
- **W.P. : CLASS 150**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Silicone Free
- Anti-static device
- Locking device
- **Mounting pad ISO 5211**
- Flange dimension: ASME B16.5
- Face to face: ASME B16.10



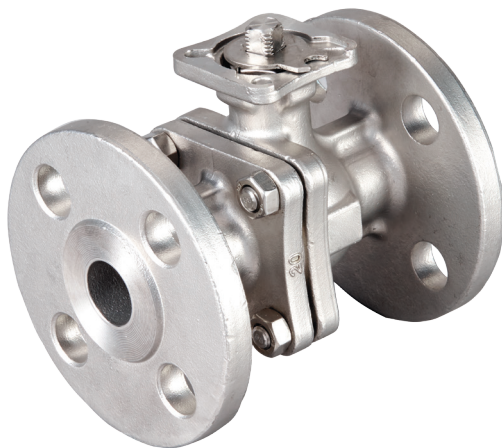
ITEM	PARTS	MATERIAL	
		B201FMMTXXX	B201FCMTXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL	ASTM A351-CF8M	
4	SEAT	TFM 1600	
5	SEAL	PTFE	
6	THRUST WASHER		
7	PACKING		
8	STEM	ASTM A276-316	
9	GLAND	AISI 304	
10	STOPPER		
11	CIRCLIPS FOR SHAFT		
12	STEEL TUBE		
13	WRENCH BLOCK		
14	BOLT		
15	BOLT		
16	HANDLE SLEEVE	PVC	

DN	d	G	C	D	L	H	H1	H2	W	T	f	N	M	S	L1	D1	U	Torque (N-M)		Weight (kg)
																		Breakaway	Action	
125	125	186	216.0	254	356	239.6	199.0	52.0	743	23.9	1.6	8	22.0	27	85	125	M12*1.75	160	96	46.0
150	150	216	241.5	279	394	256.5	220.0	50.0	743	25.4	1.6	8	22.0	27	85	125	M12*1.75	190	168	64.5
200	200	270	298.5	343	457	334.0	300.5	85.5	840	28.6	1.6	8	22.5	36	120	140	M16*2.00	470	350	121.0
250	250	324	362.0	406	533	378.0	334.5	74.5	1040	30.2	1.6	12	25.4	36	120	140	M16*2.00	750	450	186.0

unit: mm

NPS	d	G	C	D	L	H	H1	H2	W	T	f	N	M	S	L1	D1	U	Torque (in-lb)		Weight (lb)
																		Breakaway	Action	
5"	4.92	7.32	8.50	10.00	14.02	9.43	7.83	2.05	29.25	0.94	0.06	8	0.87	1.06	3.35	4.92	M12*1.75	1416.1	849.7	101.4
6"	5.91	8.50	9.51	10.98	15.51	10.10	8.66	1.97	29.25	1.00	0.06	8	0.87	1.06	3.35	4.92	M12*1.75	1681.6	1486.9	142.2
8"	7.87	10.63	11.75	13.50	17.99	13.15	11.83	3.37	33.07	1.13	0.06	8	0.89	1.42	4.72	5.51	M16*2.00	4159.8	3097.7	266.8
10"	9.84	12.76	14.25	15.98	20.98	14.88	13.17	2.93	40.94	1.19	0.06	12	1.00	1.42	4.72	5.51	M16*2.00	6638.0	3982.8	410.1

unit: in



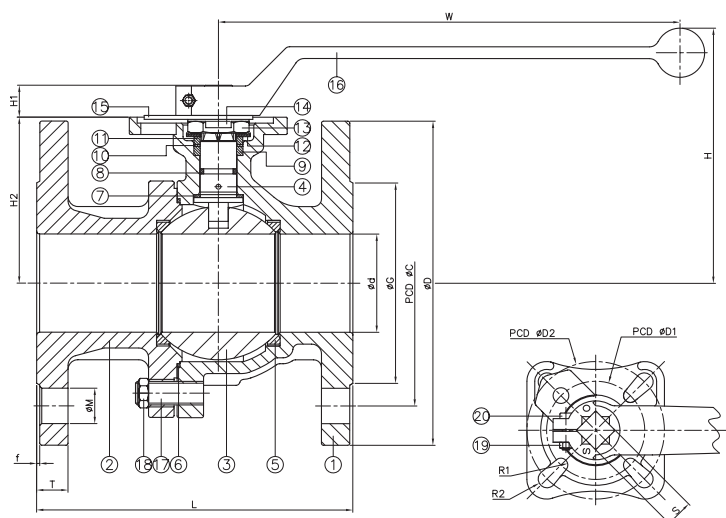
SERIES: B601FM - B601FC - Class 150

2-PC FLANGED END BALL VALVE

Stainless / Carbon Steel (1/2" - 4")

DESIGN FEATURES:

- Full port, 1/2"~4" (DN15~DN100)
- **W.P. : CLASS 150**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Silicone Free
- Live-loading design
- Anti-static device
- Locking device
- **Direct mounting pad ISO 5211**
- **API 607 Fire safe approved**
- Supplied with lever handle



ITEM	PARTS	MATERIAL	
		B601FMMGXXX	B601FCMGXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL		
4	STEM	ASTM A276-316	
5	SEAT	TFM 1600	
6	SEAL	GRAPHITE	
7	THRUST WASHER	CTFE	
8	O-RING	VITON	
9	PACKING A	GRAPHITE	
10	PACKING B	CTFE	
11	GLAND RING	AISI 304	
12	BELLEVILLE WASHER	AISI 301	
13	NUT	AISI 304	
14	LOCK WASHER		
15	STOPPER		
16	HANDLE		
17	STUD		
18	NUT		
19	NUT		
20	BOLT		

DN	d	G	C	D	L	H	H1	H2	W	T	f	S	D1	D2	R1	R2	M	ISO 5211	Torque (N-M)		Weight (kg)
																			Breakaway	Action	
15	15	35.0	60.5	89.0	108.0	85.0	8.5	50.5	190	11.1	1.6	9	36	42	2.75	2.75	16	F03 / F04	5.2	3.0	1.7
20	20	43.0	70.0	98.0	117.0	89.5	8.5	55.0	190	11.6	1.6	9	36	42	2.75	2.75	16	F03 / F04	8.0	4.7	2.1
25	24	51.0	79.5	108.0	127.5	94.2	10.5	59.0	190	11.6	1.6	11	42	50	2.75	3.50	16	F04 / F05	12.5	9.0	3.2
32	30	64.0	89.0	117.0	140.5	97.9	10.5	62.0	190	12.7	1.6	11	42	50	2.75	3.50	16	F04 / F05	14.0	11.0	3.7
40	38	73.0	98.5	127.0	165.0	120.9	14.0	76.0	235	14.3	1.6	14	50	70	3.50	4.50	16	F05 / F07	24.5	18.0	6.0
50	50	92.0	120.5	152.0	178.0	129.9	14.0	84.5	235	16.0	1.6	14	50	70	3.50	4.50	19	F05 / F07	32.0	23.0	8.0
65	64	105.0	139.5	178.0	190.5	156.3	17.0	104.5	325	17.5	1.6	17	70	102	4.50	5.50	19	F07 / F10	38.0	27.0	14.5
80	76	127.0	152.5	190.5	203.0	163.3	17.0	111.5	325	19.1	1.6	17	70	102	4.50	5.50	19	F07/ F10	45.0	30.0	18.2
100	100	157.2	190.5	229.0	229.0	195.9	23.0	142.0	325	24.3	1.6	22	102	125	5.50	6.50	19	F10 / F12	130.0	78.0	29.3

unit: mm

NPS	d	G	C	D	L	H	H1	H2	W	T	f	S	D1	D2	R1	R2	M	ISO 5211	Torque (in-lb)		Weight (lb)
																			Breakaway	Action	
1/2"	0.59	1.38	2.38	3.50	4.25	3.35	0.33	1.99	7.48	0.44	0.06	0.35	1.42	1.65	0.11	0.11	0.63	F03 / F04	46.0	26.6	3.7
3/4"	0.79	1.69	2.76	3.86	4.61	3.52	0.33	2.17	7.48	0.46	0.06	0.35	1.42	1.65	0.11	0.11	0.63	F03 / F04	70.8	41.6	4.6
1"	0.94	2.01	3.13	4.25	5.02	3.71	0.41	2.32	7.48	0.46	0.06	0.43	1.65	1.97	0.11	0.14	0.63	F04 / F05	110.6	79.7	7.1
1-1/4"	1.18	2.52	3.50	4.61	5.53	3.85	0.41	2.44	7.48	0.50	0.06	0.43	1.65	1.97	0.11	0.14	0.63	F04 / F05	123.9	97.4	8.2
1-1/2"	1.50	2.87	3.88	5.00	6.50	4.76	0.55	2.99	9.25	0.56	0.06	0.55	1.97	2.76	0.14	0.18	0.63	F05 / F07	216.8	159.3	13.2
2"	1.97	3.62	4.74	5.98	7.01	5.11	0.55	3.33	9.25	0.63	0.06	0.55	1.97	2.76	0.14	0.18	0.75	F05 / F07	283.2	203.6	17.6
2-1/2"	2.52	4.13	5.49	7.01	7.50	6.15	0.67	4.11	12.8	0.69	0.06	0.67	2.76	4.02	0.18	0.22	0.75	F07 / F10	336.3	239.0	32.0
3"	2.99	5.00	6.00	7.50	7.99	6.43	0.67	4.39	12.8	0.75	0.06	0.67	2.76	4.02	0.18	0.22	0.75	F07 / F10	398.3	265.5	40.2
4"	3.94	6.19	7.50	9.02	9.02	7.71	0.91	5.59	12.8	0.96	0.06	0.87	4.02	4.92	0.22	0.26	0.75	F10 / F12	1150.6	690.4	64.6

unit: in

FOR ADDITIONAL SIZES SEE NEXT PAGE



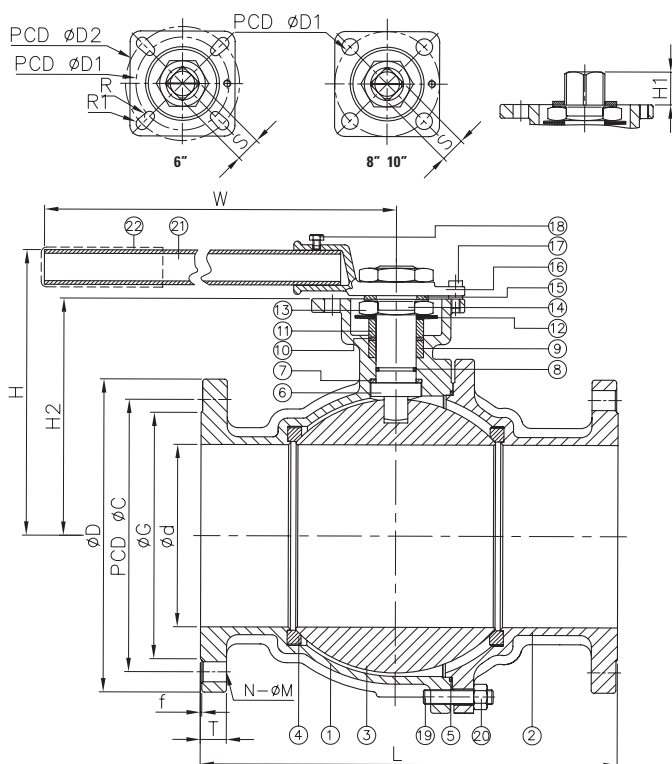
SERIES: B601FM - B601FC - Class 150

2-PC FLANGED END BALL VALVE

Stainless / Carbon Steel (6" - 10")

DESIGN FEATURES:

- Full port, 6"~10" (DN150 ~ DN250)
- **W.P. : CLASS 150**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Silicone Free
- Supplied with lever handle
- Live-loading design
- Anti-static device
- Locking device
- **Direct mounting pad ISO 5211**
- **API 607 Fire safe approved**



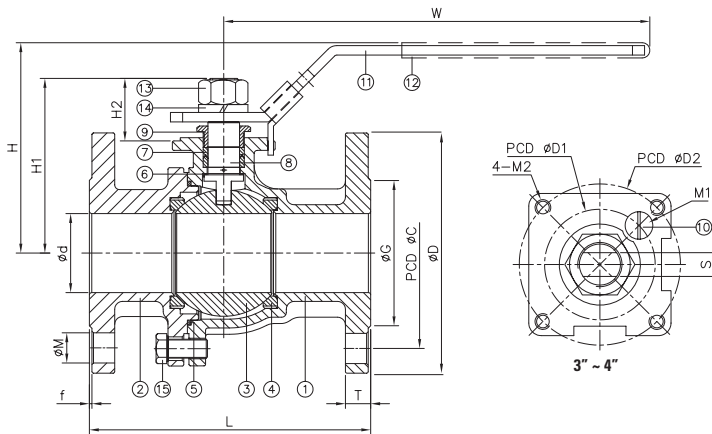
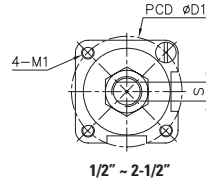
ITEM	PARTS	MATERIAL	
		B601FMMGXXX	B601FCMGXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL	ASTM A351-CF8M	
4	SEAT	TFM 1600	
5	SEAL	316+GRAPHITE	
6	STEM	ASTM A276-316	
7	THRUST WASHER	CTFE	
8	O-RING	VITON	
9	PACKING A	GRAPHITE	
10	PACKING B	CTFE	
11	GLAND RING	AISI 304	
12	BELLEVILLE WASHER	AISI 301	
13	STEM NUT	AISI 304	
14	LOCK WASHER		
15	FLAT WASHER		
16	HANDLE HEAD		
17	STOP PIN		
18	BOLT		
19	STUD		
20	NUT		
21	STEEL TUBE		
22	HANDLE SLEEVE	PVC	

DN	d	G	C	D	L	H	H1	H2	W	T	f	S	D1	D2	R	R1	N	M	ISO 5211	Torque (N-M)		Weight (kg)
																				Breakaway	Action	
150	150	216	241.5	279	394	230	27.5	201	743	25.4	1.6	27	102	125	5.5	6.5	8	22.4	F10 / F12	250	170	67
200	200	270	298.5	343	457	312	36	259	840	28.6	1.6	36	140	-	8.5	-	8	22.4	F14	470	280	116
250	250	324	362.0	406	533	350	36	295	1040	30.2	1.6	36	140	-	8.5	-	12	25.4	F14	750	532	186

unit: mm

NPS	d	G	C	D	L	H	H1	H2	W	T	f	S	D1	D2	R	R1	N	M	ISO 5211	Torque (in-lb)		Weight (lb)
																				Breakaway	Action	
6"	5.91	8.50	9.51	10.98	15.51	9.06	1.08	7.91	29.25	1.00	0.06	1.06	4.02	4.92	0.22	0.26	8	0.88	F10 / F12	2212.7	1504.6	147.7
8"	7.87	10.63	11.75	13.5	17.99	12.28	1.42	10.20	33.07	1.13	0.06	1.42	5.51	-	0.33	-	8	0.88	F14	4159.8	2478.2	255.7
10"	9.84	12.76	14.25	15.98	20.98	13.78	1.42	11.61	40.94	1.19	0.06	1.42	5.51	-	0.33	-	12	1.00	F14	6638.0	4708.6	410.1

unit: in



SERIES: B203FM - B203FC - 300#

2-PC FLANGED END BALL VALVE

Stainless / Carbon Steel (1/2" - 4")

DESIGN FEATURES:

- Full port, 1/2"~4" (DN15~DN100)
- **W.P. : CLASS 300**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Silicone Free
- Anti-static device (option)
- Locking device
- **Mounting pad ISO 5211**
- Flange dimension: ASME B16.5
- Face to face: ASME B16.10

ITEM	PARTS	MATERIAL	
		B203FMMTXXX	B203FCMTXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL	ASTM A351-CF8M	
4	SEAT	TFM 1600	
5	SEAL	PTFE	
6	THRUST WASHER		
7	PACKING		
8	STEM	ASTM A276-316	
9	GLAND NUT	AISI 304	
10	STOP PIN		
11	HANDLE	STAINLESS STEEL	
12	HANDLE SLEEVE	PVC	
13	STEM NUT	AISI 304	
14	SPRING WASHER		
15	BOLT		

DN	d	G	C	D	L	H	H1	H2	W	T	f	S	D1	D2	M	M1	M2	Torque (N-m)		Weight (kg)
																		Breakaway	Action	
15	15	35	66.5	95	140	85.7	57.2	23.7	169	14.3	1.6	8	42	-	16	M5	-	7.5	5.0	2.0
20	20	43	82.5	117	152	88.5	60.0	23.5	169	15.8	1.6	8	42	-	19	M5	-	7.6	5.0	3.2
25	25	51	89.0	124	165	103.3	73.8	29.0	205	17.5	1.6	10	50	-	19	M6	-	17.5	15.1	3.8
32	32	64	98.5	133	178	108.0	78.5	29.0	205	19.1	1.6	10	50	-	19	M6	-	20.0	17.2	5.6
40	38	73	114.5	156	190	128.4	102.9	39.4	266	20.6	1.6	12	70	-	22	M8	-	22.9	20.5	8.1
50	50	92	127.0	165	216	135.9	110.4	39.4	266	22.4	1.6	12	70	-	19	M8	-	32.2	27.2	10.3
65	63	105	149.0	190	241	147.6	122.1	38.6	298	25.4	1.6	12	70	-	22	M8	-	42.3	34.2	16.1
80	76	127	168.0	210	282	167.5	142.0	43.0	390	28.5	1.6	15	70	102	22	M8	M10	87.2	74.6	22.7
100	100	157	200.0	254	305	182.5	157.0	43.0	390	31.8	1.6	15	70	102	22	M8	M10	98.2	75.2	36.7

unit: mm

NPS	d	G	C	D	L	H	H1	H2	W	T	f	S	D1	D2	M	M1	M2	Torque (in-lb)		Weight (lb)
																		Breakaway	Action	
1/2"	0.59	1.38	2.62	3.74	5.51	3.37	2.25	0.93	6.65	0.56	0.06	0.31	1.65	-	0.63	M5	-	66.4	44.3	4.4
3/4"	0.79	1.69	3.25	4.61	5.98	3.48	2.36	0.93	6.65	0.62	0.06	0.31	1.65	-	0.75	M5	-	67.3	44.3	7.1
1"	0.98	2.01	3.50	4.88	6.50	4.07	2.91	1.14	8.07	0.69	0.06	0.39	1.97	-	0.75	M6	-	154.9	133.7	8.4
1-1/4"	1.26	2.52	3.88	5.24	7.01	4.25	3.09	1.14	8.07	0.75	0.06	0.39	1.97	-	0.75	M6	-	177.0	152.2	12.3
1-1/2"	1.50	2.87	4.51	6.14	7.48	5.06	4.05	1.55	10.47	0.81	0.06	0.47	2.76	-	0.75	M8	-	202.7	181.4	17.9
2"	1.97	3.62	5.00	6.50	8.50	5.35	4.35	1.55	10.47	0.88	0.06	0.47	2.76	-	0.87	M8	-	285.0	240.7	22.7
2-1/2"	2.48	4.13	5.87	7.48	9.49	5.81	4.81	1.52	11.73	1.00	0.06	0.47	2.76	-	0.87	M8	-	374.4	302.7	35.5
3"	2.99	5.00	6.61	8.27	11.1	6.59	5.59	1.69	15.35	1.12	0.06	0.59	2.76	4.02	0.87	M8	M10	771.8	660.3	50.0
4"	3.94	6.18	7.87	10.0	12.01	7.19	6.18	1.69	15.35	1.25	0.06	0.59	2.76	4.02	0.87	M8	M10	869.2	665.6	80.9

unit:in

FOR ADDITIONAL SIZES SEE NEXT PAGE



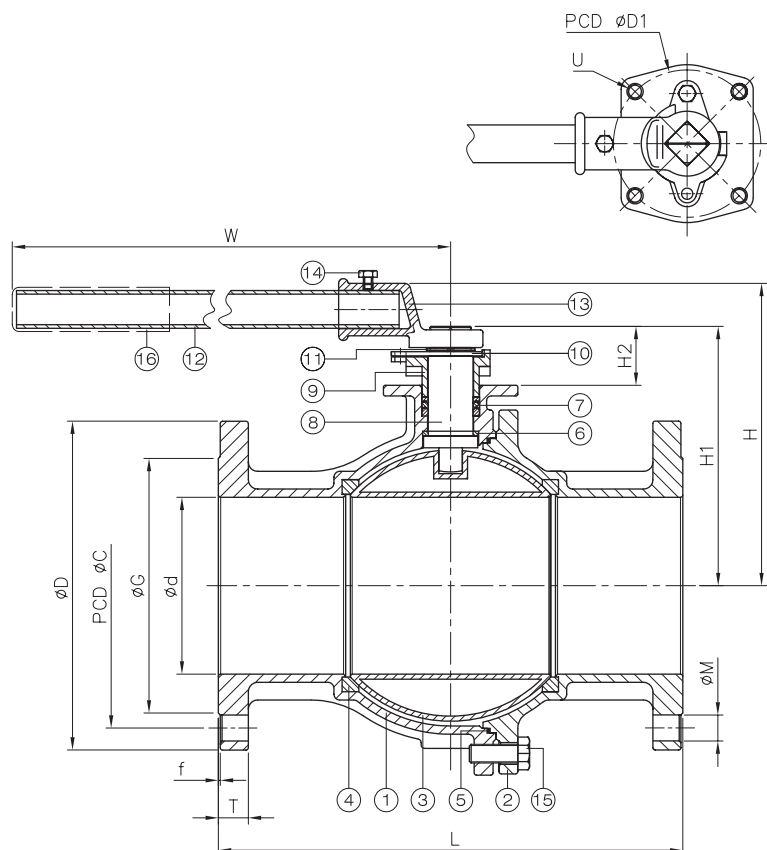
SERIES: B203FM - B203FC - 300#

2-PC FLANGED END BALL VALVE

Stainless / Carbon Steel (6")

DESIGN FEATURES:

- Full port, 6" (DN150)
- **W.P. : CLASS 300**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Anti-static device (option)
- Locking device
- **Mounting pad ISO 5211**
- Flange dimension: ASME B16.5
- Face to face: ASME B16.10



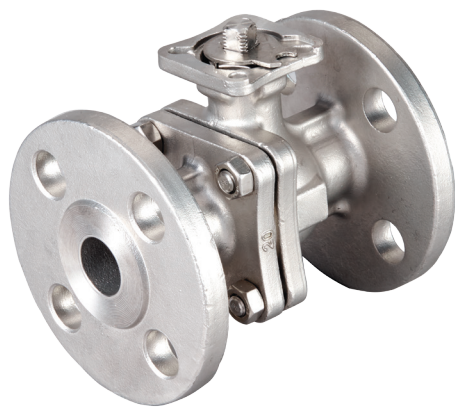
ITEM	PARTS	MATERIAL	
		B203FMMTXXX	B203FCMTXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL	ASTM A240-316	
4	SEAT	TFM 1600	
5	SEAL	PTFE	
6	THRUST WASHER		
7	PACKING		
8	STEM	ASTM A276-316	
9	GLAND	AISI 304	
10	STOPPER		
11	CIRCLIPS FOR SHAFT		
12	STEEL TUBE		
13	WRENCH BLOCK		
14	BOLT		
15	BOLT		
16	HANDLE SLEEVE	PVC	

DN	d	G	C	D	L	H	H1	H2	W	D1	T	f	U	M	Torque (N-M)		Weight (kg)
															Breakaway	Action	
150	150	216	270	317.5	403	256.5	220	50	743	125	36.6	1.6	M12X1.75	22.5	185	165	79

unit: mm

NPS	d	G	C	D	L	H	H1	H2	W	D1	T	f	U	M	Torque (in-lb)		Weight (lb)
															Breakaway	Action	
6"	5.91	8.5	10.63	12.5	15.87	10.1	8.66	1.97	29.25	4.92	1.44	0.06	M12X1.75	0.89	1637.4	1460.4	174.2

unit: in



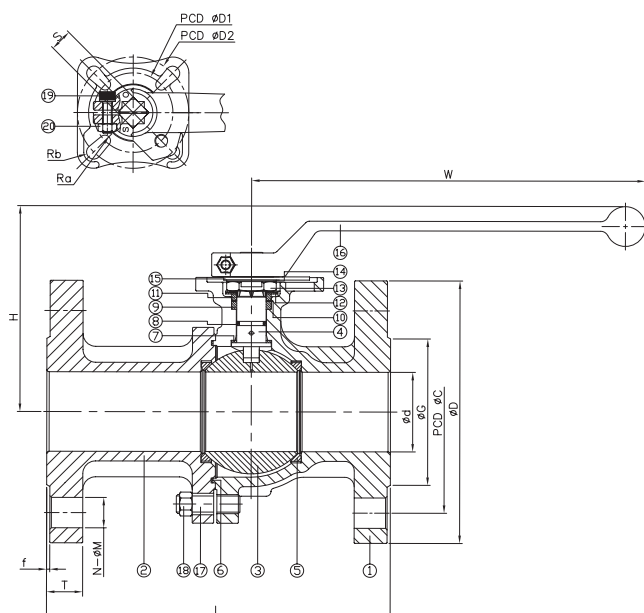
SERIES: B603FM - B603FC - Class 300

2-PC FLANGED END BALL VALVE

Stainless / Carbon Steel (1/2" - 4")

DESIGN FEATURES:

- Full port, 1/2"~4" (DN15~DN100)
- **W.P. : CLASS 300**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Silicone Free
- Supplied with lever handle
- Live-loading design
- Anti-static device
- Locking device
- **Direct mounting pad ISO 5211**
- **API 607 Fire safe approved**



ITEM	PARTS	MATERIAL	
		B603FMMGXXX	B603FCMGXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL	ASTM A351-CF8M	
4	STEM	ASTM A276-316	
5	SEAT	TFM 1600	
6	SEAL	GRAPHITE	
7	THRUST WASHER	CTFE	
8	O-RING	VITON	
9	PACKING A	GRAPHITE	
10	PACKING B	CTFE	
11	GLAND RING	AISI 304	
12	BELLEVILLE WASHER	AISI 301	
13	STEM NUT	AISI 304	
14	LOCK WASHER		
15	STOPPER		
16	HANDLE		
17	STUD		
18	NUT		
19	BOLT		
20	HANDLE NUT		

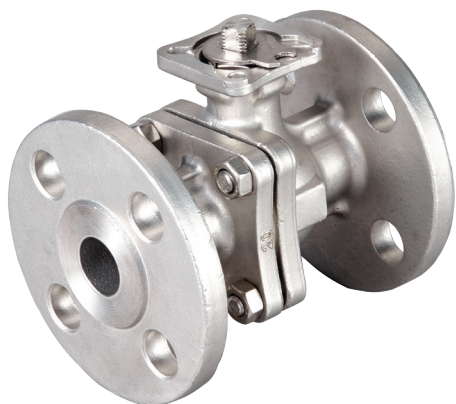
DN	d	G	C	D	L	H	W	T	f	S	D1	D2	Ra	Rb	N	M	ISO 5211	Torque(N-M)		Weight (kg)
																		Breakaway	Action	
15	15	35.0	66.7	95	140	84.5	197.5	14.7	2	9	36	42	2.75	2.75	4	16.0	F03 / F04	5.2	3.0	2.4
20	20	43.0	82.6	115	152	94.5	197.5	16.3	2	9	36	42	2.75	2.75	4	19.1	F03 / F04	8.0	4.7	3.4
25	24	51.0	89.0	125	165	99.5	197.5	17.9	2	11	42	50	2.75	3.5	4	19.1	F04 / F05	12.5	9.0	4.6
32	30	63.5	98.4	135	178	105.0	197.5	19.5	2	11	42	50	2.75	3.5	4	19.1	F04 / F05	14.0	11.0	5.9
40	38	73.0	114.3	155	190	124.5	247.5	21.1	2	14	50	70	3.50	4.5	4	22.3	F05 / F07	24.5	18.0	8.8
50	50	92.0	127.0	165	216	129.0	247.5	22.7	2	14	50	70	3.50	4.5	8	19.1	F05 / F07	32.0	23.0	11.0
65	64	104.8	149.2	190	241	154.5	340.0	25.9	2	17	70	102	4.50	5.5	8	22.3	F07 / F10	38.0	27.0	18.5
80	75	127.0	168.3	210	282	165.5	340.0	29.0	2	17	70	102	4.50	5.5	8	22.3	F07 / F10	45.0	30.0	25.3
100	98	157.2	200.0	255	305	188.0	340.0	32.2	2	22	102	125	5.50	6.5	8	22.3	F10 / F12	55.0	37.0	39.5

unit: mm

NPS	d	G	C	D	L	H	W	T	f	S	D1	D2	Ra	Rb	N	M	ISO 5211	Torque(in-lb)		Weight (lb)
																		Breakaway	Action	
1/2'	0.59	1.38	2.63	3.74	5.51	3.33	7.78	0.58	0.08	0.35	1.42	1.65	0.11	0.11	4	0.63	F03 / F04	46.0	26.6	5.3
3/4"	0.79	1.69	3.25	4.53	5.98	3.72	7.78	0.64	0.08	0.35	1.42	1.65	0.11	0.11	4	0.75	F03 / F04	70.8	41.6	7.5
1"	0.94	2.01	3.50	4.92	6.50	3.92	7.78	0.70	0.08	0.43	1.65	1.97	0.11	0.14	4	0.75	F04 / F05	110.6	79.7	10.1
1-1/4"	1.18	2.50	3.87	5.31	7.01	4.13	7.78	0.77	0.08	0.43	1.65	1.97	0.11	0.14	4	0.75	F04 / F05	123.9	97.4	13.0
1-1/2"	1.50	2.87	4.50	6.10	7.48	4.90	9.74	0.83	0.08	0.55	1.97	2.76	0.14	0.18	4	0.88	F05 / F07	216.8	159.3	19.4
2"	1.97	3.62	5.00	6.50	8.50	5.08	9.74	0.89	0.08	0.55	1.97	2.76	0.14	0.18	8	0.75	F05 / F07	283.2	203.6	24.3
2-1/2"	2.52	4.13	5.87	7.48	9.49	6.08	13.39	1.02	0.08	0.67	2.76	4.02	0.18	0.22	8	0.88	F07 / F10	336.3	239.0	40.8
3"	2.95	5.00	6.63	8.27	11.1	6.52	13.39	1.14	0.08	0.67	2.76	4.02	0.18	0.22	8	0.88	F07 / F10	398.3	265.5	55.8
4"	3.86	6.19	7.87	10.04	12.01	7.40	13.39	1.27	0.08	0.87	4.02	4.92	0.22	0.26	8	0.88	F10 / F12	486.8	327.5	87.1

unit: in

FOR ADDITIONAL SIZES SEE NEXT PAGE



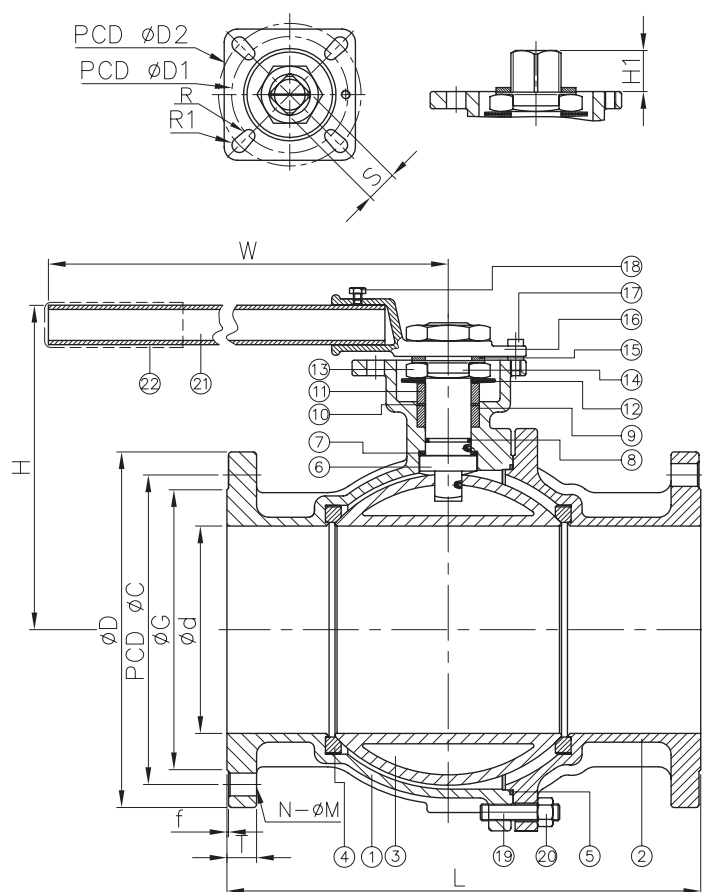
SERIES: B603FC - B603FM - Class 300

2-PC FLANGED END BALL VALVE

Stainless / Carbon Steel (6")

DESIGN FEATURES:

- Full port, 6" (DN150)
- **W.P. : CLASS 300**
- W.T. : -20°C~200°C (-4°F~392°F)
- Investment casting
- Blow-out proof stem
- Silicone Free
- Supplied with lever handle
- Live-loading design
- Anti-static device
- Locking device
- **Direct mounting pad ISO 5211**
- **API 607 Fire safe approved**



ITEM	PARTS	MATERIAL	
		B603FMMGXXX	B603FCMGXXX
1	BODY	ASTM A351-CF8M	ASTM A216-WCB
2	CAP		
3	BALL	ASTM A240-316	
4	SEAT	TFM 1600	
5	SEAL	316+GRAPHITE	
6	STEM	ASTM A276-316	
7	THRUST WASHER	CTFE	
8	O-RING	VITON	
9	PACKING A	GRAPHITE	
10	PACKING B	CTFE	
11	GLAND RING	AISI 304	
12	BELLEVILLE WASHER	AISI 301	
13	STEM NUT	AISI 304	
14	LOCK WASHER		
15	FLAT WASHER		
16	HANDLE HEAD		
17	STOP PIN		
18	BOLT		
19	STUD		
20	NUT		
21	STEEL TUBE	PVC	
22	HANDLE SLEEVE		

DN	d	G	C	D	L	H	H1	W	T	f	S	D1	D2	R	R1	N	M	ISO 5211	Torque (N-M)		Weight (kg)
																			Breakaway	Action	
150	150	216	269.9	320	403	27.5	253	743	37	2	27	102	125	5.5	6.5	12	22.3	F10 / F12	250	170	79

unit: mm

NPS	d	G	C	D	L	H	H1	W	T	f	S	D1	D2	R	R1	N	M	ISO 5211	Torque (in-lb)		Weight (lb)
																			Breakaway	Action	
6"	5.91	8.5	10.63	12.6	15.87	1.08	9.96	29.25	1.46	0.08	1.06	4.02	4.92	0.22	0.26	12	0.88	F10 / F12	2212.7	1504.6	174.2

unit: in

VALVE SEAT MATERIAL SELECTION GUIDE

MATERIAL	DESCRIPTION	COLOR
PTFE	The basic seat material used in most ball valves. Its chemical compatibility is excellent for almost all media service applications.	White
RTFE	15% Glass Reinforced TFE. This material is offered as the standard seal in most valves. Chemical resistance is compatible to virgin TFE with improved cycle life and greater pressure-temperature rating than PTFE	Off White
CTFE	25% Carbon with 75% TFE. This material offers a wide temperature range with better cycle life than RTFE	Black
TFM	TFM is chemically modified PTFE that fills the gap between conventional PTFE and melt-processable PFA. According to ASTM D 4894 and ISO Draft WDT 539-1.5, TFM is classified as a PTFE. Compared to conventional PTFE, TFM has lower permeability and much lower deformation under pressure (cold flow) at room and elevated temperature. Also, they can be used at higher pressures.	White
PEEK	Polyether-ether-ketone temperature semirigid elastomer. Best suited for high pressure and temperature service. Also offers very good corrosion resistance.	Grey
DELTRIN	Delrin is capable of handling extremely high pressure. Must not be used for oxygen service	Creamy white

ACCESSORIES

OPTIONS AVAILABLE

- T-HANDLES
- DEAD-MAN HANDLES
- GEAR OPERATORS
- STEM EXTENSIONS
- COMPLETE ACTUATION PACKAGES
 - » PNEUMATIC
 - » ELECTRIC
- SEAT OPTIONS
- MTRs AVAILABLE UPON REQUEST
- CUSTOM DESIGNS AVAILABLE

OVAL HANDLES



STEM EXTENSIONS



TYPE A

Features

- Rugged and stable
- Investment casting
- Stainless steel fabrication
- Airtight
- Mount upon ISO-5211 direct mounting pad F04 ~ F12
- Could be fitted with locking device and actuator



TYPE B

Features

- Less cost
- Bar stock
- Stainless steel fabrication
- Maintenance free

API 607 FIRE SAFE APPROVAL

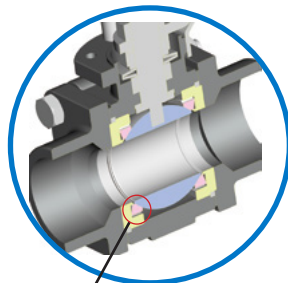
POWELL API 607 FIRE SAFE VALVES

- B820
- B836
- B860
- B920
- B501
- B601
- B603



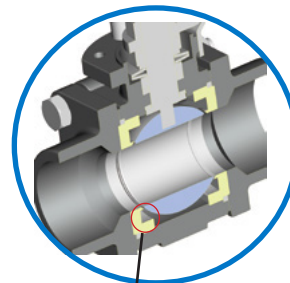
Fire Safe Design

Before the Fire



BALL SEAT

After the Fire



FIRE SAFE LIP

Secondary metal to metal seal acts as backup if primary seal is destroyed by fire.

STANDARDS AND MATERIALS

FIRE SAFE TEST

API 607
ISO 10497

"SOUR GAS"

NACE MR0175

BIOPROCESSING EQUIPMENT

ASME BPE

Certification to EN 10204.3 given only when
previously requested with valve supply inquiry

BUTT WELD ENDS

ASME/ANSI B16.25
DIN 3239 PART 1

SOCKET WELD ENDS

ASME/ANSI B16.11
DIN 3239 PART 2

THREADED ENDS

ASME/ANSI B1.20.1
ASME/ANSI B16.11
ISO 7/1
DIN 2999
BS21

FLANGED ENDS

ASME/ANSI B16.5
ASME/ANSI B16.10
ASME/ANSI B16.34
EN 1092-1
EN 558
DIN 3202

WALL THICKNESS

ASME/ANSI B16.34
EN 12516

MARKING

ASME/ANSI B16.34
MSS SP 25
ISO 5209

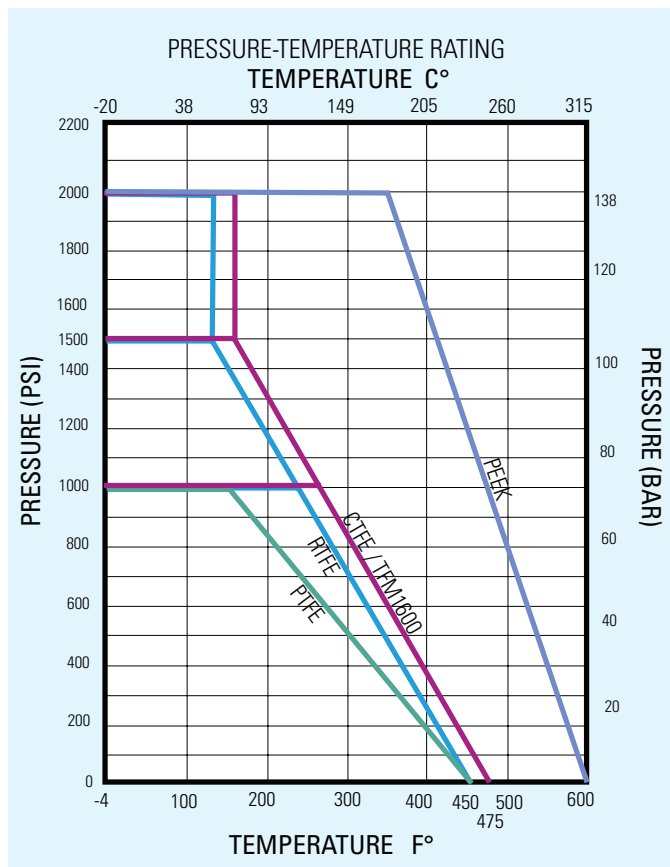
TEST AND INSPECTION

API 598
EN 12266

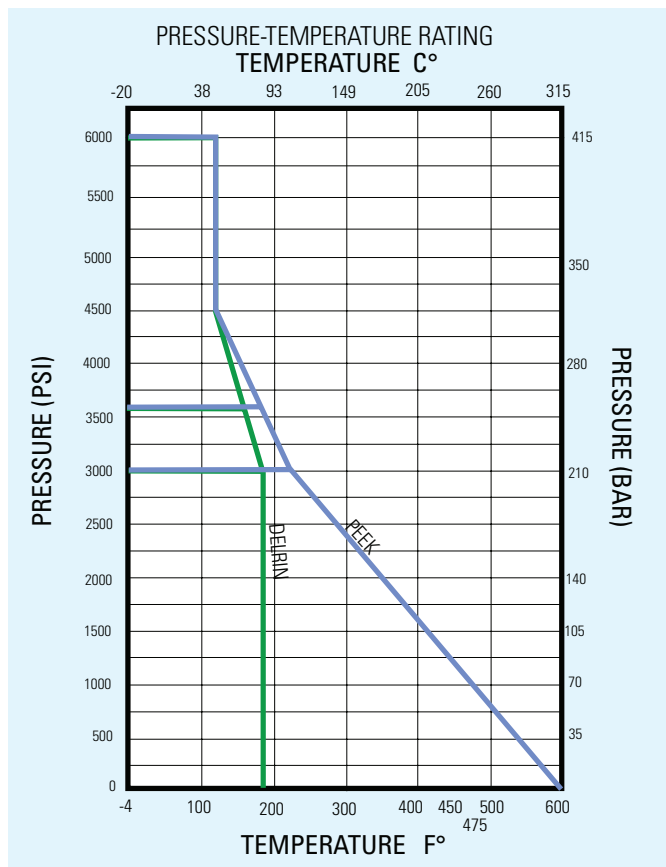
SPECIAL MATERIALS

MATERIAL TYPE	MATERIAL CODE
Austenitic Stainless Steel	CN7M, CN3MN
Precipitation Hardening Stainless Steel	17-4PH, 15-5PH
Duplex Stainless Steel	CD4MCu, CD3MN, CE3MN, Alloy2205, Ferralium255, SAF2507, ASTM A890
Monel	Monel400
Hastelloy	Hastelloy C276, Hastelloy B2, CW2M, CW12MV
Inconel	Inconel 600

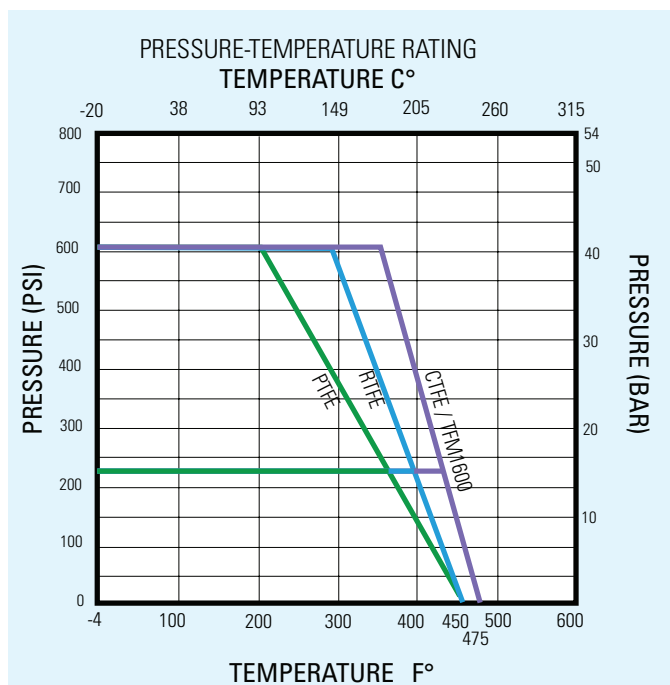
PRESSURE / TEMPERATURE RATING



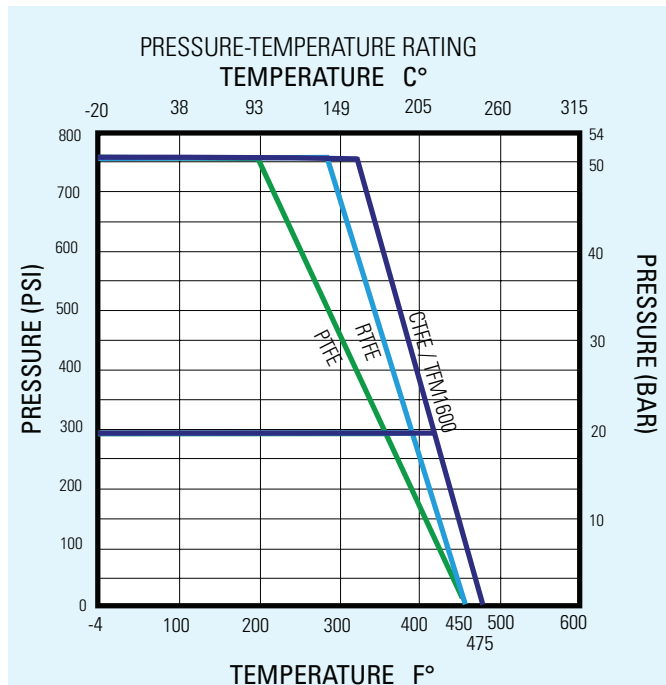
800/1000/1500/2000 WOG



3000/3600/6000 WOG



PN 16/40



CLASS 150/300

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. Only applicable to standard items shipped within the past 60 days. 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.

GENERAL TERMS AND CONDITIONS OF SALE

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.

GENERAL TERMS AND CONDITIONS OF SALE

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 States 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.

Manufacturing, Sales and Distribution Centers:

Global Corporate Headquarters

2503 Spring Grove Ave.
Cincinnati, OH 45214
513.852.2000
Sales and Engineering
800.888.2583

Powell South Carolina

Manning Manufacturing and Distribution Center
1567 Joe Rogers Jr. Blvd.
Manning, SC 29102

Orangeburg Manufacturing and Distribution Center
940 Cross Creek Road
Orangeburg, SC 29115

Powell Texas

Houston/Stafford Sales and Distribution Center
Freeport Ninety Business Park
13843 N. Promenade Blvd.
Building 5, Suite 650
Stafford, TX 77477
800.888.2583

Powell China

Yancheng Manufacturing, Sales and Distribution Center
Yancheng City, China



The Wm. Powell Company
2503 Spring Grove Ave.
Cincinnati, OH 45214
USA Phone: 513.852.2000, Fax: 513.852.2997
www.powellvalves.com
quotes@powellvalves.com



POWELL
VALVES

Protect Tomorrow. Today
Powell Valves
NextGen Engineering

www.PowellValves.com

Leading the Industry Since 1846



POWELL **VALVES**

BELLOWSEAL VALVES

FORGED AND CAST STEEL ALLOYS

GATE AND GLOBE

Table of Contents

<u>SUBJECT</u>	<u>PAGE</u>
THE WM. POWELL COMPANY—PROFILE	2-3
DESIGN FEATURES	4
CAST GATE VALVES	5
CAST GLOBE VALVES	6
FORGED GATE VALVES	7
FORGED GLOBE VALVES	8
TERMS AND CONDITIONS	9-11

The Wm. Powell Company - Profile

At The Wm. Powell Company, we are very proud of our achievements and evolution in the past 169 years. We like to refer to ourselves as 169 years young due to our flexibility in changing quickly to customer and industry needs. Our business strategy is simple, to continually provide excellent customer service. We will continue to focus on manufacturing the best of class products, both in design and quality, at very competitive prices.

Our products include a wide variety of bronze, iron, steel, and corrosion resistant alloy valves for class 125 to 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 continues to be a leader in the valve industry. Our on-going program is a long-term commitment to the valve industry and is poised for significant future growth.

Our mission has allowed us to aid the nation during five wars, endure some of the toughest economic times, and be involved in some of the most groundbreaking projects our nation has ever seen. Whether it was the Civil War, Great Depression, or “Manhattan” Project, we continue to endure the test of time and remain as one of the world’s leading industrial valve manufacturers.

Our market base is with industrial users, such as, Petro-Chemical, Industrial Gas, Pulp and Paper, and Chemical and Mechanical Construction. We have formed business partnerships with industrial end-users, contractors, distributors, and EPC’s in the United States and around the world. Business partnerships are formed on competitively priced product, on-time delivery, service, and our tradition of product reliability.

At Powell, our global network of support and product availability is unmatched. We offer the most complete multi-turn product line for a single source manufacturer. Our products are of the highest quality standards, competitively priced, and produced with ultra-modern manufacturing technology and astute materials sourcing. Our facilities are recognized with ISO 9001 “Worldwide Quality.”

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 all benefit.

We made a commitment to our industry to increase growth and market share, with high quality, competitive products, excellent service, and on-time delivery; this is a global commitment.

Powell’s customers have to react quickly to the demands of expansion by implementing increased capacity and introducing new products into the market place at low costs and fast turn around times. We have addressed our customer’s needs by increasing finished product inventory to over \$35 million in the U.S.A. as well as inventory hubs in Asia and Europe. As an additional advantage to our domestic and global customers, our Manning, South Carolina, facility is a U.S.A. Federal Registered Free Trade Zone.

With our extensive valve knowledge and expertise, our modification facility located in Manning, South Carolina, can perform a variety of valve services and modifications, such as, automation, trim changes, end connection changes, additional quality inspections, special service pressure testing, field service, and more.

We are a closely held private corporation that has been in business since 1846. In fact, only nine presidents have led the company during our 169 year existence. We have been a healthy corporation during times of war, economic depression and natural disasters; we feel this speaks for itself.

At Powell, we thank you for your interest in our company, products and services. We look forward to discussing ways to be your preferred valve supplier. If you should have any questions or comments, please feel free to contact us here at Powell.

Sincerely,

Randy Cowart
President, CEO & Chairman
The Wm. Powell Company

A handwritten signature in black ink, appearing to read "Randy Cowart", is positioned below the typed name. The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Powell Bellow-Seal Design Features

Cycle Life Testing

Cycle Life Testing of Cast Design Valves per MSS-SP-117:

Gate & Globe, Bolted Bonnet, Cast Steel Designs

- Gate Valves Over 2,000 Cycles
- Globe Valves Over 5,000 Cycles

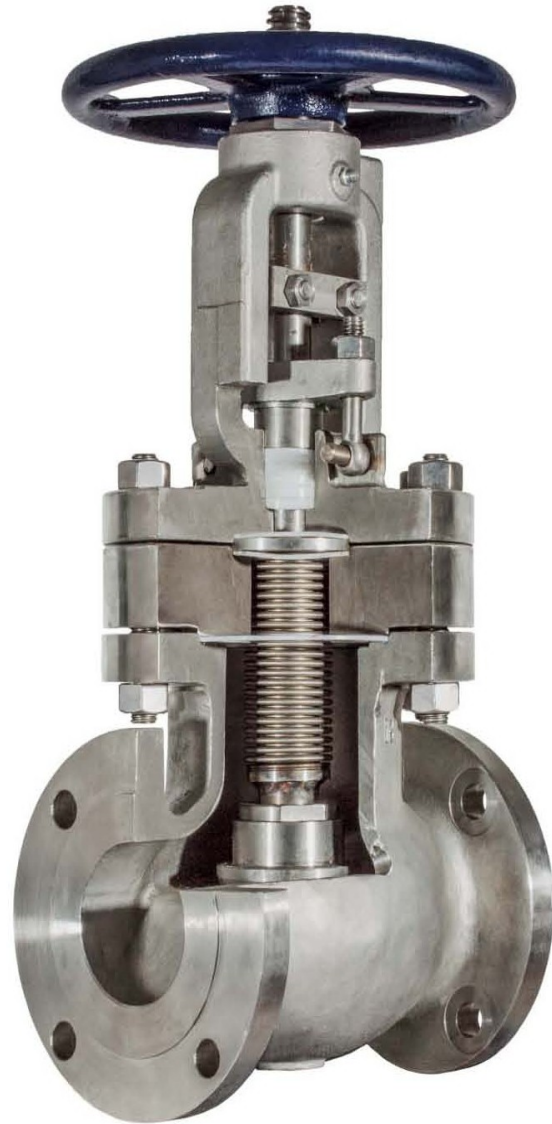
Cycle Life Testing of Forged Design Valves per API 602:

Gate & Globe, Bolted Bonnet, Forged Steel Designs

- Gate Valves Over 2,000 Cycles
- Globe Valves Over 5,000 Cycles

Features

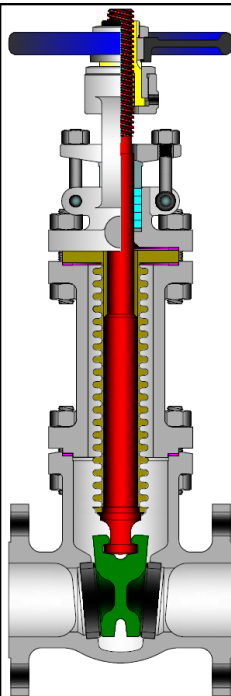
- Each Valve is Tested per API 598.
- Every Bellow Assembly is Helium Leak-Tested to Assure Zero Leakage.
- Non-Rotating Stems Prevent Torsion of Bellow.
- Secondary Stem Seals:
 - A. Stem Backseat
 - B. API 624 Stem Packing
- Lubricant Fittings to Ensure Proper Lubrication of Stem Bushing for Efficient Opening and Closing.
- Multiple Bellows Materials are available: 316Ti, Hastelloy, Inconel, Monel, Etc.)
- All Bellows are Hydroformed with a Minimum of Two Layers.
- Available in Pressure Classes 150-1500 (All Body Materials Available.)



POWELL VALVES

STANDARD MATERIALS (Other materials available)

PART	MATERIALS	
Body	A216 Gr. WCB	A351 Gr. CF8M(1)
Bonnet / Yoke arm	A216 Gr. WCB	A351 Gr. CF8M
Wedge	A216 WCB + 316 Faced	A351 Gr. CF8M
Seat Ring	Carbon Steel + Stellite 6 Faced	SST 316 + Stellite 6 Faced
Stem	SST 316	
Stem Bushing	A 439 Ductile NI-Resist Gr. D2	
Stem Bushing Lock Nut	Steel	SST 316
Bellows	316Ti	
Gland Flange	Carbon Steel	Series 300 SST
Eye Bolt	A193 Gr. B7	A193 Gr. B8
Eye Bolt Nut	A194 Gr. 2H	A194 Gr.8
Groove Pin	Steel	Series 300
Gland	SST 316	
Packing	Graphite	PTFE
Packing Washer / Packing Spacer	SST 316	SST 316
Gasket	Class 150: Corrugated SST Encapsulated w/ Graphite Class 300: Spiral Wound SST with Graphite	Class 150: PTFE Class 300: Spiral Wound SST with PTFE
Back Seat	SST 316	SST 316
Hand Wheel	Malleable Iron or Steel	
Hand Wheel Nut	Malleable Iron or Steel	
Key	Steel	
Lubricant Fitting	Steel	
Body / Bonnet Stud	A193 Gr. B7	A193 Gr. B8
Body / Bonnet Nut	A194 Gr. 2H	A194 Gr.8
Bearing Cap	Carbon Steel	Series 300 SST
Cap Screws	Steel	
Identification Plate	Series 300 SST	



Class	Fig. No.
150	1503
300	3003

DESIGN FEATURES:

- **Standard trim** is API trim 12 with 316Ti bellows.
- **Stems** are non-rotating with surface finish to maximize packing seal for low fugitive emissions.
- Other **Bellows** material options are available. Bellows are hydro-formed rather than welded.
- **Each** valve is shell, seat and backseat pressure tested per industry standard API 598.
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test report, inspection report and certificate of conformance.
- **Other** available options as follows:
 - Alternate valve materials such as chrome and stainless steel alloys
 - Alternate trim materials
 - Bypass, drain and other auxiliary connections
 - Gear, motor, and cylinder actuators available
 - NACE service
 - Special cleaning for applications such as oxygen or chlorine
 - Other options available as specified

(1) Weld end valve body A351 Gr. CF3M

Design Specifications

Item		Applicable Specification	in		A		B	C	E	A		B	C	E
			mm	FE	WE	WE/FE								
Wall thickness	API 600	2	7.00	8.50	18.8	21.1	7.0	8.50	21.5	23.9	7.0			
		50	178	216	477	535	178	216	547	608	178			
Pressure - temperature ratings	ASME B16.34	2 ½	7.50	9.50	20.6	23.4	7.0	9.50	24.9	27.8	7.0			
		65	190	241	523	594	178	241	633	705	178			
General valve design	API 600 & B16.34 & MSS SP-117	3	8.00	11.12	24.0	27.2	9.1	11.12	30.9	34.4	9.1			
		80	203	282	609	692	230	282	785	875	230			
End to End dimensions	ASME B16.10	4	9.00	12.00	30.3	34.6	10.0	12.00	35.9	40.4	10.0			
		100	229	305	769	880	254	305	913	1027	254			
Flange design	ASME B16.5	5	10.00	15.00	38.3	45.0	12.0	15.00	44.3	50.9	14.0			
		125	254	381	974	1143	305	381	1124	1294	356			
Butt Weld design	ASME B16.25	6	10.50	15.88	39.9	46.5	12.0	15.88	45.0	51.7	14.0			
		150	267	403	1014	1182	305	403	1144	1314	356			
Materials	ASTM	8	11.50	16.50	49.0	57.8	14.0	16.50	56.0	64.7	16.0			
		200	292	419	1244	1467	356	419	1423	1644	406			
		10	13.00	18.00	59.3	70.1	16.0	18.00	69.0	79.8	20.0			
		250	330	457	1507	1781	406	457	1752	2026	508			
		12	14.00	19.75	74.3	87.3	20.0	19.75	75.8	88.9	20.0			
		300	356	502	1887	2217	508	502	1925	2257	508			

WE = Butt weld ends

FE = Flanged ends

B = Center to top closed

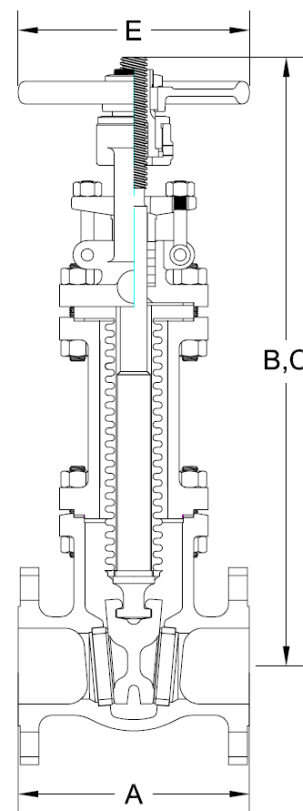
C = Center to top open

WE = Butt weld ends

FE = Flanged ends

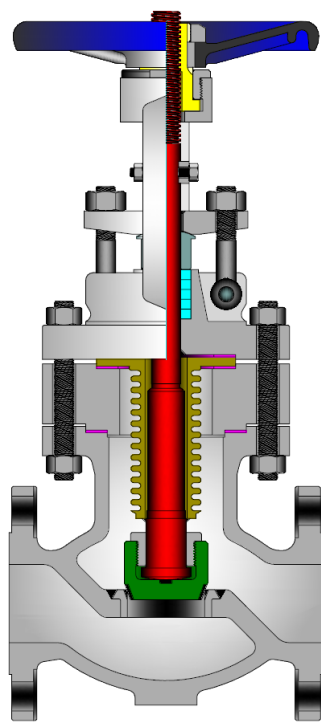
B = Center to top closed

C = Center to top open


ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE UPON REQUEST.

STANDARD MATERIALS (Other materials available)

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



Class	Fig. No.
150	1531
300	3031

DESIGN FEATURES:

- **Standard trim** is API trim 12 with 316Ti bellows.
- **Each** valve is shell, seat and back-seat pressure tested per industry standard API 598.
- Other **Bellows** material options are available. Bellows are hydro-formed rather than welded.
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test, inspection result and certificate of conformance.
- **Other** available options as follows:
 - Alternate valve materials such as chrome and stainless steel alloys
 - Alternate trim materials
 - Bypass, drain and other auxiliary connections
 - Gear, motor, and cylinder actuators available
 - NACE service
 - Special cleaning for applications such as oxygen or chlorine
 - Other options available as specified

(1) Weld end valve body A351 Gr. CF3M

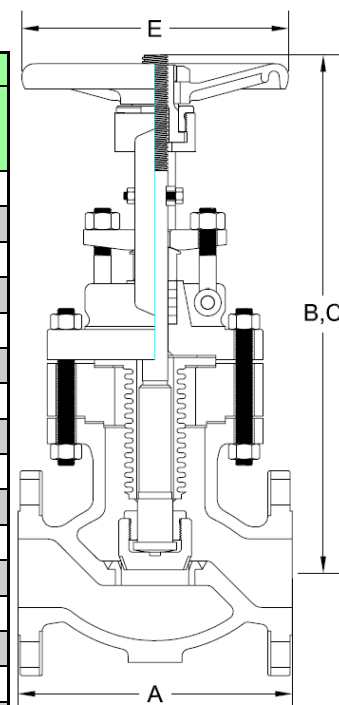
Design Specifications

Item	Applicable Specification	SIZE	ASME 150				ASME 300			
		in	A	B	C	E	A	B	C	E
		mm	WE/FE				WE/FE			
Wall thickness	API 623	2	8.00	16.0	16.8	7.9	10.50	17.5	18.4	7.9
Pressure - temperature ratings	ASME B16.34	50	203	406	426	200	267	445	468	200
		2 ½	8.50	16.0	16.9	9.8	11.50	16.9	18.0	9.8
General valve design	API 623 & B16.34 & MSS SP-117	65	216	407	428	250	292	430	458	250
End to End dimensions	ASME B16.10	3	9.50	17.9	18.9	11.8	12.50	20.7	21.7	11.8
		80	241	455	479	300	318	525	551	300
Flange design	ASME B16.5	4	11.50	23.2	24.6	11.8	14.00	30.2	32.0	13.8
Butt Weld design	ASME B16.25	100	292	590	626	300	356	767	812	350
		6	16.00	24.6	26.3	15.8	17.50	31.7	33.7	17.7
Materials	ASTM	150	406	626	669	400	444	806	857	450
		8	19.50	29.5	31.9	17.7	22.00	34.1	36.6	21.7
		200	495	750	809	450	559	866	930	550
		10	24.50	36.3	39.7	19.7	24.50	43.5	46.9	23.6
		250	622	923	1008	500	622	1106	1190	600
		12	27.50	49.8	54.1	23.6	-	-	-	-
		300	698	1265	1375	600	-	-	-	-

B = Center to top closed

C = Center to top open

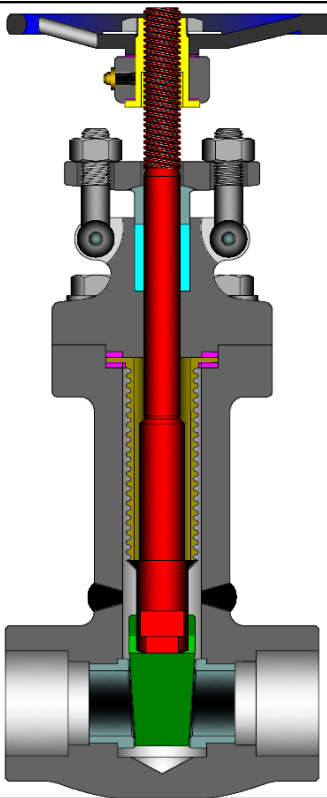
WE = Butt weld ends

FE = Flanged ends

ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE UPON REQUEST.

API 602 BELLOW-SEAL GATE VALVES
 FORGED CARBON, STAINLESS STEEL OR ALLOY STEEL
 ½" TO 2" (13 TO 50 mm), ASME CLASS 800

STANDARD MATERIALS
 (Other materials available)

PART	MATERIALS	
Body	A105	A182F316L
Bonnet	A105	A182 F316
Wedge	A182 F316	
Seat Ring	SST 316 + Stellite 6 Faced	
Stem	A182 F316	
Stem Bushing	A 439 Ductile NI-Resist Gr. D2	
Bellows	316Ti	
Gland Flange	A105	Series 300 SST
Eye Bolt	A193 Gr. B7	A193 Gr. B8M
Eye Bolt Nut	A194 Gr. 2H	A194 Gr.8M
Gland	SST 316	
Packing	Graphite	
Packing Washer / Packing Spacer	SST 316	
Gasket (2)	Spiral Wound SST with Graphite	
Hand Wheel	Malleable Iron or Steel	
Hand Wheel Nut	Malleable Iron or Steel	
Key	Steel	
Body / Bonnet Bolting	A193 Gr. B7	A193 Gr. B8M
Identification Plate	Series 300 SST	



DESIGN FEATURES:

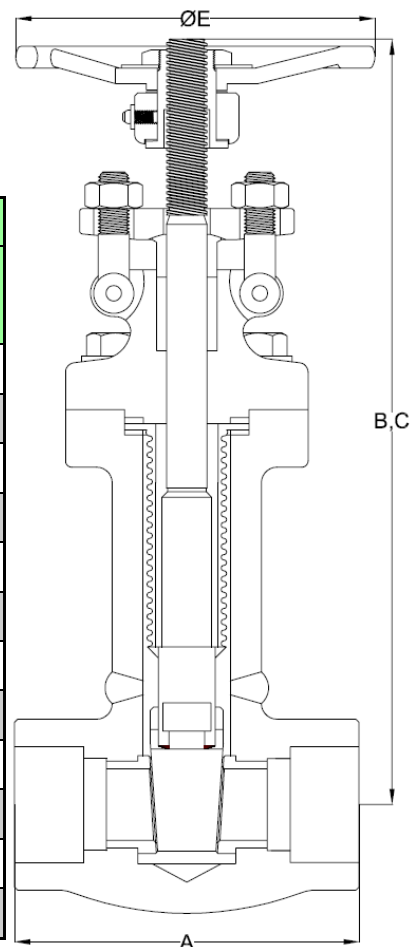
- **Standard trim** is API trim 12 with 316Ti bellows.
- **Stems** are non-rotating with surface finish to maximize packing seal for low fugitive emissions.
- **Each** valve is shell, seat and back-seat pressure tested per industry standard API 598.
- Other **Bellows** material options are available. Bellows are hydro-formed rather than welded.
- **Other** available options as follows:
 - Alternate valve materials such as chrome and stainless steel alloys
 - Alternate trim materials
 - NACE service
 - Special cleaning for applications such as oxygen or chlorine
 - Other options available as specified.

Class	Fig. No.
800	BG08

Design Specifications

Item	Applicable Specification	SIZE	ASME 800			
		in mm	A	B	C	E
Wall thickness	API 602	½	3.11	9.6	10.2	3.9
Pressure - temperature ratings	ASME B16.34 & API 602	13	79	244	260	100
General valve design	API 602 & B16.34	¾	3.62	9.6	10.2	3.9
End to End dimensions	ASME B16.10	19	92	244	260	100
Thread design	ASME B1.20.1	1	4.37	11.6	12.4	4.9
Socket Weld design	ASME B16.11	25	111	295	316	125
Materials	ASTM	1¼	4.72	16.4	17.5	6.3
THREADED AND CLASS 150-600 FLANGED ENDS AVAILABLE.		32	120	416	445	160
		1½	4.72	16.4	17.5	6.3
		38	120	416	445	160
		2	5.51	19.0	20.6	7.1
		50	140	483	524	180

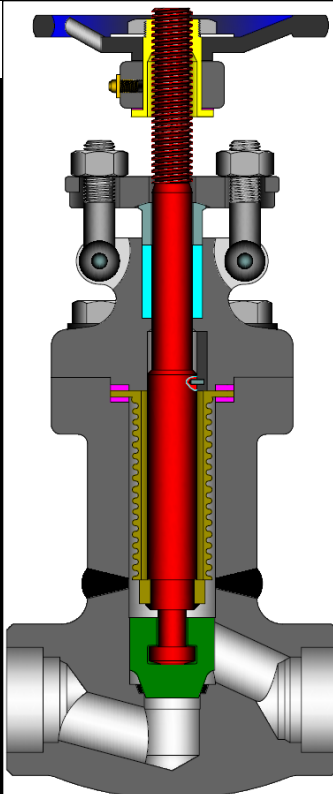
B = Center to top closed
C = Center to top open



ADDITIONAL MATERIALS AND CLASSES AVAILABLE UPON REQUEST.

STANDARD MATERIALS
 (Other materials available)

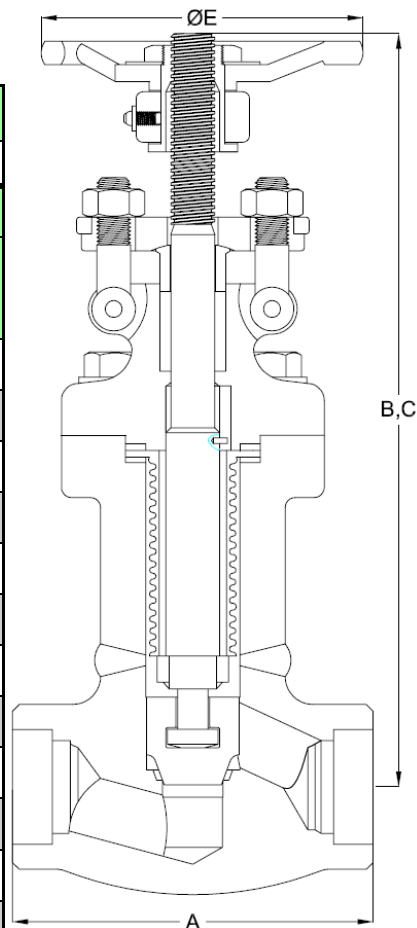
PART	MATERIALS	
Body	A105 + Stellite 6 Faced	A182 F316L + Stellite 6 Faced
Bonnet	A105	A182 F316
Disc	A182 F316	
Stem	A182 F316	
Bellows	316Ti	
Gland Flange	A105	A182 F316
Eye Bolt	A193 Gr. B7	A193 Gr. B8M
Eye Bolt Nut	A194 Gr. 2H	A194 Gr. 8M
Gland	Series 300 SST	
Packing	Graphite	
Gasket (2)	Spiral Wound SST with Graphite	
Hand Wheel	Malleable Iron or Steel	
Hand Wheel Nut	Malleable Iron or Steel	
Body / Bonnet Bolting (2)	A193 Gr. B7	A193 Gr. B8M
Identification Plate	Series 300 SST	


DESIGN FEATURES:

- **Standard trim** is API trim 12 with 316Ti bellows.
- **Stems** of hand wheel operated design are rotating / rising design.
- **Each** valve is shell, seat and back-seat pressure tested per industry standard API 598.
- Other **Bellows** material options are available. Bellows are hydro-formed rather than welded.
- **Other** available options as follows:
 - Alternate valve materials such as chrome and stainless steel alloys
 - Alternate trim materials
 - NACE service
 - Special cleaning for applications such as oxygen or chlorine
 - Other options available as specified

Design Specifications

Item	Applicable Specification	SIZE	ASME 800			
		in mm	A	B	C	E
Wall thickness	API 602	½	3.11	8.2	8.5	3.9
Pressure - temperature ratings	ASME B16.34 & API 602	13	79	209	217	100
General valve design	API 602 & B16.34	¾	3.62	8.2	8.5	3.9
End to End dimensions	ASME B16.10	19	92	209	217	100
Thread design	ASME B1.20.1	1	4.37	9.8	10.1	4.9
Socket Weld design	ASME B16.11	25	111	248	257	125
Materials	ASTM	1¼	4.72	11.6	12.1	6.3
THREADED AND CLASS 150-600 FLANGED ENDS AVAILABLE.		32	120	295	307	160
		1½	5.98	11.6	12.1	6.3
B = Center to top closed C = Center to top open		38	152	295	307	160
		2	6.77	13.2	13.7	7.1
		50	172	336	349	180


ADDITIONAL MATERIALS AND CLASSES AVAILABLE UPON REQUEST.

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.



The background of the entire page is a light green color overlaid with a complex pattern of white technical line drawings. These drawings represent various industrial valve components, including cross-sections of valve bodies, internal stem and ball assemblies, and external actuator mechanisms. The drawings are arranged in a somewhat grid-like fashion, with some larger, more detailed views and others being smaller, more schematic representations. The overall effect is one of technical precision and industrial expertise.

POWELL VALVES

2503 SPRING GROVE AVENUE, CINCINNATI, OHIO 45214-1771, U.S.A.

PHONE: 513.852.2000 • FAX NO. 513.852.2997

www.powellvalves.com



POWELL **VALVES**

CRYOGENIC SERVICE

GATE, GLOBE AND CHECK VALVES

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

Table of Contents

<u>SUBJECT</u>	<u>PAGE</u>
THE WM. POWELL COMPANY — PROFILE	2-3
HOW TO ORDER	4
FIGURE NUMBER INDEX	5
CRYOGENIC DESIGN	6
POWELL STANDARD EXTENSIONS	7
VENTING AND STAMPING GATE VALVES	8
BRONZE GATE VALVES	10-13
BRONZE GLOBE VALVES	14-17
BRONZE SWING CHECK VALVES	18-21
STAINLESS GATE VALVES	23-30
STAINLESS GLOBE VALVES	31-36
STAINLESS SWING CHECK VALVES	37-42
FORGED CRYOGENIC VALVES	43
CAST STEEL EXTENDED BONNET VALVES	44
ENGINEERING DATA	45-66
TERMS AND CONDITIONS	67-69

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.

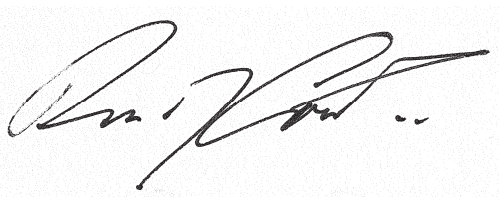
Powell also used its valve knowledge and expertise to construct a modification facility in the U.S.A. to assist customers with their needs, such as, automation, trim changes, end connection changes, additional quality inspections and special service pressure testing requirements, field service, etc...

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,

A handwritten signature in black ink, appearing to read "Randy Cowart", is written over a light gray rectangular background.

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 Fig.
E	Flat Face Fig.
F	Fig. End
G	B16.47 Series A Fig.
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

FIGURE NUMBER INDEX

TYPE	FIGURE	PAGES
BRONZE		
GATE		
	2714	10-11
	0375, 0377	12-13
GLOBE		
	0110	14-15
	0174, 2874, 2875	16-17
CHECK		
	0560, 0563	18-19
	2825	20-21
STAINLESS STEEL		
GATE		
	1832	23-24
	2490	25-26
	1973	25-28
	2467	25-30
	2456	27-30
GLOBE		
	2474	31-32
	1983	31-34
	2447	31-36
	2475	33-36
CHECK		
	2341	37-38
	2350	37-38
	2346	37-40
	2342	39-42

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.

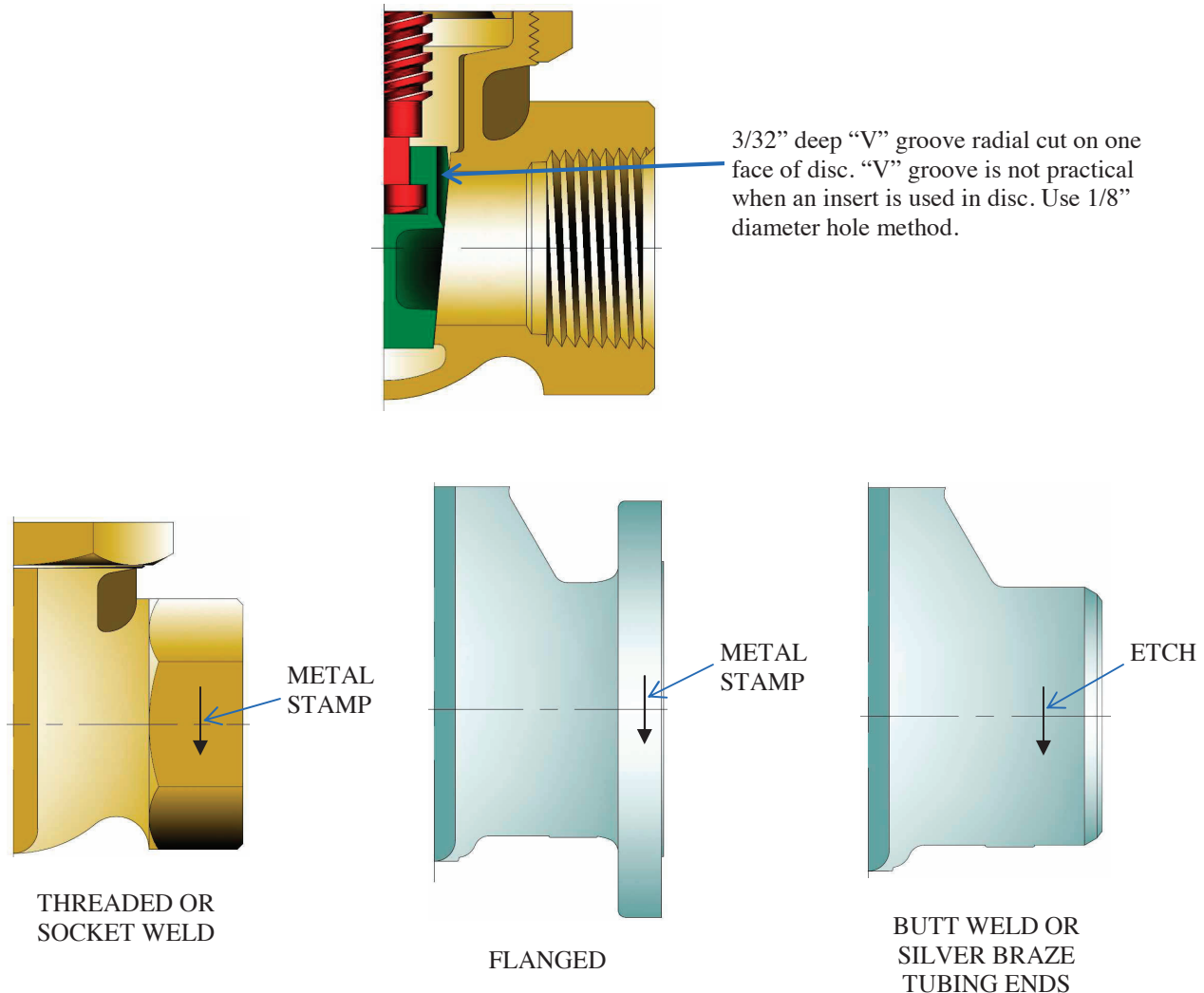
POWELL STANDARD “X” DIMENSIONS CRYOGENIC GATE & GLOBE VALVES

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



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

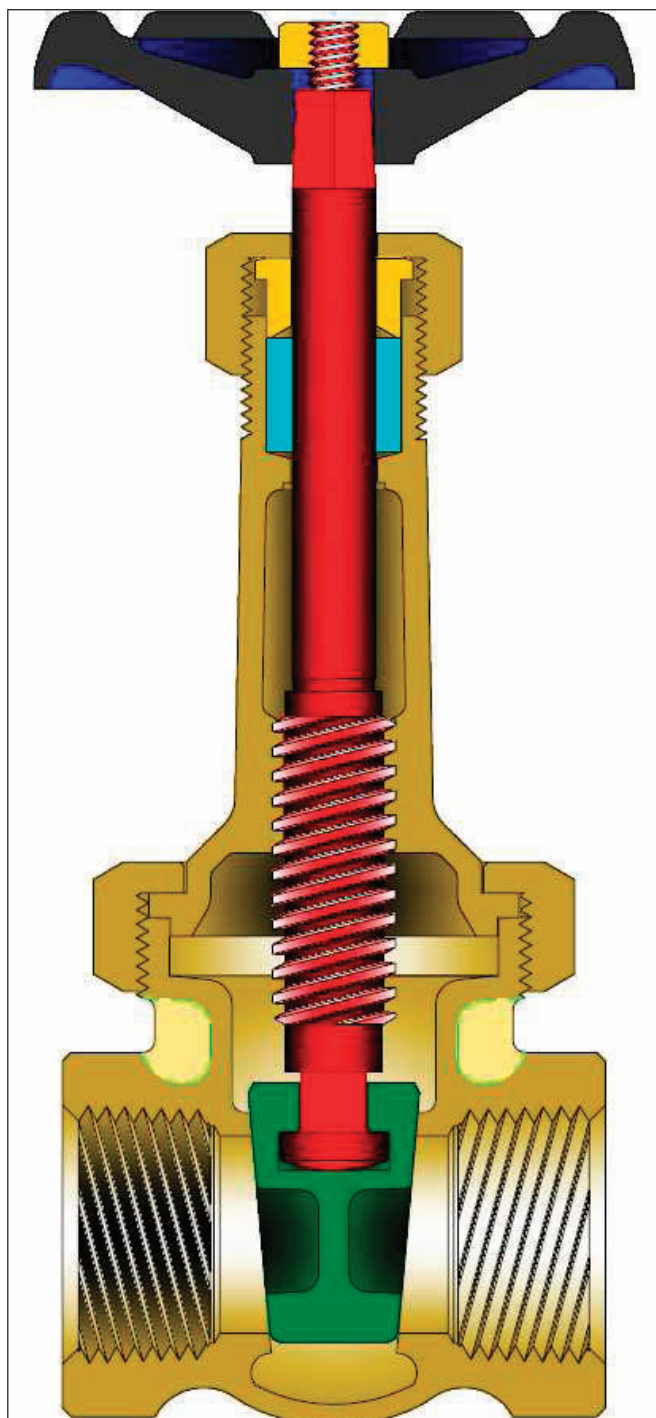
Gate valves have the potential to trap cryogenic liquids in the bonnet cavity between the two sealing faces of the wedge. To prevent excessive pressure build-up due to vaporization of this liquid, consideration must be given to venting the bonnet chamber. The most common way is to cut a 3/32" "V" groove 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 valves 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

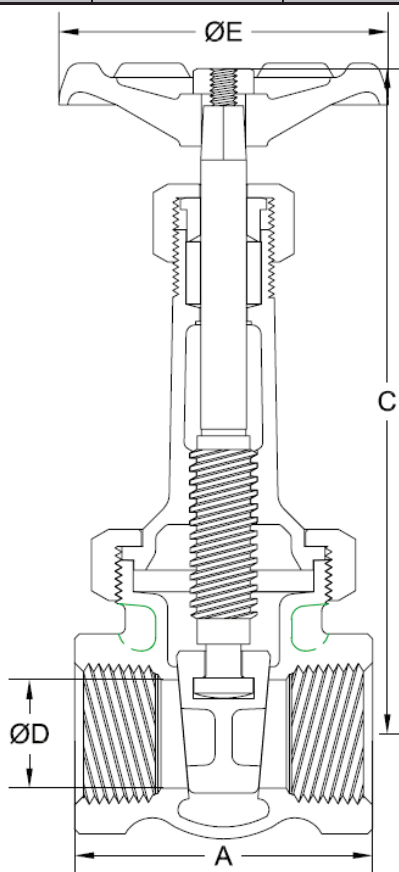
Item	Applicable Specification
Pressure - temperature ratings	MSS SP-80
General valve design	MSS SP-80
Thread design	ASME B1.20.1
Materials	ASTM

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).

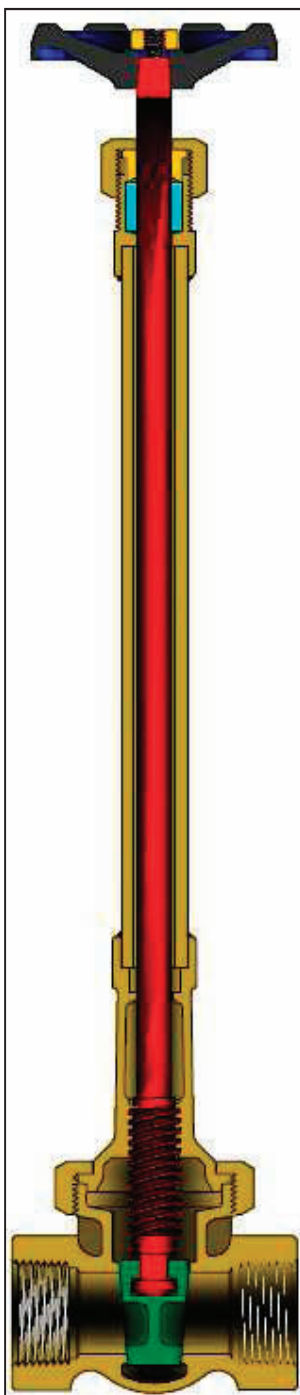
SIZE	FIG 2700 & 2714					
in	A	C	D	E	WT	lb
mm						kg
¼	1.75	4.3	0.38	2.1	0.8	3.2
6	44	108	10	54	0.4	
¾	2.00	4.3	0.38	2.1	0.8	7.1
10	51	108	10	54	0.4	
½	2.38	4.9	0.50	2.5	1.1	12.6
13	60	124	13	64	0.5	
¾	2.44	6.1	0.75	2.8	1.9	30
20	62	156	19	70	0.9	
1	2.75	7.4	1.00	3.0	2.7	55
25	70	187	25	76	1.3	
1¼	3.00	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



Class	Fig. No.
200	0375
300	0377

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

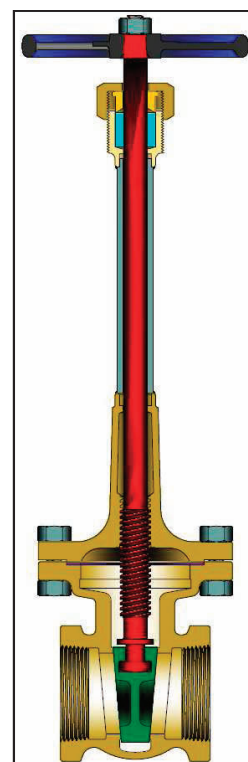
- (1) On soft seated valves only.
(2) Sizes 2½" and 3" use a bolted bonnet design.

