Ductile Iron Valve Specifications

VALVES $2^1/_2$" AND LARGER — 285 PSI CWP APPLICATION

Gate Valves	Valves to be Class 150 and 285 PSI CWP, tested in accordance with Manufacturers Standardization Society, flanged, bolted bonnet, OS&Y or Non-Rising, Ductile Iron body, bronze trimmed, with body and bonnet conforming to ASTM A 395 Ductile Iron. Packing and gaskets to be non-asbestos.
Globe/Angle Valves	Valves to be Class 150 and 285 PSI CWP, tested in accordance with Manufacturers Standardization Society, flanged, bolted bonnet, OS&Y, Ductile Iron body, bronze trimmed, with body and bonnet conforming to ASTM A 395 Ductile Iron. Packing and gaskets to be non-asbestos.
Check Valves	Valves to be Class 150 and 285 PSI CWP, shall be swing-type tested in accordance with Manufacturers Standardization Society, flanged, bolted bonnet, Ductile Iron body, bronze trimmed, with body and bonnet conforming to ASTM A 395 Ductile Iron, non-asbestos gasket.

VALVES $2^1/_2$" AND LARGER — HIGH PRESSURE STEAM/HYDROCARBON

Gate Valves	Valves to be Class 150 and 285 PSI CWP, tested in accordance with Manufacturers Standardization Society, flanged, bolted bonnet, OS&Y, Ductile Iron body, 316 SS trimmed, with body and bonnet conforming to ASTM A 395 Ductile Iron. Packing and gaskets to be non-asbestos.
Globe/Angle Valves	Valves to be Class 150 and 285 PSI CWP, tested in accordance with Manufacturers Standardization Society, flanged, bolted bonnet, OS&Y, Ductile Iron body, bronze trimmed, with body and bonnet conforming to ASTM A 395 Ductile Iron. Packing and gaskets to be non-asbestos.
Check Valves	Valves to be Class 150 and 285 PSI CWP, shall be swing-type tested in accordance with Manufacturers Standardization Society, flanged, bolted bonnet, Ductile Iron body, 316 SS trimmed, with body and bonnet conforming to ASTM A 395 Ductile Iron, non-asbestos gasket.

GLOSSARY OF TERMS

Ductility:	The ability of a material to become permanently deformed—stretched, drawn, or hammered without failure while maintaining an appreciable load.
Tensile Strength:	Measures in force per unit area [i.e. pounds per square inch (PSI)] the ultimate stress that can be withstood by a material in tension prior to failure.
Yield Strength:	Measures in force per unit area, the stress at which a material will undergo a permanent change in shape (plastic deformation) in response to an applied force.
Elongation:	Measures by percentage, the amount of plastic deformation a material will exhibit in response to a force applied in tension.
Oxide Penetration:	The depth of material deterioration or loss displayed along the surface of a metal that is exposed to highly corrosive (oxidizing) environment.

Ball Valve Seat Materials

Virgin TFE

Virgin TFE is a good all-around, general purpose seating material. TFE has outstanding resistance to chemical attack by a broad spectrum of organic chemicals, inorganic chemicals and solvents and is generally considered chemically inert. TFE is a self lubricating polymer with a very low coefficient of friction, which makes an excellent seating material for quarter-turn ball valves.

Color Code Virgin TFE resin has a natural pigment of WHITE. **Temperature Range** -20°F to +400°F temperature range in ball valve applications. **Pressure Range** 27" vacuum to 600 PSI non-shock water, oil or gas. **Unique Features** Best choice for low pressure sealing, lowest torque of all TFE polymers.	**Typical Applications** Cold and hot potable water, HVAC chilled and hot water. Evaporative cooling systems

15% Reinforced TFE

Color Code 15% reinforced TFE is color coded BLUE. This pigment is permanently molded into the TFE polymer matrix. **Temperature Range** -20°F to +400°F temperature range in ball valve applications.	**Typical Applications** Mid-range steam applications. Throttling and balancing of hydraulic heating and cooling systems.

Pressure Range 27" vacuum to 1,000 PSI non-shock water, oil or gas. **Unique Features** Greater resistance to cold-flow than virgin TFE.	

Ball Valve Seat Materials (2)

25% Reinforced TFE

Color Code 25% reinforced TFE resin has a color code of RED. This pigment is permanently molded into the TFE resin matrix. **Temperature Range** -20^{o}F to +400^{o}F temperature range in ball valve applications. **Pressure Range** 27" vacuum to 2,000 PSI non-shock water, oil or gas.	**Unique Features** Improved dimensional stability. Good wear properties. **Typical Applications** Steam service, natural and bottled gas distribution.

Carbon-Filled TFE

Carbon-filled TFE is an excellent seat material for steam applications as well as high efficiency oil-based thermal fluids. Other fillers, including graphite, enable this seat material to have better cycle life than other filled or reinforced TFE seats. Chemical resistance equal to other TFE and filled TFE products.

Color Code Carbon filled TFE has a natural pigment of BLACK. **Temperature Range** -20° to +500° F temperature range in ball valve applications.	**Typical Applications** High pressure steam and thermal fluids.

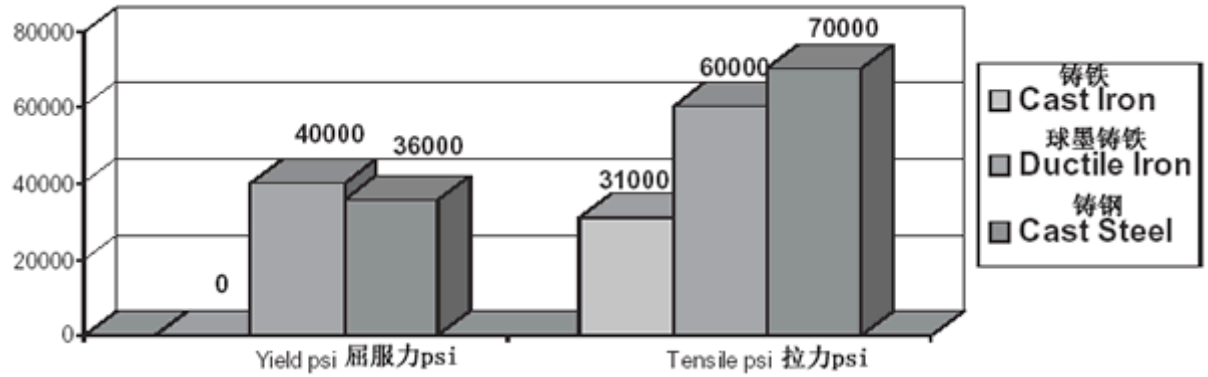
Pressure Range 27" vacuum to 2,000 PSI non-shock water, oil or gas. **Unique Features** Higher cycle life than other TFE resins.	

Nylon

Color Code Natural or Black **Temperature Range** -20° to +160° F temperature range in ball valve applications. **Pressure Range** 27" vacuum to 3,000 PSI. **Unique Features** Used in oil and gas transmission.	**Typical Applications** Grease, oils, aliphatic and aromatic hydrocarbons, paint, cosmetics, and detergents.

How Ductile Iron Compares to Cast Iron and Cast Steel

Minimum Mechanical Properties



Chemical Analysis			
	Cast Iron ASTM A 126 Class B*	**Ductile Iron ASTM A 395**	**Cast Steel ASTM A 216 WCB**
Iron and Residuals%	94.0	94.5	98.1
Carbon%	3.3	3.0	0.3
Silicon%	2.0	2.5	0.6

Manganese%	0.7		1.0
* * Typical composition, ASTM Standard does not specify materials to this detail.			

