H-600 R2

Hypresphere®

Trunnion-Mounted Ball Valves

FLOWSERVE

Nordstrom Valves

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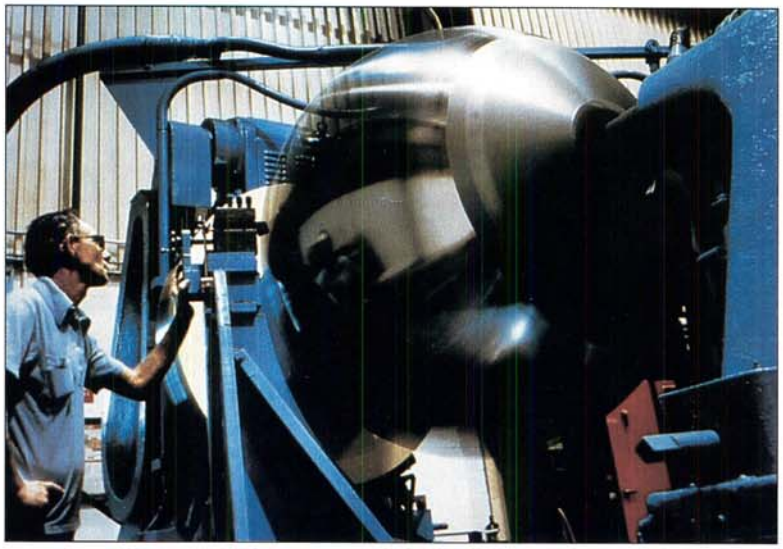
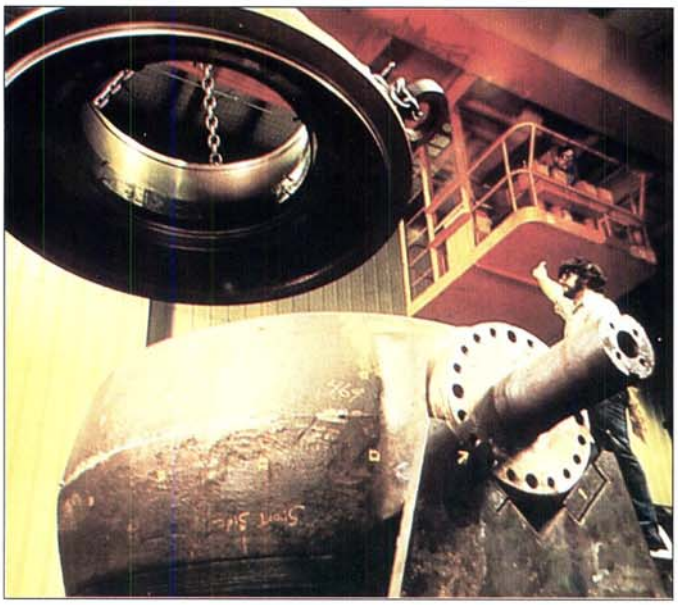
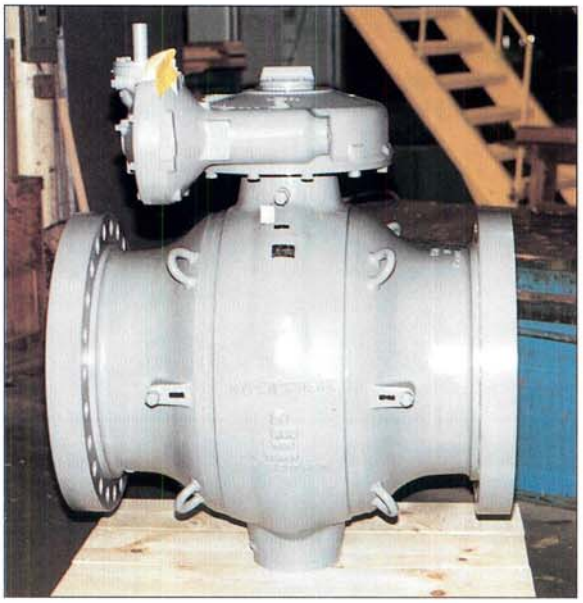






History

The first Hypresphere ball valve

The first transmission pipeline ball valve manufactured and installed in the United States was a Hypresphere valve. It was installed in 1953 and, to our knowledge, it is still in operation!

The *first generation* model had a free-floating ball and a bolted body construction. The early Hypresphere ball valves established a reputation for dependable, trouble-free service and — most importantly — bubble-tight shut-off in natural gas applications.

A great valve was made even better

In the early 1970s, a redesign program was developed to reduce service needs as well as to create a more cost efficient design. The design objectives were to:

1. provide dependable, long-term seat and stem sealing systems;
2. utilize top and bottom trunnions, for low torque;
3. have a stem independent of the top trunnion, to provide greater strength and reliability; and
4. use computer analysis to optimize the body design.

The result of this highly successful redesign program was the Hypresphere Trunnion-Mounted Ball Valve (TMBV).

The unique Hypresphere TMBV design

We put more seating — a lot more — where you need it. Our seat covers 6° to 7° of the ball, and as far as we can determine, that is twice as much as our nearest competitor. The wide seat area is especially important for long seat life, or when you rely on an actuator for closing the valve.

