Hyspan

Engineered Motion. Proven Reliability.

Ball Joints

Hyspan Precision Products™
Product Catalog

Series 6600

Hyspan Precision Products, Inc.
1685 Brandywine Avenue · Chula Vista, CA 91911
hyspan.com · +1 619.421.1355 · websales@hyspan.com

CONTENTS

Note: This catalog covers Hyspan Precision Products Series 6600 Ball Joints, including the Hyspan Barco product line. For slip joints, refer to the Series 6500 catalog. For metal bellows and hose assemblies, refer to the applicable Hyspan product catalogs.

Company Overview

Engineered Motion. Proven Reliability.

Hyspan Precision Products designs and manufactures metal expansion joints, flexible metal hose assemblies, and motion-control components for mission-critical piping and pressure systems worldwide. Founded in 1968 and headquartered in Chula Vista, California, Hyspan has built a 50+ year record of engineering quality and manufacturing capability across industrial, energy, defense, aerospace, and commercial markets.

As a member of the Expansion Joint Manufacturers Association (EJMA), Hyspan designs and manufactures in accordance with applicable ASME, military, and international codes and standards. Products are built to order in Hyspan's vertically integrated manufacturing facilities, with complete material traceability and documented inspection at every stage.

Core Capabilities

- All four expansion joint technologies
- Metal bellows expansion joints
- Flexible metal hose assemblies and braided connectors
- Ball joints and slip joints
- Venturis, VibraSnubbers, struts and pipe alignment guides
- Custom engineered assemblies — ¼" to 32 ft diameter, full vacuum to 5,000+ PSIG
- Exotic materials: Inconel 625, Hastelloy, Monel, Titanium, and others
- FEA/CFD analysis, fatigue life evaluation, seismic and vibration modeling

Certifications

Markets Served

- Energy & Petrochemical — refineries, FCCU, piping systems
- Power & Utility — steam, hot water, district energy
- Defense & Maritime — NAVSEA-qualified, naval shipboard systems
- Aerospace — AS9100D certified, fatigue-rated precision bellows
- Advanced Technology & Development — UHV, R&D
- Commercial & Industrial — HVAC, mechanical rooms, building systems
- Automotive — OEM exhaust and flexible assembly manufacturing

For custom requirements, specification review, or application engineering support, contact Hyspan at websales@hyspan.com or +1 619.421.1355

Ball Joint Applications

Overview

Ball joints can be installed to absorb pipe movement in many applications ranging from thermal expansion or contraction of pipe, tank or building settlement, movement resulting from a seismic event, equipment movement such as solar panels and platens, and repetitive motion on bridges, oil platforms, and ships. Regardless of the source of the motion, the ability of ball joints to absorb the motion relies on the Off-Set® Method.

The following illustrations are typical installations of ball joints. They are primarily illustrated in one plane; however, ball joints are completely universal, allowing motion in all planes including rotation around the centerline. No other method of absorbing pipe motion has this capability.

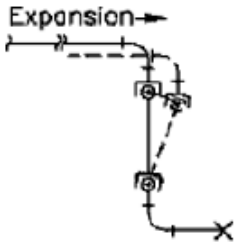


Figure 1: Two ball joints installed in an offset leg

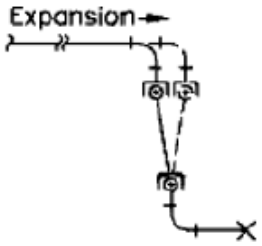


Figure 2: Two ball joints installed in an offset leg with preset or cold spring.

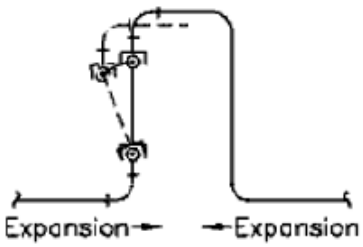


Figure 3: Two ball jointsin a loop. Can also be installed with preset similar to Figure 2.

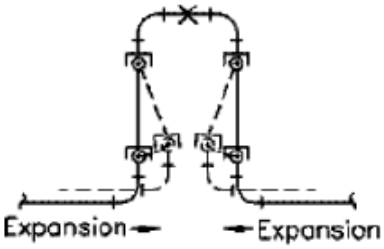


Figure 4: Four ball joints installed in a loop for high axial motion.

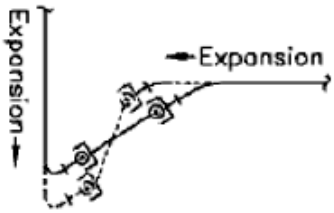


Figure 5: Two ball joints installed in an off-set leg with motion along two axes.

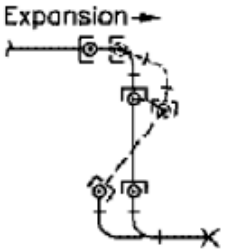


Figure 6: Three ball joint installation with an off-set leg and motion along one axis.

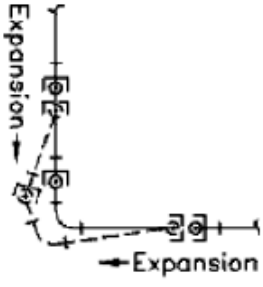


Figure 7: Three ball joint installation with motion along two axes.

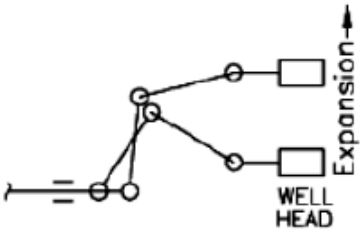


Figure 8: Oil field wellhead installation – ball joints are displaced by twisting or torsion.
(Oil Field Steam Injection)

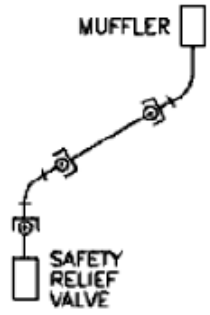


Figure 9: Three ball joints installed in safety relief valve piping.

Calculation of Thermal Expansion

When materials change temperature, they expand or contract in accordance with the equation:

(1) $\Delta Lx = \alpha(\Delta T)\, Lx$ where α is the coefficient of thermal expansion, ΔT is the change in temperature, and Lx is the linear dimension that changes temperature.

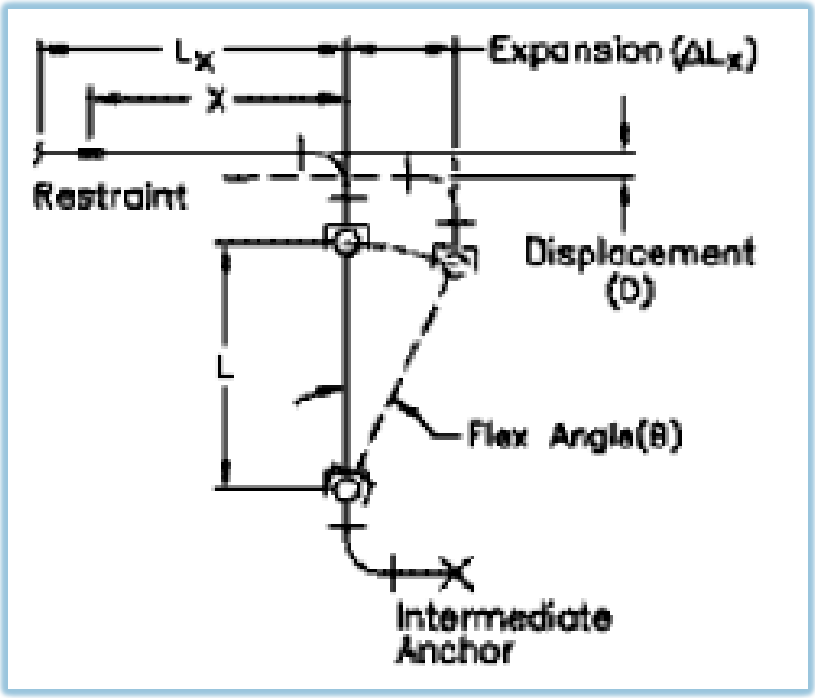
For piping applications the expansion of commonly used piping materials has been tabulated per 100 feet based on an installation temperature of 70°F. Using this tabulation:

(1') $\Delta Lx = (\text{Tabulated Value}) \times Lx \div 100$ where ΔLx is the thermal expansion in inches, Lx is the pipe run in feet.

If the installation temperature is substantially different from 70°F, correct the expansion value by adding or subtracting the expansion from 70°F as appropriate to the installation temperature.

Two Ball Joint Installation

The installation of two ball joints in a system must consider the Flex Angle (θ), the length (L) separating the ball joints (rotational center to center), the pipe displacement (D), and the forces and moments on the system. The maximum flex angle varies with the nominal size and configuration of the ball joint. Generally, 2" NPS and smaller are 30° total; sizes 2½" NPS and larger are 15° total as a minimum. The OW1500 joints are 30° total, and all ASME Class joints are 15° total. The tabulated values are total flex angles — fully deflected from the maximum offset to the maximum offset in the opposite direction.



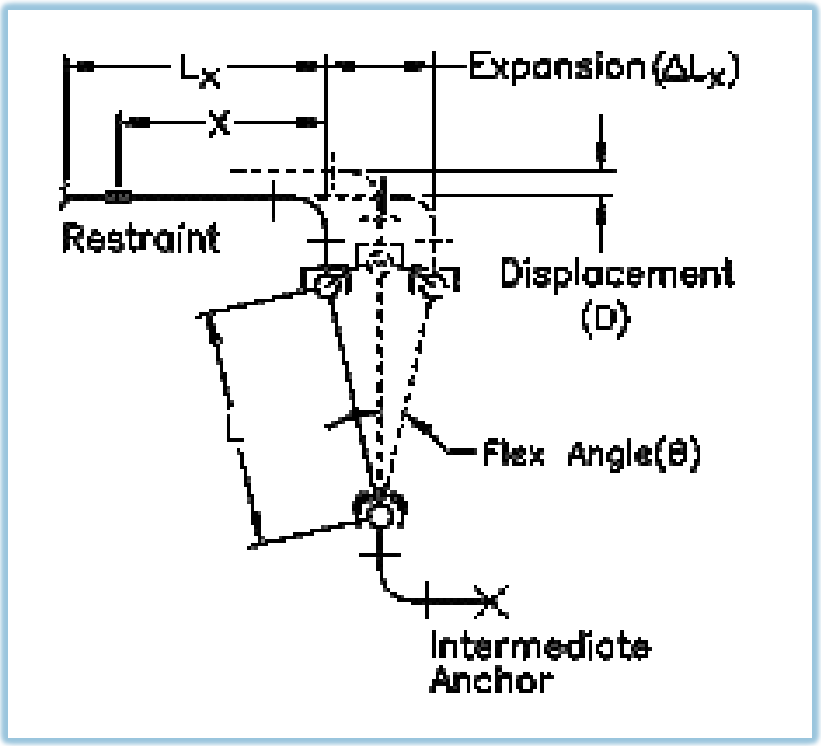
Minimum Two Ball Joint Spacing (L)