Pressure/Temperature Ratings Comparing Cast Iron, Ductile Iron and Cast Steel

°F/°C Temperature	ASTM A 126 Cast Iron		ASTM A 395 *Ductile Iron	ASTM A 216 WCB Cast Steel
	Class 125		Class 150	Class 150
	2"-12"	14"-24"	2"-24"	2"-24"
-20°F-100°F	200 psi	150 psi	**285 psi	285 psi
150°F/66°C	200 psi	150 psi	243 psi	
200°F/93°C	190 psi	135 psi	235 psi	260 psi
250°F/121°C	175 psi	125 psi	225 psi	
300°F/149°C	165 psi	110 psi	215 psi	230 psi
350°F/177°C	150 psi	100 psi	210 psi	
400°F/204°C	140 psi		200 psi	200 psi
450°F/232°C	125 psi		185 psi	
500°F/260°C			170 psi	170 psi
550°F/288°C			155 psi	
600°F/316°C			140 psi	140 psi
650°F/343°C			125 psi	126 psi

* These ratings apply when temperature exceeds 450°F and the valve has 316 SS trim. When ASTM B 584 trim is used, maximum temperature limit is 450°F.

** Engineering Note: Ductile Iron flanges are rated at 250 psi in accordance with ANSI B16.42.

Construction Features

Flanges	Ductile Iron Valves adopt standard ANSI B16.42 Class 150 flanges and the same end-to-end dimensions as Class 125 iron or Class 150 steel valves. Thus Ductile Iron valves can easily replace cast iron or steel valves. NIBCO also offers PN10/16 flanges per BS 4504 and compliant to BS 5150 face-to-face dimensions.
Trim	Bronze ASTM B 584, 316 Stainless Steel
Test Pressures	All Ductile Iron Valves are tested to MSS requirements in our ISO 9002 quality certified manufacturing plant in Blytheville, Arkansas.
Color	Ductile Iron valves are painted green in compliance with API 604.

Features and Benefits

Strength	Ductile Iron is a very strong material when compared to cast iron and comparable to cast steel. Ductile Iron has a higher yield strength than cast steel 40K vs. 30K. The strength of Ductile Iron when compared to cast iron is overwhelming. Ductile Iron tensile strength is 60K vs Cast Iron at 31K. Ductile Iron has yield strength of 40K and cast iron has none.
Corrosion Resistance	Ductile Iron has corrosion and oxidation resistance in most cases that surpasses cast steel and is slightly better than cast iron. Oxide penetration can severely affect the strength and performance of valves.
Low Transition Temps	Ferrous metals are subject to brittle fractures with severe temperature changes. The chemical composition of Ductile Iron provides transition temperatures to -20^{o}F. This property is important if physical shock loading is present in cold weather applications.
Cost Effective	These unique characteristics make Ductile Iron a cost-effective option for 150 psi steam service as well as hydrocarbon processing up to 650°F/343°C.

Applications

Steam Service	Ductile Iron gate, globe and check valves are excellent choices for 150 psi steam service. Available with ASTM B 584 bronze trim and CF8M SS trim.
Hydrocarbon Service	Ductile Iron is an acceptable substitute for cast steel in a wide range of processing services both on the production and refining side up to 650^{o}F/343^{o}C.
General Service	Ductile Iron can substitute for standard Class 125 cast iron where there may be concerns with potential stresses and a stronger material is desired, i.e. in situations of unusual pipe movement due to the system or external forces, such as cold weather, earthquakes, etc. Can substitute for Class 250 cast iron for intermediate pressure services using Class 150 flanges up to 285 psi wp. (Should save on valve and flange costs.) Ductile Iron is a good choice for general service, fire protection and Hi-rise applications. Has a higher application temperature than Teflon® seated flanged ball valves.
Marine Service	For shipboard application and tanker piping, many marine agencies recommend the use of Ductile Iron Valves because of its resistance to shock, vibration and superior corrosion-resistant properties. Approved by DOT and Certificate of Approval from Lloyds Register of Shipping. ABS approval available, consult factory.

Bronze Valve Options and Accessories - Seating and Packing

Seating Material

Material:	**TFE**
Max. Pressure:	300 SWP/600 CWP
Max. Temperature:	-28°C 至 204°C -20°F to 400°F
Service:	Oxygen, steam, and all services where the media being handled is not corrosive to the metallic parts of the valve. Available for some NIBCO valves. Specify by adding (Y) to Fig. No., i.e. T-000-Y

Material:	**Viton**
Max. Pressure:	125 SWP/200 CWP
Max. Temperature:	-20°F to 300°F
Service:	Hydrocarbon service, mineral acids and salt solutions that is not corrosive to the metallic parts of the valve.

Material:	**Buna-N**
Max. Pressure:	200 CWP
Max. Temperature:	-40°F to 180°F
Service:	Water, Oil, Gas.

Material:	**Bronze ASTM B 62**
Max. Pressure:	150 SWP/300 CWP
Max. Temperature:	207°C 406°F
Service:	Provides good seating properties for clean moderate service. Should not be used for close throttling or for handling material containing abrasive or corrosive particles.
Material:	**Bronze ASTM B 61**

Max. Pressure:	300 SWP/600 CWP
Max. Temperature:	287°C 550°F
Service:	Provides good seating properties for clean moderate service. Should not be used for close throttling or for handling material containing abrasive or corrosive particles.
Material:	**Nickel Alloy, Semi Plug Only**
Max. Pressure:	300 SWP/600 CWP
Max. Temperature:	287°C 550°F
Service:	General service, nickel alloy material is durable and resists wear and the corrosive action of some dilute acids and alkalis. Available for 300 SWP Globe Valves.
Material:	**Hardened Stainless Steel, Full Plug Only**
Max. Pressure:	300 SWP/600 CWP
Max. Temperature:	287°C 550°F
Service:	Recommended for close throttling and most all severe conditions, not to exceed the valve ratings. Available for 200 and 300 SWP Globe and Angle Valves.

Packing Material

Aramid Fibers with Graphite.

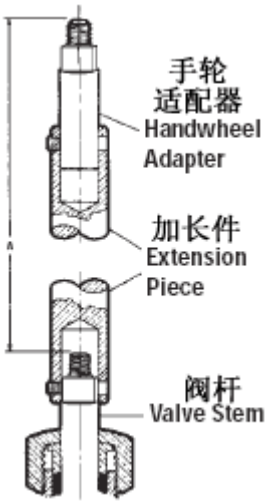
Solid TFE Packing

Bronze Valve Options and Accessories -
Drain Cap, Oxygen Service, Stem Extensions

$^{1}/_{8}$" Drain Cap

A fast and convenient means for draining sections of line between valves.
Specify by adding (D) to Fig. No., i.e. T-111-D.
(Applicable to figure numbers 111, 113 and 211 only.)

Optional Squared Stem Extension
Made from ASTM B 371 62 Alloy C69400 (rod).
Used when valves must be operated from a distance.
Adequate and rigid support must be provided for long stem extension units.
Specify valve size, figure number and length to be added to existing stem length (dimension A). 3" minimum length.



Oxygen Service; Bronze Gate, Globe and Check

The following valves are offered as oxygen cleaned and bagged.

Except for TFE disc and packing, and identification tag, all parts are identical to standard valves. Valves are thoroughly cleaned and degreased and individually packed in sealed polyethylene bags. Consult with factory on availability for other bronze valves to be oxygen cleaned.