All Hypresphere ball valves share the exclusive design features that made them *the valves of choice* — for one very good reason, the superior sealing system.

Hypresphere ball valves have an exclusive triple-sealing seat system to give you years of bubble-tight, trouble-free service. A distinguishing characteristic of this design is its provision for metal-to-metal sealing contact between the seat and ball, with an elastomeric insert, as an added feature, to enhance the bubble-tightness of the seal. And both of these are backed-up by a fully contained sealant injection system that provides a renewable seal if there is damage to the other elements. The seat system is self-relieving, to eliminate pressure build-up inside the center cavity.

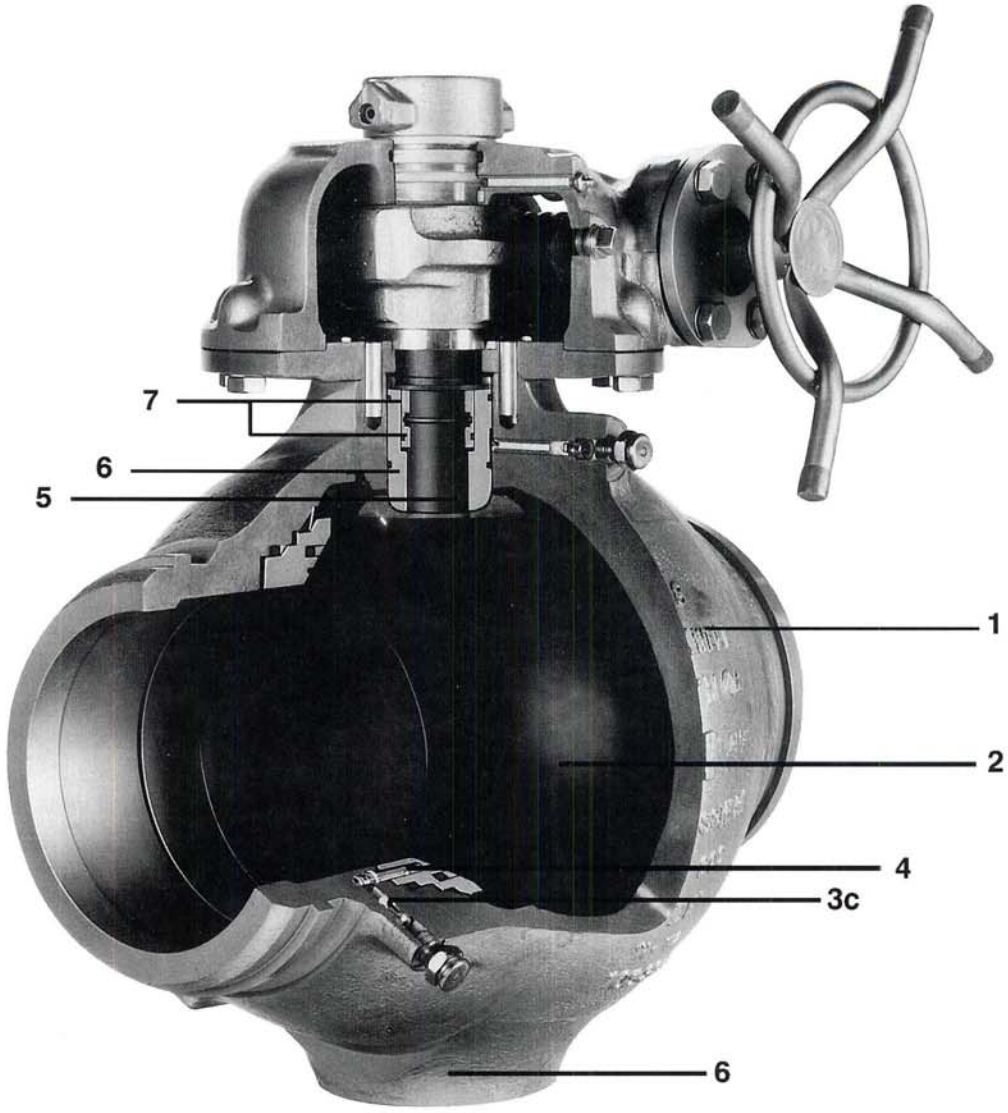
All sizes of Hypresphere ball valves feature a trunnion mounted ball. Trunnion-mounting allows upstream sealing of the valve, so that block and bleed operations can be carried out. It also means the forces exerted against the ball by pipeline pressure are absorbed through the trunnions and body, rather than the sealing elements — and assures, dependable, predictable operating torque.

The all-welded, spherical steel body assures reliability when subjected to fire, arctic conditions, and extreme bending moments.

The stem sealing system, which uses elastomeric materials and a sealant injection system, has been verified in all applicable industry tests *and* years of service.

Whether crude oil in Alaska, natural gas in Algeria, or abrasive mineral slurries in Arizona, the Hypresphere trunnion-mounted ball valve will provide years of bubble-tight, trouble-free service in *your* pipeline!

Hypresphere TMBV Design Features



1. The smoothly contoured, spherical **body** consists of a main center section with two tail pieces which are joined by welding to maximize the strength and integrity of the body shell.

2. The **ball**, with trunnion sockets at the top and bottom and coated with a low-friction material, has a full spherical shape to maintain maximum strength.