The expansion or movement (ΔLx) is determined by calculation of thermal expansion, or it may be given as other system design data such as tank settling or seismic motions. The minimum length (L) separating the ball joints (rotational center to center) when the joints are installed in the neutral position and the angle (θ) is measured from the neutral to the deflected centerline is:

(2) Lmin = ΔLx / Sinθ (inches) (Figure 10, no preset)

If the expansion or movement is in a single direction, this length can be reduced by installing the ball joints preset or with cold spring. The minimum length, L, is obtained when the preset is equal to one half of the movement (ΔLx):

(2') Lmin = (ΔLx − (Preset)²) / (2Sinθ) (inches) or Lmin = ΔLx / (2Sinθ) when preset = ΔLx / 2



Angle/Sine Reference Table

Angle (Degrees)	Sine	Angle (Degrees)	Sine	Angle (Degrees)	Sine
1	0.0175	8.5	0.148	17	0.292
2	0.0349	9	0.156	19	0.326
3	0.0523	9.5	0.165	20	0.342
4	0.0698	10	0.174	21	0.358
5	0.0872	10.5	0.182	22	0.375
6	0.104	11	0.191	23	0.391
6.5	0.113	11.5	0.199	24	0.407
7	0.121	13.5	0.233	27	0.345
7.5	0.13	15	0.259	30	0.500
8	0.139	15.5	0.267	31	0.515

Two Ball Joints Installed in an Existing Leg

When ball joints can be installed in an existing off-set leg, the length (L) can be determined and the flex angle (θ) can be calculated for a known deflection (ΔLx) by the following equation:

(3) $\theta = Sin^{-1} (\Delta Lx / L)$

Pipe Displacement (D)

As the ball joints are deflected, the off-set length between the parallel pipe runs decreases. The deflection (D) can be calculated as follows:

(4) $D = L - \sqrt{(L^2 - (\Delta Lx)^2)}$ without preset

(5) $D = L - \frac{1}{2}\sqrt{(L^2 - (\Delta Lx - Preset)^2)}$ with preset or $D = L - \frac{1}{2}\sqrt{(4L^2 - (\Delta Lx)^2)}$ with preset when preset = ΔLx / 2

These equations can be simplified:

(6) $D = (\Delta Lx)^2 / (2L)$ without preset

(7) $D = (\Delta Lx/2)^2 / (2L)$ with preset equal to ½ of the movement ΔLx

Location of First Restraint

Once the deflection (D) has been determined, the minimum length of pipe to the first restraint (x) can be calculated to avoid overstressing the pipe and elbows:

(8) $x = \sqrt{(0.0104DdE / S)}$ (feet)

where d = outside diameter of the pipe (inches), E = Modulus of Elasticity (psi), S = Allowable Stress (psi). As an approximation, E = 30 × 10^6 psi and S = 10,000 psi can be used, giving:

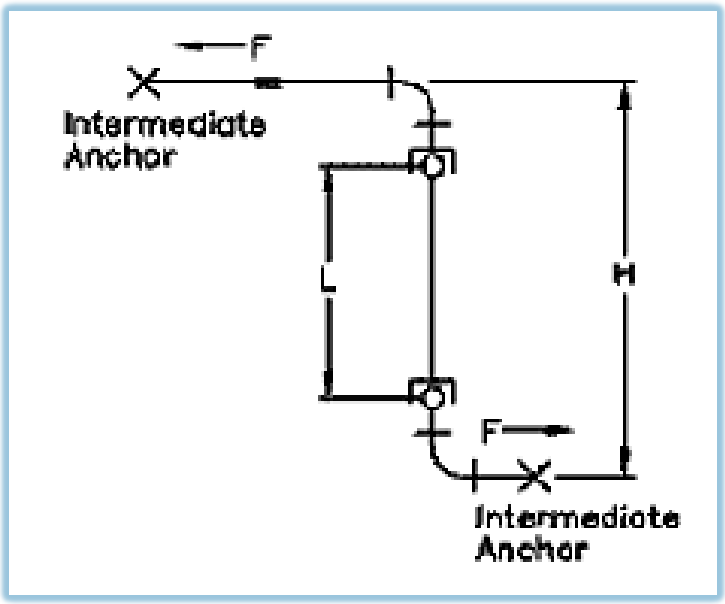
(8') $x = 5.59\sqrt{(Dd)}$ (feet)

Ball Joint Anchor Forces

The anchor forces resulting from the installation of ball joints result from the seal resistance force provided as the Flex Torque (ft.-lbs.) for each nominal size and configuration. Since the outer seal reacts the pressure thrust, the Flex Torque is a function of the system pressure. The anchor force can be calculated by the following equation:

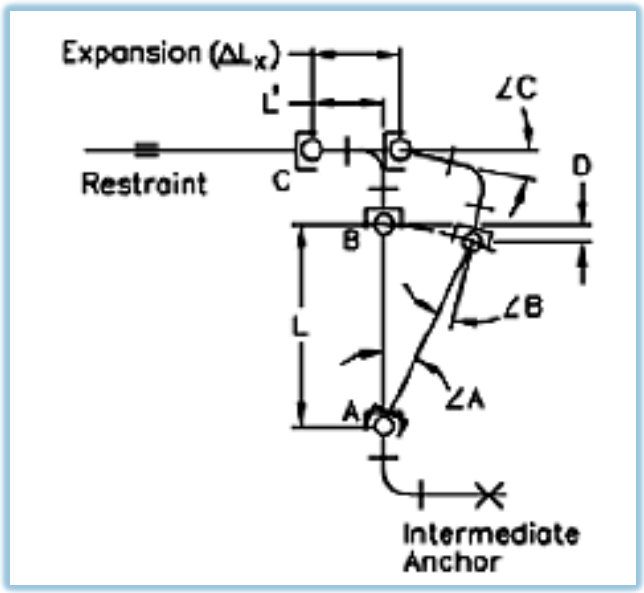
(9) $F = 2T / L$ = thrust load (lbs.)

where T = Flex Torque (ft.-lbs.) and L = center to center length (feet).



Three Ball Joint Installations

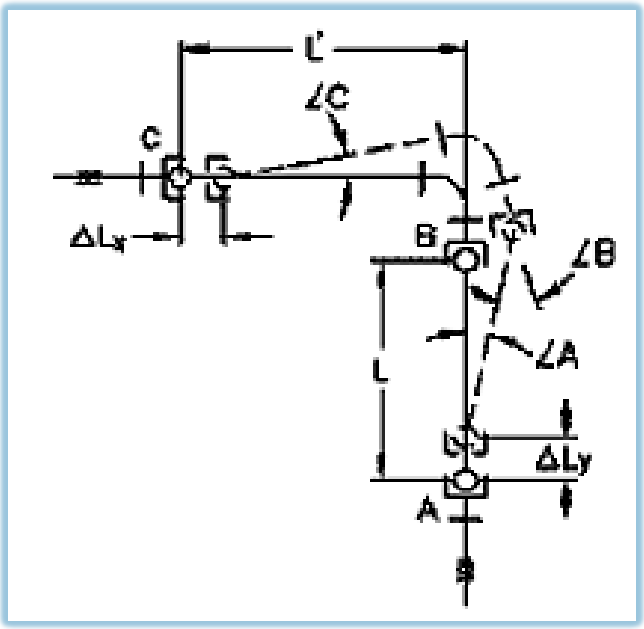
The addition of a third ball joint in a system eliminates pipe bending and allows the pipe to be restrained close to the offset leg. This is important when the ball joints are located in confined locations such as vaults or short rigid runs in process piping.



The ball joint angles (A, B & C) for a three ball joint installation can be calculated by the following equations:

(10) $\angle A = Sin^{-1} (\Delta Lx / L)$ (11) $\angle C = Sin^{-1} (D / L')$ (12) $\angle B = \angle A + \angle C$

Note: Equation (12) is the algebraic sum. In Figure 13, ∠A is positive and ∠C is negative.



When motion occurs in the same plane as the pipe run but along two perpendicular axes, three ball joints are required. For this configuration:

(10) $\angle A = Sin^{-1} (\Delta Lx / L)$ (13) $\angle C = Tan^{-1} ((\Delta Ly - D) / L)$ (12) $\angle B = \angle A + \angle C$

Worked Examples

Example 1: Minimum Spacing for Two ASME Class Ball Joints

Determine the minimum center-to-center length for two ASME Class Ball Joints (15° total flex angle) installed in piping with 12" of expansion. Using Equation (2): ΔLx = 12", θ = 15°/2 = 7.5°, Sin 7.5° = 0.131, Lmin = 12"/0.131 = 91.60". With preset equal to 6": Lmin = 91.60/2 = 45.80".

For rough sizing of the off-set length (L), the minimum flex angle for all sizes and configurations of ball joints is 15° total. Since 1/0.131 = 7.63, it can be rounded up to 8, so L = 8ΔLx without preset and L = 4ΔLx with preset.

Example 2: Type N Style I Ball Joints in an Off-Set Leg

Two 10" Type N Style I weld end ball joints with Number 11 composition seals (P/N BB-31020-70-11) are to be installed at 70°F in an off-set leg of a 300′ run of steel pipe at 300 PSIG and 417°F. The thermal expansion is: ΔLx = (2.86) × 300 ÷ 100 = 8.58" [Equation (1′)]. The minimum off-set leg without preset: Lmin = 8.58" ÷ Sin 8.5° = 57.97". The total flex angle is 17°; 17/2 = 8.5°, Sin 8.5° = 0.148.

With preset equal to ½ ΔLx: Lmin = 57.97" ÷ 2 = 28.98". Rounding up to 60" and 30" respectively: θ = Sin^{-1} (8.58/60) = 0.143 = 8° or 16° total flex angle (< 17° design value). Pipe displacement D = $(8.58)^2/2(60)$ = 0.61" without preset; D = $(8.58/2)^2/2(30)$ = 0.31" with preset. Minimum distance to first restraint: x = $5.59\sqrt{(0.61 \times 10.75)}$ = 14.31′ without preset. Anchor force = 2(5000)/5 = 2000 lbs. without preset at 300 PSIG.

Example 3: Three Ball Joint System

Using the values from Example 2 without preset (ΔLx = 8.58", L = 60", D = 0.61"): If joint C is attached directly to the elbow, L′ = 15" (tangent length for long radius elbow) + 8.25" (rotational center, Column 5 of Dimensional Data) = 23.25". ∠A = Sin^{-1} (8.58/60) = 8°, ∠C = Sin^{-1} (0.61/23.25) = 1.5°, ∠B = 8° − 1.5° = 6.5°. At L′ = L = 60": ∠C = Sin^{-1} (0.61/60) ≈ 0.5°, ∠B = 8° − 0.5° = 7.5°.