Silicone Lubricants in Nacogdoches Plant

Below lists the two ways in which NIBCO bronze gate, globe, check and ball valves are manufactured in our Nacogdoches plant:

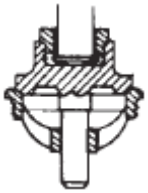
1. **Standard valves:**
   Silicone is **NOT** used in this plant in the production of valves or assembly of any component parts of the above listed products.
2. **Valves can be cleaned for oxygen service:**
   The steps involved are as follows:
   - Clean ultrasonically all component parts with a degreaser in a warm water solution
   - Rinse with warm water in an ultrasonic bath

- Rinse again in cold water
- Put all component parts under black light for inspection of any carbon. If carbon found, repeat steps above.
- Assemble and test valves
- Package the valves in a sealed plastic bag to avoid contamination

Iron Valve Options and Accessories
Seating, Packing and Gasket Materials

Iron Valve Seating Material

Material:	**Iron**
Max. Pressure:	200 CWP
Max. Temperature:	121°C 250°F
Service:	Used where bronze trim is not permitted. Specify by adding (N) to Fig. No., i.e. F-000-N. Available for some NIBCO Gate, Globe, Angle and Check Valves.



Packing and Gasket Materials

1. Standard NIBCO iron valves are furnished with Synthetic Fibers and Graphite packing, along with Synthetic Fibre gaskets. Temperature rated to 550°F. Class 250 iron valves are furnished with TFE Braided packing and Reinforced Graphite gaskets. For other special packing and gaskets, consult factory.
2. Alloy Iron Valves are furnished with TFE Braided packing and Synthetic Fibre gaskets.
3. Graphite Packing and Gaskets optional on some Iron Valves. Consult factory.

Temperature Limits of Materials

Rated Internal Working Pressures of Joints made with Copper Water Tube and Solder Type

Fittings, PSI (Bar)

Solder or Brazing Alloy Used in Joints	Service Temperature		Copper Water Tube K, L and M Nominal Sizes, In Inches (mm)										
			Water A										Saturated Steam LB (kg) All Sizes
	°F	°C	1/4" to 1"		1 1/4" to 2"		2 1/2" to 4"		5" to 8"		10" to 12"		
50- 50 Tin-Lead[B, G]	100	(38)	200	(14)	175	(12)	150	(10)	135	(9)	100	(7)	15° (6.8)°
	150	(66)	150	(19)	125	(8)	100	(7)	90	(6)	70	(4)	
	200	(93)	100	(9)	90	(6)	75	(5)	70	(40)	50	(3)	
	250	(121)	85	(6)	75	(5)	50	(3)	45	(3)	40	(2)	
95-5 Tin-Antimony	100	(38)	635	(43)	560	(39)	375	(26)	340	(23)	150	(10)	15° (6.8)°
	150	(66)	635	(43)	560	(39)	375	(26)	340	(23)	150	(10)	
	200	(93)	630	(43)	480	(33)	375	(26)	340	(23)	140	(10)	
	250	(121)	435	(30)	330	(23)	265	(18)	245	(16)	110	(7)	
Brazing Alloys, Melting at or above 1000°F (538°C)	100-150-200	(32-66-93)	H	H	H	H	H	H	H	H	H	H	120[E] (54.4)[E]
	250[F]	(121)[F]	H	H	H	H	H	H	H	H	H	H	
	350	(177)	H	H	H	H	H	H	H	H	H	H	

The values in the above table are based on data in the National Bureau of Standards publications, "Building Materials and Structures Reports" BMS 58 and BMS 83.

[A] Including other non-corrosive liquids and gases.

[B] ASTM B 32, Alloy Grade Sn50.

[C] ASTM B 32, Alloy Grade Sb5.

[D] This pressure is determined by the temperature of saturated steam at 15 Ib. (6.8 kg) pressure at 250°F (121°C).

[E] This pressure is determined by the temperature of saturated steam at 120 Ib. (54.4 kg) pressures at 350°F (177°C).

For service temperatures lower than 250°F (121°C), the solders as above may be used.

[G] The Safe Drinking Water Act Amendment of 1986 prohibits the use in potable water systems of any solder having a lead content in excess of 0.2%.

[H] Rated internal pressure is that of the tube being joined. While solders can be used, brazing alloys are recommended.

Valve Installation Tips

SOLDERING AND SILVER BRAZING		SILVER BRAZING

Analyze the application to determine which valve is best suited for installations, keeping in mind the service for which the valve is recommended. Before installing the correct valve, review the installation instructions to prevent damage to the valve and to assure its maximum efficiency.

1. Cut tube end square. Ream, burr and size.
2. Use sand cloth or steel wire brush to clean both ends to a bright metal finish. Steel wool is not recommended.
3. Apply flux to outside of tube and inside of solder cup. Surfaces to be joined must be completely covered. Use flux sparingly.
4. Be sure that valve is fully open. Apply heat to tube first. Transfer as much heat as possible through tube into valve. Avoid prolonged heating of valve itself.
5. Silver Brazing Method: Assemble parts to be brazed. If fluxed parts are allowed to stand, the water in the flux will evaporate, and dried flux is liable to flake off, exposing metal surfaces to oxidation. Assemble joint by inserting tube into socket hard against the stop. The assembly should be firmly supported so that it will remain in alignment during the brazing operation.

NOTE: On one-inch and larger valves, it is difficult to bring the whole joint up to temperature at one time. It will frequently be found desirable to use a double-tip torch to maintain the proper temperature over the larger area. A mild pre-heating of the whole socket area is recommended. Apply heat to parts to be joined. The preferred method is by oxy-acetylene flame. Heat tube first, beginning one inch from edge of valve. Sweep flame around tube in short strokes up and down at right angles to run of tube. To avoid burning through tube, the flame should be in continuous motion and not allowed to remain on any one

The strength of a brazed joint does not vary appreciably with the different brazing materials, but depends to a large extent upon the maintenance of proper clearance between the outside of the tube and the valve socket. The interior dimensions of silver brazing valve sockets are machined to the closest tolerances and finished smooth to promote full capillary attraction.

NOTE: Care should be observed in cleaning and in removing residues of the cleaning medium. Attempting to braze a contaminated or improperly cleaned surface will result in an unsatisfactory joint. Silver brazing alloys will not flow over or bond to oxides. Oily or greasy surfaces repel fluxes, leaving bare spots which oxidize and result in voids and inclusions.

THREADING

Grit, dirt or any foreign matter accumulated in the pipe can hinder efficient valve operation and seriously damage vital valve parts. Thoroughly clean pipe internally with air or steam.

When threading pipe, gauge pipe threads for size and length to avoid jamming pipe against seat and disc. Thoroughly clean threaded end to remove any harmful steel or iron deposits. For a good joint, use Teflon tape or pipe dope. If pipe dope is used, apply sparingly on pipe threads, never on valve threads. Do not allow any pipe dope into valve body in order to avoid damage to disc and seat.

Before installation, check line of flow through valve so that valve will function properly. Close valve completely before installation. Apply wrench to hex next to pipe and guard against possible distortion. After installation of valve, support line; a sagging pipe line can distort valve and cause failure.

FLANGED

point.

Apply flame to valve at base of socket. Heat uniformly, sweeping flame from valve to tube until flux on valve becomes quiet. Avoid excessive heating of valve.

When flux appears liquid and transparent on both tube and valve, start sweeping flame back and forth along axis of joint to maintain heat on parts to be joined, especially toward base of valve socket.

