High Integrity Floating Ball Valves

SWI VALVE

SWI Valve Co., Ltd

Reliable Performance In Extreme Conditions

www.swivalve.com

Critical Service Valves For The World's Industries

● SWI Global Footprint

Wherever industrial valves are needed in the world, SWI is nearby. We maintain strong partnerships with authorized stocking distributors on every continent. For your nearest authorized stocking distributor or representative, full contact details can be obtained from our web site: www.swivalve.com

● Foreword

SWI Valve Co., Ltd. is a leading industrial valve manufacturing company, specializing in the design and manufacture of Ball, Gate, Globe, Check, Cryogenic, Bellows Seal and Positive Isolation Block & Bleed valves.

Our facilities incorporate all aspects of valve design, development and manufacture ensuring that SWI can offer a degree of flexibility rarely encountered elsewhere.

At SWI, we stand for three values - quality, innovation and service. We know the worlds Oil, Chemical, Petrochemical and Process industries require precision flow control products. We have dedicated ourselves to supplying that need with an extensive range of industrial valves, manufactured in our own factories and designed for environmental sensitivity.

The Quality Policy of SWI Valve Co., Ltd. is to consistently provide product that meets customer and applicable regulatory requirements, with the aim to enhance customer satisfaction by providing exactly what has been agreed contractually, to the required quality and time stated.

The company operates under the Quality Assurance Scheme which is in accordance with ISO 9001 and API Monogram.

We are pleased to introduce our range of High Integrity Floating Ball Valves and trust this catalogue will assist our customers in the selection and application of SWI product.

SWI free floating (seat supported) ball valves have been designed to provide cost effective performance for a wide range of applications in the Chemical, Petrochemical, Oil and Gas, Power and Allied Industries. The design incorpo -rates many technically advanced features which ensures reliable and repeatable operation whilst providing the highest levels of safety and integrity as demanded by these industries.

TECHNICAL SPECIFICATIONS

Size Range	: DN15 (1/2") to DN200 (8")
Pressure Rating	: ANSI Class 150, 300 & 600
Connection	: Flanged to ASME B16.5 or Weld End
Body Materials	: Carbon steel, ITCS, Stainless steel, Duplex, Super Duplex, Inconel 625 and other special alloys.
Top Mounting	: ISO 5211 / EN 15081
Temp. Range *	: -196°C + 538°C (-320°F to +1000°F)
Design	: ISO 17292 / ISO 14313 / ASME B16.34 API 608 /API 6D
Face to Face	: ASME B16.10 Long
Fire Testing	: API 607 6th Edition / ISO 10497
Pressure Testing	: API 598 / API 6D / EN 12266-1 / ISO 5208
Certification	: EN 10204 / ISO 10474 / EN 29001 NACE MR 0175 / ISO 15156 / MR 0103 Directives PED 97/23/EC & ATEX 94/9/EC ISO 15848 Part 1 & 2 / IEC 61508 SIL 3
Quality Assurance	: ISO 9001 / API Spec Q1 / API Monogram

* Subject to materials of construction

Floating Ball Valves for the Chemical, Petrochemical, Oil & Gas and Allied Industries.
Pressure Classes 150, 300 & 600

KEY FEATURES

- Design, manufacture and materials conform to the essential requirements of ISO 17292, ISO 14313, API 608, API 6D, ASME B16.34, ASME VIII and Directives PED 97/23/EC ATEX 94/9/EC and SIL 3.
- Certified firesafe in accordance with API 607 6th Edition / ISO 10497.
- Anti-static design (10Ω under 12 Volt).
- Positive engagement and alignment of the bolted body providing 'Gap Free' connection.
- Fully contained body gasket, graphite seal can be protected from working fluid.
- Body wall thickness exceeds minimum requirements of ASME B16.34 or ISO 17292.
- Full and reduced bore designs available.
- Internally assembled blow-out proof stem.
- Superior High Integrity live loaded stem sealing system, double seal before & after fire condition. Standard valve sealing system in compliance with ISO 15848 Class AH, suitable for high vacuum service and technically eimssion free.
- Self adjusting seat design for effective shut-off across a wide range of pressures whilst minimizing operational torque.
- Bolted construction for ease of on-site maintenance.
- Independent stop plate from handlever secured to stem even if lever is removed.
- 316 stainless steel corrosion resistant trim as standard for effective service life.
- Cavity pressure relief to high pressure side in the event of thermal expansion of trapped fluid.
- Positive direct pressure relief to upstream side available via vented ball for high volatility duty.
- ISO 5211 / EN 15081 top works.
- Modular design, easily adapted for low temperature & cryogenic service or fugitive emission leak detection.
- Testing and marking to API 598 / API 6D & PED (as required).
- Available with gearbox, pneumatic, hydraulic or electric actuators.
- Soft or metal seated.

Quality Assurance

SWI operate under a Quality Assurance system which is approved by Bureau Veritas to ISO 9001: 2008 / KS Q ISO 9001: 2009 / KEPIC -MN and the company is licensed to use the API Monogram in respect of API 6D ball valves. In line with the companies high reputation for quality of design and manufacture, SWI products have been independently accredited by Bureau Veritas for design, manufacture and materials compliant with the safety requirements of the Directive 97/23/EC (PED).

High Integrity Floating Ball Valves

DESIGN FEATURES

SWI range of seat supported ball valve designs incorporate some of the most advanced features, including many major Owner & Operating Company specification preferences, whilst conforming to the design requirements of ISO 17292, ISO 14313, API 608, API 6D and ASME B16.34 codes.

The bolted body providing gap free engagement incorporating a solid ball supported via flexing seat rings provides tight shut-off of flow in either direction whilst maintaining the highest level of safety from the high integrity stem sealing system. Potential for atmospheric leakage is minimized via a double live loaded sealing system before or after fire condition. Reliable sealing is enhanced via precise pre-compression of the ball between the two flexing seat rings allowing the ball to float along the valve axis providing bubble tight and bi-directional sealing capability. Bearings and wiper seals incorporated at the top and bottom of the stem guarantees rigid alignment for optimum operation whilst aiding consistent torque combined with longevity of stem sealing and life cycle capability.

All these design features contribute towards the valves capability to provide the highest levels of performance and reliability, whilst ensuring repeatable shut off, positive sealing and a high degree of safety for both plant and personnel.

THE RANGE

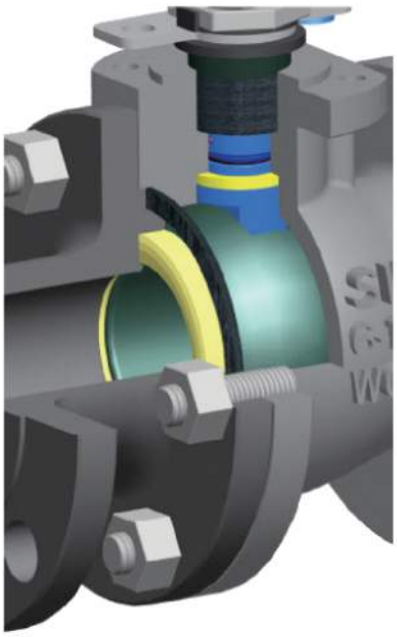
FULL BORE

SIZE (Ins)	1/2"	3/4"	1"	1½"	2"	3"	4"	6"	8"
ANSI 150	■	■	■	■	■	■	■	■	
ANSI 300	■	■	■	■	■	■	■	■	
ANSI 600	■	■	■	■	■				

REDUCED BORE

SIZE (Ins)	1/2"	3/4"	1"	1½"	2"	3"	4"	6"	8"
ANSI 150	■	■	■	■	■	■	■	■	■
ANSI 300	■	■	■	■	■	■	■	■	■
ANSI 600	■	■	■	■	■				

■ **SERIES CN-2PIECE BOLTED BODY (Cast Body Ball Valve)**
■ **SERIES AN-2PIECE BOLTED BODY (Forged Body Ball Valve)**
■ **SERIES AP-3PIECE BOLTED BODY (Forged Body Ball Valve)**



BOLTED CONSTRUCTION

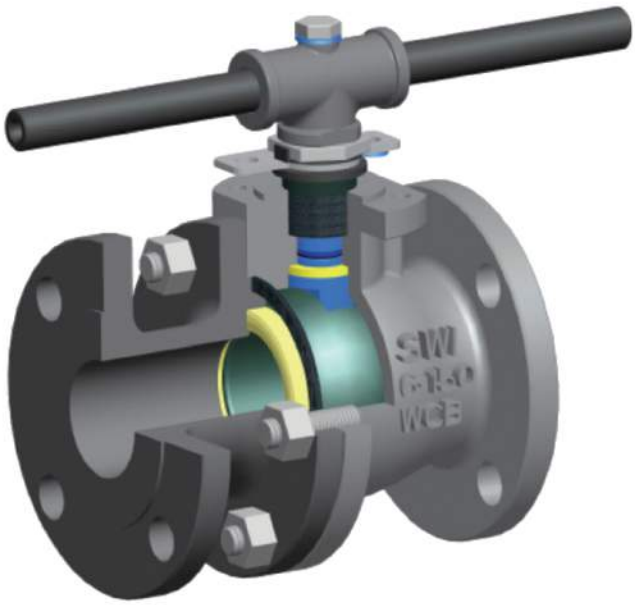
The range of ball valves feature a split body bolted construction to facilitate ease of disassembly for maintenance purposes.

Positive engagement and alignment of the split bolted body with 'GAP FREE' connection of body joint ensures maximum resistance against pipeline stresses and loads without any effect on valve sealing capability or influencing operational torque. Effective body joint is guaranteed via the fully contained Spiral Wound Gasket or via an O-ring and fully contained graphite gasket; ensuring zero leakage and fire safety assurance.