Example 4: Three Ball Joints with Motion Along Two Axes

Three 16′ Type N Style III weld end ball joints with Number 21 ductile iron seals (P/N BB-61020-76-21) are to be installed in a piping system. Horizontal motion ΔLx = 10", vertical motion ΔLy = 4". Total flex angle = 21° (Column 3 of Dimensional Data). Without cold spring and using L = L′ = 80": ∠A = Sin^{-1} (10/80) ≈ 7°, D = $(10)^2/2(80)$ = 0.625", ∠C = Tan^{-1} ((4 − 0.625)/80) ≈ 2.5°, ∠B = 7° + 2.5° = 9.5° < 10.5° (half total flex angle). With 6" preset on horizontal run and L = 48": ∠A = Sin^{-1} ((10−6)/48) = 5°, D = 48 − $\sqrt{((48)^2 - (4)^2)}$ = 0.166", ∠C = Tan^{-1} ((4 − 0.166)/48) ≈ 4.5°, ∠B = 5° + 4.5° = 9.5° < 10.5°.

For assistance with specific applications, contact Hyspan at websales@hyspan.com or +1 619.421.1355.

Series 6600 – ASME Class



Nominal Sizes	½" – 48" NPS (see availability table)
Pressure Classes	Pressure class dependent — see ASME B16.5 and Size/Class Availability table
Design Temperature	Up to 650°F (343°C) standard; higher by special design
Total Flex Angle	15°
Sealing System	Ductile iron, chrome-moly alloy steel, or Inconel 600/625 with injected Grafoil® Flexible Graphite packing
Standards	ASME B31.1, B31.3; rated to conform to ASME butt weld valves at 100°F
Fire Testing	Fire tested per API 6FA; approved by ABS Americas and Lloyd's Register for shipboard applications
CRN	0D25724.2134567890NTYC
Warranty	Five-year limited warranty — see Warranty section

Product Description

ASME Class Ball Joints are designed to conform to the ratings established for ASME butt weld valves at 100°F. Designs are available from 150 lb through 2500 lb class and are recommended for use in ASME B31.1 and B31.3 piping systems. They have been widely accepted for chemical and petroleum system applications including oil field wellheads, oil exploration drilling ships and platforms, and high pressure steam and hot water systems.

The sealing systems consist of optional seal materials including ductile iron, chrome-moly alloy steel, and high nickel alloys 600 and 625 combined with injected graphite flakes with synthetic oil carrier — Grafoil® Flexible Graphite packing. Grafoil® packing can be injected after installation if necessary, and the ball joints can be disassembled for maintenance. All ASME Class Ball Joints are designed for a total flex angle of 15°.

Size and Pressure Class Availability

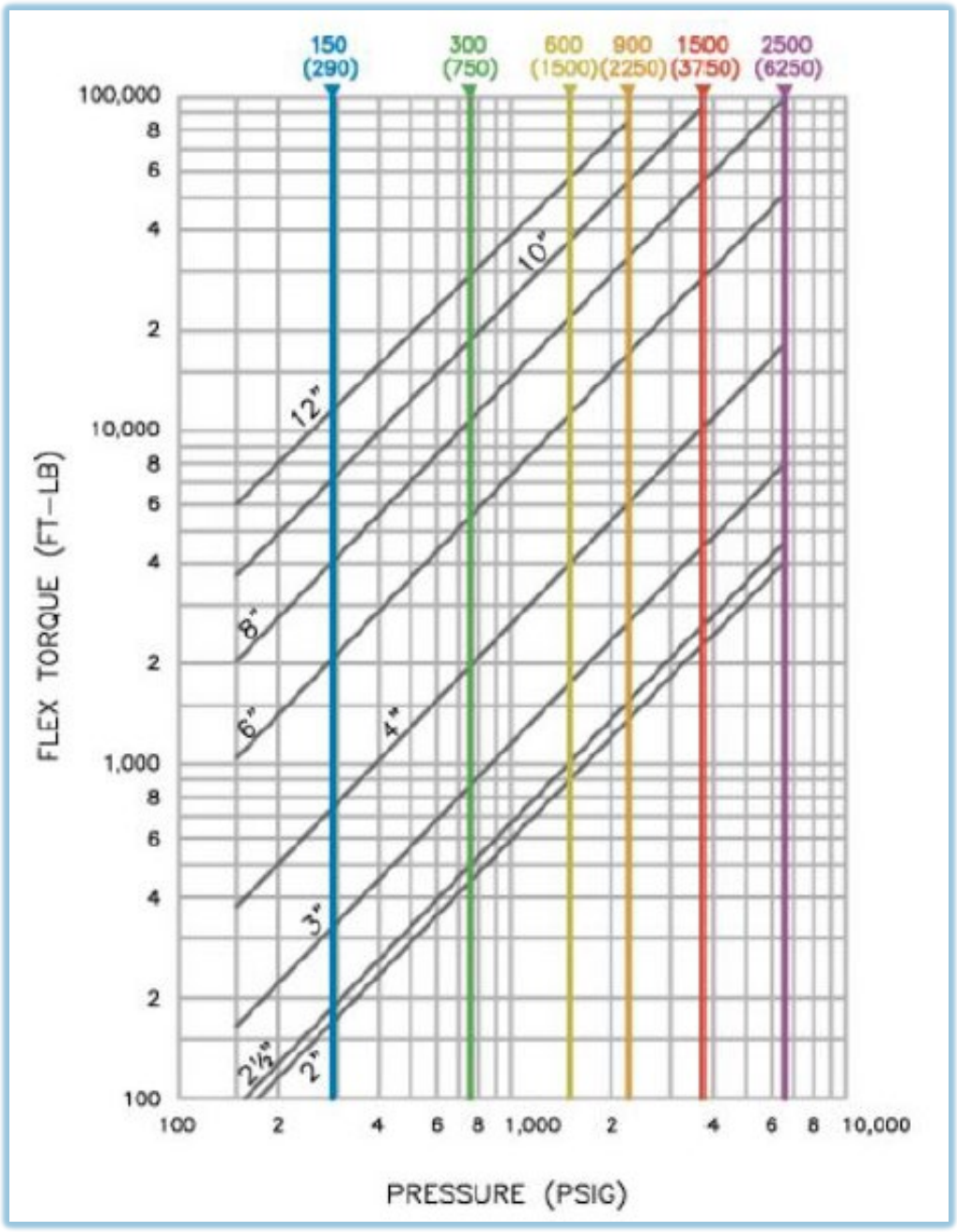
Size (NPS)	ASME Class 150 290 PSIG 20 BAR	300 750 PSIG 51.7 BAR	600 1500 PSIG 103.4 BAR	900 2250 PSIG 155.1 BAR	1500 3750 PSIG 258.6 BAR	2500 6250 PSIG 430.9 BAR
1/2 - 12						
14 -18						
20 - 24						
26 - 30						
32 - 36						
38 - 48						

Design Pressures above: 100° F (38° C), 650° F (343° C) Limit*

Currently Available Designs

*Special designs, materials, and coatings available

Flex Torque / Pressure Chart — ASME Class Ball Joints



Installation and Maintenance

Proper application and maintenance of ASME Class ball joints is important. Refer to the Installation and Maintenance Procedures for ASME Class ball joints for the correct procedures including disassembly and seal replacement. Grafoil® is a registered trademark of Graftech (formerly UCAR).

Series 6600 – Type N Style I



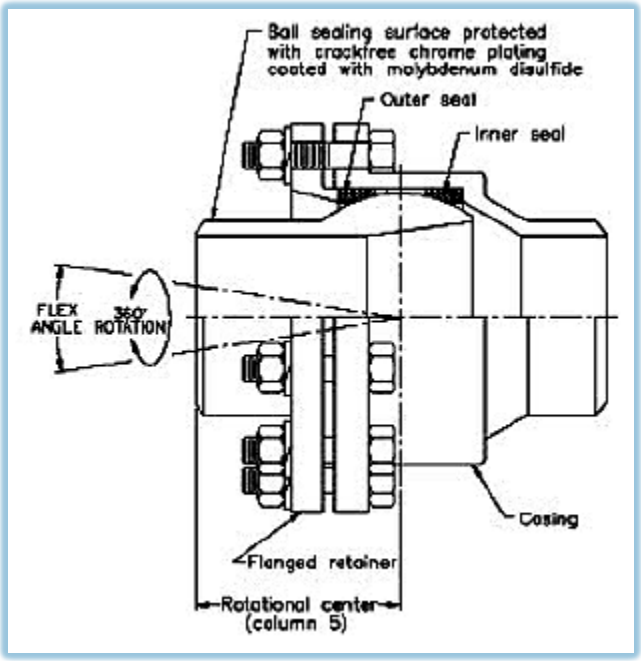
Nominal Sizes	2½" – 30" NPS
End Connections	Weld end (BB-31020), 150 lb. flanged (BB-31533), 300 lb. flanged (BB-31536)
Standard Materials	Wrought steel ball, case, and retainer; ball sealing surface with crack-free chrome plating and molybdenum disulfide coating
Total Flex Angle	15° to 31° (varies by size — see Column 3 of Dimensional Data)
Available Seals	Seal 24 (Glass-filled Teflon®) — corrosive service, -325°F to +425°F
Warranty	Hyspan Limited Warranty — see hyspan.com for full terms

Product Description

Type N Style I ball joints have been widely accepted since the design was introduced in 1960. They are commonly used in steam, hot water, chilled water, petroleum, and chemical piping to absorb thermal expansion. Common applications are tank and building settlement, seismic isolation, bridge movement, and wave motion compensation in addition to steam and hot water distribution systems.

Standard models are available as weld end or flanged with optional seal materials. The total flex angle varies with size from 15° to 31°. Refer to Column 3 of the Dimensional Data below. Standard materials are wrought steel for the ball, case, and retainer. The ball sealing surface is protected with crack-free chrome plating and coated with molybdenum disulfide.