3. The triple-feature **seat sealing system** consists of:
   a) metal-to-metal seating with a wide land area,
   b) a pressure-energized nylon seat insert, and
   c) a sealant injection capability. (Detail on page 5.)

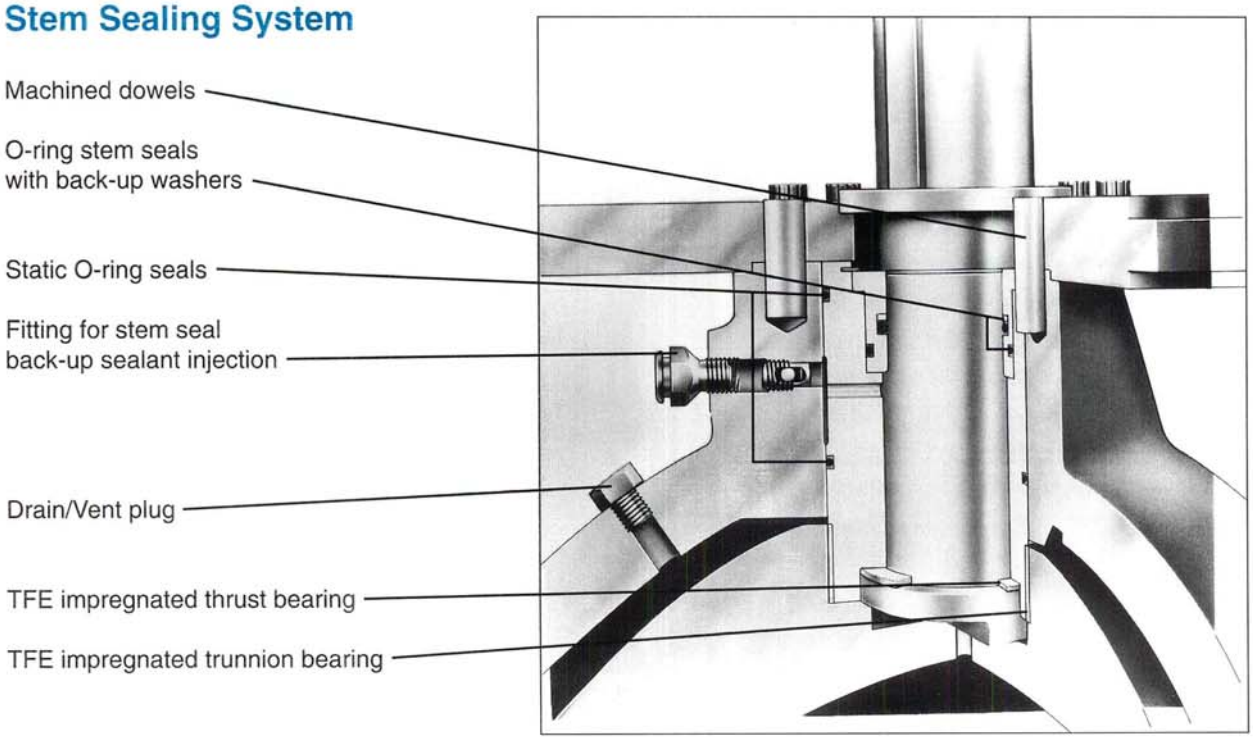
4. The **seat assembly** is designed to provide automatic pressure relief if excessive pressure builds up in the body cavity.

5. A flat metal tang on the **stem** (independent of the top trunnion) engages a slot in the spherical ball.

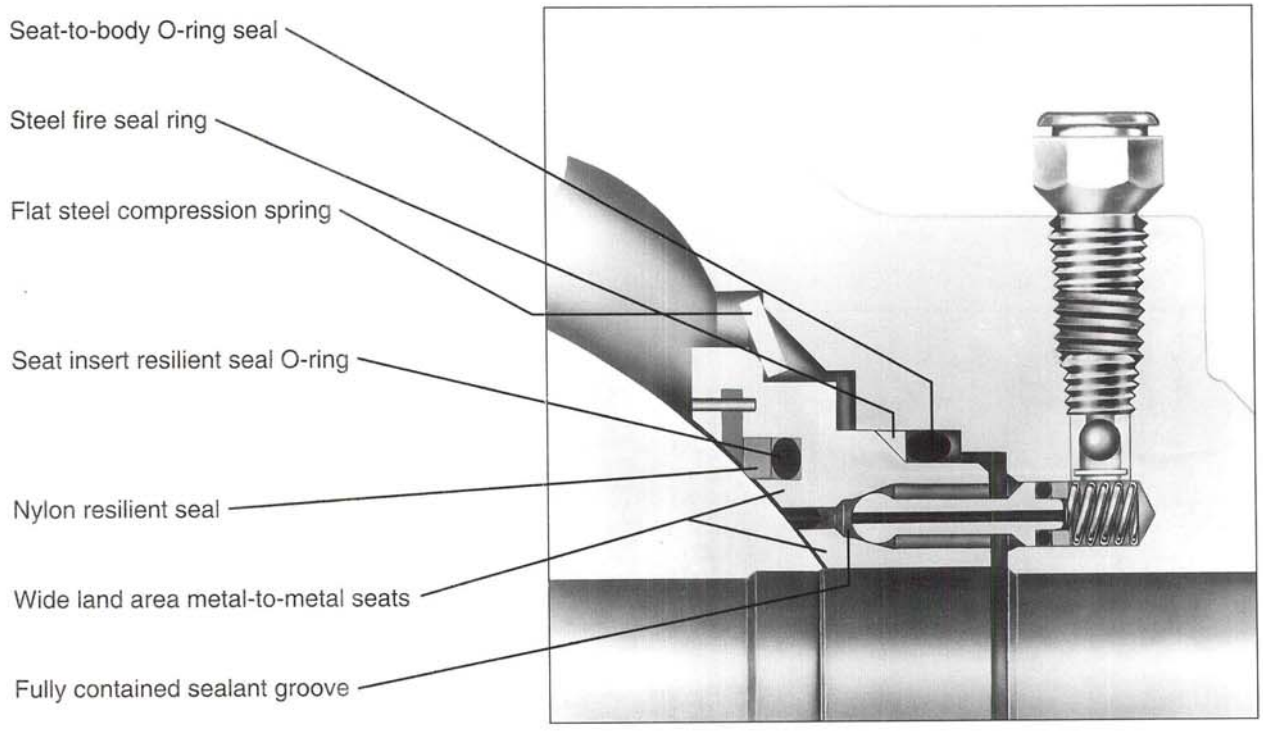
6. The top and bottom (not shown) **trunnions** reduce torque and weight, while allowing for double block-and-bleed capability (not shown here because of the "cut out" portion of the valve).

