L&T Floating Ball Valves

Technical Folder

L&T Valves

TECHNICAL FOLDER- FLOATING BALL VALVES

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L&T Floating Ball Valves

Product Range

L&T Valves

L&T Valves

Size(mm)	3P (Screwed/socket)	3P IBR (Screwed/socket)	3P Flanged (Class 150 & 300)	3P FS-Forged (Screwed / SW)	1P RB Flanged (Class 150/300)	2P FB Flanged (Class 150/300)	2P RB Flanged (Class 150/300)
DN8 FB	✓	✓	×	✓	×	×	×
DN10 FB	✓	✓	×	✓	×	×	×
DN15 FB	✓	✓	✓	✓	✓	✓	×
DN20 RB	✓	✓	✓	✓	✓	×	×
DN20 FB	✓	✓	×	✓	×	✓	×
DN25 RB	✓	✓	✓	✓	✓	×	×
DN25 FB	✓	✓	×	✓	×	✓	×
DN32 RB	✓	✓	×	×	×	×	×
DN32 FB	✓	✓	×	✓	×	×	×
DN40 RB	✓	✓	✓	✓	✓	×	×
DN40 FB	✓	✓	×	✓	×	✓	×
DN50RB	✓	✓	✓	✓	✓	×	×
DN50 FB	✓	✓	×	✓	×	✓	×
DN65 RB	×	×	×	×	✓	×	×
DN65 FB	✓	×	×	×	×	✓	×
DN80 RB	✓	×	×	×	✓	×	UD
DN80 FB	✓	×	×	×	×	✓	×
DN100 RB	✓	×	×	×	✓	×	UD
DN100 FB	✓	×	×	×	×	✓	×
DN150 RB	×	×	×	×	✓	×	UD
DN150 FB	×	×	×	×	×	✓	×
DN200 RB	×	×	×	×	×	×	UD
DN200 FB	×	×	×	×	×	✓	×
DN250 FB	×	×	×	×	×	✓	×
DN300 FB	×	×	×	×	×	✓	×

✓	Developed range
×	Not in VMU range
UD	Under dev. -
UD	Under dev.

L&T Floating Ball Valves

Product Technical Write-up

L&T Valves

Ball Valves

A ball valve is a valve with a spherical disc, the part of the valve which controls the flow through it. The sphere has a hole, or port, through the middle so that when the port is in line with both ends of the valve, flow will occur. When the valve is closed, the hole is perpendicular to the ends of the valve, and flow is blocked. The ball valve, along with the butterfly valve and plug valve, are part of the family of quarter turn valves.

Ball valves are durable and usually work to achieve perfect shutoff even after years of disuse. They are therefore an excellent choice for shutoff applications (and are often preferred to globe valves and gate valves for this purpose). They do not offer the fine control that may be necessary in throttling applications but are sometimes used for this purpose.

Ball valves are used extensively in industrial applications because they are very versatile, easy to repair and operate.

L&T Ball Valves

Over 40 years of experience in supplying valves to discerning customers and contractors worldwide. This expertise is now leveraged to bring you reliable and cost-effective flow-control solutions.

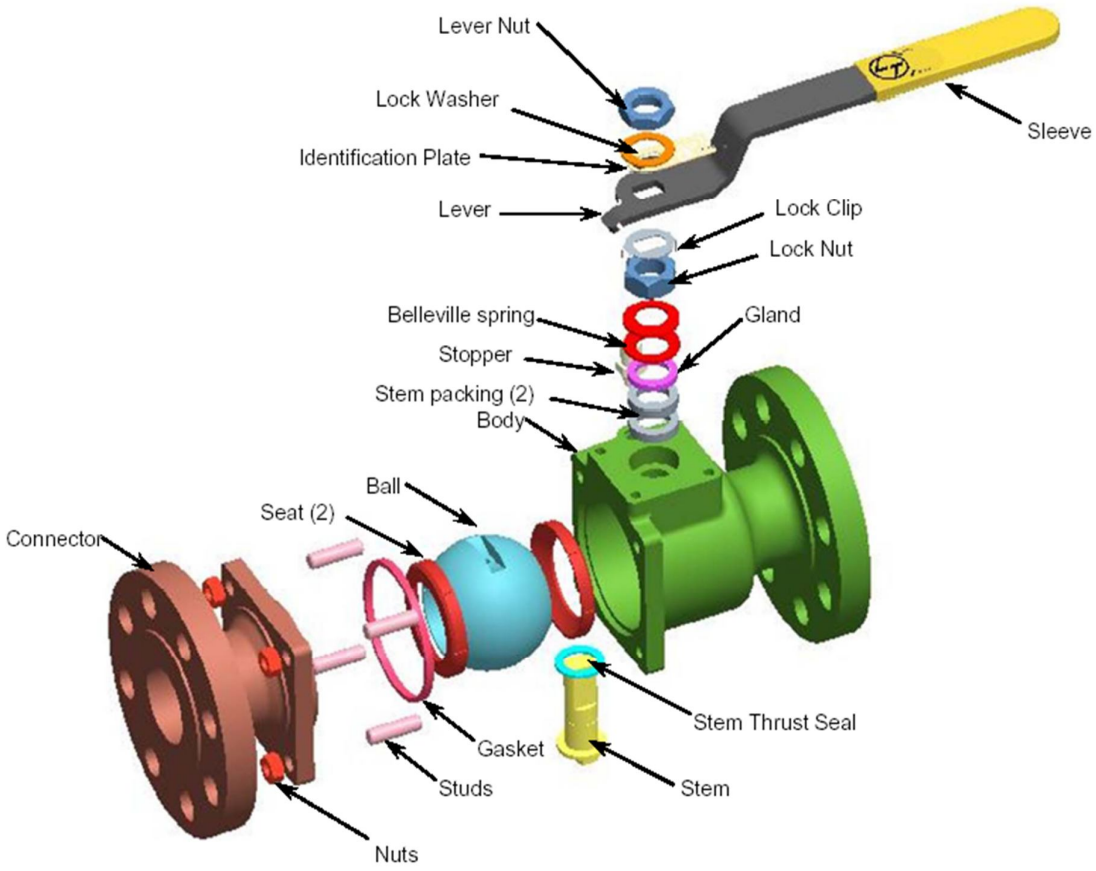
L&T Valves are manufactured in a modern facility whose quality management system conforms to international Standards.

All stages in manufacture of L&T valves are controlled by a stringent quality assurance plan. Elaborate systems are in place to guarantee casting integrity and to ensure that mechanical and chemical properties are in line with customer specifications.

Consistent quality is L&T's hallmark.

The Ball Valves manufactured by us have an international reputation for high integrity in critical services.

Components of Ball Valves



Key components of a ball valve are

- Body & Body Connector
- Ball
- Stem
- Seats
- Body Seals
- Stem Seals
- Gland Arrangement.

Let us look at the key components in a ball valve in detail.

Body & Body Connector:

The Body & Body Connector – the principal **"Pressure"** containing parts of a ball valve in which the closure element and seats are located.

L&T Ball valves castings are made using **"investment casting"** process.

Terms to learn:

Pressure: It is the force per unit area applied in a direction perpendicular to the surface of an object.

The SI unit for pressure is the Pascal (Pa), equal to one newton per square meter (N/m2 or kg·m−1·s−2).

General Units used in valves industry for pressure is "BAR"

1 bar equal to:

- 100 kPa
- 0.987 atm
- 14.5038 psi
- 29.53 in Hg
- 1×105 N/m2

Investment Casting:

It is also called as lost-wax casting, one of the oldest known metal-forming techniques. The castings allow the production of components with accuracy, repeatability, versatility and integrity in a variety of metals and high-performance alloys. A standard surface finish is 1.3–4 micrometres (50–125 µin) RMS.