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

DESIGN FEATURES:

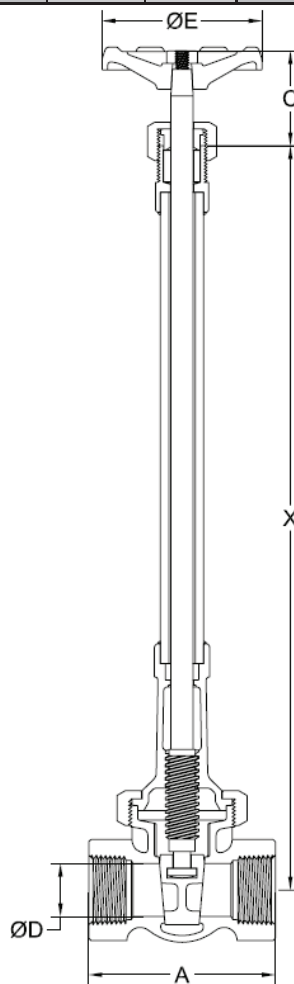
- **Renewable** solid wedges.
- **Integral** seats.
- **Stems** are rotating / rising design.
- **Available** soft-seated for sizes 2", 2½", and 3".
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-80.
- **Valves** are specially cleaned and processed for oxygen or cryogenic 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)

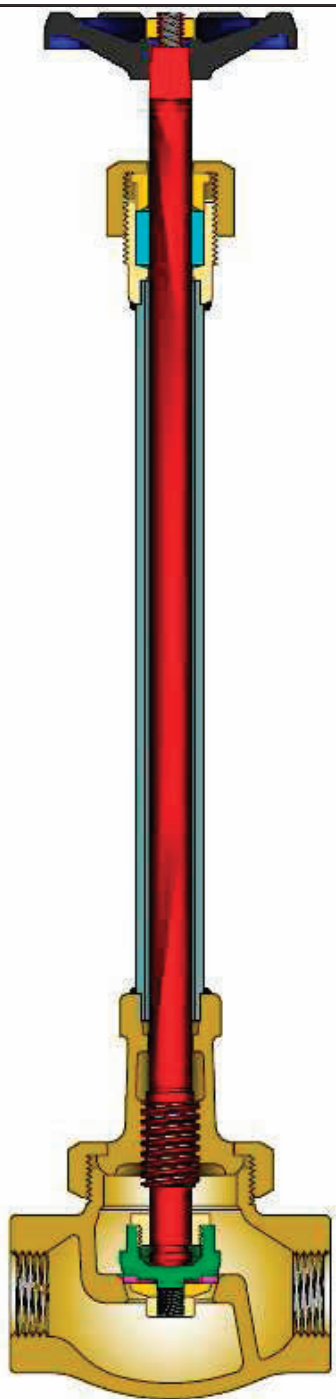
GATE VALVE DIMENSIONS (CLASSES 200 & 300).

SIZE	FIG 0375							FIG 0377								
in	A	C	D	E	X (1)	WT	lb	C _V	A	C	D	E	X (1)	WT	lb	C _V
mm							kg								kg	
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		
¾	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.



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

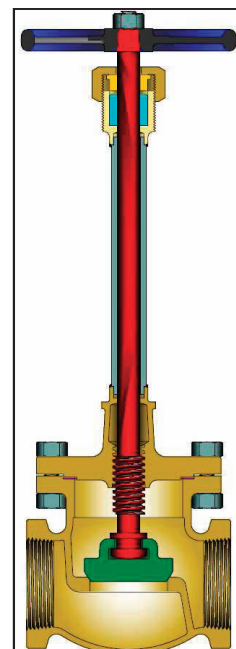
- (1) Other insert materials available.
(2) Soft Seat design
(3) Sizes 2½" and 3" use a bolted bonnet design.

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.

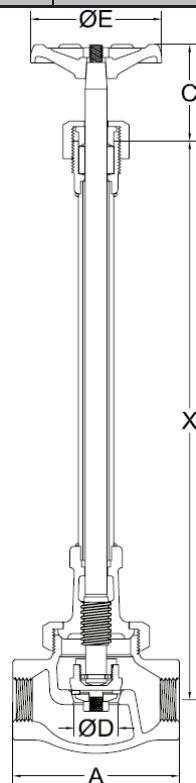


Bolted Bonnet Design (3) with metal seats

Class	Fig. No.
200	0110

GLOBE VALVE DIMENSIONS (CLASS 200).

SIZE	FIG 0110						
in	A	C	D	X (1)	E	WT	lb
mm							kg
¼	2.25	1.8	0.25	12.0	2.5	0.9	0.6
6	57	46	6	305	64	0.4	
¾	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	

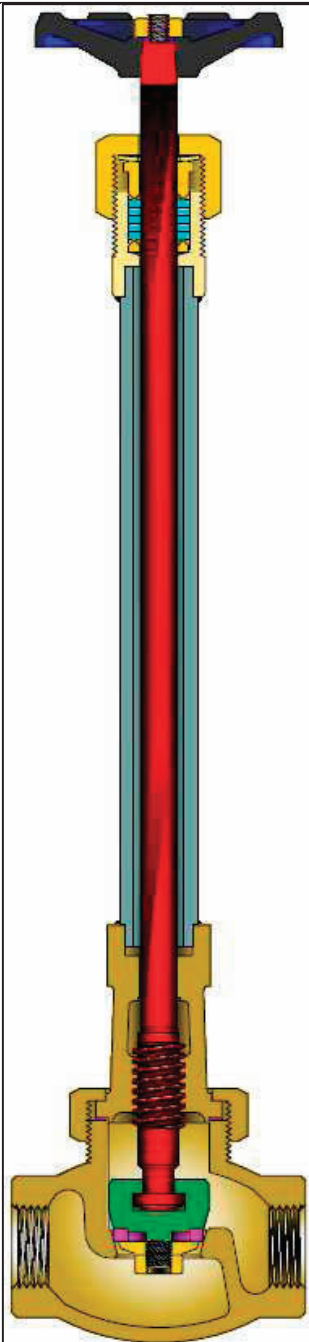


C = Packing sleeve to top open
X = Center to top of stuffing box (Std)

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



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

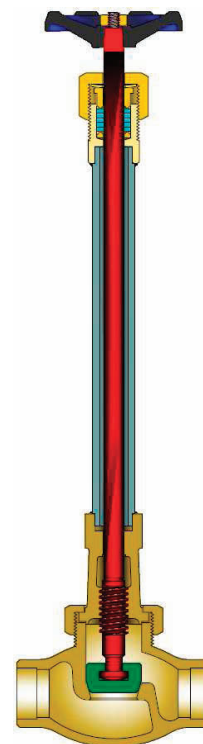
- (1) Other insert materials available.
(2) Soft Seat design.

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

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

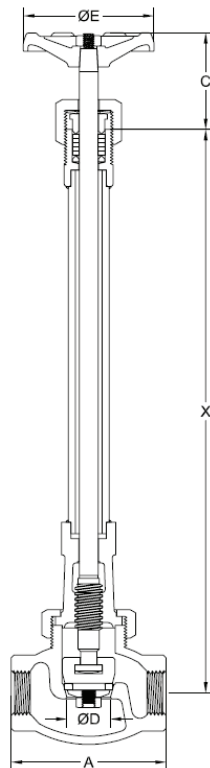
GLOBE VALVE DIMENSIONS (CLASS 300).

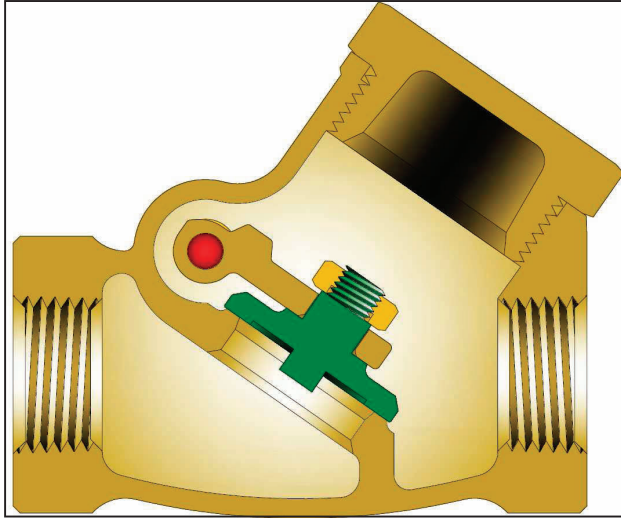
SIZE	FIG 0174						
in	A	C	D	X (1)	E	WT	lb
mm							kg
¼	2.13	2.0	0.25	12.0	2.5	1.6	0.6
6	54	51	6	305	64	0.7	
¾	2.25	2.0	0.38	12.0	2.5	1.1	1.4
10	57	51	10	305	64	0.5	
½	2.50	2.3	0.50	12.0	2.8	2.5	2.5
13	64	58	13	305	70	1.1	
¾	3.00	2.7	0.75	12.0	3.3	2.5	5.8
20	76	68	19	305	83	1.1	
1	3.56	2.7	1.00	13.0	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.





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

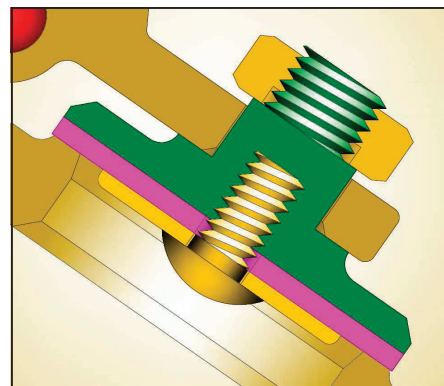
- (1) B16 for ¾" and smaller sizes
(2) Soft Seat design
(3) Other insert materials available

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:

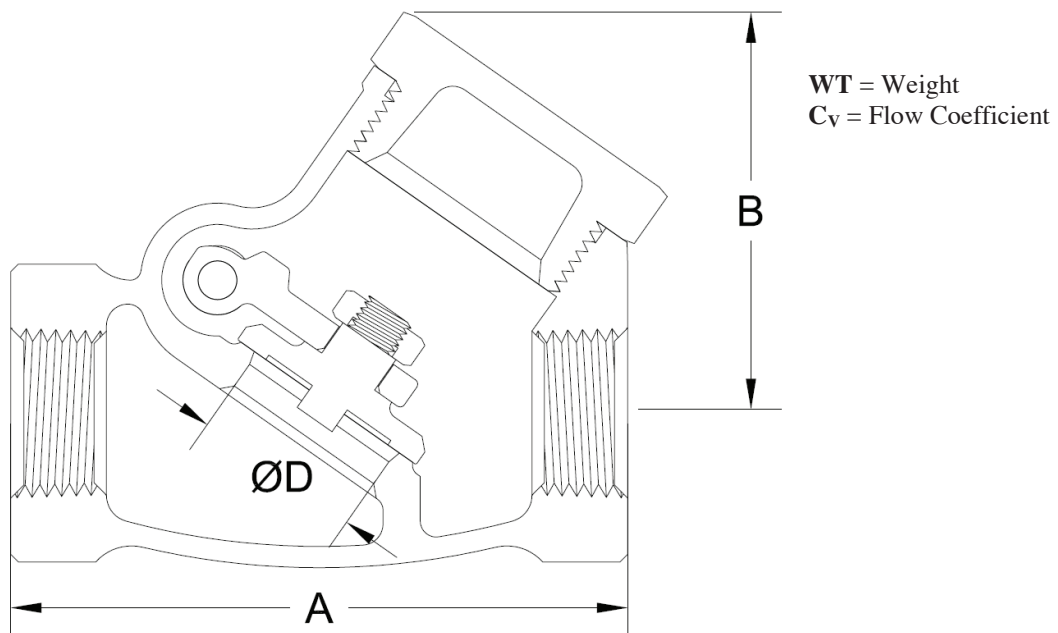
- **By** unscrewing the side plug and removing the cap and carrier pin, the carrier and disc assembly can be easily removed.
- **Renewable** disc is held by a locknut.
- **Integral** seats.
- **Valves** can be used in a horizontal or vertical position; however, when installed in vertical line, flow must 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.

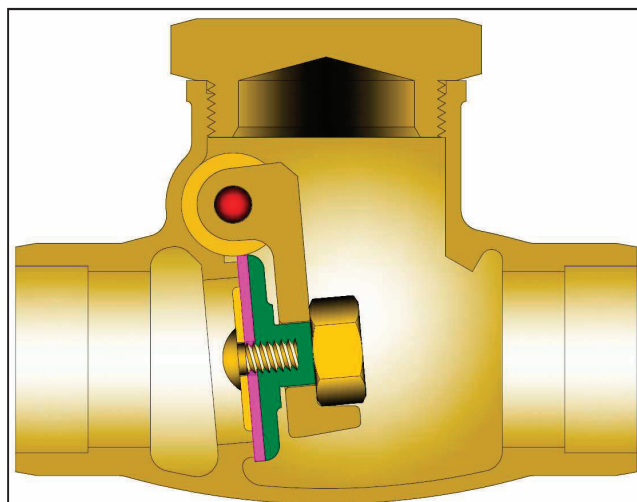


Soft Seat Design (2)

SWING CHECK VALVE DIMENSIONS (CLASS 200 & 300).

SIZE	FIG 560						FIG 563					
	in	A	B	D	WT	Cv	A	B	D	WT	Cv	Cv
	mm											
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			
¾	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			





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:

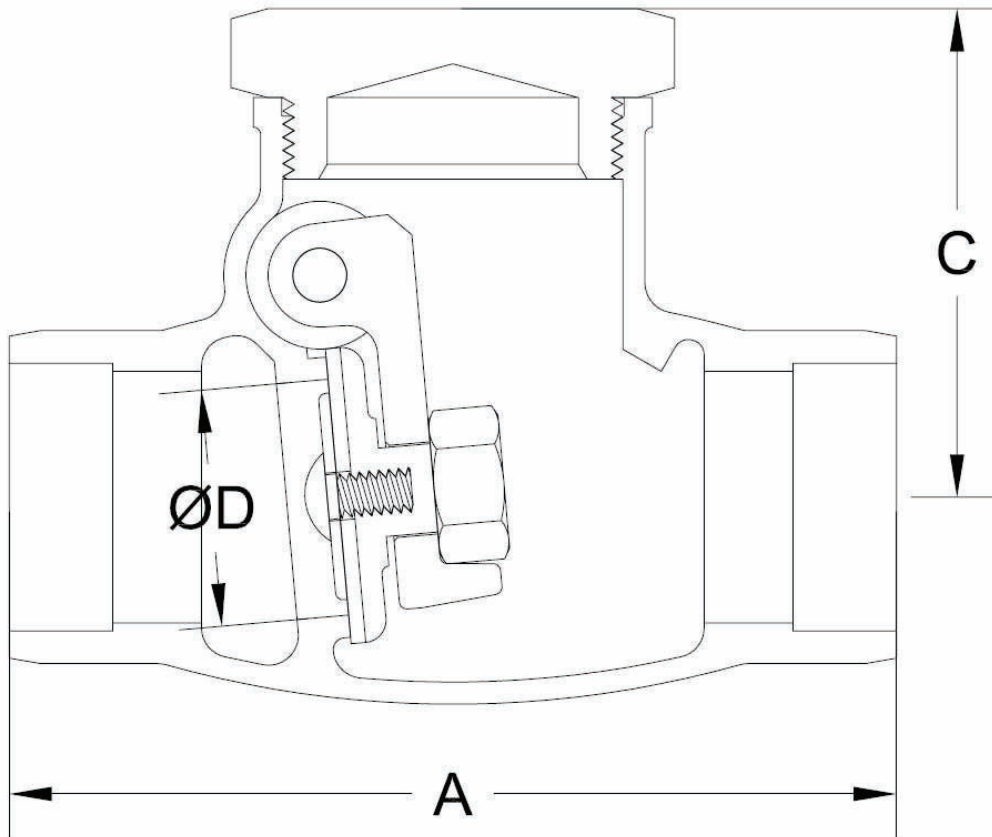
- **By** unscrewing the side plug and removing the cap and carrier pin, the carrier and disc assembly can be easily removed.
- **Renewable** disc is held by a locknut.
- **Integral** seats.
- **Valves** can be used in a horizontal or vertical position; however, when installed in vertical line, flow must 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
Cv = Flow Coefficient

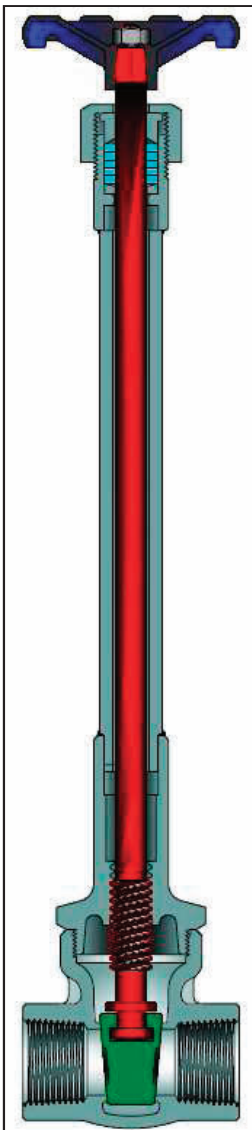
STAINLESS STEEL

GATE VALVES

THREADED BONNET, ASME CLASS 200

¼" to 2" (6 TO 50 mm), THREADED OR SOCKET WELD ENDS

CAST STAINLESS STEEL



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

Class	Figure Number
200	1832

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.

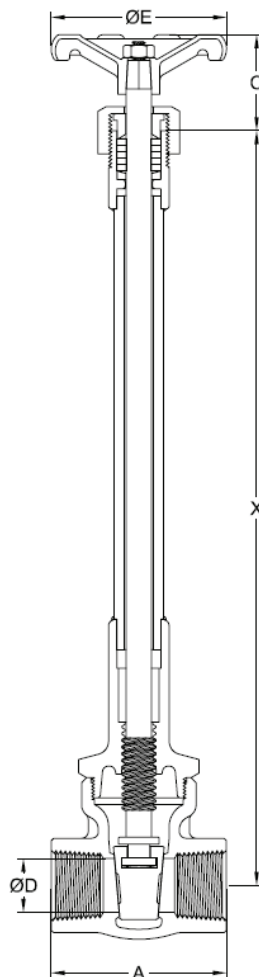
NOTE: Powell reserves the right to convert threaded ends to socket weld. Remnant of threads will exist as pipe stop behind socket bore.

GATE VALVE DIMENSIONS (CLASS 200).

SIZE	FIG 1832						
in	A	C	D	E	X (1)	WT	lb
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	
¾	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



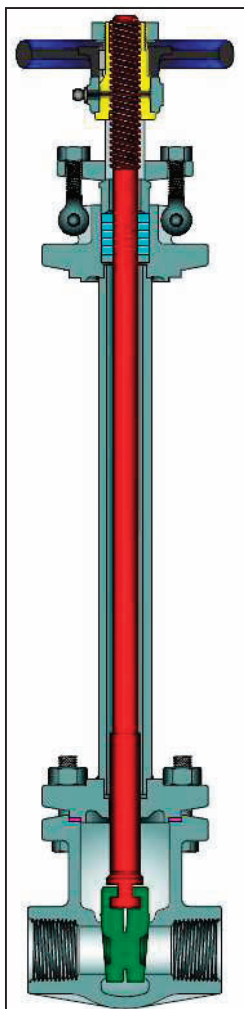
(1) Other extensions available. Consult Powell Engineering.

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.

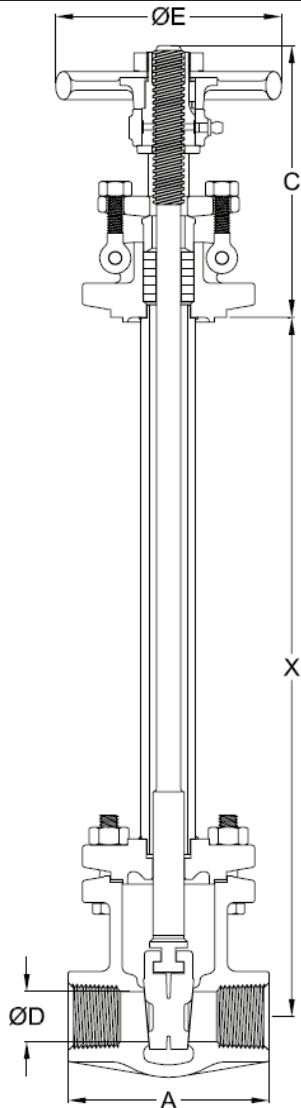
- **Valves** are available with socket weld ends.
- **Yoke** bushing can be lubricated to minimize friction and prolong life of the stem.
- **Body and bonnet** castings are precision machined.
- **Gland** has two-piece construction for easy alignment.
- **Valves** are specially cleaned and processed 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	A	C	D	E	X (1)	WT	lb	C _V	A	C	D	E	X (1)	WT	lb	C _V
mm							kg								kg	
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		
¾	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		



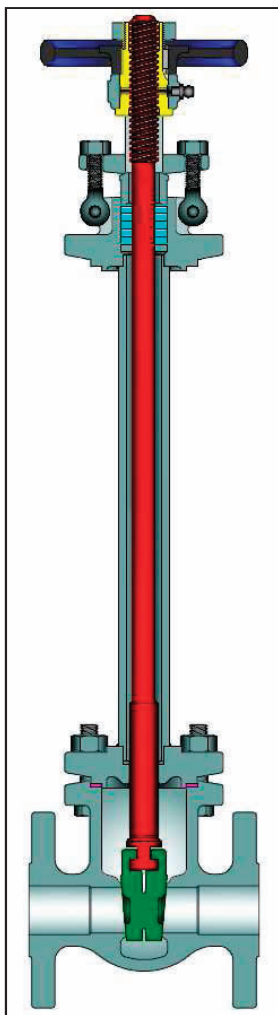
SIZE	ASME 600							
	in	A	C	D	E	X (1)	WT	lb
	mm							kg
¼		2.13	5.1	0.38	3.0	13.0	6.2	
6		54	130	10	76	330	2.8	
¾		2.13	5.1	0.38	3.0	13.0	6.2	
10		54	130	10	76	330	2.8	
½		3.00	5.6	0.50	3.5	13.0	7.8	
13		76	141	13	89	330	3.5	
¾		3.50	6.3	0.75	4.0	13.0	10.2	
19		89	189	19	102	330	4.6	
1		4.00	6.8	1.00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

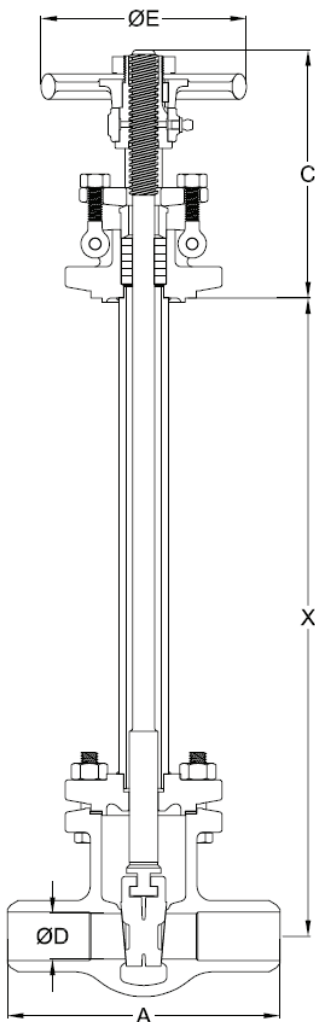
DESIGN FEATURES:

- **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. C = Bottom of yoke flange to top open
Consult Powell Engineering. X = Center to bottom of yoke flange (Std)

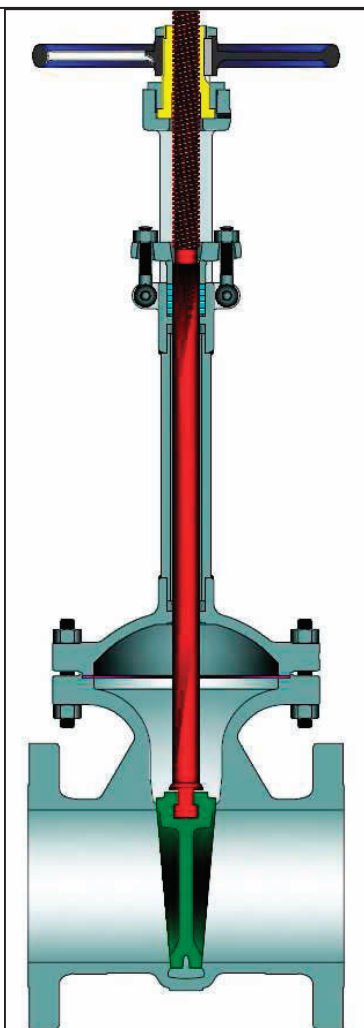
FE = Flanged ends
WE = Buttweld ends
WT = Weight
C_v = Flow coefficient

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



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

Class	Figure Number
150	2456
300	2467

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.

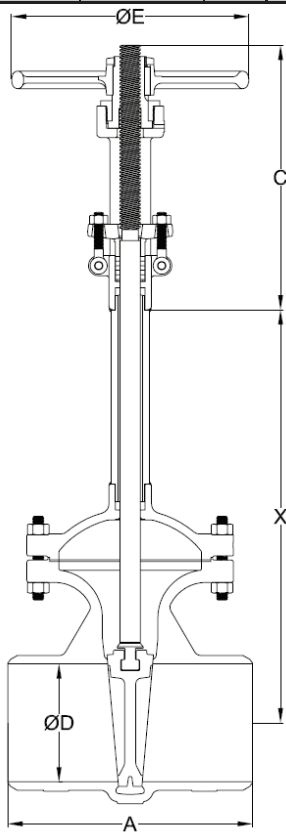
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test report, inspection report and certificate of conformance.
- **Other** available options as follows:
 - Alternate valve materials
 - Alternate trim materials
 - 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		

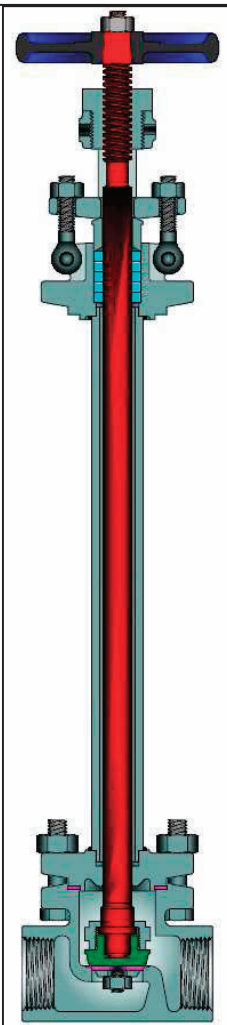
(1) Other extensions available.
Consult Powell Engineering.



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



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 butt weld designs.
- 2) Soft seat design.

Design Specifications

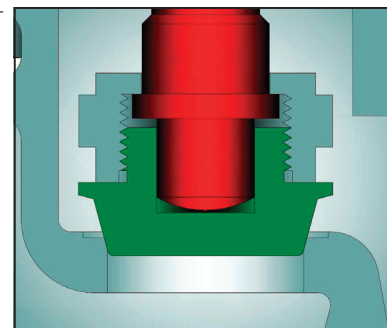
Class	Figure Number	Item	Applicable Specification
150	2474	Wall thickness	ASME B16.34
300	2447 (1)	Pressure - temperature ratings	ASME B16.34
600	1983 (1)	General valve design	ASME B16.34
		End Threads-NPT	ASME B1.20.1
		Socket Weld Ends	ASME B16.11
		Materials	ASTM

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

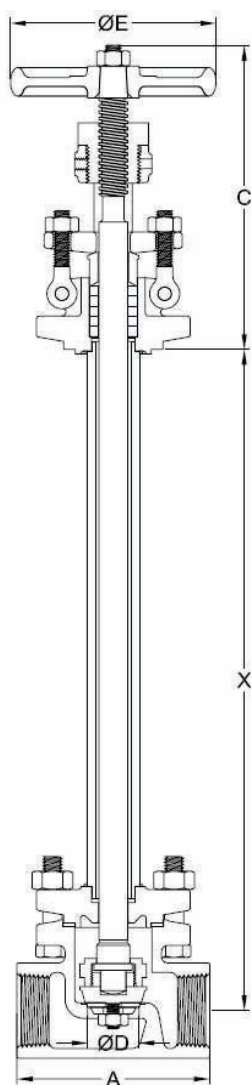
NOTE: Powell reserves the right to convert threaded ends to socket weld when needed, which will result in thread remnants as pipe stop.



Metal Disc

GLOBE VALVE DIMENSIONS (CLASSES 200-600)

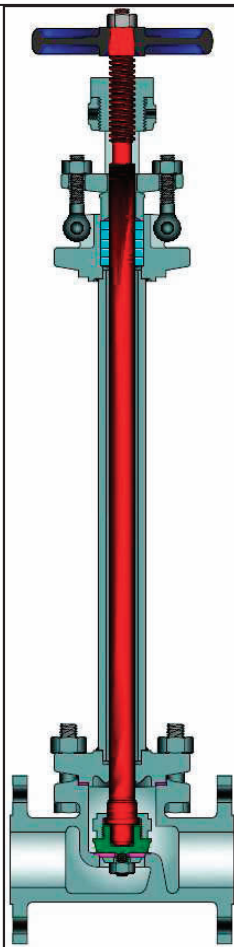
SIZE	ASME 200								ASME 300							
in	A	C	D	E	X (1)	WT	lb	C _V	A	C	D	E	X (1)	WT	lb	C _V
mm							kg								kg	
¼	2.88	5.5	0.50	3.0	12.0	5.3		2.5	2.88	5.5	0.50	3.0	12.0	5.4		2.5
7	73	140	13	76	305	2.4			73	140	13	76	305	2.4		
¾	2.88	5.5	0.50	3.0	12.0	5.3		2.5	2.88	5.5	0.50	3.0	12.0	5.4		2.5
10	73	140	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	A	C	D	E	X (1)	WT	lb	C _v
mm							kg	
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. **C** = Bottom of yoke flange to top open
Consult Powell Engineering. **X** = Center to bottom of yoke flange (Std)

WT = Weight
C_V = Flow coefficient



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.

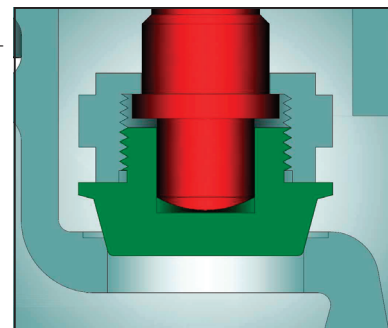
Design Specifications

Class	Figure Number	Item	Applicable Specification
150	2475	Wall thickness	ASME B16.34
300	2447 (3)	Pressure - temperature ratings	ASME B16.34
600	1983 (3)	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

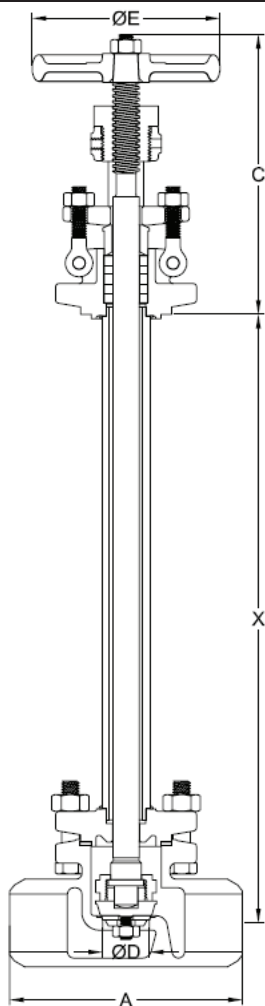


Metal Disc

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

GLOBE 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 kg	WE kg								FE kg		WE kg	
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			



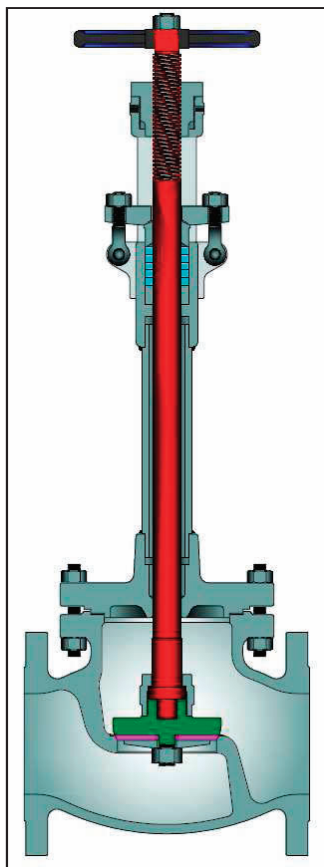
Weld End Design

SIZE	ASME 600									
in	A	C	D	E	X (1)	WT	lb	WT	lb	C _v
mm						FE	kg	WE	kg	
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. C = Bottom of yoke flange to top open
Consult Powell Engineering. 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



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.

Class	Figure Number
150	2475
300	2447

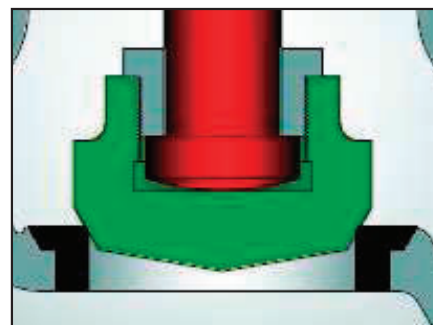
DESIGN FEATURES:

- **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.

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

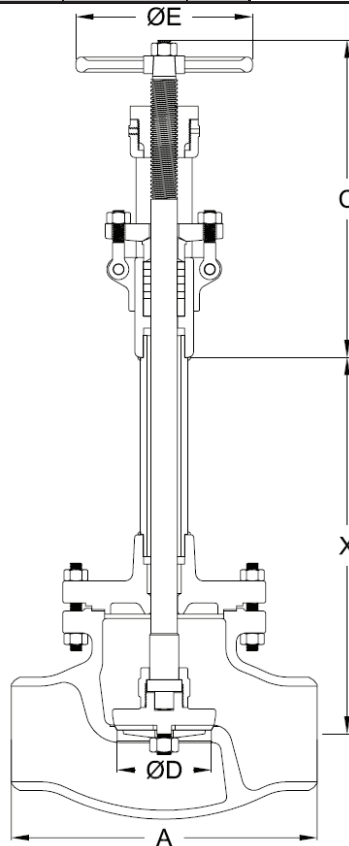


Metal Disc

GLOBE VALVE DIMENSIONS (CLASSES 150-300)

PIPE END 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	kg	WE	kg							FE	kg	WE	kg	
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.

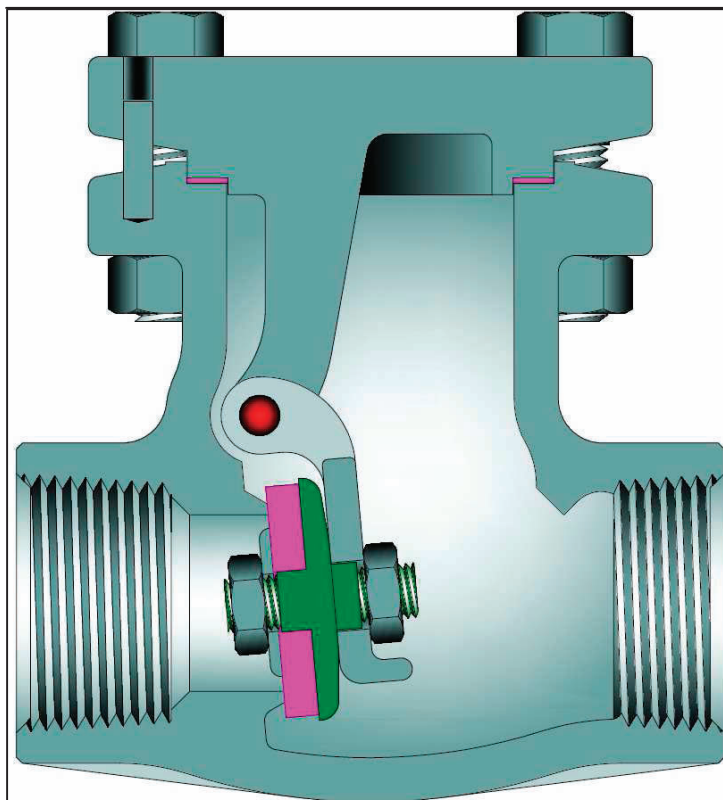


C = Bottom of yoke flange to top open
X = Center to bottom of yoke flange (Std)

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:

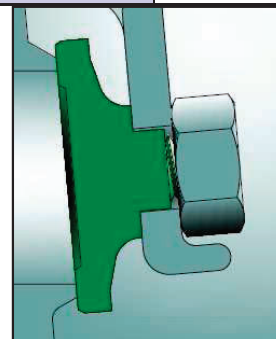
- **Integral Seats**
- **Swivel disc** for improved seat alignment and longer life.
- **Each** valve is shell and seat pressure tested.
- **Check** valves are suitable for service in horizontal line with cap vertical or in a vertical line with flow upward.
- **Carrier Pin** is confined within the body 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

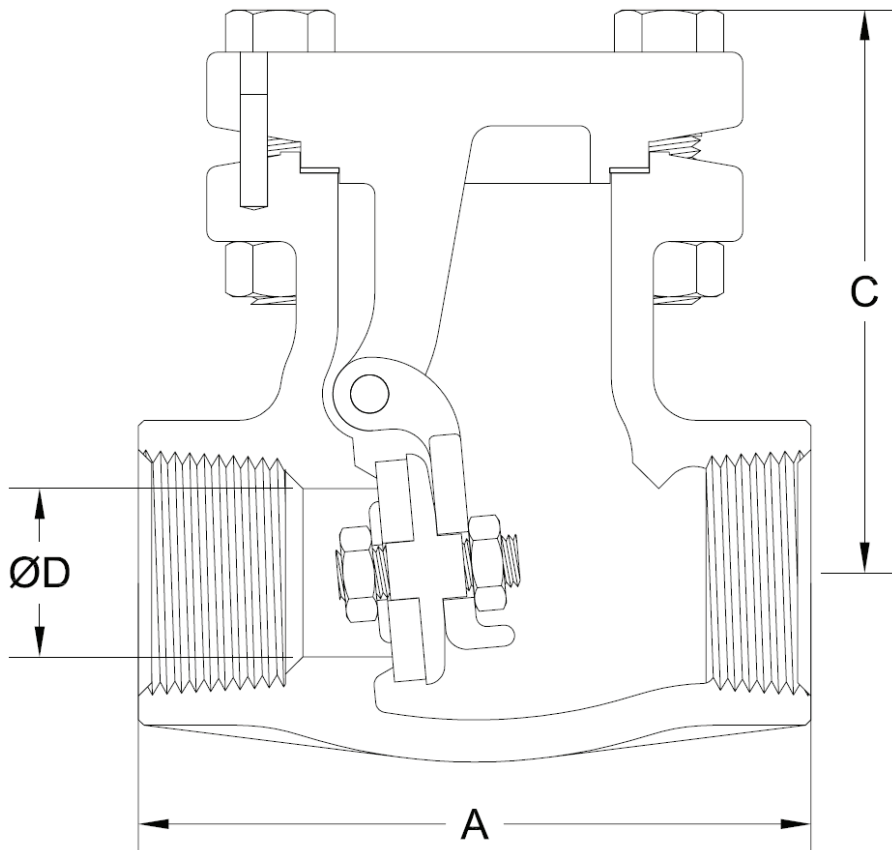
Item	Applicable Specification
Wall thickness	ASME B16.34
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
End Threads-NPT	ASME B1.20.1
Socket Weld Ends	ASME B16.11
Materials	ASTM



Metal Disc

SWING CHECK VALVE DIMENSIONS (CLASS 200-300)

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

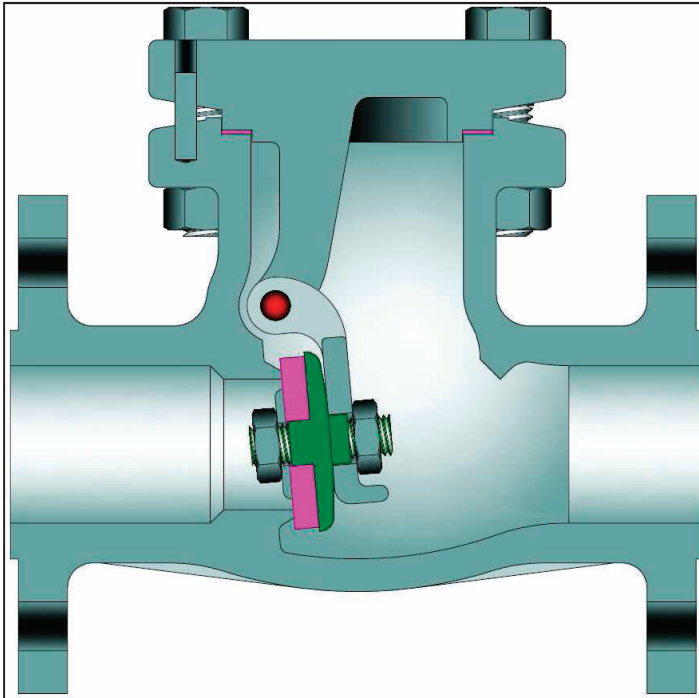


C = Center to top

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



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

Class	Figure Number
150	2342
300	2346 (1)

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

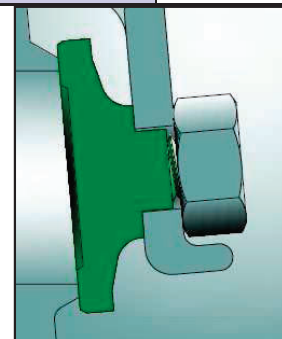
DESIGN FEATURES:

- **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

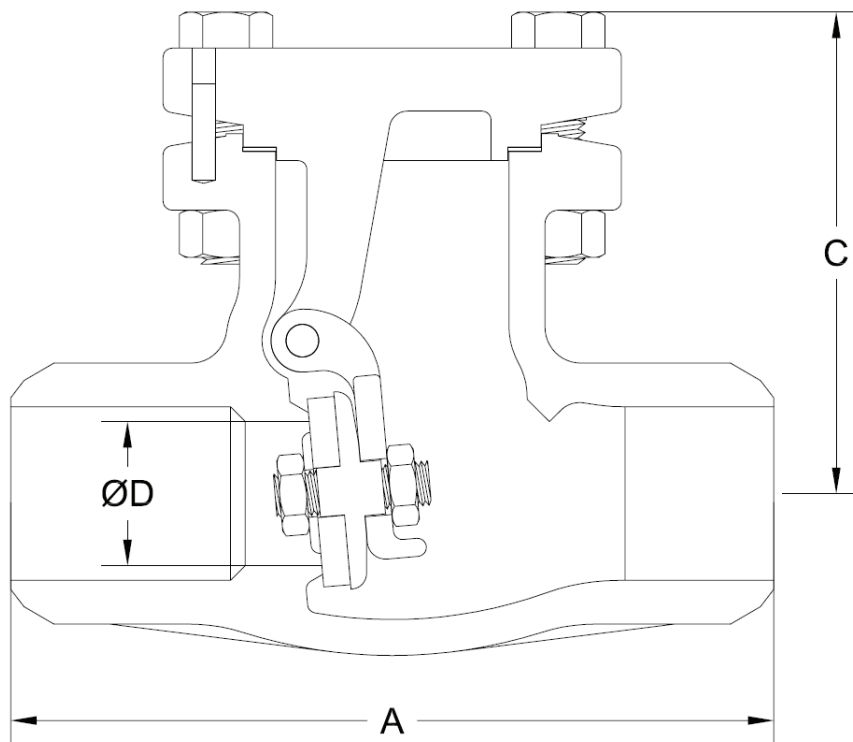
Item	Applicable Specification
Wall thickness	ASME B16.34
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
Flanged ends	ASME B16.5
Buttweld ends	ASME B16.25
Materials	ASTM



Metal Disc

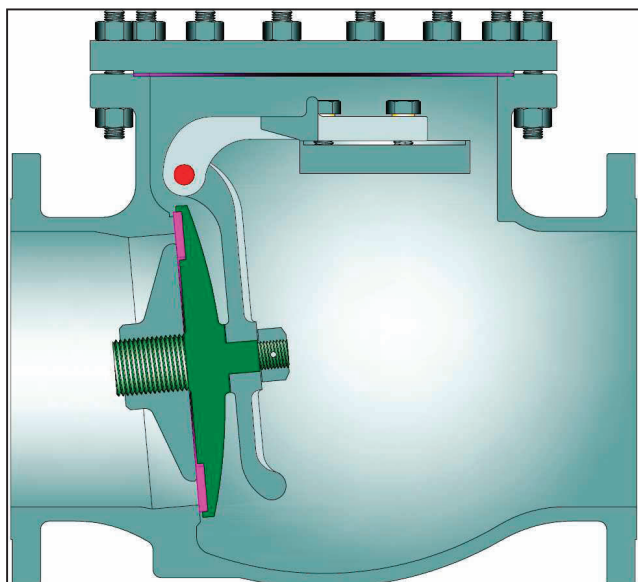
SWING CHECK VALVE DIMENSIONS (CLASS 150-300)

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			
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										



C = Center to top
FE = Flanged ends
WE = Buttweld ends
WT = Weight
C_v = Flow coefficient

Weld End Design



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

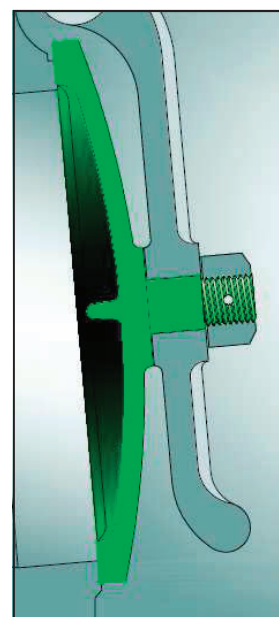
STANDARD MATERIALS (Other materials available)

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

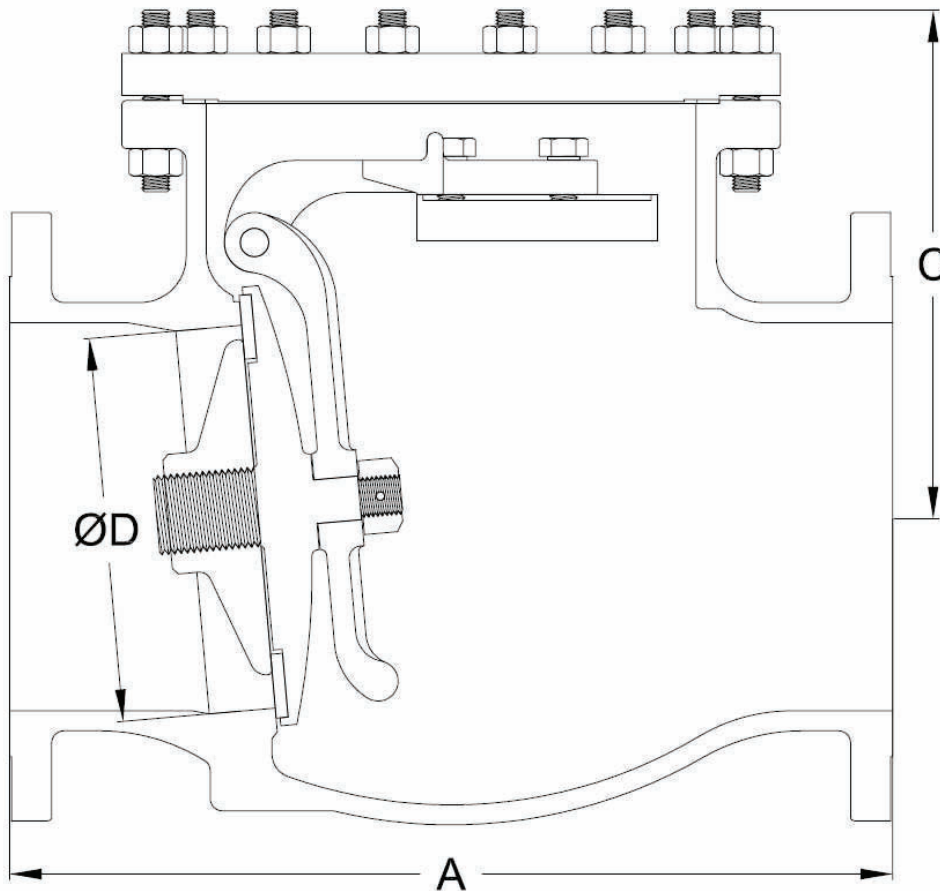
Item	Applicable Specification
Wall thickness	ASME B16.34
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
Flanged ends	ASME B16.5
Buttweld ends	ASME B16.25
Materials	ASTM



Metal Disc

SWING CHECK VALVE DIMENSIONS (CLASS 150)

SIZE	ASME 150							
in	A	C	D	WT	lb	WT	lb	C _v
mm				FE	kg	WE	kg	
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

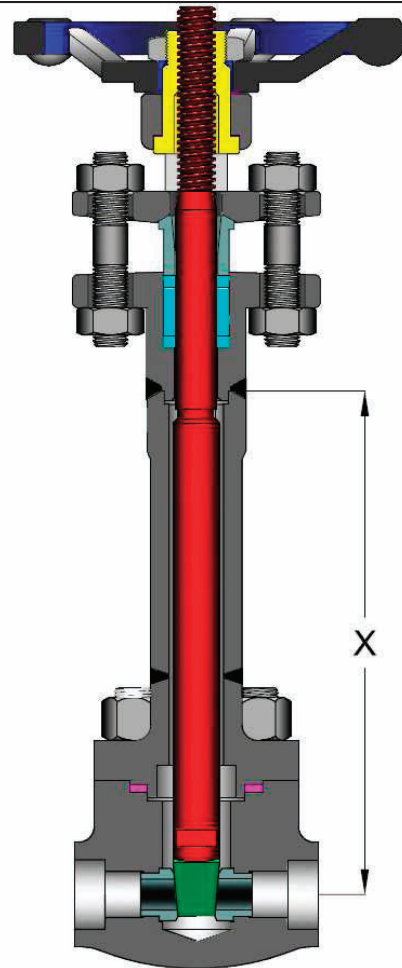
Weld End Design

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.

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.



Cryogenic Forged Gate Valve

Extension Lengths (X)															
	CLASS	GATE VALVES							GLOBE VALVES						
		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						
	CLASS	SIZE (MM)							SIZE (MM)						
		6	10	13	19	25	38	50	6	10	13	19	25	38	50
		330	330	330	330	356	356	406	305	305	305	305	330	330	356
Metric (MM)	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.

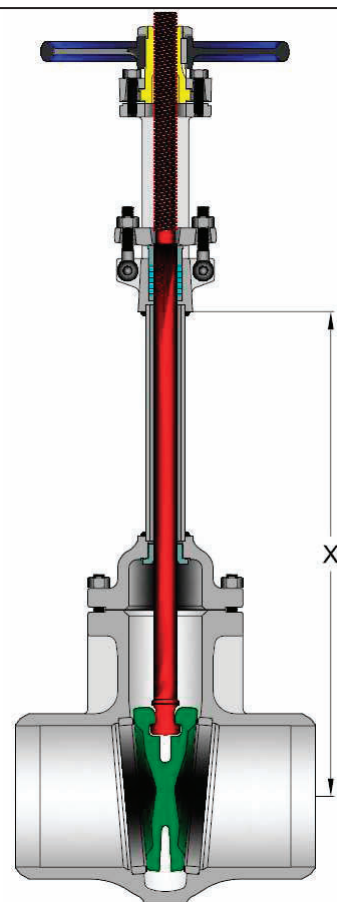
CAST STEEL EXTENDED BONNET VALVES

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

Other sizes available on request

For more dimensional information, see Powell Cast Steel Catalog.

	PAGE
VALVE STANDARDS AND RELATED INFORMATION	46
VALVE PRESSURE/TEMPERATURE RATINGS	47-49
CHEMICAL AND PHYSICAL PROPERTIES	50
TRIM DESCRIPTIONS	51
SOCKET WELD END DIMENSIONS	52
SILVER BRAZE TUBING END DIMENSIONS	53
DIMENSIONS OF WROUGHT STEEL PIPE AND WELD END CONFIGURATIONS	54-59
FLANGE DIMENSIONS	60-62
METHOD OF DESIGNATING LOCATION OF AUXILIARY CONNECTIONS	63
FLOW DESIGN AND MAINTENANCE RECOMMENDATIONS	64
CONVERSION DATA AND EQUIVALENTS	65-66

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

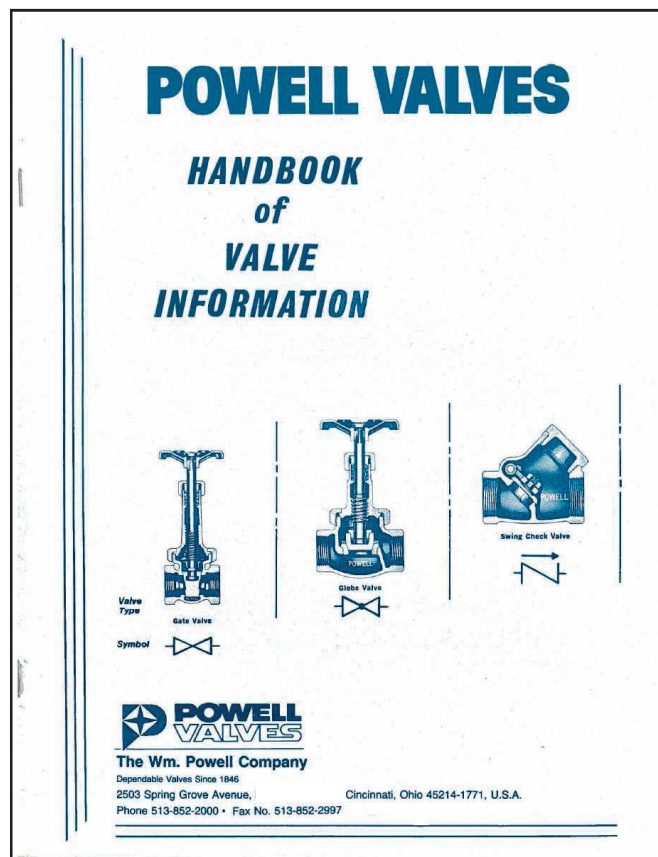
- (D) ASME B16.25 → Buttwelding Ends

- (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		
	CLASS 125	CLASS 150		CLASS 200	CLASS 300	
PRESS. CLASS						
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 1/8 - 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 1000° F, use only when the carbon content is 0.04% or higher. This requirement must be specified by customer when applicable.

STANDARD CLASS

Working Pressures by Classes, psig							
Temperature, °F	150	300	600	900	1500	2500	4500
-20 to 100	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, °F	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

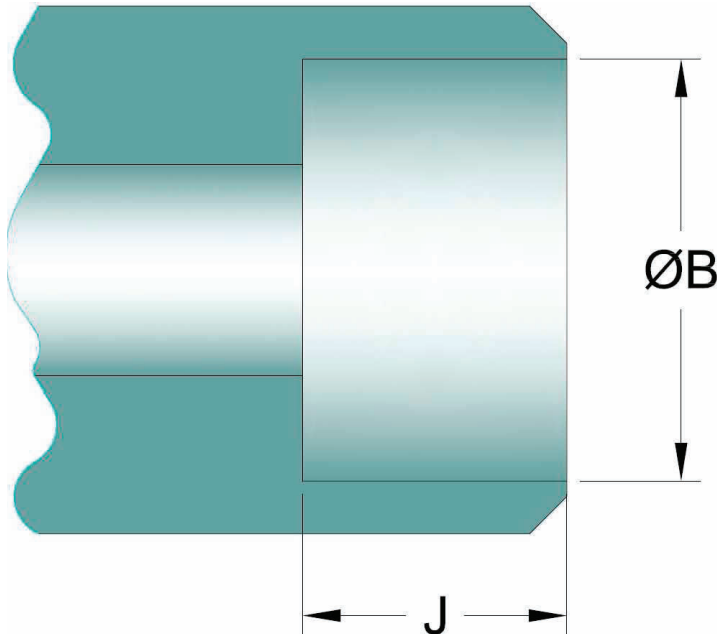
(a) Minimum 50HB differential hardness between mating seating surfaces

(b) Stellite 6 TM 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



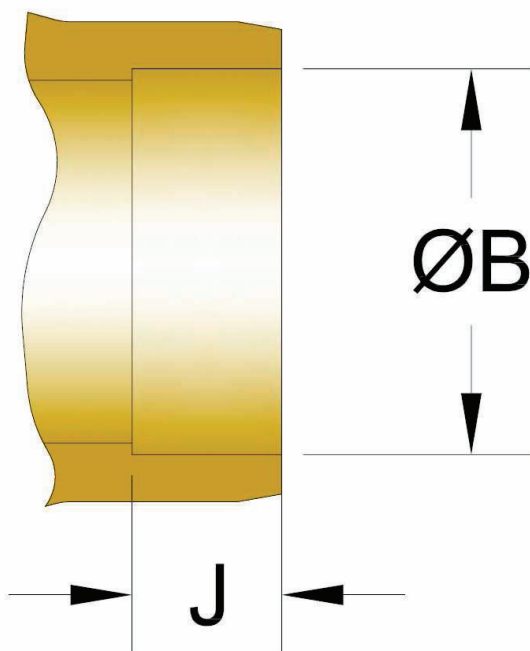
Data taken from tables
1 and I1 in ASME
B16.11

Size	English (in)			Metric (mm)		
	Socket Bore Diameter (B)	Max	Depth of Socket (J)	Socket Bore Diameter (B)	Max	Depth of Socket (J)
		Min			Min	
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	Max	Depth of Socket	Socket Bore Diameter	Max	Depth of Socket
		(B)			Min		(J)	(B)	Min	(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

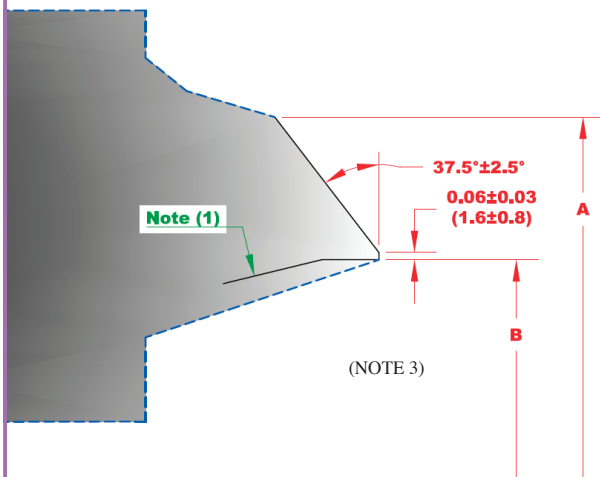
TABLE 8 (cont.)

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

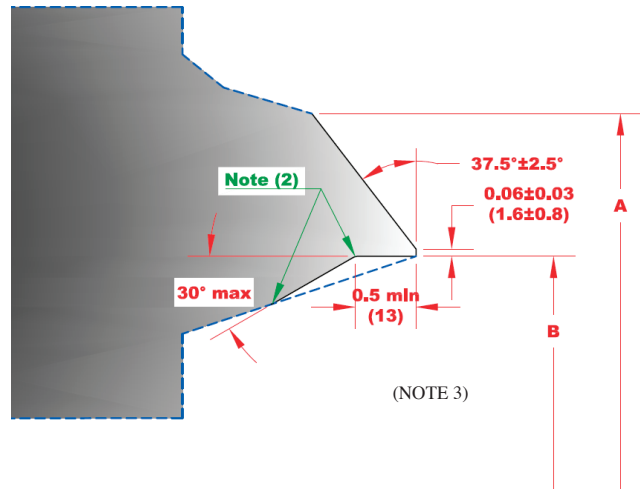
*SEE SKETCHES 1 AND 2

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

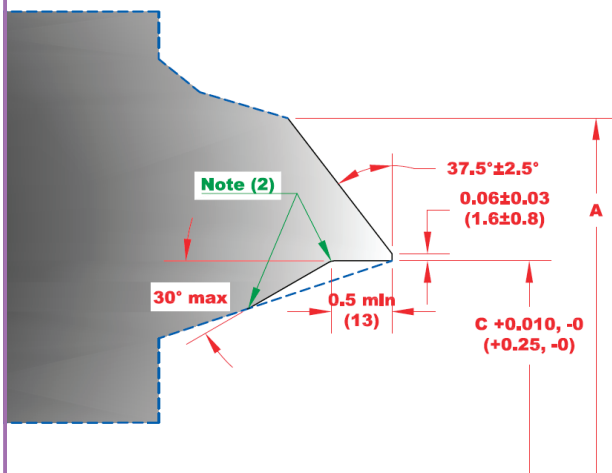
REFER TO ASME 16.25 FIG 2.



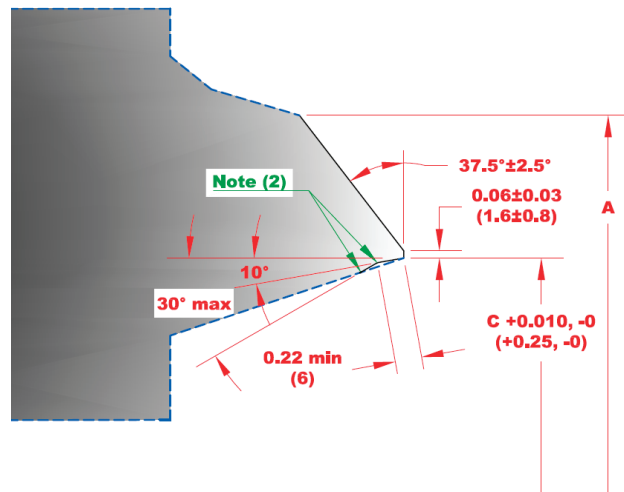
(a) Welding End Detail for Joint without Backing Ring



(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:

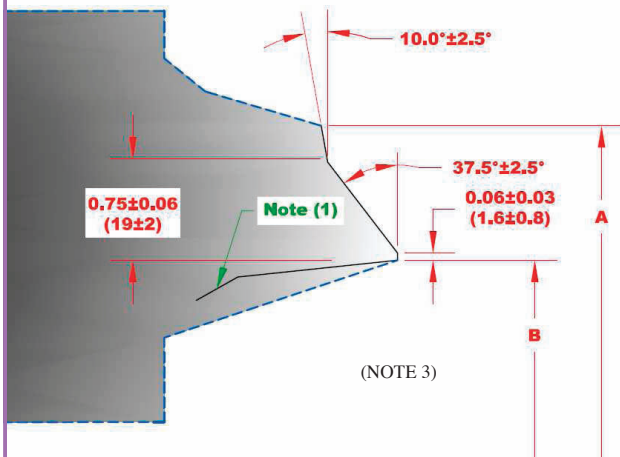
- Broken lines denote maximum envelope for transition from welding bevel and root face into body of component. Refer to Figure 1 of ASME B16.25 for details.
- Purchase order must specify contour of any backing ring to be used.
- Linear dimensions are in inches with millimeter values in parentheses.

NOTES:

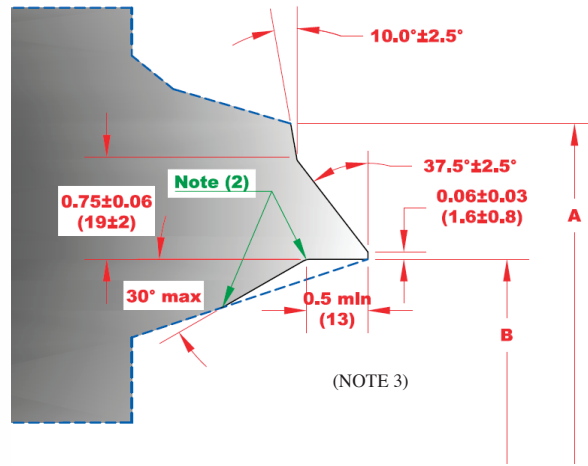
- Internal surface may be as-formed or machined for dimension B at root face.
- Intersections should be slightly rounded.
- Tolerances for "B" dimension on valve weld ends:
 - ± 0.03 " (± 1.0 mm) for $NPS \leq 10$
 - ± 0.06 " (± 2.0 mm) for $12 \leq NPS \leq 18$
 - $+0.12$ ", -0.06 " ($+3.0$ mm, -2.0 mm) for $NPS \geq 20$

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

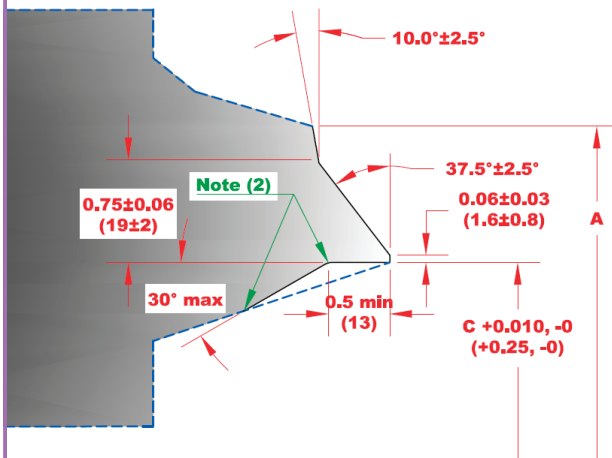
REFER TO ASME 16.25 FIG 3.



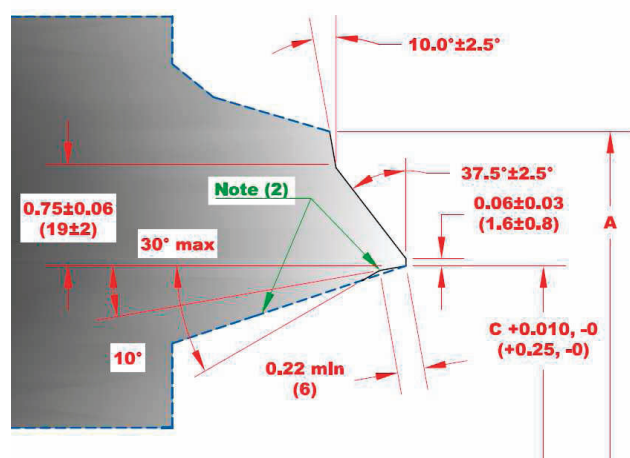
(a) Welding End Detail for Joint without Backing Ring



(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:

- 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.
- Purchase order must specify contour of any backing ring to be used.
- Linear dimensions are in inches with millimeter values in parentheses.

NOTES:

- Internal surface may be as-formed or machined for dimension B at root face.
- Intersections should be slightly rounded.
- Tolerances for "B" dimension on valve weld ends:
 - ± 0.03 " (± 1.0 mm) for $NPS \leq 10$
 - ± 0.06 " (± 2.0 mm) for $12 \leq NPS \leq 18$
 - $+0.12$ ", -0.06 " ($+3.0$ mm, -2.0 mm) for $NPS \geq 20$

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"

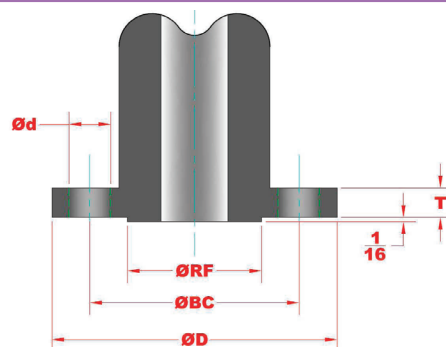
TABLE 10: ASME B16.5 CLASSES 600, Sizes ½" through 24"

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

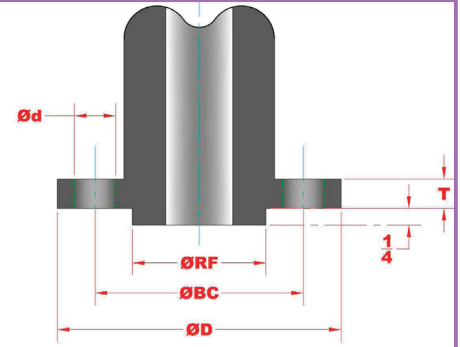
Nominal Pipe Size	Outside Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Thickness (T)	Raised Face Diameter (RF)
½	3.75	2.62	0.62	4	0.50	1.38
¾	4.62	3.25	0.75	4	0.56	1.69
1	4.88	3.50	0.75	4	0.62	2.00
1 ¼	5.25	3.88	0.75	4	0.69	2.50
1 ½	6.12	4.50	0.88	4	0.75	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

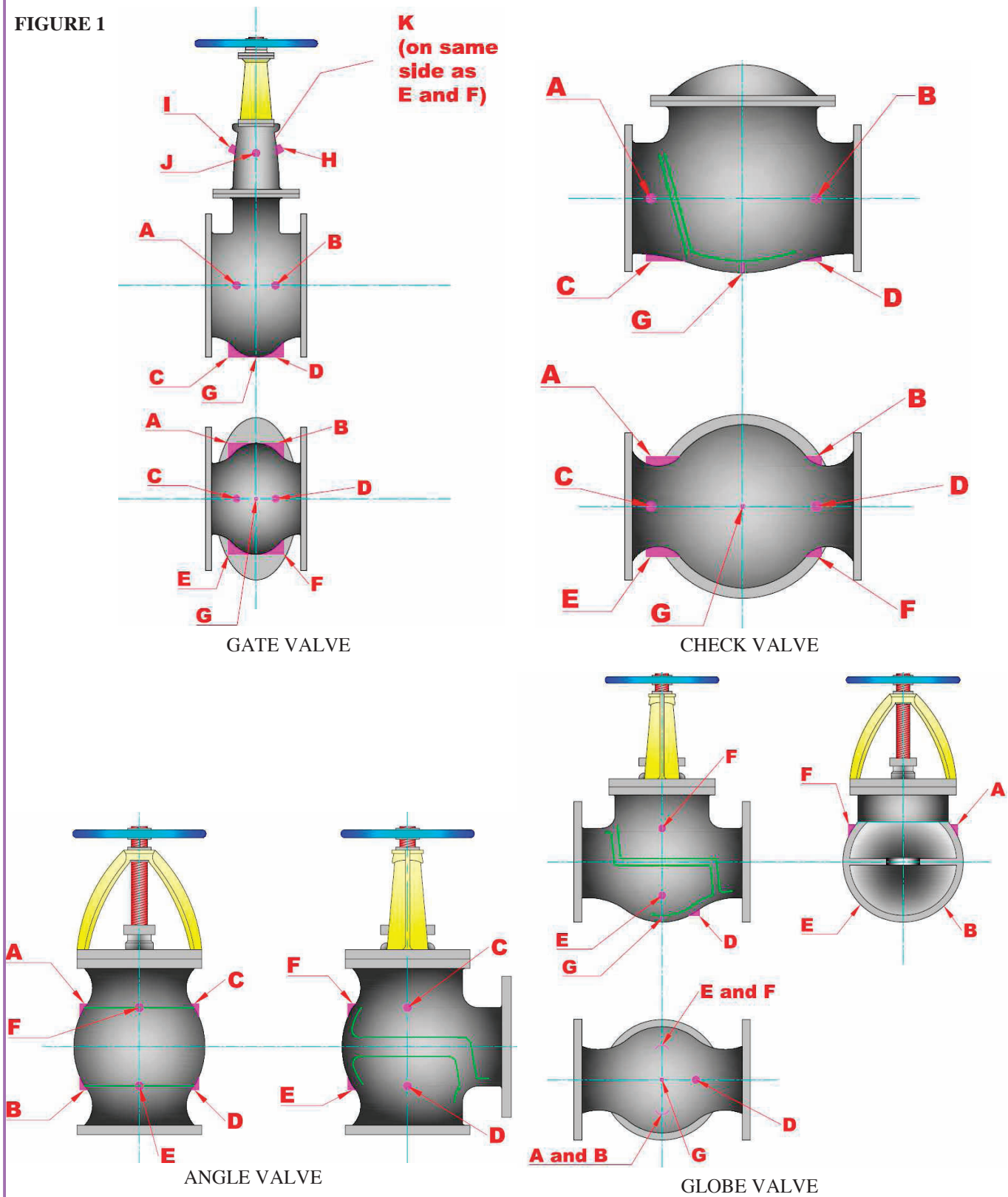
CLASS 600



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)
$\frac{1}{2}$	3.75	2.62	0.62	4	0.56	1.38
$\frac{3}{4}$	4.62	3.25	0.75	4	0.62	1.69
1	4.88	3.50	0.75	4	0.69	2.00
1 $\frac{1}{4}$	5.25	3.88	0.75	4	0.81	2.50
1 $\frac{1}{2}$	6.12	4.50	0.88	4	0.88	2.88
2	6.50	5.00	0.75	8	1.00	3.62
2 $\frac{1}{2}$	7.50	5.88	0.88	8	1.12	4.12
3	8.25	6.62	0.88	8	1.25	5.00
3 $\frac{1}{2}$	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



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 $\frac{1}{2}$ 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):

<u>VALVE SIZE</u>	<u>WATER</u> (FT/MIN)	<u>SATURATED STEAM</u> (FT/MIN)	<u>SUPERHEATED STEAM</u> (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

<u>METRIC NOMINAL SIZE</u> (DN)	<u>ENGLISH NOMINAL SIZE</u> (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): $F = 1.8 \times C + 32$

TO CONVERT FROM DEGREES FAHRENHEIT (F) TO DEGREES CENTIGRADE (C): $C = 0.556 \times (F - 32)$

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 States 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.

The logo for Powell Valves features the word "POWELL" in a bold, solid blue, sans-serif font. Below it, the word "VALVES" is written in a blue outline font of the same style. A thick, solid blue horizontal line is positioned directly beneath the word "VALVES".

Established 1846



POWELL VALVES

2503 SPRING GROVE AVENUE, CINCINNATI, OHIO 45214-1771, U.S.A.

PHONE 513.852.2000 • FAX NO. 513.852.2997

www.powellvalves.com

The background of the entire page is a technical drawing of various industrial valves, including gate valves, globe valves, and check valves. The drawing is rendered in a light orange or tan color, creating a blueprint-like effect. The lines are thin and precise, showing the internal and external components of the valves.

POWELL **VALVES**

BRONZE AND IRON VALVES
GATE, GLOBE AND CHECK VALVES
ASME CLASS 125 TO 300 / 1/4" TO 36"

Table of Contents

<u>SUBJECT</u>	<u>PAGE</u>
THE WM. POWELL COMPANY — PROFILE	2-3
BRONZE AND IRON VALVE INDEX	4
BRONZE GATE VALVES	6-17
BRONZE GLOBE VALVES	18-25
BRONZE SWING CHECK VALVES	26-29
IRON GATE VALVES	31-36
IRON GLOBE VALVES	37-38
IRON SWING CHECK VALVES	39-40
IRON UL AND FM GATE VALVES	42-51
IRON UL AND FM CHECK VALVES	52-55
CRYOGENIC VALVE INFORMATION	56
FIGURE NUMBER CROSS COMPARISON TABLE	57
ENGINEERING DATA	58-68
TERMS AND CONDITIONS	69-71

The Wm. Powell Company - Profile

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

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

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

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

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

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

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

Powell's end user customers have to react quickly to the demands that are on them to expand their businesses by implementing increased capacity and introducing new products into the market place at low costs and fast turn around times. Powell has addressed our customer's needs by increasing finished product inventory to over \$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.

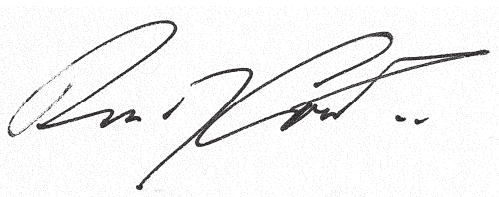
Powell also used its valve knowledge and expertise to construct a modification facility in the U.S.A. to assist customers with their needs, such as, automation, trim changes, end connection changes, additional quality inspections and special service pressure testing requirements, field service, etc...

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,

A handwritten signature in black ink, appearing to read "Randy Cowart", is written over a light gray rectangular background.

Randy Cowart

President, CEO & Chairman

The Wm. Powell Company

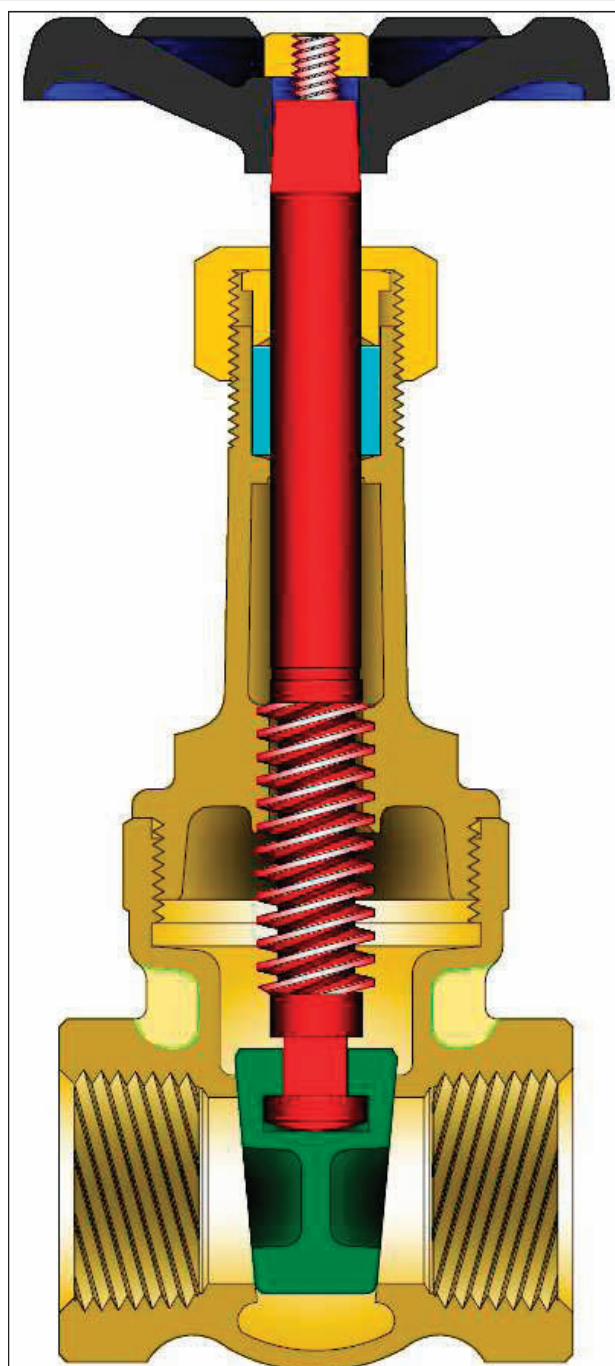
FIGURE NUMBER INDEX

TYPE	FIGURE	PAGES
BRONZE		
GATE		
	500, 514	6-7
	507, 512 / 2712	8-9
	2700, 2714	10-11
	375, 377	12-13
	2375, 2377	14-15
	1414	16-17
GLOBE		
	650	18-19
	150	20-21
	110, 120	22-23
	2600, 2608, 2612	24-25
CHECK		
	578	26-27
	560, 563	28-29
IRON		
GATE		
	3460, 3462	31-32
	1787	33-34
	1793, 1816, 1893, 1797	35-36
GLOBE		
	241	37-38
CHECK		
	559, 1259, 559P	39-40
UL / FM		
GATE		
	762U	42-43
	710U	44-45
	722U, 722F	46-47
	721UF	48-49
	710UF	50-51
CHECK		
	763 U	52-53
	453UG, 453UF	54-55

FIGURE	PAGES
110	22-23
120	22-23
150	20-21
241	37-38
375	12-13
377	12-13
453UG, 453UF	54-55
500	6-7
507, 512	8-9
514	6-7
559, 559P	39-40
560	28-29
563	28-29
578	26-27
650	18-19
710U	44-45
710UF	50-51
721UF	48-49
722U, 722F	46-47
762U	42-43
763U	52-53
1259	39-40
1414	16-17
1787	33-34
1793	35-36
1797	35-36
1816	35-36
1893	35-36
2375	14-15
2377	14-15
2600	24-25
2608	24-25
2612	24-25
2700	10-11
2712	8-9
2714	10-11
3460, 3462	31-32

BRONZE VALVES

MSS SP-80 GATE VALVE
THREADED BONNET, THREADED ENDS
GATE ¼ TO 3" (6 TO 75mm) CLASSES 125 AND 150
BRONZE RISING STEM



Class	Fig. No.
125	500
150	514

STANDARD MATERIALS

PART	MATERIALS
Body	B62
Bonnet	B62
Wedge	B62
Stem	B371 C69400
Packing Nut	B124 C37700
Gland	B124 C37700
Packing	Graphite
Hand Wheel	Ductile Iron
Hand Wheel Nut	Brass
Wheel Plate	Aluminum

Design Specifications

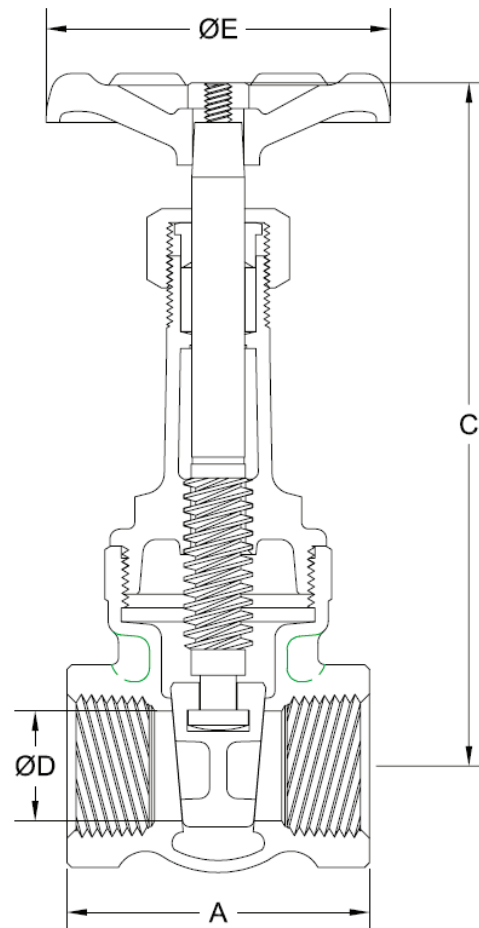
Item	Applicable Specification
Pressure - temperature ratings	MSS SP-80
General valve design	MSS SP-80
Thread design	ASME B1.20.1
Materials	ASTM

DESIGN FEATURES:

- **Renewable** solid wedges.
- **Integral** seats.
- **High-Tensile** bronze alloy stems.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-80

GATE VALVE DIMENSIONS (CLASSES 125 & 150).

SIZE	FIG 500 & 514					
in	A	C	D	E	WT	lb
mm						kg
¼	1.81	5.0	0.25	2.5	0.9	3.2
6	46	128	6	64	0.4	
⅜	1.81	5.0	0.38	2.5	0.9	7.1
10	46	128	10	64	0.4	
½	2.00	5.1	0.50	2.5	1.0	12.6
13	51	130	13	64	0.5	
¾	2.19	6.3	0.75	2.8	1.5	30
20	56	159	19	70	0.7	
1	2.50	7.5	1.00	3.0	2.3	55
25	64	190	25	77	1.0	
1¼	2.81	8.7	1.25	3.3	3.6	87
32	72	222	32	83	1.6	
1½	2.94	9.8	1.50	3.6	4.8	129
40	74	250	38	92	2.2	
2	3.31	11.9	2.00	4.1	7.1	240
50	84	303	51	103	3.2	
2½	4.13	14.6	2.50	5.1	14.0	350
65	105	370	64	130	6.4	
3	4.44	16.5	3.00	5.7	19.1	510
75	112	420	76	145	8.7	

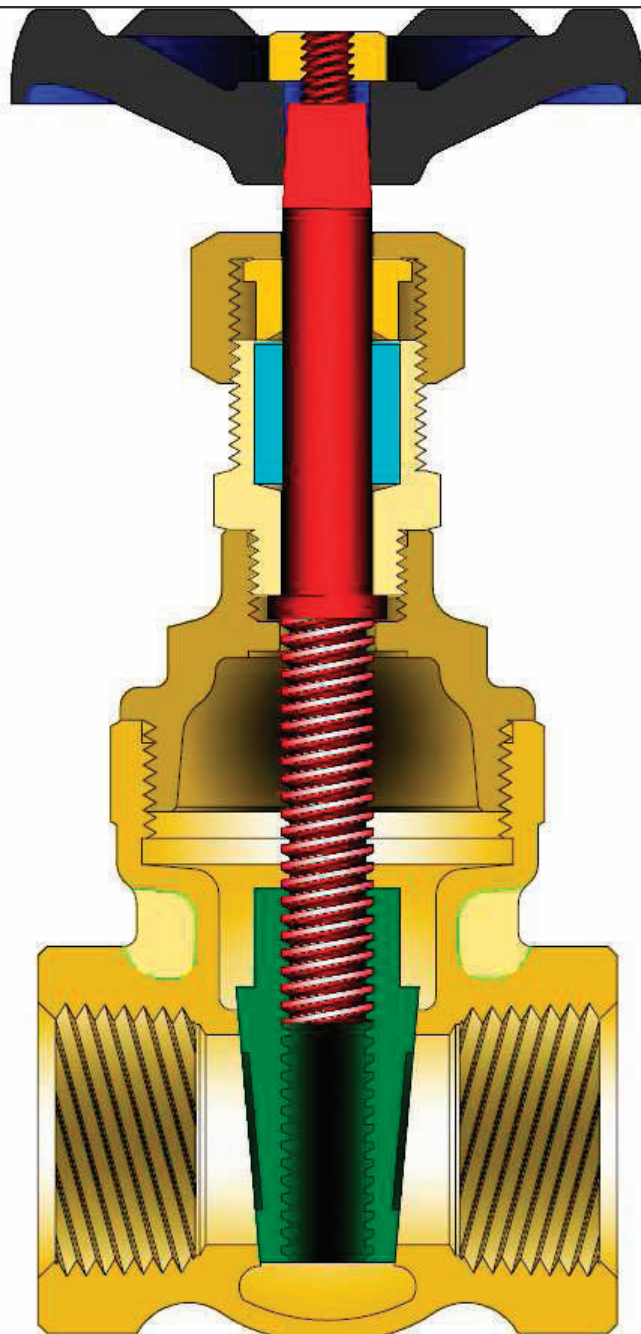


C = Center to top open

WT = Weight

C_v = Flow Coefficient

MSS SP-80 GATE VALVE
THREADED BONNET, THREADED ENDS
GATE ¼ TO 3" (6 TO 75mm) CLASSES 125 AND 150
BRONZE NON-RISING STEM



STANDARD MATERIALS

PART	MATERIALS
Body	B62
Bonnet	B62
Wedge	B62
Stem	B371 C69400
Packing Nut	B62 or B16
Gland	B16
Packing	Graphite
Hand Wheel	Ductile Iron
Hand Wheel Nut	Brass
Stuffing Box	B371 C69400
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

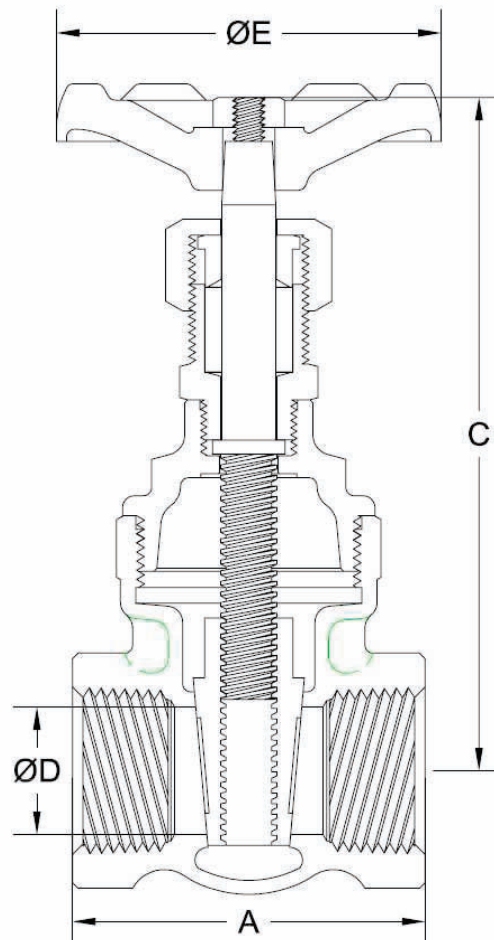
DESIGN FEATURES:

- **Renewable** solid wedges.
- **Integral** seats.
- **High-Tensile** bronze alloy stems.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-80.
- **Stems** are rotating, non-rising design.

