



CRYO - SERIES Ball Valve

Low Temperature and Cryogenic Ball Valves

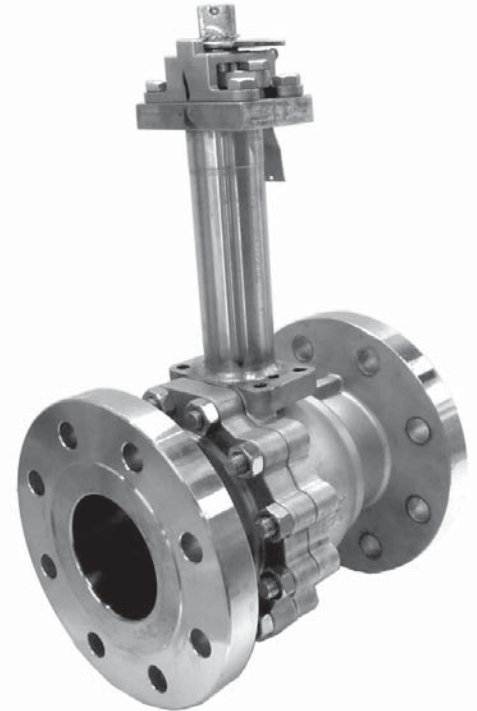
Flo-Tite's Cryogenic Ball Valves are Specifically Designed for Cryogenic Applications.



10" TM300 Bolted Bonnet



3PC-SW



4" F300 Welded Bonnet

Design Features

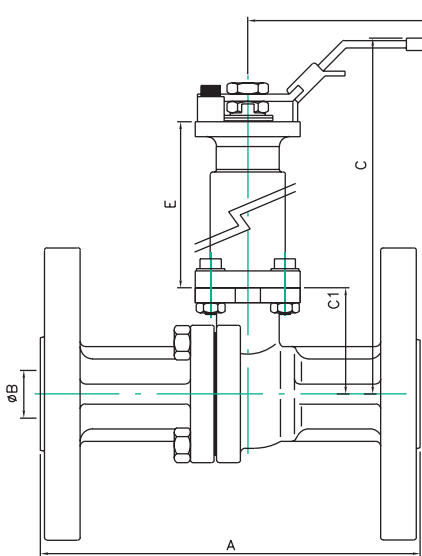
- 3PC Threaded, Socket & Butt Weld designs 1/4" thru 4" - 1500 PSI
- ANSI 150, 300, 600, 900 LB Flanged Ends 1/2" thru 14"
- One piece, high strength blowout proof stem design
- Bolt-on or welded bonnet construction
- Encapsulated body seals prevent "cold flow"
- Components Cleaned & Degreased
- Uni-directional Vented Ball
- Live Loaded V-Ring Packing
- Low Operating Torque
- Fire Safe Design
- Rigid Body Construction, Minimizes Thermal Shrinkage
- Fugitive Emission Compliance

Ideal Design for Low Temperature and Cryogenic Applications

DIMENSIONS / TECH DATA

Our Cryo extension bonnet is specially designed to reduce heat exchange between the fluid and the environment and to keep the packing chamber temperature to a maximum. The Cryo bonnet adds dead space in which boiled off vapors collect, further insulating the top of the valve from the fluid.

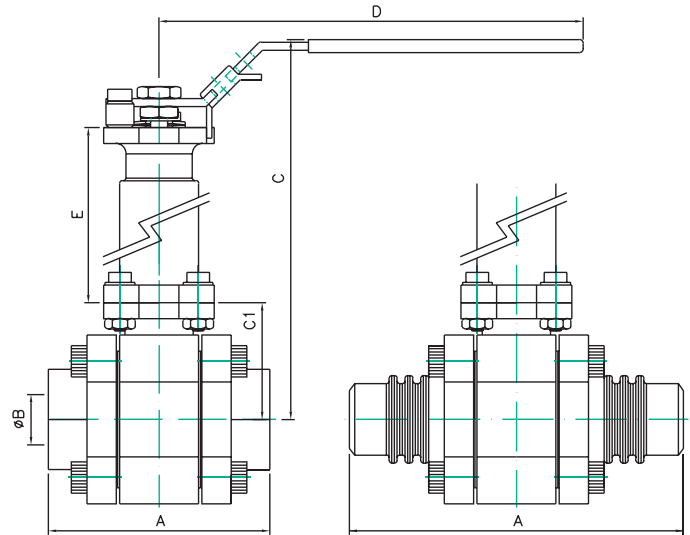
Flo-Tite offers two types of extension bonnets (short and long) and are available to better locate the gland packing closer to the ambient temperature zone. This will protect it from freeze damage caused by low temperature fluid.