All bolting calculations satisfy the requirements of ASME B16.34. In particular, allowable bolt stress used in the body or bonnet joints do not exceed the maximum value of either 7,000 or 9,000 psi respectively whichever bolt material is used.

The design complies with the requirements of ASME B16.34. Other codes (in particular ASME VIII Division 1) are only used as a supplement to ASME B16.34 for additional calculations not already covered in ASME B16.34.

DESIGN FEATURES



ISO 15848-1 Class AH Certified

MAINTENANCE FREE STEM SEALING

High Integrity Conical metal to metal sealing combined with wedging PTFE and Graphite live loaded and pressure energized provides double sealing capability before and after fire condition whilst ensuring performance well within the requirements of the ISO 15848-1 Class AH, US EPA, and TA-Luft VDI 2440.

Optional bolted gland is available.

LIVE LOADED GLAND

Live loading of gland ensures constant load of the high integrity stem sealing element whilst minimizing operational torque and providing effectively a maintenance free gland arrangement.

TOP & BOTTOM BEARINGS

Radial and axial stem loading is minimized due to dual support of the stem via effective bearings at the top and bottom of the stem.

BOTTOM ENTRY STEM

Integral shoulder stem with metal to metal conical seal internally assembled and retained by the body guarantees the stem cannot blow-out of the body due to pressure. Even after fire condition, effective sealing is provided via engagement of the metal to metal conical seal.

IEC 61508 SIL 3

Valves assessed with respect to IEC 61508:2000 Parts 1 & 2, and found meets requirements providing a level of safety integrity according to SIL 3.

ANTI-STATIC DESIGN

Positive grounding between the ball, stem and valve body is ensured via spring loaded plungers assembled and contained within the stem. Certified compliance with ATEX 94/9/EC requirements.

PRECISION BALL

Precision manufactured ball with high sphericity and surface finish ensures sealing capability combined with lower operational torques.

GAP FREE BODY JOINT

'GAP FREE' connection ensures maximum resistance against pipeline stresses and loads without any effect on valve sealing capability or influence on operational torque.

ISO 5211 & EN 15081 ACTUATOR MOUNTING

Allows precise mounting of actuator, mounting bolts are independent from stem packing gland bolts or cover bolts. Exact alignment reduces torque requirements and prevents side load causing out-of-line wear and additional stress to stem.

STEM WEATHER SEAL

A wiper / weather seal to prevent environmental contamination to stem sealing element is available.

FLEX SEAT DESIGN

Machined seats are designed to FLEX under operational conditions ensuring positive sealing performance across the pressure range whilst providing controlled operational torque and cavity relief capability.

BODY DRAIN CONNECTION

Cast or Forged in body boss provides for the provision of a drain bleed port when required (not shown).

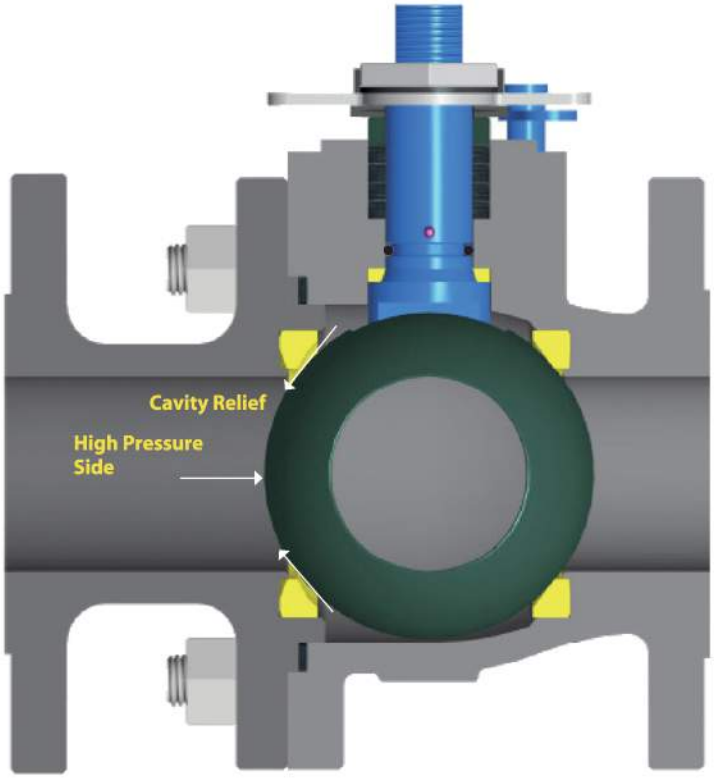
SEAT DESIGN

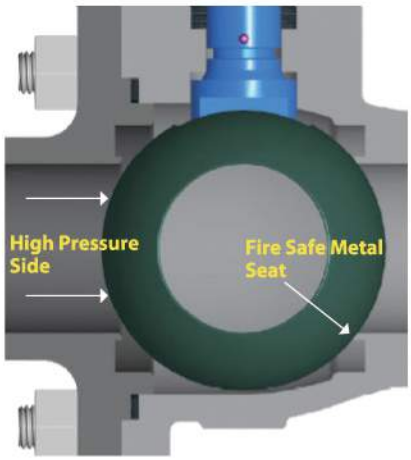
Standard valves utilise Reinforced PTFE seats for maximum chemical compatibility and are designed to FLEX ensuring positive sealing performance across a wide pressure range whilst providing controlled operational torque and cavity relief capability.

Reliable sealing is enhanced via precise pre-compression of the ball between the two flexing seat rings allowing the ball to float along the valve axis providing bubble tight and bi-directional performance.

Slots are incorporated in the external diameter of the R-PTFE seat rings to aid pressure equalization between the high pressure side and the valve cavity thus minimizing the load on the downstream seat rings and optimising the operating torque.

Support and containment of the seat rings within the valve body provides enhanced pressure temperature resistance whilst maintaining the flexing ability under load.





CERTIFIED FIRE-TESTED

Should the valve seat rings be destroyed by the effects of fire, the ball will drift to the low pressure side to form a metal to metal seal on the integral secondary metal seat within the valve body. SWI ball valves have been fire tested and certified to be in accordance with recognized international standards such as API 607 6thEdition, ISO 10497 and API 6FA.

CAVITY RELIEF

Soft seated valves are designed to relieve cavity over pressure in the closed position to the high pressure side in the event of thermal expansion of the trapped fluid. The ability for cavity relief is however influenced by many factors, including soft seat material, ball to seat compression, temperature and pressure variances and fluid characteristics.

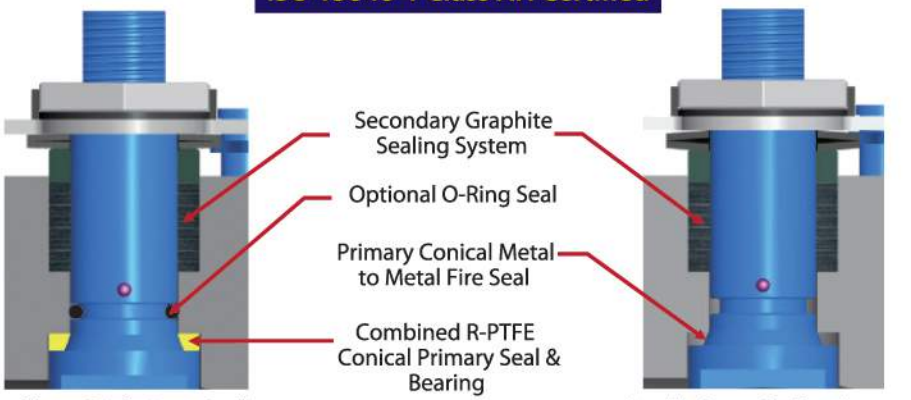
For High Volatility Duty where in some services the fluid is known to possess rapid thermal expansion characteristics and cavity over pressure could occur when trapped, it is recommended that direct discharge relief is provided via the body or a vented ball. This adaptation does render the valve uni-directional and the valve body will be marked accordingly.

Pressure equalization between the body cavity and the process stream when the valve is in the open position is provided via direct venting through the ball via a vent hole in the stem drive slot. This pressure equalization feature is only in effect when the valve is in the open position.

HIGH INTEGRITY STEM SEALING

SWI recognize the vital role of high integrity stem sealing as standard in eliminating possible emissions from valves. The range of valves incorporate a high integrity live loaded stem sealing system designed to provide the highest level of performance in quarter turn valves via double sealing capability before and after fire condition ensuring performance well within the requirements of the ISO 15848, US EPA and TA-Luft. Certified in accordance with ISO 15848-1 Class AH.

ISO 15848-1 Class AH Certified



Double or Triple Stem Sealing System For Normal Operation.

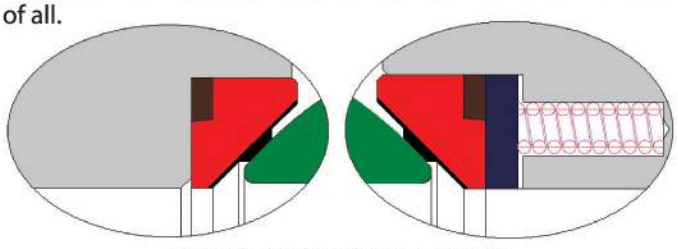
Double Stem Sealing System After Fire Condition.