Design Features

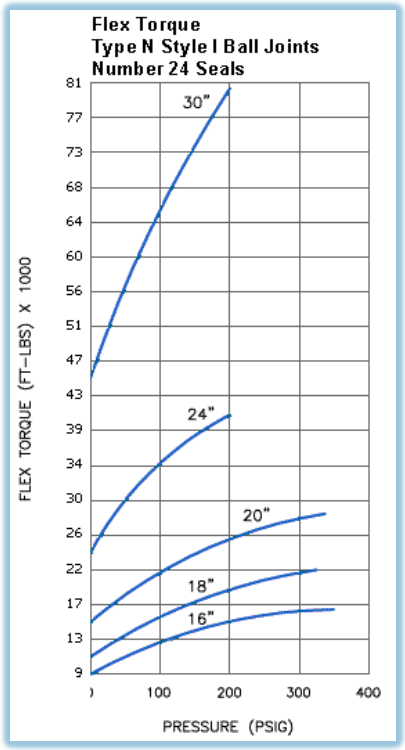


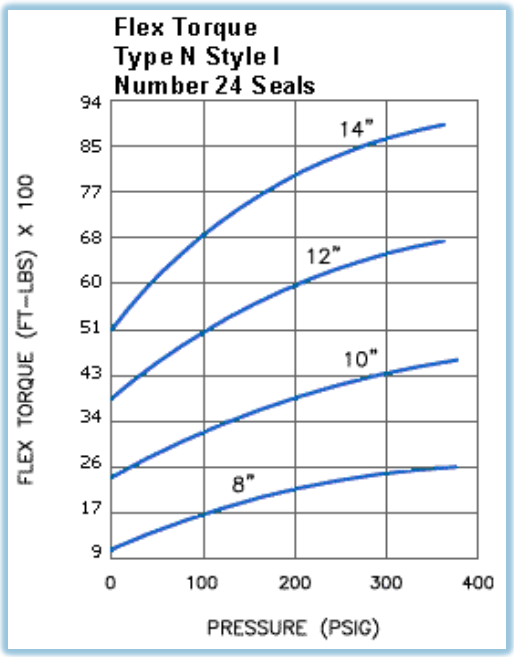
Dimensional Data — Type N Style I Ball Joints

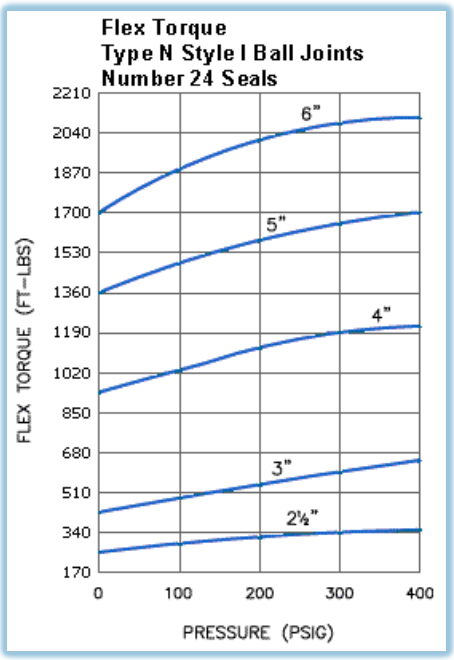
					Weld End BB-31020		150 lb. Flanged BB-31533		300 lb. Flanged BB-31536	
Nominal Size (NPS)	Size Code	Flex Angle (degrees)	Outside Diameter (inches)	Rotational Center (inches)	Overall Length (inches)	Weight (lbs)	Overall Length (inches)	Weight (lbs)	Overall Length (inches)	Weight (lbs)
2 1/2	-40	23	5.94	3.50	6.75	13	12.5	29	13	37
3	-48	22	7.19	4.25	7.88	21	13.63	41	14.38	51
4	-64	25	9.75	5.50	11.00	63	17.25	93	18	113
5	-65	25	11.28	6.00	12.00	95	19.25	133	20	159
6	-66	23	12.38	7.19	14.25	122	21.5	170	22.25	206
8	-68	17	14.75	8.00	15.94	190	24.19	268	24.94	324
10	-70	16.5	17.13	8.25	16.50	262	24.75	366	26	444
12	-72	15	19.75	8.69	17.79	380	27.04	540	28.29	660
14	-74	15.25	22.50	10.06	19.50	520	29.75	740	31	880
16	-76	15.5	25.25	11.25	22.66	736	32.91	1016	34.41	1236
18	-78	15	26.75	12.50	23.38	820	34.63	1140	36.13	1460
20	-80	15.5	30.00	11.50	24.00	940	35.63	1330	37	1740
24	-84	15	35.25	16.00	29.35	1375	41.6	1925	42.85	2535
30	-90	15	42.62	18.00	34.77	2090	45.78	2810.00	51.52	3950
1	3	3	4	5	6	7	8	9	10	11

Flex Torque

Flex torque is the moment (ft.-lbs.) at break-away to angularly displace a ball joint. Because the pressure thrust is reacted by the seals, the flex torque is a function of system pressure. The values given are for steam service. For water or oil service the torque values are 45% less.



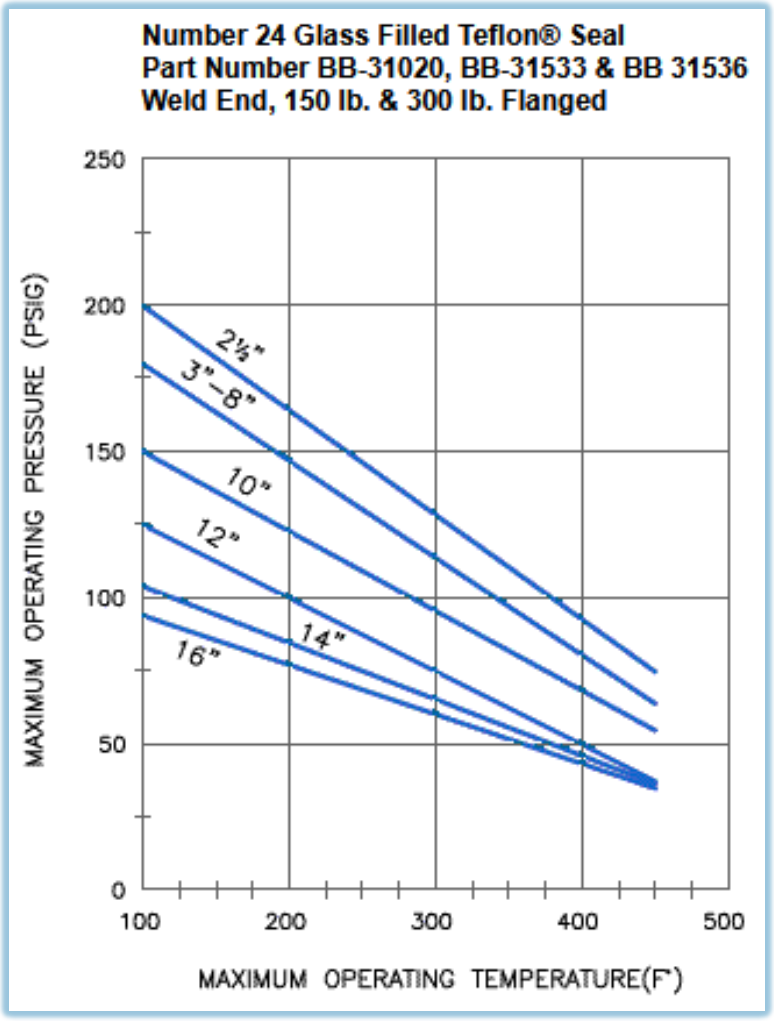




Seal Descriptions and Pressure/Temperature Ratings

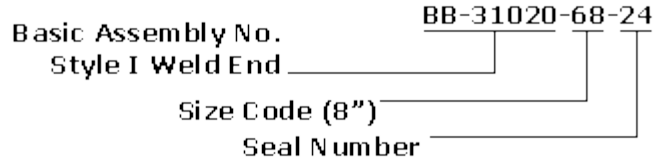
Seal Number 24 — Glass-Filled Teflon®

Compound 24 is a pressure-molded proprietary compound of glass fiber and Teflon®. The addition of glass fiber adds strength and stability to the seal. The compound is chemically inert and is recommended for applications involving corrosive fluids when a higher pressure rating is required. Designed for service at temperatures from -325°F to +425° F.



Ordering Instructions

To order or specify Hyspan Ball Joints, state the complete part number which includes: the basic Assembly Number selected from the illustrations, the Size Code from Column 2 of the Dimensional Data tabulation, and the Seal Code based on the seal composition required.



Installation and Maintenance

Proper application and maintenance of ball joints is important. Refer to the Installation and Maintenance Procedures for Type N Style I ball joints for the correct procedures including disassembly and seal replacement. Teflon® is a registered trademark of Dupont. Grafoil® is a registered trademark of UCAR.

Series 6600 – Type N Style II, III & III-V

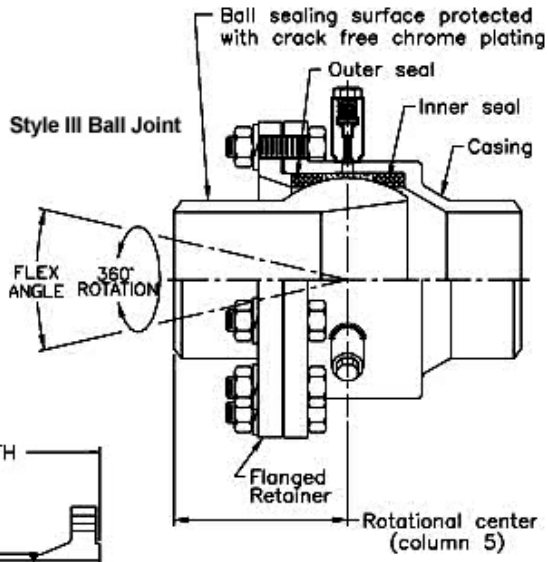
Nominal Sizes	2½" – 30" NPS
End Connections	Weld end (BB-41020/BB-61020/BB-66020), 150 lb. flanged (BB-41533/BB-61533/BB-66533), 300 lb. flanged (BB-41536/BB-61536/BB-66536)
Ball Sealing Surface	Two mils chrome plating: one mil hard chrome + one mil crack-free chrome; baked-on molybdenum disulfide lubricant coating
Available Seals	Seal 19 (Composition) — -50°F to +525°F; Seal 21 (Ductile Iron) — -20°F to +650°F; Seal 39 (Alloy 625) — corrosive/special materials; Seal 45 (Chrome-Moly F11) — high temperature
Repacking	Style II: repacked after installation. Style III & III-V: repacked under pressure. All configurations fully disassemble for maintenance.
Fire Testing	Type N Style III fire tested per API 6FA; approved by ABS Americas and Lloyd's Register for shipboard applications
Warranty	Five-year limited warranty — see Warranty section

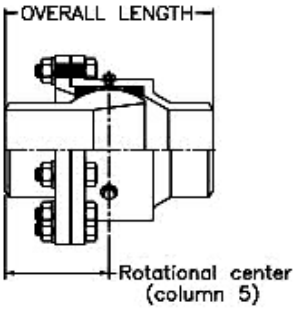
Product Description

Type N Style II, III & III-V ball joints combine the inner and outer seals that are common to all Hyspan Barco ball joints with injected graphite flakes with synthetic oil carrier, Grafoil® Flexible Graphite packing. This combination allows the use of a wide variety of high strength seal materials with the lubrication and high temperature sealing capability of Grafoil®.

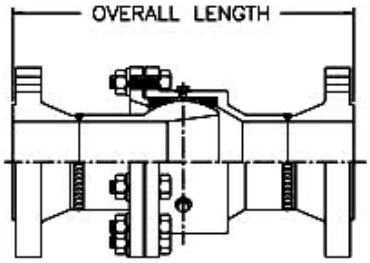
The ball sealing surface is protected with two mils of chrome plating consisting of one mil of hard chrome over one mil of crack-free chrome, and baked-on molybdenum disulfide lubricant coating. Type N Style II, III & III-V ball joints are used in steam and hot water distribution systems, chemical and petroleum plants, oil exploration drilling ships and platforms, and many other critical installations. All standard configurations are warranted for five years.