Consult factory for all trunnion design valves, & higher ANSI pressure classes

For additional technical information such as dimensions, weights, Cv & assembly exploded views can be found in our standard catalogues for all standard valve series.

The bonnet height can be altered to meet special requirements, consult factory for details.



Model F150 - ANSI Class 150

Size	A	B	CI	D	Short Ext.		Long Ext.	
					E	C	E	C
1/2"	4.25	0.59	1.54	6.50	1.97	4.57	9.0	11.6
3/4"	4.62	0.79	1.70	6.50	1.97	4.88	9.0	12.0
1"	5.00	0.98	2.06	7.87	2.91	6.34	9.0	12.5
1 1/4"	5.50	1.26	2.35	7.87	2.91	6.53	9.0	12.7
1 1/2"	6.50	1.50	2.65	9.84	2.91	7.04	9.0	13.2
2"	7.00	1.97	2.90	10.4	2.91	7.44	9.0	13.6
2 1/2"	7.50	2.56	3.39	15.4	3.78	10.0	11.8	18.1
3"	8.00	3.00	3.67	15.4	3.78	10.3	11.8	18.4
4"	9.00	4.00	4.40	15.4	3.78	11.0	11.8	19.1
6"	15.5	5.98	7.20	25.6	4.72	16.0	11.8	23.1
8"	18.0	7.87	7.60	37.4	4.72	16.3	11.8	23.4
10"	21.0	9.84	9.88	38.0	n/a	n/a	11.8	n/a
12"	24.0	11.8	11.5	38.0	n/a	n/a	11.8	n/a

Model HPF - 2000 WOG 3PC Full Bore

Size	A NPT	A BW,SW	B	CI	D	Short Ext.		Long Ext.	
						E	C	E	C
1/4"	2.72	4.81	0.46	1.54	6.50	1.97	4.66	9.0	11.7
3/8"	2.72	4.81	0.50	1.54	6.50	1.97	4.66	9.0	11.7
1/2"	2.91	4.89	0.59	1.54	6.50	1.97	4.66	9.0	11.7
3/4"	3.38	5.17	0.79	1.70	6.50	1.97	4.97	9.0	12.0
1"	3.70	5.24	0.98	2.06	7.87	2.91	6.4	9.0	12.5
1 1/4"	4.09	5.72	1.26	2.19	7.87	2.91	6.5	9.0	12.6
1 1/2"	4.61	6.19	1.57	2.65	9.84	2.91	7.2	9.0	13.3
2"	5.20	6.62	1.97	2.91	10.4	2.91	7.4	9.0	13.5
2 1/2"	7.28	8.78	2.56	3.39	15.4	3.78	10.1	11.8	18.1
3"	8.74	10.0	2.99	4.45	15.4	3.78	11.2	11.8	19.2
4"	13.5	17.0	3.94	5.53	22.5	4.72	13.3	11.8	21.3

Model F300 - ANSI Class 300

Size	A	B	CI	D	Short Ext.		Long Ext.	
					E	C	E	C
1/2"	5.50	0.59	1.54	6.50	1.97	4.57	9.0	11.6
3/4"	6.00	0.79	1.70	6.50	1.97	4.88	9.0	12.0
1"	6.50	0.98	2.06	7.87	2.91	6.34	9.0	12.5
1 1/4"	7.00	1.26	2.35	7.87	2.91	6.53	9.0	12.7
1 1/2"	7.50	1.50	2.65	9.84	2.91	7.04	9.0	13.2
2"	8.50	1.97	2.90	10.4	2.91	7.44	9.0	13.6
2 1/2"	9.50	2.56	3.39	15.4	3.78	10.0	11.8	18.1
3"	11.12	3.00	3.67	15.4	3.78	10.3	11.8	18.4
4"	12.0	4.00	4.40	15.4	3.78	11.0	11.8	19.1
6"	15.88	5.98	7.20	25.6	4.72	16.0	11.8	23.1
8"	19.75	7.87	7.60	37.4	4.72	16.3	11.8	23.4
10"	22.38	9.84	9.88	38.0	n/a	n/a	11.8	n/a
12"	25.5	11.8	11.5	38.0	n/a	n/a	11.8	n/a