The advantages of investment casting are:

- Excellent surface finish
- High dimensional accuracy
- Extremely intricate parts are castable
- Almost any metal can be cast
- No flash or parting lines.

Ball:

Ball is a Closure element of ball valve. Positioned in flow path to allow or restrict the flow.
A floating ball design offers efficient sealing with simple construction. As the name indicates, the ball has some freedom to move along the axis of the pipeline, which offers efficient downstream sealing.

When line pressure is applied to the closed ball, it moves slightly (or floats) downstream to maintain contact with the downstream seat where primary sealing occurs.

A quarter turn motion from full open to full close ensures quick open-close action, an inherent advantage for automatic remote control application. Floating ball valve offers effective bidirectional sealing.

The balls used in L&T ball valves are mirror-finished to ensure "**bubble tight**" sealing and lower operating torques. Further the stainless steel balls of solid construction possess higher corrosion resistance as well as structural strength.

A pressure-equalizing hole provided on the ball connects the body cavity and the ball port. This prevents buildup of "**cavity pressure**" when the valve is in open position.

Ball which is used in L&T Ball valves all are solid ball valves.

As per Std ISO 17292 Clause No: 5.2.10 Ball construction shall be of a solid, one-piece or two-piece construction. Other Constructions, such as cored cavity, sealed cavity, or hollow ball, may be furnished only if agreed to by the purchaser.

Terms to learn:

Bubble Tight: A Seat leakage condition in which, during the allotted time of the test, no perceptible leakage comes past the seat being tested. Applies to air-under-water testing-the same test using water-under-air is referred to as drop tight. Defined in API 598, MSS SP-61 and ANSI B16.104

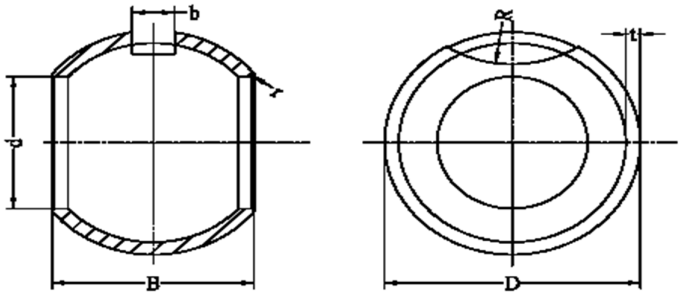
Cavity Pressure: It is the pressure build up within the combined cavity of closure member and valve body. It may lead to "**thermopiezo effect**".

Thermopiezo effect: The property of liquids, due to which a slight temperature rise of an entrapped liquid results in rapid pressure increase.

Solid Ball Vs Hollow ball:

A hollow ball has continuous wall thickness, leads to gradual change in flow bore diameter (Diverging/converging cross section through the ball flow port).Undoubtedly there is "**turbulence**".

A solid ball has a straight-through flow port which aids "**laminar flow"**, thus minimizes disruption to the flow.

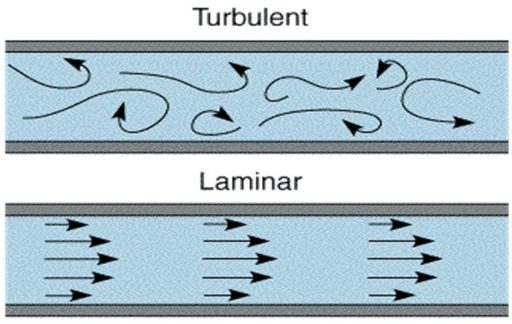


Laminar Flow:

Layers of water flow over one another at different speeds with virtually no mixing between layers. The flow velocity profile for laminar flow in circular pipes is parabolic in shape, with a maximum flow in the center of the pipe and a minimum flow at the pipe walls. The average flow velocity is approximately one half of the maximum velocity.

Turbulent Flow:

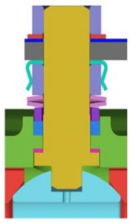
The flow is characterized by the irregular movement of particles of the fluid. The flow velocity profile for turbulent flow is fairly flat across the center section of a pipe and drops rapidly extremely close to the walls. The average flow velocity is approximately equal to the velocity at the center of the pipe.



Stem:

The Stem transmits torque from the operator to the ball.

Blow-out Proof Stem: The bottom-entry stem in all L&T ball valves have a shoulder that bears against a matching shoulder in the body to make it blow-out proof. In this design, the higher the line pressure, the better the sealing to atmosphere.



Leak Tight Stem Sealing:

Stem sealing is further enhanced by stem thrust seal and stem packing rings. The Belleville springs provided ensure sealing integrity by compensating for wear and thermal expansions.

Seats:

The Seats are components, which are mounted in the valve body on the upstream and downstream sides. They work along with the closure member to provide bubble-tight sealing.

Pressure relief slots:

If the pressure of the fluid inside the valve body cavity exceeds the line pressure due to thermal expansion of the liquids entrapped in the valve body, seats provide automatic pressure relief, without the aid of the safety or vent valve.

During closing of the valve, the maximum surge pressure occurs, during which the downstream seat can be forced to intrude into the ball port and valve can become inoperative. The pressure relief slots prevent this potential failure.

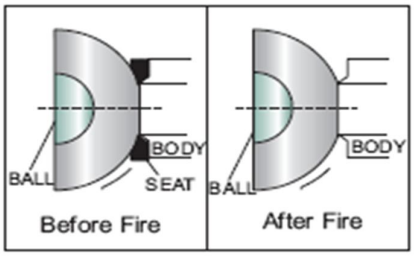
When pressure causes the upstream seat to move against the ball and the ball moves downstream, the pressure simply leaks into the ball port through the relief slots.

PTFE seats used in L&T ball valves are manufactured in a controlled process that ensures a finer grain structure and longer service life.

When the valve is in the closed position, upstream pressure can force the upstream seat against the ball. This can cause damage to the seats as well as increase operating torques.

In L&T ball valves slots are provided in the seats to relieve upstream pressure to ensure that the upstream seat does not get forced against the ball.

Fire-Safe Feature: L&T **fire-safe** ball valves, available in three-piece, single-piece and two piece Designs feature a secondary metal seat. In the event of a fire, if the soft-seat is totally sublimated, the ball moves and abuts the metal seat on the body/ connector on the downstream side to form a leak tight seal.



Valve in Closed condition.

Antistatic Feature:

When the valve is operated, the ball rubs against the non-metallic seats and this can create static electricity. Buildup of static electricity can create a potential fire hazard especially with flammable media. All L&T ball valves have inbuilt antistatic features for proper grounding of the charge generated.

Full bore valves of size DN 65 and above and regular bore valves of size DN 80 and above are provided with spring-loaded plungers between the stem and the body for full mechanical antistatic capability. In valves of smaller sizes, electrical continuity is achieved using 35% carbon filled PTFE thrust seal and stem packing.

Terms to learn:

Fire safe: A valve design that is capable of passing a fire test, with specified limits on leakage to the atmosphere and downstream after being closed subsequent to the fire exposure. Several fire test specifications are in common use.

Body Seals:

Body Seals are the set of sealing rings used to arrest leakage of the line fluid through the joints between the body and body connector.

Stem seals:

Stems Seals are the set of sealing rings fitted on the stem; to prevent leakage of the line fluid through the stem bore.

Gland arrangement:

Gland Arrangement consists of the Gland and Gland packing. Gland packing is used along with the stem seals; to prevent fluid leakage of line fluid through the stem bore.

The Gland retains and compresses, the gland packing.