7. The **stem** (and trunnion) **sealing system** consists of resilient sealing materials, backed up by sealant injection capability. (Detail on page 5.)

Stem Sealing System



Seat Sealing System



Note: A Block-and-Bleed drain/vent valve can be installed in one of the drain holes in the body (normally on the lower of the three drain holes).

Hypresphere TMBV

Figure Number System

- Identifies ANSI pressure class:
  - 3 = Class 300
  - 6 = Class 600
- Identifies operation method:
  - 9 = Worm gear operator
- Identifies end type:
  - 1/4 = Flanged X Butt Weld
  - 1/2 = Butt Weld Ends
  - Absence of ˘ or ˚ indicates Flanged Ends
- Identifies Design Category (see page 8)
- Identifies type of construction
  - SP = Special (see page 8)
  - Absence of SP indicates standard

XXXXXX

Test Pressures and Working Pressures (Minimum)

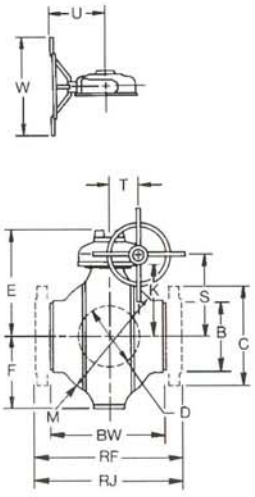
	ANSI Class		PN	
	300	600	50	100
Maximum Cold Working Pressure	740	1480	51	102
Hydrostatic Shell Test (psig/bar)	1125	2225	78	153
Hydrostatic Seat Test (psig/bar)	825	1650	57	114

Gear Information

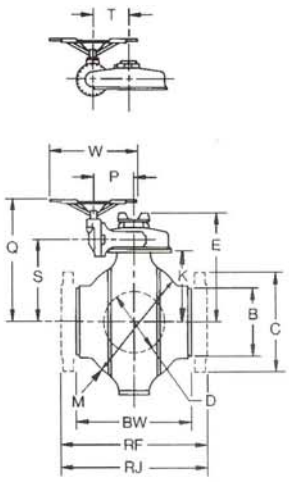
Gear mechanisms are enclosed in a grease-retaining weatherproof housing, with a position indicator mounted at the top for easy visibility.

Handwheels will be positioned to the top on Worm/Bevel and Spur/Worm/Bevel units, unless otherwise specified by the purchaser.

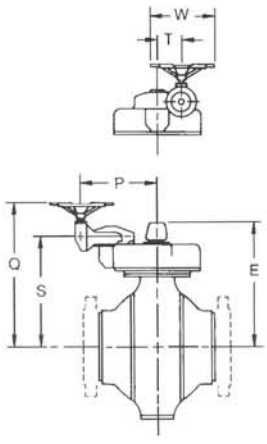
Gear Ratio	No. of Turns for 90° Operation	Gearing Type	Gear Weight (lbs.)
50:1	12.5	Worm	64
64:1	16		90
80:1	20		136
96:1	24		200
200:1	50	Worm/Bevel	400
400:1	100		
478:1	119.5		605
764:1	191	Worm/Bevel/Bevel	630



Gear Ratios: 50, 64, 80 & 96



Gear Ratios: 200, 400 & 478



Gear Ratio: 764

Dimensional Data and Weights

Figure Number 39, 39 1/4, and 39 1/2 (ANSI Class 300)

