Designation: F1298 – 90 (Reapproved 2023)

An American National Standard

Standard Specification for Flexible, Expansion-Type Ball Joints for Marine Applications[1]

This standard is issued under the fixed designation F1298; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the design, manufacture, and testing of ball joints utilized for accommodating thermal expansion and contraction, or mechanical movement of a pipeline carrying fluid. The ball joints are intended for use in systems operating above 0 °F (18 °C).

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 The following precautionary caveat pertains only to the test methods portion, Section 7, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A395/A395M Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures

F722 Specification for Welded Joints for Shipboard Piping Systems

2.2 *ANSI Standard:*[3]

B 31.1 Power Piping

2.3 *American Society of Mechanical Engineers:*[4]

ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 Pressure Vessels Section IX, Welding and Brazing Requirements

3. Ordering Information

3.1 Each purchase order or inquiry for ball joints to this specification shall include the following as applicable:

3.1.1 Title, number, and latest revision of this specification,

3.1.2 Manufacturer's part number or ball-joint type information,

3.1.3 Materials for ball joint and seals, if other than to this specification,

3.1.4 Service conditions,

3.1.4.1 Minimum and maximum operating temperature (°F),

3.1.4.2 Maximum operating pressure (psig),

3.1.5 Fluid media (internal),

3.1.6 Atmosphere or media (external),

3.1.7 ANSI pressure class, facing and drilling of flanged ends, and pipe schedule or wall thickness of ends for weld end joints,

3.1.8 Special end connections as defined by the purchaser,

3.1.9 Ball sphere or other special coatings, if required,

3.1.10 Qualification test report, if required,

3.1.11 Drawing requirements; for example, envelope drawing sufficiently detailed to describe the ball joint to be supplied, and

3.1.12 Other tests to satisfy customer requirements.

4. Materials and Manufacture

4.1 All pressure retaining components shall be fabricated from wrought or cast steel. Ductile iron complying with Specification A395/A395M may be used for the ball joint retaining ring in services not above 350 psig (2.41 *N*/mm^2) or

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

[4] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, http://www.asme.org.

450 °F (232 °C). Steel shall comply with one of the materials listed in Section VIII, Division 1, of the ASME Code, or ANSI B 31.1.

4.2 Bolting material shall be in accordance with ANSI B 31.1.

4.3 Ball spheres shall be coated in accordance with the manufacturer's standard practice or as specified by the customer's specification (see 3.1.9).

4.4 Corrosion shall be considered in the design as set forth in UG-25 of the ASME Code, Section VIII, Division 1.

4.5 Seals and packing material shall be suitable for the service intended. This includes being adequate for the pressure and temperature rating and having sufficient resistance to attack by the fluid media and atmosphere specified in Section 3.

4.6 Welding procedure qualification, welder performance qualification, and welding materials shall be in accordance with ANSI B 31.1 and Section IX of the ASME Code. Brazing or soldering shall not be used.

5. Other Requirements

5.1 *Design:*

5.1.1 Ball joints shall be designed to conform to applicable sections of the latest edition of ANSI B 31.1.

5.1.2 *Packing*—The design for containment of leakage shall be of the manufacturer's standard design and be qualified by prototype testing of 7.1.

5.2 *Pressure and Temperature Rating:*

5.2.1 The maximum allowable working pressure (MAWP) and temperature rating for ball joints conforming to this specification shall be established by at least one of the following methods:

5.2.1.1 Proof test in accordance with the requirements prescribed in paragraph UG-101 of Section VIII, Division 1, of the ASME Code. If burst type tests as outlined in paragraph UG-101(m) are used, it is not necessary to rupture the component. In this case, the value of *B* to be used in determining the MAWP shall be the maximum pressure to which the component was subjected without rupture. Components that have been subjected to a hydrostatic proof test shall not be offered for sale.

5.2.1.2 Design calculations in accordance with the requirements prescribed in Section VIII, Division 1, of the ASME Code.

5.3 Each ball joint bolting or retainer nut shall be adjusted for proper torque.

5.4 Where welded construction is used for the fabrication of pressure containing parts, welded joint design details shall be in accordance with Section VIII, Division 1, of the ASME Code and Specification F722. Except for fillet welds, all welds shall be full penetration welds extending through the entire thickness of the shell.

5.5 Inlet and outlet connections consisting of welded flanges and fittings shall be in accordance with Specification F722. When radiography is required (see 8.2), all welds shall be butt welds for Class I piping as required by Specification F722, except packing cylinders, drains, and similar ancillary connections, which may be attached by fillet or socket welds.

5.6 Threaded pipe connections shall be limited to the following services:

¾ in. (19 mm) NPS and under	1500 psig (10.3 *N*/mm^2) max
1 in. (25 mm) NPS and under	1200 psig (8.27 *N*/mm^2) max
2 in. (50 mm) NPS and under	600 psig (4.14 *N*/mm^2) max
3 in. (76 mm) NPS and under	400 psig (2.76 *N*/mm^2) max

5.7 Threaded pipe joints above 2 in. (50 mm) NPS shall not be used in systems that require radiographic examination (see 8.2.2).

6. Workmanship, Finish, and Appearance

6.1 *Cleaning*—The internal and external surfaces of the ball joint shall be cleaned of dirt and other foreign material using a suitable cleaner.

6.2 *Surface Preservation*—Unless otherwise specified by the purchaser, the ball joint shall be coated in accordance with the manufacturer's standard practice.

7. Test Methods or Analytical Methods

7.1 *Qualification Tests:*

7.1.1 A ball joint of each standard design shall be certified as having undergone the following qualification tests. The ball joint shall not show leakage of the test fluid under the conditions of pressurization stipulated in each test.

7.1.1.1 *Flex Cycle Test*—The ball joint shall be subjected to 8000 flex cycles at MAWP and maximum rated temperature over the rated flex angle. Each flex cycle shall consist of rotating the ball joint from maximum flex angle on one side through 0° to maximum flex angle on the other side and return to the original position. The flex cycle rate shall not exceed 4 cpm. At the end of 8000 cycles, MAWP shall be held for at least ½ h.

7.1.1.2 *Thermal Cycling*—Ball joints rated above 200°F shall be subjected to 100 saturated steam pressure cycles from atmospheric pressure to MAWP and back to atmospheric pressure. Each cycle shall permit the joint to reach saturated steam temperature at MAWP and then cool to ambient temperature. At the end of test, MAWP shall be held for ½ h at saturated steam temperature.

7.2 *Production Tests:*

7.2.1 Each ball joint shall be subjected to a hydrostatic test conducted at 1½ times the 100 °F (38 °C) rated maximum allowable working pressure of the ball joint. The test shall be made with water or other fluid having a maximum viscosity of 40 SSU at 125 °F (52 °C). Minimum duration of test shall be 15 s for ball joints less than 2 in. (50 mm) nominal pipe size, 1 min for ball joints 2½ in. (63.5 mm) through 8 in. (203 mm), and 3 min for larger sizes. The purpose of this test is to detect leaks and structural imperfections. No visible leakage is permitted.

7.2.1.1 The pressure-containing boundary components of each ball joint may be individually hydrostatically tested provided that an assembled prototype has been subjected to a hydrostatic test as outlined in 7.2.1.