Model HPS - 2000 WOG 3PC Reduced Bore

Size	A NPT	A BW,SW	B	CI	D	Short Ext.		Long Ext.	
						E	C	E	C
3/4"	3.11	4.89	0.59	1.54	6.50	1.97	4.66	9.0	11.7
1"	3.62	5.17	0.79	1.70	6.50	1.97	4.97	9.0	12.0
1 1/2"	4.13	5.72	1.26	2.19	7.87	2.91	6.5	9.0	12.6
2"	4.76	6.19	1.57	2.65	9.84	2.91	7.2	9.0	13.3
2 1/2"	5.90	8.78	1.97	2.91	10.4	2.91	7.4	9.0	13.5
3"	9.06	9.57	2.56	3.39	15.4	3.78	10.1	11.8	18.1
4"	13.5	12.01	2.99	4.45	15.4	3.78	11.2	11.8	19.2

Extra-long weld ends, 12" Face to Face are available, consult factory

Selection & Technical Data

Pressure-Temperature Classification

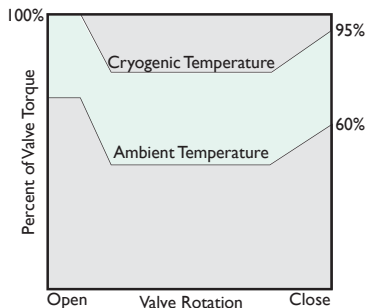
Category	Negative Working Temperature °F	Valve Size inches	ASME Class	Extension Bonnet	Seat Material	Flow Direction
A	-22 to -60	1/2 thru 12	150/300/600	Short	Super Tek TFM	Uni-direction
B	-61 to -250	1/2 thru 12	150/300/600	Long	Super Tek TFM or Super Tek III	Uni-direction
C	-251 to -300	1/2 thru 12	150/300/600	Long	Cryo-Tek or Kel-F	Uni-direction
D	-301 to -340	1/2 thru 12	150/300/600	Long	Cryo-Tek or Kel-F	Uni-direction

Typical Cryogenic Fluids & General Applications

Category	Temperature Range (°F)	Typical Fluid
A	-22 to -94	Propane (-44°F)
B	-94 to -155	Ethane (-128°F)
C	-155 to -320	Ethylene (-155°F); Methane (-260°F); LNG (-260°F); Oxygen (-297°F); Nitrogen (-320°F)

Valve Torque

Due to the nature of cryogenic fluids, valve torque can increase as a result of freezing moisture on the ball or thermal contractions of the materials. The torque curve of valves at cryogenic temperatures behaves different to those ambient temperatures as illustrated below. The torques shown include enough safety factor for actuator sizing. They are based on maximum line pressure, at lowest temperature.



Size	TFM Seat		Cryo-Tek Seat		Kel-F Seat	
	F150	F300	F150	F300	F150	F300
1/2"	69	88	87	112	93	120
3/4"	99	105	126	133	135	143
1"	110	121	140	154	150	165
1 1/4"	264	308	336	392	360	420
1 1/2"	297	319	378	406	405	435
2"	396	435	504	553	540	593
2 1/2"	682	726	868	924	930	990
3"	880	990	1120	1260	1200	1350
4"	1870	1870	2380	2380	2550	2550
6"	5060	5170	6440	6580	6900	7050
8"	10890	11000	13860	14000	14850	15000
10"	18700	19580	23800	24920	25500	26700
12"	25300	26400	32200	33600	34500	36000