The primary stem seal is wedge-shaped RTFE thrust seal and bearing which is line pressure energized and live loaded by opposing gland springs to automatically compensate for wear, combined with and backed up by secondary graphite seals forming a dual sealing system for normal operational conditions. The sealing performance may be additionally enhanced by the addition of an optional third elastomeric seal when required.

In the event of destruction by fire condition of the soft sealing elements, the live loaded and line pressure energized stem features an integral metal conical seal which engages with the body to form a metal to metal primary FIRE SAFE seal backed up by the secondary fully contained flexible graphite seals.

METAL SEATING

The complete failure of a valve in service is often due to the deterioration of its sealing element or one of the operating parts impairing its operation. Solid metal seats should be adopted for hostile conditions, CRITICAL and SEVERE applications, particularly when the service is dirty, abrasive, highly corrosive, at elevated temperature or a combination of all.



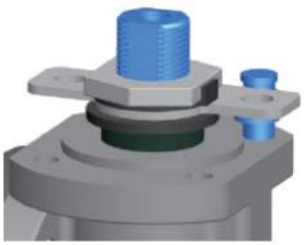
Typical Metal Seat Arrangement

SWI offer a range of solid metal seating with various surface treatments such as NITRIDING or hard facing by thermal-spraying of STELLITE or TUNGSTEN CARBIDE or HARD NICKEL ALLOY to suit almost any application or base material. Stellite & Nickel Alloy coating can additionally be fully fused to the base metal to form a metallurgical bond providing the highest integrity sealing surface, virtually porous free with hardness up to 60 ~ 65 HRc, dependant on alloy.

Suitable for a temperature range up to 538°C (1000°F), Uni or Bi-directional service combined with superior shut-off capability; SWI offers a high performance solution for may difficult applications.

LEVER REMOVAL / STOP PLATE

In the event that lever is removed to prevent unauthorized or accidental operation, the removal of the lever does not affect the integrity of the stem sealing system or operational performance of the valve.



With the lever removed, the stem remains positively loaded and cannot be forced downwards. Additionally, the stop plate is independent of the lever and remains securely attached to the valve stem, even after removal of the lever or T-Bar operator.

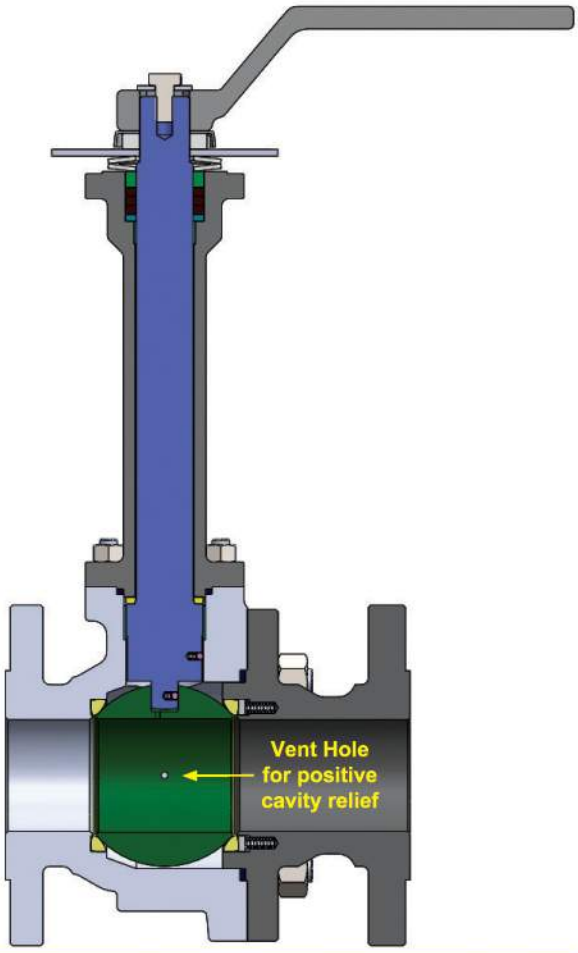
LOW TEMPERATURE & CRYOGENIC SERVICE

Floating ball valves have been widely used in low temperature and cryogenic applications, including LNG (Liquefied Natural Gas) plants by major users and engineering contractors worldwide. SWI valve designs are available with extended bonnets and special preparation for applications in extreme temperature service conditions.

Extended bonnets are recommended for valves which are required to be operated (cycled open & closed) for service at temperatures below -20°C (-4°F) down to -196°C (-320°F).

SWI low temperature and cryogenic valves are designed with special consideration in the following areas :

- Vapour space extended bonnet to relocate the stem seals outside of the cold zone
- Excellent seat & seal design to minimize potential for leakage
- Spring loaded seat design provide effecting performance at all pressures whilst minimizing operational torque.
- One-piece construction stem with top and bottom guides.
- Cavity pressure relief in case thermal expansion of trapped fluid
- Lower operational torque for reliable and smoother operation
- Rigid body construction to minimize effects of thermal shock
- Fugitive emission compliance as standard
- Modular design with ease of maintenance
- Firesafe design
- Drip collar, optional when specified
- Design and acceptance test criteria in accordance with ISO 28921-1



EXTENDED BONNET

Extended bonnet designs are of the bolted fully enclosed vapour space type with an internally assembled one piece anti-blow-out stem design whereby all stem seals are located at the top of the bonnet away from the cold zone.

The one-piece bonnet design provides for a pressurised column in which the cold liquid phase is changed, by heat transfer with the environment, to the gaseous phase forming a gas gap under the primary stem seals which protects the valve from malfunctioning due to freezing.

SWI offer two extension lengths for each size of valve in accordance with ISO 28921-1.

Short Bonnet for temperatures down to -109°C (-164°F)

Long Bonnet for temperatures down to -196°C (-320°F)

The length of the extensions offered are sufficient to maintain the stem packing at a temperature high enough to permit operation within the normal temperature range of the packing material.

CAVITY RELIEF

For valves in liquid service at temperatures below -50°C (-58°F) it is recommended a direct relief path (vent hole in ball) is provided to the high pressure side (upstream side) of the valve for positive cavity relief. This renders the valve as UNI-DIRECTIONAL and the body is marked accordingly.

DRIP COLLAR

The fitting of a drip collar helps to minimize ice accumulation on the extension and prevent possible damage to any lagging. Customers may specify the fitting of drip collars which is optional.

OPERATING TORQUE

Valves in low temperature and cryogenic service experience higher operational torques as a result of the increased rigidity of the seat material and changes in frictional coefficient. The level and variation in operational torques is dependant on the selected seat material and minimum operational service conditions. This increased operational torque must be taken into account when selecting operators or sizing for actuation. SWI has detailed experience of torque variations resulting from low temperature or cryogenic service and users are recommended to provide full application details to SWI technical for consideration.

MATERIAL TEMPERATURE LIMITS

The lower temperature limits for standard valve body materials are as follows;

· BODY MATERIAL (ASTM)

Carbon Steel A216-WCB / A105N	-29°C	-20°F
Carbon Steel A352-LCB	-46°C	-50°F
Carbon Steel A352-LCC / A350-LF2	-50°C	-58°F
Stainless Steel A351-CF8M / A182-F316	-200°C	-328°F

· SEAT MATERIAL

Reinforced PTFE	-200°C	-328°F
PEEK	-100°C	-148°F
PTFE (TFM1600)	-200°C	-328°F
PCTFE (Kel-F)	-200°C	-328°F

ACCEPTANCE TESTING

SWI's dedicated in-house test facilities enable valves to be performance tested at low temperature or cryogenic conditions in accordance with major international standards or a customer's individual requirements.

COOLANT	**NITROGEN [N_2]** - Liquid - Gaseous
TEST GAS	**NITROGEN [99% N_2 + 1% He]** - for temperatures down to -160°C (-256°F) **HELIUM [He]** - for temperatures down to -200°C (-328°F)
LEAKAGE DETECTION	**EXTERNAL** - by mass spectrometer **ACROSS SEATS** - by gas flow meters down to 5Nml/min, - then by soap bubble displacement for readings down to 0.1 Nm/min.

TEMPERATURE BAND DEFINITION

SWI have adopted the following band definitions for subzero services

BAND	TEMPERATURE RANGE
Low Temperature	-30°C ~ -100°C (-22°F ~ -148°F)
Cryogenic	-101°C (-150°F) & below

BOILING POINTS OF LIQUEFIED GASES

Propane	-42°C	-43.6°F
Carbon Dioxide	-78°C	-108.4°F
Ethylene	-104°C	-155.2°F
Methane	-161.5°C	-258.7°F
Liquid Natural Gas	-163°C	-261.4°F
Oxygen	-182.9°C	-297.2°F
Carbon Monoxide	-192°C	-313.6°F
Air	-194.4°C	-317.9°F
Nitrogen	-195.8°C	-320.4°F
Hydrogen	-252.7°C	-422.9°F
Helium	-268.9°C	-452°F

High Integrity Floating Ball Valves

DESIGN FEATURES

PERFORMANCE FOR ANY PROCESS

SWI recognizes the vital role correct seat material selection plays in delivering the highest levels of sealing performance and longevity of service which are directly effected by the process and operational requirements.

With a wide variety of SOFT & METAL seat materials to suit an extensive range of applications, SWI offers dependable operation combined with pressure integrity and endurance over the valves service life. The below outlines commonly used seat materials; other grades such as UHMWPE, Delrin®, Vespel® etc.... are available on request.

Virgin PTFE < Polytetrafluoroethylene >

This seating material has excellent chemical resistance over a wide range of chemicals and offers the lowest operational torques due to its low coefficient of friction. PTFE is non-contaminating and accepted by FDA for use in food services.