Class	Fig. No.
125	507
150	512 / 2712

GATE VALVE DIMENSIONS (CLASSES 125 & 150).

SIZE	FIG 507, 512, & 2712					
in	A	C	D	E	WT	lb
mm						kg
¼	1.75	3.5	0.25	2.1	0.7	3.2
6	44	89	6	54	0.3	
¾	2.00	3.5	0.38	2.1	0.9	7.1
10	51	89	10	54	0.4	
½	2.38	3.9	0.50	2.5	1.0	12.6
13	60	99	13	64	0.5	
¾	2.44	4.6	0.75	2.8	1.7	30
20	62	117	19	70	0.8	
1	2.75	5.4	1.00	3.0	2.8	55
25	70	137	25	76	1.3	
1¼	3.00	6.2	1.25	3.3	4.0	87
32	76	157	32	83	1.8	
1½	3.38	6.8	1.50	3.6	5.0	129
40	86	173	38	92	2.3	
2	3.50	7.8	2.00	4.1	7.2	240
50	89	198	51	103	3.3	
2½	4.50	9.4	2.50	5.1	16.0	350
65	114	239	64	130	7.3	
3	5.00	10.5	3.00	5.7	22.5	510
75	127	267	76	144	10.2	

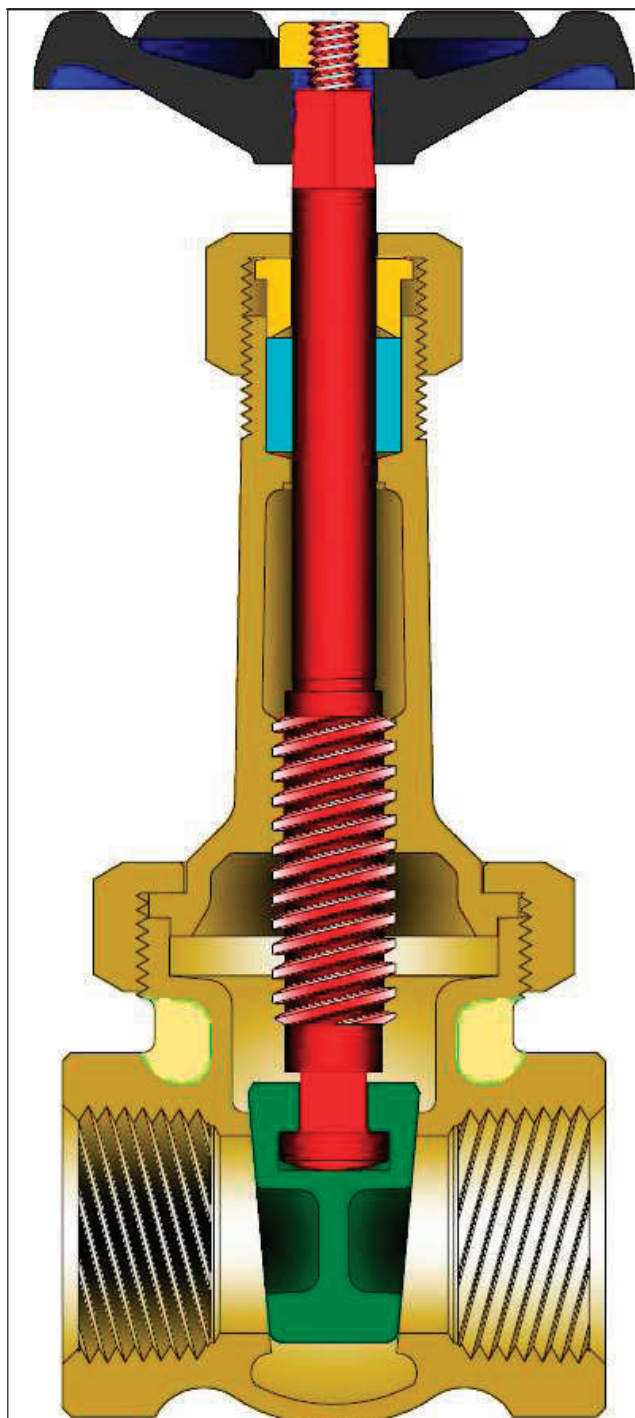


C = Center to top open / closed

WT = Weight

C_v = Flow Coefficient

MSS SP-80 GATE VALVE
UNION BONNET, THREADED ENDS
¼ TO 3" (6 TO 75mm) CLASSES 125 AND 150
BRONZE RISING STEM



Class	Fig. No.
125	2700
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	Graphite
Hand Wheel	A47 Gr. 32510
Hand Wheel Nut	Brass
Wheel Plate	Aluminum

Design Specifications

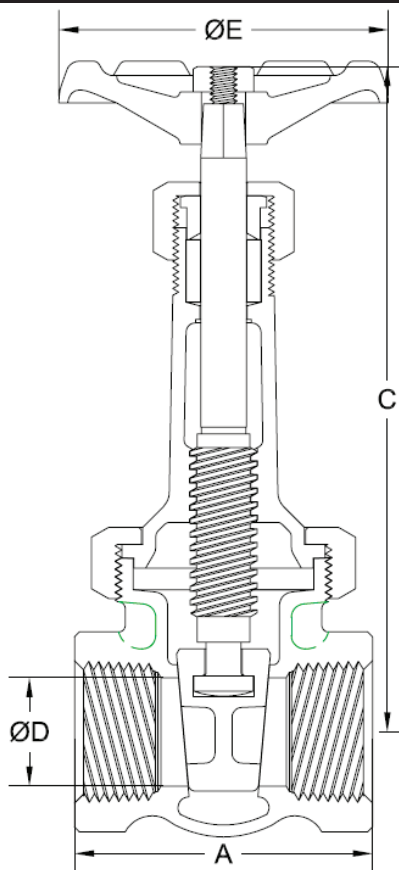
Item	Applicable Specification
Pressure - temperature ratings	MSS SP-80
General valve design	MSS SP-80
Thread design	ASME B1.20.1
Materials	ASTM

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.

GATE VALVE DIMENSIONS (CLASS 125 AND 150).

SIZE	FIG 2700 & 2714					
in	A	C	D	E	WT	lb
mm						kg
¼	1.75	4.3	0.38	2.1	0.8	3.2
6	44	108	10	54	0.4	
¾	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	

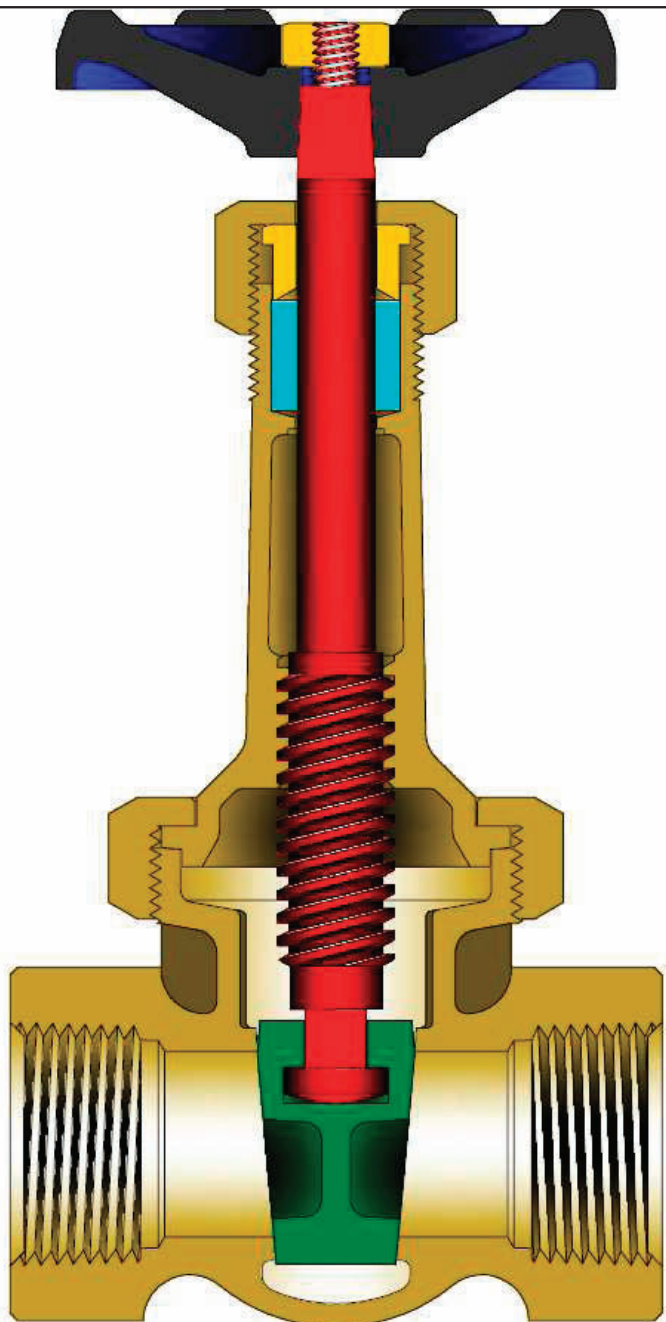


C = Center to top open

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



Class	Fig. No.
200	375
300	377

STANDARD MATERIALS

PART	MATERIALS
Body	B61
Bonnet	B61
Bonnet Ring	B61
Wedge	B61
Stem	B371 C69400
Packing Nut	B62 or B16
Gland	B16
Packing	Graphite
Hand Wheel	A47 Gr. 32510
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.

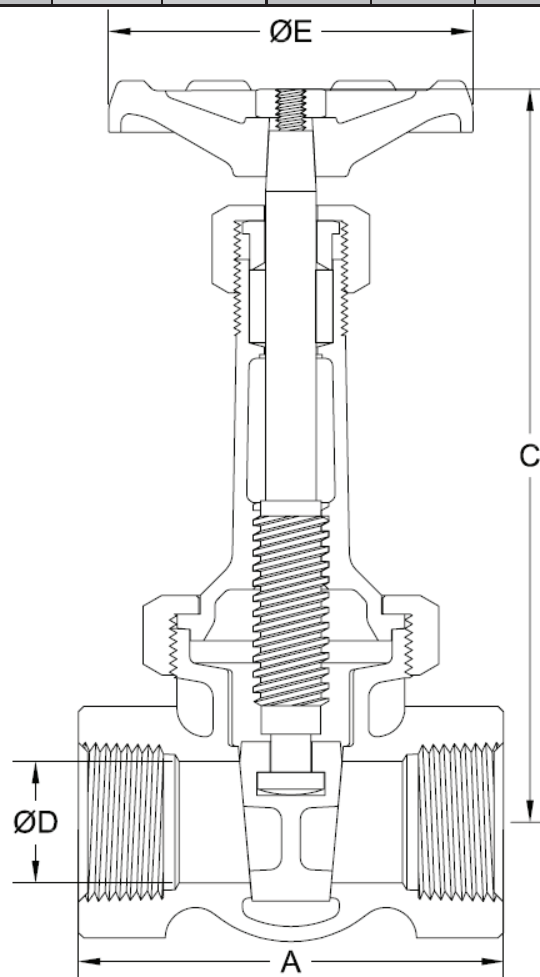
GATE VALVE DIMENSIONS (CLASSES 200 & 300).

SIZE	FIG 375							FIG 377						
in	A	C	D	E	WT	lb	C _V	A	C	D	E	WT	lb	C _V
mm						kg							kg	
¼	1.81	4.3	0.25	2.1	0.8		3.2	1.94	4.9	0.25	3.0	1.3		3.2
6	46	108	6	54	0.4			49	124	6	76	0.6		
¾	2.06	4.3	0.38	2.1	0.9		7.1	2.13	4.9	0.38	3.0	1.3		7.1
10	52	108	10	54	0.4			54	124	10	76	0.6		
½	2.44	4.9	0.50	2.5	1.2		12.6	2.44	5.9	0.50	3.3	1.8		12.6
13	62	124	13	64	0.7			62	149	13	83	0.8		
¾	2.56	6.1	0.75	2.8	2.0		30	2.69	7.2	0.75	3.6	3.0		30
20	65	156	19	70	0.9			68	183	19	92	1.3		
1	2.94	7.4	1.00	3.0	2.7		55	3.00	8.3	1.00	4.1	4.9		55
25	75	187	25	76	1.2			76	210	25	105	2.2		
1¼	3.13	8.6	1.25	3.3	4.7		90	3.38	9.5	1.25	4.6	6.9		90
32	79	219	32	83	2.1			86	241	32	117	3.1		
1½	3.50	9.6	1.50	3.6	5.5		130	3.75	10.8	1.50	5.1	8.9		130
40	89	244	38	92	2.5			95	273	38	130	4.0		
2	4.00	11.7	2.00	4.1	9.1		240	4.38	13.1	2.00	5.7	17		240
50	102	297	51	103	4.1			111	333	51	144	7.7		
2½	4.63	15.1	2.50	4.7	19		350	5.00	14.1	2.50	8.0	24		350
65	117	384	64	119	8.6			127	357	64	203	11		
3	5.13	17.4	3.00	5.7	26		510	5.63	16.4	3.00	9.0	32		510
75	130	443	76	145	11			143	416	76	229	15		

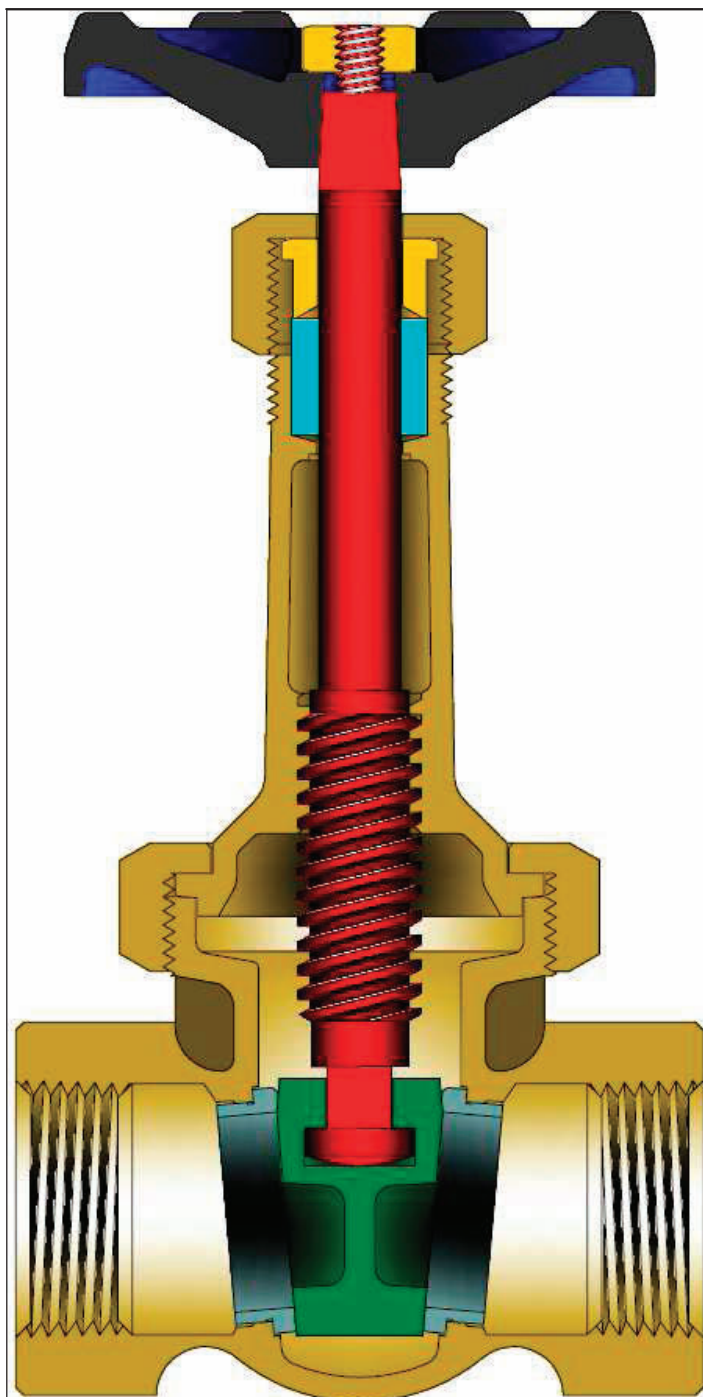
C = Center to top open

WT = Weight

C_v = Flow Coefficient



MSS SP-80 GATE VALVE
UNION BONNET, THREADED ENDS
3/8 TO 3" (6 TO 75mm) CLASSES 200 AND 300
BRONZE RISING STEM WITH ROLLED-IN SEAT RINGS



STANDARD MATERIALS

PART	MATERIALS
Body	B61
Bonnet	B61
Bonnet Ring	B61
Wedge	B61
Seat Ring	A312 Type 304 (1)
Stem	B371 C69400
Packing Nut	B62 or B16
Gland	B16
Packing	Graphite
Hand Wheel	A47 Gr. 32510
Hand Wheel Nut	Brass
Wheel Plate	Aluminum

(1) Sizes 3/8 - 1/2" use A276 T410.

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.
- **Rolled-in** seat rings.
- **High-Tensile** bronze alloy stems
- **Stems** are rotating / rising design.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-80.

Type	Class	Fig. No.
Rising Stem	200	2375
	300	2377

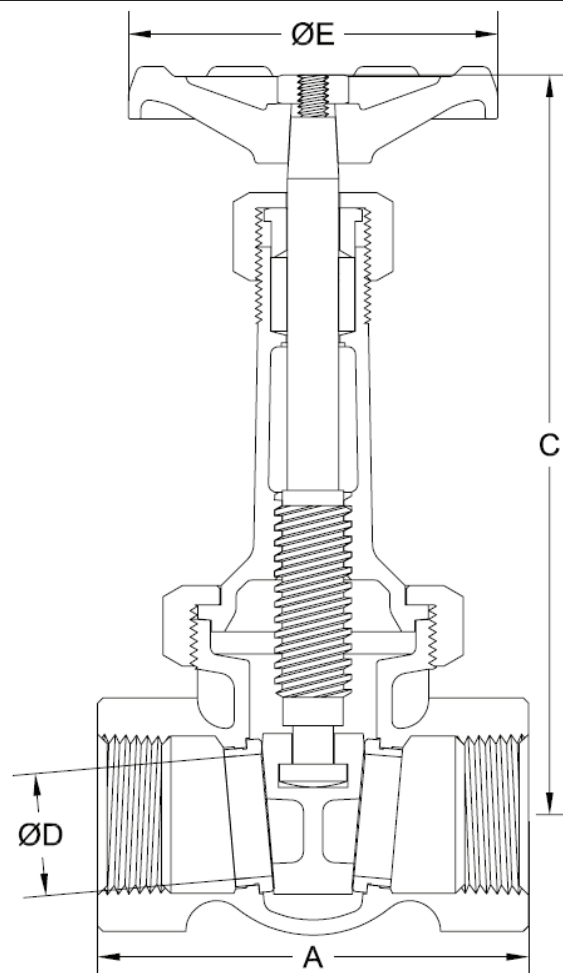
GATE VALVE DIMENSIONS (CLASSES 200 & 300).

SIZE	FIG 2375							FIG 2377						
in	A	C	D	E	WT	lb	C _V	A	C	D	E	WT	lb	C _V
mm						kg							kg	
¾	2.06	4.3	0.38	2.1	0.9		7.1	2.13	4.9	0.38	3.0	1.3		7.1
10	52	108	10	54	0.4			54	124	10	76	0.6		
½	2.31	4.9	0.50	2.5	1.2		12.6	2.44	5.9	0.50	3.3	1.7		12.6
13	59	124	13	64	0.5			62	149	13	83	0.8		
¾	2.56	6.1	0.75	2.8	1.9		30	2.69	7.2	0.75	3.6	2.9		30
20	65	156	19	70	0.9			68	183	19	92	1.3		
1	2.94	7.4	1.00	3.0	2.8		55	3.00	8.3	1.00	4.1	4.2		55
25	75	187	25	76	1.3			76	210	25	105	1.9		
1 ¼	3.13	8.6	1.25	3.3	5.0		90	3.38	9.5	1.25	4.6	6.5		90
32	79	219	32	83	2.3			86	241	32	117	2.9		
1 ½	3.50	9.6	1.50	3.6	5.4		130	3.75	10.8	1.50	5.1	9.5		130
40	89	244	38	92	2.4			95	273	38	130	4.3		
2	4.00	11.7	2.00	4.1	8.9		240	4.38	13.1	2.00	5.7	17		240
50	102	297	51	103	4.0			111	333	51	144	7.7		
2 ½	4.63	15.1	2.50	5.7	18		350	5.00	14.1	2.50	8.0	24		350
65	117	384	64	144	8.2			127	357	64	203	11		
3	5.13	17.4	3.00	6.4	25		510	5.63	16.4	3.00	9.0	32		510
75	130	443	76	162	11			143	416	76	229	15		

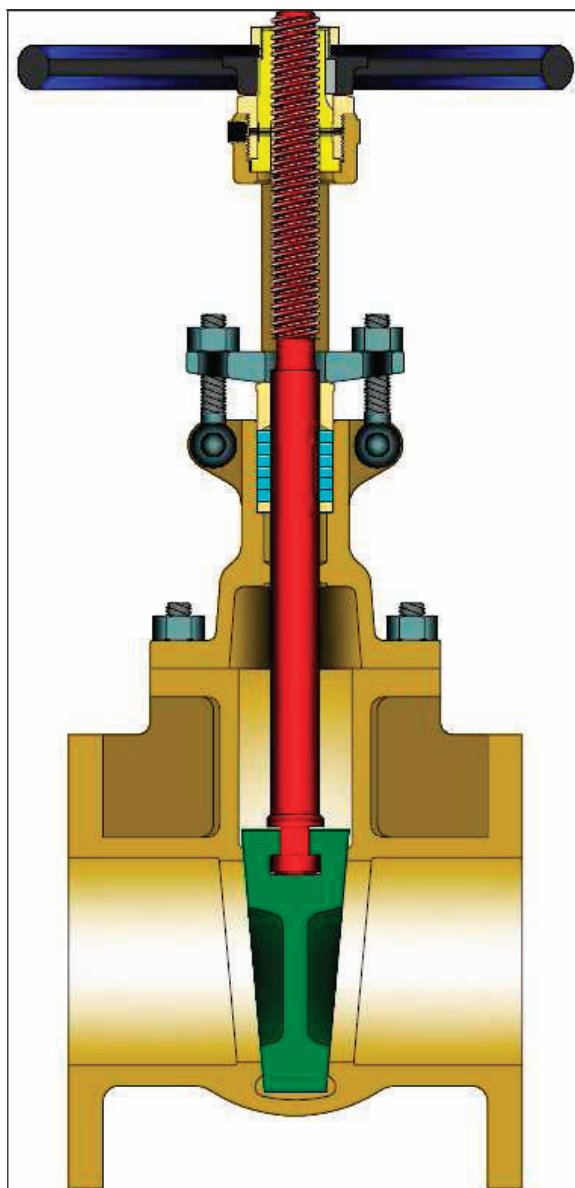
C = Center to top open

WT = Weight

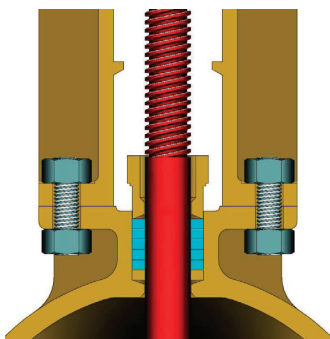
C_V = Flow Coefficient



MSS SP-80 GATE VALVE
BOLTED BONNET, FLANGED ENDS
4 TO 12" (100 TO 300mm) CLASS 150
BRONZE RISING STEM



Class	Fig. No.
150	1414



(1) Yoke and Bonnet Design for Sizes 8" - 12"

STANDARD MATERIALS

PART	MATERIALS
Body	B62
Bonnet	B62
Set Screw	Steel
Wedge	B62
Gasket	Comm. Non-Asbestos
Stem	B16
Stem Bushing	B62
Body Bolt	300 SST
Body Nut	300 SST
Gland	B62
Gland Flange	A351 CF8
Packing	Graphite
Packing Washer	Bronze
Eyebolt	300 SST
Eyebolt Nut	300 SST
Eyebolt Pin	300 SST
Hand Wheel	A47 Gr. 32510
Hand Wheel Key	Steel
Hand Wheel Nut	Steel
Lubricant Fitting	Steel
Yokearms (1)	A47 Gr. 32510
Yokearm Ear Bolts (1)	Steel
Yokearm Ear Nuts (1)	Steel
Yokearm Bolts (1)	Steel
Yokearm Nuts (1)	Steel
Wheel Plate	Aluminum

(1) Sizes 8" - 12"

Design Specifications

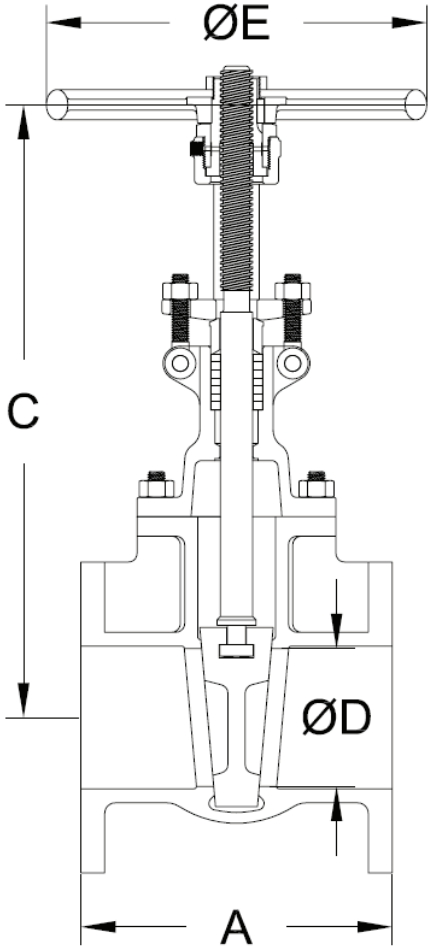
Item	Applicable Specification
Pressure - temperature ratings	MSS SP-80
General valve design	MSS SP-80
Flanged design	ASME B16.24
Materials	ASTM

DESIGN FEATURES:

- **Renewable** solid wedges.
- **Integral** seats.
- **Large** stuffing box.
- **Stems** are rotating / rising design.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-80.

GATE VALVE DIMENSIONS (CLASS 150).

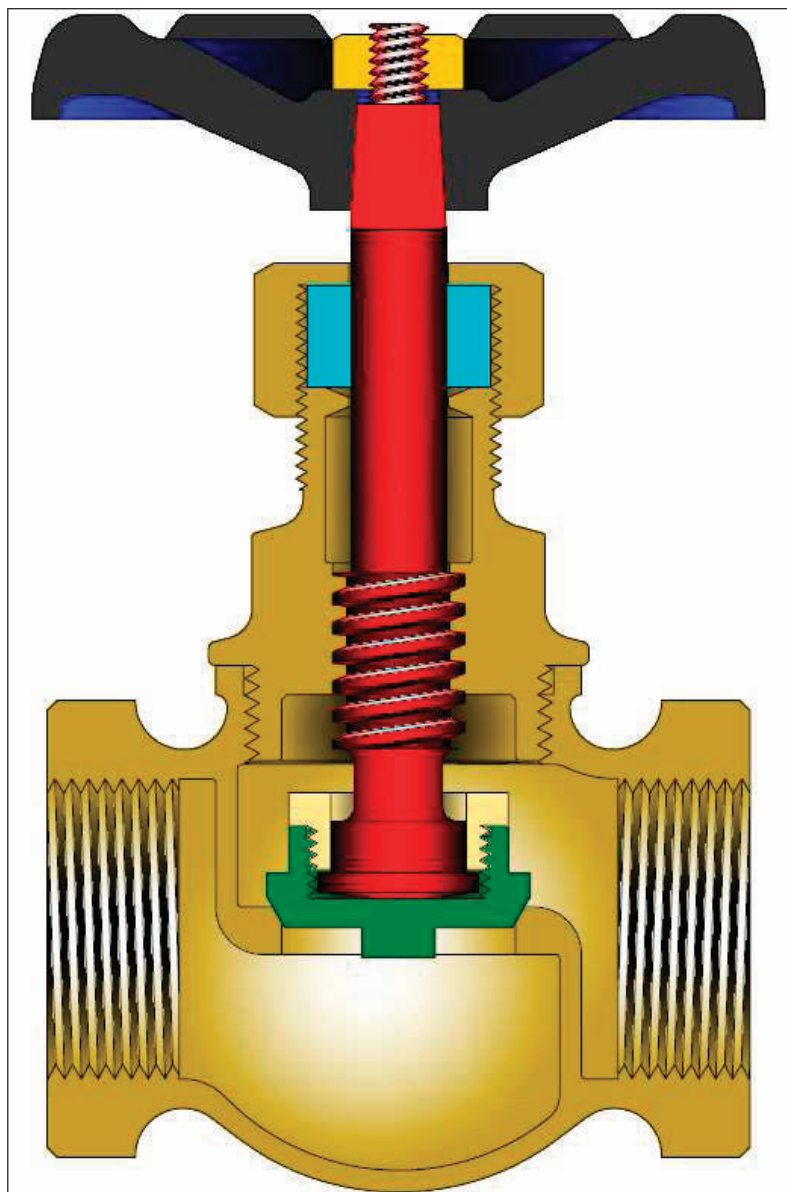
SIZE	FIG 1414					
in	A	C	D	E	WT	lb
mm						kg
4	9.00	20.3	4.00	9.0	87	1020
100	229	496	98	221	39	
6	10.50	30.0	6.00	12.0	157	2440
150	267	735	147	294	71	
8	11.50	37.4	8.00	14.0	255	4500
200	292	916	196	343	116	
10	13.00	47.3	10.00	16.0	445	7000
250	330	1203	245	406	202	
12	14.00	55.5	12.00	16.0	714	10500
300	356	1410	294	406	324	



C = Center to top open

WT = Weight

C_v = Flow Coefficient



STANDARD MATERIALS

PART	MATERIALS
Body	B62
Bonnet	B62*
Disc	B62**
Stem	B371 C69400
Packing Nut	B62 or B16
Disc Locknut	B371 C69400
Packing	Graphite
Hand Wheel	A47 Gr. 32510
Hand Wheel Nut	Brass
Horseshoe Ring	SS 303 or SS 304
Wheel Plate	Aluminum

* B16 for sizes ¼" through ¾"

** For ½" and smaller sizes, disc and stem are integral and disc material is same as stem.

Class	Fig. No.
125	650

DESIGN FEATURES:

- **High-Tensile** bronze alloy stem.
- **Integral** seats.
- **Discs** in ¾" and larger valves are attached to stem by disc locknut. The ½" and smaller valves have stem and disc integral.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-80.

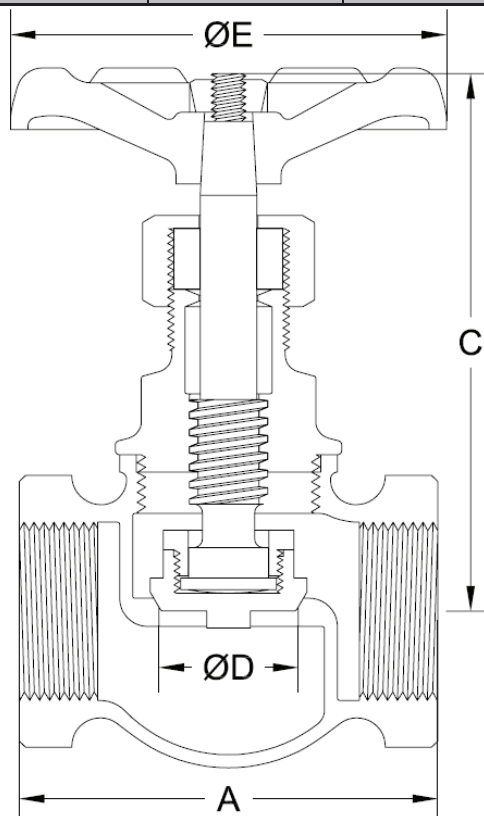
Design Specifications

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

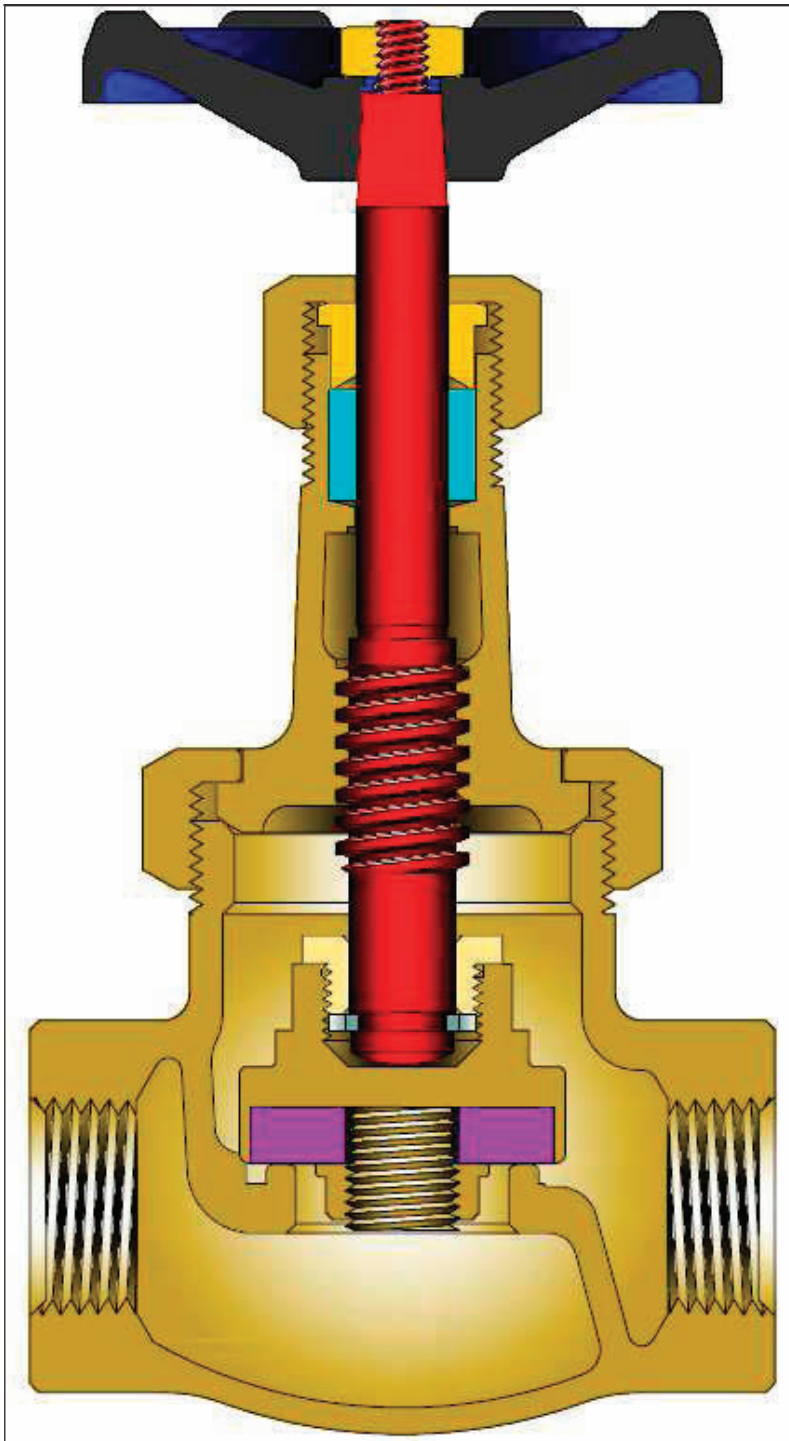
GLOBE VALVE DIMENSIONS (CLASS 125).

SIZE	FIG 650					
in	A	C	D	E	WT	lb
mm						kg
¼	1.63	2.7	0.25	2.1	0.4	0.6
6	41	68	6	54	0.2	
⅜	1.94	3.0	0.38	2.5	0.6	1.4
10	49	76	10	64	0.3	
½	2.13	3.4	0.50	2.8	0.8	2.5
13	54	86	13	70	0.4	
¾	2.50	3.9	0.75	3.0	1.3	5.8
20	64	100	19	76	0.6	
1	3.00	4.4	1.00	3.3	1.9	10.7
25	76	111	25	83	0.9	
1¼	3.44	5.1	1.25	3.6	2.7	17.1
32	87	129	32	92	1.2	
1½	3.81	5.4	1.50	4.1	4.4	25
40	97	137	38	105	2.0	
2	4.75	6.5	2.00	4.8	5.9	50
50	121	165	51	121	2.7	
2½	5.69	7.3	2.50	5.1	10.1	75
65	144	186	64	130	4.6	
3	6.56	8.3	3.00	5.8	15.4	110
75	167	210	76	146	7.0	

C = Center to top open
WT = Weight
C_v = Flow Coefficient



MSS SP-80 GLOBE VALVE
UNION BONNET, THREADED ENDS
¼ TO 3" (6 TO 75mm) CLASS 150
BRONZE WITH RENEWABLE COMPOSITION DISC



STANDARD MATERIALS

PART	MATERIALS
Body	B62
Bonnet	B62
Disc	Glass Filled PTFE
Disc Locknut	B-371 C69400
Disc Nut	B62
Disc Holder	B62
Horseshoe Ring	SS 303 or SS 304
Stem	B371 C69400
Packing Nut	B62 or B374 C69400
Gland	B16
Packing	Graphite
Hand Wheel	A47 Gr. 32510
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:

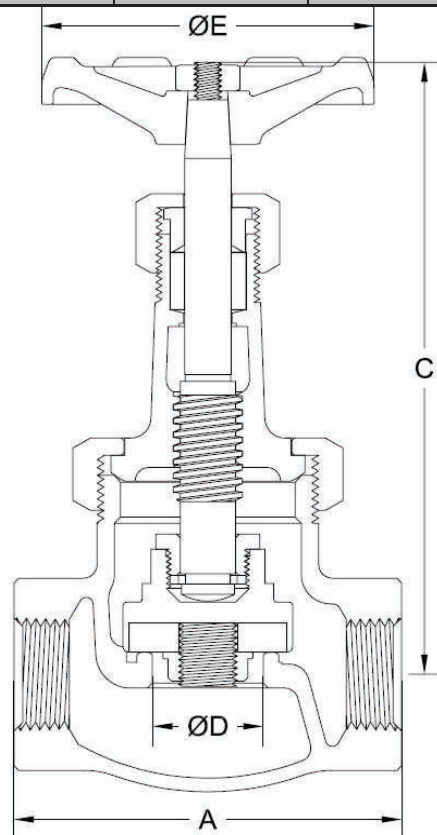
- **Integral** seats have opening equal to nominal pipe size of valve.
- **High-Tensile** bronze alloy stem.
- **Each** valve is shell and seat tested per industry standard MSS SP-80.

Class	Fig. No.
150	150

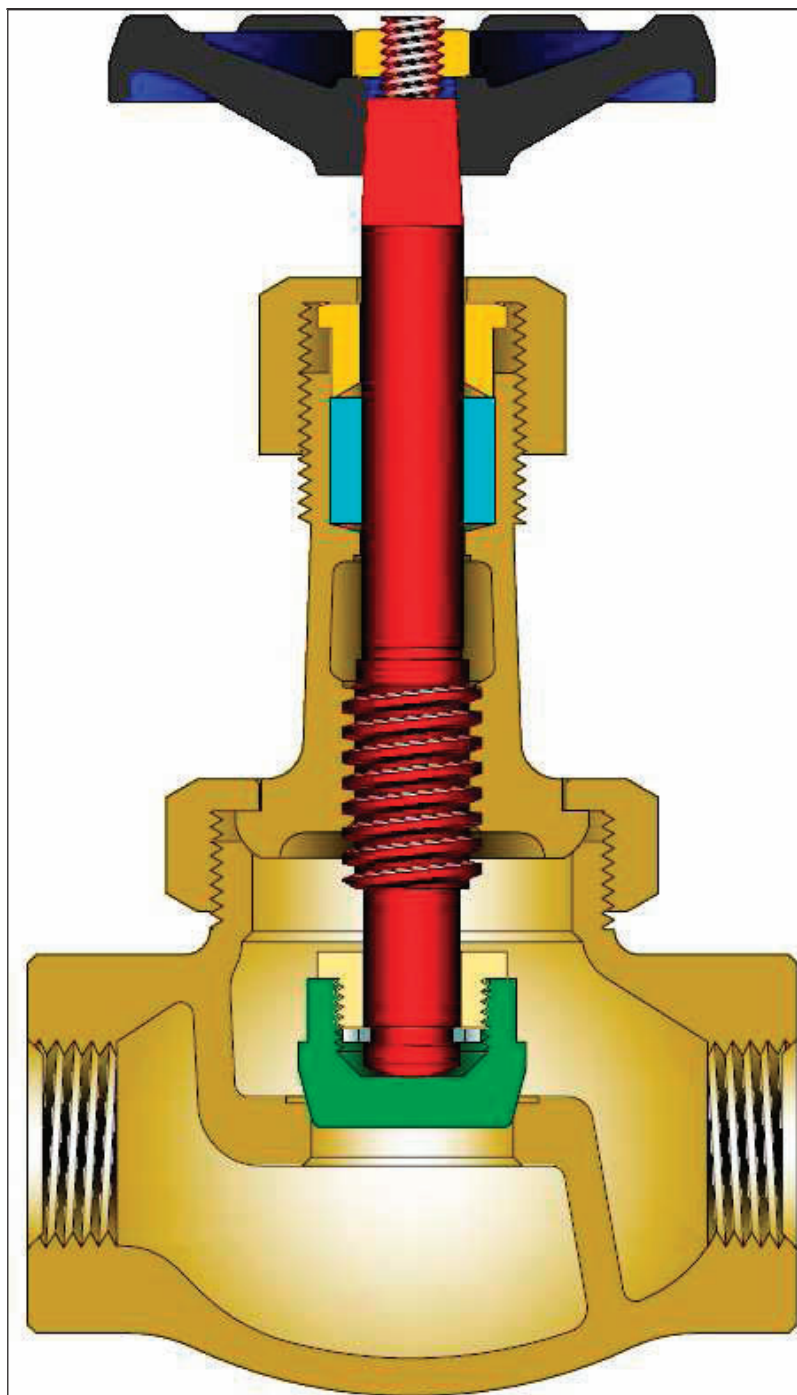
GLOBE VALVE DIMENSIONS (CLASS 125).

SIZE	FIG 150					
in	A	C	D	E	WT	lb
mm						kg
¼	2.13	4.2	0.25	2.5	0.8	0.6
6	54	106	6	64	0.4	
¾	2.25	4.2	0.38	2.5	0.9	1.4
10	57	106	10	64	0.4	
½	2.50	4.8	0.50	2.8	1.3	2.5
13	64	122	13	70	0.6	
¾	3.00	5.4	0.75	3.0	2.1	5.8
20	76	138	19	76	1.0	
1	3.56	6.1	1.00	3.3	3.4	10.7
25	90	156	25	83	1.5	
1¼	4.13	6.8	1.25	3.6	5.1	17.1
32	105	173	32	92	2.3	
1½	4.63	7.3	1.50	4.1	6.6	25
40	117	187	38	103	3.0	
2	5.75	8.1	2.00	4.6	10.5	50
50	146	206	51	117	4.8	
2½	6.63	9.5	2.50	5.7	18.6	75
65	168	241	64	144	8.4	
3	8.50	10.8	3.00	6.4	28.4	110
75	216	275	76	162	12.9	

C = Center to top open
WT = Weight
C_v = Flow Coefficient



MSS SP-80 GLOBE VALVES
UNION BONNET, THREADED ENDS
¼ TO 3" (6 TO 75mm) CLASSES 200 AND 300
BRONZE



Class	Fig. No.
200	110
300	120

DESIGN FEATURES:

- **Plug** type discs are held by a lock-nut.
- **Integral** seats have openings equal to nominal pipe size of valve.
- **High-Tensile** bronze alloy stem.
- **Valves** can be reground without being removed from the line.

STANDARD MATERIALS

PART	MATERIALS
Body	B61
Bonnet	B61
Bonnet Ring	B61
Disc	B61 or B371 C69400
Disc Locknut	B371 C69400
Horseshoe Ring	SS 303 or SS 304
Stem	B371 C69400
Packing Nut	B62
Gland	B16
Packing	Graphite
Hand Wheel	A47 Gr. 32510
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

- **Each** valve is shell and seat pressure tested per industry standard MSS SP-80.

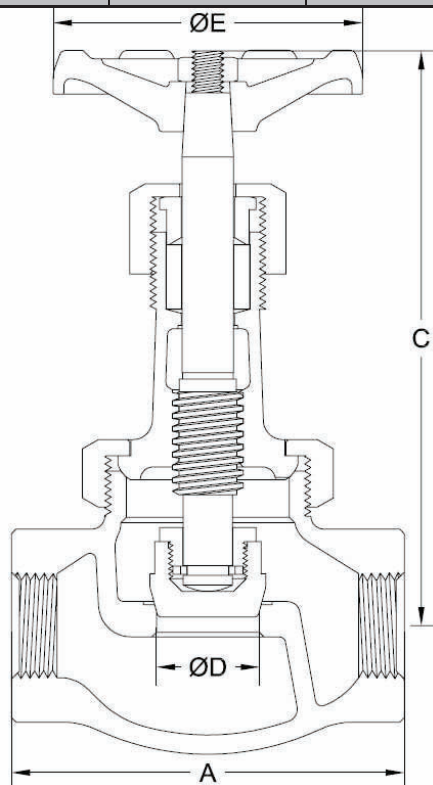
GLOBE VALVE DIMENSIONS (CLASS 200 & 300).

SIZE	FIG 110 & 120					
in	A	C	D	E	WT	lb
mm						kg
¼	2.25	4.0	0.25	2.5	0.9	0.6
6	57	102	6	64	0.4	
¾	2.38	4.0	0.38	2.5	1.1	1.4
10	60	102	10	64	0.5	
½	2.63	4.6	0.50	2.8	1.5	2.5
13	67	117	13	70	0.7	
¾	3.25	5.5	0.75	3.3	2.7	5.8
20	83	140	19	83	1.2	
1	3.81	6.2	1.00	3.6	3.9	10.7
25	97	158	25	92	1.8	
1¼	4.38	6.8	1.25	4.1	5.7	17.1
32	111	171	32	103	2.6	
1½	4.88	7.7	1.50	4.8	8.8	25
40	124	196	38	121	4.0	
2	6.00	8.7	2.00	5.7	13.9	50
50	152	221	51	144	6.3	
2½	7.00	10.9	2.50	8.0	22.5	75
65	178	276	64	203	10.2	
3	7.88	12.1	3.00	9.0	36.3	110
75	200	308	76	229	16.4	

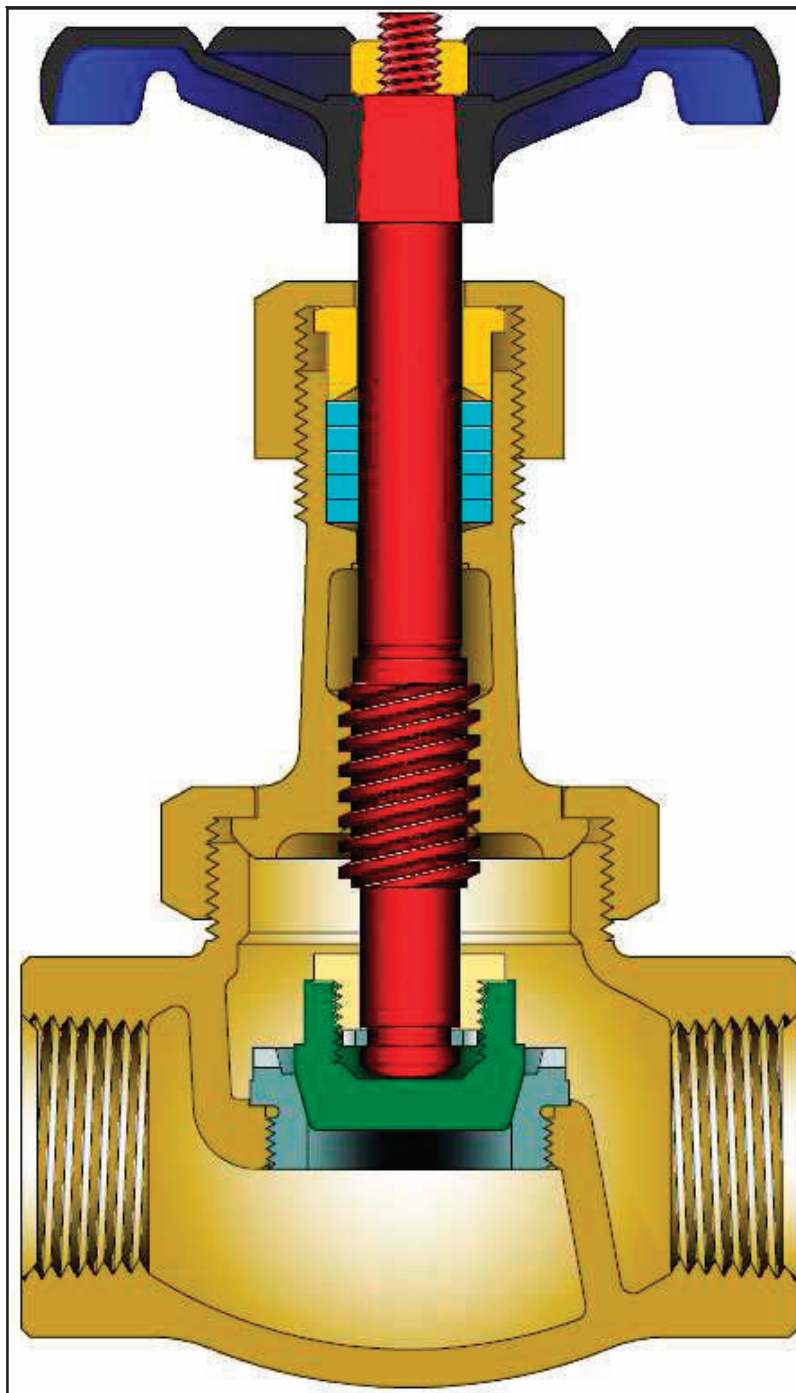
C = Center to top open

WT = Weight

C_v = Flow Coefficient



MSS SP-80 GLOBE VALVES
UNION BONNET, THREADED ENDS
¼ TO 3" (6 TO 75mm) CLASSES 150 TO 300
BRONZE WITH RENEWABLE STAINLESS STEEL SEAT AND DISC



Class	Fig. No.
150	2600
200	2608
300	2612

DESIGN FEATURES:

- **Renewable** plug type stainless steel disc.
- **Renewable** stainless steel seat has full nominal pipe size opening.
- **High-Tensile** bronze alloy stems.
- **Differential** hardness between seat and disc to prevent galling.

STANDARD MATERIALS

PART	MATERIALS
Body	B61
Bonnet	B61
Bonnet Ring	B61
Disc	A582 T416
Disc Locknut	B371 C69400
Horseshoe Ring	SS 303 or SS 304
Seat Ring	A582 T416
Stem	B371 C69400
Packing Nut	B62 or B16
Gland	B16
Packing	Graphite
Hand Wheel	A47 Gr. 32510
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

- **Each** valve is shell and seat pressure tested per industry standard MSS SP-80.

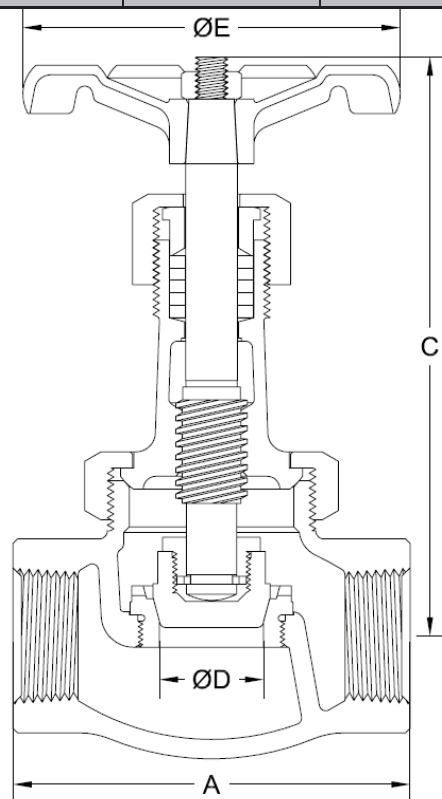
GLOBE VALVE DIMENSIONS (CLASS 200 & 300).

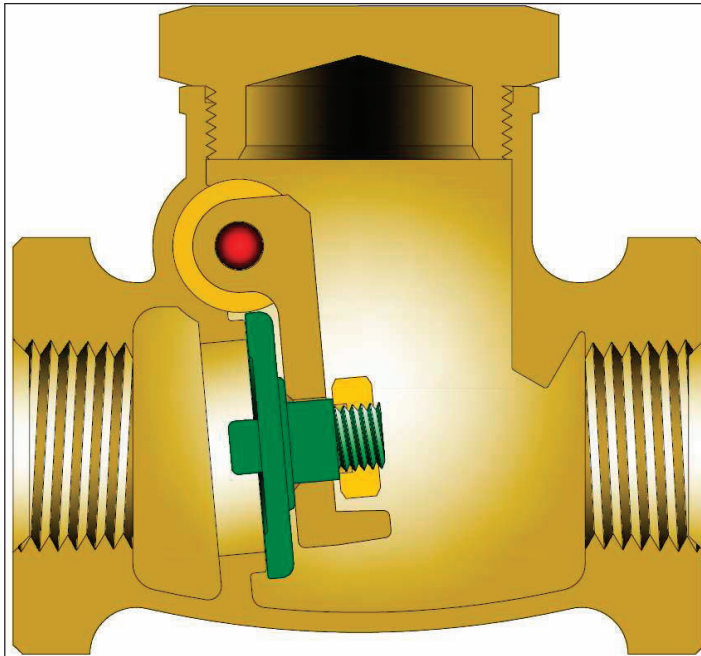
SIZE	FIG 2600, 2608, & 2612					
in	A	C	D	E	WT	lb
mm						kg
¼	2.25	4.0	0.25	2.5	0.9	0.6
6	57	102	6	64	0.4	
⅜	2.38	4.0	0.38	2.5	1.1	1.4
10	60	102	10	64	0.5	
½	2.63	4.6	0.50	2.8	1.4	2.5
13	67	117	13	70	0.6	
¾	3.25	5.5	0.75	3.3	2.4	5.8
20	83	140	19	83	1.1	
1	3.81	6.2	1.00	3.6	4.0	10.7
25	97	158	25	92	1.8	
1¼	4.38	6.8	1.25	4.1	5.7	17.1
32	111	171	32	103	2.6	
1½	4.88	7.8	1.50	4.8	8.7	25
40	124	198	38	121	3.9	
2	6.00	8.7	2.00	5.7	14.4	50
50	152	221	51	144	6.5	
2½	7.25	11.3	2.50	8.0	37.7	75
65	184	286	64	203	17.1	
3	8.75	13.1	3.00	9.0	58.5	110
75	222	333	76	229	26.5	

C = Center to top open

WT = Weight

C_v = Flow Coefficient





Class	Fig. No.
125	578

DESIGN FEATURES:

- **Renewable** discs.
- **Integral** seats.
- **Valves** can be used in a horizontal or vertical position; however, when installed in a 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.

STANDARD MATERIALS

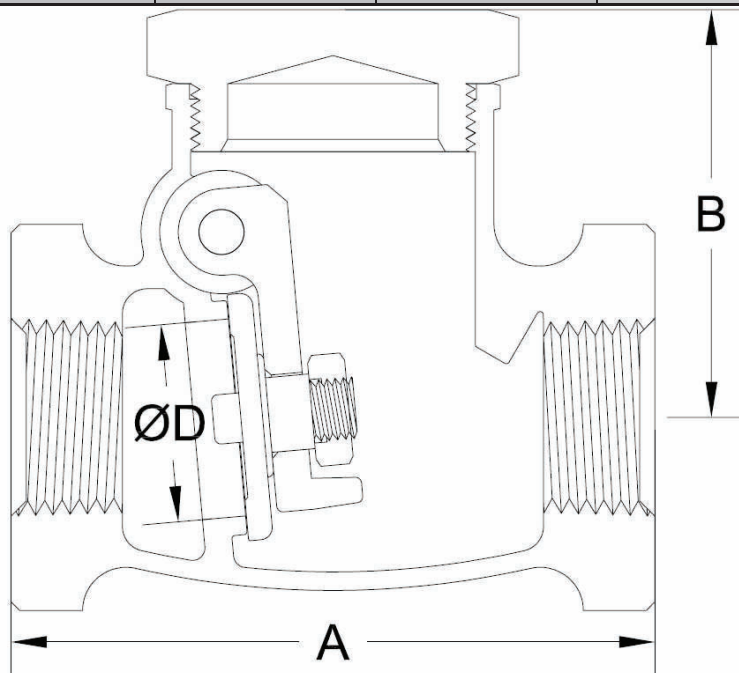
PART	MATERIALS
Body	B62
Cap	B62
Disc	B62
Disc Nut	Brass
Carrier	B124 C37700
Carrier Pin	SST 304

Design Specifications

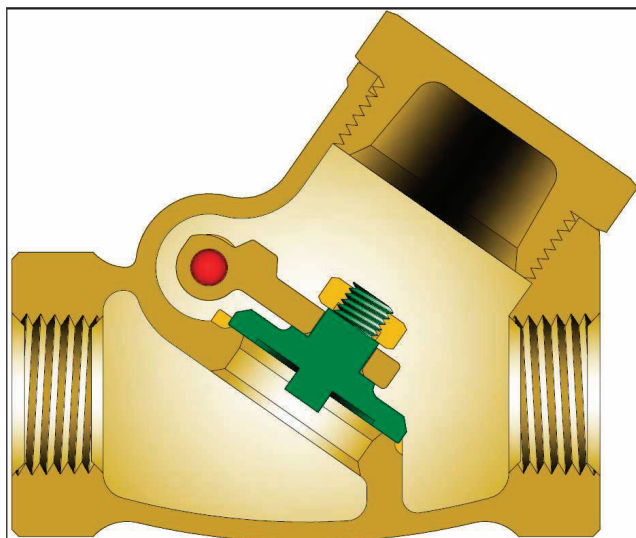
Item	Applicable Specification
Pressure - temperature ratings	MSS SP-80
General valve design	MSS SP-80
Thread design	ASME B1.20.1
Materials	ASTM

SWING CHECK VALVE DIMENSIONS (CLASS 125).

SIZE	FIG 578				
in	A	B	D	WT	lb
mm					kg
¼	1.88	1.3	0.25	0.4	2.4
6	48	33	10	0.2	
⅜	1.88	1.3	0.38	0.5	2.4
10	48	33	10	0.2	
½	2.25	1.5	0.50	0.7	4.1
13	58	37	13	0.3	
¾	2.63	1.7	0.75	1.0	9.1
20	66	43	19	0.5	
1	3.00	1.9	1.00	1.6	16.4
25	76	49	25	0.7	
1¼	3.44	2.3	1.25	2.3	30
32	88	58	32	1.0	
1½	4.25	2.5	1.50	3.0	40
40	108	63	39	1.4	
2	5.25	2.8	2.00	6.0	75
50	134	72	50	2.7	



WT = Weight
C_v = Flow Coefficient



STANDARD MATERIALS

PART	MATERIALS
Body	B61
Cap	B61*
Disc	B61 or B371 C69400
Disc Nut	B16
Carrier	B62 or B124 C37700
Carrier Pin	B16
Side Plug	B16

* B16 for ¾" and smaller sizes

Class	Fig. No.
200	560
300	563

DESIGN FEATURES:

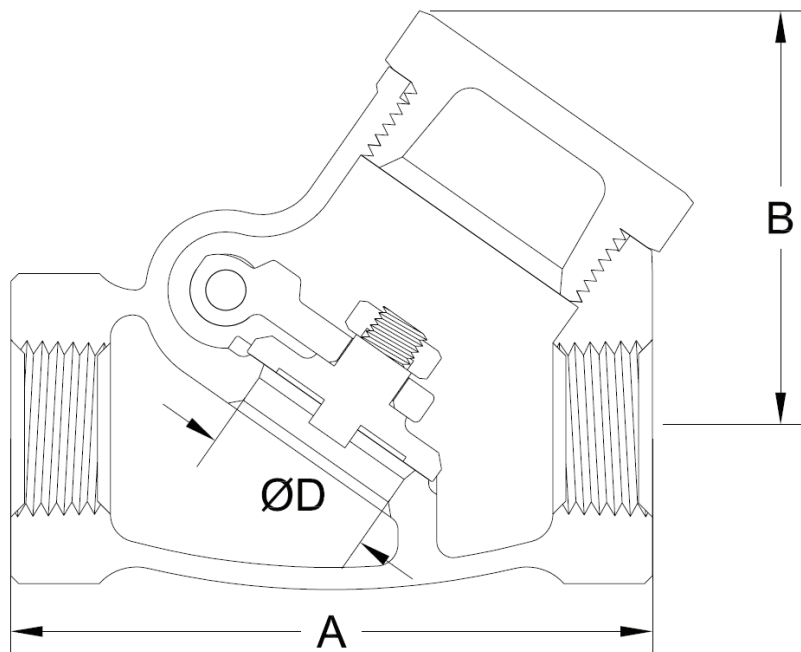
- By unscrewing the side plug and removing the cap and carrier pin, the carrier and disc assembly can be easily removed.
- Renewable disc is held by a locknut.
- Integral seats.
- Valves can be used in a horizontal or vertical position; however, when installed in vertical line, flow must be upward with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

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

SWING CHECK VALVE DIMENSIONS (CLASS 200 & 300).

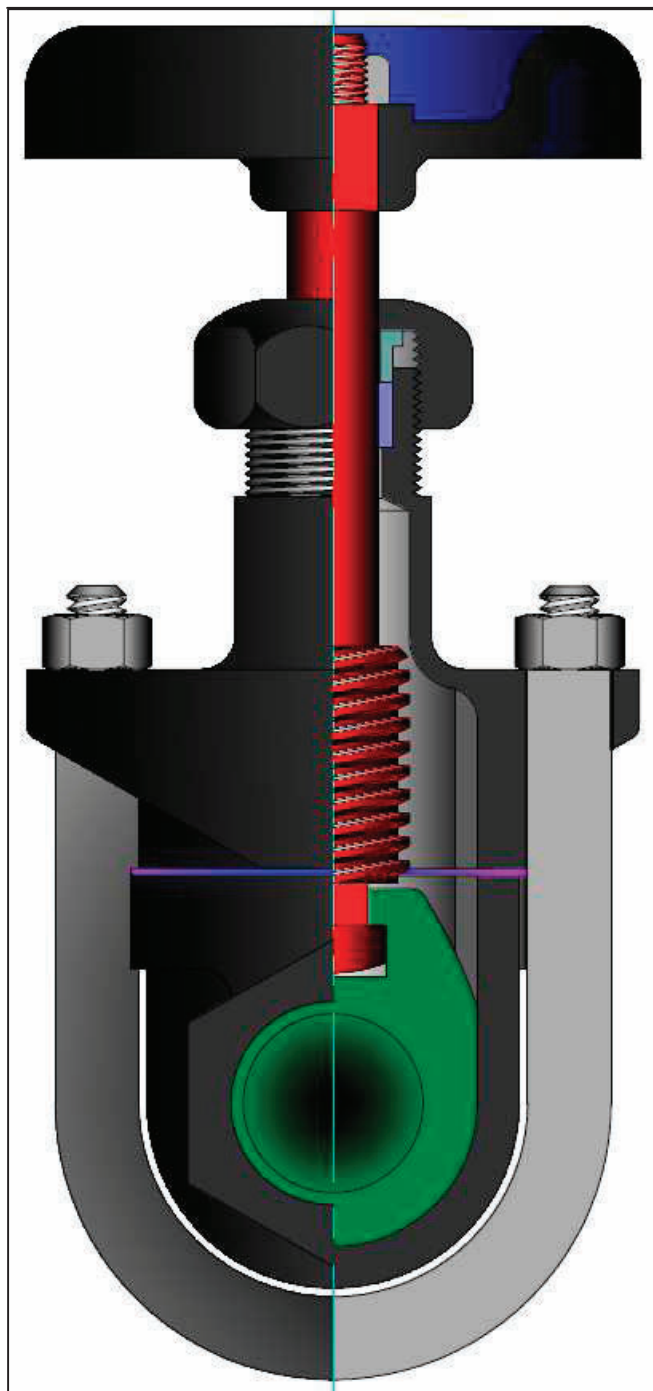
SIZE	FIG 560						FIG 563					
	in	A	B	D	WT	C _v	A	B	D	WT	C _v	lb
	mm											kg
¼		2.25	1.4	0.25	0.6	1	2.38	1.5	0.25	0.7	0.9	
6		57	35	6	0.3		60	38	6	0.3		
¾		2.38	1.4	0.38	0.6	2	2.50	1.5	0.38	0.7	2.4	
10		60	35	10	0.3		64	38	10	0.3		
½		2.75	1.7	0.50	0.8	4	2.88	1.8	0.50	1.0	4.1	
13		70	43	13	0.4		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

IRON VALVES

CLIP GATE VALVE
THREADED BONNET, THREADED ENDS
¼" TO 4" (6 TO 100 mm) CLASS 150
CAST IRON



Class	Trim	Fig. No.
125	Bronze	3460
	Iron	3462

STANDARD MATERIALS

FIGURE		3460	3462
PART		MATERIALS	
Body	¼" - 1"	A536	
	1¼" - 4"	A126-B	
Bonnet	¼" - 1"	A536	
	1¼" - 4"	A126-B	
Wedge		B62	A536
Stem		B16	A276-410
Packing Nut		A536	
Gland		B16	A276-410
Packing		Non-Asbestos	
Gasket		Non-Asbestos	
Hand Wheel		A126-B	
Hand Wheel Nut		A563-A	
U-Bolt		A307-A	
U-Bolt Nut		A563-A	
Name Plate		Aluminum	

Design Specifications

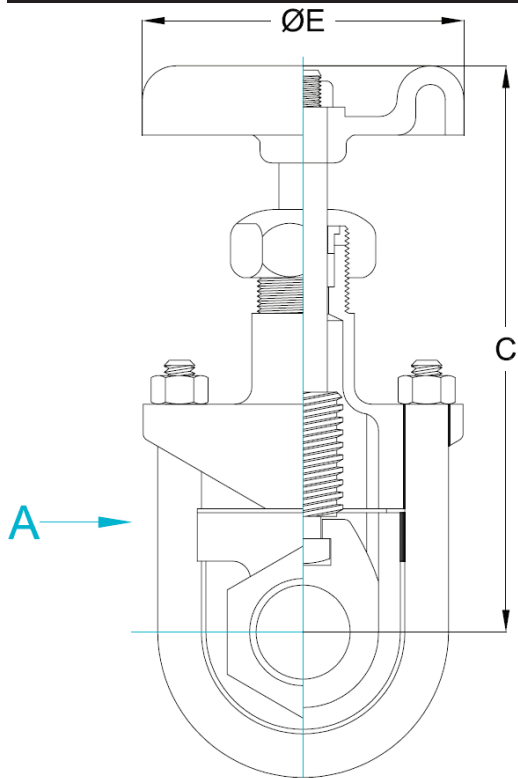
Item	Applicable Specification
Pressure-Temperature Ratings	MSS SP-70
Thread Design	ASME B1.20.1
Materials	ASTM

DESIGN FEATURES:

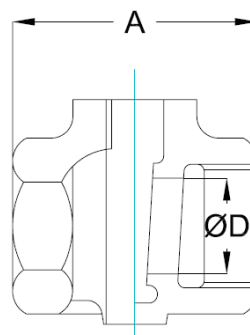
- **Seat faces** lapped for smooth finish and superior sealing.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-70.

GATE VALVE DIMENSIONS (CLASS 125).

SIZE	FIG 3460 & 3462					
in	A	C	D	E	WT	lb
mm						kg
¼	2.09	5.0	0.25	2.1	1.5	2.8
6	53	127	6	54	0.7	
¾	2.09	5.0	0.38	2.1	1.5	7.8
10	53	127	10	54	0.7	
½	2.09	5.0	0.50	2.1	1.5	13.2
13	53	127	13	54	0.7	
¾	2.52	6.2	0.75	2.4	2.0	30
20	64	158	19	62	0.9	
1	2.63	7.5	1.00	3.0	3.0	55
25	67	191	25	75	1.4	
1¼	2.91	9.0	1.25	3.0	5.0	87
32	74	229	32	75	2.3	
1½	3.14	9.1	1.50	3.8	6.5	129
40	80	232	38	95	2.9	
2	3.89	11.6	2.00	4.0	10	240
50	99	294	51	101	4.5	
2½	4.59	12.9	2.50	4.8	16	385
65	117	327	64	121	7.3	
3	4.92	14.8	3.00	6.0	24	555
75	125	375	76	152	11	
4	5.94	19.3	4.00	9.0	48	1020
100	151	490	102	229	22	



View A

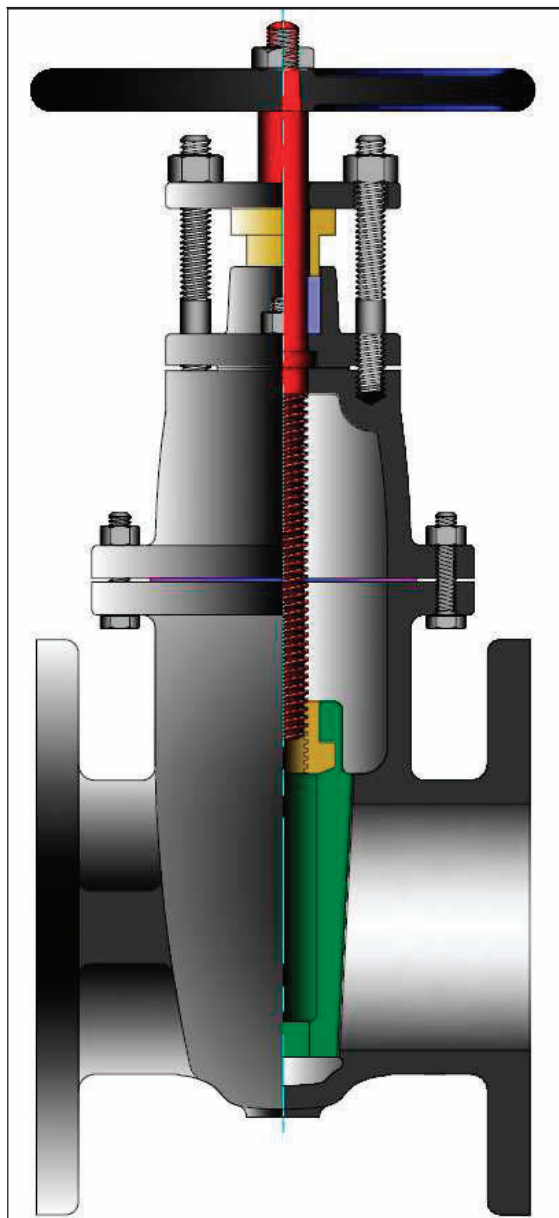


C = Center to top open

WT = Weight

C_v = Flow Coefficient

MSS SP-70 GATE VALVES
BOLTED BONNET, FLANGED ENDS
2 TO 24" (50 TO 600 mm) CLASS 125
CAST IRON NON-RISING STEM



Class	Trim	Fig. No.
125	Bronze	1787

DESIGN FEATURES:

- **Seat faces** lapped for smooth finish and superior sealing.
- **Renewable** seat rings.
- **Body** has 5 tapping bosses.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-70.
- **Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.

STANDARD MATERIALS

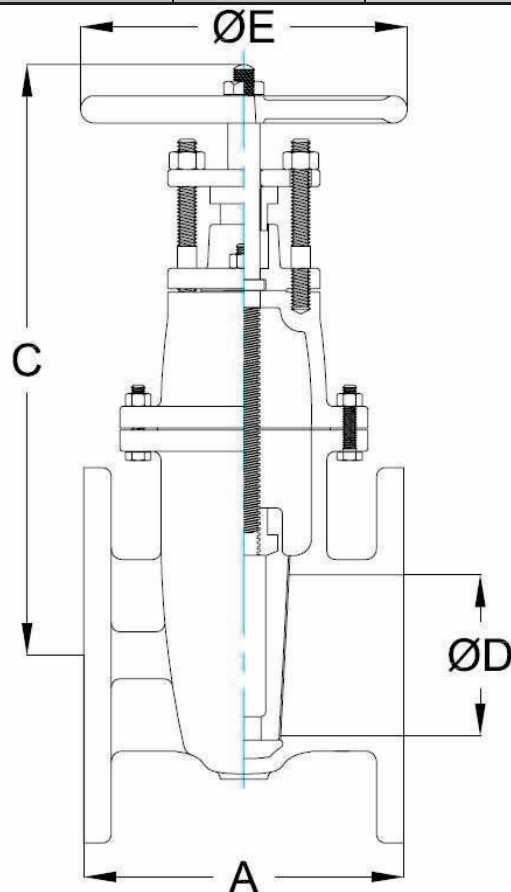
PART	MATERIALS
Body	A126-B
Bonnet	A126-B
Stuffing Box	A126-B
Wedge	A126-B
Wedge Seat Ring	B62
Body Seat Ring	B62
Stem	B16
Gasket	Non-Asbestos
Wedge Nut	B62
Gland Flange	A536-A
Gland Flange Bolt	A307-A
Gland Flange Nut	A563-A
Gland	B62
Packing	Non-Asbestos
Stuffing Box / Bonnet Gasket	Non-Asbestos
Hand Wheel	A126-B
Hand Wheel Nut	A536-A
Body / Bonnet Stud	A307-A
Body / Bonnet Nut	A536-A

Design Specifications

Item	Applicable Specification
Wall thickness	ASME B16.1
Pressure - temperature ratings	MSS SP-70
General valve design	MSS SP-70 Type I
End to End dimensions	ASME B16.10
Flange design	ASME B16.1
Materials	ASTM

GATE VALVE DIMENSIONS (CLASSES 125).

SIZE	FIG 1787					
in	A	C	D	E	WT	lb
mm						kg
2	7.00	12.3	2.00	7.0	33	240
50	178	312	51	178	15	
2½	7.50	13.3	2.50	7.0	44	390
65	191	337	64	178	20	
3	8.00	15.0	3.00	8.0	55	560
80	203	381	76	203	25	
4	9.00	17.8	4.00	10.0	95	1000
100	229	451	102	254	43	
5	10.00	20.1	5.00	12.0	132	1600
125	254	511	127	305	60	
6	10.50	23.1	6.00	12.0	172	2400
150	267	587	152	305	78	
8	11.50	27.8	8.00	14.0	271	4500
200	292	705	203	356	123	
10	13.00	32.9	10.00	16.0	361	7000
250	330	836	254	406	164	
12	14.00	37.4	12.00	18.0	578	10500
300	356	949	305	457	262	
14	15.00	41.4	14.00	20.0	660	14300
350	381	1051	356	508	299	
16	16.00	46.9	16.00	22.0	1165	18600
400	406	1190	406	559	528	
18	17.00	49.8	18.00	24.0	1462	24500
450	432	1266	457	610	663	
20	18.00	54.9	20.00	24.0	1801	30300
500	457	1394	508	610	817	
24	20.00	64.3	24.00	30.0	2600	43600
600	508	1632	610	762	1179	

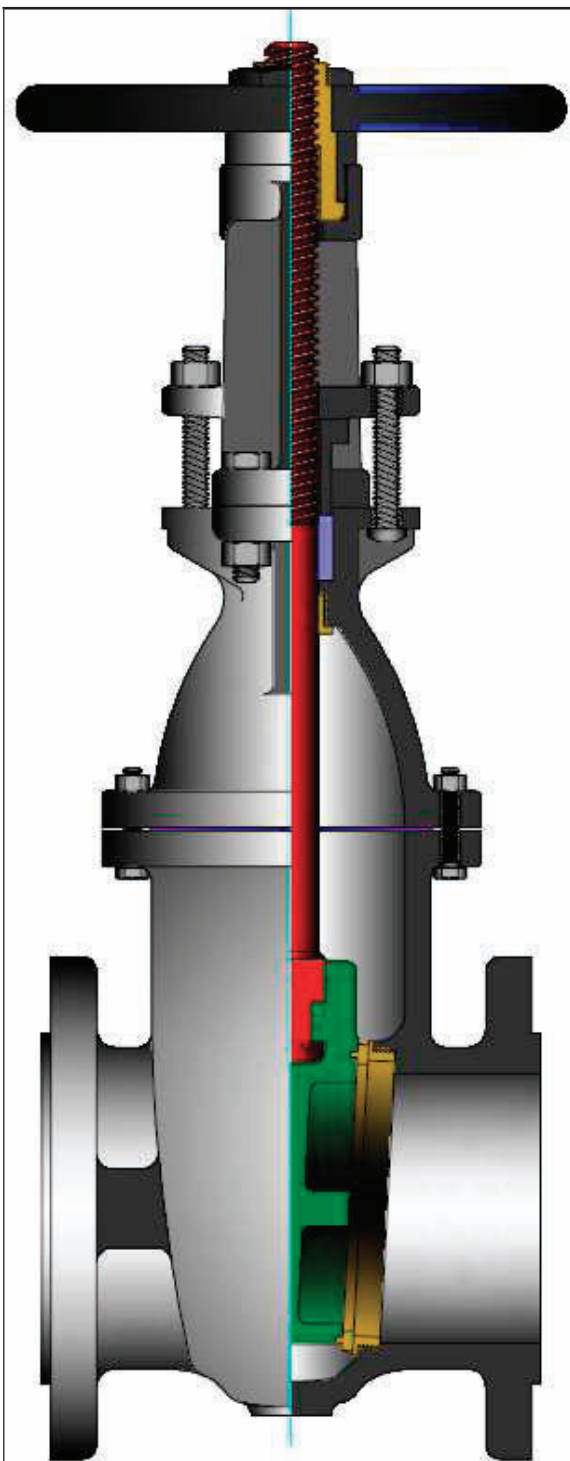


C = Center to top open and closed

WT = Weight

C_v = Flow Coefficient

MSS SP-70 GATE VALVE
BOLTED BONNET, FLANGED ENDS
2 TO 24" (50 TO 600 mm) CLASSES 125 TO 250
CAST IRON OR 3% NICKEL IRON RISING STEM



Class	Trim	Fig. No.
125	Bronze	1793
	Iron	1816
	T316 SS	1893
250	Bronze	1797

STANDARD MATERIALS

FIGURE NUMBER	1793	1797	1816	1893
CLASS	125	250	125	125
PART	MATERIALS			
Body	A126-B			3% Nickel
Bonnet	A126-B			3% Nickel
Yoke	A126-B			A126-B
Wedge	A126-B			3% Nickel
Wedge Seat Ring	B62	-	A351-CF8M	
Body Seat Ring	B62	-	A351-CF8M	
Stem	B16	A276-410	A276-316	
Stem Bushing	B62			
Stem Bushing Lock Nut	A536			
Gland Flange	A536			
Gland Flange Bolt	A307-A			
Gland Flange Nut	A563-A			
Gland	B62	A126-B		
Packing	Non-Asbestos			
Gasket	Non-Asbestos			
Backseat Ring	2 - 12"	B62	A276-410	316 SST
	14 - 24"	B16		
Hand Wheel	A126-B or A536			
Hand Wheel Nut	A536			
Body / Bonnet Stud	A307-A			
Body / Bonnet Nut	A563-A			
Bonnet / Yoke Bolt	A307-A			
Bonnet / Yoke Nut	A563-A			

Design Specifications

Item	Applicable Specification
Wall thickness	ASME B16.1
Pressure - temperature ratings	MSS SP-70
General valve design	MSS SP-70 Type I
End to End dimensions	ASME B16.10
Flange design	ASME B16.1
Materials	ASTM

DESIGN FEATURES:

- **Seat faces** lapped for smooth finish and superior sealing.
- **Stems** are non-rotating with surface finish to optimize packing seal.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-70.
- **Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.
- **Renewable** seat rings.
- **Body** has 5 tapping bosses.
- **Solid** wedge design
- **Class 125** have flat faced end flanges, class 250 has raised face end flanges.

GATE VALVE DIMENSIONS (CLASSES 125 & 250).