Materials:

Material is anything made of matter, constituted of one or more substances. Sometimes the term "material" is used more narrowly to refer to substances or components with certain physical properties that are used as inputs to production or manufacturing.

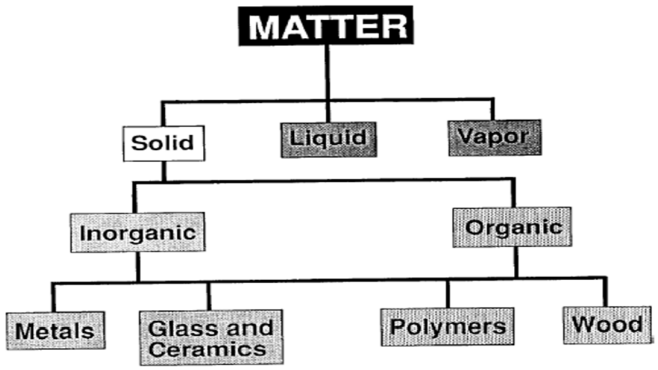


Figure 1.1. Physical Classification of Materials by State

Engineering material classified in to,

a) Metals
b) Ceramics
c) Organics
d) Composites
e) Semiconductors

a) Metals:

Metals are composed of elements, has metallic bonding between atoms and has electrical conductivity

b) Ceramics:

Ceramics are processed with inorganic & non-metallic solids and used in high temperature application.

c) Organics:

Organic materials are composed of polymer and carbon compounds. e.g. Rubber, Plastics, Paper, Wood, Fuels, Lubricants, Paints etc.

d) Composites:

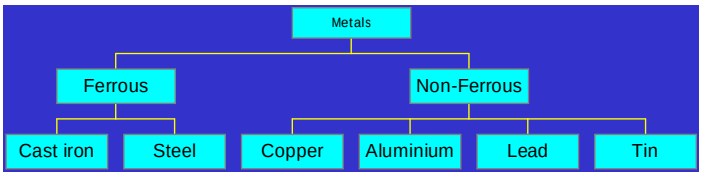
Material consists of more than one material type. E.g. Fiber-glass. Glass fiber embedded in to polymer.

e) Semiconductors:

Semiconductors are in between electrical conductor and insulator. Integrated Circuits are made with this principle.

In our valve industry we largely deal with metals. Let look at the metals,

METALS CLASSIFICATION



FERROUS:

Ferrous metals or alloys are those which contain iron. E.g. Gray cast iron, malleable iron, carbon steel, alloy steel etc.

NON FERROUS:

Non-ferrous metals or alloys are those which are not iron based. E.g. copper, brass, lead etc.
In valve industry we largely deal with ferrous metals.

Let see in detail about ferrous metals,

Steel:

Steel is an alloy of iron and small amount of carbon. It contains carbon percentage of 0.1 to 1.5. It is malleable. Usually contains other alloying elements like Si, Mn and impurities S & P.

Carbon Steel can further be divided based on Carbon percentage

- Low CS 0.3% max,
- Med CS 0.3-0.7%
- High CS: 0.7-0.8%

Low Alloy steel:
Steel contains alloying elements Cr, Mo, Ni, Mn, V, Si etc., up to 10%. High strength, good hardenability, suitable for high or low temperature, improves toughness etc.

High Alloy steel (Stainless steel):

Steel contains alloying elements Cr, Mo, Ni, Mn, V, Si etc., more than 10%.

Austenitic stainless steel:

Austenitic structure at room temperature. It has low carbon & high chromium. C 0.25% max & Cr 16% min. best corrosion resistant & suitable for high & low temperature.

Ferritic stainless steel:

Primary ferritic structure. It has low carbon & low chromium. C 0.20% max & Cr 11% min. better corrosion resistant than martensitic SS. Suitable for high temperature. Used as heating elements in furnace, Oil burner parts etc.,

Martensitic stainless steel:

Martensitic structure in hardened condition. It has high carbon & high chromium. Good wear resistant, suitable for high temperature, hardenable, good corrosion resistant.

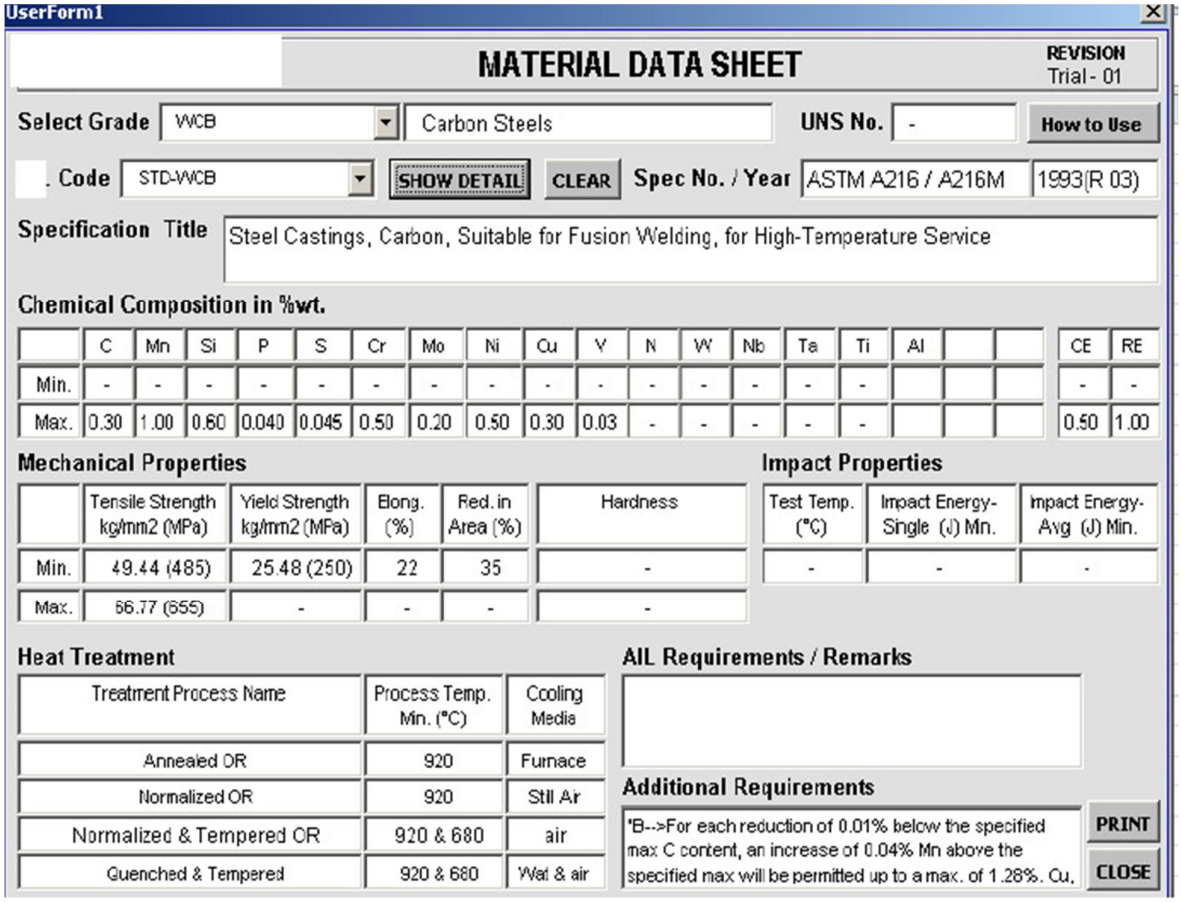
L&T Ball Valves Material of construction:

S. No	DESCRIPTION	MATERIAL
1	Body	ASTM A216 Gr. WCB / ASTM A351 Gr. CF8M
2	Ball	ASTM A351 Gr. CF8M
3	Seat	PTFE
4	Joint Seal	PTFE
5	Connector	ASTM A216 Gr. WCB / ASTM A351 Gr. CF8M
6	Stem	ASTM A479 Type 316
7	Stem Thrust Seal	Carbon Filled PTFE
8	Stem Packing	Carbon Filled PTFE
9	Identification Plate	Aluminium

ASTM A216 Gr.WCB:

Common Designation: Carbon steel
Service Recommendations: Non-corrosive applications including water, oil and gases at temperatures between -20°F (-30°C) and +800°F (+425°C.