Modified PTFE TFM1600 < Modified Polytetrafluoroethylene >

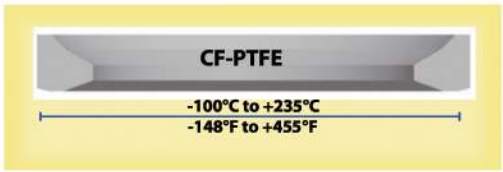
Dyneon® TFM PTFE is a modified TFE Polymer. A second generation PTFE that maintains the exceptional chemical and heat resistance properties of first generation PTFE with added process purity, strength, low permeability and high resiliency. The low permeability especially makes this material ideal for use on reactive monomer (such as styrene) and butadiene.

R-PTFE < Reinforced Polytetrafluoroethylene >

PTFE's mechanical properties are enhanced by adding 15% or 25% percent glass fiber filler material to provide improved strength, stability and wear resistance. This reinforcement permits application at higher pressure and temperature limits than unfilled PTFE.

CF-PTFE < Carbon Filled Polytetrafluoroethylene >

This is a PTFE based resin reinforced with a special composition of glass amorphous carbon powder and graphite fillers for enhanced pressure and heat resistance properties whilst providing superior abrasion and wear resistance. It is particularly suited to high temperature, steam and modulating service /applications.



PEEK < Polyetheretherketone >

Peek Polymer offers a unique combination of chemical, mechanical and thermal properties where high strength and high temperature is required in corrosive applications. Excellent for water and steam application at elevated temperatures and possesses excellent resistance to radiation and abrasion compared to PTFE's.

Metallized Carbon Insert

Metallized Carbon is a proprietary product for applications where traditional SOFT seating materials cannot be utilized. This material has exceptional capabilities and is suitable for use in a variety of SEVERE SERVICE applications ranging from high temperatures to cryogenic temperatures, harsh caustics and strong acids, dry service, whilst providing one of the lowest operational torques (coefficient of friction 0.1~0.2) due to its self-lubricating & non-galling characteristics. Being a solid and homogeneous material throughout; there are no coatings, plating or surface treatments to wear out.

Solid Metal Seats

The complete failure of a valve in service is often due to the deterioration of its sealing element or one of the operating parts impairing its operation. Solid metal seats should be adopted for hostile conditions, CRITICAL and SEVERE applications, particularly when the service is dirty, abrasive, highly corrosive, at elevated temperature or a combination of all.

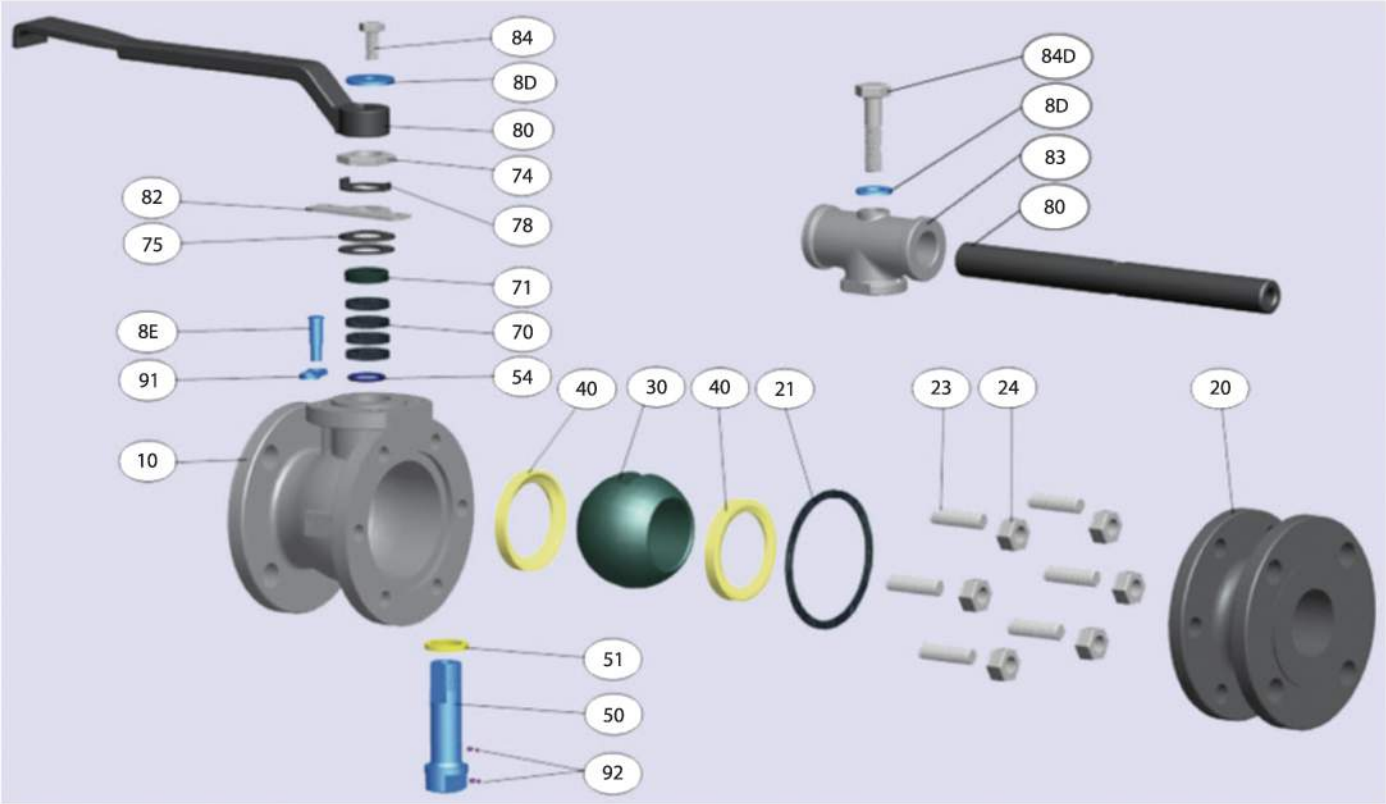
SWI offer a range of solid metal seating with various surface treatments such as NITRIDING or hard facing by thermal-spraying of STELLITE or TUNGSTEN CARBIDE or HARD NICKEL ALLOY to suit almost any application or base material. Stellite & Nickel Alloy coating can additionally be fully fused to the base metal to form a metallurgical bond providing the highest integrity sealing surface, virtually porous free with hardness up to 60 ~ 65 Hrc, dependant on alloy.

Precision lapping of ball & seat results in superior interfacing for tight shut-off.

Applications

- Slurries, pulp stock, scaling liquids
- Saturated & Superheated steam
- Fluids containing entrained particles, dirty service
- High pressure & high temperature applications
- Abrasive and erosive service applications

MATERIALS & PARTS

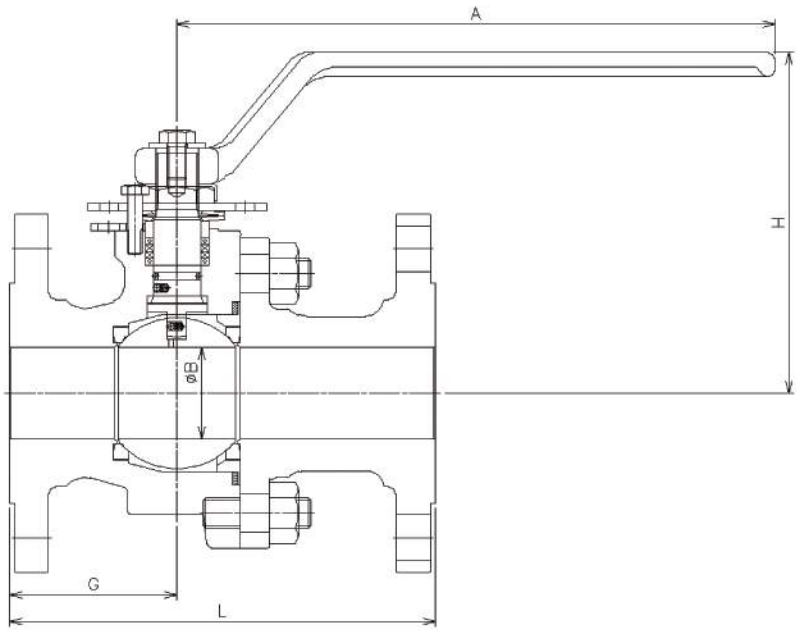


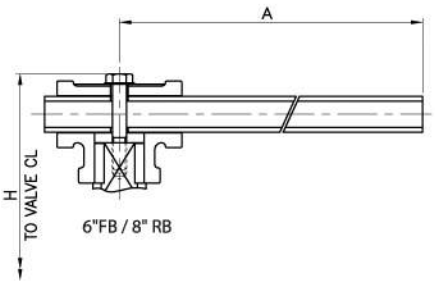
BILL OF MATERIALS[1]							
No.	Part Description	Qty.	CS	ITCS	SS	Notes	Spares
10	BODY	1	A216-WCB/A105	A352-LCC/A350-LF2	A351-CF8M/A182-F316		
20	CAP (ADAPTOR)	1	A216-WCB/A105	A352-LCC/A350-LF2	A351-CF8M/A182-F316		
21	CAP GASKET	1	HNBR / FKM-B / FKM-GLT & GRAPHITE or 316+ GRAPHITE SWG			2	S
23	CAP BOLT	1 Set	A193-B7	A320-L7	A193-B8M CL2	3	
24	CAP NUT	1 Set	A194-2H	A194-4	A194-8M	3	
30	BALL	1	A351-CF8M / A182-F316 / A276-316				
40	SEAT RING	2	R-PTFE			4	S
50	STEM	1	A182-F316 / A276-316				
51	THRUST SEAL / BEARING	1	R-PTFE				S
54	STEM O'RING	1	HNBR / FKM-B / FKM-GLT			5	S
70	GLAND PACKING	1 Set	INHIBITED FLEXIBLE GRAPHITE			6	S
71	GLAND RING	1	A182-F316 / A276-316				
74	STEM NUT	1	316 STAINLESS STEEL				
75	GLAND SPRING	2	SPRING STEEL				
78	TOOTH WASHER	1	304 STAINLESS STEEL				S
80	LEVER / T-BAR TUBE	1	A395 + BLACK PAINT / A53 + GALVANIZED			7	
82	STOP PLATE	1	316 STAINLESS STEEL				
83	T-BAR SOCKET	1	A395 + BLACK PAINT				
84	LEVER / T-BAR BOLT	1	A193-B8M				
8D	LEVER WASHER	1	304 STAINLESS STEEL				
8E	STOP PIN	1	316 STAINLESS STEEL				
91	LOCKING PLATE	1	316 STAINLESS STEEL				
92	ANTI STATIC DEVICE	1	316 STAINLESS STEEL				