6. Use just enough solder: with wire solder, use 3/4" for a 3/4" valve, etc. If too much solder is used, it may flow past tube stop and clog sealing area. When joint is filled, a continuous run of solder or brazing alloy will be visible.
7. Silver Brazing Method: Apply brazing wire or rod at point where tube enters valve socket. Keep flame away from rod or wire as it is fed into the joint. Move flame back and forth as alloy is drawn into joint. When the proper temperature is reached alloy will flow readily into space between tube outer wall and valve socket. When joint is filled, a continuous rim of brazing alloy will be visible.
8. Remove excess solder with small brush while plastic, leaving a fillet around end of valve as it cools.

There are several steps to follow to make sure that a flanged joint will be properly assembled. First, clean the joint carefully. Then loosely assemble the joint by putting in the bottom two or three bolts. Then carefully insert the gasket into place. The bottom bolts will help locate the gasket and hold it in position. Then insert the rest of the bolts into place and tighten all of the bolts evenly—not in rotation, but by the cross-over method to load the bolts evenly and eliminate concentrated stresses. The bolts should be checked for tightness after an appropriate interval of use and retightened if necessary.

Engineering Data
Flange Dimensions

Class 125 Bronze Flange Dimensions
Meets 125 lb. A.S.M.E. Standard

Nominal Size	Dim. A Flange	Dim. B Bolt	Dim. C Thickness	Dia. Bolt	Dia. Bolt	No. Bolt

Class 300 Bronze Flange Dimensions
Meets ANSI STD B16.24

Nominal Size	Dim. A Flange	Dim. B Min.	Dim. C	Dim. Bolt	Bolt. Diam.	No. of[1]

	O.D.	Circle	of Flange	Hole		Holes
1/2	3.50	2.38	0.19	0.63	0.50	4
3/4	3.88	2.75	0.19	0.63	0.50	4
1	4.25	3.13	0.25	0.63	0.50	4
1 1/4	4.63	3.50	0.25	0.63	0.50	4
1 1/2	5.00	3.88	0.31	0.63	0.50	4
2	6.00	4.75	0.38	0.75	0.63	4
2 1/2	7.00	5.50	0.38	0.75	0.63	4
3	7.50	6.00	0.44	0.75	0.63	4
3 1/2	8.50	7.00	0.44	0.75	0.63	8
4	9.00	7.50	0.44	0.75	0.63	8
5	10.00	8.50	0.44	0.88	0.75	8
6	11.00	9.50	0.50	0.88	0.75	8
8	13.50	11.75	0.63	0.88	0.75	8
10	16.00	14.25	0.63	1.00	0.88	12
12	19.00	17.00	0.69	1.00	0.88	12

Class 150 Bronze Flange Dimensions

Meets ANSI STD B16.24 and Federal Spec. WW-F-406

Nominal Size	Dim. A Flange O.D.	Dim. B Bolt Circle	Dim. C Thickness of Flange	Dia. Bolt Hole	Dia. Bolt	No. Bolt Holes
1/2	3.50	2.38	0.31	0.63	0.50	4
3/4	3.88	2.75	0.34	0.63	0.50	4
1	4.25	3.13	0.38	0.63	0.50	4
1 1/4	4.63	3.50	0.40	0.63	0.50	4
1 1/2	5.00	3.88	0.44	0.63	0.50	4

	Diam.	Flange Thickness	Bolt Circle	Hole Diam.		Bolts
1/2	3.75	0.50	2.63	0.63	0.50	4
3/4	4.63	0.53	3.25	0.75	0.63	4
1	4.88	0.59	3.50	0.75	0.63	4
1 1/4	5.25	0.63	3.88	0.75	0.63	4
1 1/2	6.13	0.69	4.50	0.88	0.75	4
2	6.50	0.75	5.00	0.75	0.63	8
2 1/2	7.50	0.81	5.88	0.88	0.75	8
3	8.25	0.91	6.63	0.88	0.75	8
3 1/2	9.00	0.97	7.25	0.88	0.75	8
4	10.00	1.06	7.88	0.88	0.75	8
5	11.00	1.13	9.25	0.88	0.75	8
6	12.50	1.19	10.63	0.88	0.75	12
8	15.00	1.38	13.00	1.00	0.88	12

[1] When flanges are integral with fittings or valves, holes for bolts are drilled to straddle the center line.

2	6.00	4.75	0.50	0.75	0.63	4
$2^1/_2$	7.00	5.50	0.56	0.75	0.63	4
3	7.50	6.00	0.63	0.75	0.63	4
$3^1/_2$	8.50	7.00	0.69	0.75	0.63	8
4	9.00	7.50	0.69	0.75	0.63	8
5	10.00	8.50	0.75	0.88	0.75	8
6	11.00	9.50	0.81	0.88	0.75	8
8	13.50	11.75	0.94	0.88	0.75	8

Corresponding sizes of class 150 (ANSI B16.24) flange diameters and drilling templates are the same as those of the American Class 125 Cast Iron Flange Standard (ANSI B16.1) and of the American Class 150 Steel Flange Standard (ANSI B16.5). Class 300 (ANSI B16.24) flange diameters and drilling templates are the same as those of the American Class 250 Cast Iron Flange Standard (ANSI B16.1) and of the American Class 300 Steel Flange Standard (ANSI B16.5).

Full face gaskets extending to the flange face edge as given in American Standard Non-Metal Gaskets for Pipe Flanges ANSI B16.21 are required. Metal gaskets should not be used.

Engineering Data
Flange Dimensions (2)

Class 125 Cast Iron Flanges - ANSI Standard B16.1
Made with 150-lb. Steel Flanges ANSI Standard B16.5
Dimension in Inches

Size	Diameter of Flange	Thickness of Flange	Diameter of Bolt Circle	Bolt Hole Diameter	Number of Bolts	Diameter of Bolts	*Length of Bolts
2	6.00	0.63	4.75	0.75	4	0.63	2.25
$2^1/_2$	7.00	0.69	5.50	0.75	4	0.63	2.50
3	7.50	0.75	6.00	0.75	4	0.63	2.50
$3^1/_2$	8.50	0.81	7.00	0.75	8	0.63	2.75
4	9.00	0.94	7.50	0.75	8	0.63	3.00
5	10.00	0.94	8.50	0.88	8	0.75	3.00

6	11.00	1.00	9.50	0.88	8	0.75	3.25
8	13.50	1.13	11.75	0.88	8	0.75	3.50
10	16.00	1.19	14.25	1.00	12	0.88	3.75
12	19.00	1.25	17.00	1.00	12	0.88	3.75
14	21.00	1.38	18.75	1.13	12	1.00	4.25
16	23.50	1.44	21.25	1.13	16	1.00	4.50
18	25.00	1.56	22.75	1.25	16	1.13	4.75
20	27.50	1.69	25.00	1.25	20	1.13	5.00
24	32.00	1.88	29.50	1.38	20	1.25	5.50

*When bolting to steel flanges, longer bolts or stud may be required.

Class 250 Cast Iron Flanges - ANSI Standard B16.1
Made with 300 lb. Steel Flanges ANSI Standard B16.5
Dimension in Inches

Size	Diameter of Flange	Thickness of Flange	Diameter of Bolt Circle	Bolt Hole Diameter	Number of Bolts	Diameter of Bolts	*Length of Bolts
2	6.50	.88	5.00	.75	8	.63	2.75
$2^1/_2$	7.50	1.00	5.88	.88	8	.75	3.25
3	8.25	1.13	6.63	.88	8	.75	3.50
$3^1/_2$	9.00	1.19	7.25	.88	8	.75	3.50
4	10.00	1.25	7.88	.88	8	.75	3.75
5	11.00	1.38	9.25	.88	8	.75	4.00
6	12.50	1.44	10.63	.88	12	.75	4.00
8	15.00	1.63	13.00	1.00	12	.88	4.50
10	17.50	1.88	15.25	1.13	16	1.00	5.25
12	20.50	2.00	17.75	1.25	16	1.13	5.50
14	23.00	2.13	20.25	1.25	20	1.13	6.00
16	25.50	2.25	22.50	1.38	20	1.25	6.25
18	28.00	2.38	24.75	1.38	24	1.25	6.50
20	30.50	2.50	27.00	1.38	24	1.25	6.75
24	36.00	2.75	32.00	1.38	24	1.50	7.50

*When bolting to steel flanges, longer bolts or stud may be required.