Design Features

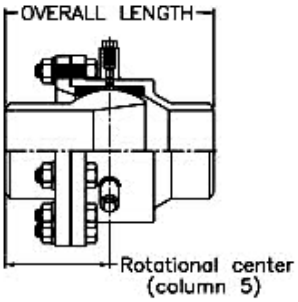




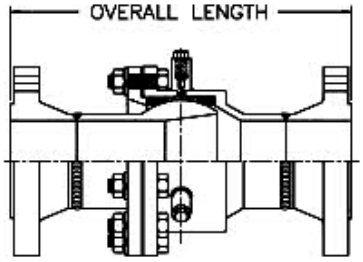
Part Number
BB-41020 (Style II)



Part Numbers
BB-41533 (150 lb. Style II)
BB-41536 (300 lb. Style II)

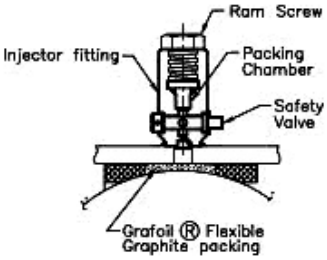


Part Numbers
BB-61020 (Style III)
BB-66020 (Style III-V)

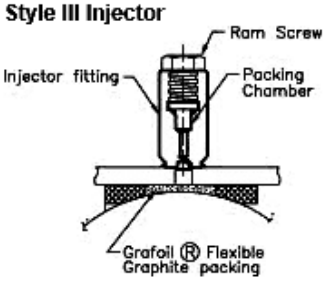


Part Numbers
BB-61533 (150 lb. Style III)
BB-66533 (150 lb. Style III-V)
BB-61536 (300 lb. Style III)
BB-66536 (300 lb. Style III-V)

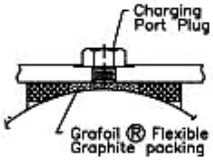
Style III-V Injector



Style III Injector



Style II Plugged Port

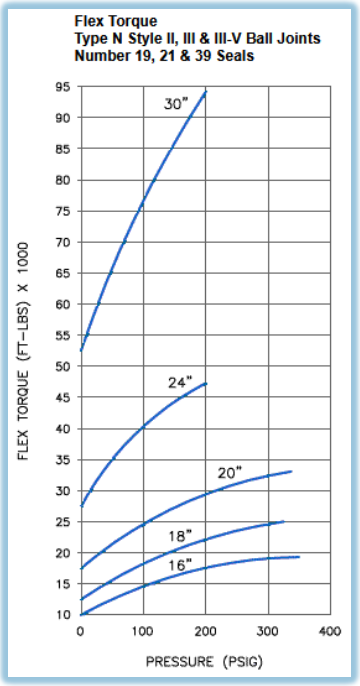


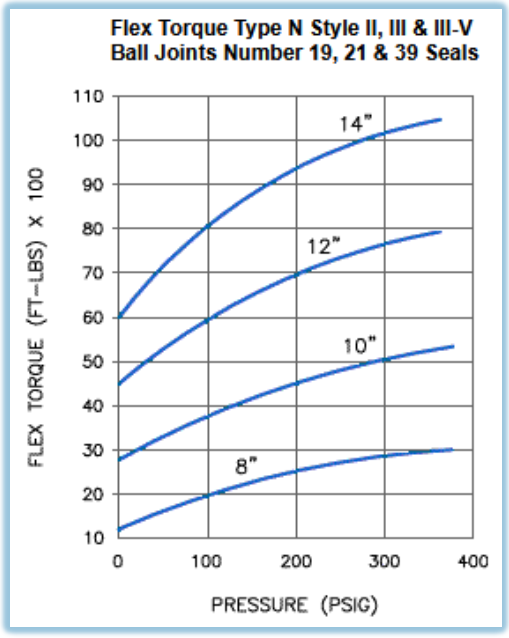
Dimensional Data — Type N Style II, III & III-V Ball Joints

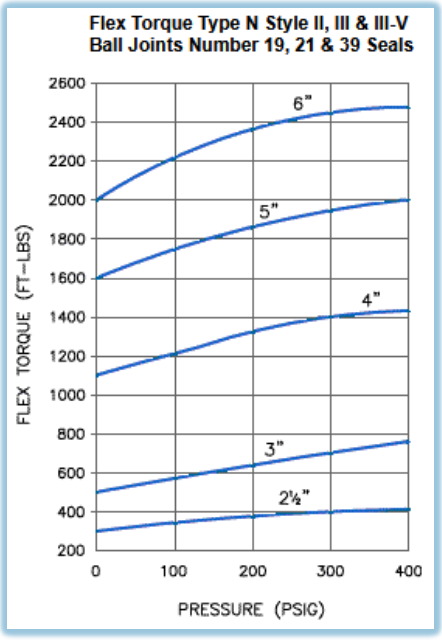
					Weld End BB-41020 BB-61020 BB-66020		150 lb. Flanged BB-41533 BB-61533 BB-66533		300 lb. Flanged BB-41536 BB-61536 BB-66536	
Nominal Size (NPS)	Size Code	Flex Angle (degrees)	Outside Diameter (inches)	Rotational Center (inches)	Overall Length (inches)	Weight (lbs)	Overall Length (inches)	Weight (lbs)	Overall Length (inches)	Weight (lbs)
2 1/2	-40	23	5.94	3.50	6.75	13	12.5	29	13	37
3	-48	22	7.19	4.25	7.88	21	13.63	41	14.38	51
4	-64	25	9.75	5.50	11.00	63	17.25	93	18	113
5	-65	25	11.28	6.00	12.00	95	19.25	133	20	159
6	-66	23	12.38	7.19	14.25	122	21.5	170	22.25	206
8	-68	17	14.75	8.00	15.94	190	24.19	268	24.94	324
10	-70	16.5	17.13	8.25	16.50	262	24.75	366	26	444
12	-72	15	19.75	8.69	17.79	380	27.04	540	28.29	660
14	-74	15.25	22.50	10.06	19.50	520	29.75	740	31	880
16	-76	15.5	25.25	11.25	22.66	736	32.91	1016	34.41	1236
18	-78	15	26.75	12.50	23.38	820	34.63	1140	36.13	1460
20	-80	15.5	30.00	11.50	24.00	940	35.63	1330	37	1740
24	-84	15	35.25	16.00	29.35	1375	41.6	1925	42.85	2535
30	-90	15	42.62	18.00	34.77	2090	45.78	2810.00	51.52	3950
1	3	3	4	5	6	7	8	9	10	11

Flex Torque

Flex torque is the moment (ft.-lbs.) at break-away to angularly displace a ball joint. Because the pressure thrust is reacted by the seals, the flex torque is a function of system pressure as illustrated by the adjacent charts for Number 19, 21, and 39 seals. The values given are for steam service. For water or oil service the torque values are 45% less.







Seal Descriptions and Pressure/Temperature Ratings

Seal Number 19 — Composition Seal

Compound 19 is a pressure-molded proprietary seal compound recommended for general purpose applications for steam, hot water, and oil systems. Compound 19 has the highest pressure/temperature ratings of the available non-metallic seal materials. Designed for service at temperatures from -50°F to +525°F.

Seal Number 21 — Ductile Iron Seal

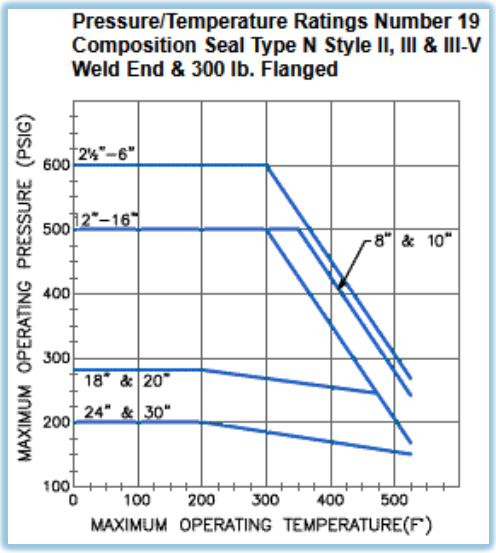
Compound 21 seals are cast ductile iron and precision machined. The ductile iron combined with the chrome-plated sealing surface of the ball provides a low-friction, long-life seal. Designed for service at temperatures from -20°F to +650°F with standard materials of construction.

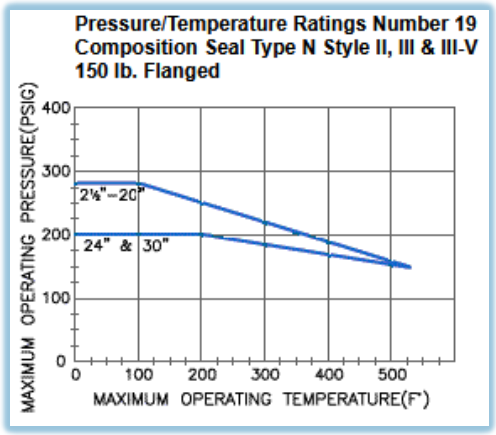
Seal Number 39 — Alloy 625

Compound 39 seals are machined from Alloy 625 high nickel stainless steel. Alloy 625 has very high strength combined with exceptionally high corrosion resistance. Number 39 seals are normally used in Type N packed ball joints made from special materials such as stainless steel and high chrome steel alloys. Temperature/pressure ratings are dependent on all materials used for construction.

Seal Number 45 — Chrome-Moly F11

Compound 45 seals are machined from ASME A-182 F11 chrome-moly steel forgings. Alloy F11 is a very high strength steel which can be used for higher temperature applications. Number 45 seals are normally used in Type N packed ball joints made from special materials flange including high chrome steel alloys. Temperature/pressure ratings are dependent on all materials used for construction.





Pressure/Temperature Ratings
Number 21 Ductile Iron Seal
Type N Style II, III & III-V Weld End

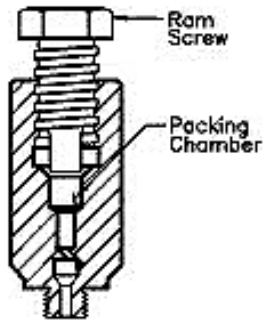
Nominal Size/Range (NPS)	Maximum Pressure @ 600° F (psig)
2 1/2" - 6"	800
8"	500
10"-14"	450
16"	400
18"-20"	250
24"	150
30"	125

**The rated pressure for flanged is determined by the rating. Consult the applicable code for the allowable pressure at the design temperature.*

Accessories

Recharge Cylinder — Part Number 10-64416-43

Type N Style II ball joints are designed to be sealed after installation if a leak develops. A recharge cylinder that is designed to be temporarily installed in the charging ports is available. Part Number 10-64416-43.



Style II Recharge Cylinder

Reload Kits — Part Number 10-64715-00

Flexible graphite packing material is available as pellets designed to be inserted into Type N Style II, III, and III-V recharge cylinders. Each kit contains 13 pellets.