Size NPS DN	RF	RJ	BW	B	C	D	E	F	K	M	P	Q	S	T	U	W	Gear Ratio	Turns To Open	Weight Less Gearing		Weight With Gearing	
																			RF	BW	RF	BW
8 200	23.5 597*	23.62 600*	20.5 521	9.5 241	15.0 381	8.0 203	15.6 396	9.8 249	9.4 239	16.6 422			11.8 300	4.9 124	13.9 353	26 660	50	12.5	700 318	566 257	765 347	630 286
10 250	26.5 673*	26.62 676*	23.24 590*	11.5 292	17.5 445	10.0 254	18.0 457	12.2 310	11.7 297	20.9 531			14.1 358	6.0 152	13.9 353	26 660	64	16	1004 455	822 373	1094 496	912 414
12 300	25.5 648	26.12 663	26.0 660*	13.6 345	20.5 521	12.0 305	24.3 617	14.6 371	14.2 361	23.7 602			16.6 422	8.2 208	14.9 378	26 660	80	20	1485 674	1209 548	1621 735	1344 610
14 350	30.0 762	30.62 778	27.76 705*	15.9 404	23.0 584	13.2 335	26.4 671	17.5 445	16.9 429	27.2 691			19.8 503	10.4 264	17.1 434	32 813	96	24	2160 980	1800 816	2360 1070	2000 907
16 400	33.0 838	33.62 854	29.76 756*	17.3 439	25.5 648	15.2 386	27.8 706	18.6 472	18.3 465	29.7 754			21.3 541	10.4 264	17.1 434	32 813	96	24	2682 1217	2190 993	2882 1307	2390 1084
18 450	36.0 914	36.62 930	34.5 876*	20.0 508	28.0 711	17.2 436	30.3 770	21.4 544	20.7 526	34.7 881			23.7 602	10.4 264	17.1 434	32 813	96	24	3750 1701	3265 1481	3950 1792	3465 1572
20 500	39.0 991	39.76 1010	37.0 940*	23.2 589	30.5 775	19.2 488	31.1 790	21.9 556	21.6 549	34.5 876			24.6 625	10.4 264	17.1 434	32 813	96	24	4295 1946	3735 1692	4495 2036	3935 1783
24 600	45.0 1143	45.88 1165	44.0 1118*	26.9 683	36.0 914	23.2 589	36.5 927	27.6 701	26.1 663	45.1 1146	13.5 343	45.0 1143	29.2 742	10.7 272		32 813	200	50	8082 3666	6992 3172	8482 3847	7392 3353
26 650	49.0 1245	50.0 1270	50.0 1270*	30.4 772	38.2 970	25.0 635	38.8 986	29.5 749	28.4 721	48.4 1229	13.5 343	47.3 1201	31.4 798	10.7 272		32 813	400	100	10440 4736	9100 4127	10840 4917	9500 4309
30 750	55.0 1397	56.0 1422	56.25 1429*	34.4 874	43.0 1092	29.0 737	42.6 1082	32.4 823	32.2 818	50.6 1285	13.5 343	50.4 1280	35.2 894	10.8 274		32 813	400	100	13442 6097	12362 5607	13842 6279	12762 5789

Figure Number 69, 69 1/4, and 69 1/2 (ANSI Class 600)

Size NPS DN	RF	RJ	BW	B	C	D	E	F	K	M	P	Q	S	T	U	W	Gear Ratio	Turns To Open	Weight Less Gearing		Weight With Gearing	
																			RF	BW	RF	BW
8 200	26.0 660	26.12 663	20.5 521*	9.5 241	16.5 419	8.0 203	15.6 396	9.8 249	9.4 239	16.6 422			11.8 300	4.9 124	13.9 353	26 660	50	12.5	711 323	566 257	775 352	630 286
10 250	31.0 787	31.12 790	23.24 590*	11.5 292	20.0 508	10.0 254	18.0 457	12.2 310	11.7 297	20.9 531			14.1 358	6.0 152	13.9 353	26 660	64	16	1200 544	822 373	1290 585	912 414
12 300	33.0 838	33.12 841	26.0 660*	13.6 345	22.0 559	12.0 305	24.3 617	14.6 371	14.2 361	23.7 602			16.6 422	8.2 208	14.9 378	26 660	80	20	1661 753	1209 548	1796 815	1344 610
14 350	35.0 889	35.12 892	27.76 705*	15.9 404	23.8 605	13.2 335	26.4 671	17.5 445	16.9 429	27.2 691			19.8 503	10.4 264	17.1 434	32 813	96	24	2300 1043	1800 816	2500 1134	2000 907
16 400	39.0 991	39.12 994	29.76 756*	17.3 439	27.0 686	15.2 386	27.8 706	18.6 472	18.3 465	29.7 754			21.2 538	10.4 264	17.1 434	32 813	96	24	3152 1430	2190 993	3352 1551	2390 1084
18 450	43.0 1092	43.12 1095	34.5 876*	20.0 508	29.2 742	17.2 437	31.1 790	21.4 544	20.7 526	34.7 881	13.5 343	38.9 988	23.7 602	10.7 272		32 813	200	50	4150 1882	3265 1481	4550 2064	3665 1662
20 500	47.0 1194	47.24 1200	37.0 940*	23.2 589	32.0 813	19.2 488	32.0 813	21.9 556	21.6 549	34.5 876	13.5 343	40.5 1029	24.7 627	10.7 272		32 813	200	50	5020 2274	3735 1692	5420 2455	4135 1873
24 600	55.0 1397	55.38 1407	44.0 1118*	26.9 683	36.0 914	23.2 589	36.5 927	27.6 701	26.1 663	41.5 1146	13.5 343	45.0 1143	29.2 742	10.7 272		32 813	400	100	8946 4058	6992 3172	9346 4239	7392 3353
26 650	57.0 1448	57.5 1461	50.0 1270*	30.4 772	40.0 1016	25.0 635	39.1 993	29.5 749	28.4 721	48.4 1229	15.2 386	47.7 1212	31.9 810	13.9 353		32 813	478	119.5	11150 5058	9100 4127	11750 5330	9700 4400
30 750	65.0 1651	65.5 1664	56.25 1429*	34.4 874	44.5 1130	29.0 737	43.0 1082	32.4 823	32.2 818	50.6 1285	15.2 386	50.2 1275	35.7 907	24.7 627		32 813	764	191	13950 6328	12362 5607	14555 6602	14111 6401