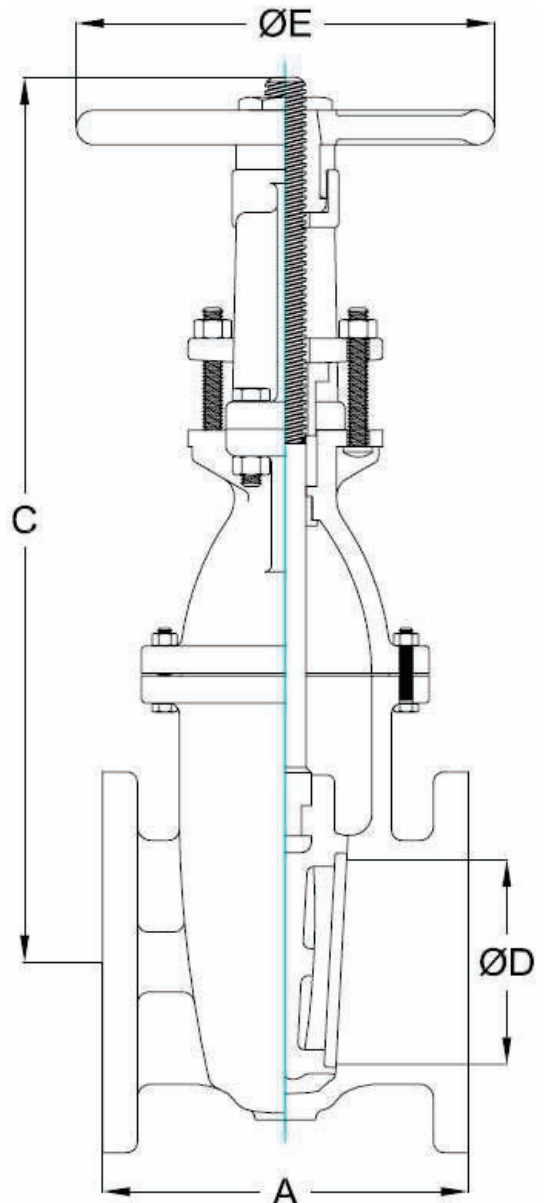
SIZE	FIG 1793, 1816, & 1893				FIG 1797			
in	A	C	D	E	A	C	D	E
mm								
2	7.00	14.7	2.00	7.0	8.50	15.0	2.00	7.0
50	178	374	51	178	216	382	51	178
2½	7.50	16.7	2.50	7.0	9.50	17.1	2.50	8.0
65	191	423	64	178	241	434	64	203
3	8.00	18.9	3.00	8.0	11.13	19.4	3.00	10.0
80	203	479	76	203	283	492	76	254
4	9.00	23.4	4.00	10.0	12.00	23.6	4.00	12.0
100	229	595	102	254	305	600	102	305
5	10.00	27.7	5.00	12.0	15.00	27.9	5.00	12.0
125	254	704	127	305	381	709	127	305
6	10.50	32.2	6.00	12.0	15.88	32.4	6.00	14.0
150	267	819	152	305	403	824	152	356
8	11.50	39.5	8.00	14.0	16.50	40.6	8.00	16.0
200	292	1002	203	356	419	1030	203	406
10	13.00	48.2	10.00	16.0	18.00	49.0	10.00	18.0
250	330	1223	254	406	457	1246	254	457
12	14.00	56.1	12.00	18.0	19.75	56.8	12.00	20.0
300	356	1424	305	457	502	1442	305	508
14	15.00	62.5	14.00	20.0				
350	381	1586	356	508				
16	16.00	71.1	16.00	22.0				
400	406	1805	406	559				
18	17.00	79.0	18.00	24.0				
450	432	2007	457	610				
20	18.00	87.1	20.00	24.0				
500	457	2213	508	610				
24	20.00	100.5	24.00	30.0				
600	508	2553	610	762				

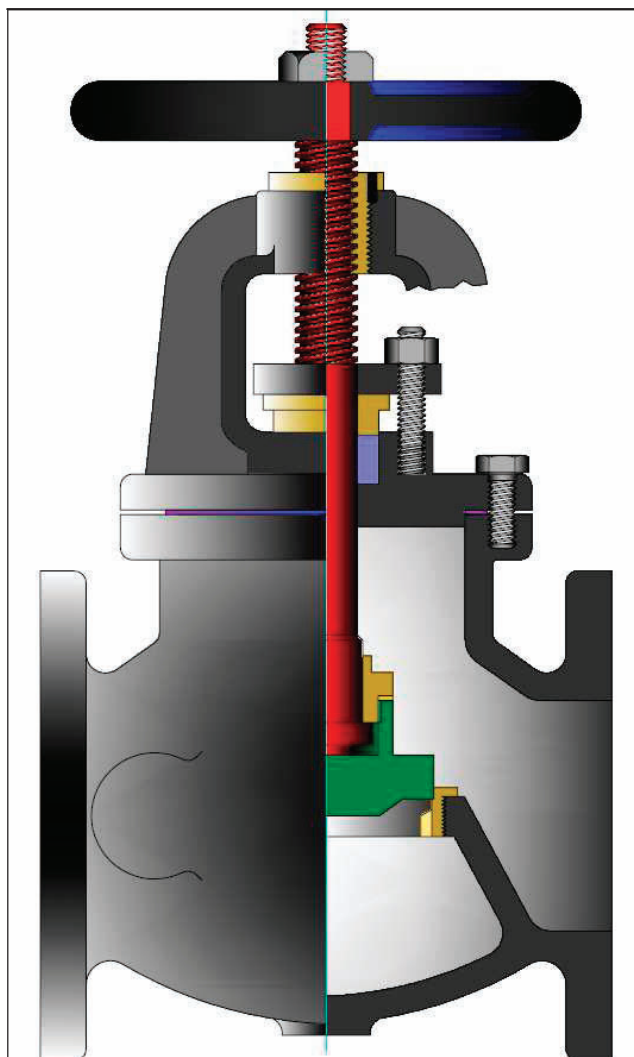
SIZE	FIG 1793, 1816, & 1893			FIG 1797		
in	WT	lb	C _v	WT	lb	C _v
mm		kg			kg	
2	36		240	53		240
50	16			24		
2½	48		390	70		390
65	22			32		
3	60		560	102		560
80	27			46		
4	103		1000	157		1000
100	47			71		
5	143		1600	198		1600
125	65			90		
6	186		2400	259		2400
150	84			117		
8	298		4500	451		4500
200	135			205		
10	441		7000	649		7000
250	200			294		
12	628		10500	913		10500
300	285			414		
14	880		14300			
350	399					
16	1166		18600			
400	529					
18	1467		24500			
450	665					
20	1824		30300			
500	827					
24	2618		43600			
600	1188					

C = Center to top open

WT = Weight

C_v = Flow Coefficient





STANDARD MATERIALS

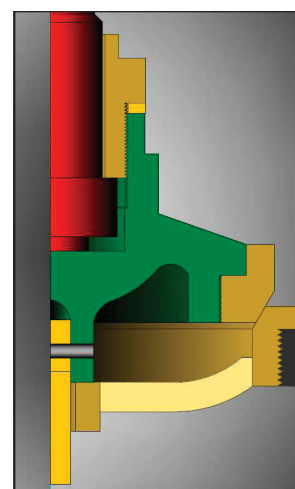
PART		MATERIALS
Body		A126-B
Bonnet		A126-B
Disc	2 - 4"	B62
	5 - 12"	A126-B
Disc Nut		B62
Body Seat Ring		B62
Disc Seat Ring (1)		B62
Stem		B16
Stem Bushing		B62
Stem Bushing Set Screw		A307-A
Gland Flange		A536
Gland Flange Bolt		A307-A
Gland Flange Nut		A563-A
Gland		B62
Packing		Non-Asbestos
Disc Nut Washer		B16
Gasket		Non-Asbestos
Hand Wheel		A126-B
Hand Wheel Nut		A563-A
Taper Pin (1)		Steel
Guide Pin (1)		B16
Body / Bonnet Stud		A307-A
Body / Bonnet Nut		A563-A

Class	Trim	Fig. No.
125	Bronze	241

(1) For valve sizes 5" to 12"

Design Specifications

Item	Applicable Specification
Wall thickness	ASME B16.1
Pressure - temperature ratings	MSS SP-85
General valve design	MSS SP-85 Type I
End to End dimensions	ASME B16.10
Flange design	ASME B16.1
Materials	ASTM



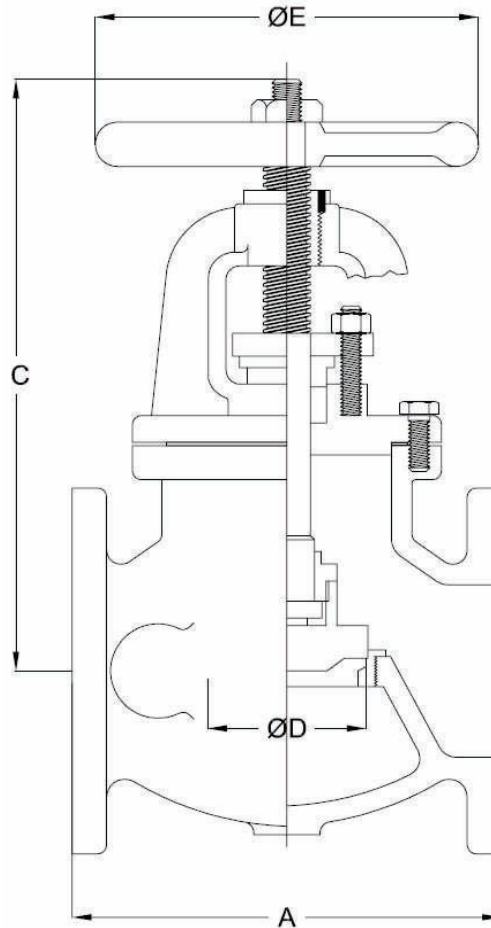
Disc design for valve sizes 5" to 12"

DESIGN FEATURES:

- **Seat faces** lapped for smooth finish and superior sealing.
- **Swivel** disc for optimal seating and longer seat life.
- **Stems** are rotating / rising design.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-85.
- **Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.

GLOBE VALVE DIMENSIONS CLASS 125

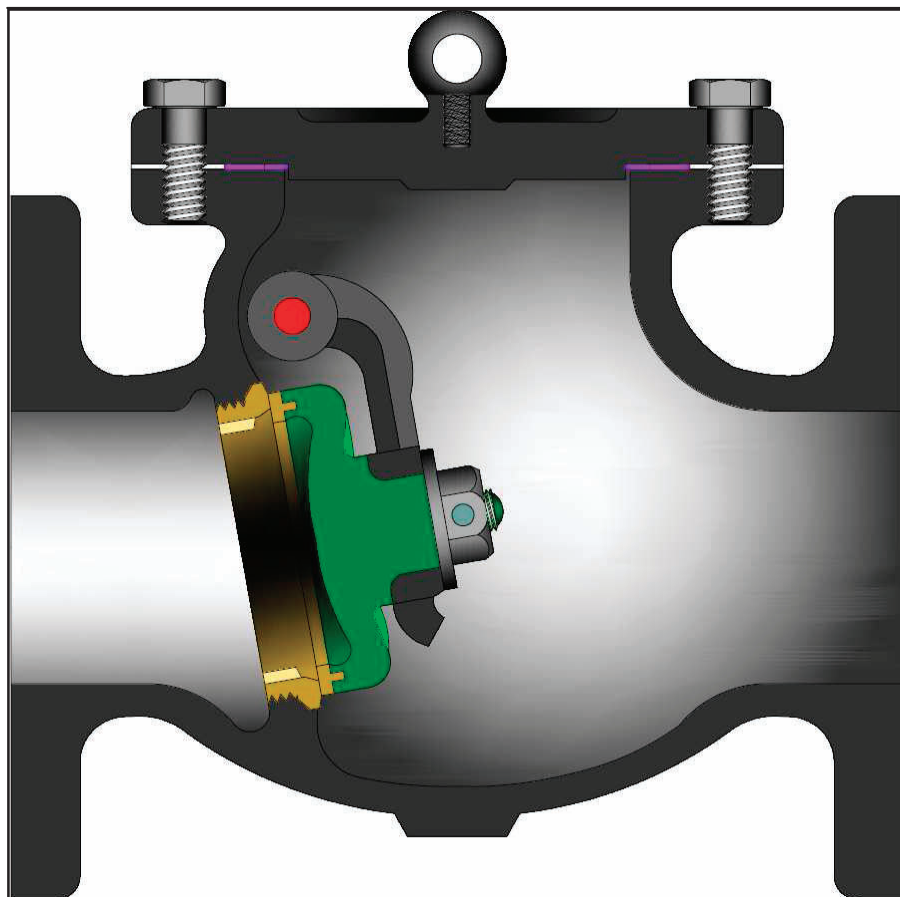
SIZE	FIG 241					
	A	C	D	E	WT	C _v
in mm						
2	8.00	11.9	2.00	7.0	36	45
50	203	303	51	178	16	
2½	8.50	12.8	2.50	7.0	49	75
65	216	326	64	178	22	
3	9.50	13.6	3.00	8.0	57	110
80	241	346	76	203	26	
4	11.50	14.6	4.00	10.0	95	200
100	292	370	102	254	43	
5	13.00	17.7	5.00	12.0	139	320
125	330	450	127	305	63	
6	14.00	19.7	6.00	12.0	183	475
150	356	500	152	305	83	
8	19.50	22.7	8.00	14.0	378	875
200	495	576	203	356	172	
10	24.50	27.0	10.00	16.0	523	1370
250	622	686	254	406	237	
12	27.50	29.8	12.00	18.0	700	2050
300	699	757	305	457	318	



C = Center to top open

WT = Weight

C_v = Flow Coefficient



Class	Trim	Fig. No.
125	Bronze	559
	Iron	1259
	T316 SS	559P

Design Specifications

Item	Applicable Specification
Wall thickness	ASME B16.1
Pressure - temperature ratings	MSS SP-71
General valve design	MSS SP-71 Type I
End to End dimensions	ASME B16.10
Flange design	ASME B16.1
Materials	ASTM

STANDARD MATERIALS

FIGURE NUMBER	559	1259	559P
CLASS	125	125	125
PART	MATERIALS		
Body	A126-B		3% Nickel
Cap	A126-B		3% Nickel
Disc	A126-B or A536		3% Nickel (1)
Disc Seat Ring	B62	-	A351 Gr. CF8M (1)
Seat Ring	B62	A536	A351 Gr. CF8M
Gasket	Non-Asbestos		
Carrier	A536		3% Nickel
Carrier Pin	B16	A276-410	A276-304
Disc Nut	A307-A		T304 SS
Split Pin	T304 SS	T410 SS	T304 SS
Washer	Steel		T304 SS
Body / Cap Stud	A307-A		
Body / Cap Nut	A563-A		
Side Plug	B16	A276-410	A276-304

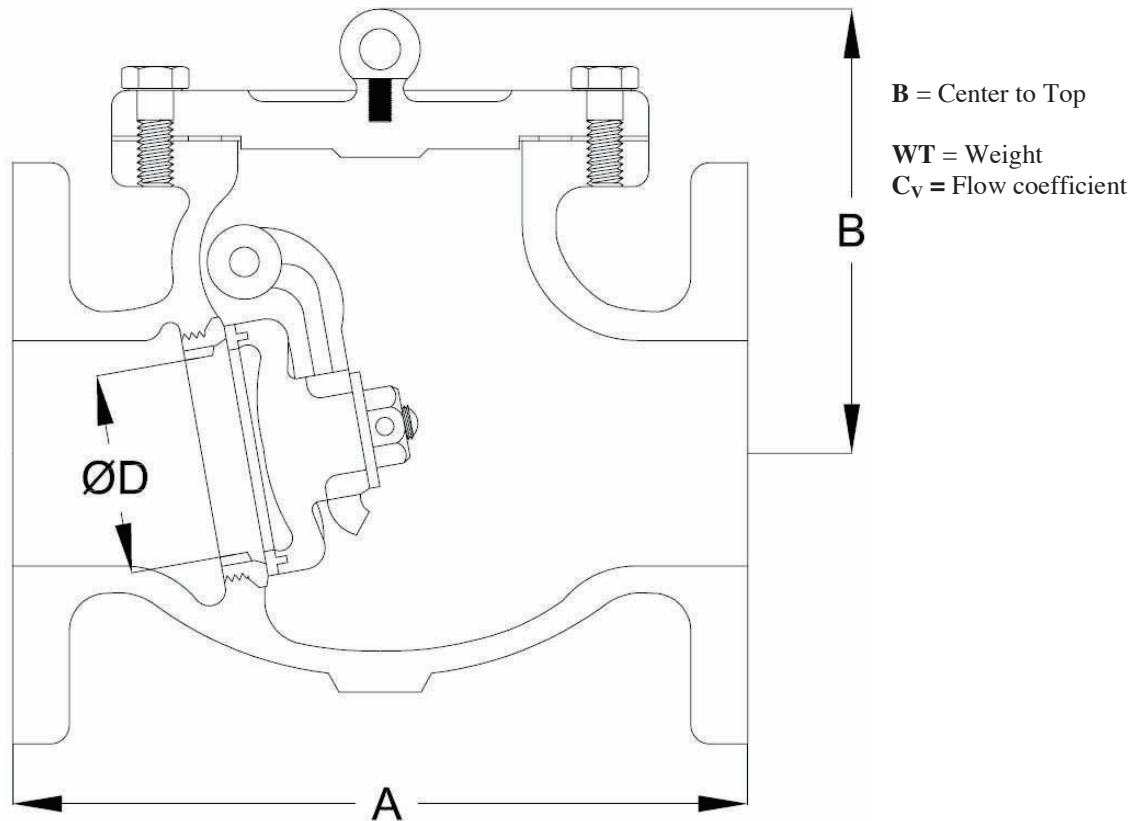
DESIGN FEATURES:

- **Seat faces** lapped for smooth finish and superior sealing.
- **Swivel disc** for improved seat alignment and longer life.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-71.
- **Check** valve are suitable for service in horizontal line with cap vertical or in a vertical line with flow upward.

(1) For sizes 2" and 3", the disc is solid A351 Gr. CF8M for figure 559P.

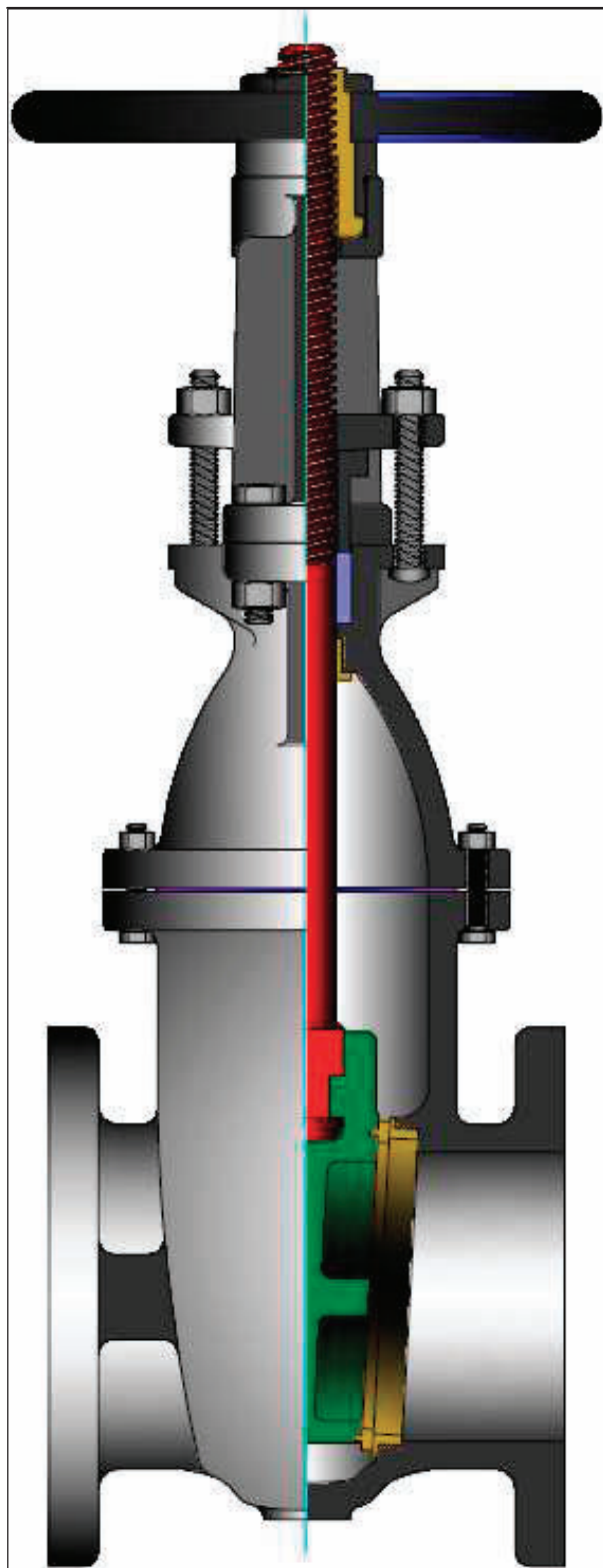
SWING CHECK VALVE DIMENSIONS CLASS 125

SIZE	FIG 559, 1259, & 559P				
in	A	B	D	WT	lb
mm					kg
2	8.00	4.7	2.00	25	45
50	203	118	50	11	
2½	8.50	5.4	2.50	36	75
65	216	136	64	16	
3	9.50	5.8	3.00	46	110
80	241	147	75	21	
4	11.50	6.7	3.94	81	210
100	292	169	100	37	
5	13.00	7.8	4.94	115	345
125	330	198	125	52	
6	14.00	8.5	5.94	150	530
150	356	215	150	68	
8	19.50	10.4	7.94	253	1010
200	495	264	200	115	
10	24.50	11.9	9.88	442	1580
250	622	303	250	200	
12	27.50	13.5	12.00	638	2460
300	699	343	305	289	
14	31.00	15.5	14.00	792	3340
350	787	394	356	359	
16	36.00	17.6	16.00	1020	4360
400	914	448	406	463	
18	36.00	19.3	18.00	1304	5980
450	914	490	457	591	
20	40.00	22.3	20.00	1771	7400
500	1016	565	508	803	
24	48.00	24.9	24.00	2630	10600
600	1219	632	610	1193	



UL AND FM IRON VALVES

UL AND FM MSS SP-70 GATE VALVE
BOLTED BONNET, FLANGED ENDS
IRON, RISING STEM
2 TO 12" (50 TO 300 mm) CLASS 175



Class	Fig. No.
175	762U

STANDARD MATERIALS

PART	MATERIALS
Body	A126-B
Bonnet	A126-B
Yoke	A126-B
Wedge	A126-B
Wedge Seat Ring	B62
Body Seat Ring	B62
Stem	B16
Stem Bushing	B62
Stem Bushing Lock Nut	A536
Gland Flange	A536
Gland Flange Bolt	A307-A
Gland Flange Nut	A307-A
Gland	B62
Packing	Non-Asbestos
Gasket	Non-Asbestos
Backseat Ring	B62
Hand Wheel	A126-B
Hand Wheel Nut	A536
Body / Bonnet Stud	A307-A
Body / Bonnet Nut	A307-A
Bonnet / Yoke Bolt	A307-A
Bonnet / Yoke Nut	A307-A

Design Specifications

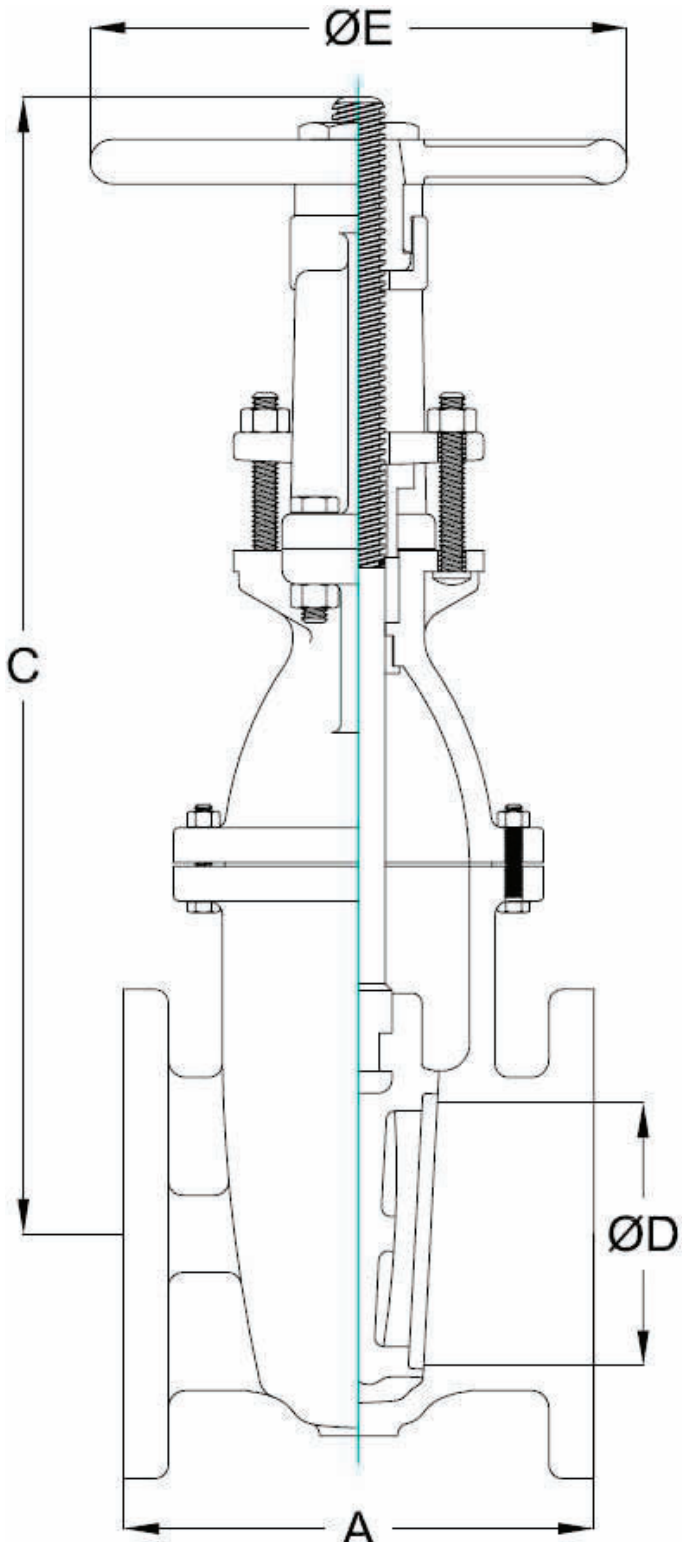
Item	Applicable Specification
Wall thickness	ASME B16.1
Pressure - temperature ratings	MSS SP-70
General valve design	MSS SP-70
End to End dimensions	ASME B16.10
Flange design	ASME B16.1
Fire Service	FM 1120, FM 1130, and UL 262
Materials	ASTM

DESIGN FEATURES:

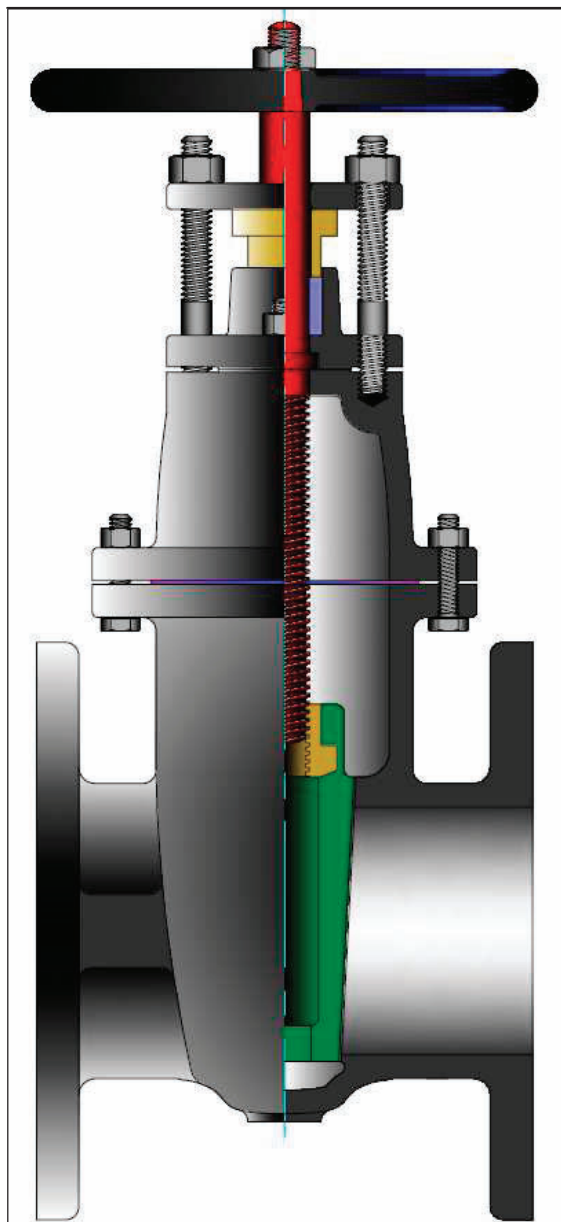
- **Seat faces** lapped for smooth finish and superior sealing.
- **Stems** are non-rotating with surface finish to optimize packing seal.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-70.
- **Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.
- **Renewable** seat rings.
- **Body** has 5 tapping bosses.
- **Solid** wedge.
- **UL and FM** approved fire safety valves.

UL AND FM GATE VALVE DIMENSIONS (CLASS 125).

SIZE	FIG 762U						
in	A	C	D	E	WT	lb	C _v
mm						kg	
2	7.00	14.8	2.00	7.0	36		240
50	178	375	51	178	16		
2½	7.50	16.6	2.50	7.0	48		390
65	191	422	64	178	22		
3	8.00	18.9	3.00	8.0	60		560
80	203	479	76	203	27		
4	9.00	23.4	4.00	10.0	103		1000
100	229	594	102	254	47		
6	10.50	32.3	6.00	12.0	186		2400
150	267	819	152	305	84		
8	11.50	39.5	8.00	14.0	298		4500
200	292	1003	203	356	135		
10	13.00	48.1	10.00	16.0	441		7000
250	330	1222	254	406	200		
12	14.00	56.0	12.00	18.0	628		10500
300	356	1422	305	457	285		



C = Center to top open
WT = Weight
C_v = Flow Coefficient



Class	Fig. No.
125	710U

DESIGN FEATURES:

- **Seat faces** lapped for smooth finish and superior sealing.
- **Renewable** seat rings.
- **Body** has 5 tapping bosses.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-70.
- **Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.
- **UL and FM** approved fire safety valves.

STANDARD MATERIALS

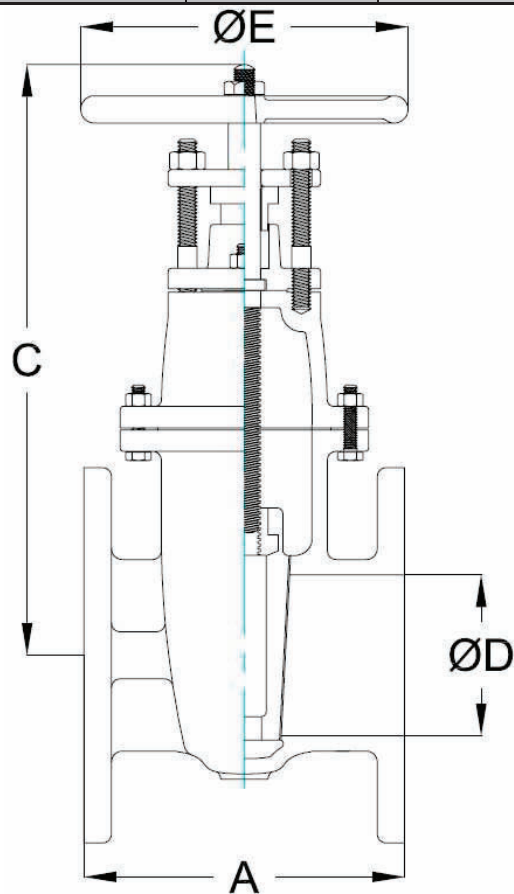
PART	MATERIALS
Body	A126-B
Bonnet	A126-B
Stuffing Box	A126-B
Wedge	A126-B
Wedge Seat Ring	B62
Body Seat Ring	B62
Stem	B16
Gasket	Non-Asbestos
Wedge Nut	B62
Gland Flange	A536
Gland Flange Bolt	A307-A
Gland Flange Nut	A563-A
Gland	B62
Packing	Non-Asbestos
Gasket	Non-Asbestos
Backseat Ring	B62
Hand Wheel	A126-B
Hand Wheel Nut	A536
Body / Bonnet Stud	A307-A
Body / Bonnet Nut	A307-A

Design Specifications

Item	Applicable Specification
Wall thickness	ASME B16.1
Pressure - temperature ratings	MSS SP-70
General valve design	MSS SP-70
End to End dimensions	ASME B16.10
Flange design	ASME B16.1
Fire Service	FM 1120, FM 1130, and UL 262
Materials	ASTM

UL AND FM GATE VALVE DIMENSIONS (CLASSES 125).

SIZE	FIG 710U					
in	A	C	D	E	WT	lb
mm						kg
2	7.00	12.3	2.00	7.0	33	240
50	178	312	51	178	15	
2½	7.50	13.3	2.50	7.0	44	390
65	191	337	64	178	20	
3	8.00	15.0	3.00	8.0	55	560
80	203	381	76	203	25	
4	9.00	17.8	4.00	10.0	95	1000
100	229	451	102	254	43	
5	10.00	20.1	5.00	12.0	132	1600
125	254	511	127	305	60	
6	10.50	23.1	6.00	12.0	172	2400
150	267	587	152	305	78	
8	11.50	27.8	8.00	14.0	271	4500
200	292	705	203	356	123	
10	13.00	32.9	10.00	16.0	361	7000
250	330	836	254	406	164	
12	14.00	37.4	12.00	18.0	578	10500
300	356	949	305	457	262	

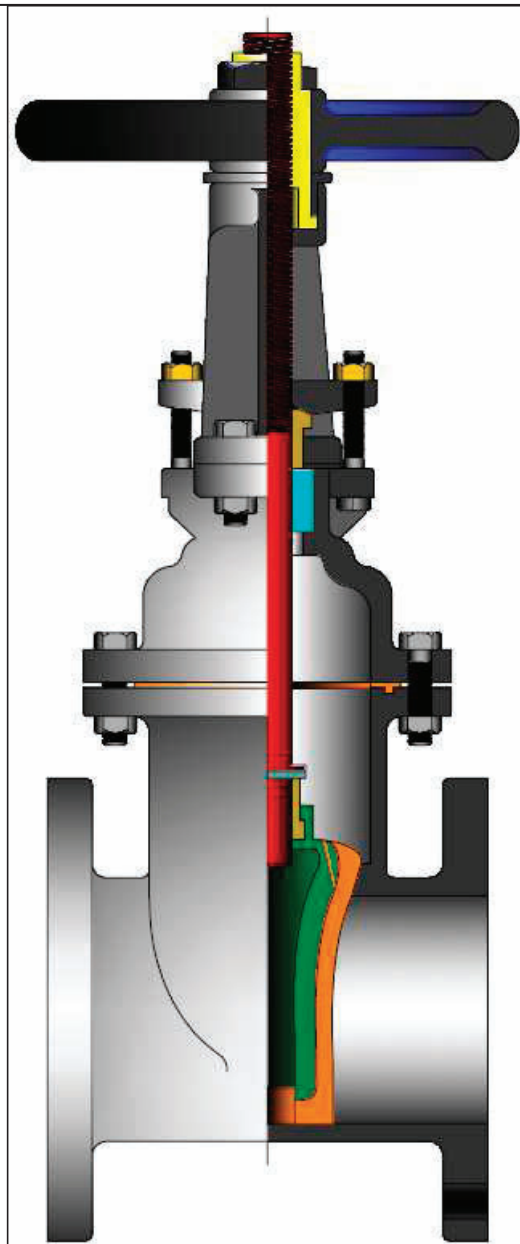


C = Center to top open

WT = Weight

C_v = Flow Coefficient

UL AND FM MSS SP-70 GATE VALVE
BOLTED BONNET, FLANGED ENDS
IRON, RISING STEM
2½ TO 12" (50 TO 300 mm) CLASSES 125 & 250



Class	Fig. No.
125	722U
250	722F

DESIGN FEATURES:

- Each valve is shell and seat pressure tested per industry standard MSS SP-70.
- Gland is two piece gland / gland flange design for optimal alignment and uniform packing compression.
- UL and FM approved fire protection valves.
- Epoxy coated interior/exterior upon request.

STANDARD MATERIALS

PART	MATERIALS
Body	A126-B
Bonnet	A126-B
Yoke (2)	A126-B
Stem Bushing	B62
Stem Bushing Locknut (3)	A536
Wedge (1)	Cast Iron Coated in EPDM
Disc Nut	B62
Taper Pin	304 SST
Stem	420 SST
Gland Flange	A536
Gland	B62
Packing	Non-Asbestos
Gasket	EPDM
O-Ring (4)	EPDM
Gland Bolt	Steel
Gland Nut	B16
Yoke Bolt (2)	Steel
Yoke Nut (2)	Steel
Body Bolt	Steel
Body Nut	Steel
Hand Wheel	A126-B
Hand Wheel Nut	A536

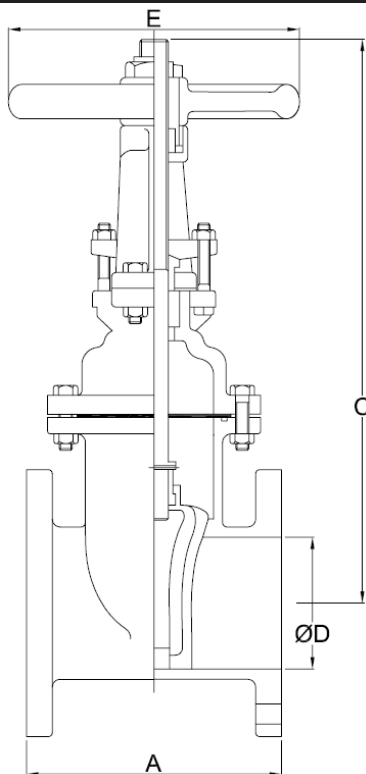
- (1) In class 250, size 2½" is cast bronze instead of EPDM.
 (2) In class 250, for sizes 6"-12".
 (3) In class 250, for sizes 2½"-6"
 (4) In class 250, disc assembly contains o-ring.

Design Specifications

Item	Applicable Specification
Wall thickness	ASME B16.1
Pressure - temperature ratings	MSS SP-70
General valve design	MSS SP-70
End to End dimensions	ASME B16.10
Flange design	ASME B16.1
Fire Service	FM 1120, FM 1130, and UL 262
Materials	ASTM

UL AND FM GATE VALVE DIMENSIONS (CLASSES 125 & 250).

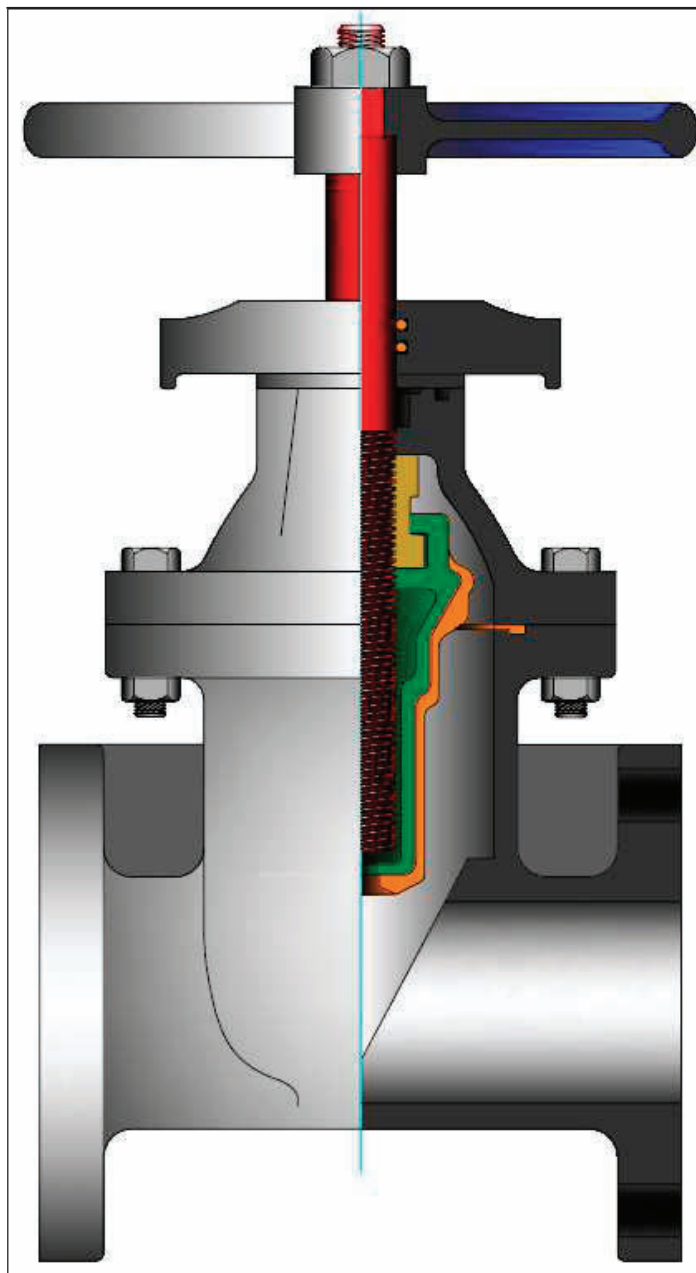
SIZE	FIG 722U							FIG 722F						
in	A	C	D	E	WT	lb	C _V	A	C	D	E	WT	lb	C _V
mm						kg							kg	
2 ½	7.50	14.1	2.50	7.0	44		490	8.50	14.1	2.50	7.0	51		490
65	191	359	64	178	20			216	359	64	178	23		
3	8.00	20.9	3.00	10.0	85		710	9.50	20.9	3.00	10.0	102		710
80	203	530	76	254	39			241	530	76	254	46		
4	9.00	22.3	4.00	10.0	96		1300	11.00	22.3	4.00	10.0	120		1300
100	229	565	102	254	44			279	565	102	254	54		
6	10.50	30.5	6.00	12.0	178		3100	12.00	30.5	6.00	12.0	218		3100
150	267	775	152	305	81			305	775	152	305	99		
8	11.50	38.3	8.00	14.0	279		5700	13.00	38.3	8.00	14.0	317		5700
200	292	972	203	356	127			330	972	203	356	144		
10	13.00	46.3	10.00	16.0	435		8900	14.75	46.3	10.00	16.0	517		8900
250	330	1175	254	406	197			375	1175	254	406	234		
12	14.00	54.9	12.00	18.0	607		13400	16.62	54.9	12.00	18.0	707		13400
300	356	1394	305	457	275			422	1394	305	457	321		



C = Center to top open

WT = Weight

C_v = Flow Coefficient



STANDARD MATERIALS

PART	MATERIALS
Body	A126-B
Bonnet	A126-B
Box	A126-B
Operation Nut	A126-B
Wedge	Cast Iron Coated in EPDM
Disc Nut	B62
Base Plate	A126-B
Stem	420 SST
O Ring	EPDM
Gasket	EPDM
Body Bolt	Steel
Body Nut	Steel
Hand Wheel	A126-B
Hand Wheel Nut	Steel

Class	Fig. No.
125	721UF

DESIGN FEATURES:

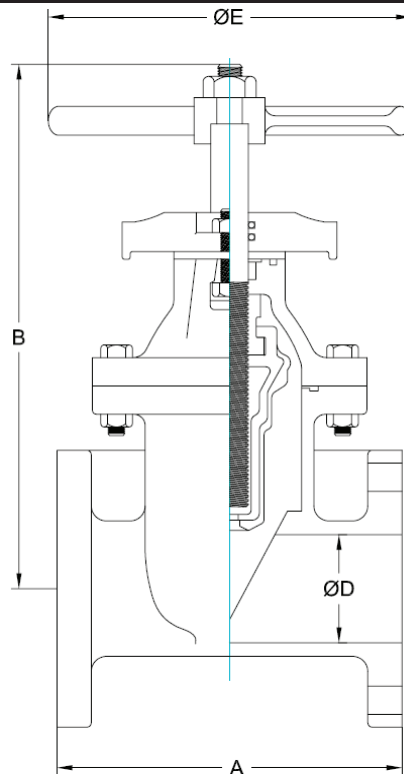
- Each valve is shell and seat pressure tested per industry standard MSS SP-70.
- UL and FM approved fire protection valves.
- Epoxy coated interior/exterior upon request.

Design Specifications

Item	Applicable Specification
Wall thickness	ASME B16.1
Pressure - temperature ratings	MSS SP-70
General valve design	MSS SP-70
End to End dimensions	ASME B16.10
Flange design	ASME B16.1
Fire Service	FM 1120, FM 1130, and UL 262
Materials	ASTM

UL AND FM GATE VALVE DIMENSIONS (CLASS 125).

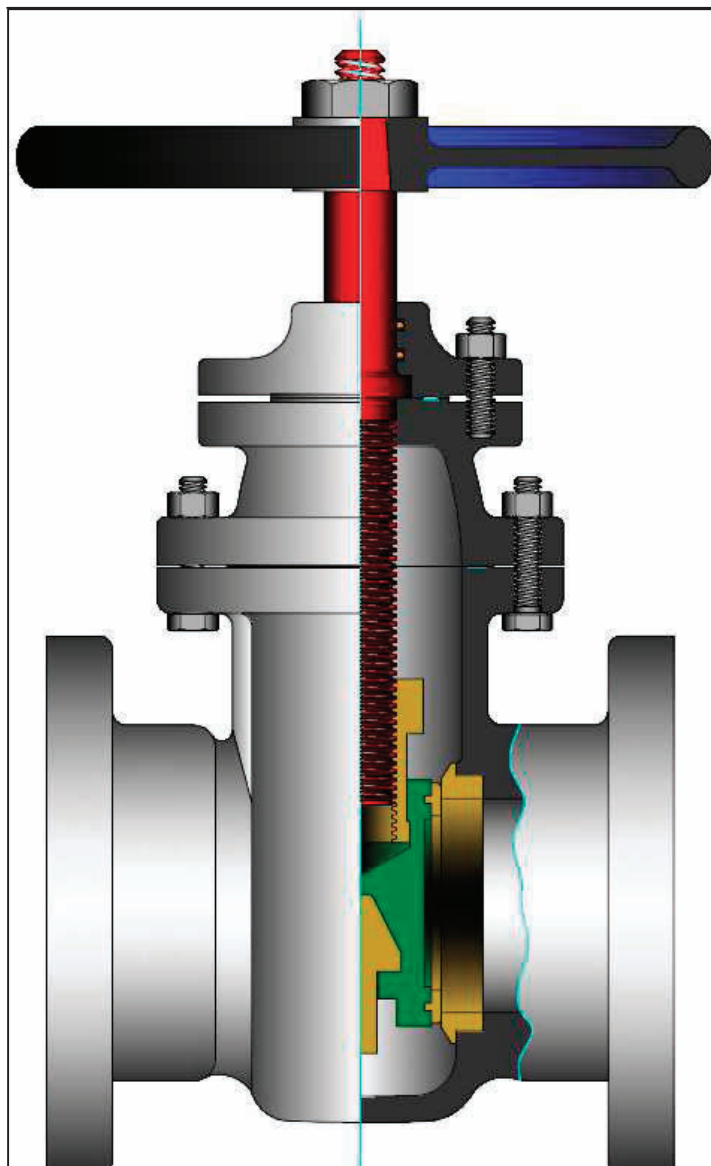
SIZE	FIG 721UF					
in	A	C	D	E	WT	lb
mm						kg
2 ½	7.50	9.9	2.50	7.0	42	390
65	191	252	64	178	19	
3	8.00	13.9	3.00	7.5	77	560
80	203	352	76	191	35	
4	9.00	14.3	4.00	9.0	104	1000
100	229	364	102	229	47	
6	10.50	18.3	6.00	11.0	182	2400
150	267	464	152	279	83	
8	11.50	21.7	8.00	13.5	246	4500
200	292	551	203	343	112	
10	13.00	25.6	10.00	16.0	436	7000
250	330	651	254	406	198	
12	14.00	29.1	12.00	19.0	605	10500
300	356	740	305	483	274	



C = Center to top open and closed

WT = Weight

C_v = Flow Coefficient



STANDARD MATERIALS

PART	MATERIALS
Body	A126-B
Bonnet	A126-B
Box	A126-B
Wedge Pin	B62
Body Seat Ring	B62
Disc Seat Ring	B62
Disc Seat Ring	A126-B
Disc Nut	B62
Body Bolt	Steel
Body Nut	Steel
Box Bolt	Steel
O Ring	EPDM
Handwheel	A126-B
Handwheel Nut	Steel
Stem	410
Body Gasket	Graphite
Bonnet Gasket	Graphite

Class	Fig. No.
175 W.O.G.	710UF

Design Specifications

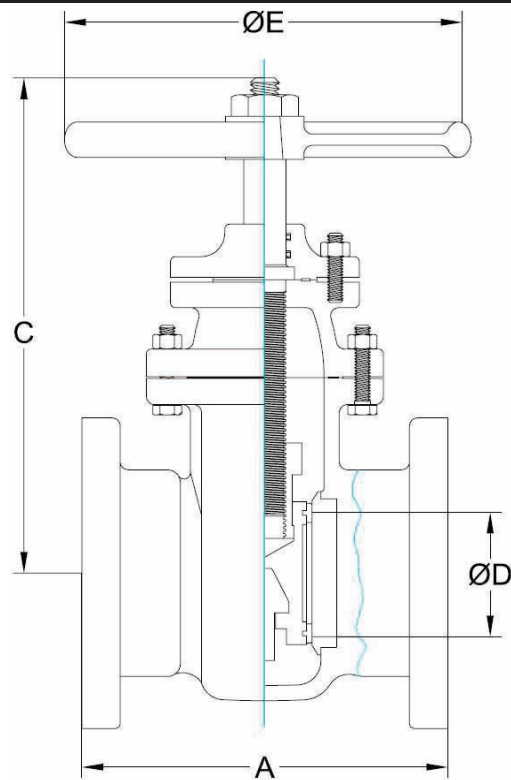
Item	Applicable Specification
Wall thickness	ASME B16.1
Pressure - temperature ratings	MSS SP-70
General valve design	MSS SP-70
End to End dimensions	ASME B16.10
Flange design	ASME B16.1
Fire Service	FM 1120, FM 1130, and UL 262
Materials	ASTM

DESIGN FEATURES:

- **Parallel** seat design allows for superior gateway seals.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-70.
- **Gasket** joints conform to AWWA C111 and ANSI A21.11.
- **UL and FM** approved fire protection valves.

UL AND FM PARALLEL SEAT GATE VALVE DIMENSIONS (175 W.O.G.).

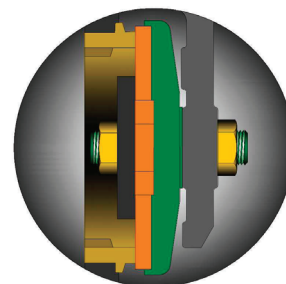
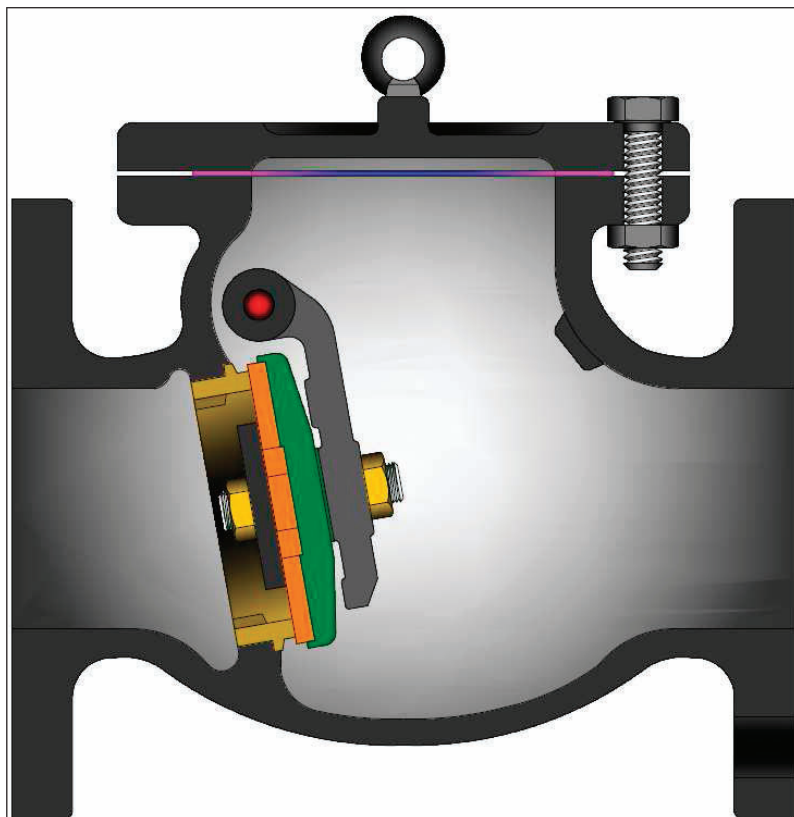
SIZE	FIG 710UF					
in	A	C	D	E	WT	lb
mm						kg
3	8.00	12.1	3.00	10.0	77	560
80	203	306	76	254	35	
4	9.00	13.7	4.00	10.0	104	1000
100	229	347	102	254	47	
6	10.50	18.1	6.00	14.0	182	2400
150	267	459	152	356	83	
8	11.50	21.0	8.00	14.0	246	4500
200	292	533	203	356	112	
10	13.00	24.6	10.00	16.0	436	7000
250	330	625	254	406	198	
12	14.00	28.2	12.00	18.0	605	10500
300	356	717	305	457	274	



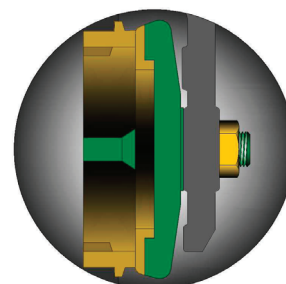
C = Center to top open and closed

WT = Weight

C_v = Flow Coefficient



Rubber Disc Ring



Bronze Disc Ring

Class	Fig. No.
200 W.O.G.	763U

STANDARD MATERIALS

PART	MATERIALS
Body	A126-B
Cap	A126-B
Disc	A536
Disc Ring	EPDM
	B62
Seat Ring	B62
Gasket	Non-Asbestos
Carrier	A536
Carrier Pin	B16
Disc Nut	B16
Disc Washer	A536
Eyebolt	Steel
Body / Cap Stud	Steel
Body / Cap Nut	Steel
Hanger Plug	B16

Design Specifications

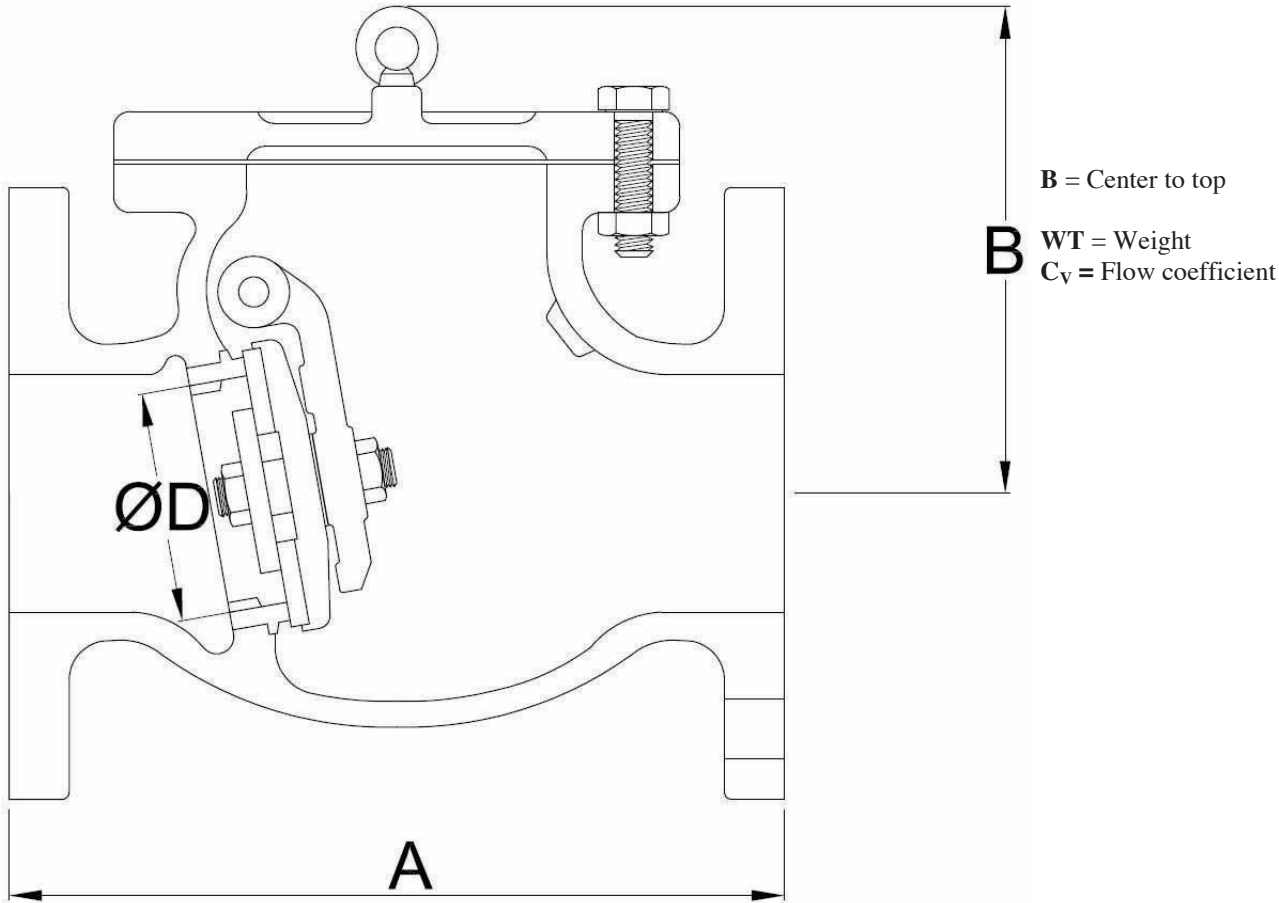
Item	Applicable Specification
Wall thickness	ASME B16.1
Pressure - temperature ratings	MSS SP-71
General valve design	MSS SP-71
End to End dimensions	ASME B16.10
Flange design	ASME B16.1
Fire Service	UL 312
Safety	FM 1210
Materials	ASTM

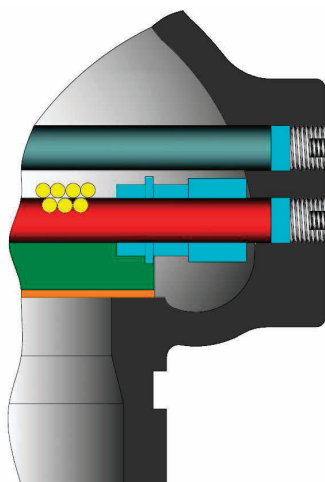
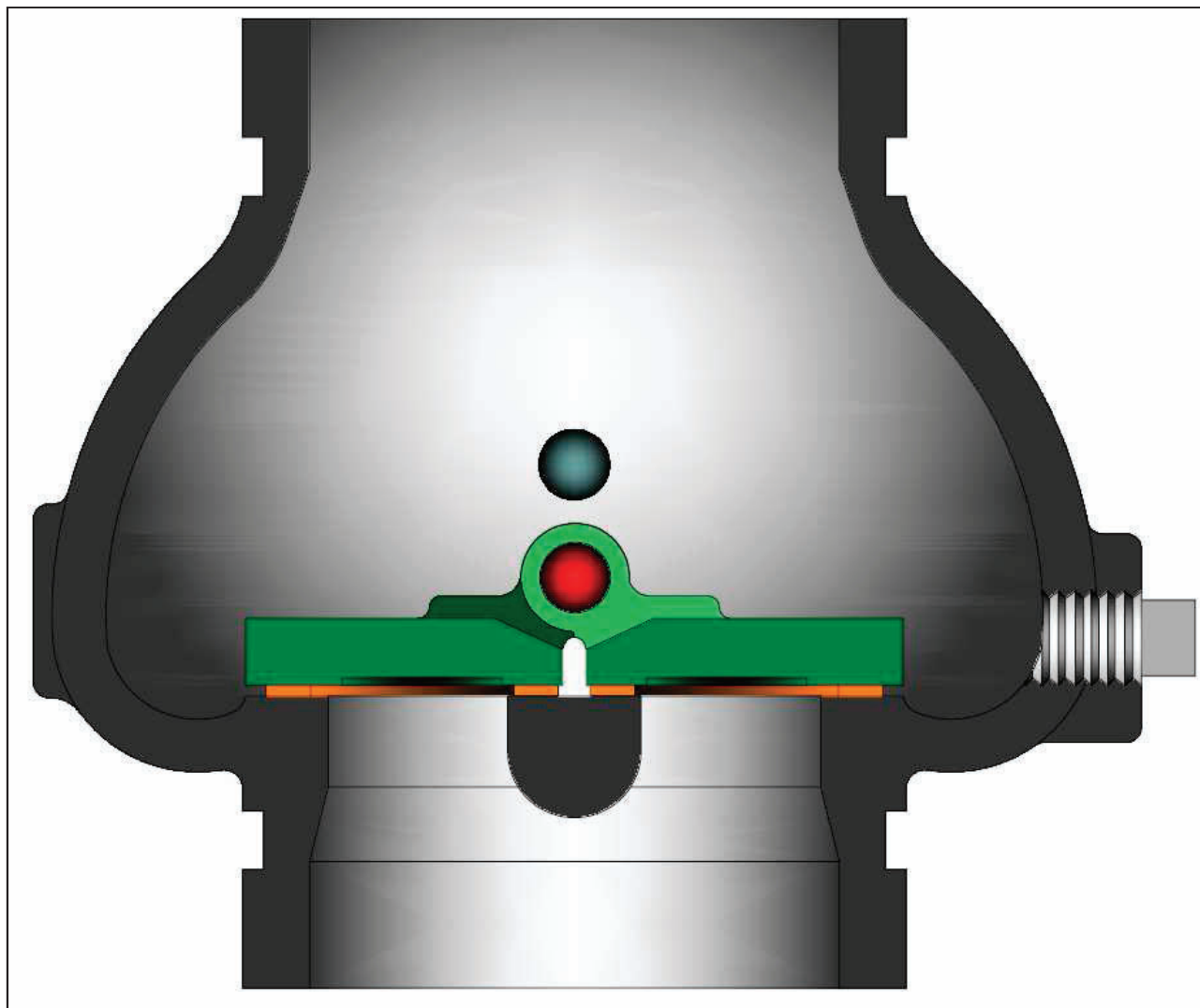
DESIGN FEATURES:

- **Seat faces** lapped for smooth finish and superior sealing.
- **Wall thickness** per heavy wall ASME B16.1 requirements.
- **Swivel disc** for improved seat alignment and longer life.
- **Each** valve is shell and seat pressure tested per industry standard MSS SP-71.
- **Check** valve are suitable for service in horizontal line with cap vertical or in a vertical line with flow upward.
- **UL and FM** approved fire protection valves.

UL AND FM SWING CHECK VALVE DIMENSIONS (CLASS 125).

SIZE	FIG 763U					
in	A	B	D	WT	lb	C _V
mm					kg	
3	9.50	7.6	3.00	46		175
80	241	194	75	21		
4	11.50	8.4	3.87	81		300
100	292	214	100	37		
6	14.00	10.2	5.87	150		730
150	356	258	150	68		
8	19.50	12.3	7.87	254		1360
200	495	312	200	115		
10	24.50	13.8	9.75	443		2090
250	622	352	250	201		
12	27.50	15.3	12.00	640		3250
300	699	389	305	290		





Pin Area Cut-Away

Class	Ends	Fig. No.
200 W.O.G.	Grooved	453UG
250 W.O.G.	Flanged	453UF

DESIGN FEATURES:

- **Flanged** ends available following ASME B16.1 class 125 standards.
- **Grooved** end dimensions follow AWWA C-606 standards for steel pipe.
- **UL and FM** approved fire protection valves.
- **Working** temperature range of 15° to 250° F (-10° to 120° C).

STANDARD MATERIALS	
PART	MATERIALS
Body	A536
Seat Ring	EPDM
Disc Plate	A351 CF8
Spring	SS 316
Hinge Pin	SS 316
Washer	Teflon
Thrust Washer	Teflon
Plug	Steel
Square Plug	Steel
Packing	Graphite

UL AND FM DUAL CHECK VALVE DIMENSIONS (CLASSES 200 AND 250).

SIZE	FIG 453UG				FIG 453UF			
in	A	C	WT	lb	A	C	WT	lb
mm				kg				kg
3	6.6	7.5	21		5.1	3.5	9	
80	168	191	10		130	89	4	
4	7.5	9.0	33		5.6	4.5	12	
100	191	229	15		143	114	6	
6	9.0	11.0	56		7.0	6.6	28	
150	229	279	25		178	168	13	
8	10.5	13.5	88		8.3	8.6	48	
200	267	343	40		210	219	22	

C = End Diameter

WT = Weight

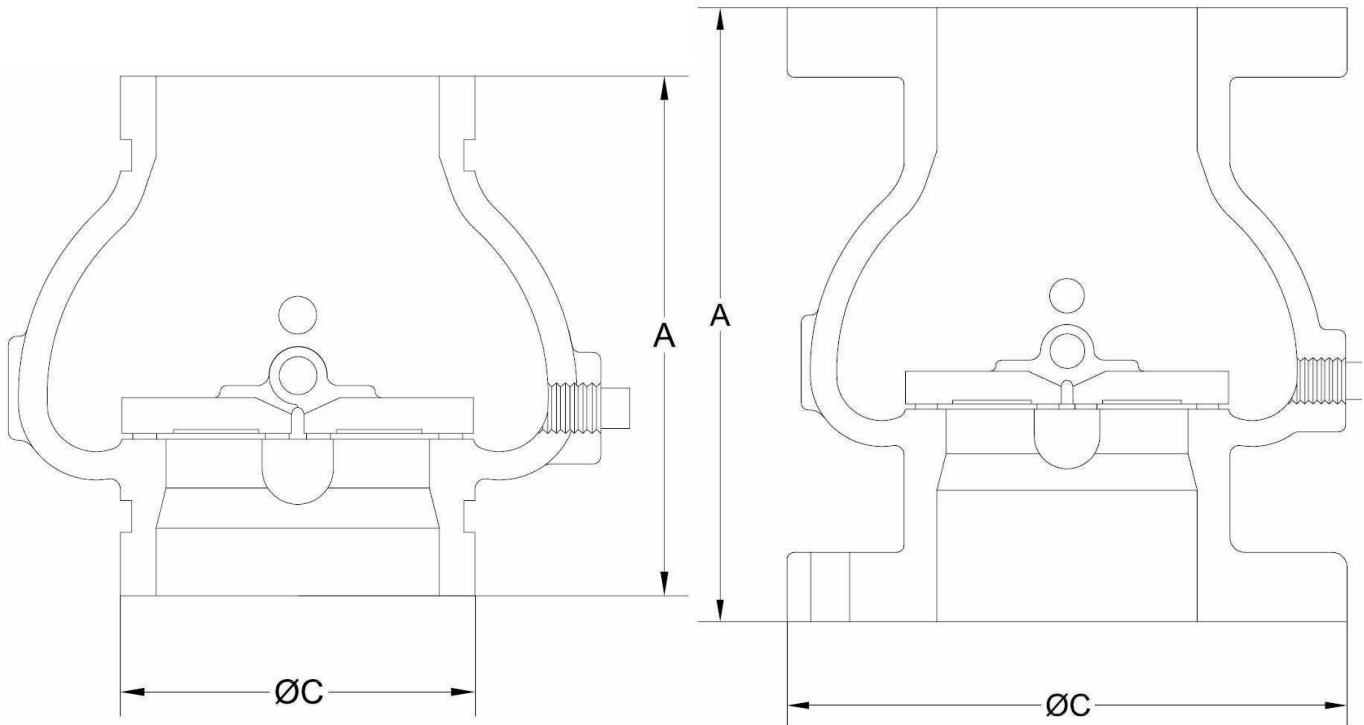


Fig. 453UG
200 LB

Fig. 453UF
250 LB

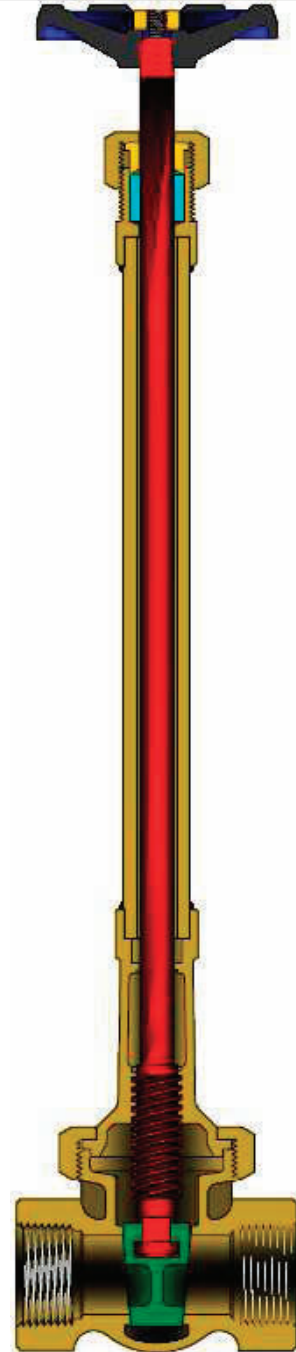
CRYOGENIC VALVES

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.

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 are offered in bronze or stainless steel and 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 bonnet chamber ventilation in order to prevent excess pressure build up caused by trapped cryogenic liquids.

Cryogenic Gate Valve



All the quality and benefits expected of all Powell valves are extended and preserved with its cryogenic line.

For more information, see Powell's Cryogenic catalog.

BRONZE and IRON Similarity Chart					
POWELL	MILWAUKEE	CRANE	NIBCO	STOCKHAM	HAMMOND
110	570			B375	
120			T-275-B	B66	IB412
150	590T	7TF	T-235-Y	B22T	IB413T
241	2981	351	F-178-B	G512	IR116
375	1153	422	T-154-A	B135	
377	1182	622E	T-174-A	B144	IB652
500	148	428/1700	T-111	B100	IB640
507	105	438/1701	T-113	B103	IB645
512	1140	437	T-133	B128	IB646
514	1150	431	T-131	B122	IB641
559	2974	373	F-918-B	G931	IR1124
559P	2974-M13	14493		AG931	IR1937
560	508	36	T-453-B	B345	IB944
578	509	37/1707	T-413-B	B319	IB904
650	502	1/1703	T-211-B	B16	IB440
1259	2974M26	373 1/2	F-918-N	G933	IR1126
1787	2882	461	F-619	G612	IR1138
1793	2885	465 1/2	F-617-O	G623	IR1140
1797	2894	7-1/2E	F-667-O	F667	IR330
1816	2885M26	475 1/2	F-617-ON	G624	IR1146
1893	2885-M13	14477		AG642	IR1913
2375	1174	424		B132	IB651
2377	1184	634E	T-174-SS	B145	IB654
2600	591A	14-1/2P		B29	
2608	592A	212P	T-256-AP	B62	IB434
2612	593A	382P	T-276-AP	B74	IB444
2614	582	384P	T-375-B	B266	
2700	1152	428UB	T-124	B105	IB617
2712	1141		T-136	B130	IB638
2714	1151	431UB	T-134	B120	IB629

VALVE STANDARDS AND RELATED INFORMATION 59

PRESSURE/TEMPERATURE RATINGS 60

CHEMICAL AND PHYSICAL PROPERTIES 61

BRONZE AND IRON VALVE FLANGE DIMENSIONS 62-64

METHOD OF DESIGNATING LOCATION OF AUXILIARY CONNECTIONS 65

FLOW DESIGN AND MAINTENANCE RECOMMENDATIONS 66

CONVERSION DATA AND EQUIVALENTS 67-68

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

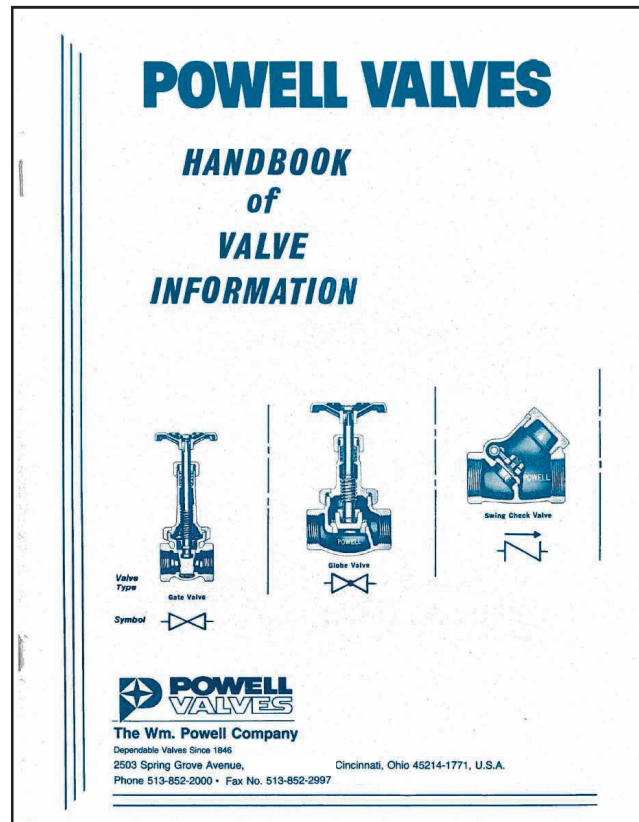
1. Bronze and Iron Valves

- (A) MSS SP-80 → Bronze Gate, Globe, Angle and Check Valves
- (B) MSS SP-70 → Cast Iron Gate Valves, Flanged and Threaded Ends
- (C) MSS SP-71 → Cast Iron Check Valves, Flanged and Threaded Ends
- (D) MSS SP-85 → Cast Iron Globe and Angle Valves, Flanged and Threaded Ends
- (E) UL 262 → Gate Valves for Fire-Protection Service
- (F) UL 312 → Check Valves for Fire-Protection Service
- (G) FM 1120/1130 → Approval Standard for Fire Service Water Control Valves (OS&Y and NRS Type Gate Valves)
- (H) FM 1130 → Approval Standard for Swing 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 1/8 - 2" having threaded ends and metal to metal union ring body-bonnet joints
- (f) Valves with resilient seat materials, synthetic rubber or urethane, shall have cold water pressure ratings of 33° F to 150° F.

TABLE 2

ASTM A126-B AND A536 IRON (f)

PRESSURE (psig)				
TEMP. °F.	CLASS 125		CLASS 250	
	NPS 2-12	NPS 14-24	NPS 2-12	NPS 14-24
-20 to 150	200	150	500	300
200	190	135	460	280
225	180	130	440	270
250	175	125	415	260
275	170	120	395	250
300	165	110	375	240
325	155	105	355	230
350	150	100	335	220
375	145		315	210
400	140		290	200
425	130		270	
450	125		250	

CHEMICAL AND PHYSICAL PROPERTIES

Bronze and Iron

TABLE 3

ASTM STANDARD GRADE		ASTM B-61	ASTM B-62	ASTM A126-B (b)	3% NICKEL IRON (b)	ASTM A536 Gr. 65-45-12 (b)
CARBON (C)	(Min)	-	-	3.2	3.2	3.5
	(Max)	-	-	3.4	3.4	3.9
MANGANESE (Mn)	(Min)	-	-	0.6	0.6	0.15
	(Max)	-	-	0.9	0.9	0.35
PHOSPHORUS (P)	(Min)	-	-	-	-	-
	(Max)	0.05	0.05	0.75	0.75	0.05
SULFUR (S)	(Min)	-	-	-	-	0.010
	(Max)	0.05	0.08	0.15	0.15	0.025
SILICON (Si)	(Min)	-	-	1.8	1.8	2.25
	(Max)	0.005	0.005	2.2	2.2	2.75
COPPER (Cu)	(Min)	86.0	84.0	-	-	-
	(Max)	90.0	86.0	-	-	-
NICKEL (Ni)	(Min)	-	-	-	3.0	-
	(Max)	1.0	1.0	-	4.0	-
TIN (Sn)	(Min)	5.5	4.0	-	-	-
	(Max)	6.5	6.0	-	-	-
IRON (Fe)	(Min)	-	-	Remainder	Remainder	Remainder
	(Max)	0.25	0.30	Remainder	Remainder	Remainder
ZINC (Zn)	(Min)	3.0	4.0	-	-	-
	(Max)	5.0	6.0	-	-	-
LEAD (Pb)	(Min)	1.0	4.0	-	-	-
	(Max)	2.0	6.0	-	-	-
ANTIMONY (Sb)	(Min)	-	-	-	-	-
	(Max)	0.25	0.25	-	-	-
ALUMINUM (Al)	(Min)	-	-	-	-	-
	(Max)	0.005	0.005	-	-	-
TENSILE STRENGTH (Ksi)	(Min)	34	30	31	31	65
YIELD STRENGTH (Ksi)	(Min)	16	14	-	-	45
ELONGATION (%)	(Min)	24	20	-	-	12
TEMPERATURE (°F)	(Min)	-20 (a)	-20 (a)	-20	-20	-20
	(Max)	550	450	450	450	450

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

(b) Chemistry is typical values.

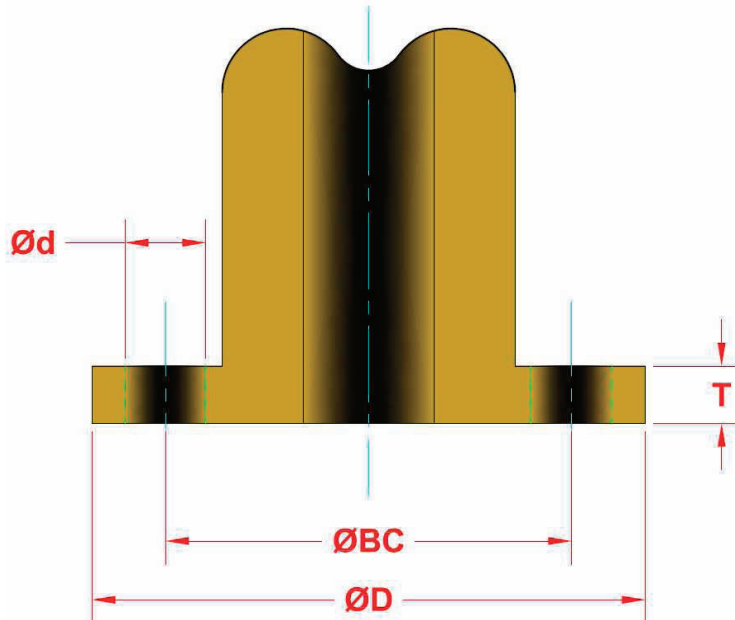
NOTE: Chemical Compositions Are In Units Of Percent.

BRONZE VALVE FLANGE DIMENSIONS

TABLE 4

All Dimensions in Units of Inches

CLASS 150



NPS	Diameter of Flange, (D)	Bolt Circle, (BC)	Diameter of Bolt Hole (d)	Number of Bolts	Minimum Thickness of Flange, (T)
2	6.00	4.75	3/4	4	0.50
2 ½	7.00	5.50	3/4	4	0.56
3	7.50	6.00	3/4	4	0.62
3 ½	8.50	7.00	3/4	8	0.69
4	9.00	7.50	3/4	8	0.69
5	10.00	8.50	7/8	8	0.75
6	11.00	9.50	7/8	8	0.81
8	13.50	11.75	7/8	8	0.94
10	16.00	14.25	1	12	1.00
12	19.00	17.00	1	12	1.06

NOTES:

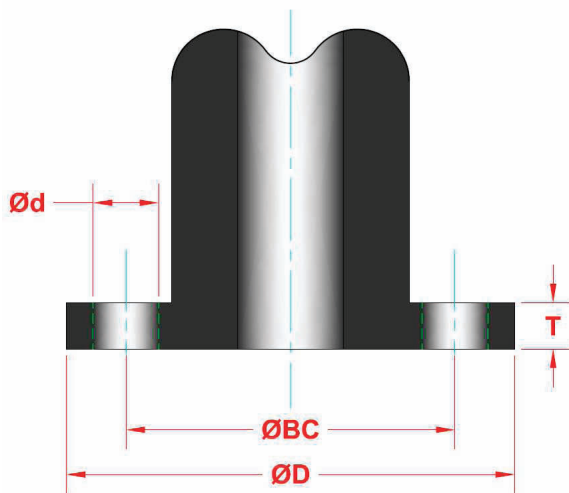
Table is excerpt from Table I-2 of ASME B16.24.

IRON VALVE FLANGE DIMENSIONS

All Dimensions in Units of Inches

TABLE 5

CLASS 125



NPS	Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Minimum Thickness of Flange, (T)
2	6.00	4.75	3/4	4	0.62
2 ½	7.00	5.50	3/4	4	0.69
3	7.50	6.00	3/4	4	0.75
3 ½	8.50	7.00	3/4	8	0.81
4	9.00	7.50	3/4	8	0.94
5	10.00	8.50	7/8	8	0.94
6	11.00	9.50	7/8	8	1.00
8	13.50	11.75	7/8	8	1.12
10	16.00	14.25	1	12	1.19
12	19.00	17.00	1	12	1.25
14	21.00	18.75	1 1/8	12	1.38
16	23.50	21.25	1 1/8	16	1.44
18	25.00	22.75	1 1/4	16	1.56
20	27.50	25.00	1 1/4	20	1.69
24	32.00	29.50	1 3/8	20	1.88

NOTES:

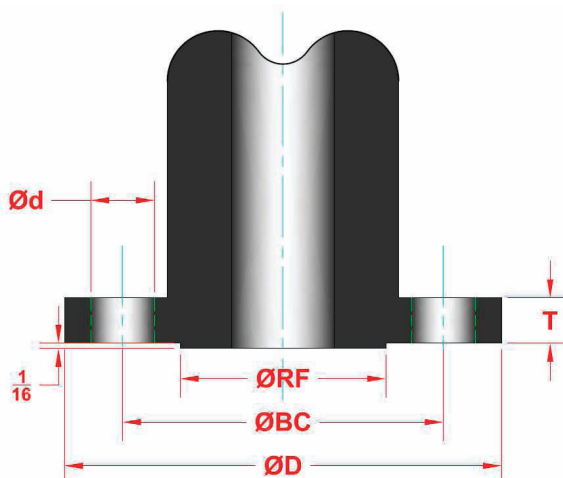
(1) Table is excerpt from Table 4 of ASME B16.1.

IRON VALVE FLANGE DIMENSIONS

All Dimensions in Units of Inches

TABLE 6

CLASS 250



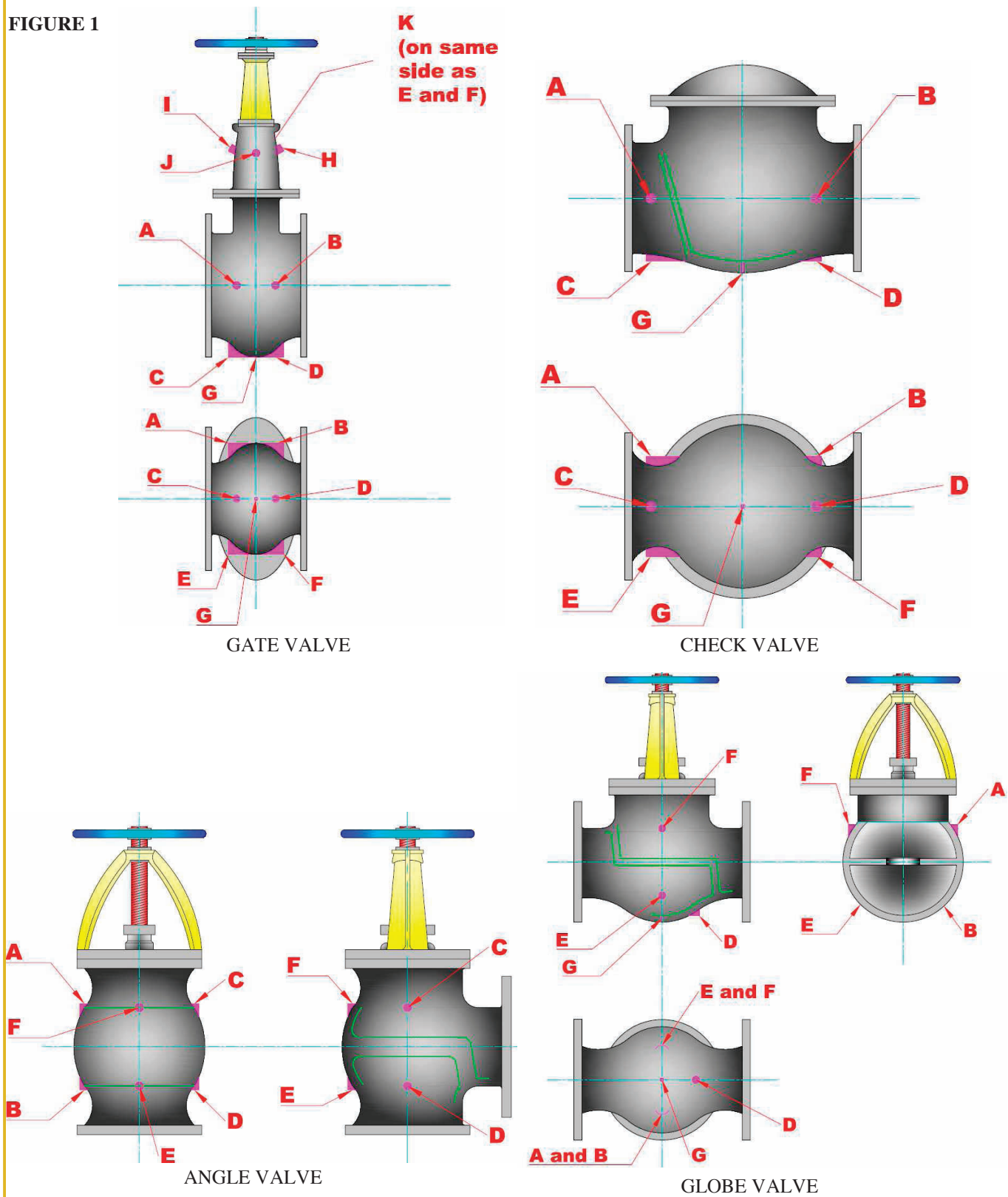
NPS	Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Minimum Thickness of Flange, (T)	Diameter of Raised Face (RF)
2	6.50	5.00	3/4	8	0.88	4.19
2 ½	7.50	5.88	7/8	8	1.00	4.94
3	8.25	6.62	7/8	8	1.12	5.69
3 ½	9.00	7.25	7/8	8	1.19	6.31
4	10.00	7.88	7/8	8	1.25	6.94
5	11.00	9.25	7/8	8	1.38	8.31
6	12.50	10.62	7/8	12	1.44	9.69
8	15.00	13.00	1	12	1.62	11.94
10	17.50	15.25	1 1/8	16	1.88	14.06
12	20.50	17.75	1 1/4	16	2.00	16.44
14	23.00	20.25	1 1/4	20	2.12	18.94
16	25.50	22.50	1 3/8	20	2.25	21.06
18	28.00	24.75	1 3/8	24	2.38	23.31
20	30.50	27.00	1 3/8	24	2.50	25.56
24	36.00	32.00	1 5/8	24	2.75	30.31

NOTES:

(1) Table is excerpt from Table 6 in ASME B16.1.

**METHOD OF DESIGNATING LOCATION OF AUXILIARY
CONNECTIONS WHEN SPECIFIED**

FIGURE 1



GENERAL NOTE:

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

FLOW DESIGN AND MAINTENANCE RECOMMENDATIONS

- (1) SWING CHECK VALVES- Minimum ½ psi differential pressure across valve to maintain proper “full open” position.
- (2) LIFT CHECK AND NON-RETURN VALVES- Minimum 2 psi differential pressure across valve to maintain proper “full open” position
- (3) Recommended length of straight pipe before and after check and non-return valves to be 10 times pipe diameter to avoid flow turbulence at valve.
- (4) For metal seated check valves at low pressure applications (approximately 50 psi or less), seat leakage may be significantly greater than normal seat test allowable limit.
- (5) RECOMMENDED MAXIMUM FLOW VELOCITIES (APPROXIMATE):

<u>VALVE SIZE</u>	<u>WATER</u>	<u>SATURATED STEAM</u>	<u>SUPERHEATED STEAM</u>
	(FT/MIN)	(FT/MIN)	(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 59.**

COMPARISON CHART OF VALVE SIZE/NOMINAL PIPE SIZE

TABLE 7

<u>METRIC NOMINAL SIZE</u> (DN)	<u>ENGLISH NOMINAL SIZE</u> (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): $F = 1.8 \times C + 32$

TO CONVERT FROM FAHRENHEIT (F) TO DEGREES CENTIGRADE (C): $C = 0.556 \times (F - 32)$

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

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.

The logo for Powell Valves features the word "POWELL" in a bold, solid blue, sans-serif font. Below it, the word "VALVES" is written in a large, white, outlined, sans-serif font. A thick blue horizontal line is positioned directly beneath the word "VALVES".

Established 1846



POWELL VALVES

2503 SPRING GROVE AVENUE, CINCINNATI, OHIO 45214-1771, U.S.A.

PHONE 513.852.2000 • FAX NO. 513.852.2997

www.powellvalves.com



RESILIENT SEATED BUTTERFLY VALVES

DUCTILE IRON

WAFER BODY AND LUG BODY

SOFT SEAT



Protect Tomorrow. Today
Powell Valves
NextGen Engineering



Powell Valves NextGen Engineering

For decades, Powell Valves has provided reliable and trusted products that not only meet, but exceed customer confidence and expectations.

Expect 100% Customer Satisfaction

Quality performance is at the heart of every product we sell. We are proud of our long-standing reputation for excellence in our industry and will continue to anticipate and meet the growing needs of consumers.

SINCE 1846

TABLE OF CONTENTS

THE WM. POWELL COMPANY - PROFILE	4
HOW TO ORDER	5
DESIGN FEATURES	6
SEAT SELECTION GUIDE	7
RESILIENT SEATED BUTTERFLY VALVES	8 - 11
TORQUE AND BOLTING DATA	12
LEVER DATA	13
POWELL "A" SERIES QUARTER TURN WORM GEARS	14 - 15
TERMS AND CONDITIONS	16 - 18

THE WM. POWELL COMPANY - PROFILE

The Wm. Powell Company is very proud of our achievements and our evolution in the past 171 years. We like to refer to ourselves as 171 years young due to our flexibility in changing quickly to our customer's 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 a 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 Valves 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 an additional inventory hub in Asia. 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 170, 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 RESILIENT SEAT BUTTERFLY VALVES

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

Digit														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Size			Blank	Base Figure Number				End Code	Material Code	Trim	Packing/Gasket	Option Code		
6	.	0		1	2	7	1	Q	6	E	T	G	L	V

Example Code for 6" Class 125, Resilient Seat Butterfly, Lug Style, Ductile Iron Body, SS 416 Stem, Ductile Iron Nickel Plated Disc, EPDM Seat, PTFE Packing, lever Operated

Size Code	
Code	Size
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"
etc.	etc.