NOTES

1) Typical materials for standard valves. Alternative materials available on request.
2) DN15 (½") ~ DN40 (1½") O-Ring & fully contained Graphite. DN50 (2") ~ DN200 (8") 316 + Graphite SWG. Addition of O-Ring seal to SWG Gasket available on request.
3) Quantity is according to valve size & rating. B7M & L7M bolting for NACE valves. Alternative grades on request.
4) Virgin PTFE, TFM1600, PCTFE, PEEK or all Metal Seated options available on request.
5) Stem O-Ring seal is optional and alternative grades available.
6) Alternative for PTFE packing available on request.
7) Class 150# 6" FB / 8" RB valves fitted with T-Bar operator. Option for Gear or alternative operators on request

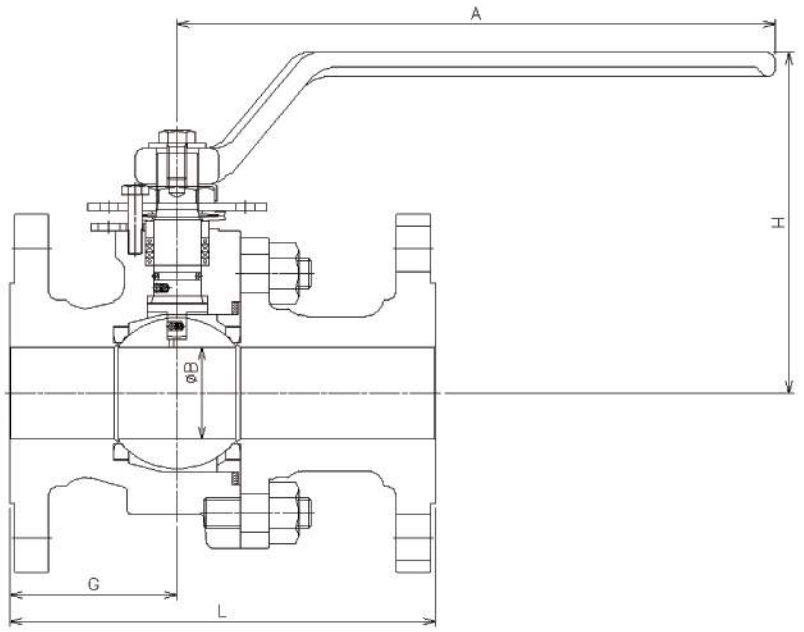
SERIES 'CN' DIMENSIONS

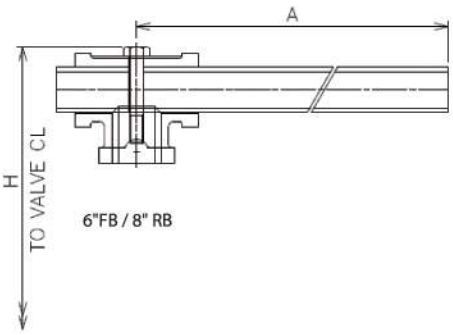




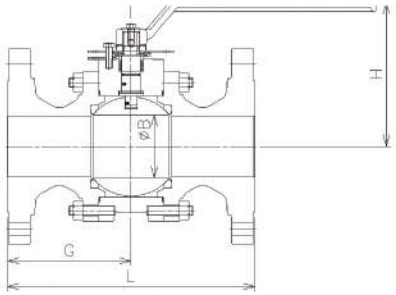
SIZE	DN15		DN20		DN25		DN40		DN50		DN80		DN100		DN150		DN200	
	1/2"		3/4"		1"		1½"		2"		3"		4"		6"		8"	
	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins
FULL BORE CLASS 150#																		
ØB	13	0.51	19	0.75	25	0.98	38	1.50	49.3	1.94	76	2.99	100.1	3.94	150.9	5.94		
L	108	4.25	117.5	4.63	127.5	5.02	165	6.50	178	7.01	203	7.99	229	9.02	394	15.51		
H	97.5	3.84	108.5	4.27	112	4.41	128	5.04	165	6.50	222	8.74	242	9.53	319	12.56		
A	150	5.91	150	5.91	200	7.87	200	7.87	250	9.84					600	23.62		
G	52	2.05	58	2.28	67	2.64	69	2.72	77	3.03	96	3.78	108	4.25	130	5.12		
Kg lbs	2.5	5.51	3.6	7.94	5.5	12.13	8	17.64	15	33.07	20	44.09	36	79.37	70	154.32		
FULL BORE CLASS 300#																		
ØB	13	0.51	19	0.75	25	0.98	38	1.50	49.3	1.94	76	2.99	100.1	3.94	150.9	5.94		
L	140	5.51	152	5.98	165	6.50	190.5	7.50	216	8.50	283	11.14	305	12.01	403	15.87		
H	97.5	3.84	108.5	4.27	112	4.41	128	5.04	165	6.50	222	8.74	242	9.53	319	12.56		
A	150	5.91	150	5.91	200	7.87	200	7.87	250	9.84	400	15.75	400	15.75	600	23.62		
G	52	2.05	58	2.28	67	2.64	69	2.72	77	3.03	96	3.78	108	4.25	140	5.51		
Kg lbs	3.2	7.05	4.2	9.26	7	15.43	11	24.25	17	37.48	25.5	56.22	44	97.00	88	194.00		
FULL BORE CLASS 600#																		
ØB	13	0.51	19	0.75	25	0.98	38	1.50										
L	185	7.28	190.5	7.50	216	8.50	241.3	9.50										
H	97.5	3.84	108.5	4.27	112	4.41	128	5.04										
A	150	5.91	150	5.91	200	7.87	250	9.84										
G	75	2.95	78	3.07	93	3.66	94	3.70										
Kg lbs	3.9	8.60	5.1	11.24	8	17.64	12	26.46										
REDUCED BORE CLASS 150#																		
ØB									38	1.50	49.3	1.94	76	2.99	100.1	3.94	150.9	5.94
L									178	7.01	203	7.99	229	9.02	394	15.51	457	17.99
H									128	5.04	165	6.50	222	8.74	242	9.53	319	12.56
A									250	9.84	250	9.84	400	15.75	400	15.75	600	23.62
G									69	2.72	77	3.03	96	3.78	108	4.25	130	5.12
Kg lbs									9	19.84	17	37.48	26	57.32	45	99.21	87	191.80
REDUCED BORE CLASS 300#																		
ØB									38	1.50	49.3	1.94	76	2.99	100.1	3.94	150.9	5.94
L									216	8.50	283	11.14	305	12.01	403	15.87	502	19.76
H									128	5.04	165	6.50	222	8.74	242	9.53	319	12.56
A									250	9.84	250	9.84	400	15.75	400	15.75	600	23.62
G									69	2.72	77	3.03	96	3.78	108	4.25	130	5.12
Kg lbs									11.2	24.69	22.5	49.60	34	74.96	63	138.89	129	284.39