Top, bold numbers designate inches and pounds, bottom numbers designate millimeters and kilograms.

To determine the end-to-end length for Butt Weld x Flanged add 1/2 the Flanged length to 1/2 the Butt Weld length. Please note, the Butt Weld end of valve will be on the right-hand side.

B = Outside diameter (O.D.) of the minimum bore valve configuration.

*Conforms to API 6D4, paragraph 2.4c, and is marked accordingly.

Other pressure classes may be available upon request.

Hypresphere TMBV

Materials of Construction

This table shows *standard* construction materials for the design categories listed.

Consult your Nordstrom representative for other materials and/or service conditions.

Design Category		A	B	C	D
Temperature		-20F to 250F	-50F to 225F	-20F to 250F	-50F to 225F
Construction		Standard	Low Temperature	*NACE	*NACE/Low Temperature
Body Shell		ASTM A216 Grade WCC	ASTM A352 Grade LCC**	ASTM A216 Grade WCC	ASTM A352 Grade LCC**
Sphere		ASTM A48 Class 50B, with permanently bonded MoS2			
Seats	8" to 24"	ASTM A395			
	26" to 42"	ASTM A105			
Stem		ASTM A322 Grade 4140			
Top Trunnion		ASTM A519 Grade 4140/42			
Bottom Trunnion		ASTM A576 Grade 1045			
Seat Spring	8" to 16"	ASTM A668 Grade 4140		ASTM A705 Type 630	
	18" to 42"			ASTM A668 Grade 4140	
Gear Flange and Trunnion Retainer		ASTM A516 Grade 70	ASTM A516 Grade 70**	ASTM A516 Grade 70	ASTM A516 Grade 70**
Bolting		ASTM A193 Grade B7	ASTM A320 Grade L7	ASTM A193 Grade B7M	ASTM A320 Grade L7M
Seat Insert		Nylon/MoS2			
O-Ring Seals		Buna N	Low Temp. Buna N	Buna N	Low Temp. Buna N

* All materials meet the hardness limitations of NACE MR-01-75.

** Impact tested to API 6D acceptance criteria.

Design Options (Accessories & Trim)

Hypresphere TMBVs are available with several different accessory and trim options, either singly or in combination. As explained on page 6, these options are indicated by the suffix "SP" on the the valve figure number. These options include, but are not limited to:

- Transition pieces attached *after* test (purchaser furnishes the pipe).
- Transition pieces attached *before* test (purchaser furnishes the pipe).
- Locking device (chain).
- 2:1 ratio auxillery bevel gear (vertical drive unit).
- .003" electroless nickel plated ball, stem, and trunnions.
- .003" electroless nickel plated ball (only).
- .001" electroless nickel plated ball and stem.
- Watertight gearing for vaults or buried service.
- Valve less gearing, for field mounting of actuator.
- Motor actuated through the valve gear head.
- With gearing and adapters for motor actuator, but less actuator.
- Power actuator mounted direct to valve stem.
- Special drain/vent valve.
- Offshore, above water trim for corrosive atmosphere.
- Epoxy coating of flow passages, for water service.
- Corrosion resistant primers and coatings.
- Optional NDE or pressure tests (see page 11).
- Elevated gearing (or actuator mounting) for valves for buried service.
- Viton seals.
- Operating shaft extensions for valves for buried service with roadbox

Actuators

Stem mounted

Hypresphere ball valves can be supplied with direct stem mounted power actuators in place of manual gearing "on application". Types available include:

- •pneumatic, double acting piston actuators
- •pneumatic, fail safe spring return piston actuators
- •gas/hydraulic, vane piston actuators
- •gas/hydraulic, double acting piston actuators

Nordstrom will also mount actuators furnished by the purchaser on Hypresphere ball valves and test the assemblies.

Gear head mounted

Hypresphere trunnion-mounted ball valves can be supplied with electric, pneumatic or gas motor actuators which are mounted to the input shaft of the manual gearing.

Valves can also be supplied with adaptation for motor actuators, but without the actuators.

Nordstrom will also mount actuators furnished by the purchaser on Hypresphere ball valves and test the assemblies.

Elevations for Buried Installations

Nordstrom can supply elevations (like the one shown here) for valve operators on all Hypresphere ball valves, whether equipped with simple worm gearing, bevel worm gearing, a hydraulic actuator, a pnuematic actuator, or an electric actuator.