Base Figure Number	
No	Class
1271	125

End Code	
Code	Type
Q	LUG
Y	Wafer
Z	Special ends

Material Codes	
Code	ASTM
6	Ductile Iron
Z	Special Material

Trim	
Code	Description
T	SS 416 Stem, 316 Disc, Teflon Seat
V	SS 416 Stem, 316 Disc, Viton Seat
E	SS 416 Stem, Ductile Iron, Nickel plated disc, EPDM Seat
B	SS 416 Stem, Ductile Iron, Nickel plated disc, Buna Seat
A	SS 416 Stem, 316 Disc, EPDM Seat
C	SS 416 Stem, 316 Disc, Buna Seat
D	SS 416 Stem, Bronze Disc, EPDM Seat
F	SS 416 Stem, Bronze Disc, Buna Seat
Z	Special Trim

Packing/Gasket	
Code	Option
T	PTFE Packing
G	Graphite Packing
Z	Special Packing

Option Codes	
Code	Option
XXX	No Options
GLV	Lever Operator
GXX	Gear Operator
M--	Actuated (Elec.)
	Actuated (pnu.)

POWELL VALVE DESIGN FEATURES:

1. Stem

- One piece through shaft

2. ISO Direct Mount Pad

- Ductile iron (ASTM A 536)
- 2"-12": square stem
- 14" and larger: double-D stem

3. O-Ring

- Prevention of stem leakage

4. Bushing

- Provides shaft support

5. Seat

- Phenolic back seat

6. Disc

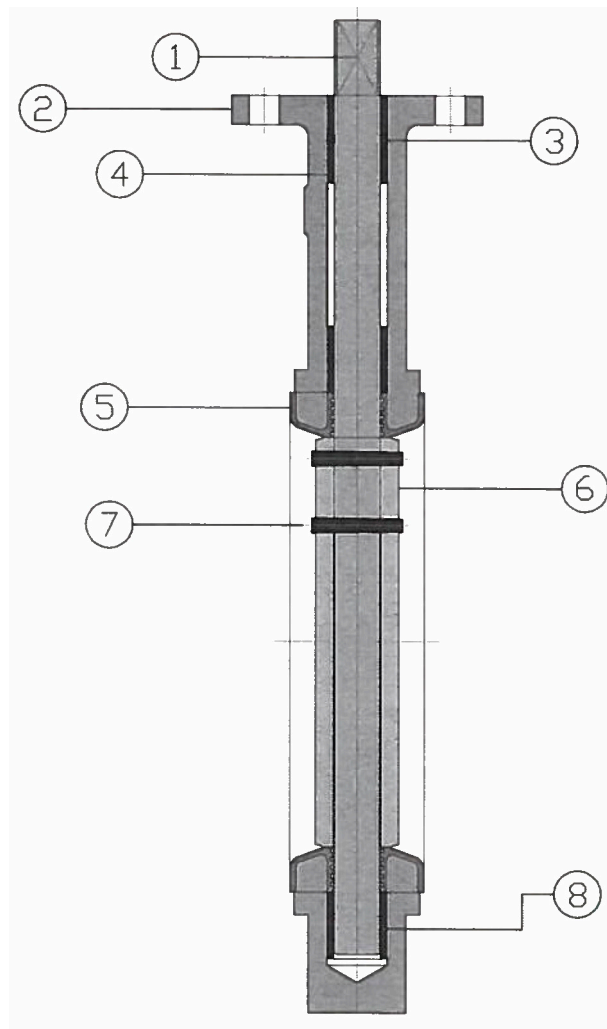
- Provides bubble tight shut-off

7. Taper Pin

- Ensures a positive vibration-proof shaft

8. Support Shaft Seal

- Bonding of elastomer to phenolic backing ring protects against distortion, a common cause of shaft leakage



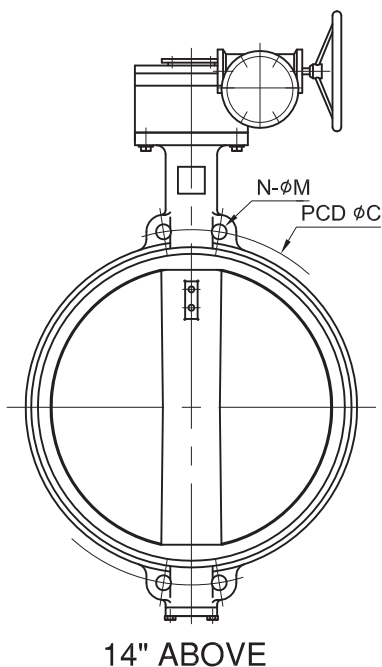
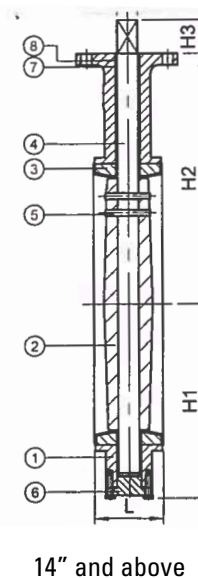
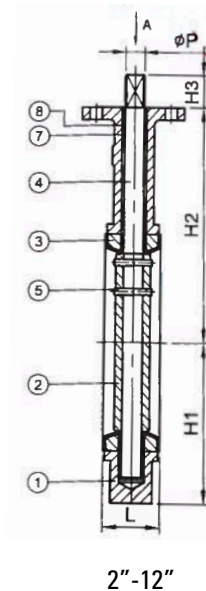
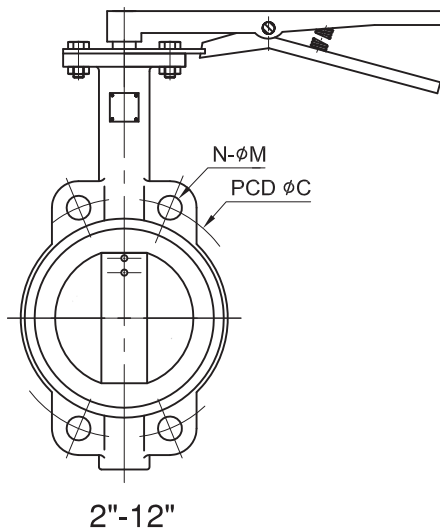
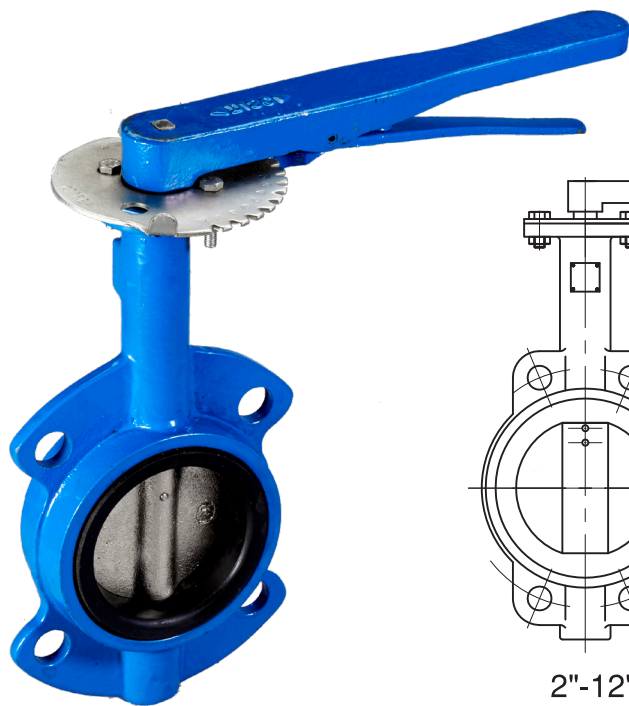
VALVE SEAT MATERIAL SELECTION GUIDE

MATERIAL	DESCRIPTION	COLOR
PTFE	<p>The material is the basic seat material used in most butterfly valves. Its chemical compatibility is excellent for almost all media service applications.</p> <p>-40°F — 275°F</p>	White
EPDM	<p>EPDM has good abrasion and tear resistance while offering excellent chemical resistance to a variety of acid and weak alkaline-based media. It also has exceptional weather aging and ozone resistance. EPDM is susceptible to attacks by oils and therefore is not recommended for applications involving petroleum oils, hydrocarbons, alcohols, strong acids, or strong alkalines.</p> <p>-30°F — 275°F</p>	Black
BUNA-N	<p>BUNA-N (NBR) is a general purpose polymer with good resistance to oil, water, solvents, and hydraulic fluids. With good compression, tensile strength and abrasion-resistance, BUNA-N performs well with diverse media such as fatty acids, oils, alcohols, compressed air, Di-ester based fluids, inactive gasses or glycerine.</p> <p>10°F — 180°F</p>	Black
VITON	<p>Viton is DuPont's trademark name for Fluoroelastomer and is widely recognized for excellent heat resistance. With extensive chemical compatibility spanning a wide range of concentration and temperature ranges, fluorocarbon elastomers have gained acceptance in a variety of applications. Viton offers excellent resistance to aggressive fuels and chemicals as well as diverse media as mineral acids, salt solutions, chlorinated hydrocarbons, and petroleum oils.</p> <p>0°F — 350°F</p>	Black or Red

SERIES 1271 Y

RESILIENT SEAT BUTTERFLY VALVES

WAFER STYLE



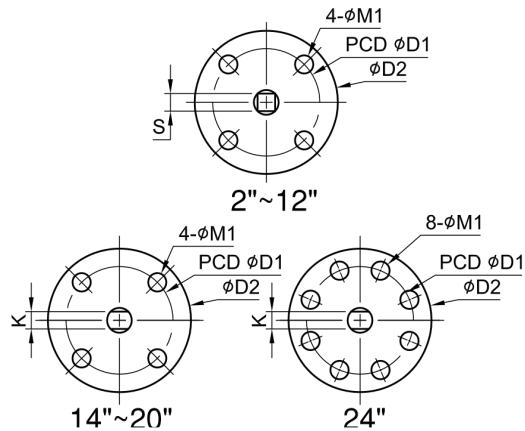
DESIGN FEATURES:

- Upper and Lower Bearings to maximize valve life
- Direct Mount
- 2"-12" standard with lever
- 14" and larger standard with gear
- Support shaft seal: bonding of elastomer to phenolic backing ring protects against distortion, a common cause of shaft leakage
- Integral ISO mounting pad for easy valve operation; no bracket needed
- One piece stem ensures dependability and positive disc positioning
- Available in Wafer and Lug styles
- Disc has a precision profile that provides bubble tight shut off and assures minimum torque
- Seat Materials: Multiple seat materials available (Page 7)
- Seat Face negates need for flange gaskets
- O-Ring ensures dependability and positive disc positioning

Class	Fig. No.	End
2"- 12" 200psi 14"- 24" 130psi	1271 Y	Wafer

PART	MATERIAL
Body	DI
Seat	EPDM / BUNA / VITON / PTFE
Disc	DI / SS 316 / BRONZE
Seat	BUNA / EPDM / PTFE
Bushing	PTFE
O-Ring	EPDM / BUNA
Taper Pin	SS 316
Stem	SS 416

See seating chart for temperature. (Page 7)



RESILIENT SEATED BUTTERFLY VALVE (WAFER STYLE) DIMENSIONS

VALVE SIZE		C		L		H1		H2		H3		S		M.FL	WEIGHT
NPS	DN													ISO	LBS
2"	DN50	4.74	120.5	1.61	46	2.99	76	6.38	162	1.18	30	0.35	9	F07	5.5
2-1/2"	DN65	5.49	139.5	1.93	49	3.5	89	6.89	175	1.18	30	0.35	9		7.7
3"	DN80	6	152.5	1.93	49	3.74	95	7.13	181	1.18	30	0.35	9		8.8
4"	DN100	7.5	190.5	2.17	55	4.49	114	7.87	200	1.18	30	0.43	11		12
5"	DN125	8.5	216	2.32	59	5	127	8.39	213	1.18	30	0.55	14		16.5
6"	DN150	9.51	241.5	2.32	59	5.51	140	8.86	225	1.18	30	0.55	14		19
8"	DN200	11.75	298.5	2.52	64	6.97	177	10.24	260	1.42	36	0.67	17	F11	30
10"	DN250	14.25	362	2.81	71.5	7.99	203	11.5	292	1.42	36	0.87	22		21
12"	DN300	17.01	432	3.13	79.5	9.53	242	13.19	335	1.42	36	0.87	22		66
14"	DN350	18.74	476	3.19	81	10.51	267	14.49	368	1.77	45				129
16"	DN400	21.24	539.5	3.54	90	11.73	298	15.75	400	2.01	51			F14	222
18"	DN450	22.76	578	4.29	109	12.52	318	16.61	422	2.01	51				235
20"	DN500	25	635	5.31	135	13.74	349	18.86	479	2.52	64				352
24"	DN600	29.51	749.5	6.18	157	17.48	444	22.13	562	2.76	70			F25	501

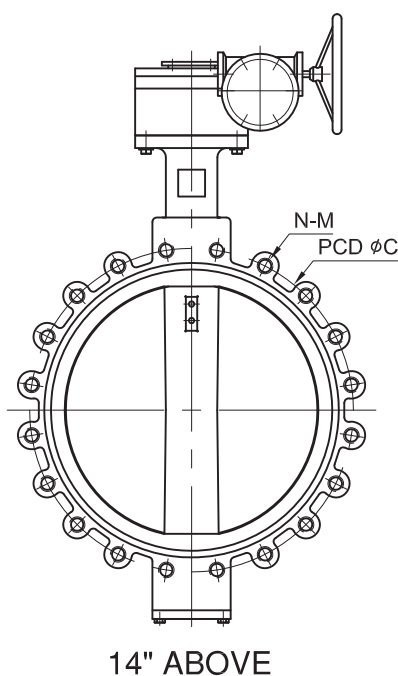
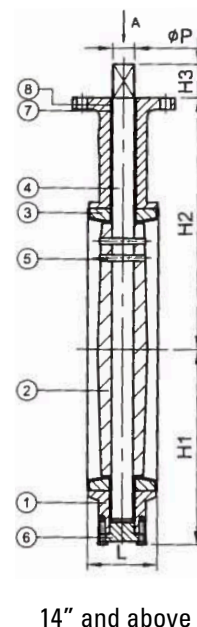
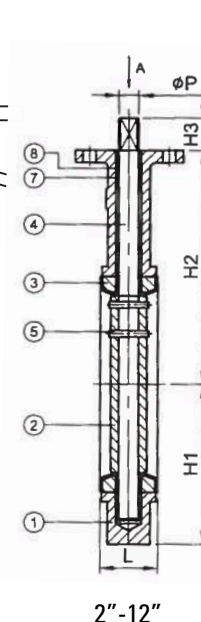
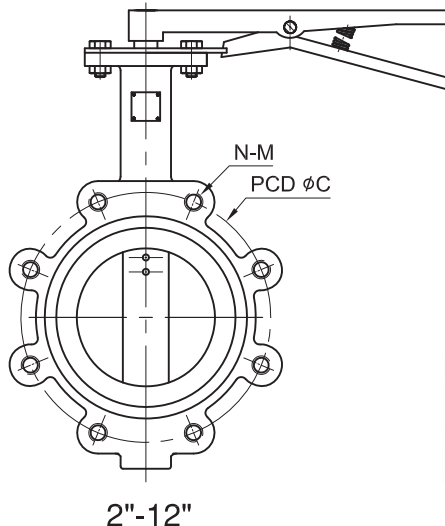
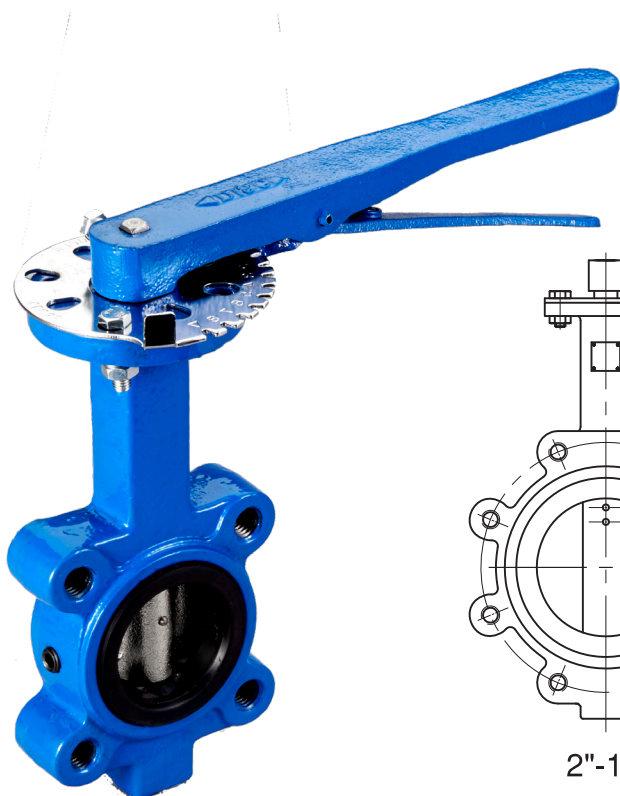
VALVE SIZE		K		P		D1		D2		N	M		M1		M.FL	WEIGHT
NPS	DN														ISO	LBS
2"	DN50			0.5	12.7	2.76	70	3.54	90	4	0.75	0.19	0.41	10.5	F07	5.5
2-1/2"	DN65			0.5	12.7	2.76	70	3.54	90	4	0.75	0.19	0.41	10.5		7.7
3"	DN80			0.5	12.7	2.76	70	3.54	90	4	0.75	0.19	0.41	10.5		8.8
4"	DN100			0.62	15.8	2.76	70	3.54	90	8	0.75	0.19	0.41	10.5		12
5"	DN125			0.75	19.05	2.76	70	3.54	90	8	0.87	22	0.41	10.5		16.5
6"	DN150			0.75	19.05	2.76	70	3.54	90	8	0.87	22	0.41	10.5		19
8"	DN200			0.87	22.2	4.02	102	4.92	125	8	0.87	22	0.49	12.5	F11	30
10"	DN250			1.13	28.6	4.02	102	4.92	125	12	0.98	25	0.49	12.5		21
12"	DN300			1.25	31.8	4.02	102	4.92	125	12	0.98	25	0.49	12.5		66
14"	DN350	0.94	24	1.25	31.8	4.02	102	4.92	125	12	1.14	29	0.49	12.5		129
16"	DN400	1.06	27	1.31	33.3	5.51	140	6.89	175	16	1.14	29	0.71	18	F14	222
18"	DN450	1.06	27	1.5	38	5.51	140	6.89	175	16	1.26	32	0.71	18		235
20"	DN500	1.26	32	1.62	41.15	5.51	140	6.89	175	20	1.26	32	0.71	18		352
24"	DN600	1.42	36	1.99	50.65	10	254	11.81	300	20	1.38	35	0.71	18	F25	501

ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE UPON REQUEST.

SERIES 1271 Q

RESILIENT SEAT BUTTERFLY VALVES

LUG STYLE



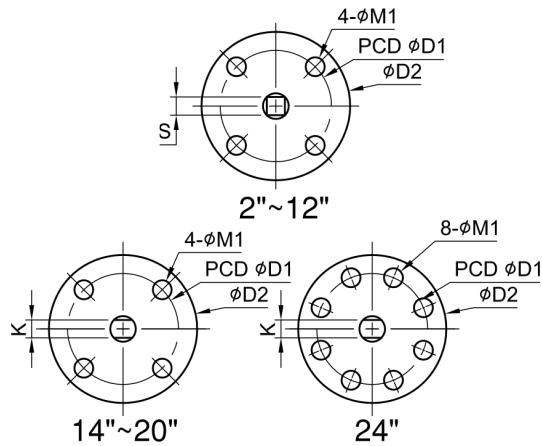
DESIGN FEATURES:

- Upper and Lower Bearings to maximize valve life
- Direct Mount
- 2"-12" standard with lever
- 14" and larger standard with gear
- Support shaft seal: bonding of elastomer to phenolic backing ring protects against distortion, a common cause of shaft leakage
- Integral ISO mounting pad for easy valve operation; no bracket needed
- One piece stem ensures dependability and positive disc positioning
- Available in Wafer and Lug styles
- Disc has a precision profile that provides bubble tight shut off and assures minimum torque
- Seat Materials: Multiple seat materials available (Page 7)
- Seat Face negates need for flange gaskets
- O-Ring ensures dependability and positive disc positioning

Class	Fig. No.	End
2" - 12" 200psi 14" - 24" 130psi	1271 Q	Lug

PART	MATERIAL
Body	DI
Seat	EPDM / BUNA / VITON / PTFE
Disc	DI / SS 316 / BRONZE
Seat	BUNA / EPDM / PTFE
Bushing	PTFE
O-Ring	EPDM / BUNA
Taper Pin	SS 316
Stem	SS 416

See seating chart for temperature. (Page 7)



RESILIENT SEATED BUTTERFLY VALVE (LUG STYLE) DIMENSIONS

VALVE SIZE		C		L		H1		H2		H3		S		M.FL	WEIGHT
NPS	DN													ISO	LBS
2"	DN50	4.74	120.5	1.81	46	2.99	76	6.36	162	1.18	30	0.35	9	F07	9
2-1/2"	DN65	5.49	139.5	1.93	49	3.5	89	6.89	175	1.18	30	0.35	9		11
3"	DN80	6	152.5	1.93	49	3.74	95	7.13	181	1.18	30	0.35	9		12
4"	DN100	7.5	190.5	2.17	55	4.49	114	7.87	200	1.18	30	0.43	11		19
5"	DN125	8.5	216	2.32	59	5	127	8.39	213	1.18	30	0.55	14		22
6"	DN150	6.51	241.5	2.32	59	5.51	140	8.86	225	1.18	30	0.55	14		31
8"	DN200	11.75	298.5	2.52	64	6.81	173	10.24	260	1.42	36	0.67	17	F11	42
10"	DN250	14.25	362	2.61	71.5	7.99	203	11.5	292	1.42	36	0.87	22		60.5
12"	DN300	17.01	432	3.13	79.5	9.33	237	13.27	337	1.42	36	0.87	22		88
14"	DN350	18.74	476	3.19	81	11.02	280	14.49	368	1.77	45				179
16"	DN400	21.24	539.5	3.54	90	11.97	304	15.75	400	2.01	51			F14	284
18"	DN450	22.76	578	4.29	109	14.25	362	16.73	425	2.01	51				349
20"	DN500	25	635	5.31	135	14.49	368	16.9	480	2.52	64				499
24"	DN600	29.51	749.5	6.18	157	17.46	444	22.13	562	2.76	70			F25	694

VALVE SIZE		K		P		D1		D2		N	M	M1		M.FL	WEIGHT
NPS	DN													ISO	LBS
2"	DN50			0.5	12.7	2.76	70	3.54	90	4	5/8"-11	0.41	10.5	F07	9
2-1/2"	DN65			0.5	12.7	2.76	70	3.54	90	4	5/8"-11	0.41	10.5		11
3"	DN80			0.5	12.7	2.76	70	3.54	90	4	5/8"-11	0.41	10.5		12
4"	DN100			0.62	15.8	2.76	70	3.54	90	8	5/8"-11	0.41	10.5		19
5"	DN125			0.75	19.05	2.76	70	3.54	90	8	3/4"-10	0.41	10.5		22
6"	DN150			0.75	19.05	2.76	70	3.54	90	8	3/4"-10	0.41	10.5		31
8"	DN200			0.87	22.2	4.02	102	4.92	125	8	3/4"-10	0.49	12.5	F11	42
10"	DN250			1.13	28.6	4.02	102	4.92	125	12	7/8"-9	0.49	12.5		60.5
12"	DN300			1.25	31.8	4.02	102	4.92	125	12	7/8"-9	0.49	12.5		88
14"	DN350	0.94	24	1.25	31.8	4.02	102	4.92	125	12	1"-8	0.49	12.5		179
16"	DN400	1.06	27	1.31	33.3	5.51	140	6.89	175	16	1"-8	0.71	18	F14	284
18"	DN450	1.06	27	1.5	38	5.51	140	6.89	175	16	1-1/8"-7	0.71	18		349
20"	DN500	1.26	32	1.62	41.15	5.51	140	6.89	175	20	1-1/8"-7	0.71	18		499
24"	DN600	1.42	36	1.99	50.65	10	254	11.81	300	20	1/4"-7	0.71	18	F25	694

ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE UPON REQUEST.

BOLTING DATA AND SOFT SEAT TORQUE DATA

Size and Quantity of Bolts for Valve Installation ANSI 125/150

SIZE	STUD BOLT FOR WAFER TYPE			HEXAGON HEAD BOLT FOR LUG TYPE	
	QTY	UNC	LENGTH	QTY	UNXCL
2"	4	5/8"	120	4x2	5/8"x35
2.5"	4	5/8"	130	4x2	5/8"x40
3"	4	5/8"	133	4x2	5/8"x40
4"	8	5/8"	139	8x2	5/8"x45
5"	8	3/4"	152	8x2	3/4"x45
6"	8	3/4"	155	8x2	3/4"x45
8"	8	3/4"	165	8x2	3/4"x50
10"	12	7/8"	183	12x2	7/8"x60
12"	12	7/8"	183	12x2	7/8"x65
14"	12	1"	214	12x2	1"x70
16"	16	1"	241	16x2	1"x85
18"	16	1 1/8"	265	16x2	1 1/8"x90
20"	20	1 1/8"	284	20x2	1 1/8"x100
24"	20	1 1/4"	305	20x2	1 1/4"x110

PTFE/VITON Seat Butterfly Valve Torques

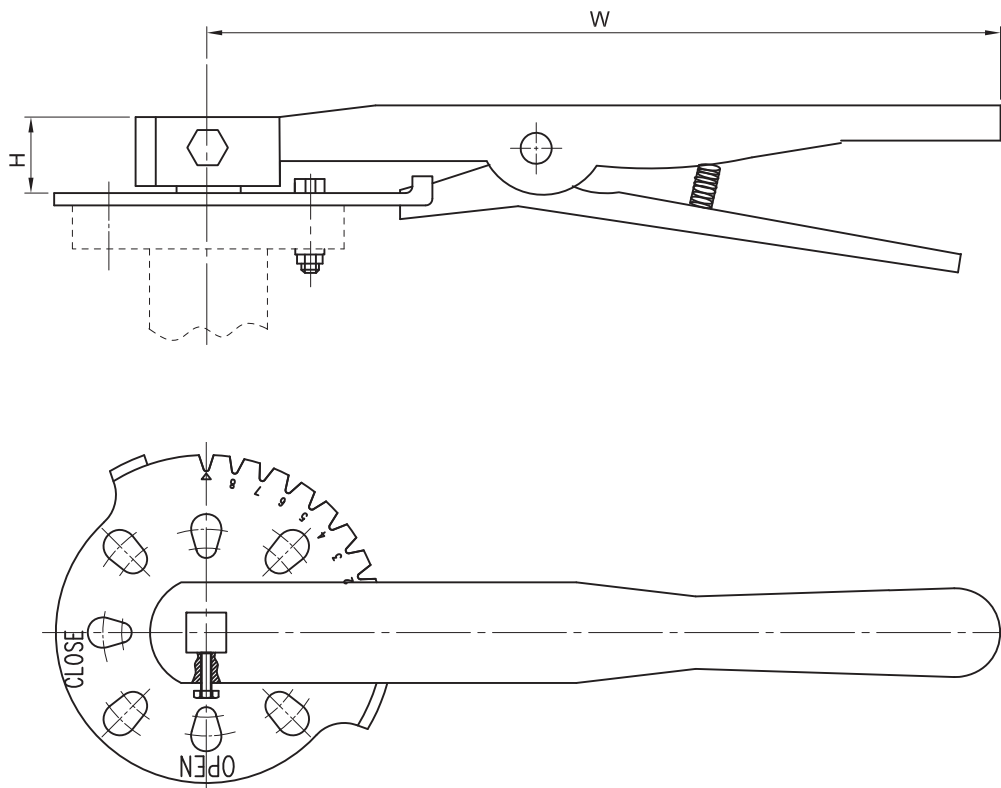
SIZE	TORQUE (N.m)	TORQUE (in.lb)
2"	20	177
2.5"	24	212
3"	32	283
4"	45	398
5"	60	531
6"	105	929
8"	260	2301
10"	365	3231
12"	520	4602

EPDM/NBR Seat Butterfly Valve Torques

SIZE	TORQUE (N.m)	TORQUE (in.lb)
2"	15	133
2.5"	17	150
3"	25	221
4"	35	310
5"	45	398
6"	80	708
8"	170	1505
10"	260	2301
12"	380	3363
14"	450	3983
16"	650	5753
18"	1000	8851
20"	1300	11506
24"	2200	19472

Note: The torque values are under wet condition. Torque values do not include a safety factor, proposed to increase by the safety value of 25%. The torque values are for reference only.

POWELL LEVER OPERATORS



Dimension (in/mm)

VALVE SIZE NPS / DN	H	W
2" - 6" / DN50-DN150	1.18 / 29.97	10.81 / 274.57
10" - 12" / DN250-DN300	1.43 / 36.32	14.49 / 368.05

[illegible]

VALVE SIZE		S		K		P		D1		M1
NPS	DN									
2"	DN50	0.35	9	-	-	0.5	12.7	2.76	70	M8
2-1/2"	DN65	0.35	9	-	-	0.5	12.7	2.76	70	M8
3"	DN80	0.35	9	-	-	0.5	12.7	2.76	70	M8
4"	DN100	0.43	11	-	-	0.62	15.8	2.76	70	M8
5"	DN125	0.55	14	-	-	0.75	19.05	2.76	70	M8
6"	DN150	0.55	14	-	-	0.75	19.05	2.76	70	M8
8"	DN200	0.67	17	-	-	0.87	22.2	4.02	102	M10
10"	DN250	0.87	22	-	-	1.13	28.6	4.02	102	M10
12"	DN300	0.87	22	-	-	1.25	31.8	4.02	102	M10
14"	DN350	-	-	0.94	24	1.25	31.8	4.02	102	M10
16"	DN400	-	-	1.06	27	1.31	33.3	5.51	140	M16
18"	DN450	-	-	1.06	27	1.5	38	5.51	140	M16
20"	DN500	-	-	1.26	32	1.62	41.15	5.51	140	M16
24"	DN600	-	-	1.42	36	1.99	50.65	10	254	M16

POWELL "A" SERIES QUARTER TURN WORM GEARS

Gear Operators for Resilient Seat Butterfly Valves

POWELL PART #	DESCRIPTION	HEX DIMENSION	GEAR ISO PATTERN	FITS VALVE SIZE:
RBF-GEAR-15-9	Gear for Resilient Seat Butterfly - 2", 2.5", 3"	9 mm	F07	2", 2.5", 3"
RBF-GEAR-15-11	Gear for Resilient Seat Butterfly - 4"	11 mm	F07	4"
RBF-GEAR-15-14	Gear for Resilient Seat Butterfly - 5", 6"	14 mm	F07	5", 6"
RBF-GEAR-50-17	Gear for Resilient Seat Butterfly - 8"	17 mm	F10	8"
RBF-GEAR-50-22	Gear for Resilient Seat Butterfly - 10"	22 mm	F10	10"
RBF-GEAR-120-22	Gear for Resilient Seat Butterfly - 12"	22 mm	F10	12"

Dimensions (in/mm) , L - L3

VALVE SIZE		L		L1		L2		L3		TORQUE (in-lbs/N-m)		RATIO
NPS	DN											
2" - 6"	DN50-DN150	8.9	226.01	4.13	105	1.42	35.99	1.1	27.99	1327.6	150	24:1
8" - 10"	DN200-DN250	12.32	313	5.98	151.99	1.81	46	1.34	34.01	4425.4	500	32:1
12" - 14"	DN300-DN350	12.09	307.01	6.46	164.01	1.81	46	1.42	35.99	10620.8	1200	50:1

Dimensions (in/mm) , L - L4

VALVE SIZE		L		L1		L2		L3		L4		TORQUE (in-lbs/N-m)		RATIO
NPS	DN													
16" - 20"	DN400-DN500	6.5	165	4.09	103.99	2.21	56.01	2.13	54	2.24	57	22126.8	2500	532:1
24"	DN600	8.78	223.01	5.75	146	2.87	73	2.76	70	2.6	65.99	70805.6	8000	704.1

Dimensions (in/mm) , H - W

VALVE SIZE		H		H1		W		TORQUE (in-lbs/N-m)		RATIO
NPS	DN									
2" - 6"	DN50-DN150	5.04	127.99	1.77	45.01	5.91	150.01	1327.6	150	24:1
8" - 10"	DN200-DN250	7.05	179.02	2.48	62.99	11.81	300	4425.4	500	32:1
12" - 14"	DN300-DN350	7.87	200	3.07	78	11.81	300	10620.8	1200	50:1

Dimensions (in/mm) , H - W

VALVE SIZE		H		H1		H2		W		TORQUE (in-lbs/N-m)		RATIO
NPS	DN											
16" - 20"	DN400-DN500	6.14	156.01	3.7	94.01	4.1	104.01	11.22	284.99	22126.8	2500	532:1
24"	DN600	7.36	186.99	5.51	140	5.75	146	15.55	395	70805.6	8000	704.1

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.

GENERAL TERMS AND CONDITIONS OF SALE

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.

GENERAL TERMS AND CONDITIONS OF SALE

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.

Manufacturing, Sales and Distribution Centers:

Global Corporate Headquarters

2503 Spring Grove Ave.
Cincinnati, OH 45214
513.852.2000
Sales and Engineering
800.888.2583

Powell South Carolina

Manning Manufacturing and Distribution Center
1567 Joe Rogers Jr. Blvd.
Manning, SC 29102

Orangeburg Manufacturing and Distribution Center
940 Cross Creek Road
Orangeburg, SC 29115

Powell Texas

Houston/Stafford Sales and Distribution Center
Freeport Ninety Business Park
13843 N. Promenade Blvd.
Building 5, Suite 650
Stafford, TX 77477
800.888.2583

Powell China

Yancheng Manufacturing, Sales and Distribution Center
Yancheng City, China



The Wm. Powell Company
2503 Spring Grove Ave.
Cincinnati, OH 45214
USA Phone: 513.852.2000, Fax: 513.852.2997
www.powellvalves.com
quotes@powellvalves.com



Protect Tomorrow. Today
Powell Valves
NextGen Engineering

The background of the entire page is a technical drawing of various industrial valves, including wafer and lug bodies, in a light yellow/gold color. The drawing is detailed, showing internal components and external flanges.

POWELL **VALVES**

HIGH PERFORMANCE DOUBLE OFFSET BUTTERFLY VALVES

CARBON AND STAINLESS ALLOYS

WAFER BODY AND LUG BODY

SOFT SEAT / FIRE SAFE SEAT / METAL SEAT

Table of Contents

<u>SUBJECT</u>	<u>PAGE</u>
THE WM. POWELL COMPANY—PROFILE	4-6
HOW TO ORDER	7
DESIGN FEATURES	8-9
HIGH PERFORMANCE BUTTERFLY VALVES	10-13
ENGINEERING DATA	14-26
TERMS OF SERVICE	27-29

The Wm. Powell Company - Profile

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

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

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

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

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

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

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

Powell's end user customers have to react quickly to the demands that are on them to expand their businesses by implementing increased capacity and introducing new products into the market place at low costs and fast turn around times. Powell has addressed our customer's needs by increasing finished product inventory to over \$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,

A handwritten signature in black ink, appearing to read "Randy Cowart", with a stylized flourish at the end.

Randy Cowart

President, CEO & Chairman

The Wm. Powell Company

How to order Double Offset High Performance Butterfly Valves

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

Digit

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

Example Code for 6" Class 150 Double Offset Butterfly, Lug Style, A216 WCB Carbon Steel, 17-4 PH Stem, 316 sst Disc, PTFE Seat, PTFE Packing, lever Operated

Size Code	
Code	Size
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"
etc.	etc.

End Code	
Code	Type
Q	LUG
Y	Wafer
Z	Special ends

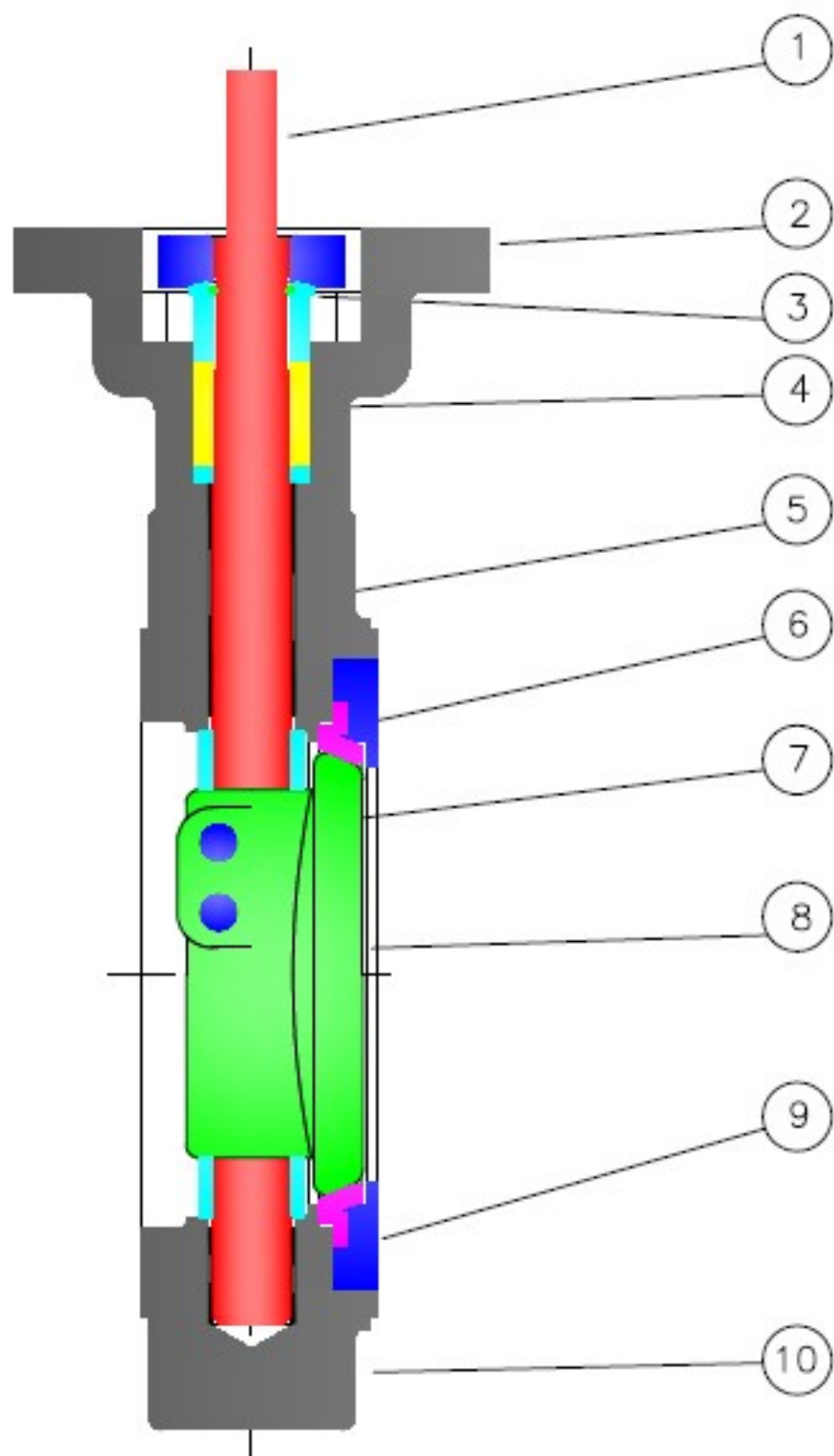
Packing/Gasket	
Code	Option
T	PTFE Packing
G	Graphite Packing
Z	Special Packing

Material Codes	
Code	ASTM
C	A216 WCB
D	A217 WC6
E	A217 WC9
J	A352 LCB
A	A351 CF8 (304)
M	A351 CF8M (316)
P	A351 CG8M (317)
S	A351 CN7M (Alloy 20)
Z	Special Material

Option Codes	
Code	Option
XXX	No Options
GLV	Lever Operator
GXX	Gear Operator
NXX	NACE
FA3	PMI

Base Figure Number	
No	Class
1572	150
3072	300
6072	600

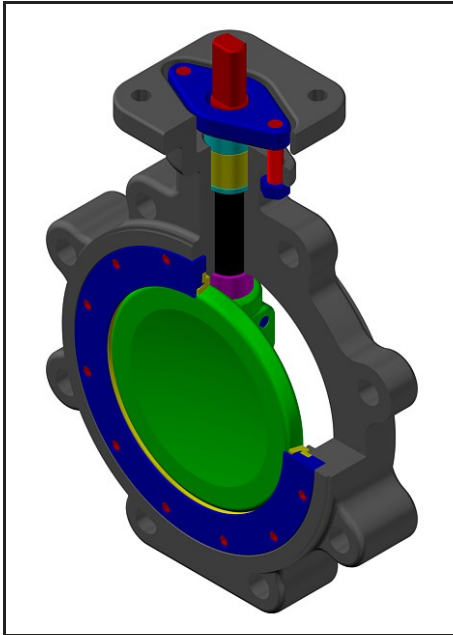
Trim	
Code	Description
R	17-4 PH Stem, 316 Disc, PTFE Seat
W	17-4 PH Stem, 316 Disc, RTFE Seat
Y	17-4 PH Stem, 316 Disc, UHMWPE Seat
Z	Special Trim



POWELL VALVE DESIGN FEATURES:

1. **Stem** – Standard 17-4PH material to handle high torque loads. Other materials available.
2. **Flange** – Standard integral ISO mounting flange cast directly on the body to provide easy mounting of levers and actuators
3. **Packing Gland** – Blow out proof design Per API 609. Packing retained top and bottom with packing gland flange. Underneath draw down gland packing adjustment allows for packing adjustment without removal of operator.
4. **Packing** - PTFE or Graphite packing for low emissions
5. **Top and bottom bearings** - Made from PTFE or Graphite impregnated 316 stainless for maximum valve life. The non-galling design provides high wear resistance and low friction.
6. **Seat** – Designed to be easily changed out for fast switching between seat designs.
7. **Taper Pins** – Double taper pins to securely attach disc and stem and designed to handle high torque applications.
8. **Disc** – CF8M 316 stainless casting standard for all carbon steel and 316 stainless valves. Available in other materials. Provide full 360 degree sealing surface.
9. **Seat Retainer** – solid material to match body, positively held to body with multiple bolts providing easy removal for seat replacement. Design protects the seat when valve is installed with the retainer in the upstream flow.
10. **Body** - One piece casting available in a variety of materials. Wafer and lug designs

**API 609 CATEGORY B HIGH PERFORMANCE DOUBLE
OFFSET BUTTERFLY VALVES**
ASME CLASSES 150 TO 600
CAST CARBON, STAINLESS STEEL OR ALLOY STEEL
WAFER, LUG, OR DOUBLE FLANGED



Class	Fig. No.	Item	Applicable Specification
150	1572	Wall Thickness	API 609
		Pressure - Temperature Ratings	ASME B16.34 & API 609
300	3072	General Valve Design	API 609 (Cat. B) & ASME B16.34
		End to End Dimensions	ASME 609
		Flange Design	ASME B16.5
		Materials	ASTM

DESIGN FEATURES:

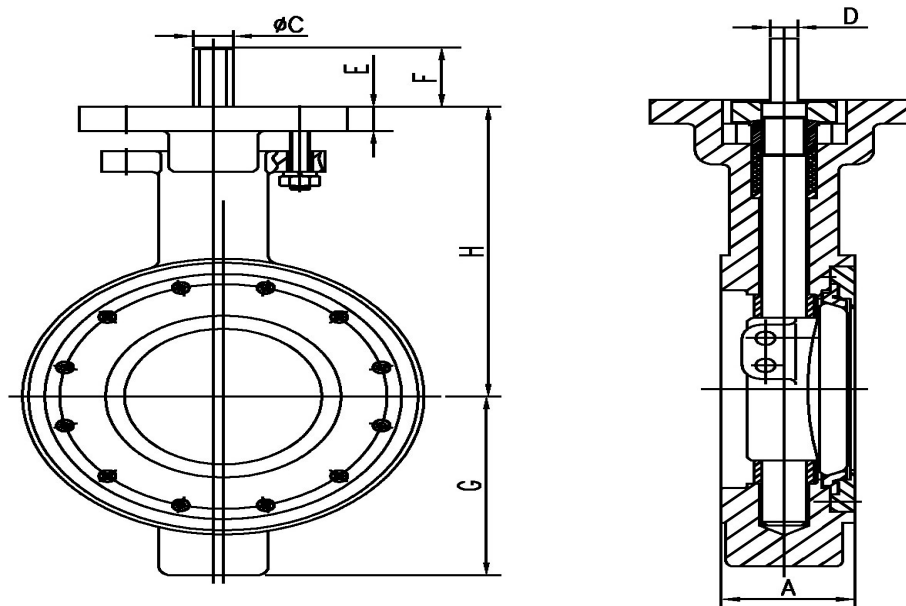
- **Upper and Lower Bearings** to maximize valve life
- **Integral ISO mounting pad** for easy valve operation no bracket needed
- **Each valve** is shell and seat pressure tested per industry standard API 598
- **Available** in Wafer and Lug styles
- **Each valve** has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test report, inspection report and certificate of conformance.
- **Seat Materials:** Multiple seat materials available.

PART	COMMON MATERIAL COMBINATIONS	
Body	A216 WCB	A351 CF8M
Seat Ring	PTFE/RTFE/UHMWPE	PTFE/RTFE/UHMWPE
Disc	A351 CF8M	A351 CF8M
Stem	17-4 PH	17-4 PH
Seat Retainer	Carbon Steel	316 SST
Seat Bolts	A193 B8	A193 B8M
Lower Bearing	316 SST + PTFE	316 SST + PTFE
Disc Spacers	304 SST	316 SST
Disc Pins	17-4 PH	17-4 PH
Upper Bearing	316 SS + PTFE	316 SS + PTFE
Packing Washer	304 SST	316 SST
Packing	PTFE	PTFE
Gland	304 SST	316 SS
Gland Flange	A216 WCB	A351 CF8
Gland Bolts	A193 B8	A193 B8
Gland Nuts	A194 8	A194 8
Retainer Plate*	Carbon Steel	316 SST
Gasket*	316 SST + PTFE	316 SST + PTFE
Bolts*	A193 B8	A193 B8

*Sizes 8" and up only

OTHER MATERIALS AND TRIMS AVAILABLE

HIGH PERFORMANCE DOUBLE OFFSET BUTTERFLY VALVE (WAFER STYLE) DIMENSIONS

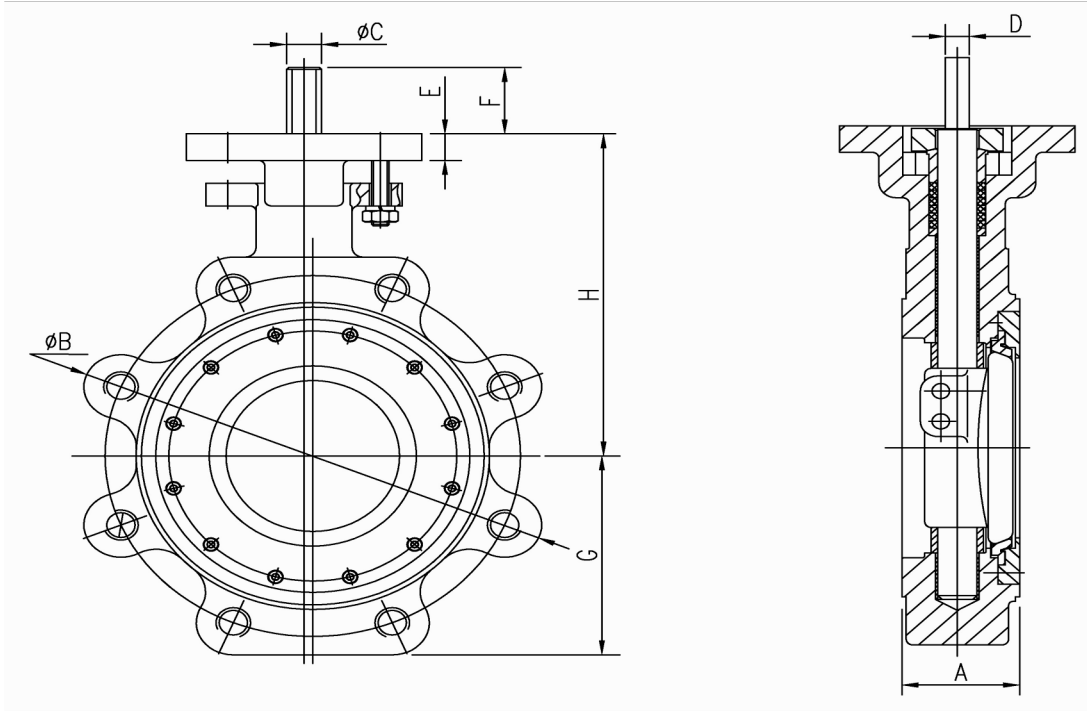


Class 150										
Size	A	C	D	E	F	G	H	M.F.L.	Cv	Weight
NPS	In	In	In	In	In	In	In	ISO		lbs
DN	mm	mm	mm	mm	mm	mm	mm			Kg
2	1.69	0.55	0.37	0.55	1.34	2.8	4.72	F10	85	11
50	43	14	9.5	14	34	72	120			5
2.5	1.88	0.55	0.37	0.55	1.34	3.2	4.96	F10	160	12
65	48	14	9.5	14	34	80	126			5.4
3	1.88	0.63	0.43	0.55	1.34	3.4	5.31	F10	200	14
80	48	16	11	14	34	86	135			6.4
4	2.12	0.63	0.43	0.55	1.42	4.13	6.7	F10	390	22
100	54	16	11	14	36	105	170			10
6	2.25	0.79	0.55	0.63	1.42	5.14	7.88	F10	960	37
150	57	20	14	16	36	130.5	200			16.8
8	2.5	0.94	0.67	0.7	1.57	6.18	9.21	F12	1600	61
200	64	24	17	18	40	157	234			27.6
10	2.81	1.1	0.79	0.7	1.57	8.4	11.1	F12	3130	95
250	71	28	20	18	40	213	282			43
12	3.19	1.42	0.98	0.87	1.57	9.9	12.72	F14	4280	150
300	81	36	25	22	40	251	323			68

Class 300										
Size	A	C	D	E	F	G	H	M.F.L.	Cv	Weight
NPS	In	In	In	In	In	In	In	ISO		lbs
DN	mm	mm	mm	mm	mm	mm	mm			Kg
3	1.88	0.63	0.43	0.55	1.34	3.78	6.3	F10	200	15
80	48	16	11	14	34	96	160			6.8
4	2.12	0.63	0.43	0.55	1.42	4.33	6.93	F10	390	23
100	54	16	11	14	36	110	176			10.5
6	2.31	0.79	0.55	0.63	1.42	5.85	8.58	F10	960	42
150	59	20	14	16	36	148.5	218			19.1
8	2.88	1.1	0.79	0.71	1.57	7.15	10.24	F12	1600	76
200	73	28	20	18	40	181.5	260			34.5
10	3.25	1.42	0.98	0.87	1.97	9.33	12.13	F14	3130	130
250	83	36	25	22	50	237	308			59
12	3.62	1.58	1.1	0.87	1.97	11.22	13.78	F14	4280	190
300	92	40	28	22	50	285	350			56.5

ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE UPON REQUEST.

HIGH PERFORMANCE DOUBLE OFFSET BUTTERFLY VALVE (LUG STYLE) DIMENSIONS



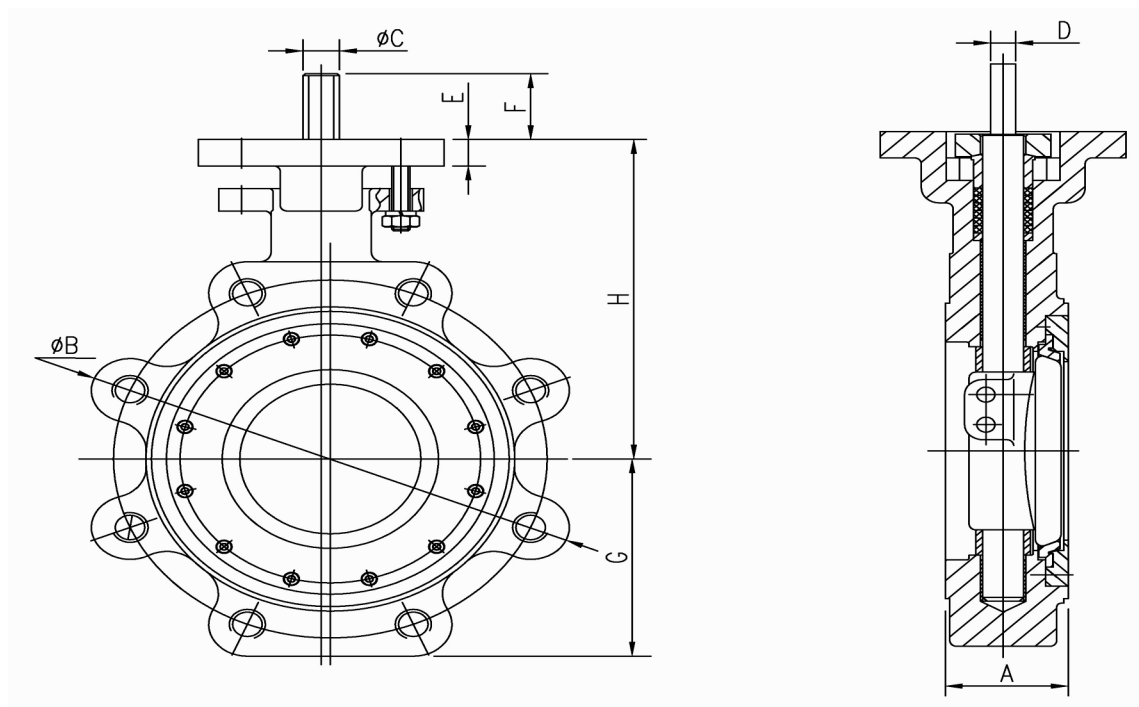
* Double key stem

Class 150

Size	A	B	C	D	E	F	G	H	M.F.L.	Cv	Weight
NPS	In	In	In	In	In	In	In	In	ISO		lbs
DN	mm	mm	mm	mm	mm	mm	mm	mm			Kg
2	1.69	6	0.55	0.37	0.55	1.34	2.8	4.72	F10	85	12
50	43	153	14	9.5	14	34	72	120			5.4
2.5	1.88	6.9	0.55	0.37	0.55	1.34	3.2	4.96	F10	160	12.8
65	48	174	14	9.5	14	34	80	126			5.8
3	1.88	7.4	0.63	0.43	0.55	1.34	3.4	5.31	F10	200	15
80	48	187	16	11	14	34	86	135			6.8
4	2.12	8.9	0.63	0.43	0.55	1.42	4.13	6.7	F10	390	26
100	54	225	16	11	14	36	105	170			11.8
6	2.25	11	0.79	0.55	0.63	1.42	5.14	7.88	F10	960	42
150	57	280	20	14	16	36	130.5	200			19.1
8	2.5	13.3	0.94	0.67	0.7	1.57	6.18	9.21	F12	1600	67
200	64	337	24	17	18	40	157	234			30.4
10	2.81	16	1.1	0.79	0.7	1.57	8.4	11.1	F12	3130	105
250	71	406	28	20	18	40	213	282			48
12	3.19	18.7	1.42	0.98	0.87	1.57	9.9	12.72	F14	4280	160
300	81	476	36	25	22	40	251	323			72.5
14	3.62	20.7	1.57	1.1	0.95	1.97	10.9	14	F14	5250	225
350	92	527	40	28	24	50	277	355			102
16	4	23.2	1.77	0.47x0.31*	1.1	3	12.75	15.75	F16	8150	345
400	102	590	45	12x8*	28	76	324	400			156.5
18	4.5	25.1	1.97	0.63x0.39*	1.1	3.35	13.6	16.7	F16	10900	460
450	114	638	50	16x10*	28	85	345	424			209
20	5	27.4	2.17	0.71x0.43*	1.26	3.75	15.1	18.7	F25	13350	640
500	127	695	55	18x11*	32	95	383	476			290
24	6.06	32	2.56	0.78x0.47*	1.34	3.95	17	21.5	F25	20150	960
600	154	814	65	20x12*	34	100	432	546			435
30	7.5	38.5	3.39	0.87x0.55*	1.65	4.75	22.45	26.4	F30	32550	1890
750	191	978	86	22x14*	42	120	570	670			857
36	8	45.7	3.94	1.10x0.63*	1.5	5.9	27.1	35.35	F30	45200	2970
900	203	1161	100	28x16*	38	150	688	898			1347

ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE UPON REQUEST.

HIGH PERFORMANCE DOUBLE OFFSET BUTTERFLY VALVE (LUG STYLE) DIMENSIONS



Class 300											
Size	A	B	C	D	E	F	G	H	M.F.L.	Cv	Weight
NPS	In	In	In	In	In	In	In	In	ISO		lbs
DN	mm	mm	mm	mm	mm	mm	mm	mm			Kg
2	1.69	6.3	0.55	0.37	0.55	1.34	2.95	5.35	F10	85	13.7
50	43	159	14	9.5	14	34	75	136			6.2
2.5	1.88	7.3	0.55	0.37	0.55	1.34	3.4	5.91	F10	160	14.3
65	48	186	14	9.5	14	34	87	150			6.5
3	1.88	8.1	0.63	0.43	0.55	1.34	3.78	6.3	F10	200	19
80	48	205	16	11	14	34	96	160			8.6
4	2.12	9.3	0.63	0.43	0.55	1.42	4.33	6.93	F10	390	28
100	54	236	16	11	14	36	110	176			12.7
6	2.31	12	0.79	0.55	0.63	1.42	5.85	8.58	F10	960	50
150	59	306	20	14	16	36	148.5	218			22.7
8	2.88	14.8	1.1	0.79	0.71	1.57	7.15	10.24	F12	1600	90
200	73	375	28	20	18	40	181.5	260			40.8
10	3.25	17.2	1.42	0.98	0.87	1.97	9.33	12.13	F14	3130	160
250	83	438	36	25	22	50	237	308			72.5
12	3.62	20.1	1.58	1.1	0.87	1.97	11.22	13.78	F14	4280	235
300	92	511	40	28	22	50	285	350			106.5

ADDITIONAL SIZES, MATERIALS AND CLASSES AVAILABLE UPON REQUEST.

	PAGE
VALVE STANDARDS AND RELATED INFORMATION	15
VALVE TORQUE DATA	16
POWELL QUARTER TURN LEVERS AND GEARS	17-19
VALVE PRESSURE/TEMPERATURE RATINGS	20
CHEMICAL AND PHYSICAL PROPERTIES	21
INSTALLATION BOLTING REQUIREMENTS	22
FLOW DATA	23
CONVERSION DATA	24

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

VALVE STANDARDS AND RELATED INFORMATION

1. Steel and Corrosion Resistant Designs

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

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

- (B) API Standard 609 → Butterfly Valves: Double-flanged, Lug, and Wafer-type

This is the basic API valve standard and contains end to end dimensions and limited ratings for soft seated valves

- (C) API Standard 598 → Valve Inspection and Testing

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

- (D) API Standard 607 → Fire Test for Quarter-turn Valves and Valves Equipped with Nonmetallic Seats

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

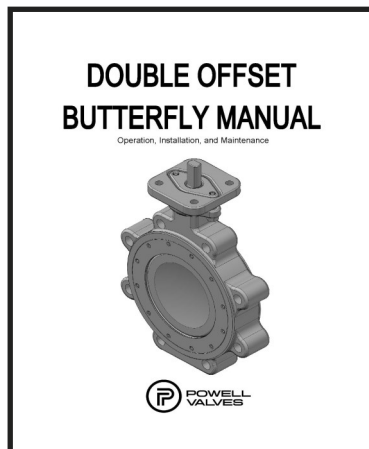
- (G) MSS SP-25 → Standard Marking System for Valves, Fittings, Flanges and Unions

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

2. Powell Publications and Miscellaneous Information

Double Offset Butterfly Manual contains operation, installation, and maintenance information specifically pertaining to Powell High Performance Double Offset Butterfly 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.



Soft Seat Torque Data

Class 150 Soft Seated Torque Chart (ft-lb)													
Pressure (psi)	Size (in)												
	2	2.5	3	4	6	8	10	12	14	16	18	20	24
0	7	7	9	9	13	13	29	55	66	101	126	179	239
50	9	9	12	14	26	37	69	120	148	215	284	386	553
100	10	11	15	20	40	61	109	185	230	330	442	594	867
150	12	14	19	26	53	85	148	251	312	444	600	801	1182
200	13	16	22	32	67	109	188	316	394	559	759	1009	1496
250	14	18	25	38	80	133	228	381	476	673	917	1216	1810
285	16	20	27	42	90	150	256	427	534	753	1027	1361	2030

Class 300 Soft Seated Torque Chart (ft-lb)													
Pressure (psi)	Size (in)												
	2	2.5	3	4	6	8	10	12	14	16	18	20	24
0	7	7	9	9	13	29	55	66	101	126	179	239	354
100	10	11	15	20	40	80	139	200	271	363	505	675	1030
200	13	16	22	32	67	131	224	333	441	599	831	1111	1707
300	16	20	28	43	94	182	308	467	610	835	1158	1547	2384
400	19	25	35	55	121	233	392	601	780	1072	1484	1982	3060
500	22	29	41	67	148	284	476	734	950	1308	1811	2418	3737
600	25	33	48	78	175	335	561	868	1120	1545	2137	2854	4414
700	28	38	55	90	202	386	645	1001	1289	1781	2463	3290	5090
740	29	40	57	94	213	406	679	1055	1357	1876	2594	3464	5361

NOTE: Contact Powell Engineering Department for sizes greater than 24"

POWELL HPBV GEAR AND LEVERS

POWELL HPBV GEAR AND LEVER SIZING CHART

POWELL PART #	DESCRIPTION	FITS SIZES	
		1572	3072
Lever-32014	12.6" Lever assembly for 14mm stem	2", 2.5"	2", 2.5"
Lever-32016	12.6" Lever assembly for 16mm stem	3", 4"	3", 4"
Lever-32020	12.6" Lever assembly for 20mm stem	6"	6"
A-1014	A-10 Worm Gear for 14 mm stem	2", 2.5"	2", 2.5"
A-1016	A-10 Worm Gear for 16 mm stem	3", 4"	3", 4"
A-1020	A-10 Worm Gear for 20 mm stem	6"	6"
A-2024	A-20 Worm Gear for 24 mm stem	8"	
A-2028	A-20 Worm Gear for 28 mm stem	10"	8"
A-3036	A-30 Worm Gear for 36 mm stem	12"	10"
A-3040	A-30 Worm Gear for 40 mm stem	14"	12"
A-4045	A-40 Worm Gear for 45 mm stem	16"	14"
A-4050	A-40 Worm Gear for 50 mm stem	18"	16"
A-5055	A-50 Worm Gear for 55 mm stem	20"	18"
A-5065	A-50 Worm Gear for 65 mm stem	24"	20, 24"
A-6086	A-60 Worm Gear for 86 mm stem	30"	
A-70100	A-70 Worm Gear for 100 mm stem	36"	

**Note: Hand levers and gear operators are priced separately (see Lever & Gear pricing section).
Hand levers are not recommended for use with 8" and larger Class 150 and Class 300.
Hand levers are not recommended for use with valves class 600 and higher.**

Technical drawings of a worm gear assembly, including side views, a perspective view, and a front view with dimensions and labels.

Labels:

- 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16

Dimensions:

- L
- W
- S
- P
- K
- J
- M
- E
- F
- G

Text:

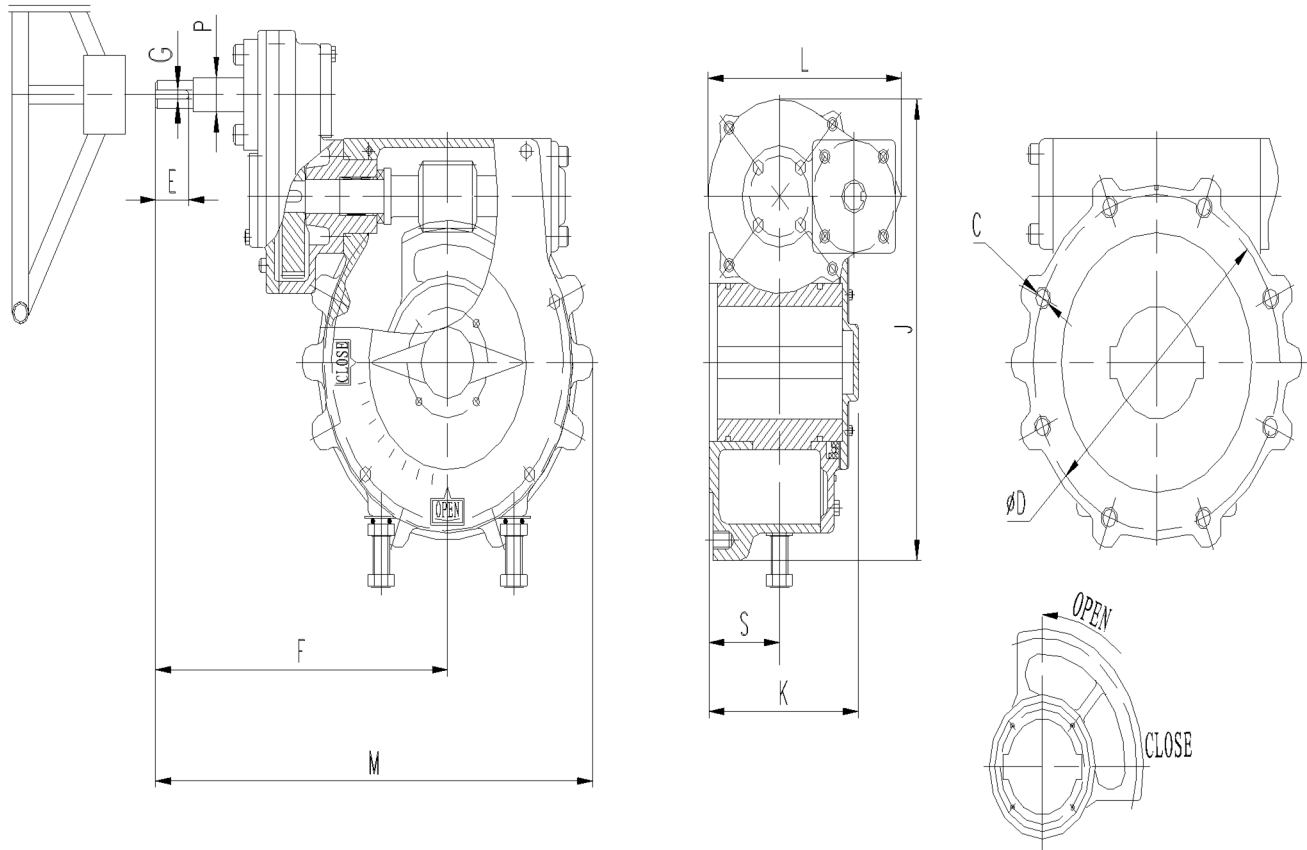
- CLOCKWISE TO CLOSE
- OPEN
- CLOSE
- C - TAP HOLES
- D - BOLT CIRCLE

Worm Gear Size			
SIZE	MAX. STEM DIA	ISO FLG.	GEAR RATIO

SIZE	MAX. STEM DIA	ISO FLG.	GEAR RATIO	MECH ADV (±15%)	MAX. TORQUE (ft-lbs)
A-10	1	F10	24	4.48	225
	25				
A-20	1 3/8	F12	30	5.68	570
	35				
A-30	1 5/8	F14	50	8.82	885
	42				
A-40	2 1/8	F16	80	18.38	1845
	55				

SIZE	C	D	E	G	F	M	J	L	K	P	S	W
A-10	M10	4	5/8	1/4	4 7/8	7	4 7/8	4	3 3/8	5/8	1 1/4	6
		102	16	6	124	176	123	104	59	16	33	150
A-20	M12	5	7/8	1/4	8 5/8	11 1/2	6 3/4	5 3/4	2 3/4	3/4	1 7/16	11 13/16
		125	22	6	220	292	170	145	70	19	36	300
A-30	M16	5 1/2	1 1/8	1/4	10 1/8	13 1/4	7 3/8	6 1/8	3	3/4	1 5/8	11 13/16
		140	29	6	258	336	186	155	77	19	41	300
A-40	M20	6 1/2	1 5/16	1/4	11	16	11 1/8	10	4 1/2	1	2 1/2	15 3/4
		165	33	6	278	405	283	254	114	25	64	400

POWELL A SERIES QUARTER TURN WORM GEARS



Worm Gear Size Chart

SIZE	MAX. STEM DIA	ISO FLG.	GEAR RATIO	MECH ADV (±15%)	MAX. TORQUE (ft-lbs)
A-50	3 3/8	F25	70	20.30	2950
	85				
A-60	4 3/8	F30	238	52.00	5755
	110				
A-70	4 3/8	F30	303	65.96	6860
	110				

Worm Gear Size Chart

SIZE	C	D	E	G	F	M	J	L	K	P	S	H.W.
A-50	M16	10	1 9/16	5/16	10 5/16	16 1/8	12 1/4	/	5 3/4	1	2 11/16	23 5/8
		254	40	8	262	409	311	/	145	25	68	600
A-60	M20	11 3/4	1 9/16	5/16	13 7/8	20 3/4	16 1/16	9 3/16	7 1/8	1 3/16	3 3/8	27 9/16
		298	40	8	352	527	408	233	180	30	85	700
A-70	M20	11 3/4	1 9/16	5/16	13 7/8	20 3/4	16 1/16	9 3/16	7 1/8	1 3/16	3 3/8	27 9/16
		298	40	8	352	527	408	233	180	30	85	700

PRESSURE/TEMPERATURE RATINGS

TABLE 1

PTFE AND RTFE SEATED DESIGN

ASTM A216 Grade WCB

Not to be used over 400° F.

STANDARD CLASS

Working Pressures by Classes, psig					
Temperature, °F	150		300		600
	PTFE	RTFE	PTFE	RTFE	RTFE
-50 to 100	285	285	740	740	1480
150	273	273	708	708	1300
200	260	260	550	675	900
250	245	245	425	530	700
300	230	230	300	390	550
350	140	215	175	250	400
400	50	100	50	100	250

TABLE 2

PTFE AND RTFE SEATED DESIGN

ASTM A351 Grade CF3M (1)

ASTM A351 Grade CF8M (2)

Not to be used over 400° F.

Working Pressures by Classes, psig					
Temperature, °F	150		300		600
	PTFE	RTFE	PTFE	RTFE	RTFE
-50 to 100	275	275	720	720	1440
150	255	255	708	670	1300
200	235	235	550	620	900
250	225	225	425	530	700
300	215	215	300	390	550
350	140	205	175	250	400
400	50	100	50	100	250

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

TABLE 5

ASTM STANDARD GRADE		A216 WCB	A351 CF3M 316L	A351 CF8M 316
CARBON (C)	(Min)	-	-	-
	(Max)	0.30	0.03	0.08
MANGANESE (Mn)	(Min)	-	-	-
	(Max)	1.00**	1.50	1.50
PHOSPHOROUS (P)	(Min)	-	-	-
	(Max)	0.04	0.040	0.040
SULFUR (S)	(Min)	-	-	-
	(Max)	0.045	0.040	0.040
SILICON (Si)	(Min)	-	-	-
	(Max)	0.60	1.50	1.50
COPPER (Cu)	(Min)	-	-	-
	(Max)	0.30*	-	-
NICKEL (Ni)	(Min)	-	9.0	9.0
	(Max)	0.50*	13.0	12.0
CHROMIUM (Cr)	(Min)	-	17.0	18.0
	(Max)	0.50*	21.0	21.0
MOLYBDENUM (Mo)	(Min)	-	2.0	2.0
	(Max)	0.20*	3.0	3.0
VANADIUM (V)	(Min)	-	-	-
	(Max)	0.03*	-	-
TUNGSTEN (W)	(Min)	-	-	-
	(Max)	-	-	-
COLUMBIUM (Cb)	(Min)	-	-	-
	(Max)	-	-	-
TENSILE STRENGTH	(Min)	70 Ksi	70 Ksi	70 Ksi
	(Max)	95	-	-
YIELD STRENGTH	(Min)	36 Ksi	30 Ksi	30 Ksi
	(Max)	-	-	-
ELONGATION	(Min)	22%	30%	30%
	(Max)	-	-	-
REDUCTION OF AREA	(Min)	35%	-	-
	(Max)	-	-	-
TEMPERATURE	(Min)	-20F	-425F	-425F
	(Max)	800F	850F	1500F ^T

*RESIDUAL ELEMENTS – Total must not exceed 1.00 maximum.

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

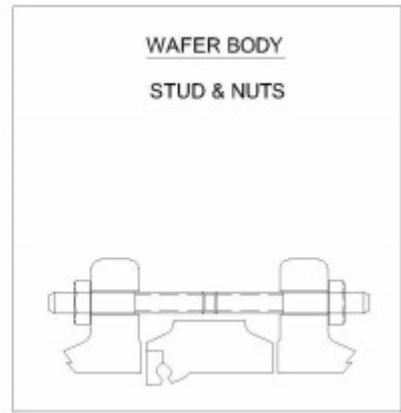
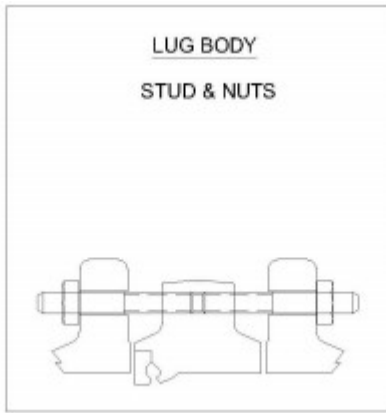
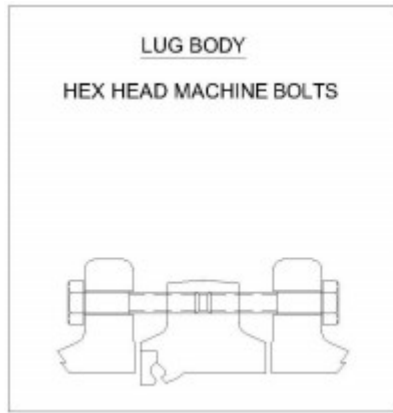
*** For temperatures below -50°F special cryogenic cleaning may be required. For temperatures below -100°F, special cryogenic extensions may be required. See cryogenic catalog for more information.

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

NOTE: Chemical compositions are in units of p ercent.

INSTALLATION BOLTING REQUIREMENTS

TABLE 6



Pressure Class	Valve Size	Thread Size	LUG BODY								WAFER BODY			
			BOLTS				STUDS				STUDS			
			QTY	LG	QTY	LG	QTY	LG	QTY	LG	QTY	LG	QTY	LG
150	2	5/8-11 UNC	4	1.75	4	1.5	4	2.5	4	2.25	4	5		
150	2.5	5/8-11 UNC	4	2	4	1.75	4	2.75	4	2.5	4	5.5		
150	3	5/8-11 UNC	4	2	4	1.75	4	2.75	4	2.5	4	5.5		
150	4	5/8-11 UNC	8	2	8	1.75	8	2.75	8	2.5	8	5.75		
150	6	3/4-10 UNC	8	2.25	8	2	8	3.25	8	3	8	6.25		
150	8	3/4-10 UNC	8	2.5	8	2	8	3.5	8	3	8	6.75		
150	10	7/8-9 UNC	12	2.75	12	2.25	12	4	12	3.5	12	7.5		
150	12	7/8-9 UNC	12	3	12	2.5	12	4.25	12	3.75	12	8		
150	14	1-8 UN	12	3	12	2.75	12	4.5	12	4.25	12	9		
150	16	1-8 UN	16	3	16	2.75	16	4.5	16	4.25	16	9.5		
150	18	1 1/8-8 UN	16	3.75	16	3	16	5.25	16	4.5	16	10.5		
150	20	1 1/8-8 UN	16	3.75	16	3	16	5.25	16	4.5	16	11.3		
			4	3.25	4	2.75	4	4.75	4	4.25	4	4.75	4	4.25
150	24	1 1/4-8 UN	16	4	16	4	16	5.75	16	5.75	16	12.5		
			4	3.5	4	3.5	4	5.25	4	5.25	4	5.25			4	5.25
150	30	1 1/4-8 UN	24	5.25	24	5	24	7	24	6.75	24	16.5		
			4	5	4	4.5	4	6.75	4	6.25	4	6.75			4	6.25
150	36	1 1/2-8 UN	28	6.25	28	5.75	28	8.25	28	7.75	28	18.8		
			4	5.75	4	5.25	4	7.75	4	7.25	4	7.75			4	7.25
300	2	5/8-11 UNC	8	2	8	1.75	8	2.75	8	2.5				
300	2.5	3/4-10 UNC	8	2.25	8	2	8	3.25	8	3				
300	3	3/4-10 UNC	8	2.25	8	2	8	3.25	8	3				
300	4	3/4-10 UNC	8	2.25	8	2	8	3.25	8	3				
300	6	3/4-10 UNC	12	2.75	12	2.5	12	3.5	12	3.5				
300	8	7/8-9 UNC	12	3.25	12	2.75	12	4.25	12	4				
300	10	1-8 UN	12	3.5	12	3.25	12	4.75	12	4.5				
			4	3.25	4	3	4	4.5	4	4.25				
300	12	1 1/8-8 UN	12	4	12	3.5	12	5.5	12	5				
			4	3.5	12	3	4	5	4	4.5				

FLOW DESIGN AND MAINTENANCE RECOMMENDATIONS

- (1) SWING CHECK VALVES- Minimum ½ psi differential pressure across valve to maintain proper “full open position.
- (2) LIFT CHECK AND NON-RETURN VALVES-
Minimum 2 psi differential pressure across valve to maintain proper “full open position”
- (3) Recommended length of straight pipe before and after check 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 seat test allowable limit.
- (5) RECOMMENDED MAXIMUM FLOW VELOCITIES (APPROXIMATE):

<u>VALVE SIZE</u>	<u>WATER</u> (FT/MIN)	<u>SATURATED STEAM</u> (FT/MIN)	<u>SUPERHEATED STEAM</u> (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 services only.
- (7) GLOBE VALVES— Not to be throttled under 20% open.

**FOR MAINTENANCE AND SAFETY INFORMATION, SEE THE POWELL
HIGH PERFORMANCE BUTTERFLY MANUAL,
AS DESCRIBED ON PAGE 15.**

COMPARISON CHART OF VALVE SIZE/NOMINAL PIPE SIZE

TABLE 7

<u>METRIC NOMINAL SIZE</u> (DN)	<u>ENGLISH NOMINAL SIZE</u> (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 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

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 States 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.



The background of the entire page is a technical drawing of various industrial valves and components, rendered in a light yellow/gold color on a dark blue background. The drawings show cross-sections and side views of different valve types, including gate valves, ball valves, and butterfly valves, along with their internal mechanisms and external flanges.

POWELL VALVES

2503 SPRING GROVE AVENUE, CINCINNATI, OHIO 45214-1771, U.S.A.

PHONE: 513.852.2000 • FAX NO. 513.852.2997

www.powellvalves.com

The background of the entire page is a technical drawing of various industrial valves and pipe fittings, rendered in a light red color. The drawing shows cross-sections and side views of different valve types, including gate valves, globe valves, and check valves, with various flanges, bolts, and internal components visible.

POWELL VALVES

FORGED STEEL API 602 VALVES

GATE, GLOBE AND CHECK VALVES

API 602 / API RP 591 / ASME CLASS 800 TO 4500 / 1/4" TO 2"

Table of Contents

<u>SUBJECT</u>	<u>PAGE</u>
THE WM. POWELL COMPANY — PROFILE	2-3
HOW TO ORDER	4
FUGITIVE EMISSIONS	5
GATE VALVES	6-9
GLOBE VALVES	10-13
Y-PATTERN GLOBE VALVES	14-16
PISTON CHECK VALVES	17-20
SWING CHECK VALVES	21-24
Y-PATTERN PISTON CHECK VALVES	25-27
CRYOGENIC VALVES	28
BELLOSEAL VALVES	29
ENGINEERING DATA	30-45
TERMS AND CONDITIONS	46-48

The Wm. Powell Company - Profile

The Wm. Powell Company is very proud of our achievements and our evolution in the past 165 years. We like to refer to ourselves as 166 years young due to our flexibility in changing quickly to our customer and the industry's needs. Our business strategy is to maintain excellent customer service. We will continue to focus on manufacturing the best of class products both in design features and quality, at competitive prices.

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

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

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

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

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

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

Powell's end user customers have to react quickly to the demands that are on them to expand their businesses by implementing increased capacity and introducing new products into the market place at low costs and fast turn around times. Powell has addressed our customer's needs by increasing finished product inventory to over \$35,000,000 USD in the U.S.A. and with inventory hubs in Asia and Europe. As an additional advantage to our domestic and global customers, The Wm. Powell Company's Manning, SC facility is a Registered Free Trade Zone.

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

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

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

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

Sincerely,

A handwritten signature in black ink, appearing to read "Randy Cowart", is written over a light gray rectangular background.

Randy Cowart

President, CEO & Chairman

The Wm. Powell Company

Powell Forged Valve Coding System

NOTE: Other configurations available upon request.

Digit

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Size				Space	Type		Class		Ends	Material	Trim	P&G	Bonnet	
1	.	0	0		G	A	0	8	T	A	5	8	G	B

Example: 1.00 GA08TA58GB for a 1" Standard Port Class 800, Threaded End, A105, Trim 8, Bolted Bonnet Gate Valve with Graphite Packing and Gasket

Type	
GA	Gate
GL	Globe
PC	Spring Piston Check
BC	Spring Ball Check
SW	Swing Check
GY	Y Globe
AN	Angle
BG	Bellows Gate
BL	Bellows Globe
YL	Y Spring Piston Check
IG	ISRS Gate
IL	ISRS Globe

Pressure Class	
01	Standard Port 150#
L1	Full Port 150#
03	Standard Port 300#
L3	Full Port 300#
06	Standard Port 600#
L6	Full Port 600#
08	Standard Port 800#
L8	Full Port 800#
15	Standard Port 1500#
L5	Full Port 1500#
16	Standard Port 1690#
L7	Full Port 1690#
25	2500#
26	2680#
45	4500#

Ends	
T	Threaded
S	Socketweld
X	Th X Sw ⁽¹⁾
F	Flanged
R	Ring Joint
Y	Inlet Th X Outlet Sw
Z	Inlet Sw X Outlet Th
A	Sw X Ext Sw ⁽¹⁾
B	Sw X Ext Th ⁽¹⁾
D	Th X Ext Sw ⁽¹⁾
E	Th X Ext Th ⁽¹⁾
K	Th X Ext WOL ⁽¹⁾
P	Sw X Ext WOL ⁽¹⁾

Trim	
0	API Trim 10
1	API Trim 1
2	API Trim 12
3	API Trim 13
5	API Trim 5
6	API Trim 16
8	API Trim 8
9	API Trim 9
A	Base Metal w/ Half Hard Facing
B	Base Metal w/ Full Hard Facing
C	Base Metal
D	API Trim 11
E	API Trim 2
N	API Trim 8 (NACE) ^[2]
K	Std Cryo trim w/ PCTFE disc insert
P	Std Cryo trim
G	Std Cryo trim w/ GFTFE disc insert
Z	Special Trim

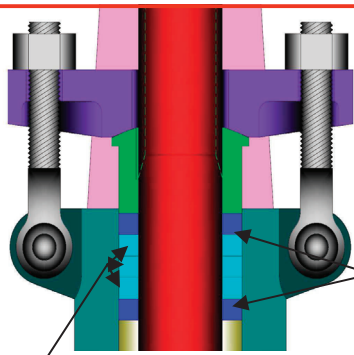
Material	
A5	A105
04	A182 304
16	A182 316
21	A182 321
47	A182 347
4H	A182 304H
4L	A182 304L
6L	A182 316L
L2	A350-LF2
A2	Alloy 20
40	Alloy N04400
F1	A182 F11
F2	A182 F22
F4	A182 F44
F5	A182 F5
51	A182 F51
F3	A182 F53
55	A182 F55
F9	A182 F9
91	A182 F91
C2	Hastelloy C276
80	Incoloy 800H
82	Incoloy 825
62	Inconel 625
17	A182 317
7L	A182 317L

Bonnet And Bolting	
W	Welded Bonnet
B	Bolted Bonnet Std. Bolting
C	Bolted Bonnet w/A193 B8M Cl.2 and A194 8M
D	Bolted Bonnet w/A193 B8 Cl.2 and A 194 8
E	Bolted Bonnet A193 B8M and A194 8M
F	Bolted Bonnet, Std. Bolting, Clean for Oxygen
N	Bolted Bonnet w/ A193 B7M and A194 2HM (NACE) ^[2]
G	Std. Extended Bolted Bonnet, Std. Bolting, Clean for Oxygen
H	Std. Extended Welded Bonnet, Clean for Oxygen
J	Welded Bonnet, Clean for Oxygen
L	Bolted Bonnet, Locking Device
K	Welded Bonnet (NACE) ^[2]
M	Bolted Bonnet A193 B8 and A194 8 (NACE) ^[2]
R	Ring Joint Bonnet.

Packing & Gasket	
G	Manuf. STD Graphite
T	Manuf. STD Teflon

1. Only To be Used For Gate Valves.

2. API Trim 10 or 12 can also be used for NACE service valves If Bonnet And Bolting codes N, K, or M are Selected. Make Sure to select A NACE Bonnet and Bolting Designation if a NACE valve is required.

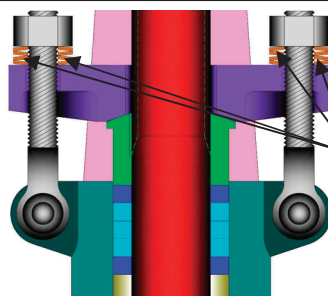


DIE FORMED FLEXIBLE GRAPHITE RIBBON INNER RINGS WITH CORROSION INHIBITOR

BRAIDED CARBON YARN
END RINGS WITH
CORROSION INHIBITOR

STANDARD PACKING ARRANGEMENT

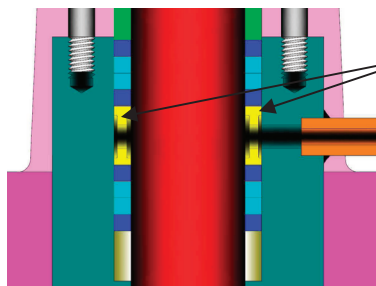
Powell standard design cast steel valves are designed and manufactured to a 100 ppm maximum fugitive emissions level.