Special Flange Facings

On special application, Pacific valves can be supplied with special end flange facings other than the raised face or ring joint. The most popular special flange facings are shown below and include large male-female, large tongue-groove, small male-female and small tongue-groove.

STANDARDS

Special flange facings supplied on Pacific valves conform to ANSI B16.5 and B16.20. Bolt templates and flange thickness "Q" for ring joint end flanges are identical to the corresponding size and class raised face flanges shown on preceding page.

FINISH (large male female)

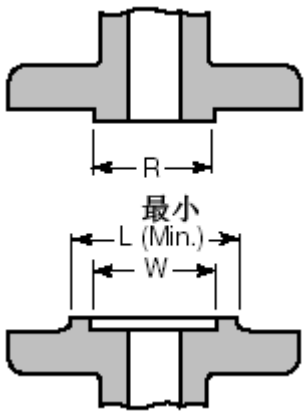
Standard finish of gasket surface is serrated, either spiral or concentric, with 125-200RA finish.

FINISH (small male female and tongue groove)

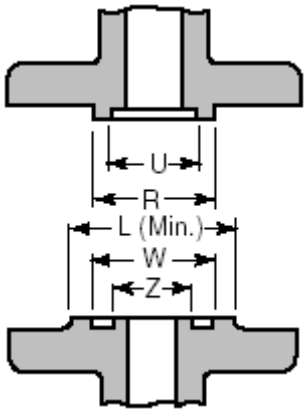
Standard finish of gasket surface is 125-200 micro-inch maximum roughness.

FACE-TO-FACE

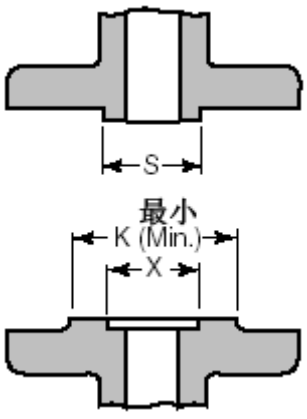
Face-to-face dimensions of Pacific valves with special flange facing will be in accordance with B16.10 and will be furnished upon application.



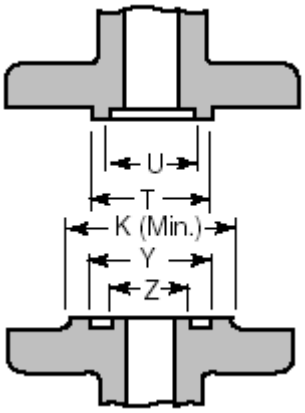
Large Male-female



Large Tongue-Groove



Small Male-Female



Small Tongue-Groove

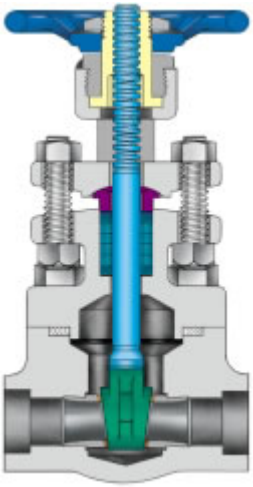
Nom Pipe Size	Outside Diameter			Inside Diameter of Large and Small Tongue	Minimum Outside Diameter of Raised Portion		Outside diameter			Inside Diameter of Large and Small Groove
	Large	Small	Small		Small	Large	Large	Small	Small	

	Male and Large Tongue R	Male S	Tongue T	U	Female and Groove K	Female and Groove L	Female and Groove W	Female X	Groove Y	Z
1/2	1.38	0.72	1.38	1.00	1.75	1.81	1.44	0.78	1.44	0.94
3/4	1.69	0.94	1.69	1.31	2.06	2.12	1.75	1.00	1.75	1.25
1	2.00	1.19	1.88	1.50	2.25	2.44	2.06	1.25	1.94	1.44
11/4	2.50	1.50	2.25	1.88	2.62	2.94	2.56	1.56	2.31	1.81
11/2	2.88	1.75	2.50	2.12	2.88	3.31	2.94	1.81	2.56	2.06
2	3.62	2.25	3.25	2.88	3.62	4.06	3.69	2.31	3.31	2.81
21/2	4.12	2.69	3.75	3.38	4.12	4.56	4.19	2.75	3.81	3.31
3	5.00	3.31	4.62	4.25	5.00	5.44	5.06	3.38	4.69	4.19
31/2	5.50	3.81	5.12	4.75	5.50	5.94	5.56	3.88	5.19	4.69
4	6.19	4.31	5.69	5.19	6.19	6.62	6.25	4.38	5.75	5.12
5	7.31	5.38	6.81	6.31	7.31	7.75	7.38	5.44	6.88	6.25
6	8.50	6.38	8.00	7.50	8.50	8.94	8.56	6.44	8.06	7.44
8	10.62	8.38	10.00	9.38	10.62	11.06	10.69	8.44	10.06	9.31
10	12.75	10.50	12.00	11.25	12.75	13.19	12.81	10.56	12.06	11.19
12	15.00	12.50	14.25	13.50	15.00	15.44	15.06	12.56	14.31	13.44
14	16.25	13.75	15.50	14.75	16.25	16.69	16.31	13.81	15.56	14.69
16	18.50	15.75	17.62	16.75	18.50	18.94	18.56	15.81	17.69	16.69
18	21.00	17.75	20.12	19.25	21.00	21.44	21.06	17.81	20.19	19.19
20	23.00	19.75	22.00	21.00	23.00	23.44	23.06	19.81	22.06	20.94
24	27.25	23.75	26.25	25.25	27.25	27.69	27.31	23.81	26.31	25.19

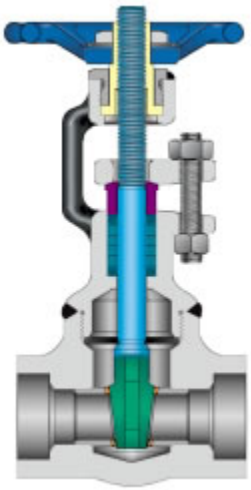
- All dimensions are given in inches.
- Height of large and small male and tongue is 0.25 in. on all sizes and classes.
- Depth of groove or female is 0.19 in. on all sizes and classes.
- Raised portion or full face may be furnished unless otherwise specified on order.
- For small male and female joints care should be taken in the use of these dimensions to insure that the inside diameter of fitting or pipe is small enough to permit sufficient bearing surface to prevent the crushing of the gasket. This applies particularly on lines where the joint is made on the end of the pipe.
- Inside diameter of fitting should match inside diameter of pipe as specified by purchaser.
- Large male and female faces and large tongue and groove are not applicable to Class 150 because of potential dimensional conflicts.