SERIES 'AN' & 'AP' DIMENSIONS





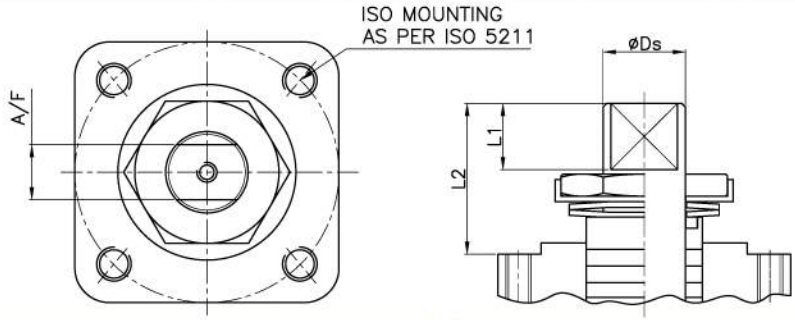
6"FB / 8" RB



6" & ABOVE

SIZ	DN15		DN20		DN25		DN40		DN50		DN80		DN100		DN150		DN200	
	1/2"		3/4"		1"		1½		2"		3"		4"		6"		8"	
	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins
FULL BORE CLASS 150#																		
ØB	13	0.51	19	0.75	25	0.98	38	1.50	49.3	1.94	76	2.99	100.1	3.94	150.9	5.94		
L	108	4.25	117.5	4.63	127.5	5.02	165	6.50	178	7.01	203	7.99	229	9.02	394	15.51		
H	97.5	3.84	108.5	4.27	112	4.41	128	5.04	156	6.14	217	8.54	236	9.29	319	12.56		
A	150	5.91	150	5.91	200	7.87	200	7.87	250	9.84	400	15.75	400	15.75	600	23.62		
G	52	2.05	58	2.28	67	2.64	69	2.72	70	2.76	90	3.54	109	4.29	197	7.76		
Kg lbs	2.5	5.51	3.6	7.94	5.5	12.13	8	17.64	15	33.07	20	44.09	36	79.37	70	154.32		
FULL BORE CLASS 300#																		
ØB	13	0.51	19	0.75	25	0.98	38	1.50	49.3	1.94	76	2.99	100.1	3.94	150.9	5.94		
L	140	5.51	152	5.98	165	6.50	190.5	7.50	216	8.50	282	11.10	305	12.01	403	15.87		
H	97.5	3.84	108.5	4.27	112	4.41	128	5.04	156	6.14	217	8.54	236	9.29	319	12.56		
A	150	5.91	150	5.91	200	7.87	200	7.87	250	9.84	400	15.75	400	15.75	600	23.62		
G	52	2.05	58	2.28	67	2.64	69	2.72	95	3.74	118	4.65	138	5.43	201.5	7.93		
Kg lbs	3.2	7.05	4.2	9.26	7	15.43	11	24.25	17	37.48	25.5	56.22	44	97.00	88	194.00		
FULL BORE CLASS 600#																		
ØB	13	0.51	19	0.75	25	0.98	38	1.50										
L	185	7.28	190.5	7.50	216	8.50	241.3	9.50										
H	97.5	3.84	108.5	4.27	112	4.41	128	5.04										
A	150	5.91	150	5.91	200	7.87	250	9.84										
G	75	2.95	78	3.07	93	3.66	94	3.70										
Kg lbs	3.9	8.60	5.1	11.24	8	17.64	12	26.46										
REDUCED BORE CLASS 150#																		
ØB									38	1.50	64	2.52	76	2.99	100.1	3.94	150.9	5.94
L									178	7.01	203	7.99	229	9.02	394	15.51	457	17.99
H									143	5.63	156	6.14	217	8.54	236	9.29	319	12.56
A									250	9.84	250	9.84	400	15.75	400	15.75	600	23.62
G									70	2.76	90	3.54	104	4.09	197	7.76	228.5	9.00
Kg lbs									9	19.84	17	37.48	26	57.32	45	99.21	87	191.80
REDUCED BORE CLASS 300#																		
ØB									38	1.50	64	2.52	76	2.99	100.1	3.94	150.9	5.94
L									216	8.50	282	11.10	305	12.01	403	15.87	502	19.76
H									143	5.63	156	6.14	217	8.54	236	9.29	319	12.56
A									250	9.84	250	9.84	400	15.75	400	15.75	600	23.62
G									95	3.74	128	5.04	112	4.41	201.5	7.93	251	9.88
Kg lbs									11.2	24.69	22.5	49.60	34	74.96	63	138.89	129	284.39

VALVE TOP FLANGE & STEM DIMENSIONS



TOP FLANGE & STEM DIMENSIONS							
STEM SIZE		ØDs	A/F	ISO 5211 Mtg. Flange	L1	L2 Nominal	L2 Tolerance
1	mm	12	8	F03	9	22	0 / -1.0
	ins	0.472	0.315		0.354	0.866	0 / -0.039
2	mm	18	12	F05	13	33	0 / -1.0
	ins	0.709	0.472		0.512	1.299	0 / -0.039
3	mm	22	15	F07	16	34	0 / -1.0
	ins	0.866	0.59		0.63	1.339	0 / -0.039
4	mm	28	19	F10	21	45	0 / -1.0
	ins	1.102	0.748		0.827	1.772	0 / -0.039
5	mm	36	24	F12	26	56	0 / -1.0
	ins	1.417	0.945		1.024	2.205	0 / -0.039

STEM SIZE SELECTION						
VALVE SIZE		FULL BORE			REDUCED BORE	
mm	ins	150#	300#	600#	150#	300#
DN15	1/2"	1	1	1		
DN20	3/4"	1	1	1		
DN25	1"	2	2	2		
DN40	1 1/2"	2	2	2		
DN50	2"	3	3		2	2
DN80	3"	4	4		3	3
DN100	4"	4	4		4	4
DN150	6"	5	5		4	4
DN200	8"				5	5

VALVE TORQUES

To calculate the valve required torque at any pressure use the formula in the below table.
Example: 3" Full Bore Class 150# Valve fitted with RTFE Seats at 285 psi = 49.72 + (0.136 x 285)= 88.5 Nm

VALVE NOMINAL INTERNAL PORT SIZE 'Ø'	BALL VALVE OPERATING STEM TORQUES (Nm) R-PTFE SEAT							
	CL 150#			CL 300#			CL 600#	
	ΔP (Psi)		285	ΔP (Psi)		740	ΔP (Psi)	1480
1/2" (13mm)	4.97 + 0.003 * ΔP		5.8	4.97 + 0.003 * ΔP		7.2	5.71 + 0.005 * ΔP	13.1
3/4" (19mm)	9.50 + 0.004 * ΔP		10.6	9.50 + 0.004 * ΔP		12.5	10.91 + 0.006 * ΔP	19.8
1" (25mm)	14.92 + 0.005 * ΔP		16.3	14.92 + 0.005 * ΔP		18.6	17.15 + 0.007 * ΔP	27.5
1½" (38mm)	17.90 + 0.006 * ΔP		19.6	17.90 + 0.006 * ΔP		22.3	20.52 + 0.009 * ΔP	33.8
2" (49mm)	28.93 + 0.034 * ΔP		38.6	28.93 + 0.034 * ΔP		54.1		
3" (74mm)	49.72 + 0.136 * ΔP		88.5	49.72 + 0.136 * ΔP		150.4		
4" (100mm)	74.58 + 0.385 * ΔP		184.3	74.58 + 0.385 * ΔP		359.5		
6" (150mm)	142.38 + 0.735 * ΔP		351.9	142.38 + 0.735 * ΔP		686.3		

MAX. ALLOWABLE 316 SS Material	
Stem Size	Lb ins
1	358
2	1219
3	2262
4	4642
5	9697

For alternative stem materials & strengths, contact SWI Technical.

FLOW COEFFICIENTS

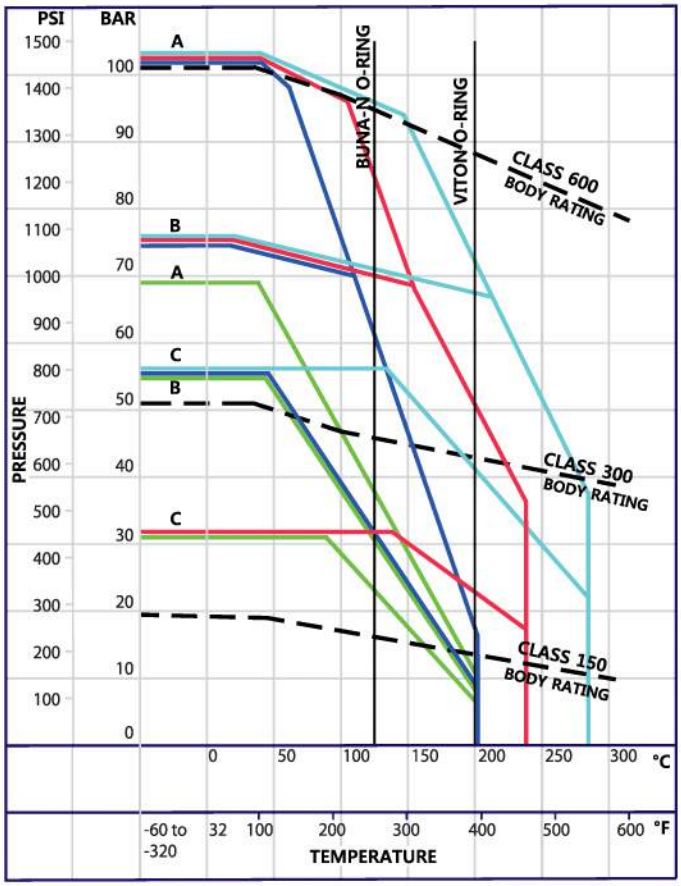
SIZE		FULL BORE	REDUCED BORE
mm	ins		
DN15	1/2"	17	10
DN20	3/4"	32	15
DN25	1"	130	35
DN40	1 1/2"	260	80
DN50	2"	460	110
DN80	3"	1200	312
DN100	4"	2200	478
DN150	6"	5000	1000
DN200	8"		1800

FLOW COEFFICIENT NOTE

Cv is defined as the volume of water flowing through the valve, in U.S. Gallons per minute at 60°F (15°C), which will result in a pressure drop of 1 psi.

The table gives Flow Coefficient (Cv) values for Series 'CN' ball valves in the full open position.