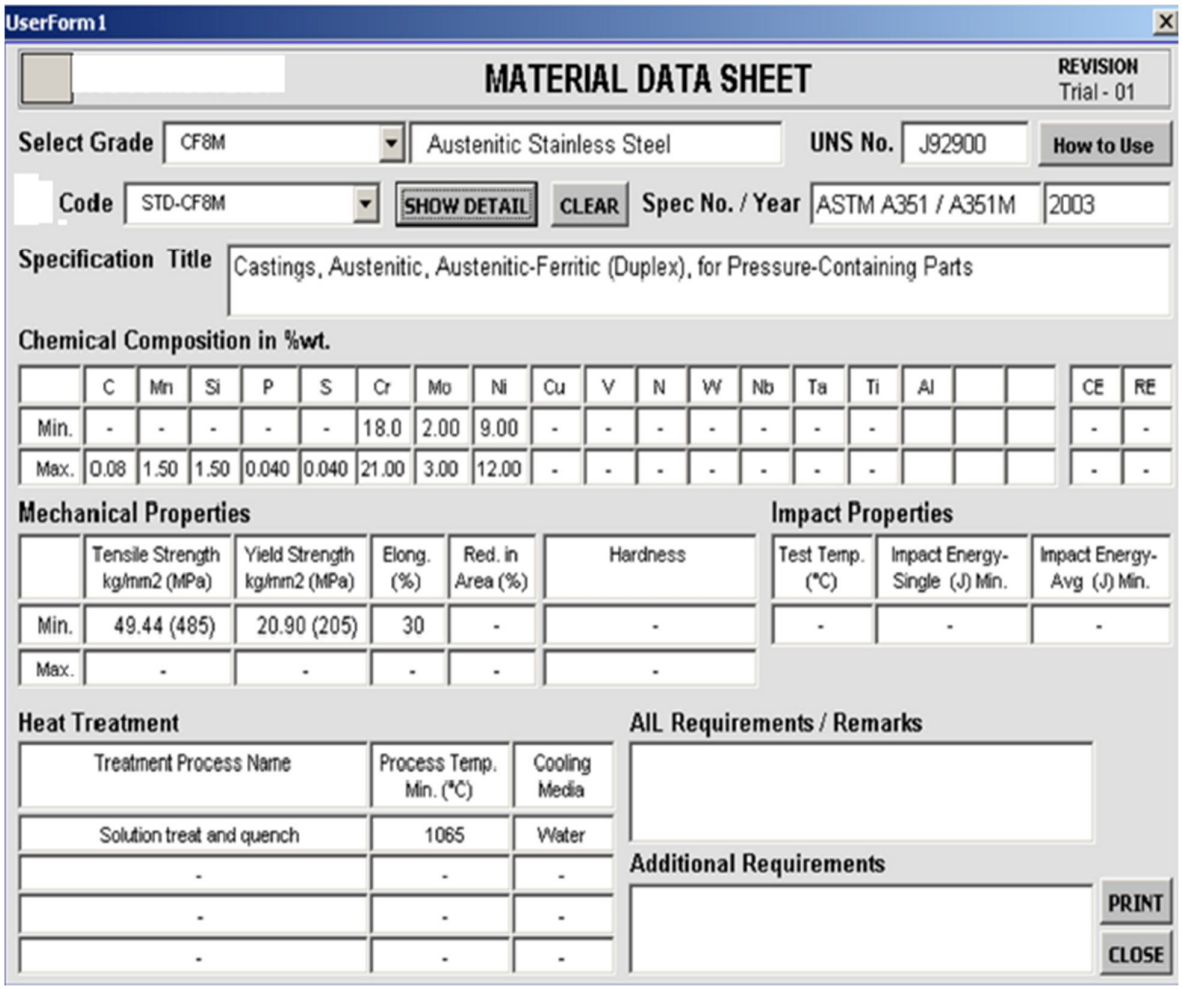
Cast: ASTM A216 Gr.WCB
Forged: ASTM A105
Bar: ASTM A105
Plate: ASTM A515 Gr.70
Pipe: ASTM A106



ASTM A351 Gr.CF8M:

Common Designation: Stainless steel (SS316)
Service Recommendations: Corrosive or either extremely low or high temperature non-corrosive services between -450°F (-268°C) and +1200°F (+649°C). Above +800°F (+425°C) specify carbon content of 0.04% or greater.

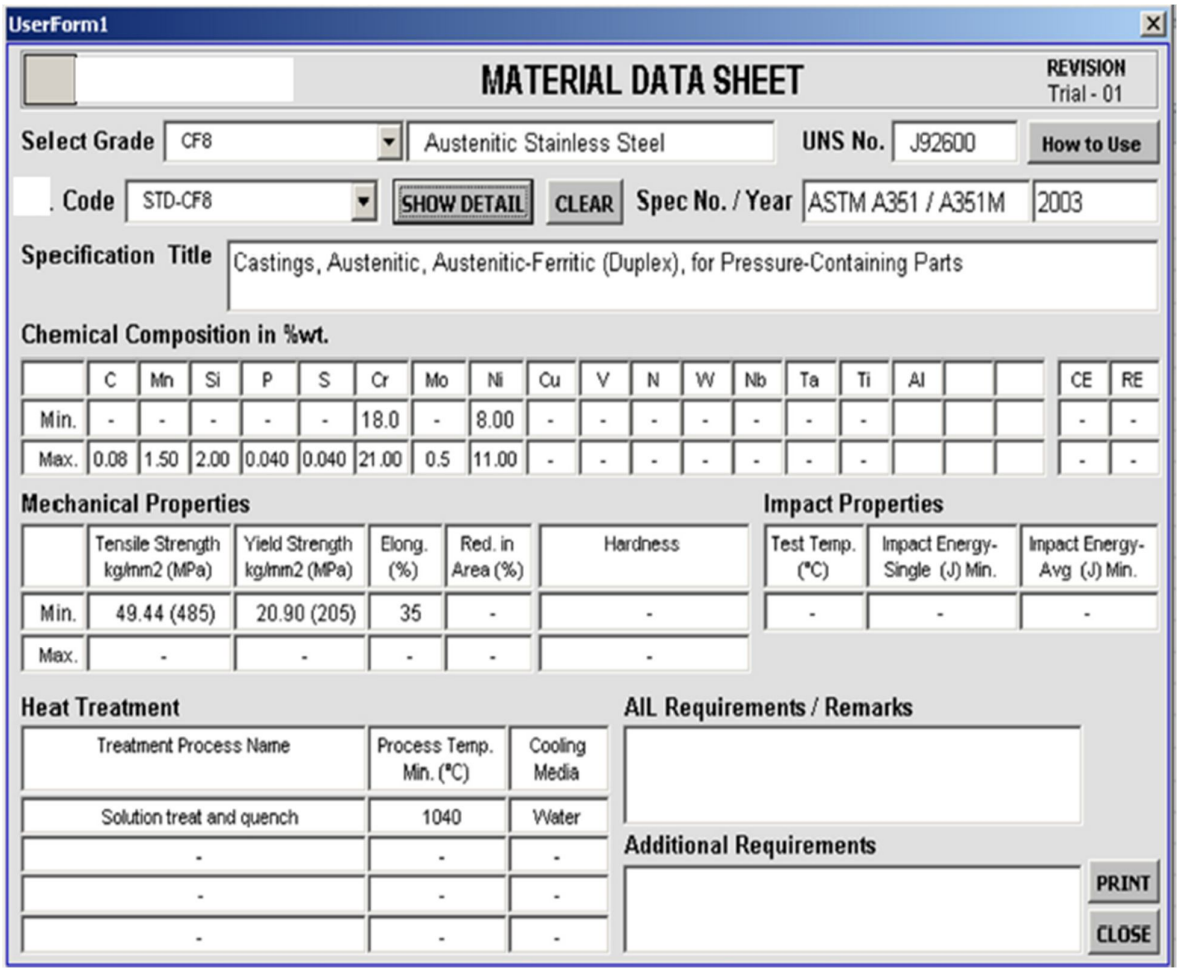
Cast: ASTM A351 Gr.CF8M
Forged: ASTM A182 Gr.F316
Bar: ASTM A276 Type 316
Plate: ASTM A240 Gr.316
Pipe: ASTM A312 TP 316