FORGED STEEL GATE VALVES

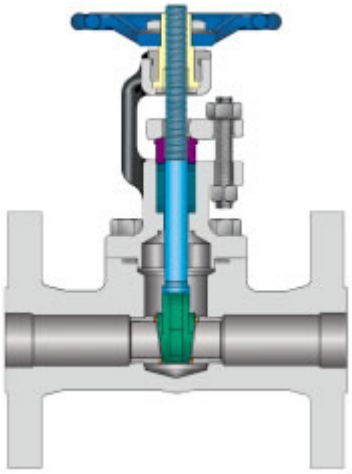
1/4–2" (8–50 mm)
THREADED, SOCKET WELD & FLANGED
ASME CLASS 800: 1975 psi @ 100°F
ASME CLASS 1500: 3705 psi @ 100°F
FLANGED ASME CLASSES 150, 300, 600, 1500



BOLTED BONNET
2054B– Class 800
3054B– Class 1500



WELDED BONNET
2054W– Class 800
3054W– Class 1500



FLANGED BOLTED BONNET
0054B–Class 150 2054B –Class 600
1054B– Class 300 3054B – Class 1500

DESIGN FEATURES

- A compact but extremely sturdy design for high pressure-temperature service.
- Solid Stellite 6 wedge (optional) ensures low friction and long service life.
- For Class 1500 valves and for steam service, seats are seal-welded to the body.
- Packing rings are precompressed to 4000 psi to provide a high integrity seal.
- For welded bonnet valves, the bonnet is threaded in and torqued to an engineered torque value and the body bonnet joint is strength-welded, offering double protection against leakage. (Body/bonnet threads and strength-weld).
- Fully guided wedge reduces wear on seating surfaces.
- Repairable 2-piece stem drive.

OPTIONAL FEATURES (SPECIAL APPLICATIONS)

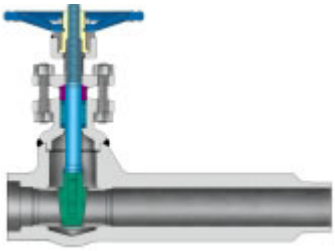
- A special design is also available with double packing, leak-off connection, live-loading and a packing blowout for easy removal of old packing.
- Bolted Bonnet Gate Valves for Alkylation service Parallel Slide Gate Valves.
- API 603 $^{1}/_{2}$–$1^{1}/_{2}$" (15– 40 mm), for ASME Classes 150, 300 & 600.

FORGED STEEL EXTENDED BODY GATE VALVES

CONVENTIONAL PORT

1/2 – 2" (15–50 mm)
THREADED OR SOCKET WELD FEMALE
API 602, ASME CLASSES 800, 1500

INTEGRALLY-REINFORCED
EXTENDED BODY – 2174W
TWO TYPES



EXTENDED BODY – 2184W

- This valve is available with an extended body or an integrally reinforced extended body (IREB).
- Extended body gate valves have a welded or threaded connection and are used for tapping of pressure vessels and header lines for vents, drains or takeoff lines and instrumentation.
- Also available: extended body assemblies for vents, drains, and instrument root valves.

AVAILABLE VARIATIONS(2)

	MALE EXTENDED END	
FEMALE STANDARD END	2184W, 3184W Standard: 2184W, 3184W	2174W, 3174W IREB: 2174W, 3174W
Thread	Couplet, Thread or Socket	Couplet or Socket
Socket Weld	Couplet or Socket	

EXTENDED BODY GATE VALVE DIMENSIONS

Size in mm	A Port	B End to End		C Center to Top Closed		D Center to Top Open		H Handwheel		K Socket Weld Bore	DA Short End to Center		DB Long End to Center	
	800-1500	800	1500	800	1500	800	1500	800	1500	800-1500	800	1500	800	1500
1/2 15	0.50(1) 13	5.63 143	5.75 146	5.90 150	6.2 158	6.6 168	6.8 173	3.5 89	3.5 89	0.855 21.72	1.63 41	1.75 44	4.00 102	4.00 102
3/4 20	0.50 13	5.63 143	5.75 146	5.90 150	6.2 158	6.6 168	6.8 173	3.5 89	3.5 89	1.065 27.05	1.63 41	1.75 44	4.00 102	4.00 102
1 25	0.69 18	5.75 146	7.25 184	6.4 163	8.1 206	7.4 188	8.9 226	3.5 89	5.0 127	1.330 33.78	1.75 44	2.50 64	4.00 102	4.75 121
1 1/4 32	1.25 32	7.00 178	-	7.6 193	-	9.2 234	-	5.0 127	-	1.675 42.55	2.25 57	-	4.75 212	-

1 1/2 40	1.25 32	7.25 184	7.88 200	7.6 193	9.40 239	9.2 234	10.80 274	5.0 127	6.00 152	1.915 48.64	2.50 64	2.63 67	4.75 121	5.25 133
2 50	1.50 38	7.88 200	12.25 311	8.50 216	12.40 315	10.40 264	14.10 358	6.00 152	10.00 254	2.406 61.11	2.63 67	5.00 127	5.25 133	7.25 184

IREB GATE VALVE DIMENSIONS

Size in mm	A Port	B End to End		C Center to Top Closed		D Center to Top Open		H Handwheel		K Socket Weld Bore	L Socket Weld Depth	DA Short End to Center		DB Long End to Center	
	800-1500	800	1500	800	1500	800	1500	800	1500	800-1500	800-1500	800	1500	800	1500
1/2 15	0.50(1) 13	8.63 219	8.88 226	5.90 150	6.2 158	6.63 168	6.8 173	3.50 89	3.50 89	0.855 21.72	0.38 10	1.63 41	1.75 44	7.00 178	7.13 181
3/4 20	0.50 13	8.63 219	8.88 226	5.90 150	6.2 158	6.63 168	6.8 173	3.50 89	3.50 89	1.065 27.05	0.50 13	1.63 41	1.75 44	7.00 178	7.13 181
1 25	0.69 18	9.38 238	10.13 257	6.4 163	8.1 206	7.4 188	8.9 226	3.50 89	5.00 127	1.330 33.78	0.50 13	1.75 44	2.50 64	7.63 194	7.63 194
1 1/4 32	1.25 32	10.50 266	10.63 270	7.6 193	9.4 239	9.2 234	10.8 274	5.0 127	6.00 152	1.675 42.55	0.50 13	2.50 64	2.63 67	8.00 203	8.00 203
1 1/2 40	1.25 32	10.50 266	10.63 270	7.6 193	9.4 239	9.2 234	10.8 274	5.0 127	6.00 152	1.915 48.64	0.50 13	2.50 64	2.63 67	8.00 203	8.00 203
2 50	1.50 38	11.88 302	14.25 362	8.50 216	12.4 315	10.4 264	14.1 358	6.00 152	10.00 254	2.406 61.11	0.62 16	2.63 67	5.00 127	9.25 235	9.25 235

(1) 0.36” (9 mm) seat for 1/2” NPT male end only.
(2) Bolted bonnet also available.

Actuators

GEAR

GEAR ACTUATORS

Our standard handwheels suffice to

ELECTRIC

CYLINDER

CYLINDER ACTUATORS

Various types of cylinders are available

reduce rimpull to acceptable levels. An optional oversized handwheel or VT-20 gear actuator can be supplied for 16" to 24" valves.

ELECTRIC ACTUATORS

Motorized controls may be applied to valves of any size, for operation in practically any position or location. All units, whether installed directly on a valve or on a floor stand, can be manually operated in case of power failure. The units are available for either alternating or direct current and are sized for specified conditions of operation. Motor units are available with limit switches and push button controls which can be selected to meet customers' requirements.

for operating Velan knife gate valves. The most commonly-used cylinders are operated by air, but oil and water types are available if required.

In most designs, the valve stem serves as a piston rod, with the knife fastened directly to the actuator. Actuators with double-ended piston rod option can be supplied to install position indicators or limit switches and for connecting an emergency device for manual actuation of the valve.