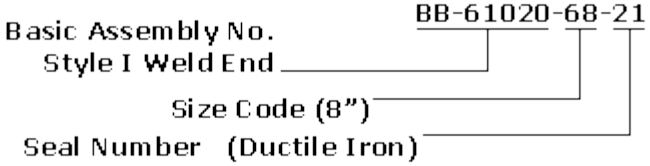
Recharge Kit Pellets

Insulation Covers

Removable, reusable insulation covers are specially made to fit all styles and configurations of Hyspan Barco ball joints. A full range of insulation and jacketing materials are available for all design temperatures. Covers for the Style III and III-V ball joints have pre-cut openings to allow access to recharge cylinders.

Ordering Instructions

To order or specify Hyspan Barco Ball Joints, state the complete part number which includes: the basic Assembly Number selected from the illustrations, the Size Code from Column 2 of the Dimensional Data tabulation, and the Seal Code based on the seal material required.



Installation and Maintenance

Proper application and maintenance of ball joints is important. Refer to Installation and Maintenance Procedures for Type N Style II, Type N Style III, and Type N Style III-V for the correct procedures including disassembly and seal replacement. Grafoil® is a registered trademark of UCAR. Teflon® is a registered trademark of Dupont.

Series 6600 – OW 1500 Style II & III-V

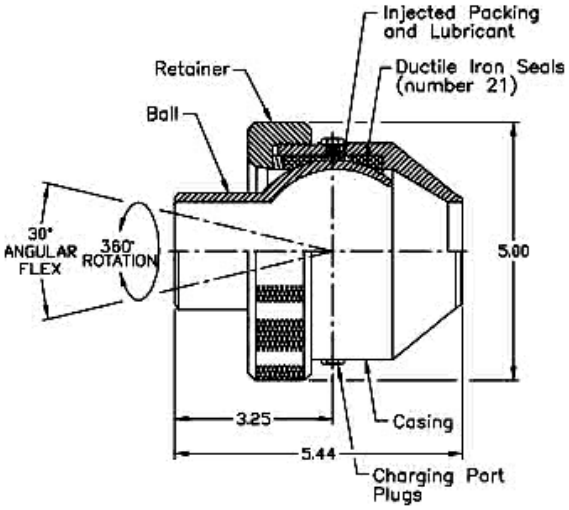
Nominal Size	2″ NPS (Size Code 32)
Design Pressure	1500 PSIG
Design Temperature	650°F
Total Flex Angle	30°
Sealing	Ductile iron inner and outer seals (Seal Number 21) with injected Grafoil® Flexible Graphite
Ball, Casing, Retainer	Wrought steel; spherical surface chrome plated (two mils: hard + crack-free); baked-on molybdenum disulfide
Style II P/Ns	BB-36203-32-21 (Sch. 80 Weld Ends), BB-36204-32-21 (Sch. 160 Weld Ends)
Style III-V P/Ns	BB-36603-32-21 (Sch. 80 Weld Ends), BB-36604-32-21 (Sch. 160 Weld Ends)
Weight	13 lbs. (Style II), 15 lbs. (Style III-V)
Applications	Oil field wellheads (riser expansion), solar panel rotation, high pressure applications
Warranty	Five-year limited warranty — see Warranty section

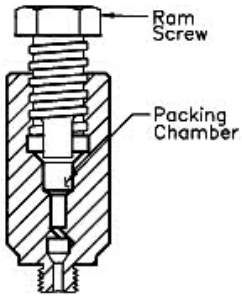
Product Description

OW1500 ball joints are designed for 1500 PSIG at 650°F. They are recommended for installation on oil field wellheads to compensate for riser expansion, solar panels to accommodate panel rotation, and other high pressure applications. Standard OW1500 ball joints are available in 2" nominal pipe size. For other sizes and pressure ratings refer to ASME Class Ball Joints.

The ball, casing, and retainer are made from wrought steel. The spherical surface of the ball is chrome plated with two mils of chrome consisting of one mil of hard chrome and one mil of crack-free chrome. The plating is protected by a coating of baked-on molybdenum disulfide lubricant. The sealing system consists of ductile iron inner and outer seals (Number 21) with injected graphite flakes with synthetic oil carrier, Grafoil® Flexible Graphite.

OW1500 Style II — Design Features





Recharge Cylinder
Part Number 01-64416-43

For repacking OW1500 Style II ball joints refer to the Installation and Maintenance Procedures.

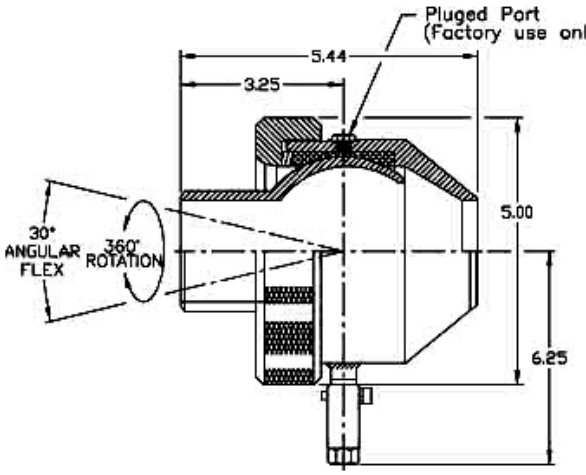
Part Number BB-36203-32-21
Schedule 80 Weld Ends

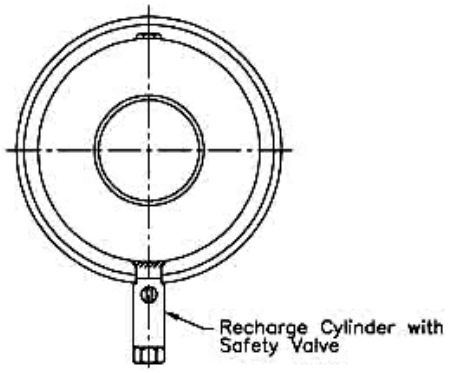
Part Number BB-36204-32-21
Schedule 160 Weld Ends

Nominal Size (NPS): 2" (Size Code 32)
Design Pressure: 1500 psig
Design Temperature: 650° F
Flex Angle: 30°
Weight: 13 lbs.

Allow 4" to install the recharge cylinder and to remove the ram screw.

OW1500 Style III-V — Design Features





Part Number BB-36603-32-21 Schedule 80 Weld Ends

Part Number BB-36604-32-21 Schedule 160 Weld Ends

Nominal Size (NPS): 2" (Size Code 32)
Design Pressure: 1500 psig
Design Temperature: 650° F
Flex Angle: 30°
Weight: 15 lbs.

Allow 2.5" to remove the ram screw.

Installation and Maintenance

Proper application and maintenance of ball joints is important. Refer to Installation and Maintenance Procedures for OW1500 Style II and OW1500 Style III-V ball joints for the correct procedures including disassembly and seal replacement. Grafoil® is a registered trademark of UCAR.

Installation and Maintenance Procedures

Standard Series & 600 Series Ball Joints

Installation Recommendations

1. The media flow direction can be from either end of the ball joint except for liquids with suspended solids, then flow should be from ball end to casing end.
2. In vertical installations, ball joints should be installed with the ball end down to prevent foreign matter from collecting between neck of ball and retainer.
3. Do not loosen the ball joint retainer during installation, or utilize ball joints as Unions. Each joint is factory preset and tested before shipment. LOOSENING OF THE BALL JOINT RETAINER IS NOT RECOMMENDED. If the retainer must be loosened it should be loosened 1/4 of a revolution maximum, and retightened an equal amount before any pressure testing or flushing of the line. There is a setscrew to maintain the position of the retainer - be sure the setscrew is loosened and retightened after the adjustment and prior to applying pressure.
4. Use CAUTION PREHEATING, WELDING, OR POST WELD HEAT-TREATING ball joints into the line. Excessive heating of the sealing area may cause leakage.
5. Protect the exposed ball surface from weld splatter, and prevent dirt and debris from collecting around neck of the ball.
6. Although ball joints can be rotated or twisted around the centerline, they are designed to absorb motion by the Offset Method that utilizes angular flex to provide the required movement. Consult a Hyspan Barco sales representative or contact Hyspan by email at websales@hyspan.com if an application involves extensive rotating motion.

General Warning

Standard Series and 600 Series Hyspan Barco Ball Joints are not designed for maintenance to be performed while the system is pressurized. DO NOT PERFORM ANY ADJUSTMENTS TO A BALL JOINT THAT IS PRESSURIZED.

Maintenance Instructions

To correct leaks or to perform routine maintenance:

1. Relieve the internal pressure.

2. Loosen the retainer setscrew and tighten retainer until it is snug against the ball using a reasonable amount of torque with manual wrenches. Tighten the setscrew and pressurize the system. If leakage still occurs the ball joint can be disassembled for maintenance

3. To disassemble the ball joint for maintenance it must be removed from the system.

    a. Disassemble by loosening the setscrew and removing the retainer.

    b. Inspect the inner seal for wear: The inner seal is seldom worn enough to require replacement.It is recommended that the outer seal should be replaced.

    c. Clean and inspect ball surface carefully. Replace the ball if it is worn, scored or pitted.

d. Replacement balls and seals are available from an authorized Hyspan Barco representative or by contacting Hyspan by email at websales@hyspan.com. Be certain to dispose of the discarded seals properly.

e. To reassemble, coat the surfaces of seal(s) and ball with a light coat of assembly lubricant. For service over 350º F use molybdenum disulfide based lubricant.

f. If the inner seal has been removed, install it in the case with the concave surface out by tapping it in place evenly with a soft mallet.

g. Slide new outer seal over extended end of ball with the concave surface mating to the convex surface of ball.

h. Replace ball into case.

i. Tap the new outer seal evenly with soft mallet into casing around ball.

j. Add thread lubricant to retainer threads and replace the retainer - tighten until the seals are snug against the ball with a reasonable amount of torque with manual wrenches. Do not back off. Tighten the setscrew.

Note: In some sizes with 90º balls, it may be necessary to slip seal and retainer over the ball before seating ball and seal into case to provide clearance at neck or elbow.

Type N Style I Ball Joints

Installation Recommendations

1. The media flow direction can be from either end of the ball joint except for liquids with suspended solids, then flow should be from ball end to casing end.
2. In vertical installations, ball joints should be installed with the ball end down to prevent foreign matter from collecting between neck of ball and retainer.
3. Do not loosen the ball joint retainer during installation, or utilize ball joints as Unions. Each joint is factory preset and tested before shipment. LOOSENING OF BALL JOINT RETAINER IS NOT RECOMMENDED. If the retainer must be loosened, loosen the bolting 1/4 revolution maximum using a standard crossing pattern. Retighten the bolting using the procedure outlined in Paragraph 2 of the Maintenance Instructions below.
4. Use CAUTION PREHEATING, WELDING, OR POST WELD HEAT-TREATING ball joints into the line. Excessive heating of the sealing area may cause leakage.
5. Protect the exposed ball surface from weld splatter, and prevent dirt and debris from collecting around neck of ball.
6. Although ball joints can be rotated or twisted around the centerline, they are designed to absorb motion by the Offset Method that utilizes angular flex to provide the required movement. Consult a Hyspan Barco sales representative or contact Hyspan by email at websales@hyspan.com if an application involves extensive rotating motion.