ASTM A351 Gr.CF8:

Common Designation: Stainless steel (SS304)
Service Recommendations: Corrosive or extremely high temperatures non-corrosive services between -450°F (-268°C) and +1200°F (+649°C). Above +800°F (+425°C) specify carbon content of 0.04% or greater.

Cast: ASTM A351 Gr.CF8
Forged: ASTM A182 Gr.F304
Bar: ASTM A276 Type 304
Plate: ASTM A240 Gr.304
Pipe: ASTM A312 TP 304



EFFECT OF ALLOYING:

Carbon:

Improves Strength, Hardness and machinability.

Chromium:

Resistant to corrosion and wear.

Nickel:

Improves strength and toughness.

Silicon:

Strength & suppresses oxidation.

Molybdenum:

Makes steel to fine grain. Improves corrosion & abrasion resistant.

Vanadium:

Makes steel to fine grain. Improves hardenability, Strength and toughness.

Manganese:

Contributes to improve strength & hardness. Lowers ductility & weldability.

Cobalt:

Improves heat resistant and wear resistant. Improves tensile and fatigue strength.

Tungsten:

Resistant to heat. Promote strength at elevated temperature.

Titanium:

Prevents localized depletion of Cr in SS during long heating. Suitable for high temperature.

PTFE:

Polytetrafluoroethylene (PTFE) is a synthetic fluoropolymer of tetrafluoroethylene that finds numerous applications. The most well-known brand name of PTFE is Teflon.

PTFE is a thermoplastic polymer, which is a white solid at room temperature, with a density of about 2.2 g/cm3.It's melting point is 327 °C (621 °F), but its mechanical properties degrade above 260 °C (500 °F).PTFE gains its properties from the aggregate effect of carbon-fluorine bonds, as do all fluorocarbons.

PTFE's coefficient of friction is 0.05 to 0.10 which is the third-lowest of any known solid material.

Other seat materials:

Seat Material	Description	Temperature range	Application
Virgin PTFE	The most common material offering the widest range of applications. Resistant to almost all chemicals, it's very low coefficient of friction and high impact resistance makes it suitable for wide chemical exposure situations.	-40°C to 225°C	Petrochemical chemical processing Food & Beverage Pharmaceutical industries
Glass filled PTFE (RPTFE)	PTFE with improved cycle life to chemical service & greater pressure temperature rating	-40°C to 225°C	Low & medium steam service
Max seal 1	L&T's special filled material capable of handling high pressure	-40°C to 270°C	High pressure steam up to 103 bar
PEEK	Outstanding pressure capabilities at elevated temperature and excellent chemical and abrasion resistance	-40°C to 270°C	Best suited for high pressure, temperature & corrosive services

L&T Floating Ball Valves

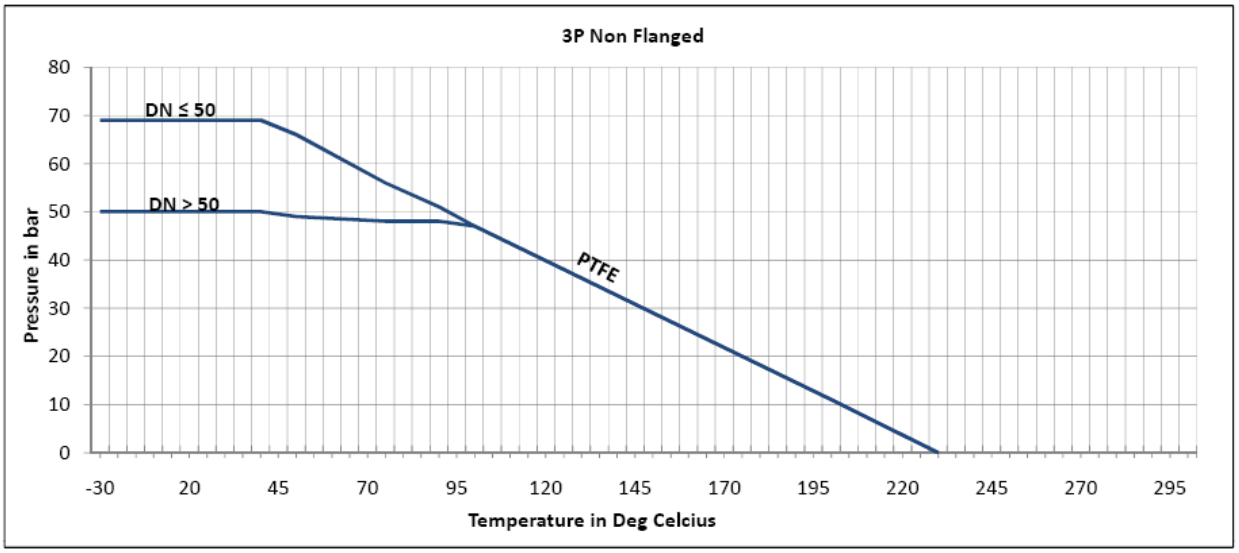
Pressure-Temp Ratings for Seat Materials