Handwheels and gear boxes can be mounted on top of the cylinders for emergency operation due to loss of operating medium in the cylinder.

If specified by the customer, Velan valves can be furnished with mounting pads for most steel cylinders or valve positioners for throttling control.

Staindard Knife Gate Valve Design Features

ADVANTAGES OVER FABRICATED VALVES

- Cast stainless steel body and investment cast yoke. In fabricated valves, leakage of corrosive medium due to neglected maintenance on the packing, or line pressure surges causes corrosion and failure of most carbon steel or cast iron components.
- An all stainless steel valve offers better corrison resistance than cast iron lined valves. The total cost of ownership becomes more attractive than the initial savings.

FIRST ALL STAINLESS STEEL KNIFE GATE VALVE

- Rugged one-piece body including flanges. Cast in stainless steel to eliminate corrosion problems that are found with cast iron, or steel valves lined with stainless steel.
- All stainless steel investment cast yoke. Up to 12”.
- Investment cast stainless steel packing flange the space between the blade and the packing flange is very small and critical on smaller size valves. For 2 – 8” Velan Knife Gate Valves feature high precision investment cast packing flanges for a tight “contact-free” fit.

THICKER KNIFE GATE

- Thicker knife gate to eliminate distortion under maximum differential pressure and to provide tight seating
- Precision ground blade on both sides for tighter packing chamber sealing. Sealing face of the gate is lapped to provide the best possible seat tightness.
- Precision machined

RAISED FACE SEAT

- The groove around the seat permits the gate to push particles aside and prevents clogging. When the valve is open the flow cleans the groove.
- Lapped seat ensures tight closure.

RELIABLE PACKING CHAMBER

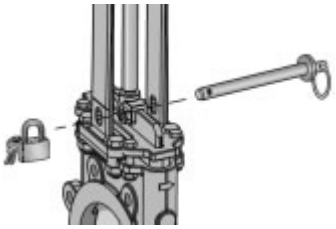
- Smooth and uniform chamber.
- Gate ground on both sides.
- Equally distributed gland bolts provide uniform compression of packing.
- Gland bolts easily accessible.

ALL NUTS SELF-LOCKING

LOW TORQUE STEM DRIVE ASSEMBLY

- Ni-resist or bronze thrust bearing to prevent seizure of handwheel hub, 2 – 12" valves.
- Needle thrust bearings, 14 – 36" valves.
- Larger more comfortable malleable iron handwheel for easier operation.
- Grease fitting.
- Acid resistant Ni-resist or bronze stem nut.

beveled gate end provides long life of seating components.
- Gate guides and lugs. 180° guiding for the moving gate, while jambs at the bottom hold the knife gate to assure proper seating.
- Integral locking device.

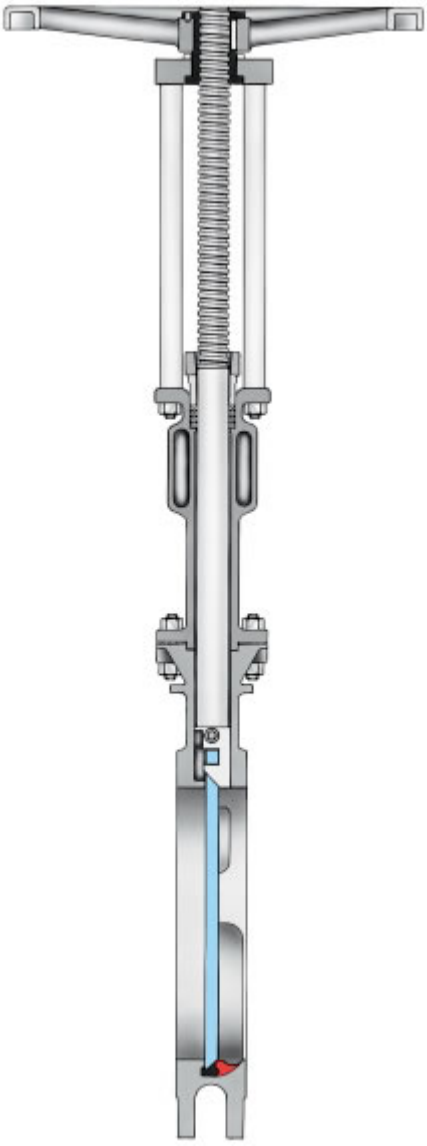


Integral Locking Device

FACTORY TESTING

- Each valve is pressure tested for seat tightness, shell and packing integrity including cycling tests to check for reliability of operation.

Bolted Bonnet Knife Gate Valve Design Features



NO LEAKAGE TO THE EXTERIOR THROUGH PACKING CHAMBER
(UNLIKE STANDARD KNIFE GATE VALVES)

- Bonnetted design.
  Standard body-bonnet joint with an efficient non-asbestos reinforced fiber or PTFE gasket.
- Long-life leakproof stem seal.
  Standard packing chamber with 125 RMS wall finish, burnished non-rotating stem and PTFE or graphite packing rings. Many times the cycle life of a standard knife gate valve.
- Virtually no contamination of the environment.
  No dewatering of stock, unlike standard knife gate valves.
- Easy repacking in-line. (Valve should be de-pressurized when repacking in-line.)

TIGHTER SEATS WITH PATENTED TORQUE CLOSURE OF KNIFE

- Beveled knife-stem connection locks the knife blade tight against the seat. The seat is sealed by positive torque

closure – not media pressure – unlike any other knife gate valve.

- Raised-face seat. A groove around the seat collects particles pushed aside by the knife and prevents clogging. When the valve opens, media pressure cleans the groove.
- Lapped seat ensures tight closure.
- Crimped resilient seat ensures longer service life.
- Four seat designs: Integral, resilient and renewable Stellite 6.

BYPASS TO PREVENT CLOGGING OF BONNET

- Bypass lets pulp circulate inside the bonnet when valve is opened, preventing clogging (patent # 2093539 CDN and # 5295661 U.S.).

EASY OPERATION

- Lower running torque due to reduced friction.
  Friction between stem and packing in bolted bonnet knife gate valve is far less than the friction between the blade and the packing in a standard knife gate valve.
- Low-friction, acid-resistant Ni-Resist stem nut.
- Valves can operate with smaller actuators than standard knife gate valves.

ALL CAST STAINLESS STEEL DESIGN

- One-piece stainless steel, fully-lugged, cast body is stronger than welded bodies and less subject to distortion due to thermal stress.
  Posts are stainless steel instead of chrome-plated carbon steel for longer life.
- Designed for vertical or horizontal line operations.
- Standard wafer, TAPPI face-to-face for easy replacement of leaky standard knife gate valves.
- Maintenance and adjustment-free. Long cycle life.
- Suitable for most pulp and paper applications.
  Can be used throughout the mill as a general-purpose knife gate valve.

Crane Handles

Handles are available for on/off and throttling control of Crane resilient seated butterfly valves. These handles can be used for manual actuation of 2" to 12" valves at 200 psi and for 2" to 6" valves at 285 psi. For valves larger than 8", excessive operator effort and extreme handle reaction to internal valve forces are possible. In these cases, a gear operator is recommended for safe operation.

Features

The rugged construction of Crane handles makes them ideally suited for manually actuating smaller valves. The latch plate permits the valve to be locked in any of the 10 positions on

DIT handles or in any position on IOL handles.