General Warning

Type N Style I Hyspan Barco Ball Joints are not designed for maintenance to be performed while the system is pressurized. DO NOT PERFORM ANY ADJUSTMENTS TO A BALL JOINT THAT IS PRESSURIZED.

Maintenance Instructions

To correct leaks or to perform routine maintenance:

1. Relieve the internal pressure.
2. Tighten retainer bolting to a maximum of twice the factory torque settings that are given below. Use a standard crossing pattern.

   Number 24 Glass Filled Teflon® Seals

Nominal Size(s)	Factory Torque (ft.-lbs.)
2 1/2"	4-5
3" & 4"	8-10
5" & 6"	12-14
8"-14"	24-26
16"-24"	20-24

If leakage still occurs the ball joint can be disassembled for maintenance.

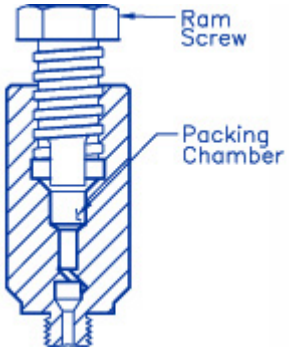
3. TO DISASSEMBLE the ball joint for maintenance it must be removed from the system.
    a. Disassemble by loosening the retainer bolts and removing the retainer.
    b. Inspect the inner seal for wear: The inner seal is seldom worn enough to require replacement. It is recommended that the outer seal should be replaced.
    c. Clean and inspect ball surface carefully. Replace the ball if it is worn, scored or pitted.
    d. Replacement balls and seals are available from an authorized Hyspan Barco representative or by contacting Hyspan by email at websales@hyspan.com. Be certain to dispose of the discarded seals properly.
    e. To reassemble, coat the surfaces of seal(s) and ball with a light coat of assembly lubricant. For service over 350º F use molybdenum disulfide based lubricant.
    f. If the inner seal has been removed, install it in the case with the concave surface out by tapping it in place evenly with a soft mallet.
    g. Slide new outer seal over extended end of ball with the concave surface mating to the convex surface of ball.
    h. Replace ball into case.
    i. Tap the new outer seal evenly with soft mallet into casing around ball.
    j. Replace the retainer tighten the bolting to the factory settings given in Paragraph 2 above.

Type N Style II, OW 1500 Style II & ASME Class Ball Joints

Installation Recommendations

1. The media flow direction can be from either end of the ball joint except for liquids with suspended solids, then flow should be from ball end to casing end.
2. In vertical installations, ball joints should be installed with the ball end down to prevent foreign matter from collecting between neck of ball and retainer.
3. Do not loosen the ball joint retainer during installation, or utilize ball joints as Unions.
   Each joint is factory preset and tested before shipment. LOOSENING OF THE BALL JOINT RETAINER IS NOT RECOMMENDED. If the retainer must be loosened, loosen bolted retainers by loosening the bolting 1/4 revolution maximum using a standard crossing pattern. Retightened using the procedure outlined in Paragraph 7(j) of the Maintenance Instructions below. OW 1500 Style II ball joints have threaded retainers. Loosen the retainer 1/4 revolution maximum and retighten the same rotation.
4. Use CAUTION PREHEATING, WELDING, OR POST WELD HEAT-TREATING ball joints into the line. Excessive heating of the sealing area may cause leakage.
5. Protect the exposed ball surface from weld splatter, and prevent dirt and debris from .
   collecting around neck of ball.
6. Although ball joints can be rotated or twisted around the centerline, they are designed to absorb motion by the Offset Method that utilizes angular flex to provide the required movement. Consult a Hyspan Barco sales representative or contact Hyspan by email at websales@hyspan.com if an application involves extensive rotating motion.

General Warning



Style II Recharge Cylinder

Type N Style II, OW 1500 Style II and ASME Class Hyspan Barco Ball Joints are not designed for maintenance to be performed while the system is pressurized. DO NOT PERFORM ANY ADJUSTMENTS TO A BALL JOINT THAT IS PRESSURIZED.

Maintenance Instructions

To correct leaks or perform routine maintenance.

In order to repack Type N Style II, OW 1500 Style II and ASME Class Hyspan Barco Ball Joints a recharge cylinder (Part Number 10-64416-43) and packing pellets available in reload kits of 13 pellets (Part Number 10-64715-00) will be required. These products are available from an authorized Hyspan Barco representative or contact Hyspan at websales@hyspan.com.

1. Relieve the internal pressure and allow ball joint to cool to a safe temperature for handling.
2. Remove all of the charging port plugs.
3. Prior to installing the recharge cylinder remove the ram screw and insert one (1) packing pellet. Replace the ram screw and rotate until a small amount of sealant has been forced out of the tip of the cylinder. Apply thread lubricant to recharge cylinder threads, and thread the recharge cylinder into the one of the ball joint ports.
4. Inject sealant into the port by turning the ram screw until sealant is forced from the adjacent port. If necessary add additional packing pellets. Do not exceed 150 ft.-lbs of torque on the ram screw.
5. Remove the recharge cylinder. Sealant should expand from the port. Replace the port plug.
6. Thread the recharge cylinder into the adjacent port and repeat steps 5 and 6 until all of the ports have been charged and the plugs replaced. Be certain that all of the plugs have been replaced with the threads fully engaged and tightened prior to pressurizing. If leakage still occurs the ball joint can be disassembled for maintenance
7. TO DISASSEMBLE the ball joint for maintenance it must be removed from the system.
    a. Disassemble the joint by removing the retainer.
    b. Inspect the inner seal for wear: The inner seal is seldom worn enough to require replacement.
    c. Clean and inspect ball surface carefully. Replace the ball if it is worn, scored or pitted.
    d. Replacement balls, seals and packing are available from an authorized Hyspan Barco representative or contact Hyspan at websales@hyspan.com. Be certain to dispose of discarded seals and injected packing properly.

Recharge Kit Pellets

e. To reassemble, coat the surfaces of the seal(s) and ball with a light coat of assembly lubricant. For service over 350º F use molybdenum disulfide based lubricant.

f. If the inner seal has been removed, install it in the case with the concave surface out by tapping it in place evenly with a soft mallet.

g. Slide new outer seal over extended end of ball with the concave surface mating to the convex surface of ball.

h. Replace ball into casing.

i. Tap the new outer seal evenly with plastic or rubber hammer into casing around ball.

j. For bolted retainers tighten retainer bolting to the following factory torque settings using a standard crossing pattern.

Number 21 Ductile Iron & Other Metal Seals

Nominal Size(s)	Factory Torque (ft.-lbs.)
2 1/2"	6
3" & 4"	10-12
5" & 6"	14-16
8" through14"	24-26
16" through 30"	20-22

k. For the threaded retainer on OW 1500 ball joints add thread lubricant to the retainer threads and torque the retainer to 360 ft.-lbs.

l. Add the injected packing following Paragraphs 2 through 6 above. If possible perform an air and soap bubble leak test before reinstalling.

Type N Style III Ball Joints

Installation Recommendations

1. The media flow direction can be from either end of the ball joint except for liquids with suspended solids, then flow should be from ball end to casing end.
2. In vertical installations, ball joints should be installed with the ball end down to prevent foreign matter from collecting between neck of ball and retainer.
3. Do not loosen the ball joint retainer during installation, or utilize ball joints as Unions. Each joint is factory preset and tested before shipment. LOOSENING OF BALL JOINT RETAINER IS NOT RECOMMENDED. If the retainer must be loosened, loosen the bolting 1/4 revolution maximum using a standard crossing pattern. Retighten the bolting using the procedure outlined in Paragraph 6(j) of the Maintenance Instructions below.
4. Use CAUTION PREHEATING, WELDING, OR POST WELD HEAT-TREATING ball joints into the line. Excessive heating of the sealing area may cause leakage.
5. Protect the exposed ball surface from weld splatter, and prevent dirt and debris from collecting around neck of ball.
6. Although ball joints can be rotated or twisted around the centerline, they are designed to absorb motion by the Offset Method that utilizes angular flex to provide the required movement. Consult a Hyspan Barco sales representative or contact Hyspan by email at websales@hyspan.com if an application involves extensive rotating motion.

General Warning

Type N Style III Hyspan Barco Ball Joints are designed for repacking to be performed while the system is pressurized utilizing integral recharge cylinders. DO NOT PERFORM ANY ADJUSTMENTS TO THE RETAINER OF A BALL JOINT THAT IS PRESSURIZED. There are plugged ports between the recharge cylinders that are for factory use only - do not remove these plugs.

Maintenance Instructions

To correct leaks or to perform routine maintenance.

In order to repack Type N Style III Hyspan Barco Ball Joints packing pellets are required that are available in reload kits of 13 pellets (Part Number 10-64715-00). Reload kits are available from an authorized Hyspan Barco representative or contact Hyspan at websales@hyspan.com).

1. Type N Style III ball joints are designed to be recharged by injecting packing under full line pressure provided the correct safety precautions are observed. Recharge only if aleak occurs. Only Hyspan packing material must be used. Recharging is accomplished by injecting packing through the recharging cylinders - DO NOT PERFORM ANY
   ADJUSTMENTS TO THE RETAINER OF A PRESSURIZED BALL JOINT. DO NOT RECHARGE WHILE PRESSURIZED IF LEAKAGE APPEARS THROUGH OR ARROUND A RECHARGE CYLINDER.

   WEAR EYE PROTECTION (FULL FACE MASK) AND PROPER SAFETY APPAREL.