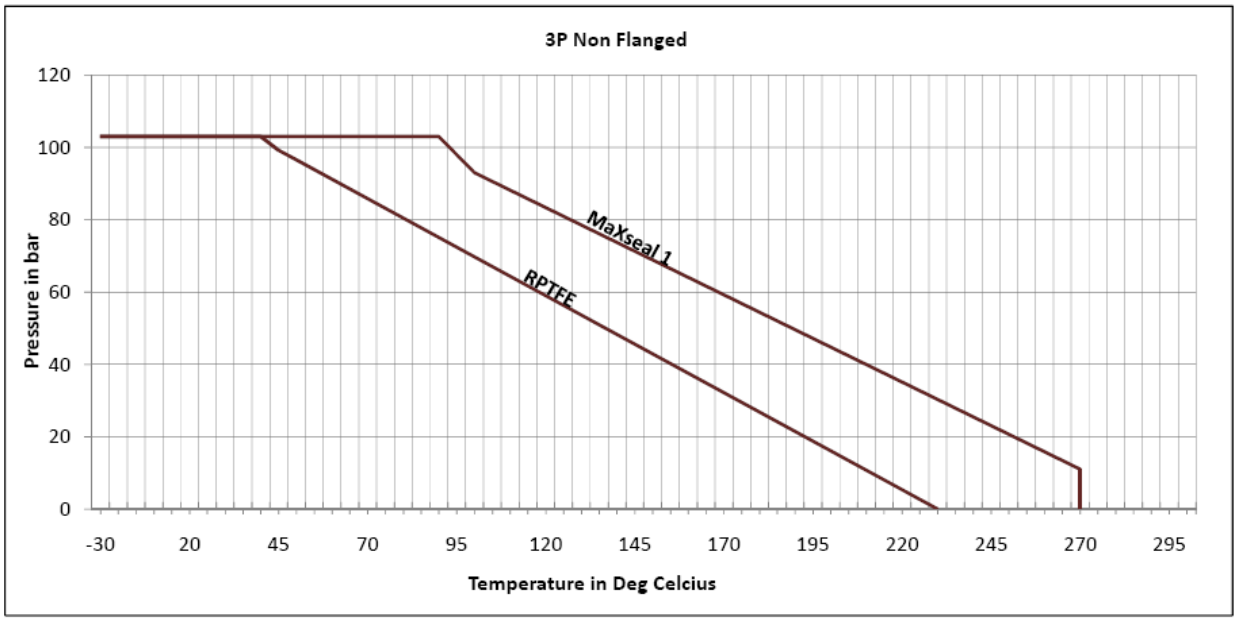
L&T Valves

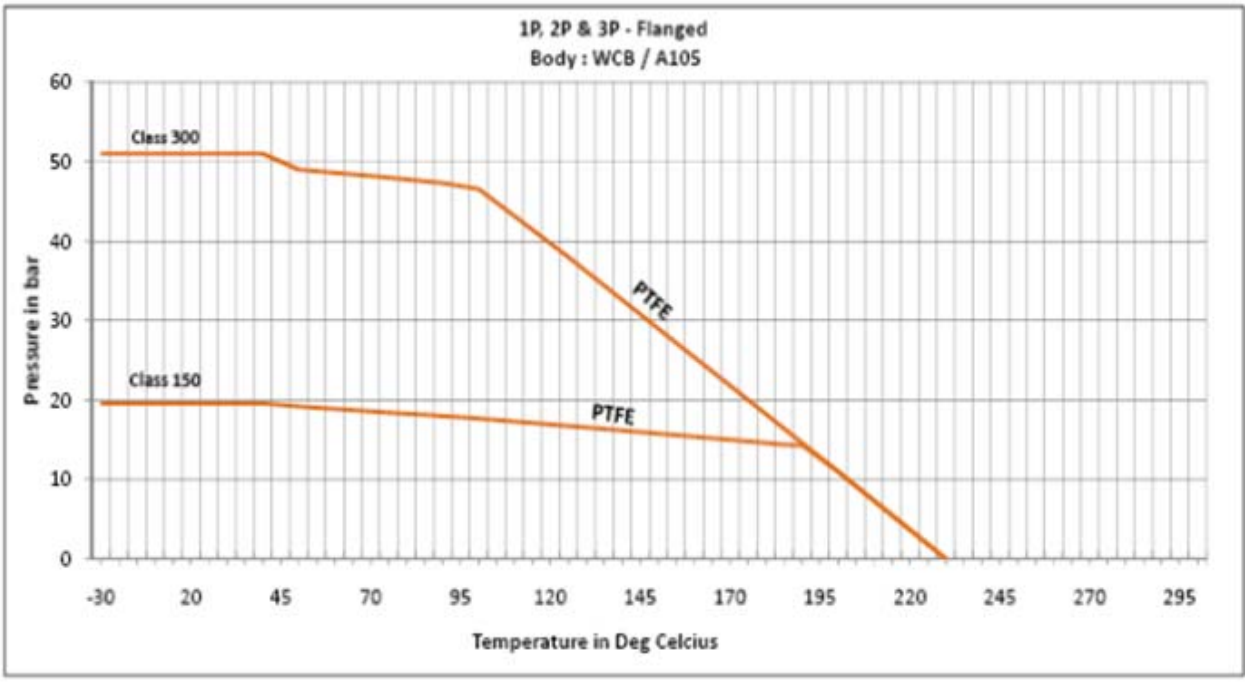
1. **Scope:**

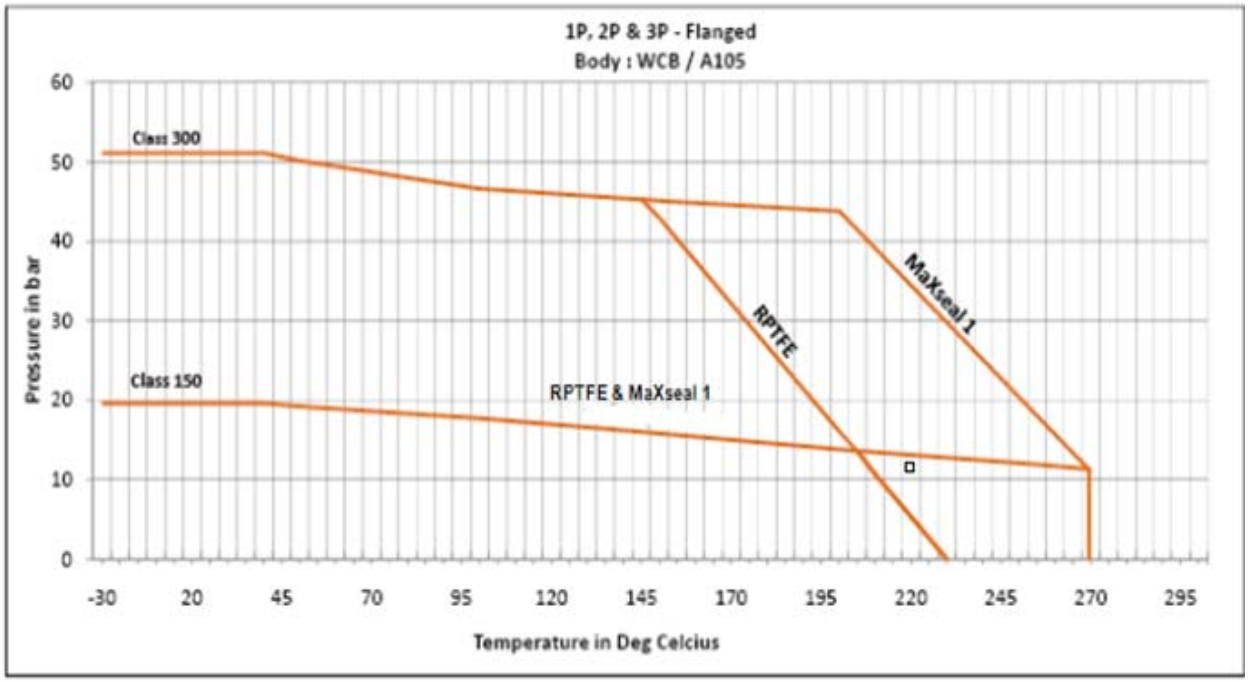
This procedure provides pressure vs temperature graphs for floating ball valves.