BELLEVILLE WASHERS

LIVE LOAD

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

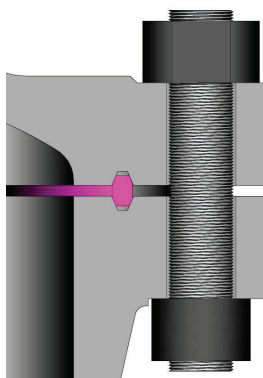


LANTERN RING

LANTERN RING

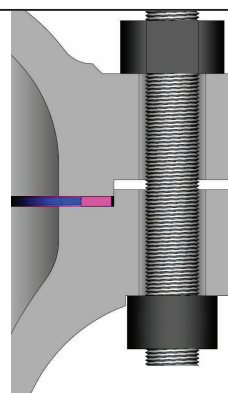
Lantern ring design and other special packing arrangements available. The lantern ring arrangement consists of two packing sets with lantern spacer between the sets. The bonnet connection at the lantern ring location allows monitoring of leakage past packing set.

GASKETS



RING JOINT

ASME B16.20 ring joint gasket with material at least equal to body. Standard gasket arrangement for class 2500 and higher class valves. Optionally available on most other valves.



SPIRAL WOUND

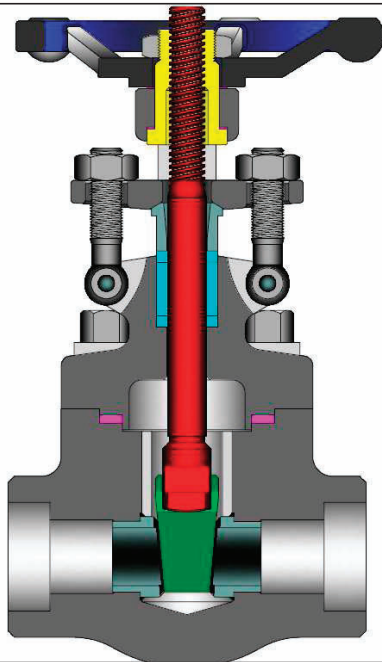
Stainless steel spiral wound gasket with graphite fill. Standard gasket arrangement for class 150-1500 valves.

API 602 GATE VALVES

FORGED CARBON , STAINLESS STEEL OR ALLOY STEEL

¼" TO 2" (6 TO 50 mm)

ASME CLASSES 150 TO 2680



Class	Bore	Fig. No.
150	Standard	GA01
	Full	GAL1
300	Standard	GA03
	Full	GAL3
600	Standard	GA06
	Full	GAL6
800	Standard	GA08
	Full	GAL8
1500	Standard	GA15
	Full	GAL5
1680	Standard	GA16
2500	Standard	GA25
2690	Standard	GA26

DESIGN FEATURES:

- **Wedges** are accurately guided thru the entire stroke.
- **Standard trim** is stellite faced seat rings, 13% chrome wedge seat surfaces, and 13% chrome stem (API trim 8). Other trims available on request.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Stems** are non-rotating with surface finish to maximize packing seal for low fugitive emissions.
- **Each** valve is shell, seat and back-seat pressure tested per industry standard API 598.
- **Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.

STANDARD MATERIALS (Other materials available)

PART	MATERIALS			
Body	A105	A182 F11	A182 F22	A182F316 (1)
Bonnet	A105	A182 F11	A182 F22	A182 F316
Wedge	SST 420			A182 F316
Seat Ring	SST 410 + Stellite 6 Faced			SST 316
Stem	A182 F6a			A182 F316
Stem Bushing	A 439 Ductile NI-Resist Gr. D2			
Gland Flange	A105			Series 300 SST
Eye Bolt	A193 Gr. B7	A193 Gr. B16		A193 Gr. B8M
Eye Bolt Nut	A194 Gr. 2H	A194 Gr. 7		A194 Gr.8M
Gland	SST 420			SST 316
Packing	Graphite			PTFE
Packing Washer / Packing Spacer	SST 410			SST 316
Gasket (2)	Spiral Wound SST with Graphite			Spiral Wound SST with PTFE
Hand Wheel	Malleable Iron or Steel			
Hand Wheel Nut	Malleable Iron or Steel			
Key	Steel			
Body / Bonnet Bolting (2)	A193 Gr. B7	A193 Gr. B16		A193 Gr. B8M
Identification Plate	Series 300 SST			

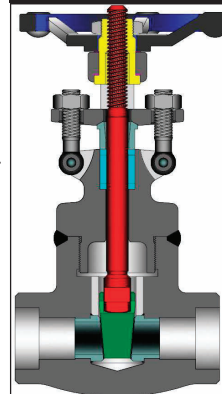
- (1) Threaded and weld end valve bodies A182 F316L
(2) Welded bonnet design also available.

NOTE: See page 43 for flow, safety and maintenance information.

- **End Flanges** have the following raised faces per ASME B16.5:
Classes 150-300: 1/16" (2mm).
Classes 600: 1/4" (7mm).
- **Weld ends** are available per ASME B16.25/B16.11 or per customer's specification.
- **Extended** body ends available on gate valves.
- **Other** available options as follows:
-Alternate valve materials such as chrome and stainless steel alloys
-Alternate trim materials
-NACE service
-Special cleaning for applications such as oxygen or chlorine
-Other options available as specified.

Design Specifications

Item	Applicable Specification
Wall thickness	API 602
Pressure - temperature ratings	ASME B16.34
General valve design	API 602 & B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Thread design	ASME B1.20.1
Butt Weld design	ASME B16.25
Socket Weld design	ASME B16.11
Materials	ASTM

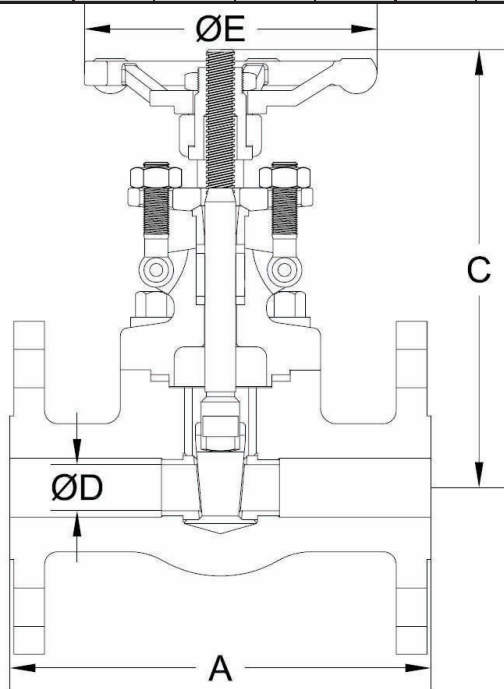


Welded Bonnet Design

GATE VALVE DIMENSIONS (CLASS 150—800).

SIZE	ASME 150				ASME 300				ASME 600			
	Bolted Bonnet				Bolted Bonnet				Bolted Bonnet			
	Standard Bore				Standard Bore				Standard Bore			
in	A	C	D	E	A	C	D	E	A	C	D	E
mm	FE				FE				FE			
½	4.25	6.0	0.50	3.9	5.50	6.0	0.50	3.9	6.50	6.0	0.50	3.9
13	108	153	13	100	140	153	13	100	165	153	13	100
¾	4.62	6.0	0.50	3.9	6.00	6.0	0.50	3.9	7.50	6.0	0.50	3.9
19	117	153	13	100	152	153	13	100	190	153	13	100
1	5.00	7.3	0.71	4.9	6.50	7.3	0.71	4.9	8.50	7.3	0.71	4.9
25	127	185	18	125	165	185	18	125	216	185	18	125
1¼	5.50	8.7	0.94	6.3	7.00	8.7	0.94	6.3	9.00	8.7	0.94	6.3
32	140	222	24	160	178	222	24	160	229	222	24	160
1½	6.50	9.4	1.14	6.3	7.50	9.4	1.14	6.3	9.50	9.4	1.14	6.3
38	165	240	29	160	190	240	29	160	241	240	29	160
2	7.00	11.0	1.46	7.1	8.50	11.0	1.46	7.1	11.50	11.0	1.46	7.1
50	178	279	37	180	216	279	37	180	292	279	37	180

SIZE	ASME 800											
	Bolted Bonnet								Welded Bonnet			
	Standard Bore				Full Bore				Standard Bore			
in	A	C	D	E	A	C	D	E	A	C	D	E
mm	WE				WE				WE			
¼	3.11	5.9	0.31	3.9	-	-	-	-	3.11	6.2	0.31	3.9
6	79	149	8	100	-	-	-	-	79	157	8	100
¾	3.11	5.9	0.39	3.9	-	-	-	-	3.11	6.2	0.39	3.9
10	79	149	10	100	-	-	-	-	79	157	10	100
½	3.11	6.0	0.50	3.9	3.62	6.0	0.50	3.9	3.11	6.3	0.50	3.9
13	79	153	13	100	92	153	13	100	79	161	13	100
¾	3.62	6.0	0.50	3.9	4.37	7.3	0.71	4.9	3.62	6.3	0.50	3.9
19	92	153	13	100	111	185	18	125	92	161	13	100
1	4.37	7.3	0.71	4.9	4.72	8.7	0.94	6.3	4.37	7.5	0.71	4.9
25	111	185	18	125	120	222	24	160	111	190	18	125
1¼	4.72	8.7	1.14	6.3	4.72	9.4	1.14	6.3	4.72	8.7	1.14	6.3
32	120	222	29	160	120	240	29	160	120	220	29	160
1½	4.72	9.4	1.14	6.3	5.51	11.0	1.46	7.1	4.72	9.4	1.14	6.3
38	120	240	29	160	140	279	37	180	120	240	29	160
2	5.51	11.0	1.46	7.1	6.30	13.1	1.89	7.9	5.51	11.0	1.46	7.1
50	140	279	37	180	160	333	48	200	140	279	37	180

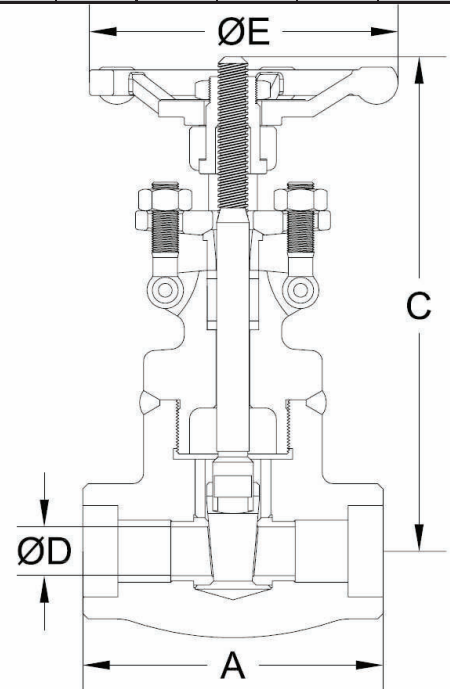


Bolted Bonnet Flanged Ends Design

**ADDITIONAL
MATERIALS AND
CLASSES
AVAILABLE UPON
REQUEST.**

WE = Socket Weld /
Threaded Ends
FE = Flanged ends

C = Center to top open

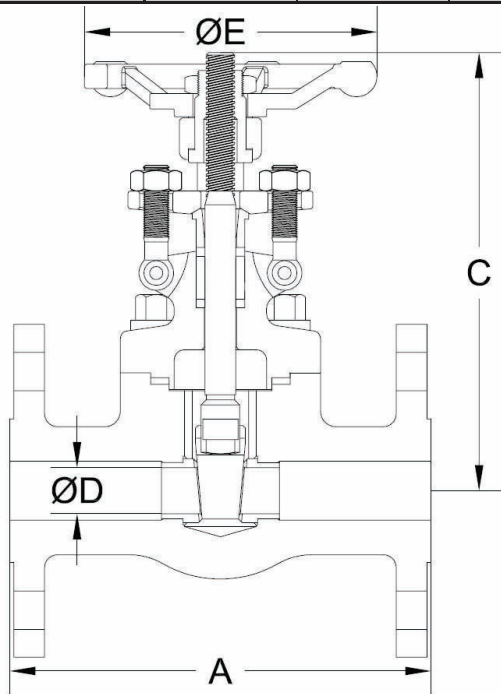


Welded Bonnet Socket Weld Ends Design

GATE VALVE DIMENSIONS (CLASS 1500—2680).

SIZE	ASME 1500 & 1690																
	Bolted Bonnet									Welded Bonnet							
	Standard Bore					Full Bore				Standard Bore				Full Bore			
	A		C	D	E	A	C	D	E	A	C	D	E	A	C	D	E
in mm	FE	WE				WE				WE				WE			
¼	-	3.11	6.9	0.31	3.9	-	-	-	-	3.11	6.9	0.31	3.9	-	-	-	-
6	-	79	175	8	100	-	-	-	-	79	175	8	100	-	-	-	-
¾	-	3.62	7.0	0.50	3.9	-	-	-	-	3.62	6.9	0.50	3.9	-	-	-	-
10	-	92	178	13	100	-	-	-	-	92	175	13	100	-	-	-	-
½	8.50	3.62	7.1	0.50	4.9	4.37	7.1	0.50	4.9	3.62	7.1	0.50	4.9	4.37	7.1	0.50	4.9
13	216	92	181	13	125	111	181	13	125	92	181	13	125	111	181	13	125
¾	9.00	4.37	7.1	0.50	4.9	4.72	8.6	0.71	6.3	4.37	7.1	0.50	4.9	4.72	8.6	0.71	6.3
19	229	111	181	13	125	120	218	18	160	111	181	13	125	120	218	18	160
1	10.00	4.72	8.6	0.71	6.3	4.72	9.3	0.94	6.3	4.72	8.6	0.71	6.3	4.72	9.3	0.94	6.3
25	254	120	218	18	160	120	237	24	160	120	218	18	160	120	237	24	160
1¼	11.00	4.72	9.3	0.94	6.3	5.51	10.8	1.14	7.1	4.72	9.3	0.94	6.3	5.51	10.8	1.14	7.1
32	279	120	237	24	160	140	274	29	180	120	237	24	160	140	274	29	180
1½	12.00	5.51	10.8	1.14	7.1	6.30	12.6	1.46	7.9	5.51	10.8	1.14	7.1	6.30	12.6	1.46	7.9
38	305	140	274	29	180	160	319	37	200	140	274	29	180	160	319	37	200
2	14.50	6.30	12.6	1.46	7.9	9.1	13.6	1.89	7.9	6.30	12.6	1.46	7.9	9.1	13.6	1.89	7.9
50	368	160	319	37	200	230	345	48	200	160	319	37	200	230	345	48	200

SIZE	ASME 2500 & 2680							
	Bolted Bonnet				Welded Bonnet			
	Standard Bore				Standard Bore			
	A	C	D	E	A	C	D	E
in mm	WE				WE			
½	5.91	11.2	0.55	6.3	5.91	10.0	0.55	6.3
13	150	284	14	160	150	253	14	160
¾	5.91	11.2	0.55	6.3	5.91	10.0	0.55	6.3
19	150	284	14	160	150	253	14	160
1	6.69	12.9	0.75	7.9	6.69	11.5	0.75	7.9
25	170	327	19	200	170	291	19	200
1¼	7.87	14.7	1.00	9.8	7.87	13.3	1.00	9.8
32	200	374	25	250	200	339	25	250
1½	7.87	14.8	1.10	9.8	7.87	13.5	1.10	9.8
38	200	377	28	250	200	342	28	250
2	9.84	17.1	1.38	11.8	9.84	15.7	1.38	11.8
50	250	434	35	300	250	398	35	300



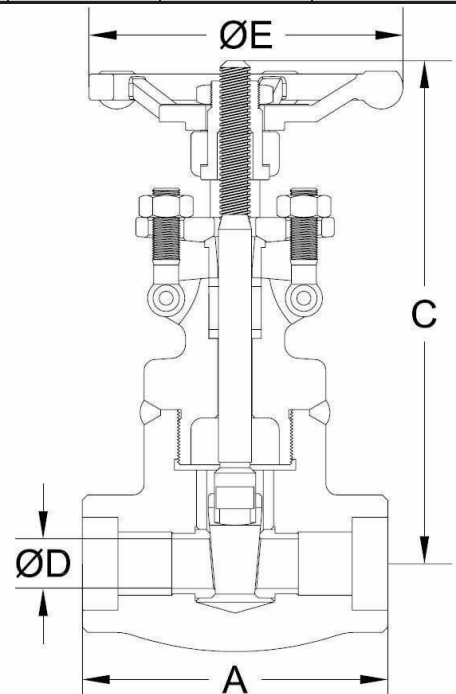
Bolted Bonnet Flanged Ends Design

**ADDITIONAL
MATERIALS AND
CLASSES
AVAILABLE UPON
REQUEST.**

WE = Socket Weld /
Threaded Ends

FE = Flanged Ends

C = Center to top open



Welded Bonnet Socket Weld Ends Design



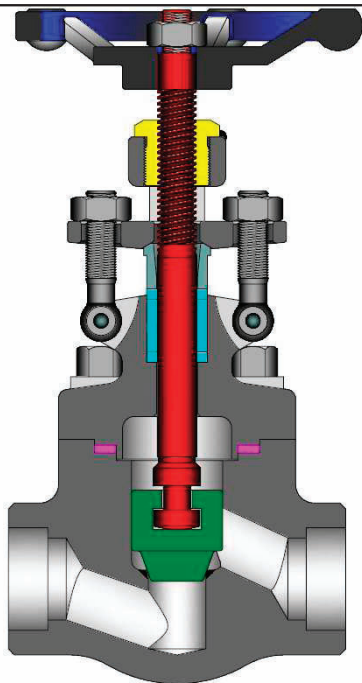
API 602 GATE VALVES
FORGED CARBON , STAINLESS STEEL OR ALLOY STEEL
¼" TO 2" (6 TO 50 mm)
ASME CLASSES 150 TO 2680

SIZE	ASME 150			ASME 300			ASME 600			ASME 800											
	Bolted Bonnet			Bolted Bonnet			Bolted Bonnet			Bolted Bonnet						Welded Bonnet					
	Standard Bore			Standard Bore			Standard Bore			Standard Bore			Full Bore			Standard Bore			Full Bore		
in	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v
mm	FE	KG		FE	KG		FE	KG		WE	KG		WE	KG		WE	KG		WE	KG	
¼	-	-	-	-	-	-	-	-	-	4.2	5	-	-	-	3.7	5	-	-	-	-	
6	-	-	-	-	-	-	-	-	-	1.9	-	-	-	-	1.7	-	-	-	-	-	
¾	-	-	-	-	-	-	-	-	-	4.2	8	-	-	-	3.7	8	-	-	-	-	
10	-	-	-	-	-	-	-	-	-	1.9	-	-	-	-	1.7	-	-	-	-	-	
½	6.6	-	13	7.9	-	13	9.3	-	13	4.4	13	7.3	-	13	4.0	13	7.1	-	13	-	
13	3.0	-	-	3.6	-	-	4.2	-	-	2.0	-	3.3	-	-	1.8	-	3.2	-	-	-	
¾	7.7	-	13	10.8	-	13	12.8	-	13	4.9	13	8.4	-	25	4.4	13	8.2	-	25	-	
19	3.5	-	-	4.9	-	-	5.8	-	-	2.2	-	3.8	-	-	2.0	-	3.7	-	-	-	
1	12.1	-	30	15.4	-	30	19.4	-	30	7.9	30	12.8	-	45	7.5	30	12.6	-	45	-	
25	5.5	-	-	7.0	-	-	8.8	-	-	3.6	-	5.8	-	-	3.4	-	5.7	-	-	-	
1¼	15.0	-	70	20.7	-	70	26.7	-	70	13.7	70	14.8	-	70	11.7	70	14.6	-	70	-	
32	6.8	-	-	9.4	-	-	12.1	-	-	6.2	-	6.7	-	-	5.3	-	6.6	-	-	-	
1½	22.9	-	70	29.3	-	70	34.4	-	70	13.7	70	22.7	-	110	13.2	70	22.5	-	110	-	
38	10.4	-	-	13.3	-	-	15.6	-	-	6.2	-	10.3	-	-	6.0	-	10.2	-	-	-	
2	31.7	-	120	39.7	-	80	43.0	-	120	21.4	120	33.5	-	220	20.9	120	33.3	-	220	-	
50	14.4	-	-	18.0	-	-	19.5	-	-	9.7	-	15.2	-	-	9.5	-	15.1	-	-	-	

SIZE	ASME 1500 & 1690												ASME 2500 & 2680					
	Bolted Bonnet						Welded Bonnet						Bolted Bonnet			Welded Bonnet		
	Standard Bore			Full Bore			Standard Bore			Full Bore			Standard Bore			Standard Bore		
in	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v
mm	FE	KG		WE	KG		WE	KG		WE	KG		WE	KG		WE	KG	
¼	-	-	6.6	5	-	-	6.2	5	-	-	-	-	-	-	-	-	-	-
6	-	-	3.0	-	-	-	2.8	-	-	-	-	-	-	-	-	-	-	-
¾	-	-	7.1	13	-	-	6.6	13	-	-	-	-	-	-	-	-	-	-
10	-	-	3.2	-	-	-	3.0	-	-	-	-	-	-	-	-	-	-	-
½	15.9	-	7.7	13	9.5	13	7.3	13	9.3	-	13	21.6	20	15.0	20	-	-	-
13	7.2	-	3.5	-	4.3	-	3.3	-	4.2	-	-	9.8	-	6.8	-	-	-	-
¾	25.4	-	8.8	13	13.9	25	8.2	13	13.7	-	25	22.0	20	15.4	20	-	-	-
19	11.5	-	4.0	-	6.3	-	3.7	-	6.2	-	-	10.0	-	7.0	-	-	-	-
1	34.4	-	13.2	25	16.1	45	12.6	25	15.9	-	45	49.6	25	22.0	25	-	-	-
25	15.6	-	6.0	-	7.3	-	5.7	-	7.2	-	-	22.5	-	10.0	-	-	-	-
1¼	35.7	-	15.4	45	24.7	70	14.8	45	24.5	-	70	69.9	55	43.4	55	-	-	-
32	16.2	-	7.0	-	11.2	-	6.7	-	11.1	-	-	31.7	-	19.7	-	-	-	-
1½	49.8	-	23.8	70	35.1	110	23.1	70	34.8	-	110	70.5	70	57.3	70	-	-	-
38	22.6	-	10.8	-	15.9	-	10.5	-	15.8	-	-	32.0	-	26.0	-	-	-	-
2	62.2	-	34.2	120	36.4	220	33.5	120	36.2	-	220	83.8	120	69.9	120	-	-	-
50	28.2	-	15.5	-	16.5	-	15.2	-	16.4	-	-	38.0	-	31.7	-	-	-	-

FE = Flanged Ends
WE = Socket Weld / Threaded Ends

WT = Weight
C_v = Flow Coefficient



STANDARD MATERIALS (Other materials available)

PART	MATERIALS			
Body	A105 + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced	A182 F316 (1)
Bonnet	A105	A182 F11	A182 F22	A182 F316
Disc	SST 420			A182 F316
Stem	A182 F6a			A182 F316
Gland Flange	A105			A182 F316
Eye Bolt	A193 Gr. B7	A193 Gr. B16		A193 Gr. B8M
Eye Bolt Nut	A194 Gr. 2H	A194 Gr. 7		A194 Gr. 8M
Gland	SST 420			Series 300 SST
Packing	Graphite			PTFE
Gasket (2)	Spiral Wound SST with Graphite			Spiral Wound SST with PTFE
Hand Wheel	Malleable Iron or Steel			
Hand Wheel Nut	Malleable Iron or Steel			
Body / Bonnet Bolting (2)	A193 Gr. B7	A193 Gr. B16		A193 Gr. B8M
Identification Plate	Series 300 SST			

Class	Bore	Fig. No.
150	Standard	GL01
	Full	GLL1
300	Standard	GL03
	Full	GLL3
600	Standard	GL06
	Full	GLL6
800	Standard	GL08
	Full	GLL8
1500	Standard	GL15
	Full	GLL5
1680	Standard	GL16
2500	Standard	GL25
2690	Standard	GL26

- (1) Threaded and weld end valve bodies A182 F316L
(2) Welded bonnet design also available.

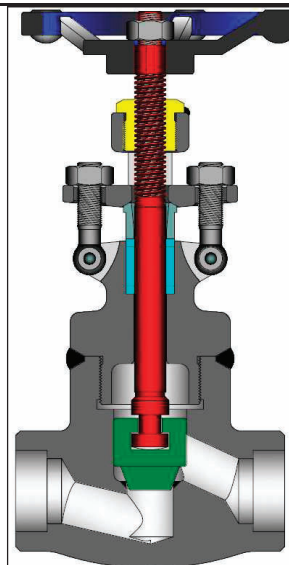
NOTE: See page 43 for flow, safety and maintenance information.

Design Specifications

Item	Applicable Specification
Wall thickness	API 602
Pressure - temperature ratings	ASME B16.34
General valve design	API 602 & B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Thread design	ASME B1.20.1
Butt Weld design	ASME B16.25
Socket Weld design	ASME B16.11
Materials	ASTM

DESIGN FEATURES:

- Standard trim** is stellite faced seats integral to the body, 13% chrome disc, and 13% chrome stem (API trim 8). Other trims available on request.
- Wall thickness** per heavy wall API 602 requirements.
- Seat faces** lapped for smooth finish and superior sealing.
- Swivel disc** for optimal seating and longer seat life are non-rotating.
- Stems** of hand wheel operated design are rotating / rising design.
- Each valve** is shell, seat and backseat pressure tested per industry standard API 598.
- Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.
- End Flanges** have the following raised faces per ASME B16.5:
Classes 150-300: 1/16" (2mm)
Classes 600: 1/4" (7mm)
- Weld ends** are available per ASME B16.25/ B16.11 or per customer's specification.
- Other** available options as follows:
-Alternate valve materials such as chrome and stainless steel alloys
-Alternate trim materials
-NACE service
-Special cleaning for applications such as oxygen or chlorine
-Other options available as specified

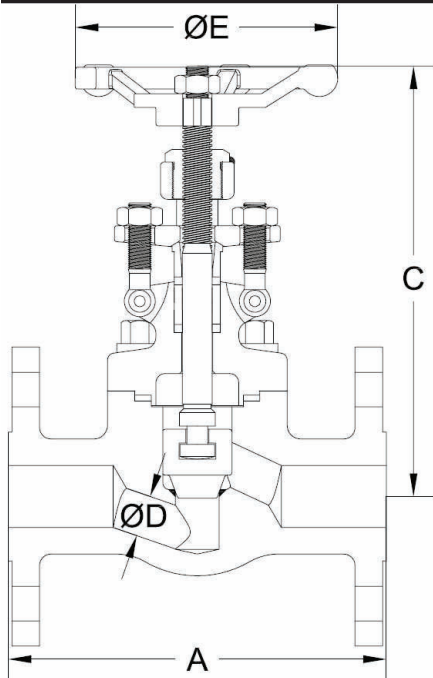


Welded
Bonnet
Design

GLOBE VALVE DIMENSIONS (CLASS 150—800).

SIZE	ASME 150				ASME 300				ASME 600			
	Bolted Bonnet				Bolted Bonnet				Bolted Bonnet			
	Standard Bore				Standard Bore				Standard Bore			
in	A	C	D	E	A	C	D	E	A	C	D	E
mm	FE				FE				FE			
½	4.25	6.0	0.39	3.9	6.00	6.2	0.39	3.9	6.50	6.2	0.39	3.9
13	108	153	10	100	152	158	10	100	165	158	10	100
¾	4.62	6.2	0.50	3.9	7.00	6.2	0.50	3.9	7.50	6.2	0.50	3.9
19	117	158	13	100	178	158	13	100	190	158	13	100
1	5.00	7.6	0.69	4.9	8.00	7.6	0.69	4.9	8.50	7.6	0.69	4.9
25	127	192	18	125	203	192	18	125	216	192	18	125
1¼	5.50	8.9	0.91	6.3	8.50	8.9	0.91	6.3	9.00	5.0	0.91	6.3
32	140	227	23	160	216	227	23	160	229	127	23	160
1½	6.50	9.4	1.12	6.3	9.00	9.4	1.12	6.3	9.50	9.4	1.12	6.3
38	165	240	29	160	229	240	29	160	241	240	29	160
2	8.00	11.0	1.38	7.1	10.50	11.0	1.38	7.1	11.50	11.0	1.38	7.1
50	203	279	35	180	267	279	35	180	292	279	35	180

SIZE	ASME 800											
	Bolted Bonnet						Welded Bonnet					
	Standard Bore				Full Bore				Standard Bore			
in	A	C	D	E	A	C	D	E	A	C	D	E
mm	WE				WE				WE			
¼	3.11	6.1	0.26	3.9	-	-	-	-	3.11	6.1	0.26	3.9
6	79	154	7	100	-	-	-	-	79	154	7	100
¾	3.11	6.1	0.39	3.9	-	-	-	-	3.11	6.1	0.39	3.9
10	79	154	10	100	-	-	-	-	79	154	10	100
½	3.11	6.2	0.39	3.9	3.62	6.2	0.50	6.3	3.11	6.1	0.39	3.9
13	79	158	10	100	92	158	13	160	79	154	10	100
¾	3.62	6.2	0.50	3.9	4.37	7.6	0.69	4.9	3.62	6.2	0.50	3.9
19	92	158	13	100	111	192	18	125	92	158	13	100
1	4.37	7.6	0.69	4.9	4.72	8.9	0.91	6.3	4.37	7.6	0.69	4.9
25	111	192	18	125	120	227	23	160	111	192	18	125
1¼	4.72	8.9	0.91	6.3	5.98	9.4	1.12	6.3	4.72	8.9	0.91	6.3
32	120	227	23	160	152	240	29	160	120	227	23	160
1½	5.98	9.4	1.12	6.3	6.77	11.0	1.40	7.1	5.98	9.4	1.12	6.3
38	152	240	29	160	172	279	36	180	152	240	29	160
2	6.77	11.0	1.38	7.1	8.66	12.8	1.85	7.9	6.77	11.0	1.38	7.1
50	172	279	35	180	220	325	47	200	172	279	35	180

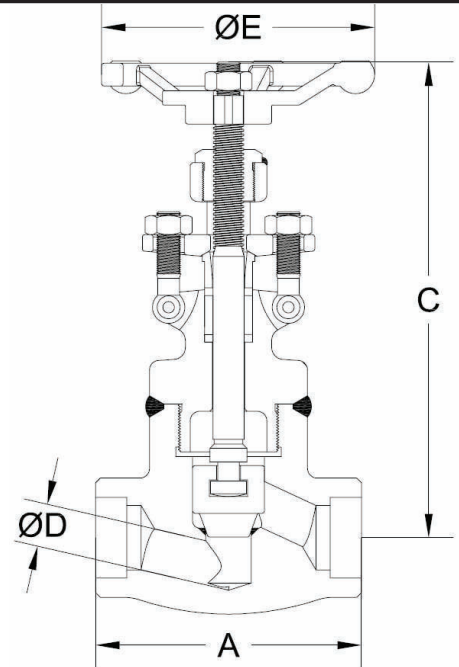


Bolted Bonnet Flanged Ends Design

**ADDITIONAL MATERIALS
AND CLASSES AVAILABLE
UPON REQUEST.**

WE = Socket Weld /
Threaded ends
FE = Flanged Ends

C = Center to top open

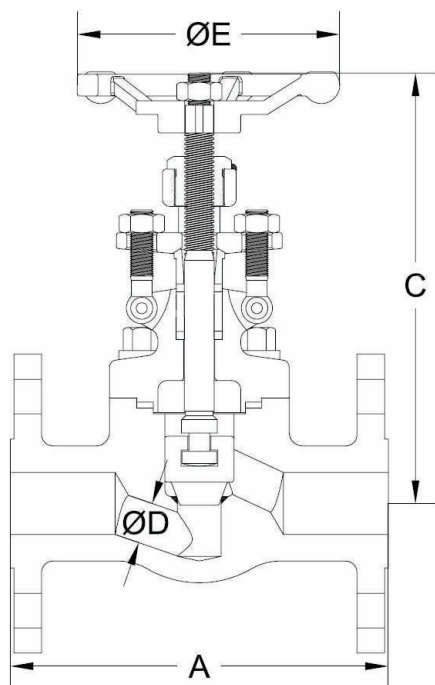


Welded Bonnet Socket Weld Ends Design

GLOBE VALVE DIMENSIONS (CLASS 1500—2680).

SIZE	ASME 1500 & 1690																
	Bolted Bonnet									Welded Bonnet							
	Standard Bore					Full Bore				Standard Bore				Full Bore			
	A		C	D	E	A	C	D	E	A	C	D	E	A	C	D	E
in mm	FE	WE				WE				WE				WE			
¼	-	3.11	6.9	0.26	3.9	-	-	-	-	3.11	6.2	0.39	3.9	-	-	-	-
6	-	79	175	7	100	-	-	-	-	79	158	10	100	-	-	-	-
¾	-	3.62	7.0	0.39	4.9	-	-	-	-	3.62	6.2	0.50	3.9	-	-	-	-
10	-	92	178	10	125	-	-	-	-	92	158	13	100	-	-	-	-
½	8.50	3.62	7.4	0.39	4.9	4.37	7.4	0.50	4.9	4.37	7.4	0.39	4.9	4.37	7.4	0.50	4.9
13	216	92	187	10	125	111	187	13	125	111	187	10	125	111	187	13	125
¾	9.00	4.37	7.4	0.50	4.9	4.72	8.9	0.69	6.3	4.37	7.4	0.50	4.9	4.72	8.9	0.69	6.3
19	229	111	187	13	125	120	227	18	160	111	187	13	125	120	227	18	160
1	10.00	4.72	8.9	0.69	6.3	5.98	9.5	0.91	6.3	4.72	8.9	0.69	6.3	5.98	9.5	0.91	6.3
25	254	120	227	18	160	152	242	23	160	120	227	18	160	152	242	23	160
1¼	11.00	5.98	9.5	0.91	6.3	6.77	10.9	1.12	7.1	5.98	9.5	0.91	6.3	6.77	10.9	1.12	7.1
32	279	152	242	23	160	172	278	29	180	152	242	23	160	172	278	29	180
1½	12.00	6.77	10.9	1.12	7.1	8.66	12.8	1.38	7.9	6.77	10.9	1.12	7.1	8.66	12.8	1.38	7.9
38	305	172	278	29	180	220	325	35	200	172	278	29	180	220	325	35	200
2	14.50	8.66	12.8	1.38	7.9	9.84	14.0	1.85	7.9	8.66	12.8	1.38	7.9	9.84	14.0	1.85	7.9
50	368	220	325	35	200	250	355	47	200	220	325	35	200	250	355	47	200

SIZE	ASME 2500 & 2680							
	Bolted Bonnet				Welded Bonnet			
	Standard Bore				Standard Bore			
	A	C	D	E	A	C	D	E
in mm	WE				WE			
½	5.91	11.5	0.43	6.3	5.91	9.8	0.55	6.3
13	150	293	11	160	150	249	14	160
¾	5.91	11.5	0.43	6.3	5.91	9.8	0.55	6.3
19	150	293	11	160	150	249	14	160
1	6.69	13.5	0.55	7.9	6.69	11.5	0.75	7.9
25	170	344	14	200	170	292	19	200
1¼	7.87	15.1	0.63	9.8	7.87	12.9	0.98	9.8
32	200	383	16	250	200	327	25	250
1½	7.87	15.1	0.98	9.8	7.87	12.9	1.10	9.8
38	200	383	25	250	200	327	28	250
2	9.84	17.4	1.10	11.8	9.84	15.0	1.38	11.8
50	250	442	28	300	250	381	35	300

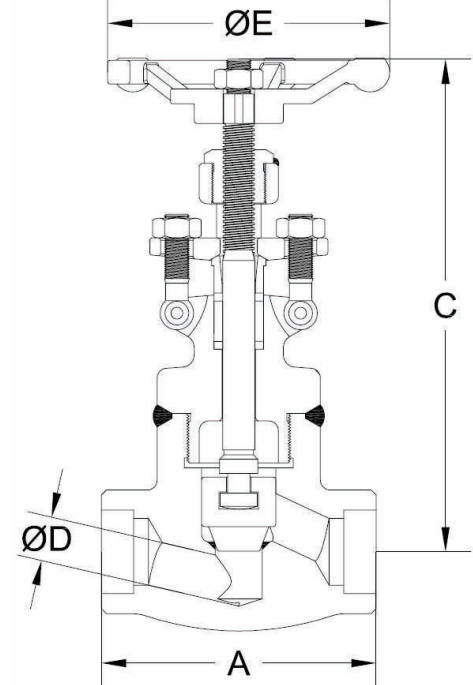


Bolted Bonnet Flanged Ends Design

**ADDITIONAL
MATERIALS AND
CLASSES AVAILABLE
UPON
REQUEST.**

WE = Socket Weld /
Threaded ends
FE = Flanged Ends

C = Center to top open



Welded Bonnet Socket Weld Ends Design

API 602 GLOBE VALVES
FORGED CARBON , STAINLESS STEEL OR ALLOY STEEL
¼" TO 2" (6 TO 50 mm)
ASME CLASSES 150 TO 2680

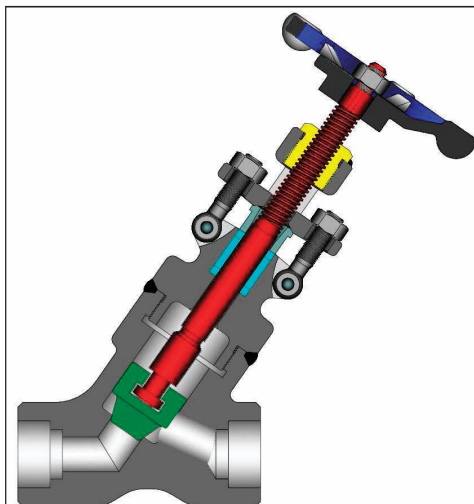
SIZE	ASME 150			ASME 300			ASME 600			ASME 800											
	Bolted Bonnet			Bolted Bonnet			Bolted Bonnet			Bolted Bonnet						Welded Bonnet					
	Standard Bore			Standard Bore			Standard Bore			Standard Bore			Full Bore			Standard Bore			Full Bore		
in	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v
mm	FE	KG		FE	KG		FE	KG		WE	KG		WE	KG		WE	KG		WE	KG	
¼	-	-	-	-	-	-	-	-	-	4.6	0.7	-	-	-	-	4.4	0.7	-	-	-	-
6	-	-	-	-	-	-	-	-	-	2.1	-	-	-	-	-	2.0	-	-	-	-	-
¾	-	-	-	-	-	-	-	-	-	4.6	1.5	-	-	-	-	4.4	1.5	-	-	-	-
10	-	-	-	-	-	-	-	-	-	2.1	-	-	-	-	-	2.0	-	-	-	-	-
½	9.9	1.5	-	10.6	1.5	-	12.3	1.5	-	4.4	1.5	-	4.9	2.6	-	4.2	1.5	-	4.6	2.6	-
13	4.5	-	-	4.8	-	-	5.6	-	-	2.0	-	-	2.2	-	-	1.9	-	-	2.1	-	-
¾	15.2	2.7	-	17.0	2.7	-	17.2	2.7	-	4.9	2.7	-	8.4	4.9	-	4.6	2.7	-	8.2	4.9	-
19	6.9	-	-	7.7	-	-	7.8	-	-	2.2	-	-	3.8	-	-	2.1	-	-	3.7	-	-
1	21.6	5.1	-	24.3	5.1	-	27.6	5.1	-	5.5	5.1	-	12.1	8.9	-	8.2	5.1	-	11.9	8.9	-
25	9.8	-	-	11.0	-	-	12.5	-	-	2.5	-	-	5.5	-	-	3.7	-	-	5.4	-	-
1¼	29.8	9.1	-	37.0	9.1	-	37.5	9.1	-	12.1	9.1	-	15.4	13.7	-	11.9	9.1	-	15.2	13.7	-
32	13.5	-	-	16.8	-	-	17.0	-	-	5.5	-	-	7.0	-	-	5.4	-	-	6.9	-	-
1½	43.0	14.0	-	46.5	14.0	-	51.8	14.0	-	15.4	14.0	-	25.4	21.9	-	15.2	14.0	-	25.1	21.9	-
38	19.5	-	-	21.2	-	-	23.5	-	-	7.0	-	-	11.5	-	-	6.9	-	-	11.4	-	-
2	61.7	22.4	-	68.0	22.4	-	71.9	22.4	-	25.4	22.4	-	26.5	40	-	25.1	22.4	-	26.2	40	-
50	28.0	-	-	31.0	-	-	32.6	-	-	11.5	-	-	12.0	-	-	11.4	-	-	11.9	-	-

SIZE	ASME 1500 & 1687												ASME 2500 & 2680					
	Bolted Bonnet						Welded Bonnet						Bolted Bonnet			Welded Bonnet		
	Standard Bore			Full Bore			Standard Bore			Full Bore			Standard Bore			Standard Bore		
in	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v
mm	FE	KG		WE	KG		WE	KG		WE	KG		WE	KG		WE	KG	
¼	-	-	-	6.6	0.7	-	-	-	-	6.2	0.7	-	-	-	-	-	-	-
6	-	-	-	3.0	-	-	-	-	-	2.8	-	-	-	-	-	-	-	-
¾	-	-	-	7.7	1.5	-	-	-	-	6.6	1.5	-	-	-	-	-	-	-
10	-	-	-	3.5	-	-	-	-	-	3.0	-	-	-	-	-	-	-	-
½	24.3	7.7	1.5	-	8.8	1.5	7.3	1.5	-	8.6	1.5	-	23.8	1.8	-	16.1	3.0	-
13	11.0	3.5	-	-	4.0	-	3.3	-	-	3.9	-	-	10.8	-	-	7.3	-	-
¾	29.1	8.8	2.7	-	13.9	2.7	8.4	2.7	-	13.7	2.7	-	24.3	1.9	-	18.7	3.1	-
19	13.2	4.0	-	-	6.3	-	3.8	-	-	6.2	-	-	11.0	-	-	8.5	-	-
1	38.4	13.9	5.1	-	17.6	5.1	13.4	5.1	-	17.4	5.1	-	26.8	3.2	-	27.6	6.0	-
25	17.4	6.3	-	-	8.0	-	6.1	-	-	7.9	-	-	12.1	-	-	12.5	-	-
1¼	41.9	17.6	9.1	-	27.6	9.1	17.2	9.1	-	27.3	9.1	-	47.8	4.3	-	45.6	10.5	-
32	19.0	8.0	-	-	12.5	-	7.8	-	-	12.4	-	-	21.7	-	-	20.7	-	-
1½	54.0	27.6	14.0	-	43.0	14.0	27.1	14.0	-	42.8	14.0	-	48.5	10.7	-	46.3	13.5	-
38	24.5	12.5	-	-	19.5	-	12.3	-	-	19.4	-	-	22.0	-	-	21.0	-	-
2	85.5	43.0	22.4	-	44.1	22.4	42.5	22.4	-	43.9	22.4	-	81.6	14.2	-	79.4	22.4	-
50	38.8	19.5	-	-	20.0	-	19.3	-	-	19.9	-	-	37.0	-	-	36.0	-	-

FE = Flanged Ends
WE = Socket Weld / Threaded Ends

WT = Weight
C_v = Flow Coefficient

STANDARD MATERIALS (Other materials available)



PART	MATERIALS			
Body	A105 + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced	A182 F316 (1)
Bonnet	A105	A182 F11	A182 F22	A182 F316
Disc	SST 420			A182 F316
Stem	A182 F6a			A182 F316
Gland Flange	A105			A182 F316
Eye Bolt	A193 Gr. B7	A193 Gr. B16		A193 Gr. B8M
Eye Bolt Nut	A194 Gr. 2H	A194 Gr. 7		A194 Gr. 8M
Gland	SST 420			Series 300 SST
Packing	Graphite			PTFE
Hand Wheel	Malleable Iron or Steel			
Hand Wheel Nut	Malleable Iron or Steel			
Identification Plate	Series 300 SST			

Class	Bore	Fig. No.
800	Standard	GY08
	Full	GYL8
1500	Standard	GY15
	Full	GYL5
1680	Standard	GY16
2500	Standard	GY25
2690	Standard	GY26

(1) Threaded and weld end valve bodies A182 F316L

NOTE: See page 43 for flow, safety and maintenance information.

Design Specifications

Item	Applicable Specification
Wall thickness	API 602
Pressure - temperature ratings	ASME B16.34
General valve design	API 602 & B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Thread design	ASME B1.20.1
Butt Weld design	ASME B16.25
Socket Weld design	ASME B16.11
Materials	ASTM

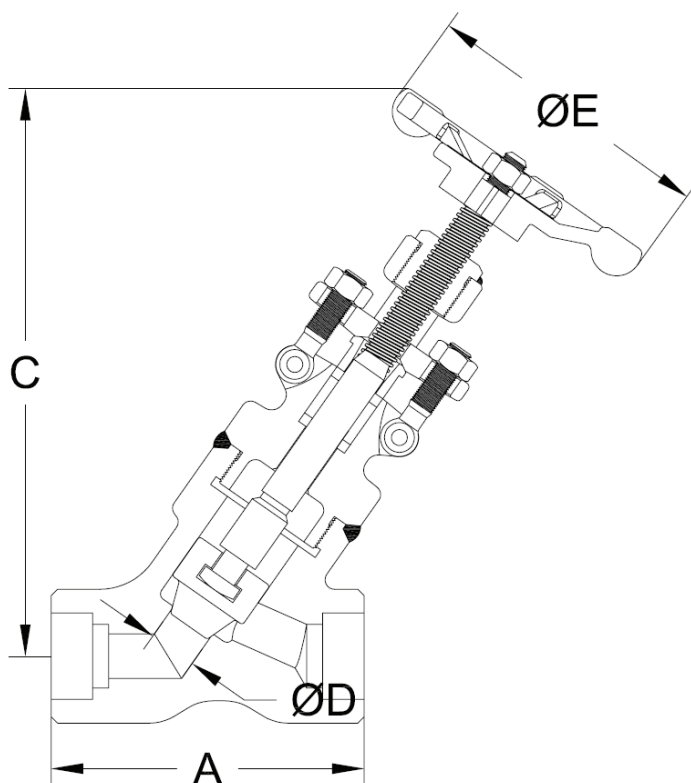
DESIGN FEATURES:

- **Standard trim** is stellite faced seat integral to the body, 13% chrome disc, and 13% chrome stem (API trim 8). Other trims available on request.
- **Wall thickness** per heavy wall API 602 requirements.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Swivel disc** for optimal seating and longer seat life are non-rotating.
- **Stems** of hand wheel operated design are rotating / rising design.
- **Each valve** is shell, seat and backseat pressure tested per industry standard API 598.
- **Gland** is two piece gland / gland flange design for optimal alignment and uniform packing compression.
- **End Flanges** have the following raised faces per ASME B16.5:
Classes 150-300: 1/16" (2mm)
Classes 600: 1/4" (7mm)
- **Weld ends** are available per ASME B16.25/B16.11 or per customer's specification.
- **Other** available options as follows:
-Alternate valve materials such as chrome and stainless steel alloys
-Alternate trim materials.
-NACE service.
-Special cleaning for applications such as oxygen or chlorine.
-Other options available as specified.

Y-PATTERN GLOBE VALVE DIMENSIONS (CLASS 800—2680).

SIZE	ASME 800							
	Bolted Bonnet				Welded Bonnet			
	Standard Bore				Standard Bore			
in	A	C	D	E	A	C	D	E
mm	WE				WE			
½	4.17	6.7	0.39	3.9	4.17	6.5	0.39	3.9
13	106	170	10	100	106	166	10	100
¾	4.17	6.7	0.50	3.9	4.17	6.5	0.50	3.9
19	106	170	13	100	106	166	13	100
1	4.72	8.0	0.69	4.9	4.72	7.8	0.69	4.9
25	120	202	18	125	120	197	18	125
1¼	5.98	9.8	0.91	6.3	5.98	9.6	0.91	6.3
32	152	249	23	160	152	243	23	160
1½	5.98	9.8	1.12	6.3	5.98	9.6	1.12	6.3
38	152	249	29	160	152	243	29	160
2	7.09	11.1	1.38	7.1	7.09	10.7	1.38	7.1
50	180	281	35	180	180	272	35	180

SIZE	ASME 1500 & 1690								ASME 2500 & 2680			
	Bolted Bonnet				Welded Bonnet				Welded Bonnet			
	Standard Bore				Standard Bore				Standard Bore			
in	A	C	D	E	A	C	D	E	A	C	D	E
mm	WE				WE				WE			
½	4.72	7.9	0.39	4.9	4.72	7.6	0.39	4.9	5.98	9.6	0.43	6.3
13	120	200	10	125	120	192	10	125	152	243	11	160
¾	4.72	7.9	0.50	4.9	4.72	7.6	0.50	4.9	5.98	9.6	0.55	6.3
19	120	200	13	125	120	192	13	125	152	243	14	160
1	5.98	9.8	0.69	6.3	5.98	9.4	0.69	6.3	7.09	11.4	0.75	7.9
25	152	250	18	160	152	240	18	160	180	290	19	200
1¼	5.98	9.8	0.91	6.3	5.98	9.4	0.91	6.3	7.87	13.2	0.98	9.8
32	152	250	23	160	152	240	23	160	200	335	25	250
1½	7.09	11.1	1.12	7.1	7.09	10.7	1.12	7.1	7.87	13.2	1.10	9.8
38	180	283	29	180	180	273	29	180	200	335	28	250
2	7.87	12.8	1.38	7.9	7.87	12.4	1.38	7.9	9.06	15.4	1.38	11.8
50	200	324	35	200	200	316	35	200	230	390	35	300



**ADDITIONAL MATERIALS
AND CLASSES AVAILABLE
UPON REQUEST.**

WE = Socket Weld /
Threaded Ends

C = Center to top open

API 602 Y-PATTERN GLOBE VALVES
FORGED CARBON , STAINLESS STEEL OR ALLOY STEEL
¼" TO 2" (6 TO 50 mm)
ASME CLASSES 800 TO 2680

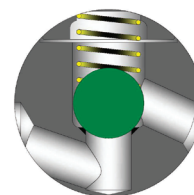
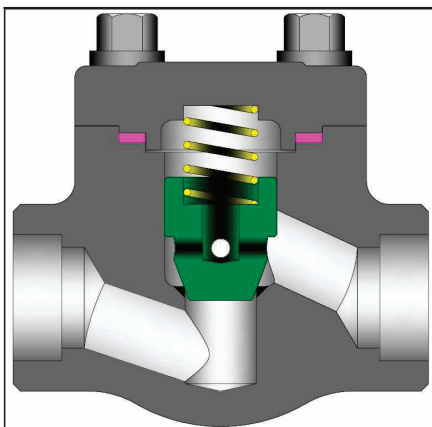
SIZE	ASME 800						ASME 1500 & 1687						ASME 2500 & 2680		
	Bolted Bonnet			Welded Bonnet			Bolted Bonnet			Welded Bonnet			Welded Bonnet		
	Standard Bore			Standard Bore			Standard Bore			Standard Bore			Standard Bore		
in	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v
mm	WE	KG		WE	KG		WE	KG		WE	KG		WE	KG	
½	4.4		3.3	3.3		3.3	9.3		3.3	7.7		3.3	9.9		4.0
13	2.0			1.5			4.2			3.5			4.5		
¾	4.9		5.9	4.4		5.9	9.3		5.9	7.7		5.9	15.7		6.8
19	2.2			2.0			4.2			3.5			7.1		
1	9.3		11.2	8.4		11.2	12.1		11.2	11.0		11.2	24.3		13.3
25	4.2			3.8			5.5			5.0			11.0		
1¼	12.1		20.0	11.0		20.0	20.7		20.0	19.8		20.0	37.7		23.1
32	5.5			5.0			9.4			9.0			17.1		
1½	20.7		30	19.8		30	28.7		30	23.1		30	37.7		30
38	9.4			9.0			13.0			10.5			17.1		
2	28.7		49	28.7		49	36.4		49	32.0		49	55.1		49
50	13.0			13.0			16.5			14.5			25.0		

FE = Flanged Ends

WE = Socket Weld / Threaded Ends

WT = Weight

C_v = Flow Coefficient



Ball Check

STANDARD MATERIALS (Other materials available)

				PART	MATERIALS			
Class	Bore	Fig. No.		Body	A105 + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced	A182 F316 (1)
		Piston	Ball	Cap	A105	A182 F11	A182 F22	A182 F316
150	Standard	PC01	BC01	Disc/Ball	A276 T420			A276 T316
300	Full	PCL1	BCL1					
	Standard	PC03	BC03					
600	Full	PCL3	BCL3					
	Standard	PC06	BC06	Gasket (2)	Spiral Wound SST with Graphite			Spiral Wound SST with PTFE
800	Full	PCL6	BCL6					
	Standard	PC08	BC08	Spring	Inconel 625			
1500	Full	PCL8	BCL8					
	Standard	PC15	BC15	Body / Cap Bolting (2)	A193 Gr. B7	A193 Gr. B16		A193 Gr. B8M
1680	Full	PCL5	BCL5					
2500	Standard	PC16	BC16	Identification Plate	Series 300 SST			
2690	Standard	PC25	BC25					
	Standard	PC26	BC26					

DESIGN FEATURES:

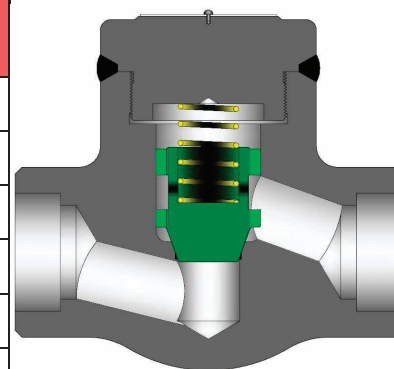
- Standard trim** is stellite faced seat integral to the body and 13% chrome disc/ball (API trim 8). Other trims available on request.
- Seat faces** lapped for smooth finish and superior sealing.
- Wall thickness** per heavy wall API 602 requirements.
- Each** valve is shell and seat pressure tested per industry standard API 598.
- Check** valve are suitable for service in horizontal line with cap vertical.
- End Flanges** have the following raised faces per ASME B16.5:
Classes 150-300: 1/16" (2mm).
Classes 600: 1/4" (7mm).
- Other** available options as follows:
-Alternate valve materials such as chrome and stainless steel alloys.
-Alternate trim materials.
-NACE service.
-Special cleaning for applications such as oxygen or chlorine.
-Other options available as specified.

- Threaded and weld end valve bodies A182 F316L
- Welded bonnets also available.

NOTE: See page 43 for flow, safety and maintenance information.

Design Specifications

Item	Applicable Specification
Wall thickness	API 602
Pressure - temperature ratings	ASME B16.34
General valve design	API 602 & B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Thread design	ASME B1.20.1
Butt Weld design	ASME B16.25
Socket Weld design	ASME B16.11
Materials	ASTM



Welded Bonnet Design

PISTON CHECK VALVE DIMENSIONS (CLASS 150—800).

SIZE	ASME 150			ASME 300			ASME 600		
	Bolted Bonnet			Bolted Bonnet			Bolted Bonnet		
	Standard Bore			Standard Bore			Standard Bore		
in	A	C	D	A	C	D	A	C	D
mm	FE			FE			FE		
½	4.25	2.2	0.39	6.00	2.2	0.39	6.50	2.2	0.39
13	108	55	10	152	55	10	165	55	10
¾	4.62	2.2	0.50	7.00	2.2	0.50	7.50	2.2	0.50
19	117	55	13	178	55	13	190	55	13
1	5.00	2.8	0.69	8.00	2.8	0.69	8.50	2.8	0.69
25	127	72	18	203	72	18	216	72	18
1¼	5.50	3.2	0.91	8.50	3.2	0.91	9.00	3.2	0.91
32	140	81	23	216	81	23	229	81	23
1½	6.50	3.6	1.12	9.00	3.7	1.12	9.50	3.7	1.12
38	165	91	29	229	94	29	241	94	29
2	8.00	4.4	1.26	10.50	4.4	1.38	11.50	4.4	1.38
50	203	112	32	267	112	35	292	112	35

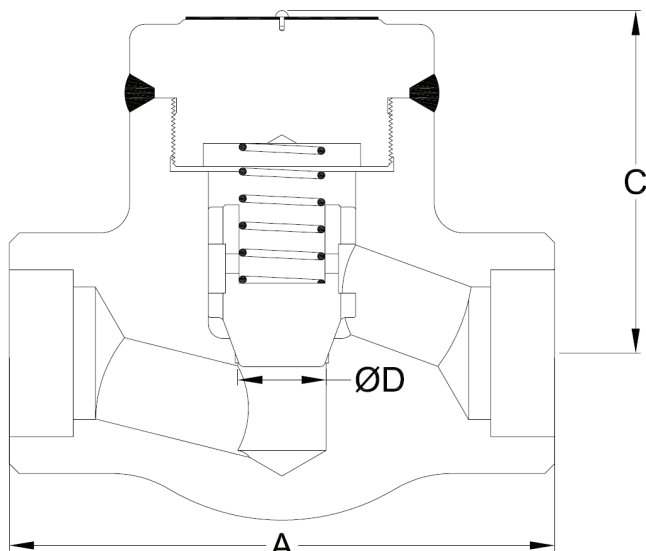
SIZE	ASME 800											
	Bolted Bonnet						Welded Bonnet					
	Standard Bore			Full Bore			Standard Bore			Full Bore		
in	A	C	D	A	C	D	A	C	D	A	C	D
mm	WE			WE			WE					
¼	3.11	2.2	0.26	-	-	-	3.11	2.2	0.26	-	-	-
6	79	55	7	-	-	-	79	55	7	-	-	-
¾	3.11	2.2	0.39	-	-	-	3.11	2.2	0.39	-	-	-
10	79	55	10	-	-	-	79	55	10	-	-	-
½	3.11	2.2	0.39	3.62	2.2	0.50	3.11	2.2	0.39	3.62	2.2	0.50
13	79	55	10	92	55	13	79	55	10	92	55	13
¾	3.62	2.2	0.50	4.37	3.0	0.69	3.62	2.2	0.50	4.37	3.0	0.69
19	92	55	13	111	72	18	92	55	13	111	72	18
1	4.37	3.0	0.69	4.72	3.2	0.91	4.37	3.0	0.69	4.72	3.2	0.91
25	111	72	18	120	81	23	111	72	18	120	81	23
1¼	4.72	3.2	0.91	5.98	3.7	1.12	4.72	3.2	0.91	5.98	3.7	1.12
32	120	81	23	152	94	29	120	81	23	152	94	29
1½	5.98	3.7	1.12	6.77	4.4	1.40	5.98	3.7	1.12	6.77	4.4	1.42
38	152	94	29	172	112	36	152	94	29	172	112	36
2	6.77	4.4	1.38	8.66	5.2	1.85	6.77	4.4	1.38	8.66	5.2	1.85
50	172	112	35	220	132	47	172	112	35	220	132	47

**ADDITIONAL MATERIALS
AND CLASSES AVAILABLE
UPON REQUEST.**

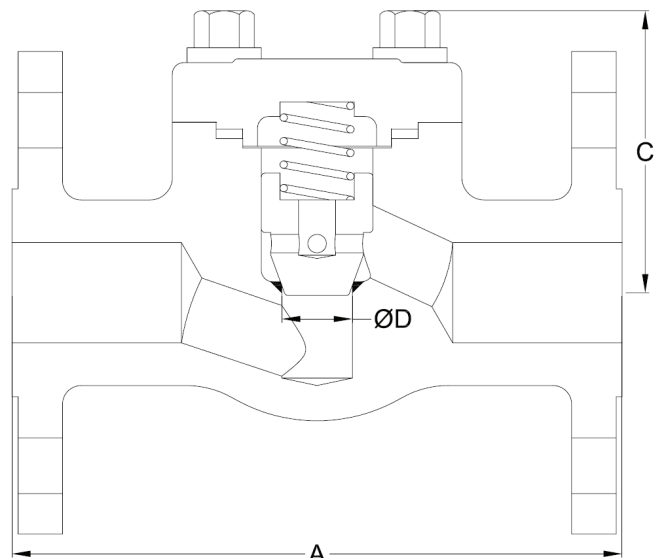
WE = Socket Weld / Threaded Ends

FE = Flanged Ends

C = Center to top



Welded Bonnet Socket Weld Ends Design



Bolted Bonnet Flanged Ends Design

PISTON CHECK VALVE DIMENSIONS (CLASS 1500—2680).

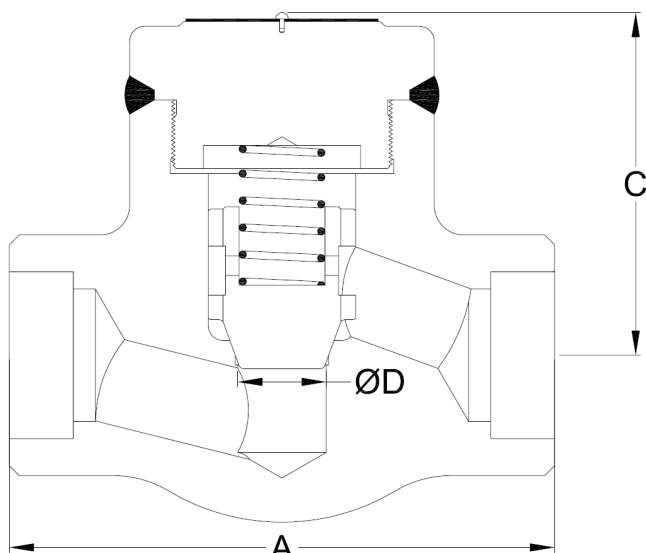
SIZE	ASME 1500 & 1690												
	Bolted Bonnet							Welded Bonnet					
	Standard Bore				Full Bore			Standard Bore			Full Bore		
	A		C	D	A	C	D	A	C	D	A	C	D
in	mm	FE			WE			WE			WE			WE
¼	-	3.11	2.9	0.26	-	-	-	3.11	2.9	0.39	-	-	-
6	-	79	73	7	-	-	-	79	73	10	-	-	-
¾	-	3.11	2.9	0.39	-	-	-	3.11	2.9	0.50	-	-	-
10	-	79	73	10	-	-	-	79	73	13	-	-	-
½	8.50	3.62	2.9	0.39	4.37	2.9	0.50	3.62	2.9	0.39	4.37	2.9	0.50
13	216	92	73	10	111	73	13	92	73	10	111	73	13
¾	9.00	4.37	2.9	0.50	4.72	3.3	0.69	4.37	2.9	0.51	4.72	3.3	0.69
19	229	111	73	13	120	84	18	111	73	13	120	84	18
1	10.00	4.72	3.3	0.69	5.98	3.8	0.91	4.72	3.3	0.69	5.98	3.8	0.91
25	254	120	84	18	152	97	23	120	84	18	152	97	23
1¼	11.00	5.98	3.8	0.91	6.77	4.5	1.12	5.98	3.8	0.91	6.77	4.5	1.12
32	279	152	97	23	172	115	29	152	97	23	172	115	29
1½	12.00	6.77	4.5	1.12	8.66	5.2	1.38	6.77	4.5	1.12	8.66	5.2	1.38
38	305	172	115	29	220	132	35	172	115	29	220	132	35
2	14.50	8.66	5.2	1.38	9.84	5.2	1.85	8.66	5.2	1.38	10.24	5.2	1.85
50	368	220	132	35	250	132	47	220	132	35	260	132	47

SIZE	ASME 2500 & 2680					
	Bolted Bonnet			Welded Bonnet		
	Standard Bore			Standard Bore		
	in	A	C	D	A	C	D
mm	WE	WE				
½	5.91	4.0	0.43	5.91	5.3	0.55
13	150	102	11	150	135	14
¾	5.91	4.0	0.43	5.91	5.3	0.55
19	150	102	11	150	135	14
1	6.69	4.2	0.55	6.69	5.7	0.75
25	170	107	14	170	146	19
1¼	7.87	5.0	0.63	7.87	6.9	0.98
32	200	128	16	200	176	25
1½	7.87	5.0	0.98	7.87	6.9	1.10
38	200	128	25	200	176	28
2	9.84	5.6	1.10	9.84	7.7	1.38
50	250	143	28	250	196	35

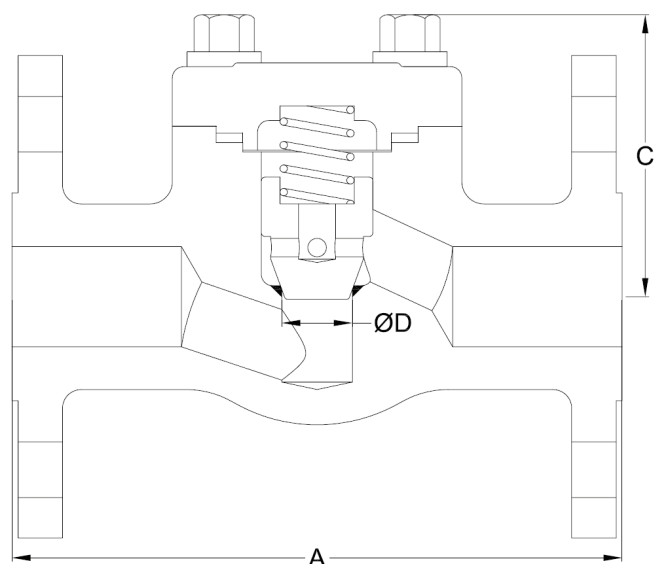
**ADDITIONAL MATERIALS
AND CLASSES AVAILABLE
UPON REQUEST.**

WE = Socket Weld / Threaded Ends
FE = Flanged Ends

C = Center to top open



Welded Bonnet Socket Weld Ends Design



Bolted Bonnet Flanged Ends Design

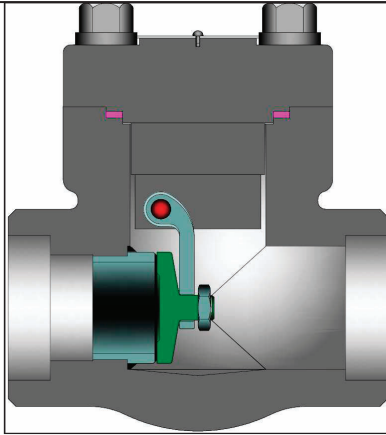
API 602 PISTON CHECK VALVES
FORGED CARBON , STAINLESS STEEL OR ALLOY STEEL
¼" TO 2" (6 TO 50 mm)
ASME CLASSES 150 TO 2680

SIZE	ASME 150			ASME 300			ASME 600			ASME 800											
	Bolted Bonnet			Bolted Bonnet			Bolted Bonnet			Bolted Bonnet						Welded Bonnet					
	Standard Bore			Standard Bore			Standard Bore			Standard Bore			Full Bore			Standard Bore			Full Bore		
in	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v
mm	FE	KG		FE	KG		FE	KG		WE	KG		WE	KG		WE	KG		WE	KG	
¼	-	-	-	-	-	-	-	-	-	3.3	0.7	-	-	-	-	3.1	0.7	-	-	-	-
6	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-	1.4	-	-	-	-	-
¾	-	-	-	-	-	-	-	-	-	3.3	1.5	-	-	-	-	3.1	1.5	-	-	-	-
10	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-	1.4	-	-	-	-	-
½	7.5	1.5	-	8.2	1.5	-	7.5	1.5	-	3.1	1.5	-	4.2	2.6	-	3.1	1.5	-	4.2	2.6	-
13	3.4	-	-	3.7	-	-	3.4	-	-	1.4	-	-	1.9	-	-	1.4	-	-	1.9	-	-
¾	9.7	2.7	-	10.6	2.7	-	12.8	2.7	-	4.2	2.7	-	5.7	4.9	-	4.0	2.7	-	5.7	4.9	-
19	4.4	-	-	4.8	-	-	5.8	-	-	1.9	-	-	2.6	-	-	1.8	-	-	2.6	-	-
1	18.1	5.1	-	19.4	5.1	-	20.9	5.1	-	5.7	5.1	-	9.3	8.9	-	5.7	5.1	-	9.3	8.9	-
25	8.2	-	-	8.8	-	-	9.5	-	-	2.6	-	-	4.2	-	-	2.6	-	-	4.2	-	-
1¼	19.6	9.1	-	21.2	9.1	-	22.9	9.1	-	9.3	9.1	-	11.7	13.7	-	9.3	9.1	-	11.7	13.7	-
32	8.9	-	-	9.6	-	-	10.4	-	-	4.2	-	-	5.3	-	-	4.2	-	-	5.3	-	-
1½	26.5	14.0	-	30.2	14.0	-	34.4	14.0	-	11.7	14.0	-	19.8	21.9	-	11.7	14.0	-	19.8	21.9	-
38	12.0	-	-	13.7	-	-	15.6	-	-	5.3	-	-	9.0	-	-	5.3	-	-	9.0	-	-
2	31.5	22.4	-	39.2	22.4	-	54.0	22.4	-	19.8	22.4	-	34.4	40	-	19.8	22.4	-	34.4	40	-
50	14.3	-	-	17.8	-	-	24.5	-	-	9.0	-	-	15.6	-	-	9.0	-	-	15.6	-	-

SIZE	ASME 1500 & 1687												ASME 2500 & 2680					
	Bolted Bonnet						Welded Bonnet						Bolted Bonnet			Welded Bonnet		
	Standard Bore			Full Bore			Standard Bore			Full Bore			Standard Bore			Standard Bore		
in	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v
mm	FE	KG		WE	KG		WE	KG		WE	KG		WE	KG		WE	KG	
¼	-	-	-	4.9	0.7	-	-	-	-	4.9	0.7	-	-	-	-	-	-	-
6	-	-	-	2.2	-	-	-	-	-	2.2	-	-	-	-	-	-	-	-
¾	-	-	-	4.9	1.5	-	-	-	-	4.9	1.5	-	-	-	-	-	-	-
10	-	-	-	2.2	-	-	-	-	-	2.2	-	-	-	-	-	-	-	-
½	20.7	5.3	-	5.3	1.5	-	6.4	1.5	-	5.3	1.5	-	6.4	1.5	-	17.6	1.8	15.4
13	9.4	-	-	2.4	-	-	2.9	-	-	2.4	-	-	2.9	-	-	8.0	-	7.0
¾	24.7	6.4	-	6.4	2.7	-	10.1	2.7	-	6.4	2.7	-	10.1	2.7	-	17.2	1.9	15.0
19	11.2	-	-	2.9	-	-	4.6	-	-	2.9	-	-	4.6	-	-	7.8	-	6.8
1	31.7	10.1	-	10.1	5.1	-	14.3	5.1	-	10.1	5.1	-	14.3	5.1	-	26.5	3.2	24.3
25	14.4	-	-	4.6	-	-	6.5	-	-	4.6	-	-	6.5	-	-	12.0	-	11.0
1¼	35.3	14.3	-	14.3	9.1	-	23.1	9.1	-	14.3	9.1	-	23.1	9.1	-	43.0	4.3	39.7
32	16.0	-	-	6.5	-	-	10.5	-	-	6.5	-	-	10.5	-	-	19.5	-	18.0
1½	47.4	23.1	-	23.1	14.0	-	34.4	14.0	-	23.1	14.0	-	34.4	14.0	-	42.5	10.7	39.0
38	21.5	-	-	10.5	-	-	15.6	-	-	10.5	-	-	15.6	-	-	19.3	-	17.7
2	61.7	34.2	-	34.2	22.4	-	37.5	22.4	-	34.2	22.4	-	37.5	22.4	-	59.5	14.2	63.9
50	28.0	-	-	15.5	-	-	17.0	-	-	15.5	-	-	17.0	-	-	27.0	-	29.0

FE = Flanged Ends
WE = Socket Weld / Threaded Ends

WT = Weight
C_v = Flow Coefficient



Class	Bore	Fig. No.
150	Standard	SW01
	Full	SWL1
300	Standard	SW03
	Full	SWL3
600	Standard	SW06
	Full	SWL6
800	Standard	SW08
	Full	SWL8
1500	Standard	SW15
	Full	SWL5
1680	Standard	SW16
2500	Standard	SW25
2690	Standard	SW26

DESIGN FEATURES:

- **Standard trim** is stellite faced seat rings and 13% chrome disc (API trim 8). Other trims available on request.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Wall thickness** per heavy wall API 602 requirements.
- **Swivel disc** for improved seat alignment and longer life.
- **Each valve** is shell and seat pressure tested per industry standard API 598.
- **Check valve** are suitable for service in horizontal line with cap vertical or in a vertical line with flow upward.
- **Carrier Pin** is confined within the body wall and is not accessible from the exterior, thus no side body penetrations, eliminating a common leak path.
- **End Flanges** have the following raised faces per ASME B16.5:
Classes 150-300: 1/16" (2mm).
Classes 600: 1/4" (7mm).

STANDARD MATERIALS (Other materials available)

PART	MATERIALS			
Body	A105	A182 F11	A182 F22	A182 F316 (1)
Cap	A105	A182 F11	A182 F22	A182 F316
Disc	A276 T420			A276 T316
Seat Ring	SST 410 + Stellite 6 Faced			316 SST
Gasket (2)	Spiral Wound SST with Graphite			Spiral Wound SST with PTFE
Carrier	304 SST			316 SST
Carrier Pin	304 SST			316 SST
Disc Nut	A182 F304 or A194 Gr. 8			A182 F316 or A194 Gr. 8M
Body / Cap Bolting (2)	A193 Gr. B7	A193 Gr. B16		A193 Gr. B8M
Identification Plate	Series 300 SST			

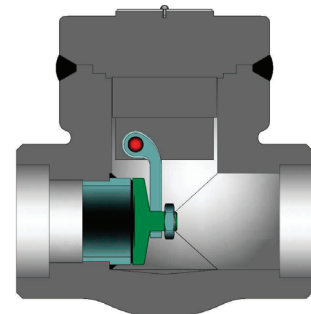
- (1) Threaded and weld end valve bodies A182 F316L
- (2) Welded bonnets also available.

NOTE: See page 43 for flow, safety and maintenance information.

Design Specifications

Item	Applicable Specification
Wall thickness	API 602
Pressure - temperature ratings	ASME B16.34
General valve design	API 602 & B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Thread design	ASME B1.20.1
Butt Weld design	ASME B16.25
Socket Weld design	ASME B16.11
Materials	ASTM

- **Other available options** as follows:
-Alternate valve materials such as chrome and stainless steel alloys
-Alternate trim materials
-NACE service
-Special cleaning for applications such as oxygen or chlorine
-Other options available as specified



Welded Bonnet Design

SWING CHCK VALVE DIMENSIONS (CLASS 150—800).

SIZE	ASME 150			ASME 300			ASME 600		
	Bolted Bonnet			Bolted Bonnet			Bolted Bonnet		
	Standard Bore			Standard Bore			Standard Bore		
in	A	C	D	A	C	D	A	C	D
mm	FE			FE			FE		
½	4.25	2.2	0.39	6.00	2.2	0.39	6.50	2.2	0.39
13	108	55	10	152	55	10	165	55	10
¾	4.62	2.2	0.50	7.00	2.2	0.50	7.50	2.2	0.50
19	117	55	13	178	55	13	190	55	13
1	5.00	2.8	0.69	8.00	2.8	0.69	8.50	2.8	0.69
25	127	72	18	203	72	18	216	72	18
1¼	5.50	3.2	0.91	8.50	3.2	0.91	9.00	3.2	0.91
32	140	81	23	216	81	23	229	81	23
1½	6.50	3.6	1.12	9.00	3.7	1.12	9.50	3.7	1.12
38	165	91	29	229	94	29	241	94	29
2	8.00	4.4	1.26	10.50	4.4	1.38	11.50	4.4	1.38
50	203	112	32	267	112	35	292	112	35

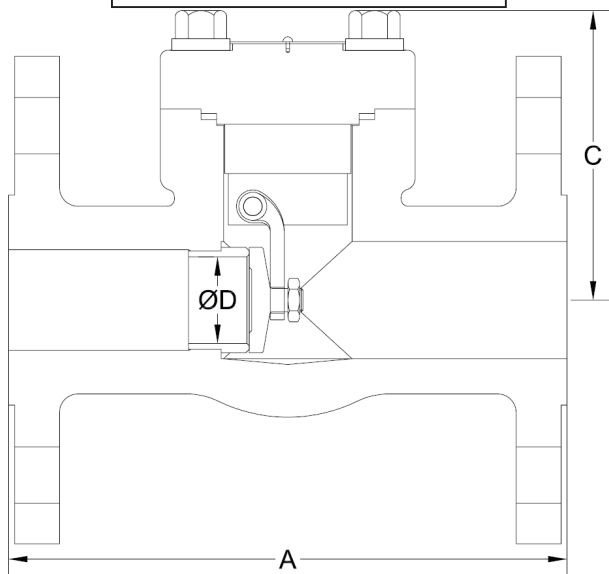
SIZE	ASME 800									
	Bolted Bonnet						Welded Bonnet			
	Standard Bore			Full Bore			Standard Bore		Full Bore	
in	A	C	D	A	C	D	A	C	A	C
mm	WE			WE			WE		WE	
¼	3.11	2.2	0.26	-	-	-	3.11	2.2	0.26	-
6	79	55	7	-	-	-	79	55	7	-
¾	3.11	2.2	0.39	-	-	-	3.11	2.2	0.39	-
10	79	55	10	-	-	-	79	55	10	-
½	3.11	2.2	0.39	3.62	2.2	0.50	3.11	2.2	0.39	3.62
13	79	55	10	92	55	13	79	55	10	92
¾	3.62	2.2	0.50	4.37	3.0	0.69	3.62	2.2	0.50	4.37
19	92	55	13	111	72	18	92	55	13	111
1	4.37	3.0	0.69	4.72	3.2	0.91	4.37	3.0	0.69	4.72
25	111	72	18	120	81	23	111	72	18	120
1¼	4.72	3.2	0.91	4.72	3.7	1.12	4.72	3.2	0.91	4.72
32	120	81	23	120	94	29	120	81	23	120
1½	4.72	3.7	1.12	5.51	4.4	1.40	4.72	3.7	1.12	5.51
38	120	94	29	140	112	36	120	94	29	140
2	5.51	4.4	1.38	6.30	5.2	1.85	5.51	4.4	1.38	6.30
50	140	112	35	160	132	47	140	112	35	160

**ADDITIONAL MATERIALS
AND CLASSES AVAILABLE
UPON REQUEST.**

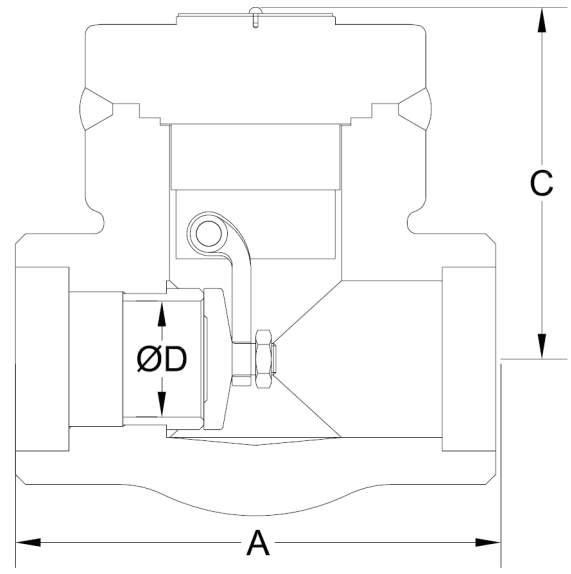
WE = Socket Weld / Threaded Ends

FE = Flanged Ends

C = Center to top



Bolted Bonnet Flanged Ends Design



Welded Bonnet Socket Weld Ends Design

SWING CHECK VALVE DIMENSIONS (CLASS 1500—2680).

SIZE	ASME 1500 & 1690												
	Bolted Bonnet							Welded Bonnet					
	Standard Bore				Full Bore			Standard Bore			Full Bore		
	in	A		C	D	A	C	D	A	C	D	A	C	D
mm	FE	WE	WE			WE			WE				
¼	-	3.11	2.9	0.26	-	-	-	3.11	2.9	0.39	-	-	-
6	-	79	73	7	-	-	-	79	65	10	-	-	-
¾	-	3.11	2.9	0.39	-	-	-	3.11	2.9	0.50	-	-	-
10	-	79	73	10	-	-	-	79	65	13	-	-	-
½	8.50	3.62	2.9	0.39	4.37	2.9	0.50	3.62	2.9	0.39	4.37	2.9	0.50
13	216	92	73	10	111	73	13	92	65	10	111	65	13
¾	9.00	4.37	2.9	0.50	4.72	3.3	0.69	4.37	2.9	0.51	4.72	3.3	0.69
19	229	111	73	13	120	84	18	111	65	13	120	77	18
1	10.00	4.72	3.3	0.69	4.72	3.8	0.91	4.72	3.3	0.69	4.72	3.8	0.91
25	254	120	84	18	120	97	23	120	77	18	120	89	23
1¼	11.00	4.72	3.8	0.91	5.51	4.5	1.12	4.72	3.8	0.91	5.51	4.5	1.12
32	279	120	97	23	140	115	29	120	89	23	140	103	29
1½	12.00	5.51	4.5	1.12	6.30	5.2	1.38	5.51	4.5	1.12	6.30	5.2	1.38
38	305	140	115	29	160	132	35	140	103	29	160	115	35
2	14.50	6.30	5.2	1.38	8.66	5.2	1.85	6.30	5.2	1.38	8.66	5.2	1.85
50	368	160	132	35	220	152	47	160	115	35	220	132	47

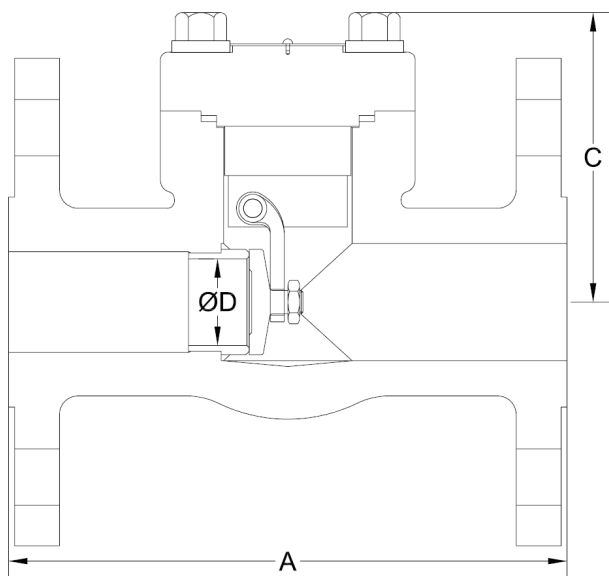
SIZE	ASME 2500 & 2680					
	Bolted Bonnet			Welded Bonnet		
	Standard Bore			Standard Bore		
	in	A	C	D	A	C	D
mm	WE	WE				
½	5.91	3.4	0.55	5.91	3.4	0.55
13	150	87	14	150	87	14
¾	5.91	3.6	0.55	5.91	3.4	0.55
19	150	92	14	150	87	14
1	6.69	4.4	0.75	6.69	3.6	0.75
25	170	113	19	170	92	19
1¼	7.87	4.4	1.10	7.87	4.4	1.10
32	200	113	28	200	113	28
1½	7.87	5.2	1.10	7.87	4.4	1.10
38	200	131	28	200	113	28
2	9.84	5.9	1.50	9.84	5.2	1.50
50	250	151	38	250	131	38

**ADDITIONAL MATERIALS
AND CLASSES AVAILABLE
UPON REQUEST.**

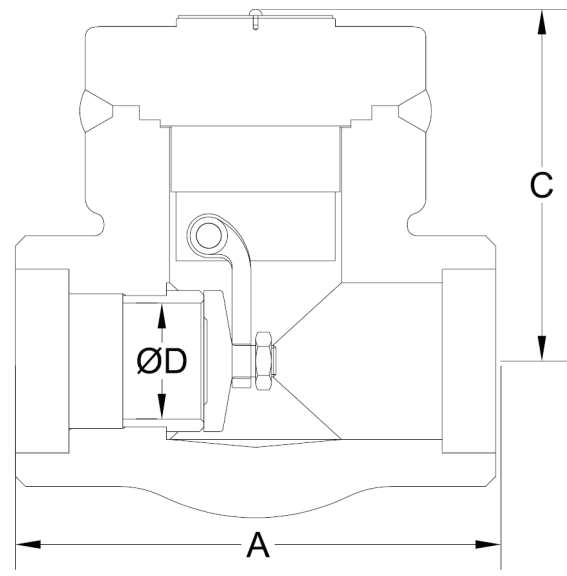
WE = Socket Weld / Threaded Ends

FE = Flanged Ends

C = Center to top open



Bolted Bonnet Flanged Ends Design



Welded Bonnet Socket Weld Ends Design

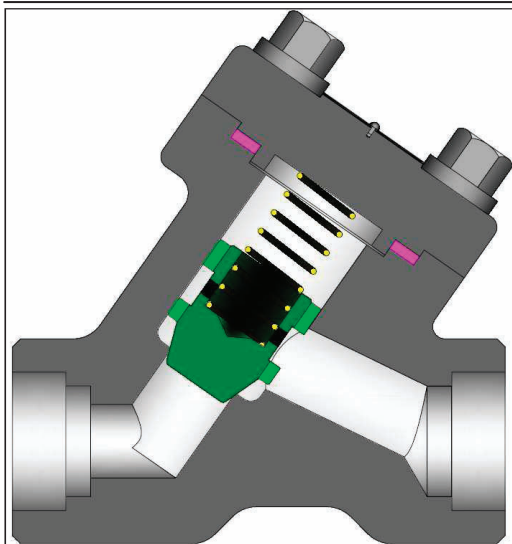
API 602 SWING CHECK VALVES
FORGED CARBON , STAINLESS STEEL OR ALLOY STEEL
¼" TO 2" (6 TO 50 mm)
ASME CLASSES 150 TO 2680

SIZE	ASME 150			ASME 300			ASME 600			ASME 800											
	Bolted Bonnet			Bolted Bonnet			Bolted Bonnet			Bolted Bonnet						Welded Bonnet					
	Standard Bore			Standard Bore			Standard Bore			Standard Bore			Full Bore			Standard Bore			Full Bore		
in	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v
mm	FE	KG		FE	KG		FE	KG		WE	KG		WE	KG		WE	KG		WE	KG	
¼	-	-	-	-	-	-	-	-	-	2.9	0.7	-	-	-	-	2.9	0.7	-	-	-	-
6	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-	1.3	-	-	-	-	-
¾	-	-	-	-	-	-	-	-	-	2.9	1.5	-	-	-	-	2.9	1.5	-	-	-	-
10	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-	1.3	-	-	-	-	-
½	7.1	1.5	-	7.7	1.5	-	7.1	1.5	-	2.6	1.5	-	3.7	2.6	-	2.6	1.5	-	3.7	2.6	-
13	3.2	-	-	3.5	-	-	3.2	-	-	1.2	-	-	1.7	-	-	1.2	-	-	1.7	-	-
¾	9.3	2.7	-	10.1	2.7	-	12.3	2.7	-	3.7	2.7	-	5.3	4.9	-	3.7	2.7	-	5.3	4.9	-
19	4.2	-	-	4.6	-	-	5.6	-	-	1.7	-	-	2.4	-	-	1.7	-	-	2.4	-	-
1	17.6	5.1	-	19.0	5.1	-	20.5	5.1	-	5.3	5.1	-	8.8	8.9	-	5.3	5.1	-	8.8	8.9	-
25	8.0	-	-	8.6	-	-	9.3	-	-	2.4	-	-	4.0	-	-	2.4	-	-	4.0	-	-
1¼	19.2	9.1	-	20.7	9.1	-	22.5	9.1	-	8.8	9.1	-	11.2	13.7	-	8.8	9.1	-	11.2	13.7	-
32	8.7	-	-	9.4	-	-	10.2	-	-	4.0	-	-	5.1	-	-	4.0	-	-	5.1	-	-
1½	26.0	14.0	-	29.8	14.0	-	34.0	14.0	-	11.2	14.0	-	19.2	21.9	-	11.2	14.0	-	19.2	21.9	-
38	11.8	-	-	13.5	-	-	15.4	-	-	5.1	-	-	8.7	-	-	5.1	-	-	8.7	-	-
2	31.1	22.4	-	38.8	22.4	-	53.6	22.4	-	19.4	22.4	-	33.7	40	-	19.4	22.4	-	33.7	40	-
50	14.1	-	-	17.6	-	-	24.3	-	-	8.8	-	-	15.3	-	-	8.8	-	-	15.3	-	-

SIZE	ASME 1500 & 1687												ASME 2500 & 2680					
	Bolted Bonnet						Welded Bonnet						Bolted Bonnet			Welded Bonnet		
	Standard Bore			Full Bore			Standard Bore			Full Bore			Standard Bore			Standard Bore		
in	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v
mm	FE	KG		WE	KG		WE	KG		WE	KG		WE	KG		WE	KG	
¼	-	-	-	4.9	0.7	-	-	-	-	4.4	0.7	-	-	-	-	-	-	-
6	-	-	-	2.2	-	-	-	-	-	2.0	-	-	-	-	-	-	-	-
¾	-	-	-	4.4	1.5	-	-	-	-	4.4	1.5	-	-	-	-	-	-	-
10	-	-	-	2.0	-	-	-	-	-	2.0	-	-	-	-	-	-	-	-
½	20.3	4.9	1.5	6.0	1.5	-	4.4	1.5	-	6.0	1.5	-	16.1	1.8	-	14.3	3.0	-
13	9.2	2.2	-	2.7	-	-	2.0	-	-	2.7	-	-	7.3	-	-	6.5	-	-
¾	24.3	6.0	2.7	9.5	2.7	-	6.0	2.7	-	9.5	2.7	-	16.1	1.9	-	14.3	3.1	-
19	11.0	2.7	-	4.3	-	-	2.7	-	-	4.3	-	-	7.3	-	-	6.5	-	-
1	31.3	9.7	5.1	13.7	5.1	-	9.7	5.1	-	13.7	5.1	-	25.4	3.2	-	23.1	6.0	-
25	14.2	4.4	-	6.2	-	-	4.4	-	-	6.2	-	-	11.5	-	-	10.5	-	-
1¼	34.8	13.9	9.1	22.5	9.1	-	13.9	9.1	-	22.5	9.1	-	41.7	4.3	-	38.6	10.5	-
32	15.8	6.3	-	10.2	-	-	6.3	-	-	10.2	-	-	18.9	-	-	17.5	-	-
1½	47.0	22.7	14.0	33.7	14.0	-	22.7	14.0	-	33.7	14.0	-	41.7	10.7	-	38.6	13.5	-
38	21.3	10.3	-	15.3	-	-	10.3	-	-	15.3	-	-	18.9	-	-	17.5	-	-
2	61.3	33.7	22.4	36.8	22.4	-	33.7	22.4	-	36.8	22.4	-	58.9	14.2	-	62.8	22.4	-
50	27.8	15.3	-	16.7	-	-	15.3	-	-	16.7	-	-	26.7	-	-	28.5	-	-

FE = Flanged Ends
WE = Socket Weld / Threaded Ends

WT = Weight
C_v = Flow Coefficient



STANDARD MATERIALS (Other materials available)

PART	MATERIALS			
Body	A105 + Stellite 6 Faced	A182 F11 + Stellite 6 Faced	A182 F22 + Stellite 6 Faced	A182 F316 (1)
Cap	A105	A182 F11	A182 F22	A182 F316
Disc/Ball	A276 T420			A276 T316
Gasket (2)	Spiral Wound SST with Graphite			Spiral Wound SST with PTFE
Spring	Inconel 625			
Body / Cap Bolting (2)	A193 Gr. B7	A193 Gr. B16		A193 Gr. B8M
Identification Plate	Series 300 SST			

Class	Bore	Fig. No.
800	Standard	YL08
	Full	YLL8
1500	Standard	YL15
	Full	YLL5
1680	Standard	YL16
2500	Standard	YL25
2690	Standard	YL26

- (1) Threaded and weld end valve bodies A182 F316L
(2) Welded bonnets also available.