PRESSURE & TEMPERATURE LIMITS



GRAPH	FULL BORE	REDUCED BORE
A	1/2"~2"	2"
B	3"~4"	3"~6"
C	6"	8"

PTFE
R-PTFE
CF-PTFE
PEEK
BODY RATING

PRESSURE/TEMPERATURE RATINGS (SOFT SEAT AND SEALS)

SOFT SEAT / SEAL MATERIAL SELECTION & LIMITS

MATERIAL	STATIC / SHORT PERIODS				CONTINUOUS			
	TEMP. ° C		TEMP. ° F		TEMP. ° C		TEMP. ° F	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
PEEK	- 100	+290	-148	+554	- 80	+250	-112	+482
R-PTFE / TFM1600	-200	+205	-328	+400	-200	+160	-328	+320
CF-PTFE (Carbon & Glass Reinforced)	- 100	+235	-148	+455	- 100	+205	-148	+400
PTFE (Virgin)	-200	+205	-328	+400	-200	+150	-328	+302
PCTFE (KEL-F)	-200	+160	-328	+320	-200	+150	-328	+302
FKM A & B (Viton)	-15	+230	-5	+446	-10	+200	-14	+392
FKM GLT (Viton)	-46	+210	-50.8	+410	-40	+180	-40	+356
NITRILE	-30	+150	-22	+302	-30	+120	-22	+248
HNBR	-46	+200	-50.8	+392	-25	+160	-13	+320
SILICONE	-60	+250	-76	+482	-60	+200	-76	+392
FLUOROSILICONE	-60	+200	-76	+392	-60	+180	-76	+356

NOTES

1) Temperature limitations may vary between manufacturer grades; always consult with SWI Technical if in doubt.
2) Valves Pressure~ temperature (P~T) ratings are limited by the body ratings according to ASME B16.34, seat and seal material.
3) Metal seated valves seat P~T ratings are equal to the body ratings.
4) The P~T ratings advised for seats & seals are a guide for general service; always consult with SWI Technical for specific recommendations.

ACTUATION & OPERATION METHODS

SWI floating ball valves may be manually operated by lever or gearbox depending on torque requirements, and are built to easily accept pneumatic, hydraulic or electric actuators.

Valve designs minimize operational torques, which normally affects actuator sizing, allowing for economical automation packages. Complete valve / actuator assemblies can be provided fully tested and certified according to customer requirements as a single package, supplied directly from SWI.

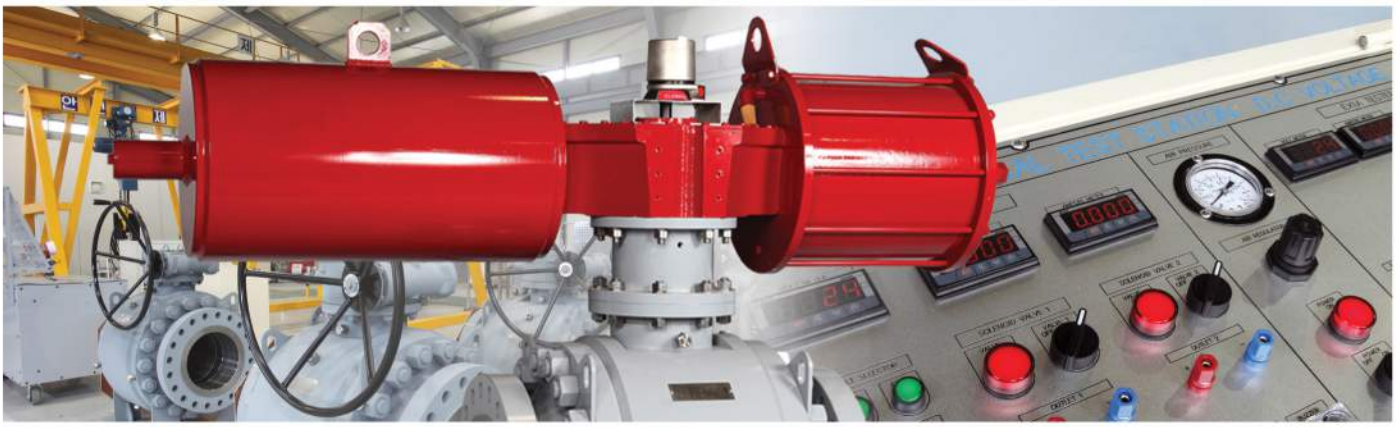
Over many years, SWI has built up a reputation for providing high quality valves supported by factory field experts. To maintain and extend our reputation, we have aligned ourselves with highly accredited and respected Automation Manufacturers in the industry. With fully equipped valve automation assembly & test shop combined with our extensive knowledge of the valves and actuator requirements, SWI can offer competitive prices, best service and proven products.

Production is centered at our new 14,500 m^2 World Class facility near Seoul with all manufacturing processes covered by the same documentation that ensures compliance to our standardized quality assurance programs. Product quality has been subject to continued enhancements and all products are constantly reviewed so as to improve quality and maintainability.

From general on / off duty with position indication and solenoid control to complete modulating packages with smart positioners, regulators, partial stroke and sophisticated control systems are all available from SWI.

SWI valves are ideal for ESD applications. Valves specified as ESD are equipped with actuators which ensure their positive operation in an emergency. In the case of such critical equipment, full details of the application conditions and relevant specifications should always be provided to our technical department.

To provide further customer support, SWI has partnered with key companies worldwide to distribute products and respond quickly to our client needs.



METAL TO METAL SEATED VALVES

For applications where solid particles may be present in the fluid or involve very high pressure and / or elevated temperature beyond the capability of soft seats, SWI can provide valves with metal to metal seating. SWI achieves the metal to metal seating through the use of various advanced hard facing technologies incorporating Tungsten Carbide coatings, Stellite, Hard Nickel Alloy or alternative processes considering the intended application.

Please consult with our technical department for specific requirements.

OPTIONS & VARIATIONS

LOW TEMPERATURE SERVICE

SWI valves can be supplied for use in low temperature or cryogenic service.

Extended bonnet designs are of the fully enclosed vapour space type featuring an internally assembled anti-blow-out stem with the bonnet bolted to the body. Critical stem seals are located at the top of the bonnet outside of the cold zone.

Extended bonnets are recommended for valves which are required to be operated (opened & closed) in service at temperatures below -20°C (-4°F) or above 200°C (392°F).

UNDERGROUND / EXTENDED OPERATOR

Operator extensions may be required where valves are to be installed in underground (buried service) locations or whereby extended operators are required due to inaccessibility. SWI can offer a full range of extensions in a wide range of materials, from simple spindle type extensions to fully enclosed and oil filled type extensions. Extensions and lengths are manufactured according to client requirements.

SOUR SERVICE

Valves are available conforming to the requirements of the NACE specification MR 01-75 or MR 01-03 for use on applications where the presence of wet H_2S generates a risk of stress corrosion cracking. NACE compliance certificates are available on request.

QUALITY ASSURANCE

SWI Valves operate under a Quality Assurance system which is approved by Bureau Veritas to ISO 9001:2008 / KS Q ISO 9001: 2009 / KEPIC-MN and API Q1. The company is licensed to use the API Monogram in respect of API 6D ball valves and our facilities are always open to customer audits.

SWI ball valves have been independently accredited for Design and Fire Safety. In addition, manufacture and materials comply with the essential safety requirements of the Pressure Equipment Directive 97/23/EC (PED).

High Integrity Floating Ball Valves

A	B		C	D	E	F	G	H	J	K		L	M	N	P	R		S
SIZE	MODEL	CLASS	BODY MARETIAL	INTERNAL COATING	BALL& SEAT RING	STEM	SEATS	TRIM SEALS	BODY SEALS	TRIM COATING		END CONN.	BORE	BONNET	OPP.	BOLRING		OPTIONS
2"	CN	B	C2	0	33	33	R	06	E1	00	–	R	2	0	3	A	0	0 0

N = NACE materials
N = Non NACE materials

EXAMPLE:2"CNB-C203333R06E100-R203A0-00

A

VALVE TYPE / SERIES		
AN	2-PCE BODY END ENTRY FLOATING BALL VALVE	F
AP	3-PCE BODY END ENTRY FLOATING BALL VALVE	F
CN	2-PCE BODY END ENTRY FLOATING BALL VALVE	C

F = Forged Body Ball Valve C = Cast Body Ball Valve

B

CLASS	
B	150
D	300
E	600

C

SHELL MATERIAL BODY / BONNET / COVER (1 & 2)	
C1	A105N / A350-LF2 (Dual Grade)
C2	A216-WCB / A105N
C3	A216-WCC
C4	A352-LCB / A350-LF2
C5	A352-LCC
A1	A217-C5 / A182-F5
A2	A217-C12 / A182-F9
A3	A217-WC6 / A182-F11
A4	A217-WC9 / A182-F22
S1	A182-F304 / F304L (Dual Grade)
S2	A351-CF8 / A182-F304
S3	A351-CF3 / A182-F304L
S4	A182-F316 / F316L (Dual Grade)
S5	A351-CF8M / A182-F316
S6	A351-CF3M / A182-F316L
S7	A351-CF8C / A182-F347
D1	ASTM A995-4A / A182-F51
D3	ASTM A995-5A / A182-F53
D5	ASTM A890-6A / A182-F55
E4	ASTM A351-CK3MCUN / A182-F44
H1	A494 CW-12MW / B564-N10276
J1	A494-CW6MC / B564-N06625
J2	A494-CU5MCuC / B564-N08825
M1	A494-M35-1 / B564-N04400
N1	A990-CN3MCu / B462-N08020
T2	B367 Grade C2 / B381-F2
T3	B367-Grade C3 / B381-F3
B1	ASTM B148-C95800 (NI-AL-BZ)
ZZ	Other

(1) Cast valves may include forged material grades.
(2) Only forged material grades applied to forged body valves

D

INTERNAL COATING	
0	N/A
B	SS316L Weld Overlay to Dynamic Seal Area
C	SS321 Weld Overlay to Dynamic Seal Area
D	UNS S31803 Weld Overlay to Dynamic Seal Area
E	INCONEL 625 Weld Overlay to Dynamic Seal Area
F	INCOLOY 825 Weld Overlay to Dynamic Seal Area
Z	Other