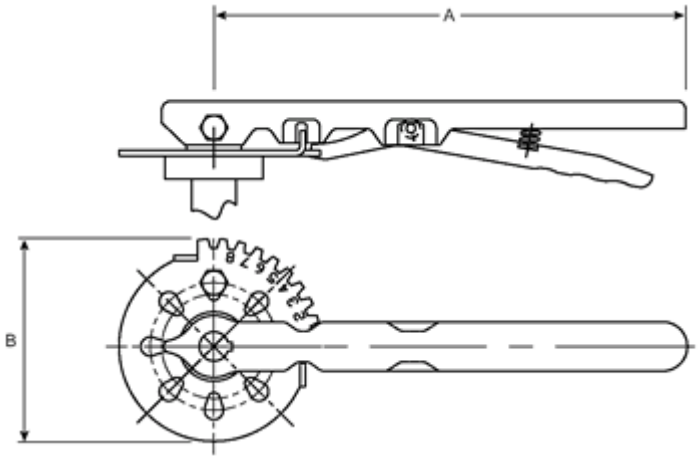
Specifications

DIT Mechanically locks the valve in any of the 10 positions from 0° to 90° in 10° increments

DIT/IOL Can hold the valve in intermediate positions (32°, 68°, etc.) and can also be locked in 0° and 90° positions.

Dimensions

mm Inches	A	B	Weight
DN50～DN159 2" - 6"	57.15 2.25	257.56 10.14	0.8 1.8
DN200～DN300 8" - 12"	84.84 3.34	357.12 14.06	1.8 4.0



NOTE: TECHNICAL DATA SUBJECT TO CHANGE WITHOUT NOTICE.

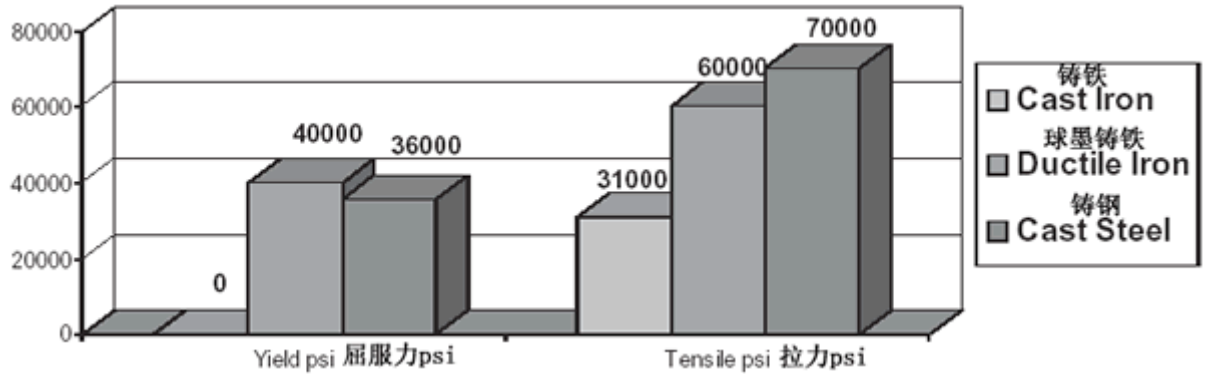
Typical Applications

HVAC ·Chemical/ Petrochemical Processing · Food and Beverage

·Power and Utilities · Pulp and Paper

How Ductile Iron Compares to Cast Iron and Cast Steel

Minimum Mechanical Properties



Chemical Analysis			
	Cast Iron ASTM A 126 Class B*	**Ductile Iron ASTM A 395**	**Cast Steel ASTM A 216 WCB**

Iron and Residuals%	94.0	94.5	98.1
Carbon%	3.3	3.0	0.3
Silicon%	2.0	2.5	0.6
Manganese%	0.7		1.0
* * Typical composition, ASTM Standard does not specify materials to this detail.			

Pressure/Temperature Ratings Comparing Cast Iron, Ductile Iron and Cast Steel

°F/°C Temperature	ASTM A 126 Cast Iron		ASTM A 395 *Ductile Iron	ASTM A 216 WCB Cast Steel
	Class 125		Class 150	Class 150
	2"-12"	14"-24"	2"-24"	2"-24"
-20°F-100°F	200 psi	150 psi	**285 psi	285 psi
150°F/66°C	200 psi	150 psi	243 psi	
200°F/93°C	190 psi	135 psi	235 psi	260 psi
250°F/121°C	175 psi	125 psi	225 psi	
300°F/149°C	165 psi	110 psi	215 psi	230 psi
350°F/177°C	150 psi	100 psi	210 psi	
400°F/204°C	140 psi		200 psi	200 psi
450°F/232°C	125 psi		185 psi	
500°F/260°C			170 psi	170 psi
550°F/288°C			155 psi	
600°F/316°C			140 psi	140 psi
650°F/343°C			125 psi	126 psi

* These ratings apply when temperature exceeds 450°F and the valve has 316 SS trim. When ASTM B 584 trim is used, maximum temperature limit is 450°F.

** Engineering Note: Ductile Iron flanges are rated at 250 psi in accordance with ANSI B16.42.

Construction Features

Flanges	Ductile Iron Valves adopt standard ANSI B16.42 Class 150 flanges and the same end-to-end dimensions as Class 125 iron or Class 150 steel valves. Thus Ductile Iron valves can easily replace cast iron or steel valves. NIBCO also offers PN10/16 flanges per BS 4504 and compliant to BS 5150 face-to-face dimensions.
Trim	Bronze ASTM B 584, 316 Stainless Steel
Test Pressures	All Ductile Iron Valves are tested to MSS requirements in our ISO 9002 quality certified manufacturing plant in Blytheville, Arkansas.

Color	Ductile Iron valves are painted green in compliance with API 604.

Features and Benefits

Strength	Ductile Iron is a very strong material when compared to cast iron and comparable to cast steel. Ductile Iron has a higher yield strength than cast steel 40K vs. 30K. The strength of Ductile Iron when compared to cast iron is overwhelming. Ductile Iron tensile strength is 60K vs Cast Iron at 31K. Ductile Iron has yield strength of 40K and cast iron has none.
Corrosion Resistance	Ductile Iron has corrosion and oxidation resistance in most cases that surpasses cast steel and is slightly better than cast iron. Oxide penetration can severely affect the strength and performance of valves.
Low Transition Temps	Ferrous metals are subject to brittle fractures with severe temperature changes. The chemical composition of Ductile Iron provides transition temperatures to -20^{o}F. This property is important if physical shock loading is present in cold weather applications.
Cost Effective	These unique characteristics make Ductile Iron a cost-effective option for 150 psi steam service as well as hydrocarbon processing up to 650°F/343°C.

Applications

Steam Service	Ductile Iron gate, globe and check valves are excellent choices for 150 psi steam service. Available with ASTM B 584 bronze trim and CF8M SS trim.
Hydrocarbon Service	Ductile Iron is an acceptable substitute for cast steel in a wide range of processing services both on the production and refining side up to 650^{o}F/343^{o}C.
General Service	Ductile Iron can substitute for standard Class 125 cast iron where there may be concerns with potential stresses and a stronger material is desired, i.e. in situations of unusual pipe movement due to the system or external forces, such as cold weather, earthquakes, etc. Can substitute for Class 250 cast iron for intermediate pressure services using Class 150 flanges up to 285 psi wp. (Should save on valve and flange costs.) Ductile Iron is a good choice for general service, fire protection and Hi-rise applications. Has a higher application temperature than Teflon® seated flanged ball valves.
Marine Service	For shipboard application and tanker piping, many marine agencies recommend the use of Ductile Iron Valves because of its resistance to shock, vibration and superior corrosion-resistant properties. Approved by DOT and Certificate of Approval from Lloyds Register of Shipping.

	ABS approval available, consult factory.