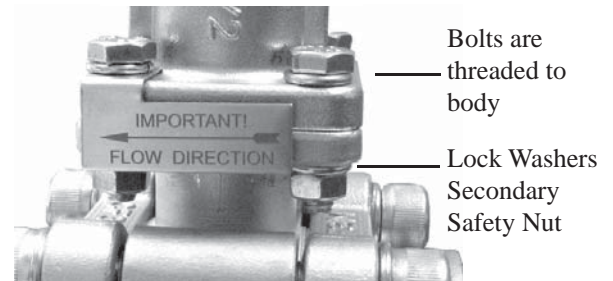
Size	TFM Seat		Cryo-Tek Seat		Kel-F Seat	
	HPF	HPS	HPF	HPS	HPF	HPS
1/4"	83		105		113	
3/8"	83		105		113	
1/2"	94		119		128	
3/4"	154	94	196	119	210	128
1"	209	154	266	196	285	210
1 1/4"	352	209	448	266	480	285
1 1/2"	473	352	602	448	645	480
2"	616	473	784	602	840	645
2 1/2"	1045	616	1330	784	1425	840
3"	1320	1045	1680	1330	1800	1425
4"	2200	1320	3000	1680	C/F	1800

Seat Material

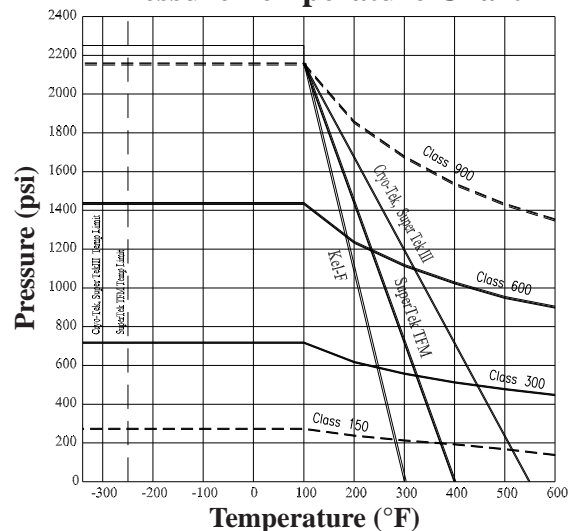
Seat Code	Material	Technical Description
F	Super Tek (TFM)	TFM is second generation of PTFE, traditionally has been used in cryogenic service with great success.
Y	Super Tek III	Super Tek III is TFM blended with carbon filler, commonly known as TFM 4215, popular selection for cryogenic application.
K	Kel F (PCTFE)	Kel F has been heavily used in severe cryogenic service with reliable performance.
Q	Cryo-Tek (modified PTFE)	Cryo-Tek is a form of modified PTFE which contains bronze and other cryogenic fillers, specially suitable for LOX service.

Safety

The ball has an upstream pressure relief hole to prevent overpressure from thermal expansion. The valves have an arrow showing flow direction. Cryogenic valves are unidirectional and must be installed in correct position. All valves have name plates indicating flow direction as illustrated below.



Pressure Temperature Chart



Flo-Tite's Cryo Series ball valves are designed for use in low temperature and cryogenic applications. Low temperature service is generally understood to mean temperatures below freezing down to -150°F , while the term cryogenic applies to service temperatures of -150 down to -450°F .