E

F

TRIM MATERIAL			
BALL		STEM	
20	A217-CA15 / A276-410 / A182-F6A	20	A276-410 / A182-F6A
30	A351-CF8 / A276-304 / A182-F304	30	A276-304 / A182-F304
31	A351-CF3 / A276-304L / A182-F304L	31	A276-304L / A182-F304L
32	A182-F316 / F316L (Dual Grade)	33	A276-316 / A182-F316
33	A351-CF8M / A276-316 / A182-F316	34	A276-316L / A182-F316L
34	A351-CF3M / A276-316L / A182-F316L	35	A276-321 / A182-F321
35	A276-321 / UNS S32100	36	A276-347 / A182-F347
36	A351-CF8C / A276-347 / A182-F347	37	A453 Grade 660 / A-286
40	A351-CK3MCUN / A276-S31254 / A182-F44	38	A564-630 / 17-4PH
51	A995-4A / A276-S32205 / A182-F51	39	A276 Type XM-19 (Nitronic® 50)
53	A995-5A / A276-S32750 / A182-F53	40	A182-F44 / UNS S31254
55	A995-6A / A275-S32760 / A182-F55	51	A182-F51 / UNS S31803
60	B473-N08020	55	A182-F55 / UNS S32760
61	A990-CN3MCu / B473-N08020	61	B473-N08020 (Alloy 20)
62	A494 CW-12MW / B574-N10276 (Hastelloy C276)	62	B574-N10276 (Hastelloy C276)
63	A494-CW6MC / B446-N06625	63	B446 - N06625 (Inconel 625)
64	A494-CU5MCuC / B425-N08825	64	B425 - N08825 (Inconel 825)
70	A494-M35-1 / B164 Class A / N04400	65	B166 - N06600 (Inconel 600)
81	B348 Grade 4 / UNS R50700	72	B865-N05500 (MONEL K500)
82	B348 Grade 5 / UNS R56400	82	B348 Grade 5 / UNS R56400
90	NICKEL ALUMINIUM BRONZE (NI-AL-BZ)	90	NI-AL-BZ
Z0	Other	Z0	Other

G

H

SEAT, SEAT RING & STEM SEAL MATERIAL			
SEATS		TRIM SEALS (4)	
P	PTFE	01	PTFE
T	Modified PTFE (TFM1600)	02	RTFE & GRAPHITE
R	R-PTFE (Glass Filled)	03	PEEK & GRAPHITE
C	CF-PTFE (Carbon Filled)	04	HARD CARBON & GRAPHITE
D	DEVON V-API (Nylon 6.12)	05	RTFE / HNBR / GRAPHITE
K	PCTFE (KEL-F®)	06	RTFE / FKM-B & GRAPHITE
P	PEEK	07	RTFE / FKM-GLT & GRAPHITE
V	VESPEL SP21	08	RTFE / FFKM & GRAPHITE
H	HARD CARBON / GRAPHITE	09	HNBR / GRAPHITE
M	METALLIC	10	FKM-B & GRAPHITE
N	METALLIC + O-ring	11	FKM-GLT & GRAPHITE
		12	FFKM & GRAPHITE
		13	PTFE ELGILOY LIP SEAL & GRAPHITE
		14	ENERGIZED PTFE / PTFE O-RING
		15	ENERGIZED GRAPHITE / GRAPHITE
Z	OTHER	Z0	OTHER

(4) Elastomeric O-ring seals ED resistant.

A	B		C	D	E	F	G	H	J	K		L	M	N	P	R		S
SIZE	MODEL	CLASS		BODY MARETIAL	INTERNAL COATING	BALL& SEAT RING	STEM	SEATS	TRIM SEALS	BODY SEALS	TRIM COATING		END CONN.	BORE	BONNET	OPP.	BOLRING		OPTIONS
2"	CN	B	–	C2	0	33	33	R	06	E1	00	–	R	2	0	3	A	0	– 0 0

– = NACE materials
N = Non NACE materials

EXAMPLE:2"CNB-C203333R06E100-R203A0-00

J

BODY JOINT SEAL / GASKET (6)

B0	PTFE / GRAPHITE
C0	O-RING / GRAPHITE
D0	O-RING / 304L + GRAPHITE SWG / GRAPHITE
D1	O-RING / 316L + GRAPHITE SWG / GRAPHITE
D2	O-RING / UNS S31803 + GRAPHITE SWG / GRAPHITE
D3	O-RING / UNS S32760 + GRAPHITE SWG / GRAPHITE
D4	O-RING / MONEL + GRAPHITE SWG / GRAPHITE
D5	O-RING / ALLOY 20 + GRAPHITE SWG / GRAPHITE
D6	O-RING / INCONEL 625 + GRAPHITE SWG / GRAPHITE
D7	O-RING / INCONEL 825 + GRAPHITE SWG / GRAPHITE
D8	O-RING / HASTELLOY C276 + GRAPHITE SWG / GRAPHITE
E0	304L + GRAPHITE SWG / GRAPHITE
E1	316L + GRAPHITE SWG / GRAPHITE
E2	UNS S31803 + GRAPHITE SWG / GRAPHITE
E3	UNS S32760 + GRAPHITE SWG / GRAPHITE
E4	MONEL + GRAPHITE SWG / GRAPHITE
E5	ALLOY 20 + GRAPHITE SWG / GRAPHITE
E6	INCONEL 625 + GRAPHITE SWG / GRAPHITE
E7	INCONEL 825 + GRAPHITE SWG / GRAPHITE
E8	HASTELLOY C276 + GRAPHITE SWG / GRAPHITE
F0	316L + PTFE SWG / PTFE or R-PTFE
F1	MONEL + PTFE SWG / PTFE or R-PTFE
F2	ALLOY 20 + PTFE SWG / PTFE or R-PTFE
F3	INCONEL 625 + PTFE SWG / PTFE or R-PTFE
F4	HASTELLOY C276 + PTFE SWG / PTFE or R-PTFE
Z0	OTHER

(6) O-ring material follows stem seal

K

TRIM COATING

	BALL	SEAT RING	STEM
00	N/A	N/A	N/A
01	ENP 0.001"	ENP 0.001"	ENP 0.001"
02	ENP 0.003"	ENP 0.003"	ENP 0.003"
03	N/A	N/A	ENP 0.003"
04	NITRIDE	NITRIDE	N/A
05	ENP 0.003"	STELLITE 6	N/A
06	NITRIDE	STELLITE 6	N/A
07	STELLITE 6	STELLITE 6	N/A
08	TC 150 micron	TC 150 micron	N/A
09	TC 400 micron	TC 400 micron	N/A
10	CC 200 micron	CC 200 micron	N/A
11	M16C	M16C	N/A
Z0	OTHER	OTHER	OTHER

TC = Tungsten Carbide
CC = Chromium Carbide
M16C = Nickel Alloy Hard Coating

L

END CONNECTION (7)

D	FLANGED - ASME B16.5 RF x NPT-F
E	FLANGED - ASME B16.5 RTJ x NPT-F
R	FLANGED - ASME B16.5 RF
F	FLANGED - ASME B16.5 FF
U	FLANGED - ASME B16.5 RTJ
Z	OTHER

(7) For weld ends pipe schedule to be specified

M

BORE

1	REDUCED BORE
2	FULL BORE

N

BONNET (8)

0	STANDARD BONNET
1	BONNET, LT -46°C
2	EXTN. BONNET, LT -46°C ~ -196°C
3	LAGGING EXTENSION
4	HEAT DISSIPATION BONNET
5	RIGID EXTENDED STEM (Inner / Outer)
6	EXTENDED STEM - BURIED SERVICE
7	STANDARD BONNET + FED
8	HEAT DISSIPATION BONNET + FED
9	

(8) 1 & 2 are vapour space extensions.

P

OPERATOR

0	BARE STEM
1	OVAL HANDWHEEL + LD
2	WRENCH OPERATED
3	WRENCH OPERATED + LD
4	4" EXTENDED OPERATOR
5	4" EXTENDED OPERATOR + LD
6	GEAR OPERATED
7	GEAR OPERATED - LD
8	GEAR (MARINIZED) OPERATED
9	GEAR (MARINIZED) OPERATED + LD
P	PNEUMATIC
E	ELECTRIC (MOV)
H	HYDRAULIC
G	GAS OVER OIL (GOV)

LD = Open & Closed Locking Facility

R

BOLTING MATERIAL (9)

	BOLT	NUT
A	A193-B7	A194-2H
B	A193-B7M	A194-2HM
C	A320-L7	A194-4
D	A320-L7M	A194-4M
E	A320-L7M	A194-7
F	A320-L7M	A194-7M
G	A193-B8 CL.2	A194-8
H	A193-B8M	A194-8M
J	A193-B8M CL.2	A194-8MA
K	F51	F51
L	A453-660A	A453-660A
M	A453-660C	A453-660C
N	A193-B16	A194-4
Z	Other	Other

BOLTING COATING CODES

0	N/A
1	PTFE (Fluorocarbon) coated
2	Zinc Bichromate treated
3	Hot dip galvanized according to ASTM A153
4	Zinc Electroplate + PTFE
Z	Other

(9) Bolting + Coating code.

S

SUPPLEMENTARY OPTIONS

00	N/A
03	VENTED BALL , UNI-DIRECTIONAL VALVE
04	CHLORINE INST. PAMPHLET No. 6
05	STEAM JACKET
06	NPT PLUG (fitted in outlet end of valve)
07	DRAIN PLUG
14	SPRING LOADED SEAT, VENTED BALL, UNI-DIRECTIONAL
Z0	Other