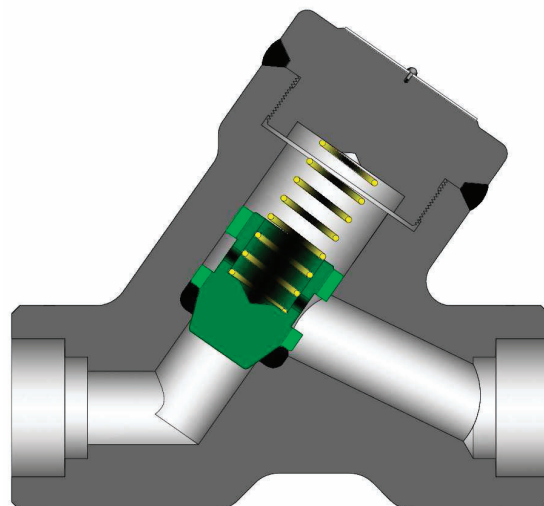
Design Specifications

Item	Applicable Specification
Wall thickness	API 602
Pressure - temperature ratings	ASME B16.34
General valve design	API 602 & B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Thread design	ASME B1.20.1
Butt Weld design	ASME B16.25
Socket Weld design	ASME B16.11
Materials	ASTM

NOTE: See page 43 for flow, safety and maintenance information.

DESIGN FEATURES:

- **Standard trim** is stellite faced seat integral to the body and 13% chrome disc (API trim 8). Other trims available on request.
- **Seat faces** lapped for smooth finish and superior sealing.
- **Wall thickness** per heavy wall API 602 requirements.
- **Each** valve is shell and seat pressure tested per industry standard API 598.
- **Check** valve are suitable for service in horizontal line with cap vertical or in a vertical line with flow upward.
- **End Flanges** have the following raised faces per ASME B16.5:
Classes 150-300: 1/16" (2mm).
Classes 600: 1/4" (7mm).
- **Y-Pattern** features reduced flow restrictions compared to the upright design.
- **Other** available options as follows:
-Alternate valve materials such as chrome and stainless steel alloys.
-Alternate trim materials.
-NACE service.
-Special cleaning for applications such as oxygen or chlorine.
-Other options available as specified.



Welded Bonnet Design

Y-PATTERN PISTON CHECK VALVE DIMENSIONS (CLASS 800—2680).

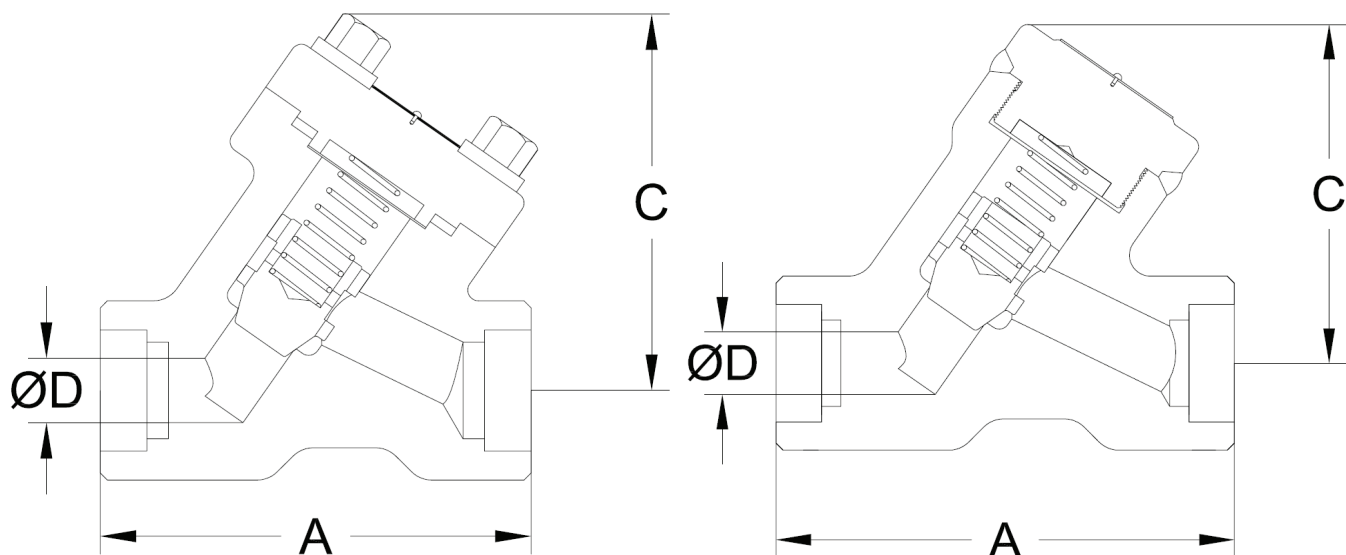
SIZE	ASME 800					
	Bolted Bonnet			Welded Bonnet		
	Standard Bore			Standard Bore		
in	A	C	D	A	C	D
mm	WE			WE		
½	4.17	3.5	0.39	4.17	3.0	0.39
13	106	88	10	106	77	10
¾	4.17	3.5	0.50	4.17	3.0	0.50
19	106	88	13	106	77	13
1	4.72	4.0	0.69	4.72	3.5	0.69
25	120	101	18	120	88	18
1¼	5.98	4.9	0.91	5.98	4.3	0.91
32	152	124	23	152	108	23
1½	5.98	4.9	1.12	5.98	4.3	1.12
38	152	124	29	152	108	29
2	7.09	5.9	1.38	7.09	4.9	1.38
50	180	142	35	180	124	35

SIZE	ASME 1500 & 1690						ASME 2500 & 2680		
	Bolted Bonnet			Welded Bonnet			Welded Bonnet		
	Standard Bore			Standard Bore			Standard Bore		
in	A	C	D	A	C	D	A	C	D
mm	WE			WE			WE		
½	4.72	4.1	0.39	4.72	3.5	0.39	5.98	4.4	0.43
13	120	103	10	120	88	10	152	111	11
¾	4.72	4.1	0.50	4.72	3.5	0.50	5.98	4.4	0.55
19	120	103	13	120	88	13	152	111	14
1	5.98	5.0	0.69	5.98	4.3	0.69	7.09	5.0	0.75
25	152	126	18	152	108	18	180	128	19
1¼	5.98	5.7	0.91	5.98	4.3	0.91	7.87	5.7	0.98
32	152	146	23	152	108	23	200	145	25
1½	7.09	5.7	1.12	7.09	4.9	1.12	7.87	5.7	1.10
38	180	146	29	180	124	29	200	145	28
2	7.87	6.6	1.38	7.87	5.7	1.38	9.06	6.3	1.38
50	200	168	35	200	144	35	230	160	35

WE = Socket Weld / Threaded Ends

C = Center to top open

**ADDITIONAL MATERIALS AND CLASSES
AVAILABLE UPON REQUEST.**



API 602 Y-PATTERN PISTON CHECK VALVES
FORGED CARBON , STAINLESS STEEL OR ALLOY STEEL
¼" TO 2" (6 TO 50 mm)
ASME CLASSES 800 TO 2680

SIZE	ASME 800					
	Bolted Bonnet			Welded Bonnet		
	Standard Bore			Standard Bore		
in	WT	LB	C _v	WT	LB	C _v
mm	WE	KG		WE	KG	
½	3.1		1.5	2.6		1.5
13	1.4			1.2		
¾	4.2		2.7	2.6		2.7
19	1.9			1.2		
1	5.7		5.1	4.4		5.1
25	2.6			2.0		
1¼	9.3		9.1	7.3		9.1
32	4.2			3.3		
1½	11.7		14.0	11.0		14.0
38	5.3			5.0		
2	19.8		22.4	15.4		22.4
50	9.0			7.0		

SIZE	ASME 1500 & 1687						ASME 2500 & 2680		
	Bolted Bonnet			Welded Bonnet			Welded Bonnet		
	Standard Bore			Standard Bore			Standard Bore		
in	WT	LB	C _v	WT	LB	C _v	WT	LB	C _v
mm	WE	KG		WE	KG		WE	KG	
½	5.7		1.5	4.4		1.5	7.7		3.0
13	2.6			2.0			3.5		
¾	5.7		2.7	4.4		2.7	7.7		3.1
19	2.6			2.0			3.5		
1	9.3		5.1	7.3		5.1	13.7		6.0
25	4.2			3.3			6.2		
1¼	11.7		9.1	9.3		9.1	22.9		10.5
32	5.3			4.2			10.4		
1½	19.8		14.0	15.4		14.0	22.9		13.5
38	9.0			7.0			10.4		
2	25.4		22.4	20.9		22.4	32.2		22.4
50	11.5			9.5			14.6		

WE = Socket Weld / Threaded Ends

WT = Weight

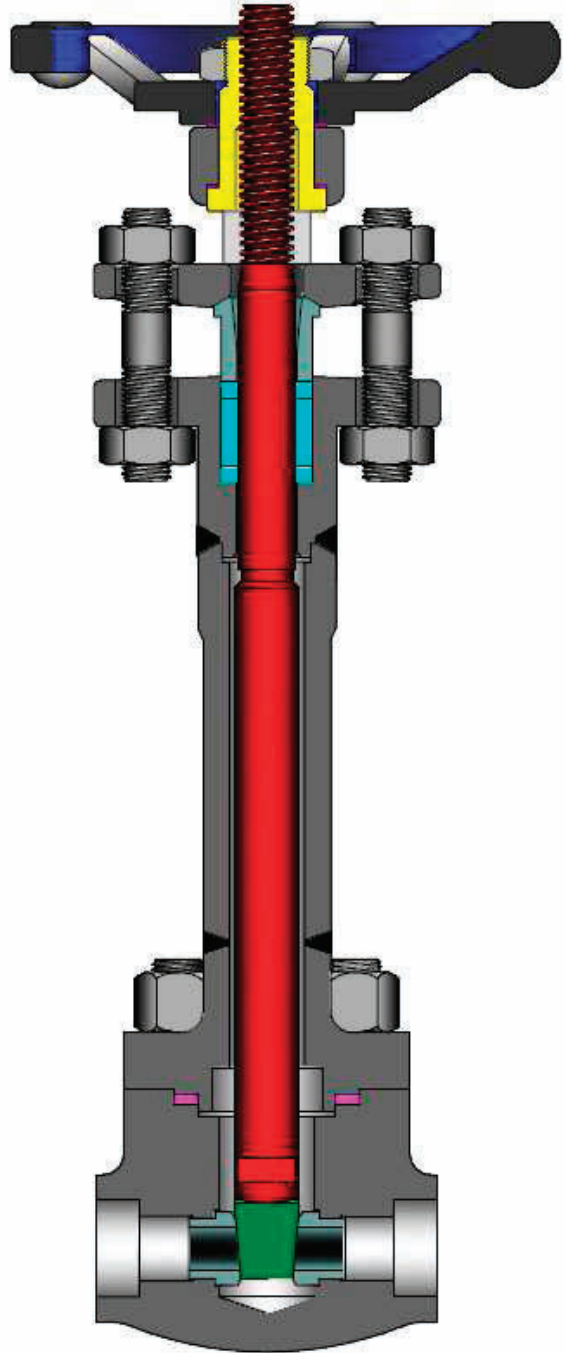
C_v = Flow Coefficient

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.

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 bonnet chamber ventilation in order to prevent excess pressure build up caused by trapped cryogenic liquids.



Cryogenic Forged Gate Valve

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

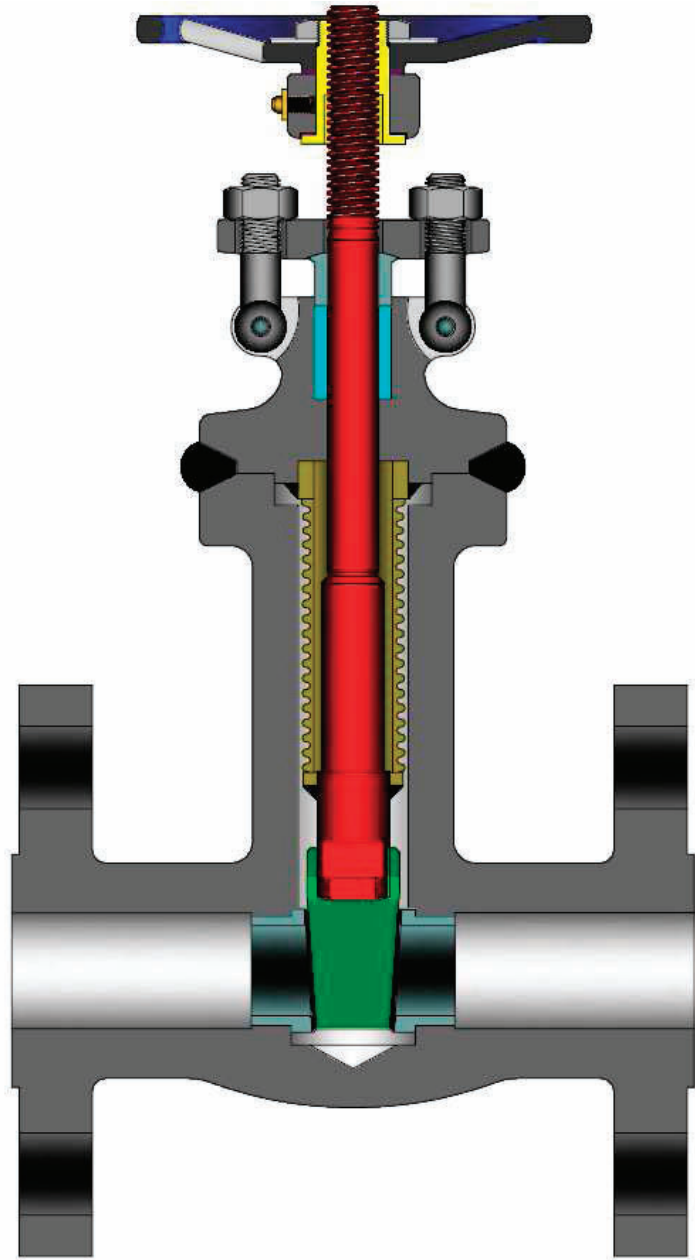
For more information, see Powell's Cryogenic catalog.

FORGED BELLOSEAL VALVES

When sensitive services call for the best in leakage prevention, Powell Belloseal valves are the perfect answer. Whether it is preventing the exposure of harmful toxic fluids, maintaining high vacuums, or preventing the loss of high cost fluids, Powell Belloseal products are the ultimate valves in total fluid containment and durability. Bellows of the formed convolute type are closely secured to the bonnet and seal welded to the stem, creating a firm seal between the two while still allowing the opening and closing of the stem.

Features:

- ⇒ Bellows are designed to same pressure/temperature ranges of the valves they inhabit.
- ⇒ In addition to the primary bellows seal, Powell Belloseal valves maintain a secondary packing seal. This additional seal allows safe operation of the valve in the event of a bellows failure until the bellows can be replaced.
- ⇒ All Powell Belloseals are built in accordance of MSS SP-117 and API 602 specifications.



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

For more information, see Powell's Belloseal brochure.

VALVE STANDARDS AND RELATED INFORMATION

31

VALVE PRESSURE/TEMPERATURE RATINGS

32-37

CHEMICAL AND PHYSICAL PROPERTIES

38

TRIM DESCRIPTIONS

39

SOCKET WELD END DIMENSIONS

40

FLANGE DIMENSIONS

41-42

FLOW DESIGN AND MAINTENANCE RECOMMENDATIONS

43

CONVERSION DATA AND EQUIVALENTS

44-45

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

VALVE STANDARDS AND RELATED INFORMATION

1. Steel and Corrosion Resistant Designs

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

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

- (B) API Standard 602 → Steel Gate, Globe, and Check Valves for Sizes NPS 4 (DN 100) and Smaller for the Petroleum and Natural Gas Industries

This is the basic standard for forged valves NPS 4 and under. It also defines the pressure/temperature ratings for the intermediate class 800.

- (C) API Standard 598 → Valve Inspection and Testing

This standard is referenced by both ASME B16.34 and API 602 and contains minimum inspection and pressure test requirements.

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

- (F) ASME B16.11 → Forged Fittings, Socket Welding and Threaded

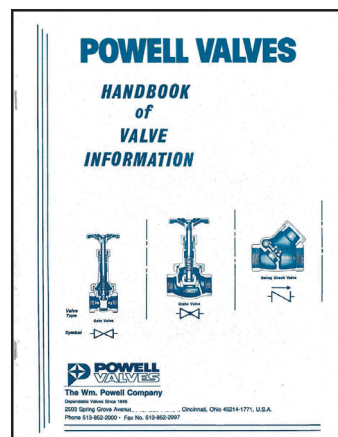
- (G) MSS SP-25 → Standard Marking System for Valves, Fittings, Flanges and Unions

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

2. Powell Publications and Miscellaneous Information

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

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



PRESSURE/TEMPERATURE RATINGS

TABLE 1

**ASTM A105
ASTM A350 LF2**

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

Working Pressures by Classes, psig							
Temperature, °F	150	300	600	800	1500	2500	4500
-20 to 100	285	740	1,480	1,975	3,705	6,170	11,110
200	260	680	1,360	1,810	3,395	5,655	10,185
300	230	655	1,310	1,745	3,270	5,450	9,815
400	200	635	1,265	1,690	3,170	5,280	9,505
500	170	605	1,205	1,610	3,015	5,025	9,040
600	140	570	1,135	1,515	2,840	4,730	8,515
650	125	550	1,100	1,465	2,745	4,575	8,240
700	110	530	1,060	1,415	2,665	4,425	7,960
750	95	505	1,015	1,350	2,535	4,230	7,610
800	80	410	825	1,100	2,055	3,430	6,170

TABLE 2

ASTM A182 F11

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

Working Pressures by Classes, psig							
Temperature, °F	150	300	600	800	1500	2500	4500
-20 to 100	290	750	1,500	2,000	3,750	6,250	11,250
200	260	750	1,500	2,000	3,750	6,250	11,250
300	230	720	1,445	1,925	3,610	6,015	10,830
400	200	695	1,385	1,850	3,465	5,775	10,400
500	170	665	1,330	1,775	3,325	5,540	9,965
600	140	605	1,210	1,615	3,025	5,040	9,070
650	125	590	1,175	1,570	2,940	4,905	8,825
700	110	570	1,135	1,515	2,840	4,730	8,515
750	95	530	1,065	1,420	2,660	4,430	7,970
800	80	510	1,015	1,355	2,540	4,230	7,610
850	65	485	975	1,300	2,435	4,060	7,305
900	50	450	900	1,200	2,245	3,745	6,740
950	35	320	640	850	1,595	2,655	4,785
1000	20	215	430	575	1,080	1,800	3,240
1050	20(1)	145	290	385	720	1,200	2,160
1100	20(1)	95	190	255	480	800	1,440

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

PRESSURE/TEMPERATURE RATINGS

TABLE 3

ASTM A182 F22

Not to be used over 1100° F.

Working Pressures by Classes, psig							
Temperature, °F	150	300	600	800	1500	2500	4500
-20 to 100	290	750	1,500	2,000	3,750	6,250	11,250
200	260	750	1,500	2,000	3,750	6,250	11,250
300	230	730	1,455	1,940	3,640	6,070	10,925
400	200	705	1,410	1,880	3,530	5,880	10,585
500	170	665	1,330	1,775	3,325	5,540	9,965
600	140	605	1,210	1,615	3,025	5,040	9,070
650	125	590	1,175	1,570	2,940	4,905	8,825
700	110	570	1,135	1,515	2,840	4,730	8,515
750	95	530	1,065	1,420	2,660	4,430	7,970
800	80	510	1,015	1,355	2,540	4,230	7,610
850	65	485	975	1,300	2,435	4,060	7,305
900	50	450	900	1,200	2,245	3,745	6,740
950	35	385	755	1,025	1,930	3,220	5,795
1000	20	265	535	710	1,335	2,230	4,010
1050	20(1)	175	350	465	875	1,455	2,625
1100	20(1)	110	220	295	550	915	1,645

TABLE 4

ASTM A182 F5

Working Pressures by Classes, psig							
Temperature °F	150	300	600	800	1500	2500	4500
-20 to 100	290	750	1,500	2,000	3,750	6,250	11,250
200	260	735	1,470	1,965	3,680	6,135	11,040
300	230	700	1,400	1,865	3,495	5,830	10,490
400	200	670	1,335	1,780	3,345	5,570	10,030
500	170	645	1,290	1,725	3,230	5,385	9,690
600	140	605	1,210	1,615	3,025	5,040	9,070
650	125	590	1,175	1,570	2,940	4,905	8,825
700	110	570	1,135	1,515	2,840	4,730	8,515
750	95	530	1,065	1,420	2,660	4,430	7,970
800	80	510	1,015	1,355	2,540	4,230	7,610
850	65	485	975	1,300	2,435	4,060	7,305
900	50	375	745	995	1,870	3,115	5,605
950	35	275	550	735	1,370	2,285	4,115
1000	20	200	400	530	995	1,655	2,985
1050	20(1)	145	290	385	720	1,200	2,160
1100	20(1)	95	190	255	480	800	1,440
1150	20(1)	60	125	165	310	515	925
1200	15(1)	35	70	95	170	285	515

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

PRESSURE/TEMPERATURE RATINGS

TABLE 5

ASTM A182 F9

Working Pressures by Classes, psig							
Temperature °F	150	300	600	800	1500	2500	4500
-20 to 100	290	750	1,500	2,000	3,750	6,250	11,250
200	260	750	1,500	2,000	3,750	6,250	11,250
300	230	730	1,455	1,940	3,640	6,070	10,925
400	200	705	1,410	1,880	3,530	5,880	10,585
500	170	665	1,330	1,775	3,325	5,540	9,965
600	140	605	1,210	1,615	3,025	5,040	9,070
650	125	590	1,175	1,570	2,940	4,905	8,825
700	110	570	1,135	1,515	2,840	4,730	8,515
750	95	530	1,065	1,420	2,660	4,430	7,970
800	80	510	1,015	1,355	2,540	4,230	7,610
850	65	485	975	1,300	2,435	4,060	7,305
900	50	450	900	1,200	2,245	3,745	6,740
950	35	375	755	1,005	1,885	3,145	5,655
1000	20	255	505	675	1,270	2,115	3,805
1050	20(1)	170	345	460	855	1,430	2,570
1100	20(1)	115	225	300	565	945	1,695
1150	20(1)	75	150	200	375	630	1,130
1200	20(1)	50	105	140	255	430	770

TABLE 6

ASTM A182 F91

Working Pressures by Classes, psig							
Temperature °F	150	300	600	800	1500	2500	4500
-20 to 100	290	750	1,500	2,000	3,750	6,250	11,250
200	260	750	1,500	2,000	3,750	6,250	11,250
300	230	730	1,455	1,945	3,640	6,070	10,925
400	200	705	1,410	1,880	3,530	5,880	10,585
500	170	665	1,330	1,775	3,325	5,540	9,965
600	140	605	1,210	1,615	3,025	5,040	9,070
650	125	590	1,175	1,570	2,940	4,905	8,825
700	110	570	1,135	1,515	2,840	4,730	8,515
750	95	530	1,065	1,420	2,660	4,430	7,970
800	80	510	1,015	1,355	2,540	4,230	7,610
850	65	485	975	1,300	2,435	4,060	7,305
900	50	450	900	1,200	2,245	3,745	6,740
950	35	385	775	1,035	1,930	3,220	5,795
1000	20	365	725	970	1,820	3,030	5,450
1050	20(1)	360	720	960	1,800	3,000	5,400
1100	20(1)	300	605	805	1,510	2,515	4,525
1150	20(1)	225	445	595	1,115	1,855	3,345
1200	20(1)	145	290	385	720	1,200	2,160

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

PRESSURE/TEMPERATURE RATINGS

TABLE 7

ASTM A182 F316

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.

Working Pressures by Classes, psig							
Temperature, °F	150	300	600	800	1500	2500	4500
-20 to 100	275	720	1,440	1,920	3,600	6,000	10,800
200	235	620	1,240	1,655	3,095	5,160	9,290
300	215	560	1,120	1,495	2,795	4,660	8,390
400	195	515	1,025	1,370	2,570	4,280	7,705
500	170	480	955	1,275	2,390	3,980	7,165
600	140	450	900	1,205	2,255	3,760	6,770
650	125	440	885	1,180	2,210	3,680	6,625
700	110	435	870	1,160	2,170	3,620	6,515
750	95	425	855	1,140	2,135	3,560	6,410
800	80	420	845	1,125	2,110	3,520	6,335
850	65	420	835	1,115	2,090	3,480	6,265
900	50	415	830	1,105	2,075	3,460	6,230
950	35	385	775	1,030	1,930	3,220	5,795
1000	20	365	725	970	1,820	3,030	5,450
1050	20(1)	360	720	960	1,800	3,000	5,400
1100	20(1)	305	610	815	1,525	2,545	4,575
1150	20(1)	235	475	630	1,185	1,970	3,550
1200	20(1)	185	370	495	925	1,545	2,775
1250	20(1)	145	295	390	735	1,230	2,210
1300	20(1)	115	235	310	585	970	1,750
1350	20(1)	95	190	255	480	800	1,440
1400	20(1)	75	150	200	380	630	1,130
1450	20(1)	60	115	155	290	485	875
1500	15(1)	40	85	110	205	345	620

TABLE 8

ASTM A182 F304

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.

Working Pressures by Classes, psig							
Temperature, °F	150	300	600	800	1500	2500	4500
-20 to 100	275	720	1,440	1,920	3,600	6,000	10,800
200	230	600	1,200	1,600	3,000	5,000	9,000
300	205	540	1,075	1,435	2,690	4,480	8,065
400	190	495	995	1,325	2,485	4,140	7,450
500	170	465	930	1,240	2,330	3,880	6,985
600	140	440	885	1,180	2,210	3,680	6,625
650	125	430	865	1,150	2,160	3,600	6,480
700	110	420	845	1,125	2,110	3,520	6,335
750	95	415	825	1,100	2,065	3,440	6,190
800	80	405	810	1,080	2,030	3,380	6,085
850	65	395	790	1,055	1,980	3,300	5,940
900	50	390	780	1,035	1,945	3,240	5,830
950	35	380	765	1,020	1,910	3,180	5,725
1000	20	355	710	945	1,770	2,950	5,315
1050	20(1)	325	650	865	1,630	2,715	4,885
1100	20(1)	255	515	685	1,285	2,145	3,855
1150	20(1)	205	410	545	1,030	1,715	3,085
1200	20(1)	165	330	440	825	1,370	2,470
1250	20(1)	135	265	355	670	1,115	2,005
1300	20(1)	115	225	300	565	945	1,695
1350	20(1)	95	185	250	465	770	1,390
1400	20(1)	75	150	200	380	630	1,130
1450	20(1)	60	115	155	290	485	875
1500	15(1)	40	85	110	205	345	620

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

PRESSURE/TEMPERATURE RATINGS

TABLE 9

**ASTM A182 F316L
ASTM A182 F304L (a)**

(a) Not to be used over 800° F.

Working Pressures by Classes, psig							
Temperature, °F	150	300	600	800	1500	2500	4500
-20 to 100	230	600	1,200	1,600	3,000	5,000	9,000
200	195	510	1,020	1,365	2,555	4,260	7,670
300	175	455	910	1,215	2,280	3,800	6,840
400	160	420	840	1,120	2,100	3,500	6,300
500	150	395	785	1,050	1,970	3,280	5,905
600	140	370	745	990	1,860	3,100	5,580
650	125	365	730	975	1,825	3,040	5,470
700	110	360	720	960	1,800	3,000	5,400
750	110	355	705	940	1,765	2,940	5,290
800	80	345	690	920	1,730	2,880	5,185
850	65	340	675	900	1,690	2,820	5,075

TABLE 10

ASTM A182 F321

Not to be used over 1000° F.

Working Pressures by Classes, psig							
Temperature, °F	150	300	600	800	1500	2500	4500
-20 to 100	275	720	1,440	1,920	3,600	6,000	10,800
200	250	650	1,295	1,730	3,240	5,400	9,720
300	230	595	1,190	1,585	2,975	4,960	8,930
400	200	550	1,105	1,470	2,760	4,600	8,280
500	170	515	1,030	1,375	2,580	4,300	7,740
600	140	485	975	1,300	2,435	4,060	7,310
650	125	475	950	1,265	2,375	3,960	7,130
700	110	465	930	1,240	2,330	3,880	6,985
750	95	460	915	1,220	2,290	3,820	6,875
800	80	450	900	1,205	2,255	3,760	6,770
850	65	445	895	1,190	2,230	3,720	6,695
900	50	440	885	1,180	2,210	3,680	6,625
950	35	385	775	1,030	1,930	3,220	5,795
1000	20	365	725	970	1,820	3,030	5,450

PRESSURE/TEMPERATURE RATINGS

TABLE 11

ASTM A182 F347

Not to be used over 1000° F.

Working Pressures by Classes, psig

Temperature, °F	150	300	600	800	1500	2500	4500
-20 to 100	275	720	1,440	1,920	3,600	6,000	10,800
200	255	660	1,325	1,765	3,310	5,520	9,935
300	230	615	1,235	1,645	3,085	5,140	9,250
400	200	575	1,150	1,535	2,880	4,800	8,640
500	170	540	1,085	1,445	2,710	4,520	8,135
600	140	515	1,030	1,375	2,580	4,300	7,740
650	125	505	1,015	1,350	2,530	4,220	7,595
700	110	495	995	1,325	2,485	4,140	7,450
750	95	490	985	1,310	2,460	4,100	7,380
800	80	485	975	1,300	2,435	4,060	7,310
850	65	485	970	1,295	2,425	4,040	7,270
900	50	450	900	1,200	2,245	3,745	6,740
950	35	385	775	1,030	1,930	3,220	5,795
1000	20	365	725	970	1,820	3,030	5,450

CHEMICAL AND PHYSICAL PROPERTIES
CAST CARBON AND ALLOY STEELS

TABLE 12

ASTM STANDARD GRADE		A105 ***	A182 F11 Cl. 2	A182 F22 Cl. 3	A182 F5	A182 F9	A182 F91**	A182 F316L	A182 F316	A182 F304L	A182 F304	A182 F321	A182 F347
CARBON (C)	(Min)	-	0.10	0.05	-	-	0.08	-	-	-	-	-	-
	(Max)	0.35	0.20	0.15	0.15	0.15	0.12	0.030	0.08	0.030	0.08	0.08	0.08
MANGANESE (Mn)	(Min)	0.60	0.30	0.30	0.30	0.30	0.30	-	-	-	-	-	-
	(Max)	1.05	0.80	0.60	0.60	0.60	0.60	2.00	2.00	2.00	2.00	2.00	2.00
PHOSPHORUS (P)	(Min)	-	-	-	-	-	-	-	-	-	-	-	-
	(Max)	0.035	0.040	0.040	0.030	0.030	0.020	0.045	0.045	0.045	0.045	0.045	0.045
SULFUR (S)	(Min)	-	-	-	-	-	-	-	-	-	-	-	-
	(Max)	0.040	0.040	0.040	0.030	0.030	0.010	0.030	0.030	0.030	0.030	0.030	0.030
SILICON (Si)	(Min)	0.10	0.50	-	-	0.50	0.20	-	-	-	-	-	-
	(Max)	0.35	1.00	0.50	0.50	1.00	0.50	1.00	1.00	1.00	1.00	1.00	1.00
COPPER (Cu)	(Min)	-	-	-	-	-	-	-	-	-	-	-	-
	(Max)	0.40*	-	-	-	-	-	-	-	-	-	-	-
NICKEL (Ni)	(Min)	-	-	-	-	-	-	10.0	10.0	8.0	8.0	9.0	9.0
	(Max)	0.40*	-	-	0.5	-	0.40	15.0	14.0	13.0	11.0	12.0	13.0
CHROMIUM (Cr)	(Min)	-	1.00	2.00	4.0	8.0	8.0	16.0	16.0	18.0	18.0	17.0	17.0
	(Max)	0.30*@	1.50	2.50	6.0	10.0	9.5	18.0	18.0	20.0	20.0	19.0	20.0
MOLYBDENUM (Mo)	(Min)	-	0.44	0.87	0.44	0.90	0.85	2.00	2.00	-	-	-	-
	(Max)	0.12*@	0.65	1.13	0.65	1.10	1.05	3.00	3.00	-	-	-	-
VANADIUM (V)	(Min)	-	-	-	-	-	0.18	-	-	-	-	-	-
	(Max)	0.08*	-	-	-	-	0.25	-	-	-	-	-	-
TITANIUM (Ti)	(Min)	-	-	-	-	-	-	-	-	-	-	\$	-
	(Max)	-	-	-	-	-	0.01	-	-	-	-	0.70	-
NITROGEN (N)	(Min)	-	-	-	-	-	0.03	-	-	-	-	-	-
	(Max)	-	-	-	-	-	0.07	0.10	0.10	0.10	0.10	-	-
COLUMBIUM (Cb)	(Min)	-	-	-	-	-	0.06	-	-	-	-	-	#
	(Max)	-	-	-	-	-	0.10	-	-	-	-	-	1.10
TENSILE STRENGTH	(Min)	70 Ksi	70 Ksi	75 Ksi	70 Ksi	85 Ksi	90 Ksi	70 Ksi	75 Ksi	70 Ksi	75 Ksi	75 Ksi	75 Ksi
YIELD STRENGTH	(Min)	36 Ksi	40 Ksi	45 Ksi	40 Ksi	55 Ksi	60 Ksi	25 Ksi	30 Ksi	25 Ksi	30 Ksi	30 Ksi	30 Ksi
ELONGATION	(Min)	30%	20%	20%	20%	20%	20%	30%	30%	30%	30%	30%	30%
REDUCTION OF AREA	(Min)	30%	30%	30%	35%	40%	40%	50%	50%	50%	50%	50%	50%
TEMPERATURE	(Min)+	-20F	-20F	-20F	-20F	-20F	-20F	-425F	-425F	-425F	-425F	-425F	-425F
	(Max)	800F	1100F	1100F	1200F	1200F	1200F	850F	1500F [‡]	850F	1500F [‡]	1000F	1000F

* RESIDUAL ELEMENTS-Maximum total must not exceed 1.00%.

** ALUMINUM is 0.02% max and ZIRCONIUM is 0.01% max.

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

+ For temperatures 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.

@ The sum of CHROMIUM and MOLYBDENUM shall not exceed 0.32%.

\$ TITANIUM content shall not be less than five times the CARBON content.

COLUMBIUM content shall not be less than ten times the CARBON content.

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

NOTE: Chemical Compositions Are In Units Of Percent.

TRIM DESCRIPTIONS

TABLE 13

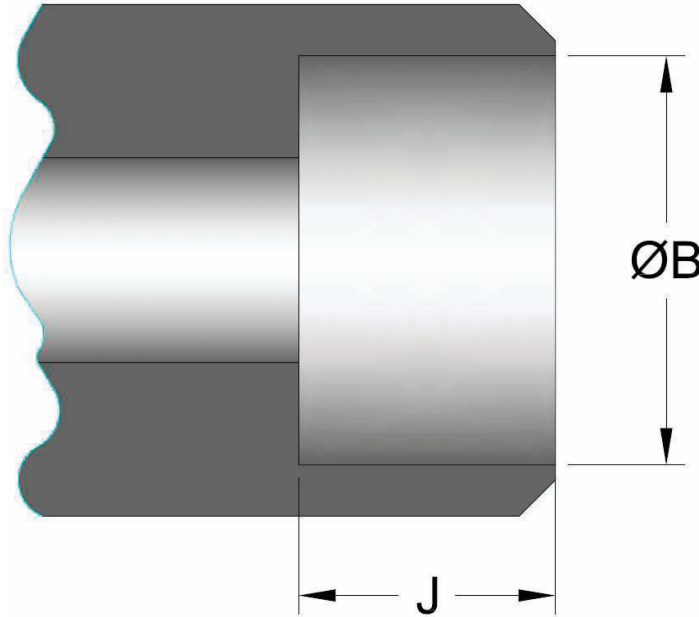
API Trim No.	Powell Trim Designation	Seat Nominal Designation	Seat Nominal Composition	Nominal Hardness (HB)	Typical Stem/Backseat Material
1	1	F6	13 Cr	250 min (a)	TYPE 410 or 420 (13Cr)
2	E	304	18Cr-8Ni	-	TYPE 304(18Cr-8Ni)
5	5	Hardfaced	Co-CrA (b)	350	TYPE 410 or 420 (13 Cr)
8	8	F6 and	13 Cr.	250	TYPE 410 or 420 (13 Cr)
		Hardfaced	Co-CrA (b)	350	
9	9	Monel	Ni-Cu Alloy	-	Monel (Ni-Cu)
10	0	316	18Cr-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)	350	
Integral Full HF	B	Hardfaced	Co-CrA (b)	350	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 TM or equal.

SOCKET WELD END DIMENSIONS

TABLE 14



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)
		Min			Min	
¼	0.575	0.38	0.38	14.6	9.5	9.5
	0.555			14.2		
⅜	0.710	0.38	0.38	18.0	9.5	9.5
	0.690			17.6		
½	0.875	0.38	0.38	22.2	9.5	9.5
	0.855			21.8		
¾	1.085	0.50	0.50	27.6	12.5	12.5
	1.065			27.2		
1	1.350	0.50	0.50	34.3	12.5	12.5
	1.330			33.9		
1¼	1.695	0.50	0.50	43.1	12.5	12.5
	1.675			42.7		
1½	1.935	0.50	0.50	49.2	12.5	12.5
	1.915			48.8		
2	2.426	0.62	0.62	61.7	16.0	16.0
	2.406			61.2		

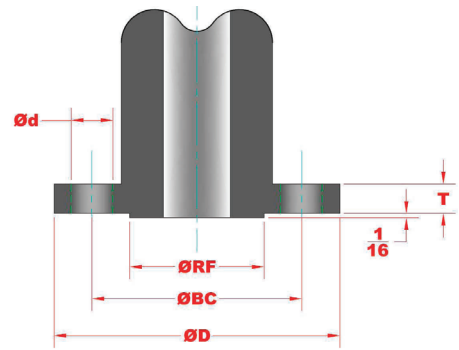
NOTE: Powell reserves the right to convert threaded ends to socket weld, which may result in thread remnants as pipe stop.

STEEL VALVE FLANGE DIMENSIONS

All Dimensions in Units of Inches

TABLE 15

Classes 150 and 300 valves use flanged fitting dimensions.
Information taken from ASME B16.5.



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)
$\frac{1}{2}$	3.50	2.38	0.62	4	0.31	1.38
$\frac{3}{4}$	3.88	2.75	0.62	4	0.34	1.69
1	4.25	3.12	0.62	4	0.38	2.00
1 $\frac{1}{4}$	4.62	3.50	0.62	4	0.44	2.50
1 $\frac{1}{2}$	5.00	3.88	0.62	4	0.50	2.88
2	6.00	4.75	0.75	4	0.56	3.62

CLASS 300

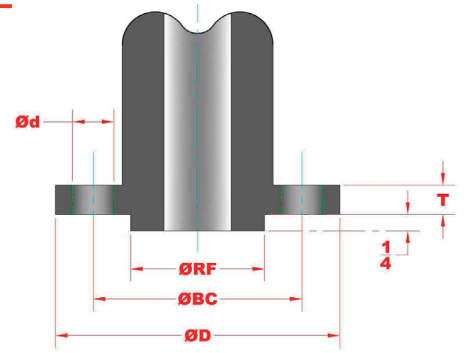
Nominal Pipe Size	Outside Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Thickness (T)	Raised Face Diameter (RF)
$\frac{1}{2}$	3.75	2.62	0.62	4	0.50	1.38
$\frac{3}{4}$	4.62	3.25	0.75	4	0.56	1.69
1	4.88	3.50	0.75	4	0.62	2.00
1 $\frac{1}{4}$	5.25	3.88	0.75	4	0.69	2.50
1 $\frac{1}{2}$	6.12	4.50	0.88	4	0.75	2.88
2	6.50	5.00	0.75	8	0.81	3.62

STEEL VALVE FLANGE DIMENSIONS

All Dimensions in Units of Inches

TABLE 16

Classes 600 and higher valves use flange dimensions.
Information taken from ASME B16.5.



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)
$\frac{1}{2}$	3.75	2.62	0.62	4	0.56	1.38
$\frac{3}{4}$	4.62	3.25	0.75	4	0.62	1.69
1	4.88	3.50	0.75	4	0.69	2.00
1 $\frac{1}{4}$	5.25	3.88	0.75	4	0.81	2.50
1 $\frac{1}{2}$	6.12	4.50	0.88	4	0.88	2.88
2	6.50	5.00	0.75	8	1.00	3.62

CLASS 1500

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)
$\frac{1}{2}$	4.75	3.25	0.88	4	0.88	1.38
$\frac{3}{4}$	5.12	3.50	0.88	4	1.00	1.69
1	5.88	4.00	1.00	4	1.12	2.00
1 $\frac{1}{4}$	6.25	4.38	1.00	4	1.12	2.50
1 $\frac{1}{2}$	7.00	4.88	1.12	4	1.25	2.88
2	8.50	6.50	1.00	8	1.50	3.62

FLOW DESIGN AND MAINTENANCE RECOMMENDATIONS

- (1) SWING CHECK VALVES- Minimum $\frac{1}{2}$ 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 seat test allowable limit.
- (5) RECOMMENDED MAXIMUM FLOW VELOCITIES (APPROXIMATE):

<u>VALVE SIZE</u>	<u>WATER</u> (FT/MIN)	<u>SATURATED STEAM</u> (FT/MIN)	<u>SUPERHEATED STEAM</u> (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 services 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 30.**

COMPARISON CHART OF VALVE SIZE/NOMINAL PIPE SIZE

TABLE 17

<u>METRIC NOMINAL SIZE</u> (DN)	<u>ENGLISH NOMINAL SIZE</u> (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 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

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 States 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.

The logo for Powell Valves features the word "POWELL" in a bold, solid blue, sans-serif font. Below it, the word "VALVES" is written in a blue outline font of the same style. A thick, solid blue horizontal line is positioned directly beneath the word "VALVES".

Established 1846



POWELL VALVES

2503 SPRING GROVE AVENUE, CINCINNATI, OHIO 45214-1771, U.S.A.

PHONE 513.852.2000 • FAX NO. 513.852.2997

www.powellvalves.com

The background of the entire page is a light green technical drawing of various industrial valves and piping components. The drawing is detailed, showing cross-sections and external views of valves, flanges, and pipe fittings. The lines are thin and black, creating a complex pattern of mechanical parts.

POWELL **VALVES**

STAINLESS AND ALLOY STEEL VALVES

GATE, GLOBE AND CHECK VALVES

API 603 / ASME CLASS 150 TO 2500 / 1" TO 60"

Table of Contents

<u>SUBJECT</u>	<u>PAGE</u>
THE WM. POWELL COMPANY—PROFILE	2-3
POWELL’S STANDARD MATERIAL INSPECTION FLOW	4
HOW TO ORDER	5
FUGITIVE EMISSIONS	6
GATE VALVES	7-12
GLOBE VALVES	13-18
SWING CHECK VALVES	19-24
CRYOGENIC VALVES	25
ACCESSORIES	26-29
ENGINEERING DATA	30-53
TERMS OF SERVICE	54-56

The Wm. Powell Company - Profile

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

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

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

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

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

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

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

Powell's end user customers have to react quickly to the demands that are on them to expand their businesses by implementing increased capacity and introducing new products into the market place at low costs and fast turn around times. Powell has addressed our customer's needs by increasing finished product inventory to over \$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,

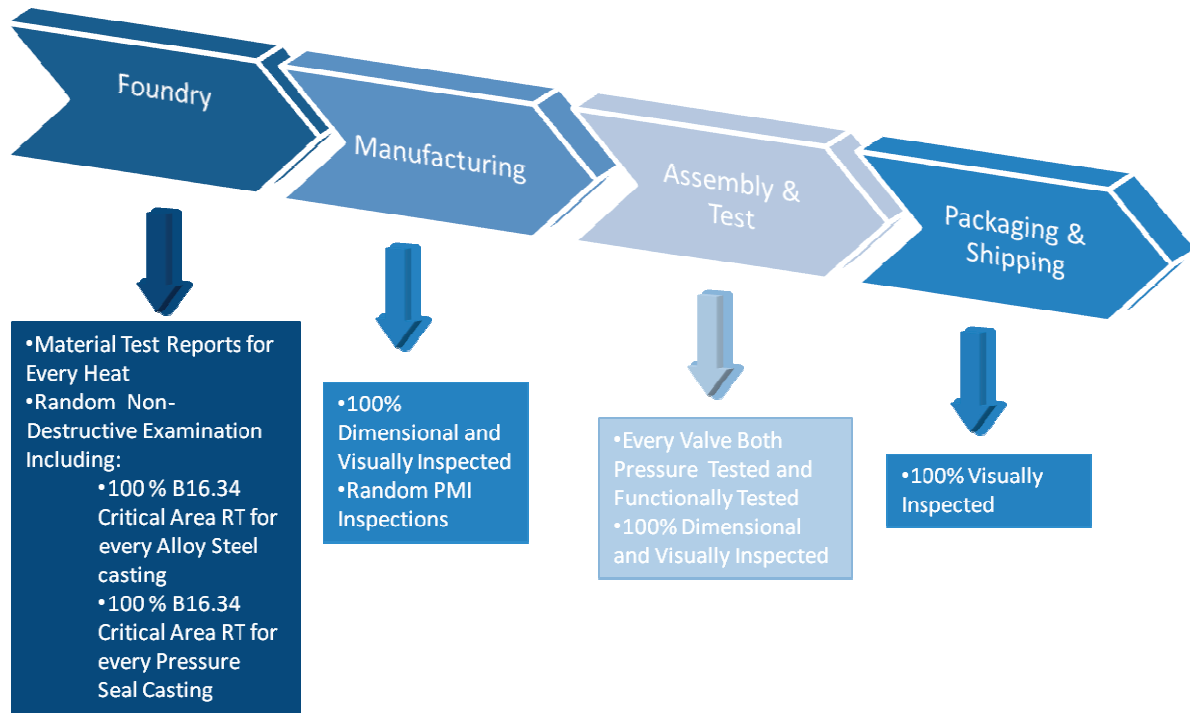
A handwritten signature in black ink, appearing to read "Randy Cowart", is written over a light gray rectangular background.

Randy Cowart

President, CEO & Chairman

The Wm. Powell Company

POWELL'S STANDARD MATERIAL INSPECTION FLOW



How to Order Powell Corrosion Resistant Valves

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

Digit

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

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

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

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

Material Codes	
Code	Option
A	A351 CF8 (304)
B	A351 CF3 (304L)
M	A351 CF8M (316)
N	A351 CF3M (316L)
P	A351 CG8M (317)
Q	A351 CG3M (317L)
R	A351 CF8C (347)
S	A351 CN7M (Alloy 20)
T	A494 CZ100 (Nickel)
V	A494 M35-1 (Monel)
W	A494 CW6MC (Inconel 625)
X	A494 CW12MW (Hastelloy C)
Y	A494 CY40 (Inconel 600)
Z	Special Material

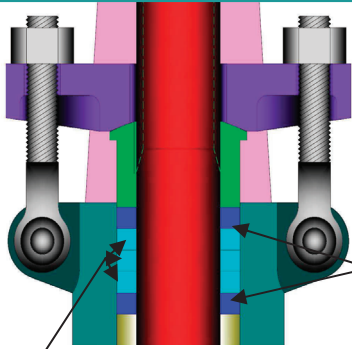
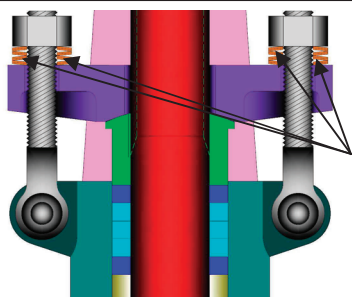
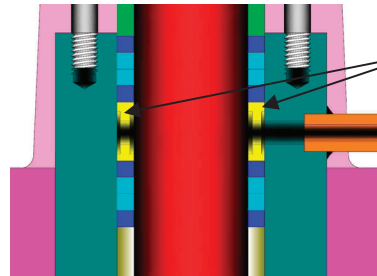
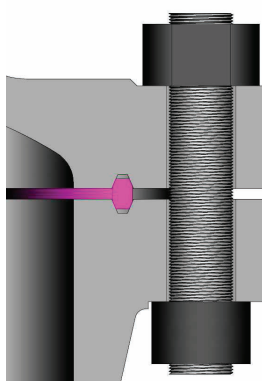
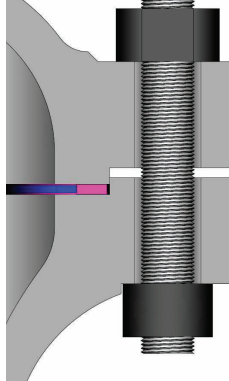
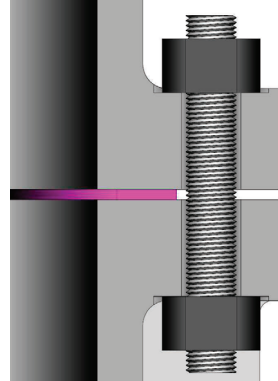
Trim	
Code	Option
0	API Trim 10
2	API Trim 12
3	API Trim 13
6	API Trim 16
7	API Trim 17
9	API Trim 9
A	Integral half HF
B	Integral full HF
C	Integral
D	API Trim 11
E	API Trim 2
K	Std Cryo trim w/ PCTFE disc insert
P	Std Cryo trim
G	Std Cryo trim w/ GF TFE disc insert
Z	Special Trim

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

Option Codes	
Code	Option
XXX	No Options
BXX	Single Valve Bypass
BA1	Two Valve Bypass
BA2	Two Valve Bypass w/Drain Valve
BA3	One Valve Bypass w/Drain Valve
BA4	Drill & Tap @ Position G
BVX	Bonnet Vent
GXX	Gear Operator
GA5	Gear, 1.25" Hex
GBP	Gear, Single Valve Bypass
GCA	Gear, Locking Device
GB1	Gear, Postion Ind.
EA6	B16.25 FIG 2C
TGD	Glass Filled Disc
TKD	Kel-F Disc
PLL	Live Load Packing
PLR	Lantern Ring
FRT	Radiography
NXX	NACE

Examples:

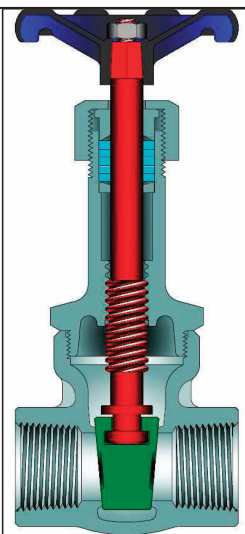
6.0 2456FM0TXXX 6" Figure 2456 Flanged end, CF8M, trim 10, PTFE
3.0 2342FS6TX 3" Figure 2342 Flanged end, CN7M, trim 16, PTFE
3.0 2467JN2TXXX 3" Figure 2467 Sch. 80S, CF3M, trim 12, PTFE
8.0 2456JXCTGXX 8" Figure 2456 Sch. 80S, CW12MW, integral trim, PTFE, gear operator

 <p>BRAIDED CARBON YARN END RINGS WITH CORROSION INHIBITOR</p> <p>DIE FORMED FLEXIBLE GRAPHITE RIBBON INNER RINGS WITH CORROSION INHIBITOR</p>	<h2>STANDARD PACKING ARRANGEMENT</h2> <p>Powell standard design cast steel valves are designed and manufactured to a 100 ppm maximum fugitive emissions level.</p>	
 <p>BELLEVILLE WASHERS</p>	<h2>LIVE LOAD OPTION</h2> <p>Live load design with standard packing. Live load washer help maintain packing load to reduce frequency of packing adjustment.</p>	
 <p>LANTERN RING</p>	<h2>LANTERN RING OPTION</h2> <p>Lantern ring design and other special packing arrangements available. The lantern ring arrangement consists of two packing sets with lantern spacer between the sets. The bonnet connection at the lantern ring location allows monitoring of leakage past packing set.</p>	
<h2>BODY/BONNET GASKETS</h2>		
 <p>RING JOINT</p> <p>ASME B16.20 ring joint gasket with material at least equal to body. Standard gasket arrangement for class 900-1500 valves. Optionally available on most other valves.</p>	 <p>SPIRAL WOUND</p> <p>Stainless steel spiral wound gasket with PTFE fill and gauge ring for controlled compression. Standard gasket arrangement for class 300-600 valves.</p>	 <p>SHEET</p> <p>Sheet PTFE gasket. Standard gasket arrangement for class 150 valves.</p>

GATE VALVES

THREADED BONNET, ASME CLASS 200

¼" to 2" (6 TO 50 mm), THREADED OR SOCKET WELD ENDS
CAST STAINLESS STEEL

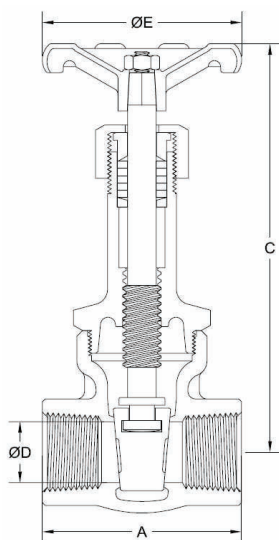


Class	Figure Number
200	1832

DESIGN FEATURES:

- **Fully** guided solid wedge.
- **Socket** weld ends are available.
- **Each** valve is shell, seat and backseat pressure tested per industry standard API 598.
- **Integral** seats are standard.
- **Threaded** ends are NPT type per ASME B1.20.1.
- **Socket** weld ends are per ASME B16.11.

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



C = Center to top open

WT = Weight

C_v = Flow coefficient

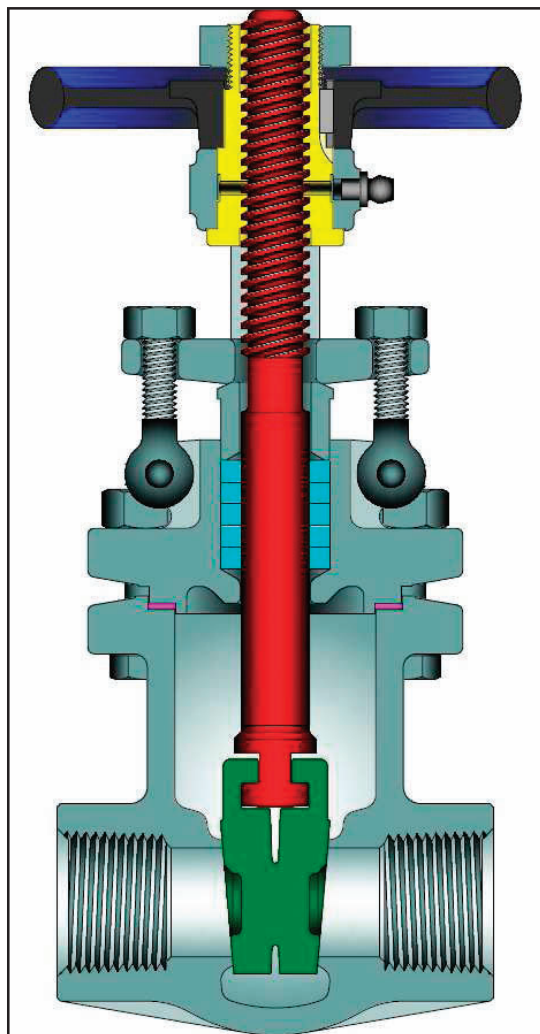
PART	MATERIALS
Body	A351 Gr. CF8M
Bonnet	A351 Gr. CF8M
Wedge	A351 Gr. CF8M
Stem	A276 316
Packing Nut	SST 316
Gland	SST 316
Packing	PTFE
Packing Collar	SST 316
Hand Wheel	A47
Hand Wheel Nut	Steel
Identification Plate	Aluminum

Design Specifications

Item	Applicable Specification
Pressure - temperature ratings	ASME B16.34
General valve design	ASME B16.34
Materials	ASTM

SIZE	ASME 200					
in	A	C	D	E	WT	lb
mm						kg
¼	1.75	4.6	0.38	2.5	0.8	7.1
7	44	116	10	64	0.4	
¾	2.00	4.6	0.38	2.5	0.8	7.1
10	51	116	10	64	0.4	
½	2.25	5.3	0.50	2.8	1.3	12.6
13	57	133	13	70	0.6	
¾	2.50	6.7	0.75	3.0	2.1	30
20	64	170	19	76	1.0	
1	3.25	7.8	1.00	3.3	3.3	55
25	83	198	25	83	1.5	
1¼	3.50	9.3	1.25	3.6	4.8	87
32	89	236	32	91	2.2	
1 ½	3.75	10.5	1.50	4.1	6.2	130
38	95	267	38	103	2.8	
2	4.00	12.6	2.00	4.8	10.4	240
50	102	321	51	121	4.7	

API 603 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)

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. Gasket materials and details on page 6.
- **Each** valve is shell, seat and backseat pressure tested per industry standard API 598.

- **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.
- **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
-NACE service
-Special cleaning for applications such as oxygen or chlorine
-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.

STANDARD MATERIALS (Other materials available)

PART	MATERIALS
Body	A351 Gr. CF3M
Bonnet	A351 Gr. CF8M
Wedge	A351 Gr. CF8M
Stem	A276 316
Stem Bushing	A 439 Ductile NI-Resist Gr. D2
Gland Flange	A351 Gr. CF8M
Eye Bolt	A193 Gr. B8
Eye Bolt Nut	A194 Gr.8
Groove Pin	Series 300
Gland	A276 316
Packing	PTFE (2)
Gasket	PTFE (2)
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

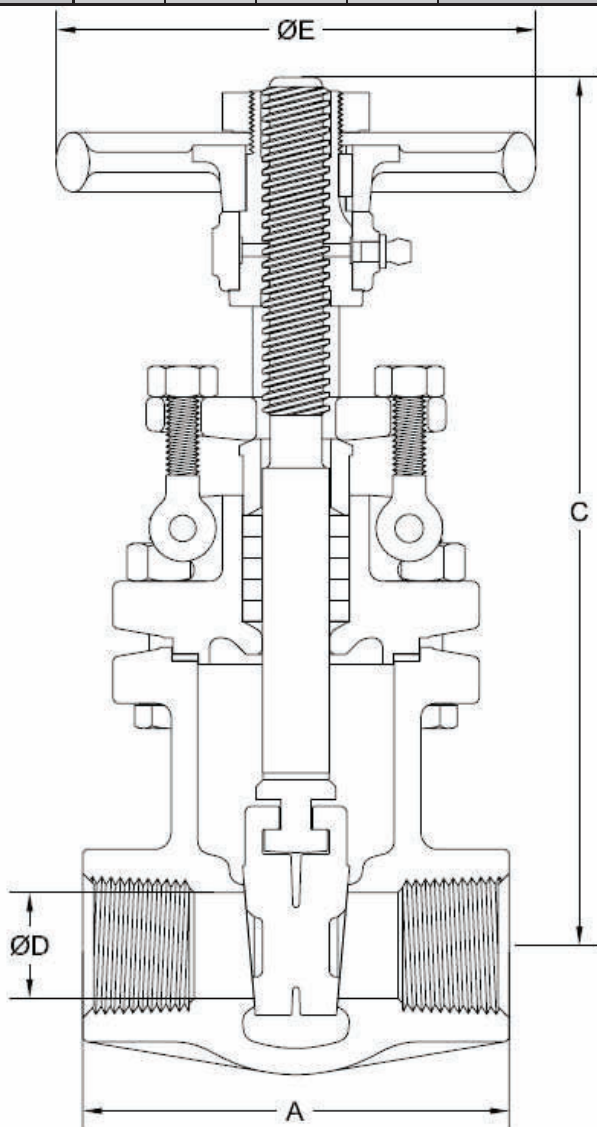
- 1) See pages 10-12 for flanged and buttweld designs.
- 2) For API 603 compliance, optional graphitic packing and gasket are required.

Design Specifications

Item	Applicable Specification
Wall thickness	API 603 + B16.34
Pressure - temperature ratings	ASME B16.34
General valve design	API 603 & B16.34
End threads—NPT	ASME B1.20.1
Socket weld ends	ASME B16.11
Materials	ASTM

GATE VALVE DIMENSIONS (CLASSES 200-600)

SIZE	ASME 200						ASME 300							
in	A	C	D	E	WT	lb	C _v	A	C	D	E	WT	lb	C _v
mm						kg							kg	
¼	2.13	6.5	0.38	3.0	3.5	7.1	2.13	6.5	0.38	3.0	3.4	7.1		
6	54	165	10	76	1.6		54	165	10	76	1.5			
¾	2.13	6.5	0.38	3.0	3.5	7.1	2.13	6.5	0.38	3.0	3.4	7.1		
10	54	165	10	76	1.6		54	165	10	76	1.5			
½	3.00	7.8	0.50	3.5	4.8	12.6	3.00	7.9	0.50	3.5	4.6	12.6		
13	76	198	13	89	2.2		76	200	13	89	2.1			
¾	3.50	8.6	0.75	4.0	6.5	30	3.50	8.9	0.75	4.0	6.1	30		
19	89	219	19	102	2.9		89	225	19	102	2.8			
1	4.00	9.4	1.00	4.5	9.0	55	4.00	9.4	1.00	4.5	9.1	55		
25	102	240	25	114	4.1		102	240	25	114	4.1			
1¼	4.63	10.8	1.50	5.0	13.1	130	4.63	10.8	1.25	5.0	13.1	87		
32	140	274	38	127	6.0		178	274	32	127	6.0			
1½	4.63	12.1	1.50	6.0	18.0	130	4.63	12.1	1.50	6.0	18.0	130		
38	117	308	38	152	8.2		117	308	38	152	8.2			
2	5.00	14.3	2.00	7.0	24.3	240	5.00	14.3	2.00	7.0	28.9	240		
50	127	362	51	178	11.0		127	362	51	178	13.1			



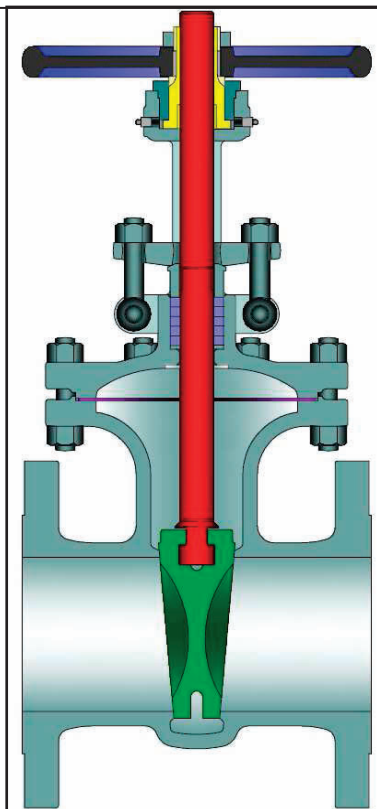
SIZE	ASME 600						
in	A	C	D	E	WT	lb	C _v
mm						kg	
¼	2.13	6.6	0.38	3.0	4.3		7.1
6	54	168	10	76	2.0		
¾	2.13	6.6	0.38	3.0	4.3		7.1
10	54	168	10	76	2.0		
½	3.00	7.9	0.50	3.5	5.1		12.6
13	76	202	13	89	2.3		
¾	3.50	8.9	0.75	4.0	7.1		30
19	89	225	19	102	3.2		
1	4.00	9.8	1.00	5.0	10.6		55
25	102	248	25	127	4.8		
1¼	4.50	11.1	1.25	6.0	15.7		87
32	229	281	32	152	7.1		
1½	5.00	12.4	1.50	7.0	21.3		130
38	127	316	38	178	9.7		
2	5.75	14.3	2.00	8.0	32.0		240
50	146	362	51	203	14.5		

C = Center to top open

WT = Weight

C_v = Flow coefficient

API 603 GATE VALVES
BOLTED BONNET, ASME CLASSES 150-600
FLANGED OR BUTTWELD ENDS
CAST STAINLESS STEEL



Class	Figure Number
150	2456
300	2467 (4)
600	1973 (4)

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 tightly guided to prevent dragging and seat damage.
- **Non-rotating stem** with precision ACME threads and burnished finish. Double start ACME thread for faster operation.
- **Body and bonnet joint** accurately machined. Gasket materials and details on page 6.
- **Body and bonnet** castings are precision machined. One-piece bonnet up to 12" (350 mm) valve size on all classes.
- **Gland** has two-piece construction for easy alignment.

STANDARD MATERIALS (Other materials available)

PART	MATERIALS
Body	A351 Gr. CF8M (2)
Bonnet	A351 Gr. CF8M
Wedge	A351 Gr. CF8M
Stem	SST 316
Stem Bushing	A 439 Ductile NI-Resist Gr. D2
Stem Bushing Lock Nut	Series 300 SST
Gland Flange	A351 Gr. CF8M
Eye Bolt	A193 Gr. B8
Eye Bolt Nut	A194 Gr.8
Groove Pin	Series 300 SST
Gland	SST 316
Packing	PTFE (3)
Packing Washer / Packing Spacer	SST 316
Gasket	PTFE (3)
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
Yoke arm (1)	A351 CF8
Bonnet / Yoke arm Stud (1)	A193 Gr. B8
Bonnet / Yoke arm Nut (1)	A194 Gr.8
Bearing Cap (1)	Series 300 SST
Cap Screws (1)	
Identification Plate	

- (1) 14" Valve sizes and up all classes have a two piece yoke.
- (2) CF3M for weld end bodies.
- (3) For API 603 compliance, optional graphitic packing and gasket are required.
- (4) See pages 8-9 for 2" and smaller sizes with threaded or socket weld ends.

Design Specifications

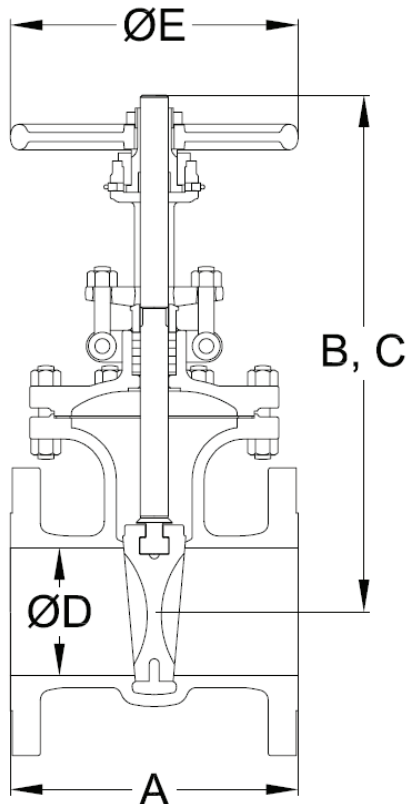
Item	Applicable Specification
Wall thickness	API 603 + B16.34
Pressure - temperature ratings	ASME B16.34
General valve design	API 603 & B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Butt Weld design	ASME B16.25
Materials	ASTM

- **Flanges:**
 - Classes 150-300: 1/16" raised face.
 - Class 600: 1/4" raised face.
 - Finish 125-250 AARH for all valves.
- **Rotating stem nut** is Austenitic ductile iron Gr D2 renewable in line. Thrust bearings are supplied as follows:
 - Class 150 & 300** 14" (400 mm) and larger valve size.
 - Class 600** 6" (150 mm) and larger valve size.
- **Heavier** walled API 600 design available.
- **Classes** above 600 are available; see the API 600 catalog.
- **Other** available options as follows:
 - Alternate valve materials available
 - Bypass, drain and other auxiliary connections
 - Gear, motor, and cylinder actuators available
 - NACE service
 - Special cleaning for applications such as oxygen or chlorine
 - Other options available as specified

GATE VALVE DIMENSIONS (CLASS 150—600).

SIZE	ASME 150						ASME 300					ASME 600				
in mm	A		B(1)	C(1)	D	E	A	B(1)	C(1)	D	E	A	B(1)	C(1)	D	E
	FE	WE														
½	4.25	4.25	7.2	7.8	0.50	3.5	5.50	7.2	7.9	0.50	3.5	6.50	7.3	7.9	0.50	3.5
13	109	108	183	198	13	89	140	183	200	13	89	165	185	202	13	89
¾	4.63	4.63	7.7	8.6	0.75	4.0	6.00	7.9	8.9	0.75	4.0	7.50	8.0	8.9	0.75	4.0
19	117	117	196	219	19	102	152	201	225	19	102	191	203	225	19	102
1	5.00	5.00	8.3	9.4	1.00	4.5	6.50	8.3	9.4	1.00	4.5	8.50	8.6	9.8	1.00	5.0
25	127	127	211	240	25	114	165	211	240	25	114	216	218	248	25	127
1½	6.50	6.50	10.4	12.1	1.50	5.0	7.50	10.4	12.1	1.50	6.0	9.50	10.7	12.4	1.50	7.0
38	165	165	264	308	38	127	191	264	308	38	152	241	272	316	38	178
2	7.00	8.50	12.0	14.3	2.00	6.0	8.50	12.0	14.3	2.00	7.0	11.50	12.3	14.3	2.00	9.0
50	178	216	305	362	51	152	216	305	362	51	178	292	312	362	51	229
2½	7.50	9.50	12.3	15.0	2.50	7.0	9.50	12.6	14.3	2.50	7.9	13.00	18.1	21.9	2.50	12.0
65	191	241	312	380	64	178	241	319	364	64	201	330	461	555	64	305
3	8.00	11.12	13.8	17.0	3.00	7.0	11.12	13.8	17.0	3.00	9.0	14.00	19.2	22.8	3.00	12.0
80	203	282	350	431	76	178	283	350	431	76	229	356	487	580	76	305
4	9.00	12.00	16.8	20.9	4.00	9.0	12.00	16.8	20.9	4.00	10.0	17.00	23.0	27.5	4.00	14.0
100	229	305	427	530	102	229	305	426	530	102	254	432	585	698	102	356
6	10.50	15.88	22.2	28.3	6.00	11.0	15.88	22.6	28.7	6.00	14.0	22.00	32.5	39.1	6.00	20.0
150	267	403	563	720	152	279	403	574	730	152	356	559	825	993	152	508
8	11.50	16.50	29.3	38.0	8.00	14.0	16.50	30.6	39.2	8.00	16.0	26.00	35.0	45.4	7.87	22.0
200	292	419	744	965	203	356	419	777	995	203	406	660	890	1154	200	560
10	13.00	18.00	35.6	46.3	10.00	16.0	18.00	36.8	47.2	10.00	20.0	31.00	41.9	52.4	9.75	25.2
250	330	457	905	1175	254	406	457	935	1199	254	508	787	1065	1332	248	640
12	14.00	19.75	41.1	53.5	12.00	18.0	19.75	42.6	54.7	12.00	20.0	33.00	47.3	59.9	11.75	26.8
300	356	502	1045	1359	305	457	502	1082	1390	305	508	838	1202	1521	298	680
14	15.00	22.50	46.3	60.3	13.25	20.0	30.00	49.1	63.4	13.25	22.0	35.00	51.6	65.4	12.87	28.3
350	381	572	1175	1531	337	508	762	1248	1611	337	560	889	1310	1662	327	720
16	16.00	24.00	51.6	67.9	15.25	22.0	33.00	70.7	85.3	15.25	25.2	39.00	73.2	88.9	14.75	35.4
400	406	610	1310	1725	387	560	838	1796	2387	387	640	991	1860	2475	375	900
18	17.00	26.00	58.1	76.4	17.25	25.2	36.00	77.2	96.5	17.00	26.8	43.00	79.1	99.1	16.50	35.4
450	432	660	1477	1940	438	640	914	1961	2591	432	680	1092	2008	2664	419	900
20	18.00	28.00	63.3	83.3	19.25	26.7	38.88	85.3	109.1	19.00	28.2	46.75	85.3	109.1	18.25	28.0
500	457	711	1615	2123	489	680	991	2176	2883	483	720	1194	2166	2883	464	710
24	20.00	32.00	76.7	101.1	23.25	28.3	45.00	100.9	128.3	23.00	35.4	55.00	102.3	128.3	22.00	32.0
600	508	813	1948	2568	591	720	1143	2562	3362	584	900	1397	2599	3362	559	810

(1) Gear operators standard for 16" and up classes 300 and 600. Height is to top of actuator.

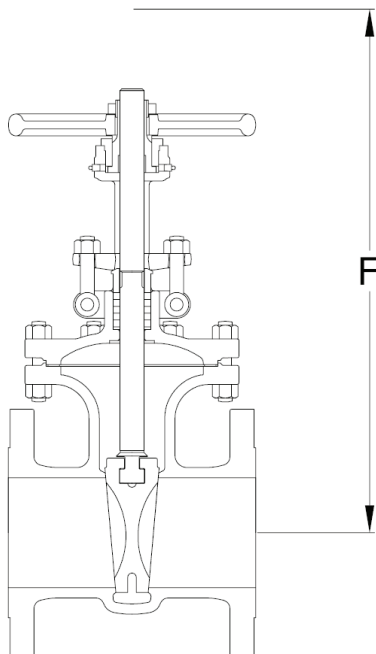


FE = Flanged
WE = Butt weld

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

API 603 GATE VALVES
BOLTED BONNET, ASME CLASSES 150-600
FLANGED OR BUTTWELD ENDS
CAST STAINLESS STEEL

SIZE	ASME 150							ASME 300							ASME 600						
in	F	in	WT	lb	WT	lb	Cv	F	in	WT	lb	WT	lb	Cv	F	in	WT	lb	WT	lb	Cv
mm		mm	FE	kg	WE	kg			mm	FE	kg	WE	kg			mm	FE	kg	WE	kg	
½	9.5		6.0		4.8		12.6	9.5		7.3		4.6		12.6	9.6		8.3		5.1		12.6
13	241		2.7		2.2			241		3.3		2.1			244		3.8		2.3		
¾	10.3		8.4		6.5		30	10.3		11.2		6.1		30	10.6		15.0		7.1		30
19	262		3.8		2.9			262		5.1		2.8			269		6.8		3.2		
1	11.3		12.5		9.0		55	11.3		15.4		9.1		55	11.5		20.9		10.6		55
25	287		5.7		4.1			287		7.0		4.1			292		9.5		4.8		
1½	14.5		23.9		18.0		130	14.5		33.1		18.0		130	14.8		38.1		21.3		130
38	368		10.8		8.2			368		15.0		8.2			376		17.3		9.7		
2	16.6		29		24.3		240	16.8		37		28		240	19.8		77		57		240
50	421		13		11			426		17		13			502		35		26		
2½	18.3		43		37		390	20.2		50		36		390	25.7		148		126		390
65	464		20		17			514		23		16			653		67		57		
3	20.7		53		48		560	20.9		53		48		560	27.9		174		143		560
80	527		24		22			530		24		22			709		79		65		
4	25.8		86		75		1020	25.9		119		101		1020	33.4		315		251		1020
100	655		39		34			658		54		46			848		143		114		
6	34.1		139		129		2440	34.6		227		174		2440	46.5		677		573		2440
150	867		63		58			878		103		79			1182		307		260		
8	44.1		251		210		4490	46.5		412		379		4490	54.3		1096		942		4340
200	1119		114		95			1180		187		172			1380		497		427		
10	53.6		419		348		7000	56.0		673		617		7000	62.2		1574		1334		6660
250	1362		190		158			1423		305		280			1581		714		605		
12	61.4		551		536		10500	65.0		957		917		10500	71.1		2000		1702		10000
300	1560		250		243			1650		434		416			1806		907		772		
14	66.7		741		732		12800	73.8		1555		1277		12800	76.2		2761		2373		12000
350	1693		336		332			1875		705		579			1935		1252		1076		
16	74.4		975		963		16900	81.8		1949		1663		16900	84.7		3616		3098		15800
400	1889		442		437			2078		884		754			2151		1640		1405		
18	84.7		1433		1299		22500	89.3		4935		2196		21900	91.5		4507		3861		20600
450	2151		650		589			2267		2238		996			2324		2044		1751		
20	94.7		1744		1678		28100	98.1		3380		2745		27300	99.1		4507		4279		25200
500	2414		791		761			2502		1533		1245			2517		2044		1941		
24	112.6		2580		2481		40900	115.8		4911		3958		40000	116.5		7949		7621		36600
600	2859		1170		1125			2942		2227		1795			2960		3605		3457		



FE = Flanged ends

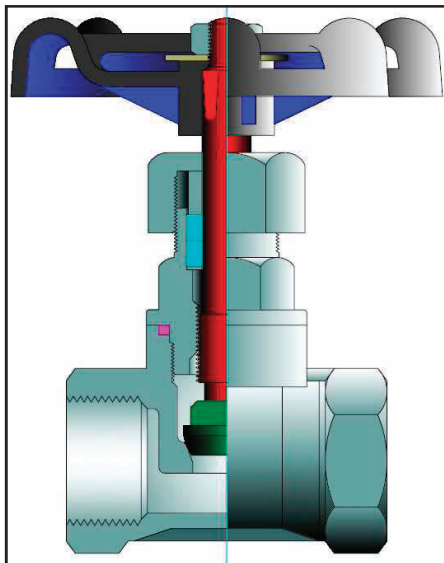
WE = Weld ends

F = Dismantling
Dimension

WT = Weight

Cv = Flow coefficient

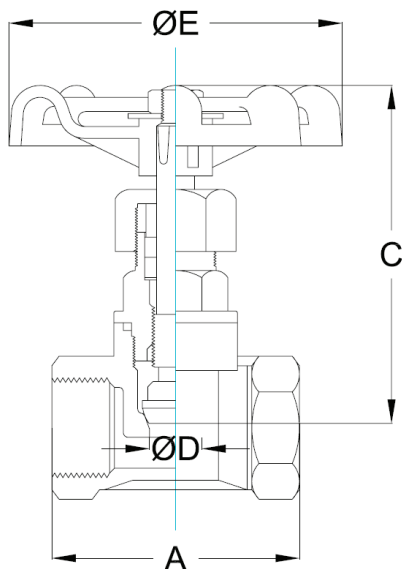
GLOBE VALVES
THREADED BONNET, 200 W.O.G.
¼ to 2" (6 TO 50 mm), THREADED ENDS
CAST STAINLESS STEEL



Class	Figure Number
200 W.O.G.	1861

DESIGN FEATURES:

- **Swivel disc** for optimal seating and longer seat life are non-rotating.
- **Stems** are rotating / rising design.
- **Each valve** is shell, seat and backseat pressure tested per industry standard API 598.
- **Integral seats** are standard.
- **Threaded ends** are NPT type per ASME B1.20.1.



C = Center to top open

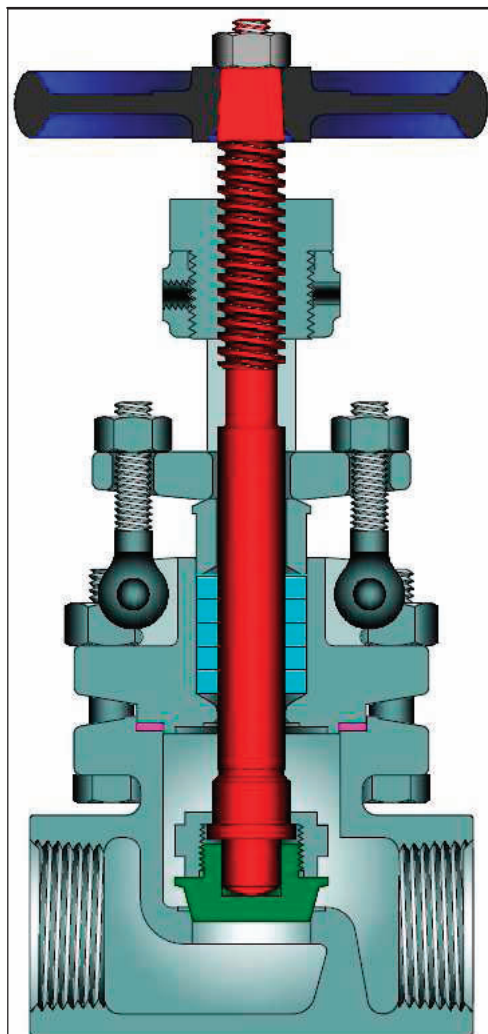
WT = Weight

C_v = Flow coefficient

PART	MATERIALS
Body	A351 Gr. CF8M
Bonnet	A351 Gr. CF8M
Disc	SST 316
Disc Nut	SST 316
Stem	SST 316
Packing Nut	SST 316
Gland	SST 304
Packing	PTFE
Packing Washer	SST 316
Gasket	PTFE
Hand Wheel	Aluminum
Hand Wheel Nut	SST 304
Identification Plate	Series 300 SST

SIZE	200 W.O.G.					
in	A	C	D	E	WT	lb
mm						kg
¼	2.05	3.0	0.50	2.8	0.6	2.5
7	52	77	12	70	0.3	
¾	2.05	3.0	0.50	2.8	0.6	2.5
10	52	77	12	70	0.3	
½	2.05	3.1	0.50	2.8	0.6	2.5
13	52	79	12	70	0.3	
¾	2.36	3.6	0.60	2.8	1.0	3.7
20	60	91	15	70	0.4	
1	2.83	4.1	0.80	3.1	1.3	6.8
25	72	105	20	80	0.6	
1¼	3.19	5.0	1.00	3.1	2.5	10.9
32	81	127	25	80	1.1	
1½	3.54	5.6	1.25	3.5	2.7	17.5
38	90	142	32	90	1.2	
2	3.98	6.2	1.60	3.9	3.8	30
50	101	158	40	100	1.7	

API 603 WALL GLOBE VALVES
BOLTED BONNET, CLASSES 200-600
¼" to 2" (6 TO 50 mm), THREADED OR SOCKET WELD ENDS
CAST STAINLESS STEEL



PART	MATERIALS
Body	A351 Gr. CF3M
Bonnet	A351 Gr. CF8M
Disc	A276 316
Disc Nut	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	PTFE
Hand Wheel	A47
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

Class	Figure Number
200	2474
300	2447 (1)
600	1983 (1)

1) See pages 16-18 for flanged and butt weld designs.