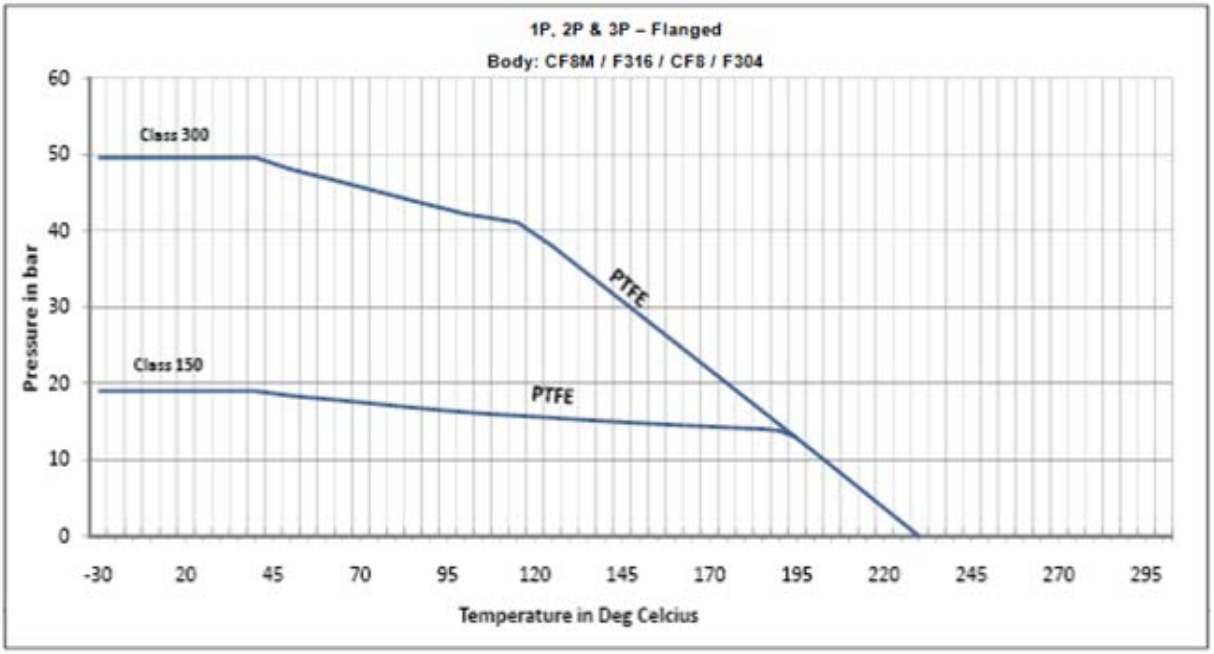
2. **Pressure Vs Temperature Graphs:**

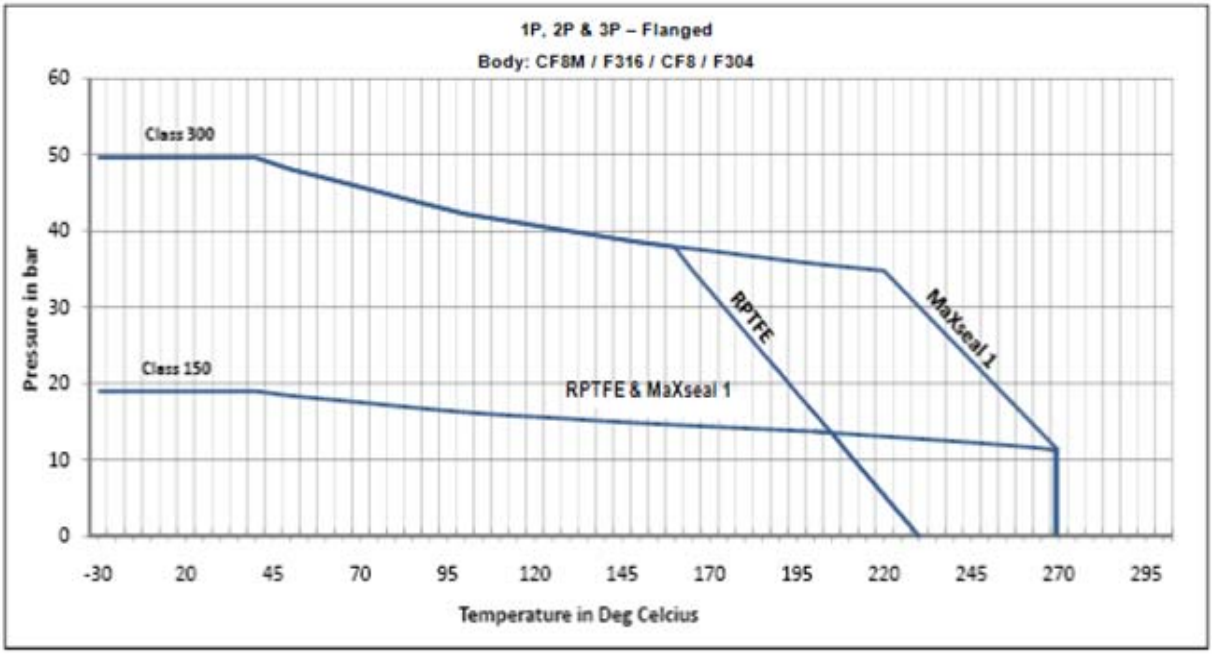





1P, 2P & 3P - Flanged
Body : WCB / A105
Class 300
PTFE
Class 150
PTFE
Pressure in bar
Temperature in Deg Celcius
60
50
40
30
20
10
0
-30
20
45
70
95
120
145
170
195
220
245
270
295


1P, 2P & 3P - Flanged
Body : WCB / A105
Class 300
MaXseal 1
RPTFE
Class 150
RPTFE & MaXseal 1
Pressure in bar
Temperature in Deg Celcius
60
50
40
30
20
10
0
-30
20
45
70
95
120
145
170
195
220
245
270
295


1P, 2P & 3P – Flanged
Body: CF8M / F316 / CF8 / F304
Pressure in bar
60
50
40
30
20
10
0
Class 300
PTFE
Class 150
PTFE
-30
20
45
70
95
120
145
170
195
220
245
270
295
Temperature in Deg Celcius


1P, 2P & 3P – Flanged
Body: CF8M / F316 / CF8 / F304
Pressure in bar
60
50
40
30
20
10
0
Class 300
RPTFE
MaXseal 1
Class 150
RPTFE & MaXseal 1
-30
20
45
70
95
120
145
170
195
220
245
270
295
Temperature in Deg Celcius

L&T Floating Ball Valves

General Arrangement Drawings

L&T Valves

L&T Floating Ball Valves

Torque Values

L&T Valves

1.0 SCOPE:

This procedure describes the requirement of operating torque of Three Piece Ball Valves.

2.0 Ball Valves:

2.1 The torque values indicated are the maximum for Pressure indicated.

VALVE SIZE	BORE	TORQUE VALUES , Nm		
		PTFE SEAT		RPTFE/MAXSEAL
		10 bar	69 bar	103 bar
DN 8	FB	5.0	6.5	8.0
	RB	5.0	6.5	8.0
DN 10	FB	5.0	6.5	8.0
	RB	5.0	6.5	8.0
DN 15	FB	5.0	6.5	8.0
	RB	5.0	6.5	8.0
DN 20	FB	8.0	9.0	13.0
	RB	5.0	6.5	8.0
DN 25	FB	9.0	11.0	16.0
	RB	8.0	9.0	13.0
DN 32	FB	16.0	30.0	34.0
	RB	9.0	16.0	21.0
DN 40	FB	16.0	34.0	38.0
	RB	13.0	13.0	28.0
DN 50	FB	24.0	44.0	54.0
	RB	16.0	34.0	40.0

FB - Full Bore; RB - Regular Bore

2.2 The torque values with no pressure shall be equal or less than values at 10 bar.

2.3 The torque values are for clean line fluid, for Virgin PTFE seats and at room temperature

2.4 For PEEK, multiply above values by 2.25,

2.5 No Safety Factor included. For Actuator Valve, a factor of 1.3 recommended.

2.6 The values are break torques (Close to Open)

Run Torque: 60% of break torque.

Reseat Torque: 75% of break torque (Open to Close)

2.7 Torque Multiplication Factor based on frequency of operation.

Frequency	Multiplication Factor
Day or more	1.0
Week or more	1.3
Month or more	1.4
Four months or more	1.5

Value reverts to normal after first operation.