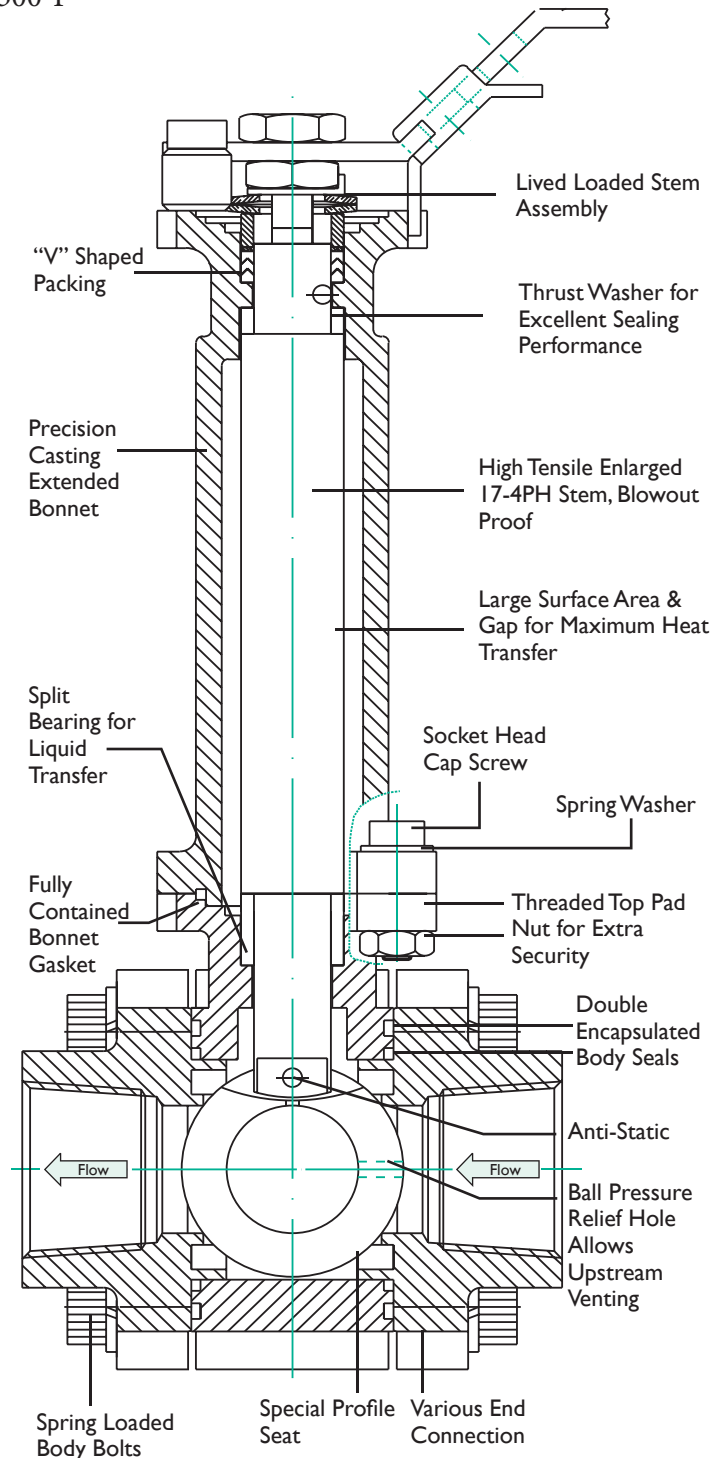
Cryogenic service is much more complicated and usually involves the handling of liquefied gases such as oxygen, nitrogen, hydrogen, fluorine, helium and methane.

Serious consideration must be given to thermal expansion rates of materials since the service temperature can be more than 500°F below ambient temperature.

In liquid oxygen and liquid fluorine, applications the situation is further complicated requiring special cleaning and degreasing of all wetted parts. This is required due to the heavy risk of ignition with both these fluids if they come in contact with any hydrocarbon-based residue left on valve parts during fabrication. As a standard process all Flo-Tite's valve components are cleaned and degreased before final assembly.

Design Features

- Straight through-flow providing minimum pressure drop and maximum flow
- Tight shutoff according to cryogenic standards
- Quick opening for automation
- Rugged construction with precision welding bonnet or secure bolting bonnet
- Blowout proof one-piece stem with enlarged diameter and wide stem-to-ball engagement, high tensile strength 17-4PH material
- Seats with specially designed profiles to allow flexible movement under very low temperatures
- Encapsulated body seals, two per side
- Spring loaded body bolts to compensate for thermal contractions of valve parts during operation
- Live loaded packing (Belleville washers) automatically self-adjusts for packing wear and thermal expansion.
- "V" type TFM stem packing with deep packing chamber to reduce stem leakage
- The valves are standard with ISO 5211 pad for ease of automation



Flo-Tite, Inc.
4815 West 5th St.
Lumberton, NC 28358

P. O. Box 1293
Lumberton, NC 28359
Website: www.flotite.com

Tel: (910) 738-8904
Fax: (910) 738-9112
E-mail: flotite@flotite.com