Design Specifications

Item	Applicable Specification
Wall thickness	API 603 & 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:

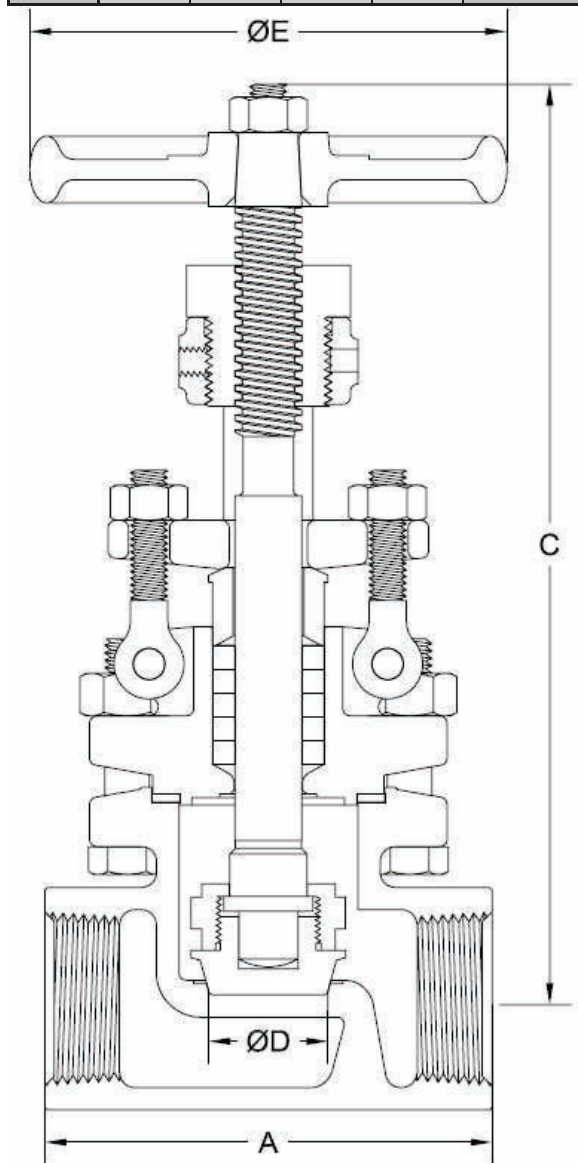
- **Seat face:** Ground and lapped to a smooth finish.
- **Body and bonnet joint** accurately machined. Gasket materials and details on page 6.
- **Swivel disc** for optimal seating and longer seat life .
- **Stems** are rotating / rising design.
- **Each** valve is shell, seat and backseat pressure tested per industry standard API 598.
- **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, inspection result and certificate of conformance.
- **Other** available options as follows:
 - Alternate valve materials available
 - NACE service
 - Special cleaning for applications such as oxygen or chlorine
 - 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.

GLOBE VALVE DIMENSIONS (CLASS 200—600).

SIZE	ASME 200						ASME 300					
	A	C	D	E	WT	C _V	A	C	D	E	WT	C _V
	in mm				lb kg						lb kg	
¼	2.88	6.8	0.50	3.0	3.5	2.5	2.88	6.8	0.50	3.0	3.6	2.5
7	73	171	13	76	1.6		73	171	13	76	1.6	
⅜	2.88	6.8	0.50	3.0	3.5	2.5	2.88	6.8	0.50	3.0	3.6	2.5
10	73	171	13	76	1.6		73	171	13	76	1.6	
½	2.88	6.8	0.50	3.0	3.5	2.5	2.88	6.8	0.50	3.0	3.8	2.5
13	73	171	13	76	1.6		73	171	13	76	1.7	
¾	3.25	7.3	0.75	3.5	4.5	5.8	3.25	7.3	0.75	3.5	4.6	5.8
20	83	186	19	89	2.0		83	186	19	89	2.1	
1	3.75	8.2	1.00	4.0	6.7	10.7	3.75	8.2	1.00	4.0	7.1	10.7
25	95	208	25	102	3.0		95	208	25	102	3.2	
1¼	5.50	8.9	1.50	5.0	10.5	25	5.50	8.9	1.50	5.0	13.5	25
32	140	226	38	127	4.8		140	226	38	127	6.1	
1½	5.50	9.9	1.50	5.0	13.7	25	5.50	9.9	1.50	5.0	19.1	25
38	140	251	38	127	6.2		140	251	38	127	8.7	
2	6.00	10.9	2.00	6.0	19.8	50	6.00	10.9	2.00	6.0	25.8	50
50	152	276	51	152	9.0		152	276	51	152	11.7	



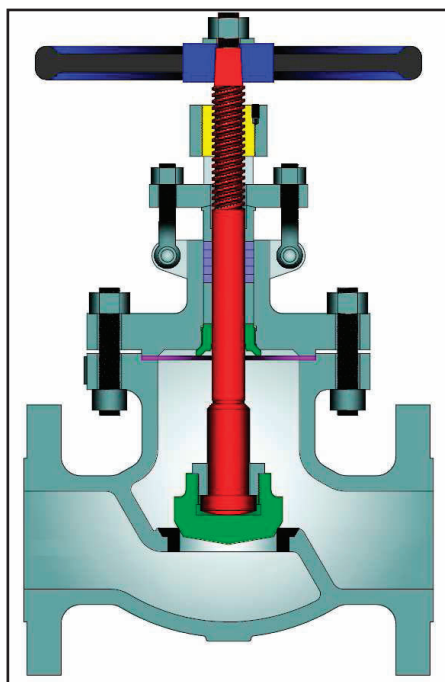
SIZE	ASME 600					
	A	C	D	E	WT	C _V
	in mm				lb kg	
¼	2.88	6.8	0.50	3.0	3.7	2.5
7	73	171	13	76	1.7	
⅜	2.88	6.8	0.50	3.0	3.7	2.5
10	73	171	13	76	1.7	
½	2.88	6.8	0.50	3.0	3.7	2.5
13	73	171	13	76	1.7	
¾	3.25	7.3	0.75	3.5	4.8	5.8
20	83	186	19	89	2.2	
1	3.75	8.3	1.00	5.0	7.4	10.7
25	95	211	25	127	3.4	
1¼	5.00	10.6	1.25	6.0	17.5	17.1
32	127	269	32	152	7.9	
1½	5.63	10.9	1.50	7.0	21.0	25
38	143	276	38	178	9.5	
2	6.25	12.8	2.00	8.0	40.0	50
50	159	324	51	203	18.1	

C = Center to top open

WT = Weight

C_V = Flow Coefficient

API 603 WALL GLOBE VALVES
BOLTED BONNET, ASME CLASS 150-600
FLANGED AND BUTTWELD ENDS
CAST STAINLESS STEEL



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

DESIGN FEATURES:

- **Seat face:** Ground and lapped to a smooth finish.
- **Body and bonnet joint** accurately machined. Gasket materials and details on page 6.
- **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 back-seat pressure tested per industry standard API 598.
- **Integral** seats are standard. Renewable seat rings available on special order
- **Body and bonnet** castings are precision machined. One-piece bonnet up to 12" (350 mm) valve size on all classes.
- **Gland** has two-piece construction for easy alignment.
- **Weld** ends are available per ASME B16.25 or per customer's specification.

PART	MATERIALS
Body	A351 Gr. CF8M (2)
Bonnet / Yoke arm	A351 Gr. CF8M
Disc	A276 316
Disc Nut	A276 316
Stem	A276 316
Stem Bushing	A439 D-2 (4)
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	PTFE
Back Seat Bushing (5)	A276 316
Hand Wheel	A47
Hand Wheel Nut	Steel
Body / Bonnet Stud	A193 Gr. B8
Body / Bonnet Nut	A194 Gr.8
Bonnet / Yoke arm Stud (1)	A193 Gr. B8
Bonnet / Yoke arm Nut (1)	A194 Gr.8
Bearing Cap (1)	Series 300 SST
Cap Screws (1)	
Identification Plate	

- (1) 14" Valve sizes and up all classes have a two piece yoke.
 (2) CF3M for weld end bodies.
 (3) See pages 14-15 for 2" and smaller sizes with threaded or socket weld ends.
 (4) For valve sizes 2" and smaller, T416 steel is used.
 (5) Used in valve sizes 2½" and larger.

Design Specifications

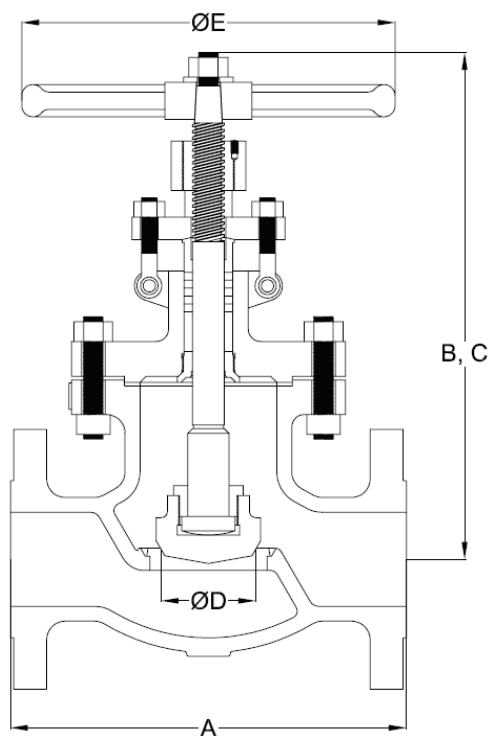
Item	Applicable Specification
Wall thickness	API 603 & B16.34
Pressure - temperature ratings	ASME B16.34
General valve design	B16.34
End to End dimensions	ASME B16.10
Flange design	ASME B16.5
Butt Weld design	ASME B16.25
Materials	ASTM

- **Flanges:**
 - Classes 150-300: 1/16" raised face.
 - Class 600: 1/4" raised face.
 - Finish 125-250 AARH for all valves.
- **Threaded and socket weld** ends are available on sizes 2" and smaller.
- **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 such as chrome and stainless steel alloys
 - Alternate trim materials
 - Bypass, drain and other auxiliary connections
 - Gear, motor, and cylinder actuators available
 - NACE service
 - Special cleaning for applications such as oxygen or chlorine
 - Other options available as specified

GLOBE VALVE DIMENSIONS (CLASS 150—600).

SIZE	ASME 150					ASME 300					ASME 600				
	A	B	C	D	E	A	B	C	D	E	A	B (1)	C (1)	D	E
	FE/WE					FE/WE					FE/WE				
½	4.25	6.3	6.8	0.50	3.0	6.00	6.3	6.8	0.50	3.0	6.50	7.5	8.1	0.50	3.0
13	108	160	171	13	76	152	160	171	13	76	165	191	206	13	76
¾	4.63	6.8	7.3	0.75	3.5	7.00	6.8	7.3	0.75	3.5	7.50	8.9	9.5	0.75	3.5
20	117	173	186	19	89	178	173	186	19	89	191	225	241	19	89
1	5.00	7.7	8.2	1.00	4.0	8.00	7.7	8.2	1.00	4.0	8.50	9.9	10.5	1.00	5.0
25	127	196	208	25	102	203	196	208	25	102	216	251	267	25	127
1½	6.50	9.0	9.9	1.50	5.0	9.00	9.0	9.9	1.50	5.0	9.50	10.9	11.6	1.50	7.0
38	165	229	251	38	127	229	229	251	38	127	241	277	295	38	178
2	8.00	9.9	10.9	2.00	6.0	10.50	9.9	10.9	2.00	6.0	11.50	12.5	13.3	2.00	8.0
50	203	251	276	51	152	267	251	276	51	152	292	318	338	51	203
2½	8.50	14.9	16.4	2.50	9.8	11.50	16.7	18.2	2.50	9.8	13.00	16.4	17.6	2.50	11.81
65	216	378	416	64	250	292	423	461	64	250	330	416	448	64	300
3	9.50	14.1	15.4	3.00	11.8	12.50	14.1	15.4	3.00	11.8	14.00	17.2	18.7	3.00	13.8
80	241	357	390	76	300	318	357	390	76	300	355	438	475	76	350
4	11.50	16.5	18.0	4.00	11.8	14.00	16.7	18.0	4.00	13.8	17.00	20.2	21.7	4.00	17.7
100	292	419	457	102	300	356	423	458	102	350	431	514	552	102	450
6	16.00	17.6	19.7	6.00	15.8	17.50	21.0	23.2	6.00	17.7	22.00	25.7	27.9	6.00	23.6
150	406	446	499	152	400	445	534	589	152	450	558	653	709	152	600
8	19.50	20.1	22.6	8.00	17.7	22.00	23.9	26.3	8.00	21.7	26.00	29.1	31.6	7.88	27.7
200	495	511	574	203	450	559	606	669	203	550	660	739	803	200	700
10	24.50	23.9	26.9	10.00	21.7	24.50	26.7	29.7	10.00	23.6	31.00	41.3 (1)		9.75	27.7
250	622	606	682	254	550	622	677	753	254	600	787	1049 (1)		248	700
12	27.50	27.1	30.6	12.00	23.6	28.00	30.6	34.2	12.00	27.6	33.00	47.8 (1)		11.75	31.5
300	699	688	778	305	600	711	778	868	305	700	838	1215 (1)		298	800

(1) Gear operators standard for 10" and up for class 600. Height is to top of actuator.

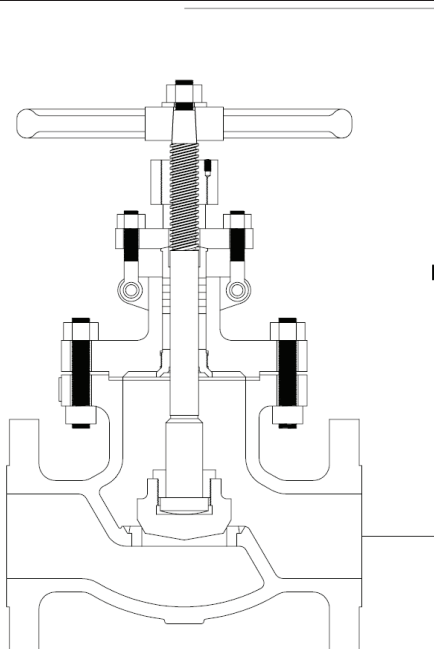


FE = Flanged
WE = Butt weld

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

API 603 WALL GLOBE VALVES
BOLTED BONNET, ASME CLASS 150-600
FLANGED AND BUTTWELD ENDS
CAST STAINLESS STEEL

SIZE	ASME 150							ASME 300							ASME 600						
in	F	in	WT	lb	WT	lb	C _v	F	in	WT	lb	WT	lb	C _v	F	in	WT	lb	WT	lb	C _v
mm		mm		FE		kg			WE		kg		mm			FE		kg		WE	
½	7.9		5.0		3.5		2.5	7.9		6.5		3.8		2.5	9.0		8.1		3.8		2.5
13	201		2.3		1.6			201		2.9		1.7			229		3.7		1.7		
¾	8.5		6.5		4.5		5.8	8.5		11.3		4.6		5.8	10.6		12.8		4.8		5.8
20	216		2.9		2.0			216		5.1		2.1			269		5.8		2.2		
1	9.6		9.3		6.7		10.7	9.6		13.1		7.1		10.7	11.9		16.5		7.4		10.7
25	244		4.2		3.0			244		5.9		3.2			302		7.5		3.4		
1½	11.5		20.0		13.7		25	11.5		25.3		19.1		25	13.9		35.8		21.0		25
38	292		9.1		6.2			292		11.4		8.7			353		16.2		9.5		
2	13.1		29.5		19.8		50	13.1		34.1		25.8		50	16.3		58.0		40.0		50
50	333		13.4		9.0			333		15.5		11.7			414		26.3		18.1		
2½	16.0		46		38		75	16.3		71		57		75	20.1		148		126		75
65	406		21		17			414		32		26			510		67		57		
3	18.0		87		71		110	18.0		117		95		110	25.5		174		143		110
80	456		40		32			456		53		43			647		79		65		
4	21.3		135		108		200	20.7		165		132		200	25.0		315		251		200
100	541		61		49			525		75		60			635		143		114		
6	25.3		227		183		480	27.2		342		273		480	32.3		677		573		480
150	643		103		83			692		155		124			822		307		260		
8	26.7		375		300		880	30.6		644		516		880	36.5		1096		942		850
200	678		170		136			776		292		234			928		497		427		
10	31.5		706		565		1370	34.4		1064		851		1370	41.7		1574		1334		1300
250	801		320		256			873		483		386			1059		714		605		
12	37.6		1056		849		2050	40.1		1361		1089		2050	54.8		2000		1702		2000
300	956		479		385			1018		617		494			1391		907		772		

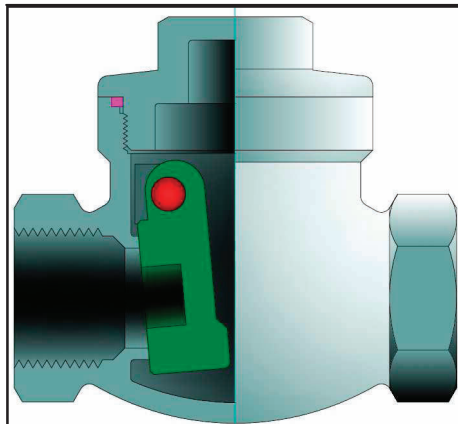


FE = Flanged ends
WE = Weld ends

F = Dismantling
Dimension

C_v = Flow coefficient
WT = Weight

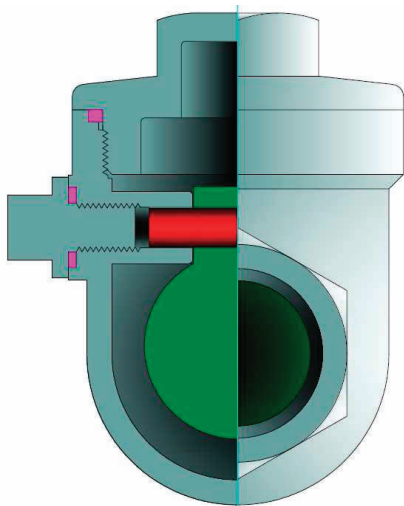
SWING CHECK VALVES
THREADED BONNET, 200 W.O.G.
¼ to 2" (6 TO 50 mm), THREADED
CAST STAINLESS STEEL



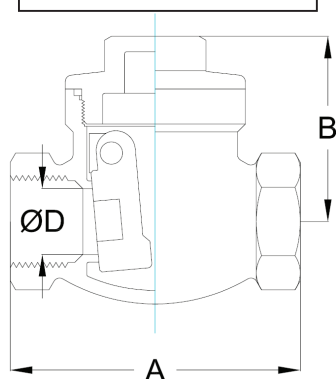
Class	Figure Number
200 W.O.G.	1847

DESIGN FEATURES:

- **Integral Seats.**
- **Each** valve is shell and seat pressure tested per industry standard API 598.
- **Check** valve are suitable for service in horizontal line with cap vertical or in a vertical line with flow upward.
- **Threaded ends** are NPT type per ASME B1.20.1.



Side view of valve.



STANDARD MATERIALS (Other materials available)

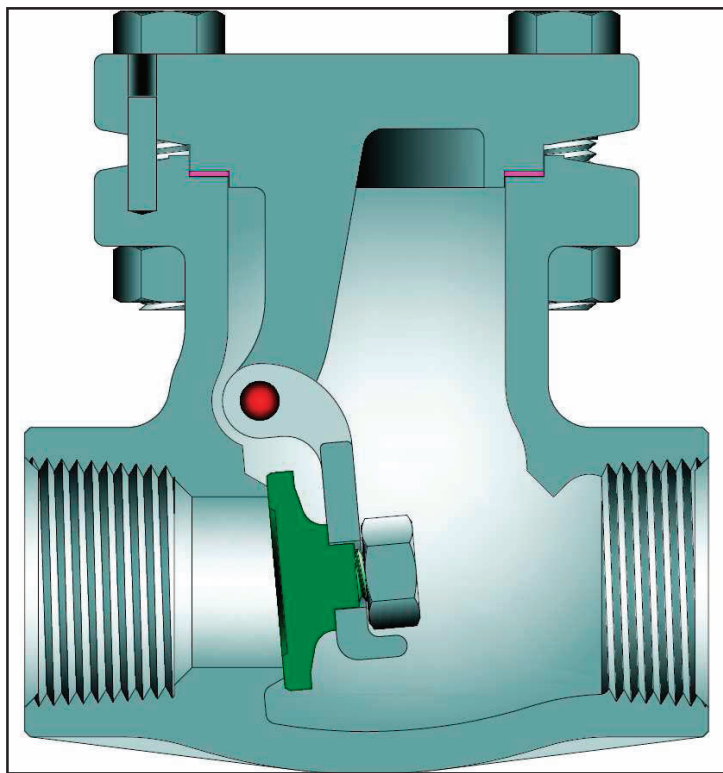
PART	MATERIALS
Body	A351 Gr. CF8M
Cap	A351 Gr. CF8M
Disc	A276 316
Gasket	PTFE
Pin	A276 316
Plug	SST 316
Plug Gasket	PTFE
Identification Plate	Series 300 SST

SIZE	200 W.O.G.				
in	A	B	D	WT	lb
mm					kg
¼	2.50	1.7	0.56	0.7	1.0
6	65	42	15	0.3	
¾	2.50	1.7	0.56	0.7	2.2
10	65	42	15	0.3	
½	2.50	1.7	0.56	0.7	3.9
13	65	42	15	0.3	
¾	3.13	2.0	0.75	0.9	9.2
19	80	51	20	0.4	
1	3.56	2.4	1.00	1.5	17.0
25	90	60	25	0.7	
1¼	4.13	2.64	1.25	2.2	27
32	105	67	32	1.0	
1 ½	4.75	3.0	1.56	3.2	40
38	120	75	40	1.5	
2	5.50	3.2	2.00	4.7	75
50	140	81	50	2.1	

B = Center to top

WT = Weight

C_v = Flow coefficient



STANDARD MATERIALS
(Other materials available)

PART	MATERIALS
Body	A351 Gr. CF3M
Cap	A351 Gr. CF8M
Disc	A276 316
Gasket	PTFE
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 22-24 for flanged and butt weld designs.

DESIGN FEATURES:

- **Integral Seats**
- **Wall thickness** per API 603 requirements.
- **Swivel disc** for improved seat alignment and longer life.
- **Each** valve is shell and seat pressure tested per industry standard API 598.
- **Check** valves are suitable for service in horizontal line with cap vertical or in a vertical line with flow upward.
- **Carrier Pin** is confined within the body wall and is not accessible from the exterior. 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.

- **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
-NACE service
-Special cleaning for applications such as oxygen or chlorine

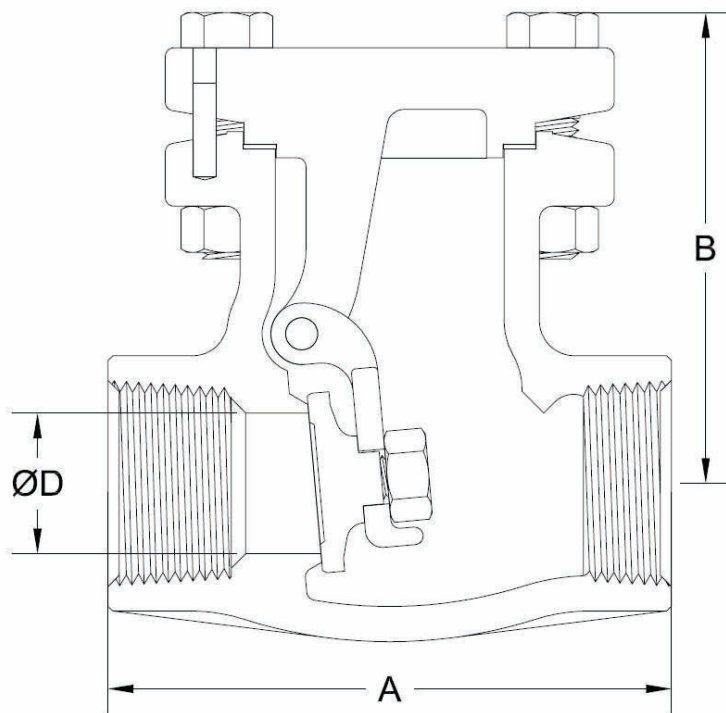
NOTE: Powell reserves the right to convert threaded ends to socket weld, which will result in thread remnants as pipe stop.

Design Specifications

Item	Applicable Specification
Wall thickness	API 603 & 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

SWING CHECK VALVE DIMENSIONS (CLASS 200-600)

SIZE	ASME 200						ASME 300					
in	A	B	D	WT	lb	C _V	A	B	D	WT	lb	C _V
mm					kg						kg	
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		
¾	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		

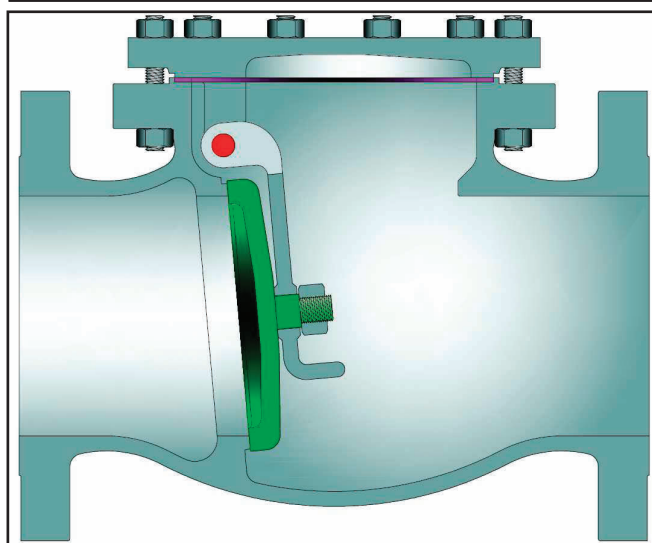


B = Center to top

WT = Weight

C_v = Flow coefficient

SIZE	ASME 600					
in	A	B	D	WT	lb	C _v
mm					kg	
¼	2.75	2.3	0.44	7.0		3.0
6	70	58	11	3.2		
¾	2.75	2.3	0.44	7.0		3.0
10	70	58	11	3.2		
½	2.75	2.3	0.44	7.0		3.0
13	70	58	11	3.2		
¾	3.75	3.1	0.75	8.5		9.2
19	95	79	19	3.9		
1	4.00	3.5	1.00	11.0		17
25	102	90	25	5.0		
1¼	4.75	3.5	1.25	13.2		27
32	121	90	32	6.0		
1½	5.63	4.3	1.50	14.6		40
38	143	108	38	6.6		
2	6.25	5.4	2.00	35.0		75
50	159	138	51	15.9		



Class	Figure Number
150	2342
300	2346 (3)
600	2350 (3)

STANDARD MATERIALS (Other materials available)

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

DESIGN FEATURES:

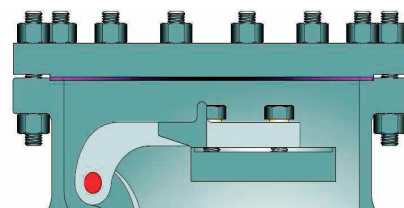
- **Integral Seats**, however, renewable screwed-in seat rings are available on order.
- **Wall thickness** per API 603 requirements.
- **Swivel disc** for improved seat alignment and longer life.
- **Each** valve is shell and seat pressure tested per industry standard API 598.
- **Check** valve are 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 reducing potential leak points.
- **End Flanges** have the following raised faces per ASME B16.5:
Classes 150-300: 1/16" (2mm).
Classes 600-1500: 1/4" (7mm).
- **Weld ends** are available per ASME B16.25 or per customer's specification.
- **Each** valve has a unique certification number that is traceable to the valve certification sheet which includes MTR data, pressure test, inspection result and certificate of conformance.
- **Thicker** walled API 600 design available.

- (1) 10" Valve size and up have a hanger design as shown below.
- (2) CF3M for weld end bodies.
- (3) See pages 20-21 for 2" and smaller sizes with threaded or socket weld ends.

Design Specifications

Item	Applicable Specification
Wall thickness	API 603 & 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

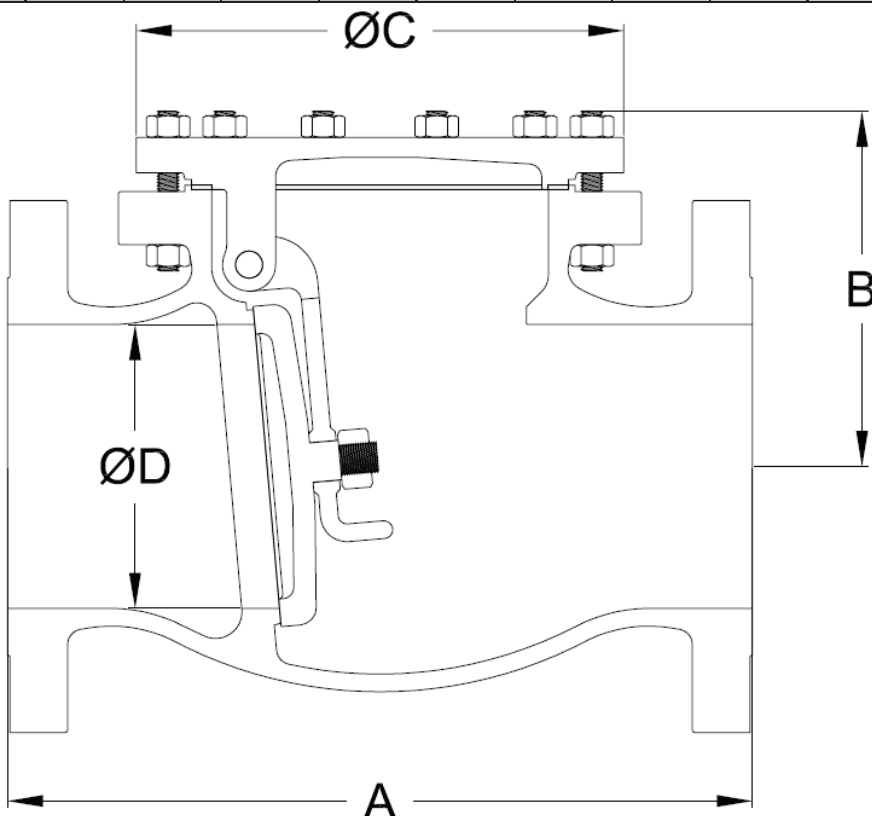
- **Other** available options as follows:
-Alternate valve materials such as chrome and stainless steel alloys
-Alternate trim materials
-Bypass, drain and other auxiliary connections
-NACE service
-Special cleaning for applications such as oxygen or chlorine
-Other options available as specified



Valve design for valve sizes 10" and above all classes.

SWING CHECK VALVE DIMENSIONS (CLASS 150—600).

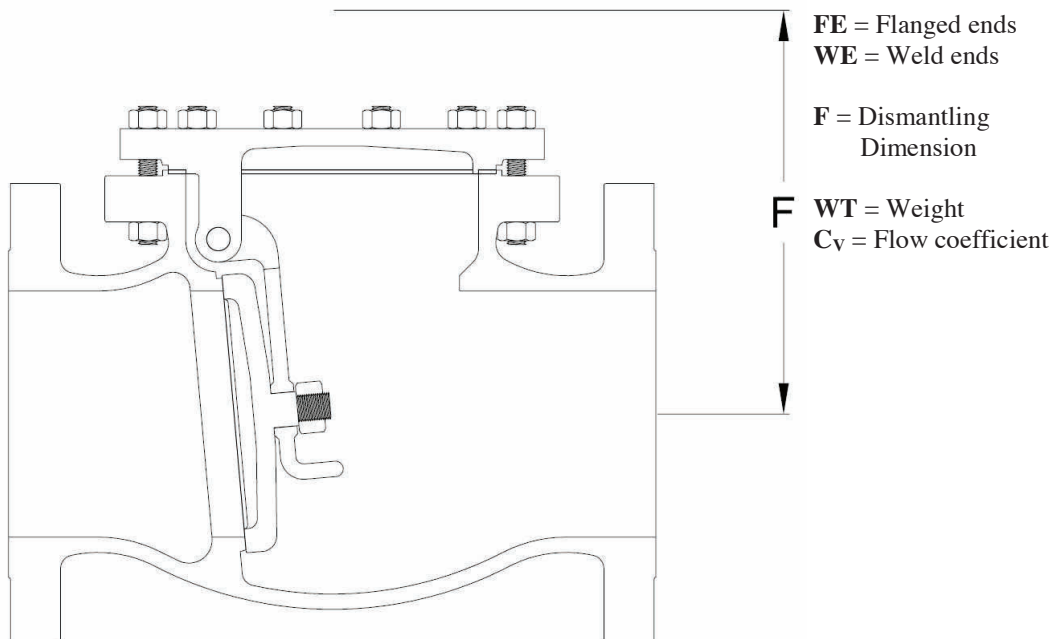
SIZE	ASME 150				ASME 300				ASME 600			
in mm	A	B	C	D	A	B	C	D	A	B	C	D
½	4.25	2.2	2.4	0.50	6.00	2.2	2.4	0.50	6.50	2.3	2.4	0.50
13	108	55	61	13	152	55	61	13	165	58	61	13
¾	4.62	3.0	2.8	0.75	7.00	3.0	2.8	0.75	7.50	3.1	2.8	0.75
20	117	76	70	19	178	76	70	19	190	79	70	19
1	5.00	3.4	3.2	1.00	8.50	3.4	3.2	1.00	8.50	3.5	3.2	1.00
25	127	86	81	25	216	86	81	25	216	90	81	25
1½	6.50	4.1	4.2	1.50	9.50	4.1	4.2	1.50	9.50	4.3	4.2	1.50
38	165	103	106	38	241	103	106	38	241	108	106	38
2	8.00	4.6	4.6	2.00	10.50	4.6	4.6	2.00	11.50	5.4	6.5	2.00
50	203	116	117	51	267	116	117	51	292	138	165	51
2½	8.50	5.6	5.9	2.50	11.50	5.6	5.9	2.50	13.00	7.4	7.9	2.50
65	216	142	151	170	292	142	151	170	330	189	200	64
3	9.50	5.8	6.8	3.00	12.50	5.8	6.8	3.00	14.00	8.3	8.5	3.00
80	241	148	171	192	318	148	171	192	356	212	215	76
4	11.50	6.5	7.4	4.00	14.00	6.5	7.4	4.00	17.00	10.3	10.6	4.00
100	292	165	189	213	356	164	189	213	432	262	270	102
6	14.00	8.2	10.0	6.00	17.50	8.6	10.0	6.00	22.00	14.0	13.5	6.00
150	356	208	254	273	444	218	254	299	559	356	342	152
8	19.50	10.1	13.8	8.00	21.00	10.7	13.8	8.00	26.00	18.5	17.1	7.88
200	495	257	349	349	533	273	349	375	660	469	435	200
10	24.50	14.2	17.8	10.00	24.50	15.3	18.5	10.00	31.00	21.2	20.1	9.75
250	622	359	451	451	622	388	470	470	787	539	510	248
12	27.50	15.6	20.5	12.00	28.00	17.9	22.3	12.00	33.00	23.4	22.6	11.75
300	698	397	521	521	711	455	565	305	838	594	575	298
14	31.00	16.3	20.9	13.25	33.00	23.4	21.7	13.25	35.00	25.4	23.5	12.88
350	787	413	532	337	838	595	550	337	889	645	598	327
16	34.00	23.7	25.3	15.25	34.00	24.9	27.4	15.25	39.00	28.6	27.6	14.75
400	864	602	642	387	864	632	695	387	991	727	700	375
18	38.50	27.9	29.6	17.25	38.50	28.5	30.4	17.00	43.00	32.5	29.1	16.50
450	978	709	752	438	978	723	772	432	1092	826	740	419
20	38.50	26.7	27.0	19.25	40.00	24.9	29.1	19.00	47.00	31.6	32.3	18.25
500	978	679	685	489	1016	632	738	483	1194	802	820	464
24	51.00	33.5	36.0	23.25	53.00	34.8	37.6	23.00	55.00	40.2	39.4	22.00
600	1295	852	915	591	1346	884	955	584	1397	1020	1000	559



WE = Butt weld
FE = Flanged
B = Center to top

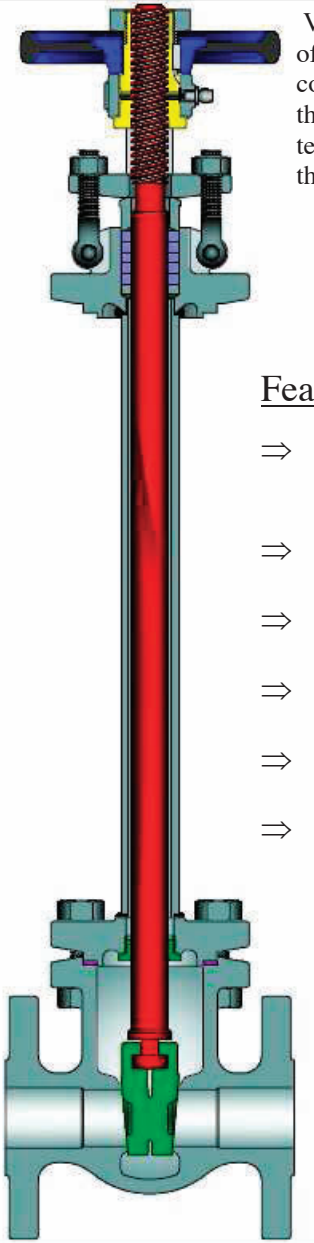
API 603 SWING CHECK VALVES
BOLTED BONNET, CLASSES 150-600
FLANGED AND BUTTWELDED ENDS
CAST STAINLESS STEEL

SIZE	ASME 150							ASME 300							ASME 600						
in	F	in	WT	lb	WT	lb	C _v	F	in	WT	lb	WT	lb	C _v	F	in	WT	lb	WT	lb	C _v
mm		mm	FE	kg	WE	kg			mm	FE	kg	WE	kg			mm	FE	kg	WE	kg	
½	3.8		3.6		2.1		3.9	4.1		7.0		2.1		3.9	4.1		9.1		2.8		3.9
13	97		1.6		1.0			104		3.2		1.0			104		4.1		1.3		
¾	5.4		5.3		3.3		9.2	5.8		12.5		3.3		9.2	5.8		14.9		5.2		9.2
20	137		2.4		1.5			147		5.7		1.5			147		6.8		2.4		
1	6.2		7.5		4.9		17	6.3		18.0		4.9		17	6.5		23.8		6.6		17
25	157		3.4		2.2			160		8.2		2.2			165		10.8		3.0		
1½	7.3		14.6		10.6		40	7.5		30.0		10.6		40	7.8		40.0		14.5		40
38	185		6.6		4.8			191		13.6		4.8			198		18.1		6.6		
2	8.4		24.0		15.5		75	8.7		39.0		15.5		75	9.6		52.4		34.7		75
50	213		10.9		7.0			221		17.7		7.0			244		23.8		15.7		
2½	10.1		33		30		120	10.3		45		34		120	13.1		79		62		120
65	257		17		15			262		22		17			333		36		28		
3	11.0		38		37		175	11.2		73		52		175	14.8		110		79		175
80	279		19		18			284		36		26			376		50		36		
4	12.3		69		51		315	12.6		92		69		315	18.4		215		168		315
100	312		34		25			320		46		34			467		98		76		
6	15.9		119		94		760	16.2		172		124		760	23.8		439		335		760
150	404		59		46			411		85		61			605		199		152		
8	19.0		229		178		1390	19.7		365		273		1390	26.5		811		633		1350
200	483		113		88			500		180		135			673		368		287		
10	25.2		448		348		2175	25.8		759		577		2175	31.1		1343		1047		2070
250	640		221		172			655		375		285			790		609		475		
12	28.6		648		504		3250	30.1		1160		1077		3250	35.4		1702		1363		3120
300	726		320		249			765		526		488			899		772		618		
14	31.5		979		834		3960	37.0		1411		1241		3960	38.6		1958		1585		3740
350	800		444		378			940		640		563			980		888		719		
16	40.1		1438		1250		5250	42.3		1764		1550		5250	44.0		2994		2364		4910
400	1019		652		567			1074		800		703			1118		1358		1072		
18	47.2		1927		1656		6990	48.9		2578		2192		6790	50.7		3449		2932		6400
450	1199		874		751			1242		1169		994			1288		1564		1330		
20	49.4		1771		1522		8700	52.5		2913		2505		8480	53.1		4792		4121		7800
500	1255		803		690			1334		1321		1136			1349		2174		1869		
24	57.7		3559		3062		12700	60.4		5204		4428		12400	62.5		7608		6467		11400
600	1466		1614		1388			1534		2360		2008			1588		3451		2933		



CRYOGENIC VALVES

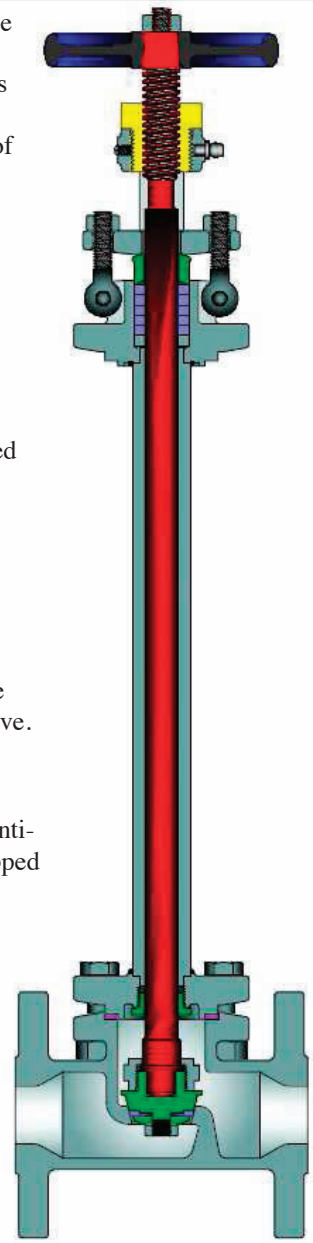
Valves in cold service can present an engineering challenge because of the fragility of the packing at continuously low temperatures. To combat this, Powell Valves offers an assortment of cryogenic valves that all come standard with an extended bonnet and stem. These extensions help to keep the packing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



Cryogenic 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 are offered in bronze or stainless steel and 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 bonnet chamber ventilation in order to prevent excess pressure build up caused by trapped cryogenic liquids.



Cryogenic Globe Valve

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

For more information, see Powell's Cryogenic catalog.

ACCESSORIES

GEAR ACTUATOR

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



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

Typical Adapto-Gear Installation:

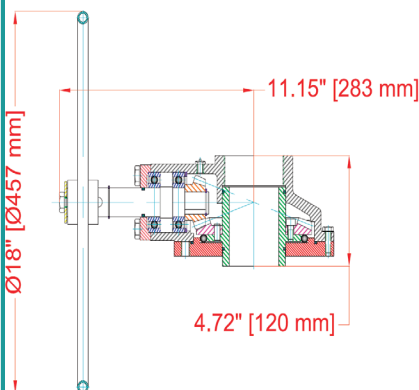
- Remove the handwheel.
- Remove bolts from the yoke, mount the adaptor, replace bolts and tighten.
- Install the sleeve and key on stem bushing.
- Mount gear operator on adaptor and bolt together.
- Conversion is completed.

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

ADVANTAGES

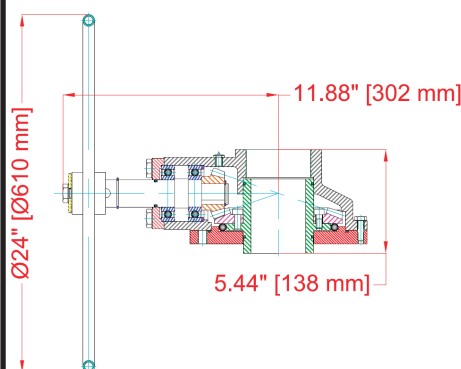
- Anti-friction bearings permits ease of operation.
- Housing protects gears from dirt, dust, and other foreign materials. Also good as a safety factor to protect operating personnel.
- Housing has provision for plug or pipe stem protector when required. Sealed housing retains the lubricant and protects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

MODEL AA-18 ACTUATOR



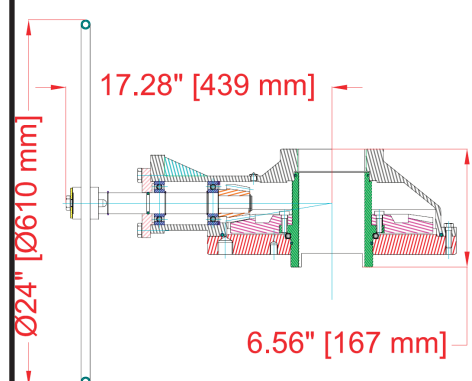
Max Torque: 996 ft-lb [1350 Nm]
Gear Ratio: 2.92:1

MODEL B-24 ACTUATOR



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

MODEL C-24 ACTUATOR

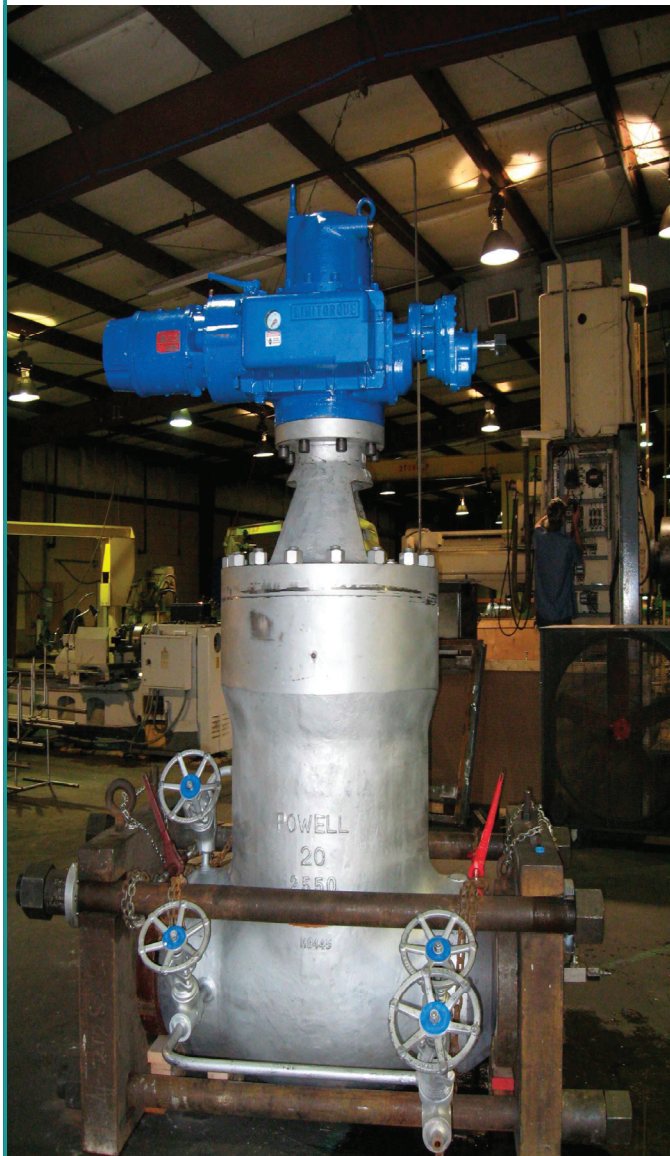


Max Torque: 3980 ft-lb [5400 Nm]
Gear Ratio: 6:1

ACCESSORIES cont...

MOTOR ACTUATOR

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

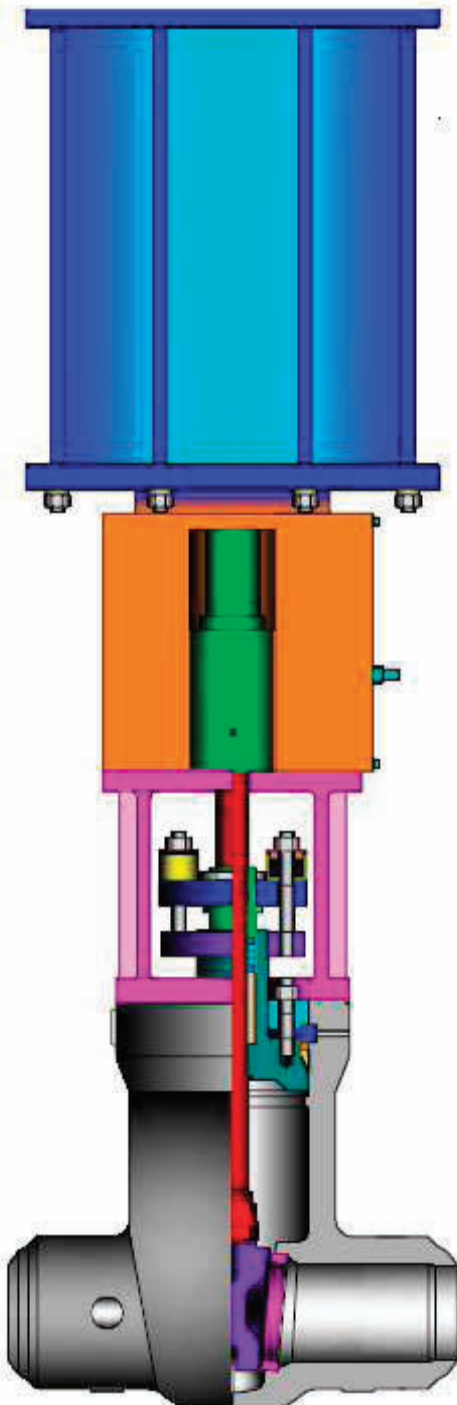


To enable Powell to quote accurately on Motor Actuated Valves, please provide the following complete information:

- A. Valve Size and Figure Number
- B. Media
- C. Media Pressure and Temperature
- D. Differential Pressure against which the valve must open and close and Line Pressure if different from differential pressure.
- E. Opening or Closing Time Requirements. Unless specified - gate valve stem speed is 12" per minute (approx.) and globe valve stem speed is 4" per minute (approx.).
- F. Voltage, Frequency and Number of Phases
- G. Special Features (e.g. control station requirements, special enclosure types, etc.)

ACCESSORIES cont...

HYDRAULIC OR PNEUMATIC ACTUATOR



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

When ordering such valves, please provide the following information:

- A. Valve Size and Figure Number
- B. Media
- C. Media Pressure and Temperature
- D. Differential Pressure against which the valve must open and close and Line Pressure if different from differential pressure.
- E. Opening or Closing Time Requirements
- F. Actuator Media Pressure - Min./Max.
- G. Failure Position (open, close, or as is)
- H. Special Features (e.g. limit switches, manual override, etc.)
- I. Environmental Temperature Range - Min./Max.

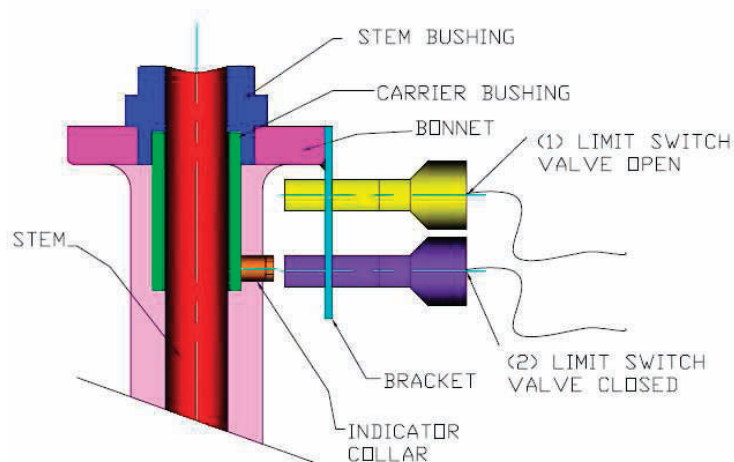
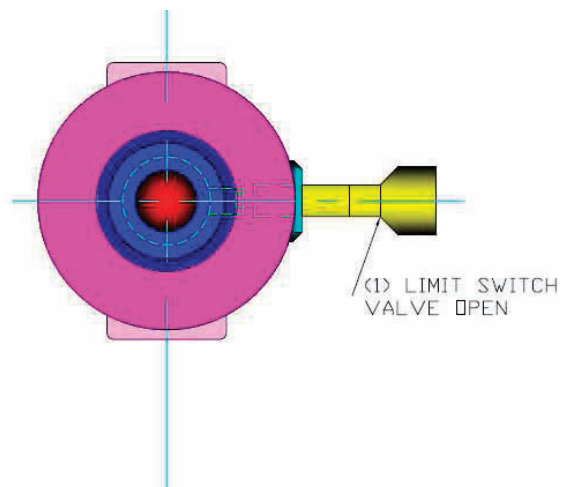
ACCESSORIES cont...

LIMIT SWITCH

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

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

Typical installation on handwheel operated valves.



	PAGE
VALVE STANDARDS AND RELATED INFORMATION	31
PRESSURE/TEMPERATURE RATINGS	32-37
CHEMICAL AND PHYSICAL PROPERTIES	38
TRIM DESCRIPTIONS	39
SOCKET WELD END DIMENSIONS	40
DIMENSIONS OF WROUGHT STEEL PIPE AND WELD END CONFIGURATIONS	41-46
STEEL VALVE FLANGE DIMENSIONS	47-49
METHOD OF DESIGNATING LOCATION OF AUXILIARY CONNECTIONS	50
FLOW DESIGN AND MAINTENANCE RECOMMENDATIONS	51
CONVERSION DATA AND EQUIVALENTS	52-53

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

VALVE STANDARDS AND RELATED INFORMATION

1. Steel and Corrosion Resistant Designs

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

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

- (B) API 603 → Corrosion-resistant, Bolted Bonnet Gate Valves—Flanged and Butt-welding Ends

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

- (C) API Standard 598 → Valve Inspection and Testing

This standard is referenced by API 603 and contains minimum inspection and pressure test requirements.

- (D) ASME B16.5 → Pipe Flanges and Flanged Fittings

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

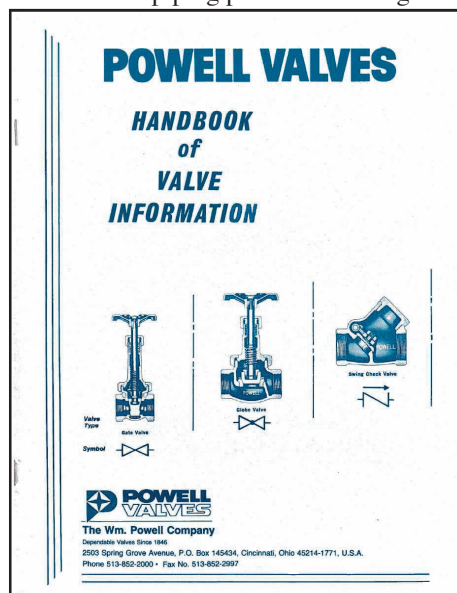
- (F) ASME B16.25 → Buttwelding Ends

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

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 A351 Grade CF3M (316L) (a)
ASTM A351 Grade CF8M (316) (b)
ASTM A351 Grade CG3M (317L) (a)
ASTM A351 Grade CG8M (317) (c)

- (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.
(c) Not to be used over 1000° F.

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 2

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

- (a) Not to be used over 800° F.
(b) At temperatures over 1000° F, use only when the carbon content is 0.04% or higher. This requirement must be specified by customer when applicable.

STANDARD CLASS

Working Pressures by Classes, psig							
Temperature, °F	150	300	600	900	1500	2500	4500
-20 to 100	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, °F	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

PRESSURE/TEMPERATURE RATINGS

TABLE 3

ASTM A351 Grade CF8C (347)

At temperatures over 1000° F, use only when the carbon content is 0.04% or higher. This requirement must be specified by customer when applicable.

STANDARD CLASS

Working Pressures by Classes, psig							
Temperature, °F	150	300	600	900	1500	2500	4500
-20 to 100	275	720	1,440	2,160	3,600	6,000	10,800
200	255	660	1,325	1,985	3,310	5,520	9,935
300	230	615	1,235	1,850	3,085	5,140	9,250
400	200	575	1,150	1,730	2,880	4,800	8,640
500	170	540	1,085	1,625	2,710	4,520	8,135
600	140	515	1,030	1,550	2,580	4,300	7,740
650	125	505	1,015	1,520	2,530	4,220	7,595
700	110	495	995	1,490	2,485	4,140	7,450
750	95	490	985	1,475	2,460	4,100	7,380
800	80	485	975	1,460	2,435	4,060	7,310
850	65	485	970	1,455	2,425	4,040	7,270
900	50	450	900	1,350	2,245	3,745	6,740
950	35	385	775	1,160	1,930	3,220	5,795
1,000	20	365	725	1,090	1,820	3,030	5,450
1,050	20(1)	360	720	1,080	1,800	3,000	5,400
1,100	20(1)	310	625	935	1,560	2,600	4,680
1,150	20(1)	210	420	625	1,045	1,745	3,135
1,200	20(1)	150	300	455	755	1,255	2,265
1,250	20(1)	115	225	340	565	945	1,695
1,300	20(1)	75	150	225	375	630	1,130
1,350	20(1)	50	105	155	255	430	770
1,400	15(1)	40	80	125	205	345	615
1,450	10(1)	30	60	95	155	255	465
1,500	10(1)	25	55	80	135	230	410

NOTE: (1) 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	290	750	1,500	2,250	3,750	6,250	11,250
200	275	715	1,435	2,150	3,585	5,975	10,750
300	255	660	1,320	1,975	3,295	5,490	9,885
400	240	620	1,245	1,865	3,105	5,180	9,320
500	230	600	1,200	1,800	3,000	5,000	9,000
600	220	575	1,150	1,730	2,880	4,800	8,640
650	215	565	1,130	1,695	2,825	4,710	8,480
700	215	555	1,110	1,665	2,770	4,620	8,315
750	210	550	1,100	1,645	2,745	4,575	8,235
800	210	545	1,090	1,630	2,720	4,530	8,155
850	205	540	1,080	1,625	2,705	4,510	8,115
900	205	540	1,080	1,625	2,705	4,510	8,115
950	180	470	945	1,415	2,360	3,930	7,070
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	150	390	780	1,170	1,950	3,250	5,850
1,150	100	260	525	785	1,305	2,180	3,920
1,200	70	190	375	565	945	1,570	2,830
1,250	55	140	285	425	705	1,180	2,120
1,300	35	95	190	285	470	785	1,415
1,350	25	65	130	195	320	535	965
1,400	20	50	105	155	255	430	770
1,450	15	40	75	115	195	320	580
1,500	15	35	70	105	170	285	515

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

PRESSURE/TEMPERATURE RATINGS

TABLE 4

ASTM A351 Grade CN7M (Alloy 20)

STANDARD CLASS

Working Pressures by Classes, psig

Temperature, °F	150	300	600	900	1500	2500	4500
-20 to 100	230	600	1,200	1,800	3,000	5,000	9,000
200	200	520	1,035	1,555	2,590	4,320	7,775
300	180	465	930	1,395	2,330	3,880	6,985
400	160	420	845	1,265	2,110	3,520	6,335
500	150	390	780	1,165	1,945	3,240	5,830
600	140	360	720	1,080	1,800	3,000	5,400

SPECIAL CLASS

Working Pressures by Classes, psig

Temperature, °F	150	300	600	900	1500	2500	4500
-20 to 100	255	665	1,330	1,995	3,320	5,535	9,965
200	215	560	1,125	1,685	2,805	4,680	8,420
300	195	510	1,020	1,535	2,550	4,260	7,665
400	180	470	945	1,415	2,355	3,930	7,070
500	165	435	870	1,300	2,170	3,615	6,510
600	155	400	805	1,205	2,010	3,350	6,025

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

PRESSURE/TEMPERATURE RATINGS

TABLE 5

ASTM A494 Grade M35-1 (Monel)

STANDARD CLASS

Working Pressures by Classes, psig

Temperature, °F	150	300	600	900	1500	2500	4500
-20 to 100	230	600	1,200	1,800	3,000	5,000	9,000
200	200	525	1,050	1,575	2,630	4,380	7,885
300	190	490	980	1,470	2,450	4,080	7,345
400	180	475	945	1,420	2,365	3,940	7,090
500	170	475	945	1,420	2,365	3,940	7,090
600	140	475	945	1,420	2,365	3,940	7,090
650	125	475	945	1,420	2,365	3,940	7,090
700	110	470	940	1,410	2,350	3,920	7,055
750	95	465	930	1,395	2,330	3,880	6,985
800	80	460	915	1,375	2,290	3,820	6,875
850	65	375	755	1,130	1,885	3,145	5,655
900	50	275	550	825	1,370	2,285	4,115

SPECIAL CLASS

Working Pressures by Classes, psig

Temperature, °F	150	300	600	900	1500	2500	4500
-20 to 100	255	670	1,340	2,010	3,350	5,580	10,045
200	225	585	1,175	1,760	2,935	4,890	8,800
300	210	545	1,095	1,640	2,730	4,555	8,195
400	200	530	1,055	1,585	2,640	4,395	7,915
500	200	530	1,055	1,585	2,640	4,395	7,915
600	200	530	1,055	1,585	2,640	4,395	7,915
650	200	530	1,055	1,585	2,640	4,395	7,915
700	200	525	1,050	1,575	2,625	4,375	7,875
750	200	520	1,040	1,560	2,600	4,330	7,795
800	195	510	1,025	1,535	2,560	4,265	7,675
850	180	470	945	1,415	2,355	3,930	7,070
900	130	345	685	1,030	1,715	2,855	5,145

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

PRESSURE/TEMPERATURE RATINGS

TABLE 6

ASTM A494 Grade CW-12MW (Hastelloy C)

Not to be used over 1000° F. Material to be in the solution annealed condition.

STANDARD CLASS

Working Pressures by Classes, psig

Temperature, °F	150	300	600	900	1500	2500	4500
-20 to 100	230	600	1,200	1,800	3,000	5,000	9,000
200	210	550	1,105	1,655	2,760	4,600	8,280
300	200	520	1,040	1,560	2,605	4,340	7,810
400	190	490	980	1,470	2,450	4,080	7,345
500	170	465	925	1,390	2,315	3,860	6,950
600	140	440	880	1,320	2,195	3,660	6,590
650	125	430	860	1,290	2,150	3,580	6,445
700	110	420	835	1,255	2,090	3,480	6,265
750	95	410	820	1,230	2,050	3,420	6,155
800	80	400	800	1,200	2,005	3,340	6,010
850	65	395	785	1,180	1,970	3,280	5,905
900	50	385	775	1,160	1,930	3,220	5,795
950	35	380	760	1,140	1,895	3,160	5,690
1,000	20	365	725	1,090	1,820	3,030	5,450

SPECIAL CLASS

Working Pressures by Classes, psig

Temperature, °F	150	300	600	900	1500	2500	4500
-20 to 100	255	670	1,340	2,010	3,350	5,580	10,045
200	235	615	1,230	1,850	3,080	5,135	9,040
300	225	580	1,165	1,745	2,905	4,845	8,720
400	210	545	1,095	1,640	2,730	4,555	8,195
500	200	515	1,035	1,550	2,585	4,310	7,755
600	190	490	980	1,470	2,450	4,085	7,355
650	185	480	960	1,440	2,395	3,995	7,190
700	180	465	930	1,400	2,330	3,885	6,990
750	175	460	915	1,375	2,290	3,815	6,870
800	170	445	895	1,340	2,235	3,730	6,710
850	170	440	880	1,320	2,195	3,660	6,590
900	165	430	865	1,295	2,155	3,595	6,470
950	160	425	845	1,270	2,115	3,525	6,350
1,000	160	415	830	1,245	2,075	3,460	6,230

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 NICKEL ALLOYS

TABLE 7

ASTM STANDARD GRADE TYPE		A351 CF3 304L	A351 CF8 304	A351 CF3M 316L	A351 CF8M 316	A351 CN7M Alloy20	A351 CG3M 317L	A351 CG8M 317	A351 CF8C 347	A494 M35-1 Monel	A494 CW12MW Hast.C
CARBON (C)	(Min)	-	-	-	-	-	-	-	-	-	-
	(Max)	0.03	0.08	0.03	0.08	0.07	0.03	0.08	0.08	0.35	0.12
MANGANESE (Mn)	(Min)	-	-	-	-	-	-	-	-	-	-
	(Max)	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.00
PHOSPHOROUS (P)	(Min)	-	-	-	-	-	-	-	-	-	-
	(Max)	0.040	0.040	0.040	0.040	0.040	0.04	0.04	0.040	0.03	0.040
SULFUR (S)	(Min)	-	-	-	-	-	-	-	-	-	-
	(Max)	0.040	0.040	0.040	0.040	0.040	0.04	0.04	0.040	0.03	0.030
SILICON (Si)	(Min)	-	-	-	-	-	-	-	-	-	-
	(Max)	2.00	2.00	1.50	1.50	1.50	1.50	1.50	2.00	1.25	1.00
COPPER (Cu)	(Min)	-	-	-	-	3.0	-	-	-	26.0	-
	(Max)	-	-	-	-	4.0	-	-	-	33.0	-
NICKEL (Ni)	(Min)	8.0	8.0	9.0	9.0	27.5	9.0	9.0	9.0	-	-
	(Max)	12.0	11.0	13.0	12.0	30.5	13.0	13.0	12.0	Balance	Balance
CHROMIUM (Cr)	(Min)	17.0	18.0	17.0	18.0	19.0	18.0	18.0	18.0	-	15.5
	(Max)	21.0	21.0	21.0	21.0	22.0	21.0	21.0	21.0	-	17.5
MOLYBDENUM (Mo)	(Min)	-	-	2.0	2.0	2.0	3.0	3.0	-	-	16.0
	(Max)	0.50	0.50	3.0	3.0	3.0	4.0	4.0	0.50	-	18.0
VANADIUM (V)	(Min)	-	-	-	-	-	-	-	-	-	0.20
	(Max)	-	-	-	-	-	-	-	-	-	0.40
TUNGSTEN (W)	(Min)	-	-	-	-	-	-	-	-	-	3.75
	(Max)	-	-	-	-	-	-	-	-	-	5.25
COLUMBIUM (Cb)	(Min)	-	-	-	-	-	-	-	-	-	-
	(Max)	-	-	-	-	-	-	-	***	0.5	-
IRON (Fe)	(Min)	-	-	-	-	-	-	-	-	-	4.5
	(Max)	-	-	-	-	-	-	-	-	3.50	7.5
TENSILE STRENGTH	(Min)	70 Ksi	70 Ksi	70 Ksi	70 Ksi	62 Ksi	75 Ksi	75 Ksi	70 Ksi	65 Ksi	72 Ksi
YIELD STRENGTH	(Min)	30 Ksi	30 Ksi	30 Ksi	30 Ksi	25 Ksi	35 Ksi	35 Ksi	30 Ksi	25 Ksi	40 Ksi
ELONGATION	(Min)	35%	35%	30%	30%	35%	25%	25%	30%	25%	4%
TEMPERATURE	(Min)**	-425F	-425F	-425F	-425F	-325F	-425F	-425F	-425F	-325F	-325F
	(Max)	800F	1500F*	850F	1500F*	600F	850F	1500F*	1500F*	900F	1000F

*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.

***COLUMBIUM content of not less than 8 times the CARBON content, but not over 1.00%.

NOTE: Chemical Compositions Are In Units Of Percent

TRIM DESCRIPTIONS

TABLE 8

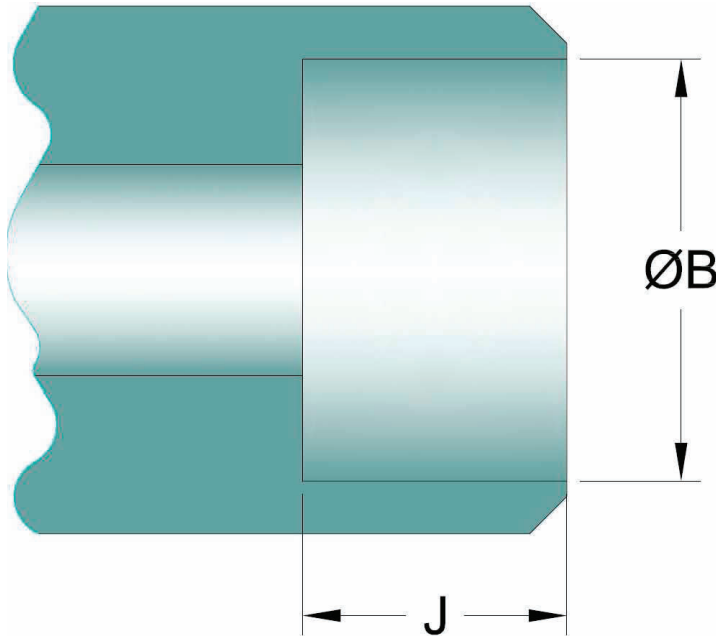
API Trim No.	Powell Trim Designation	Seat Nominal Description	Seat Nominal Composition	Nominal Hardness (HB)	Typical Stem/ Backseat Material
1	1	F6	13 Cr	250 min (a)	TYPE 410 or 420 (13Cr)
2	E	304	18Cr-8Ni	-	TYPE 304 (18Cr-8Ni)
5	5	Hardfaced	Co-CrA (b)	350	TYPE 410 or 420 (13 Cr)
8	8	F6 and	13 Cr.	250	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 TM or equal.

SOCKET WELD END DIMENSIONS

TABLE 9



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

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

DIMENSIONS OF WROUGHT STEEL PIPE AND WELD END CONFIGURATIONS

TABLE 10

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 10 (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 10 (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

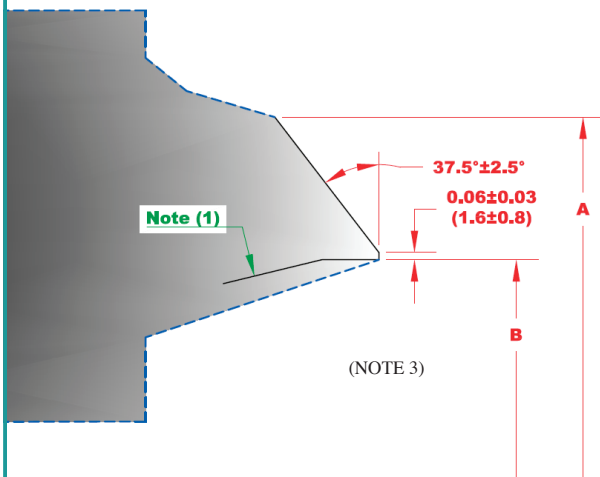
TABLE 10 (cont.)

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

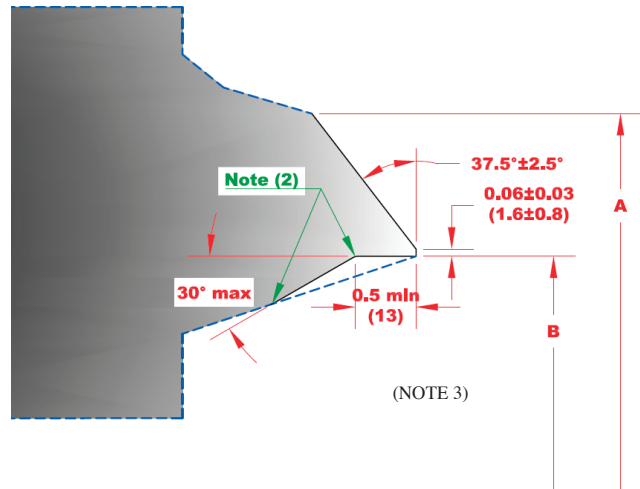
*SEE SKETCHES 1 AND 2

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

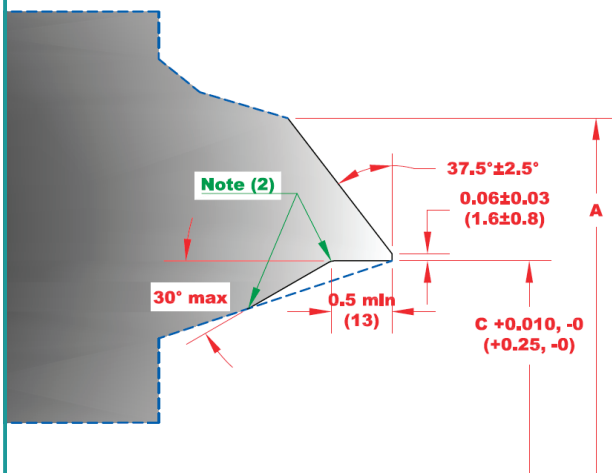
REFER TO ASME 16.25 FIG 2.



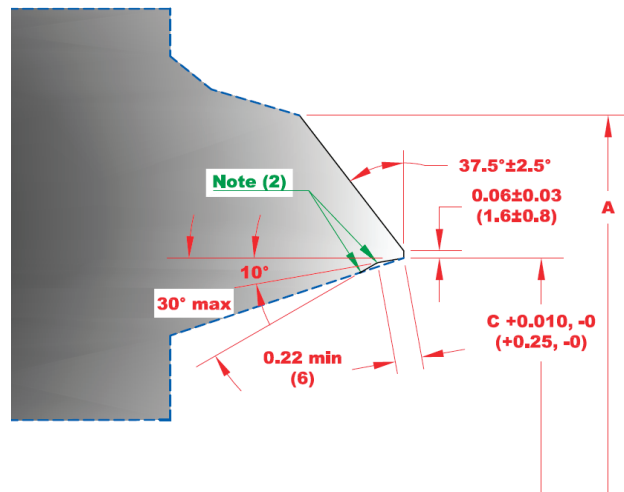
(a) Welding End Detail for Joint without Backing Ring



(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:

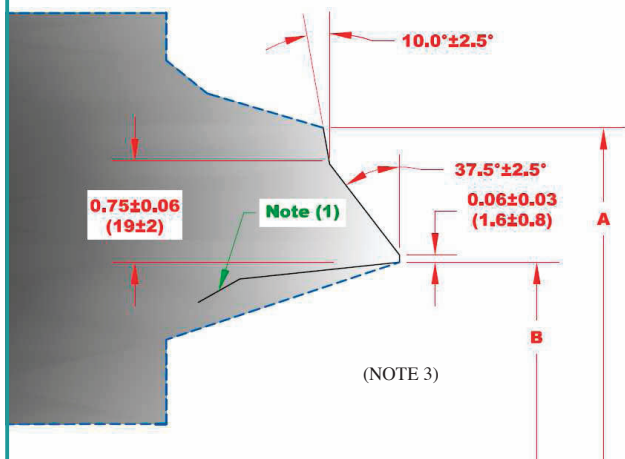
- Broken lines denote maximum envelope for transition from welding bevel and root face into body of component. Refer to Figure 1 of ASME B16.25 for details.
- Purchase order must specify contour of any backing ring to be used.
- Linear dimensions are in inches with millimeter values in parentheses.

NOTES:

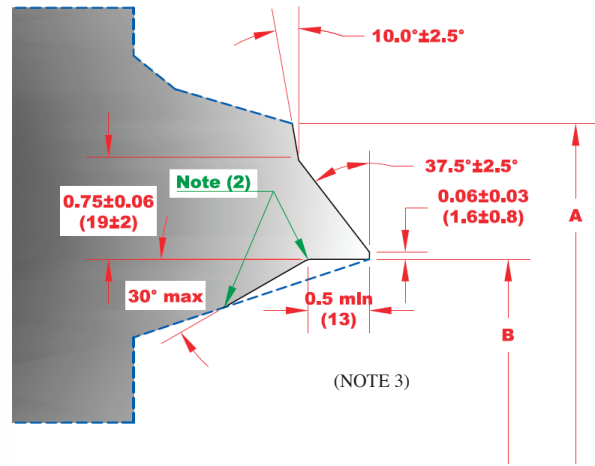
- Internal surface may be as-formed or machined for dimension B at root face.
- Intersections should be slightly rounded.
- Tolerances for "B" dimension on valve weld ends:
 - ± 0.03 " (± 1.0 mm) for $NPS \leq 10$
 - ± 0.06 " (± 2.0 mm) for $12 \leq NPS \leq 18$
 - $+0.12$ ", -0.06 " ($+3.0$ mm, -2.0 mm) for $NPS \geq 20$

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

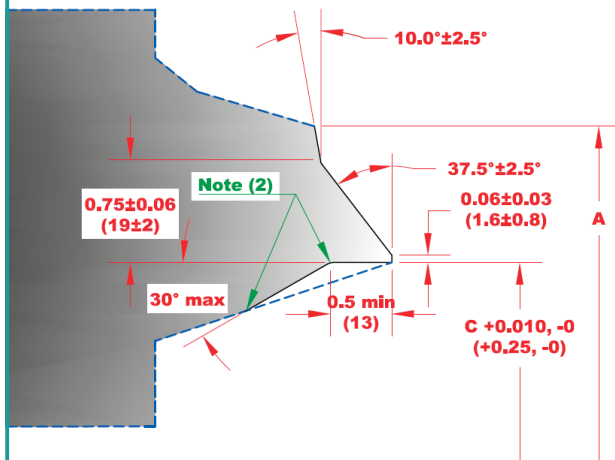
REFER TO ASME 16.25 FIG 3.



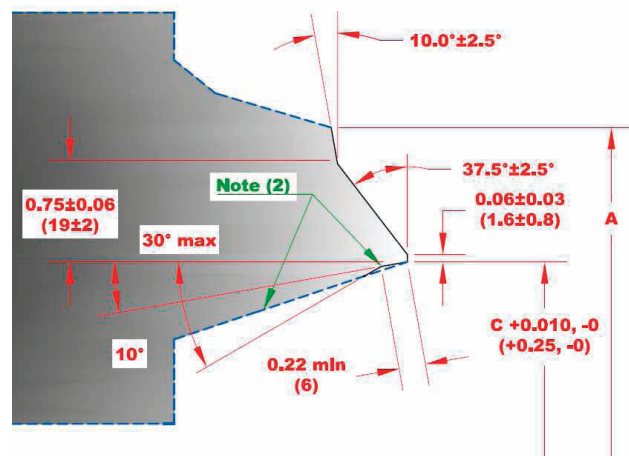
(a) Welding End Detail for Joint without Backing Ring



(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:

- 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.
- Purchase order must specify contour of any backing ring to be used.
- Linear dimensions are in inches with millimeter values in parentheses.

NOTES:

- Internal surface may be as-formed or machined for dimension B at root face.
- Intersections should be slightly rounded.
- 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 11: ASME B16.5 CLASSES 150 and 300, Sizes $\frac{1}{2}$ " through 24"

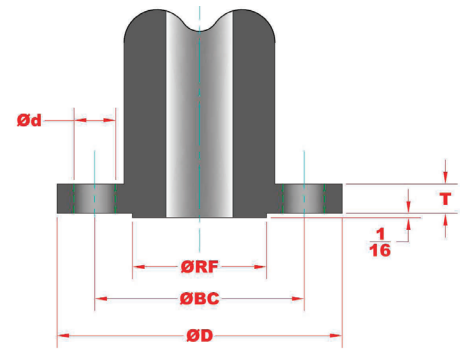
TABLE 12: ASME B16.5 CLASSES 600, Sizes $\frac{1}{2}$ " through 24"

STEEL VALVE FLANGE FITTING DIMENSIONS

TABLE 11

All Dimensions in Units of Inches

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

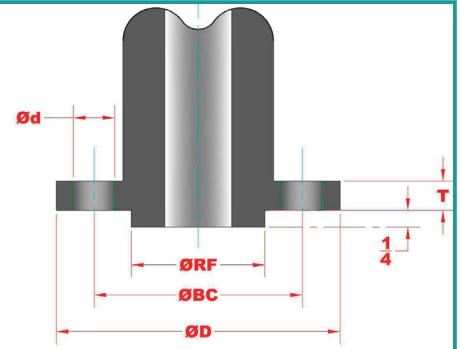
Nominal Pipe Size	Outside Diameter of Flange (D)	Diameter of Bolt Circle (BC)	Diameter of Bolt Holes (d)	Number of Bolts	Thickness (T)	Raised Face Diameter (RF)
½	3.75	2.62	0.62	4	0.50	1.38
¾	4.62	3.25	0.75	4	0.56	1.69
1	4.88	3.50	0.75	4	0.62	2.00
1 ¼	5.25	3.88	0.75	4	0.69	2.50
1 ½	6.12	4.50	0.88	4	0.75	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 12

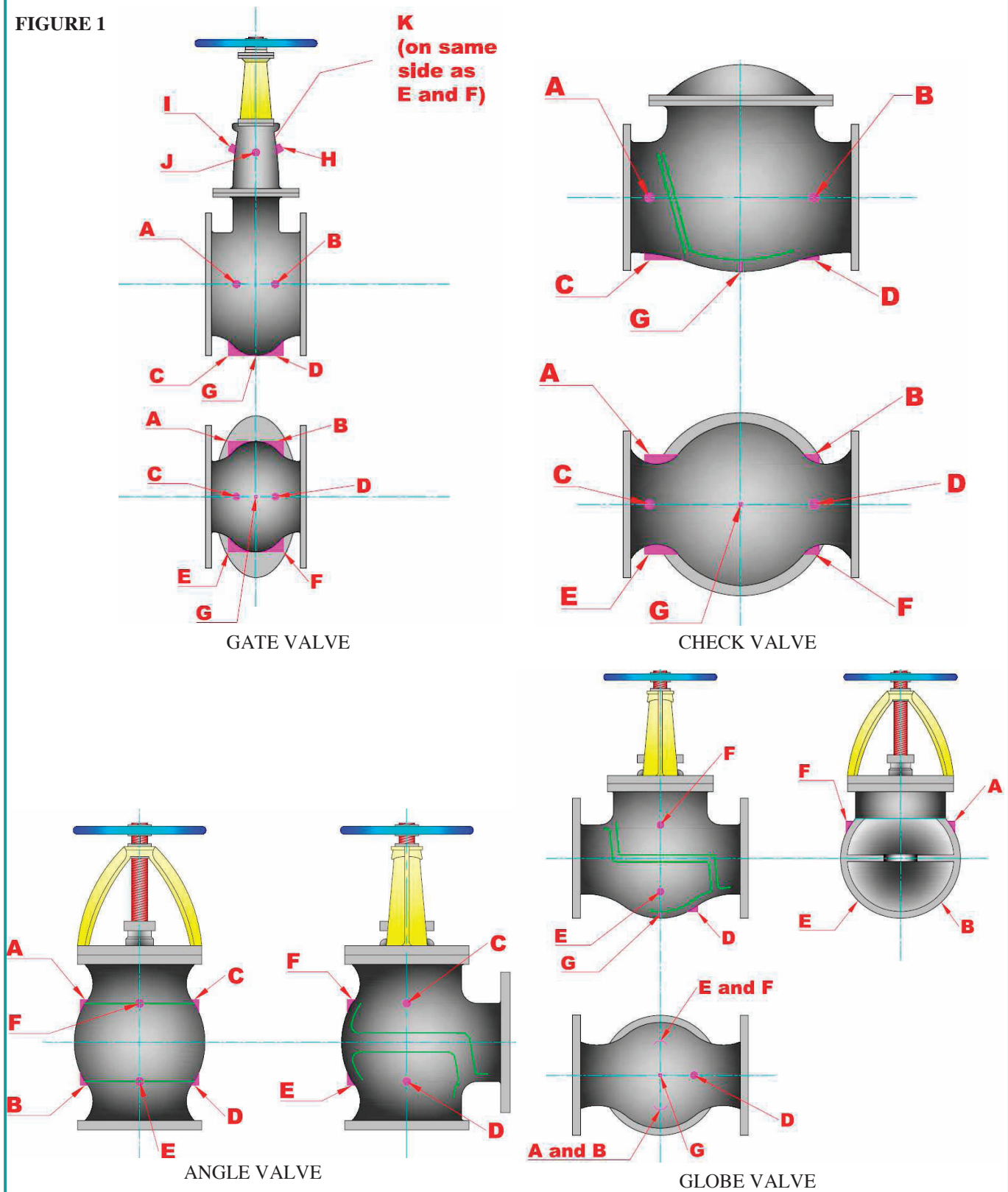
CLASS 600



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)
$\frac{1}{2}$	3.75	2.62	0.62	4	0.56	1.38
$\frac{3}{4}$	4.62	3.25	0.75	4	0.62	1.69
1	4.88	3.50	0.75	4	0.69	2.00
1 $\frac{1}{4}$	5.25	3.88	0.75	4	0.81	2.50
1 $\frac{1}{2}$	6.12	4.50	0.88	4	0.88	2.88
2	6.50	5.00	0.75	8	1.00	3.62
2 $\frac{1}{2}$	7.50	5.88	0.88	8	1.12	4.12
3	8.25	6.62	0.88	8	1.25	5.00
3 $\frac{1}{2}$	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



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 $\frac{1}{2}$ 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):

<u>VALVE SIZE</u>	<u>WATER</u> (FT/MIN)	<u>SATURATED STEAM</u> (FT/MIN)	<u>SUPERHEATED STEAM</u> (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 31.**

COMPARISON CHART OF VALVE SIZE/NOMINAL PIPE SIZE

TABLE 13

<u>METRIC NOMINAL SIZE</u> (DN)	<u>ENGLISH NOMINAL SIZE</u> (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**	2.768
	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 14

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 States 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.

The logo for Powell Valves features the word "POWELL" in a bold, solid blue, sans-serif font. Below it, the word "VALVES" is written in a large, white, outlined, sans-serif font. A thick blue horizontal line is positioned directly beneath the word "VALVES".

Established 1846



POWELL VALVES

2503 SPRING GROVE AVENUE, CINCINNATI, OHIO 45214-1771, U.S.A.

PHONE 513.852.2000 • FAX NO. 513.852.2997

www.powellvalves.com