When ordering elevations, please be sure to specify:

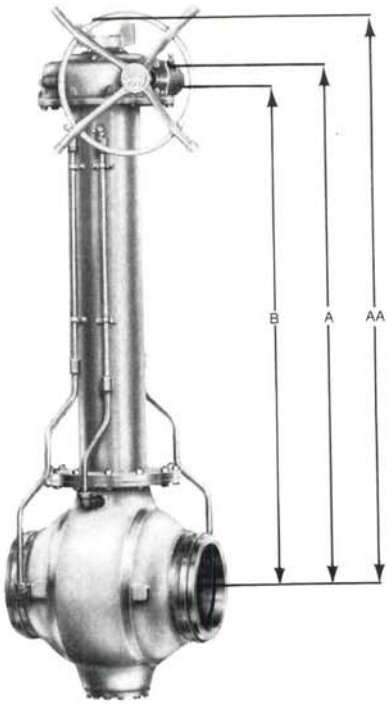
- •Valve Size and Figure Number
- •Dimension "A", "B", or "AA".

These 3 "dimensions" are defined as:

"A": Distance from the centerline of the valve to the centerline of the handwheel (when horizontal).

"B": Distance from the centerline of the valve to the top attachment flange of the elevation spool.

"AA": (For larger valves with compound gearing.) Distance from the centerline of the valve to the top of the handwheel (when horizontal).



Hypresphere TMBV

Codes and Standards

Hypresphere trunnion-mounted ball valves are designed, rated, manufactured and tested in accordance with the latest edition of:

ANSI — American National Standards Institute

B16.5 *Pipe Flanges and Flanged Fittings*

B16.34 *Valves - Flanged, Threaded & Welding End*

API — American Petroleum Institute

6D *Specification for Pipeline Valves*

598 *Valve Inspection and Testing*

Q1 *Specification for Quality Programs*

MSS — Manufacturers Standardization Society of the Valve and Fittings Industry

SP-44 *Steel Pipe Line Flanges*

SP-55 *Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components*

DOT - United States Department of Transportation
49 CFR Part 192 *Pipeline Safety Regulations*

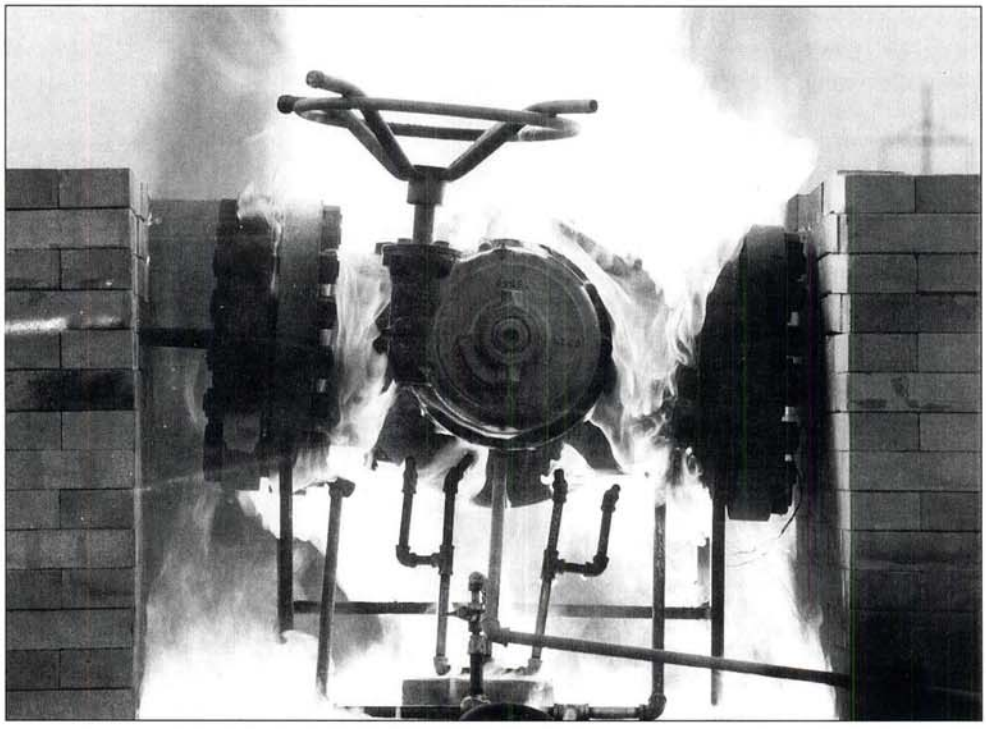
On special application (contact your Nordstrom representative for further information) Hypresphere trunnion-mounted ball valves are also available in conformance with:

MSS — Manufacturers Standardization Society of the Valve and Fittings Industry

SP-53 *Quality Standard for Steel Castings - Magnetic Particle Examination Method*

SP-54 *Quality Standard for Steel Castings - Radiographic Examination Method*

MR-O1-75 *Standard Material Requirements Sulfide Stress Cracking Resistant Metallic Materials for Oilfield Equipment* (Valves for NACE Service)



Standard Tests and Non-Destructive Examination

All body shell castings are visually examined in accordance with MSS SP-55.

All butt-weld ends are radiographically examined for a distance of 2" back from the end, in accordance with MSS SP-54 to a level 2 acceptance criteria.

All finish machined butt-weld end bevels are magnetic particle examined in accordance with MSS SP-53 acceptance criteria.