1.0 Scope

This procedure describes the requirement of operating torque of Two Piece Ball Valves

2.0 2P Ball Valves

2.1 The torque values indicated are the maximum for Pressure indicated

Pressure Rating: Class 150			
Valve Size	Bore	Torque Values , Nm	
		10 bar	20 bar
DN 15	FB	9	9
DN 20	FB	9	9
DN 25	FB	11	14
DN 40	FB	22	25
DN 50	FB	60	65
DN 65	FB	80	90
DN 80	FB	140	150
DN 100	FB	160	165
DN 150	FB	230	250
DN 200	FB	580	650

Pressure Rating: Class 300			
Valve Size	Bore	Torque Values , Nm	
		25 bar	50 bar
DN 15	FB	9	9
DN 20	FB	9	9
DN 25	FB	13	16
DN 40	FB	25	28
DN 50	FB	65	70
DN 65	FB	90	98
DN 80	FB	160	165
DN 100	FB	175	185
DN 150	FB	280	350
DN 200	FB	690	750

2.2 The torque values with no pressure shall be equal or less than values at 10 bar

2.3 The torque values are for clean line fluid, for Virgin PTFE seats and at room temperature

2.4 For RPTFE and MaXseal 1, multiply above values by 1.3

2.5 For PEEK, multiply above values by 2.5

2.6 No Safety Factor included. For Actuator Valve, a factor of 1.3 recommended.

2.7 The values are break torques (Close to Open)

Run Torque: 60% of break torque

Reseat Torque: 75% of break torque (Open to Close)

2.8 Torque Multiplication Factor based on frequency of operation

Frequency	Multiplication Factor
Day or more	1.0
Week or more	1.3
Month or more	1.4
Four months or more	1.5

Value reverts to normal after first operation

1.0 Scope

This procedure describes the requirement of operating torque of Single Piece Ball Valves

2.0 1P Ball Valves

2.1 The torque values indicated are the maximum for Pressure indicated

Pressure Rating: Class 150			
Valve Size	Bore	Torque Values , Nm	
		10 bar	20 bar
DN 15	FB	5	5
DN 20	RB	5	5
DN 25	RB	10	12
DN 40	RB	16	18
DN 50	RB	26	38
DN 65	RB	42	48
DN 80	RB	80	90
DN 100	RB	140	145
DN 150	RB	160	165

Pressure Rating: Class 300			
Valve Size	Bore	Torque Values , Nm	
		25 bar	50 bar
DN 15	FB	5	5
DN 20	RB	5	5
DN 25	RB	12	15
DN 40	RB	18	22
DN 50	RB	32	40
DN 65	RB	50	60
DN 80	RB	95	100
DN 100	RB	150	160
DN 150	RB	180	190

FB - Full Bore; RB - Regular Bore

2.2 The torque values with no pressure shall be equal or less than values at 10 bar

2.3 The torque values are for clean line fluid, for Virgin PTFE seats and at room temperature

2.4 For RPTFE and MaXseal 1, multiply above values by 1.3

2.5 For PEEK, multiply above values by 2.5

2.6 No Safety Factor included. For Actuator Valve, a factor of 1.3 recommended

2.7 The values are break torques (Close to Open)

Run Torque: 60% of break torque

Reseat Torque: 75% of break torque (Open to Close)

2.8 Torque Multiplication Factor based on frequency of operation

Frequency	Multiplication Factor
Day or more	1.0
Week or more	1.3
Month or more	1.4
Four months or more	1.5

Value reverts to normal after first operation.

L&T Floating Ball Valves

Flow coefficient Details

L&T Valves

1.0 SCOPE:

This procedure provides Flow coefficient for Ball Valves.

2.0 Flow coefficient:

2.1 Cv values are given for valve in fully open condition.

2.2 The values are common for Three piece, Two piece and Single piece ball valves

Size		Cv
DN 8	FB	8
	RB	8
DN 10	FB	9
	RB	9
DN 15	FB	30
	RB	9
DN 20	FB	58
	RB	12
DN 25	FB	108
	RB	36
DN 32	FB	215
	RB	52
DN 40	FB	280
	RB	84

Size		Cv
DN 50	FB	478
	RB	128
DN 65	FB	680
	RB	245
DN 80	FB	1260
	RB	358
DN 100	FB	2150
	RB	720
DN 150	FB	5180
	RB	1075
DN 200	FB	9400
	RB	1850

FB - Full Bore; RB - Regular Bore

Cv = 1.16 x Kv

Cv = Flow coefficient of a valve is defined as flow of water at 60°F in gallon (US) per minute at a pressure drop of one psi across the valve.

Kv = Flow coefficient of a valve is defined as flow of water with temperature ranging 5 to 30°C in cubic meter per hour (m^3/hr) at a pressure drop of one kgf/cm^2 across the valve.

L&T Floating Ball Valves

Quality Assurance Plan

L&T Valves

L&T Valves	INSPECTION TEST PLAN FOR THREE PIECE FLOATING BALL VALVES							QAP No:	BV - 600XXXX			Rev:	0
								Date:	17.02.2012			Prepared by:	
SO No	600XXXX		**Customer**	------								Approved by: PBB	
PO No	NIL		**Project**	**NA**				**Appl Tech Spec**	**NA**				

Sl No	**Component & Operation**	**Characteristic**	**Class**	**Type of Check**	**Quantum of Check**	**Reference Document**	**Acceptance Norm**	**Format of Record**	**Agency**				**Remarks**
									Supp	**CMG**	**L&T**	**TPI**	
1.0	**RAW MATERIAL:**												
1.1	Casting & Forging: Body & connector	Chemical	Major	Chemical Analysis	Each Heat	Standard	Standard	Test Certificate	P	R	R	-	
		Heat Treatment	Major	Review of TC	100%	Standard	Standard	Test Certificate	P	R	R	-	
		Mechanical	Major	Mechanical Test	Each Heat	Standard	Standard	Test Certificate	P	R	R	-	
		Visual Inspection	Major	Visual	100%	MSS SP-55	MSS SP-55	Test Certificate	P	P	R	-	
2.0	**FINSHED METAL ITEMS:**												
2.1	Stem & Ball	Chemical, Mechanical	Major	Review of TC or CC	L&T Sampling Plan	Standard / Drawing	Standard / Drawing	TC or CC	P	R	R	-	
3.0	**FINSHED NON METAL ITEMS:**												
3.1	Seat, Seal & Packings	Density	Major	Review of TC or CC	L&T Sampling Plan	Standard / Drawing	Standard / Drawing	TC or CC	P	R	R	-	
4.0	**IN-PROCESS:**												
4.1	Machined Components	Visual & Dimension	Major	Visual & Measurement	5% at random	L&T Drawing	L&T Drawing	Record	-	P	R	-	
5.0	**FINAL INSPECTION:**												
5.1	Valve Assembly	Shell Test	Critical	Air	100%	Approved GAD	Approved GAD	Test Record - VTR	-	P	10% W	10% W	Per size / Class / Type
		Seat Test	Critical	Air									
		Visual & Dimensions	Major	Visual & Measurement	L&T Sampling Plan	Approved GAD	Approved GAD	PDI Report	-	P	R	R	
5.2	Cleaning & Packing	Visual Inspection	Minor	Visual	Random	L&T Procedure	L&T Procedure	Packing List	-	-	P	-	
6.0	**FINAL RELEASE:**												
6.1	Final Release	Release for despatch						VTC	-	-	P	R	

NOTE: R - Review, P - Perform, W - Witness, H - Hold point, TC - Test Certificate, GAD - General Assembly Drawing, CC - Compliance Certificate, TPI - Third Party Inspection, CMG - Contract Manufacturing, VTC - Valve Test Certificate, VTR - Valve Test Report