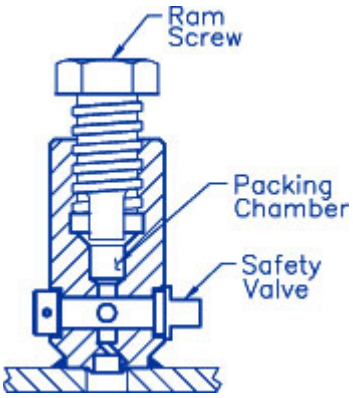
2. Remove the ram screw from the recharge cylinder nearest the point of leakage.
3. Add lubricant (molybdenum disulfide based) to ram screw threads and insert one packing pellet in the chamber, and start ram screw.
4. Inject sealant into the port by turning the ram screw until it is bottomed against the cylinder. Do not exceed 250 ft.-lbs of torque on the ram screw.
5. Repeat Paragraphs 3 and 4 for the remaining recharge cylinders or until the leakage stops. Insert one pellet per cylinder. Repeat Paragraphs 3 and 4 one additional packing rotation or until leakage stops. If leakage still occurs the ball joint can be disassembled for maintenance.
6. TO DISASSEMBLE the ball joint for maintenance it must be removed from the system.
    a. Disassemble joint by removing the retainer.
    b. Inspect the inner seal for wear: The inner seal is seldom worn enough to require replacement.
    c. Clean and inspect ball surface carefully. Replace the ball if it is worn, scored or pitted.
    d. Replacement balls, seals and packing are available from an authorized Hyspan Barco representative or contact Hyspan at websales@hyspan.com. Be certain to dispose of discarded seals and injected packing properly.
    e. To reassemble, coat the surfaces of the seal(s) and ball with a light coat of assembly lubricant. For service over 350º F use molybdenum disulfide based lubricant.
    f. If the inner seal has been removed, install it in the case with the concave surface out by tapping it in place evenly with a soft mallet.
    g. Slide new outer seal over extended end of ball with the concave surface mating to the convex surface of ball.
    h. Replace ball into casing.
    i. Tap the new outer seal evenly with plastic or rubber hammer into casing around ball.
    j. For bolted retainers tighten retainer bolting to the following factory torque settings using a standard crossing pattern.
    Number 21 Ductile Iron & Other Metal Seals

Nominal Size(s)	Factory Torque (ft.-lbs.)
2 1/2" & 3"	12-15
4" through 6"	40-50
8" through 30"	80-90

    k. Add the packing following Paragraphs 2 through 6 above. Repeat the sequence until the packing no longer flows freely into the ball joint. If possible perform air and soap bubble leak test before reinstalling.

Type N Style III-V & OW 1500 Style III-V Ball Joints

Installation Recommendations



Style III-V Recharge Cylinder

1. The media flow direction can be from either end of the ball joint except for liquids with suspended solids, then flow should be from ball end to casing end.
2. In vertical installations, ball joints should be installed with the ball end down to prevent foreign matter from collecting between neck of ball and retainer.
3. Do not loosen ball joint retainer during installation, or utilize ball joints as Unions. Each joint is factory preset and tested before shipment. LOOSENING OF BALL JOINT RETAINERS IS NOT RECOMMENDED. If the retainer must be loosened, loosen the bolting 1/4 revolution maximum using a standard crossing pattern. Retighten the bolting using the procedure outlined in Paragraph 7(j) of the Maintenance Instructions below.
4. Use CAUTION PREHEATING, WELDING, OR POST WELD HEAT-TREATING ball joints into the line. Excessive heating of the sealing area may cause leakage.
5. Protect the exposed ball surface from weld splatter, and prevent dirt and debris from collecting around neck of ball.
6. Although ball joints can be rotated or twisted around the centerline, they are designed to absorb motion by the Offset Method that utilizes angular flex to provide the required movement. Consult a Hyspan Barco sales representative or contact Hyspan by email at websales@hyspan.com if an application involves extensive rotating motion.

General Warning

Type N Style III-V and OW 1500 Style III-V Hyspan Barco Ball Joints are designed for repacking to be performed while the system is pressurized utilizing the integral recharge cylinders. DO NOT PERFORM ANY ADJUSTMENTS TO THE RETAINER OF A PRESSURIZED BALL JOINT. There are plugged ports between the recharge cylinders that are for factory use only - do not remove these plugs.

Maintenance Instructions

To correct leaks or to perform routine maintenance.

In order to repack Type N Style III-V and OW1500 Style III-V Hyspan Barco Ball Joints, packing pellets are required that are available in reload kits of 13 pellets (Part Number 10-64715-00). Reload kits are

available from an authorized Hyspan Barco representative or contact Hyspan at websales@hyspan.com).

1. Type N Style III-V and OW 1500 Style III-V ball joints are designed to be recharged by injecting packing under full line pressure provided the correct safety precautions are observed. Recharge only if a leak occurs. Only Hyspan packing material must be used. Recharging is accomplished by injecting packing through the recharging cylinders - DO NOT PERFORM ANY ADJUSTMENTS TO THE RETAINER OF A PRESSURIZED BALL JOINT. DO NOT RECHARGE WHILE PRESSURIZED IF LEAKAGE APPEARSTHROUGH OR ARROUND A RECHARGE CYLINDER.

   WEAR EYE PROTECTION (FACE MASK) AND PROPER SAFETY APPAREL.

2. Select the recharge cylinder nearest the leak and rotate the 1/4 turn safety valve at the base of the cylinder to the off position (arrow is perpendicular to cylinder centerline).

3. Remove the ram screw from the recharge cylinder selected.

4. Add lubricant (molybdenum disulfide based) to ram screw threads and insert one packing pellet in the chamber and start ram screw two turns.

5. Open the valve (arrow is inline with cylinder centerline) and inject the sealant into the port by turning the ram screw until it is bottomed against the cylinder. Do not exceed 250 ft.-lbs of torque on the ram screw.

6. Repeat Paragraphs 3 through 5 for the remaining recharge cylinders or until the leakage stops. It leakage continues repeat Paragraphs 3 through 6 one additional packing rotation. If leakage still occurs the ball joint can be disassembled for maintenance.

7. TO DISASSEMBLE the ball joint for maintenance, the ball joint it must be removed from the system.

   a. Disassemble the joint by removing the retainer.

   b. Inspect the inner seal for wear: The inner seal is seldom worn enough to require replacement.

   c. Clean and inspect ball surface carefully. Replace the ball if it is worn, scored or pitted.

   d. Replacement balls, seals and packing are available from an authorized Hyspan Barco representative or contact Hyspan by email at websales@hyspan.com. Be certain to dispose of discarded seals and injected packing properly.

   e. To reassemble, coat the surfaces of the seal(s) and ball with a light coat of assembly lubricant. For service over 350º F use molybdenum disulfide based lubricant.

   f. If the inner seal has been removed, install it in the case with the concave surface out by tapping it in place evenly with a soft mallet.

   g. Slide new outer seal over the extended end of ball with the concave surface mating to the convex surface of ball.

   h. Replace ball into casing.

   i. Tap the new outer seal evenly with plastic or rubber hammer into casing around ball.

   j. For bolted retainers tighten retainer bolting to the following factory torque settings using a standard crossing pattern.

Number 21 Ductile Iron & Other Metal Seals

Nominal Size(s)	Factory Torque (ft.-lbs.)
2 1/2"	6-7
3" & 4"	10-12
5" & 6"	14-16
8" through 14"	24-26
16" through 30"	20-22

k. For the threaded retainer on OW 1500 ball joints torque the retainer to 360 ft.-lbs.

l. Add the packing following Paragraphs 2 through 6 above. Repeat the sequence until the packing no longer flows freely into the ball joint. If possible perform air and soap bubble leak test before reinstalling.

Teflon® is a registered trademark of Dupont

Engineering Support

Custom Engineered Solutions

Hyspan's engineering team supports specification review, reverse engineering of legacy components, replacement of discontinued product lines, and development of application-specific ball joint systems for new installations, retrofits, and replacement programs. Higher pressure designs and designs conforming to the ASME code are available as ASME Class Ball Joints.

Size Range	¼" to 32 ft diameter
Pressure Range	Up to 5,000+ PSIG
Temperature Range	Cryogenic to 1,250°F
Materials	Inconel 625, Hastelloy X, Monel, Titanium and others
Analysis Tools	SolidWorks, ANSYS FEA, Inventor — stress, fatigue, cycle life, thermal, vibration
Standards	EJMA, ASME B31.1, B31.3, BPVC Sec. VIII Div. 1, NAVSEA, MIL-STD-2035, PED, ITAR

Contact Hyspan

Headquarters	1685 Brandywine Avenue, Chula Vista, CA 91911
Phone	619.421.1355
Email	websales@hyspan.com
Website	hyspan.com
LinkedIn	linkedin.com/company/hyspan-precision-products-inc-/

Legacy Product Line Support

Hyspan maintains the engineering drawings, specifications, and production rights for acquired product lines including Hyspan Barco, American BOA, Anaconda/Anamet, and Flexider USA. Original data and tooling are preserved to ensure long-term replacement continuity and system upgrade capability.

Ordering Guidance

To place an order or request a quotation, contact Hyspan with the following information:

- Product series and model/type/style designation (e.g., Series 6600 Type N Style III)
- Nominal pipe size (NPS)
- Design pressure and temperature
- End connection type and flange class
- Seal material required
- Special materials, coatings, or certifications required
- Applicable code or standard (ASME, API, NAVSEA, etc.)
- Quantity and requested delivery

Warranty

Five (5) Year Limited Warranty — Series 6600 Ball Joints

This warranty is given by HYSPAN PRECISION PRODUCTS, INC. (HYSPAN) for the benefit of the first purchasers for use of Hyspan Barco Type N Style II, Style III, and Style III-V Ball Joints manufactured by HYSPAN to standard catalog construction. The product is warranted to be free from defects in material and workmanship, and to be leak-free for a period of five (5) years from the date of shipment by HYSPAN in accordance with the following conditions:

- The design pressure and temperature are not exceeded — including surge and upset conditions.
- The installation conforms to HYSPAN installation procedures and approved practice for anchoring, supporting and guiding, and generally accepted good piping practice.
- Substances in contact with all internal and external surfaces must be compatible with the materials of construction, including all contaminates.
- The warranty shall be limited to the replacement by HYSPAN of the same model Hyspan Barco Ball joint, and payment for transportation of the replacement assembly by the least expensive method. Labor, material, and other costs related to the failure or replacement of the expansion joint are not included. HYSPAN shall not be liable for damage or delay suffered by the purchaser regardless of whether such damages are general, special or consequential in nature, whether caused by defective material or workmanship, or whether caused by HYSPAN'S negligence regardless of the degree.
- HYSPAN warranties satisfactory leak-free performance. If leakage occurs through the packing and cannot be prevented by the addition of packing by the user in accordance with the field packing installation instructions, HYSPAN will repair or replace the ball joint within the terms of this warranty.
- This warranty is expressed in lieu of all other warranties, expressed or implied, including the warranty of merchantability, the implied warranty of fitness for a particular purpose, and all other obligations or liabilities on the part of HYSPAN, and it neither assumes nor authorizes any other persons to assume for HYSPAN any other liabilities in connection with the sale of the products.
- The warranty is limited to installations in the United States, Puerto Rico, and Canada.

The purchaser shall advise the HYSPAN factory of any warranty claim including the nature of the failure. HYSPAN shall provide return goods authorization and shipping directions to return the failed joint to the factory. A mutually agreeable delivery schedule and method of shipping the replacement shall be established. The purchaser shall furnish a confirming purchase order and is obligated to the current replacement cost of the joint and shipping expense. Upon receipt of the failed product, the cause of failure shall be determined by the factory at no expense to the purchaser. A credit shall be issued by the factory for the replacement cost and least expensive shipping for valid warranty claims. In the event of a dispute, HYSPAN shall furnish the failed product to the purchaser or their representative for failure analysis.

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Hyspan

Hyspan Precision Products, Inc. · 1685 Brandywine Avenue · Chula Vista, CA 91911
+1 619.421.1355 · websales@hyspan.com · hyspan.com