All body joint welds are spot radiographed in accordance with ASME Section VIII, section UW-52 (6 inches for every 50 feet of weld).

The first 5 body shell castings from each new pattern, or when a pattern is modified or is moved from one foundry to another, are 100% radiographed to determine the quality level. Additional castings are radiographed as necessary to determine a quality level indicative of level 3 throughout, with level 2 in weld joint/weld end areas.

All valves are hydrostatically tested to meet the requirements of API 6D, ANSI B16.34, and MSS SP-61.

- Shell tests are performed at 1.5 x the rating of the valve.
- Seat tests are performed at 1.1 times the rating of the valve.
- An air test (80 psig minimum) per API 598, is performed on all valves.

The acceptance criteria for all pressure testing is no visible leakage.

Optional Tests and Non-Destructive Examination

Special higher pressure tests:

- Shell tests up to 2 times the rating of the valve
- Seat tests up to 1.5 times the rating of the valve

Extended duration chart tests (pressure & temperature).

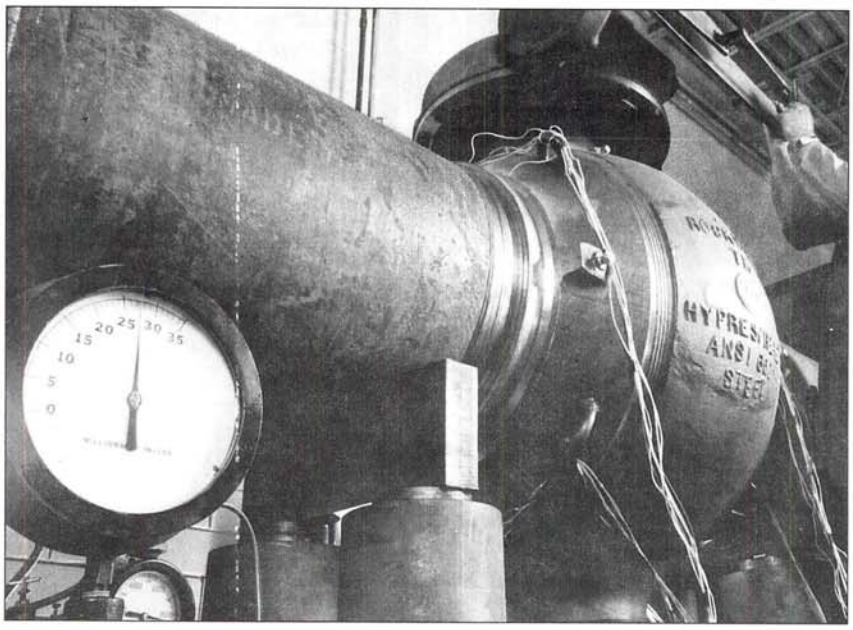
Special air seat tests (80 psig air seat test is standard).

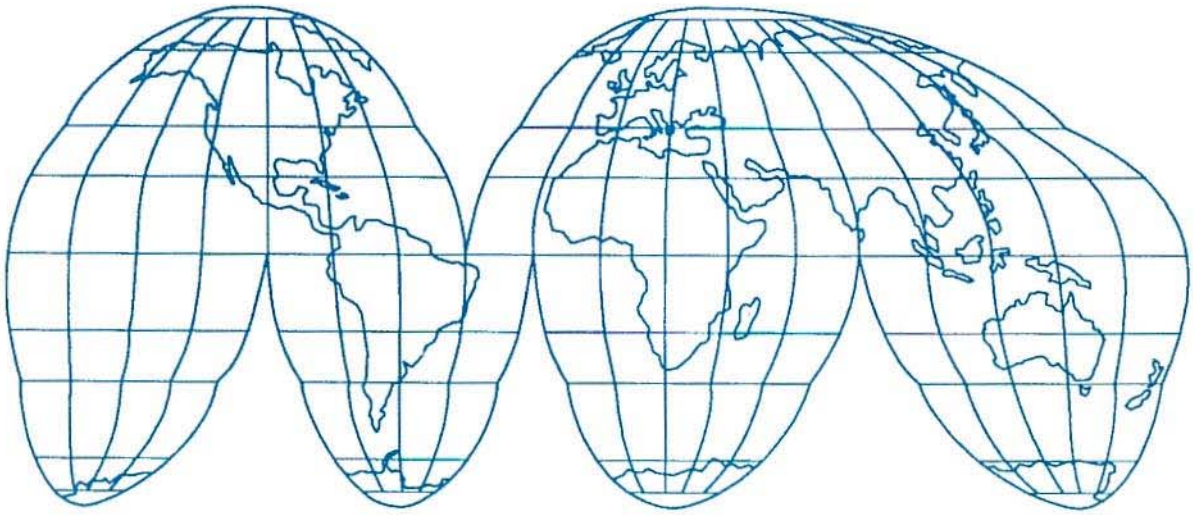
100% radiography/ultrasonic examination of body joint welds.

Critical area radiography of body casting (MSS SP-54).

Magnetic particle examination of body casting (MSS SP-53).

Mount and adjust actuator furnished by purchaser.





Around the world, Nordstrom valves have worked for over 75 years

Get the Nordstrom Edge...
Value • Quality • Dependability

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