



## BALL STUD AND SOCKET ASSEMBLY PERFORMANCE TEST PROCEDURE — SAE J193

### SAE Recommended Practice

Report of Ball Stud and Tie Rod Socket Committee approved August 1970.

**1. Scope**—The purpose of this test procedure is to provide a uniform method of testing ball stud and socket assemblies to determine their performance characteristics. This procedure is an extension of the dimensional requirements for ball stud assemblies as used in integral assembly. Parts should meet all provisions of this procedure which are applicable to the end use of the socket assembly being tested. All tests, except ball stud yield load, may be run using complete integral assemblies representing the application.

**2. Objective**—To provide adequate testing format to ensure that the parts will meet performance and functional requirements of the individual application.

**3. Performance Test Procedures**—The test procedures cover the following characteristics:

- 3.1 Ball stud to socket rotating and oscillating torque.
- 3.2 Ball stud to socket end movement.
- 3.3 Ball stud to socket cam out strength.
- 3.4 Ball stud to socket assembly fatigue and wear test.
- 3.5 Ball stud yield load.

#### 4. Objectives and Test Procedures

##### 4.1 Ball Stud to Socket Rotating and Oscillating Torque

**4.1.1 OBJECTIVE**—To ensure desired rotating and oscillating torque is obtained.

**4.1.2 PROCEDURE**—The assembly should be clamped at an area away from the socket to prevent addition of external clamping pressures which may affect torque readings.

**4.1.2.1 Breakaway Torque**—Assemblies should be filled with specified application lubricant when it is required.

For some designs and applications it is necessary to store the assembly (with lubricant) for 48 hr without movement prior to test to ascertain the cold flow characteristics of the materials and congelation effect of the selected lubricant on breakaway torque.

The torque is read with a torque device with gradual application of a rotating force.

Breakaway torque values may be varied to suit the application.

**4.1.2.2 Rotating or Oscillating Torque**—Assemblies should be filled with specified application lubricant when it is required.

Rotate stud a minimum of five complete revolutions, when practical, to minimize congelation and other factors prior to recording torque.

The torque is read with a torque device while the stud is being revolved or oscillated at approximately 5 rpm.

Rotating and oscillating torque values may be varied to suit the application.

##### 4.2 Ball Stud to Socket Axial End Movement

**4.2.1 OBJECTIVE**—To determine end movement measurement.

**4.2.2 PROCEDURE**

**4.2.2.1 Spring Loaded Type**—For axial movement the following is commonly used. The stud should be set perpendicular to the socket. Socket should be supported on the bottom of assembly. A force is applied to the stud (less nut) and the axial movement of the stud is noted and recorded. Fig. 1A depicts typical fixture.

**NOTE:** Ensure that the top of the stud is flat at the contact point of force (grind if necessary).

**4.2.2.2 All Other Types of Socket Assemblies**—With the shank of the socket assembly clamped to prevent squeezing of socket and stud, pull upward. After the movement of the stud is noted and recorded, the operation is repeated with a force pushing downward. Fig. 1B depicts a typical fixture.

##### 4.3 Ball Stud to Socket Cam Out Strength

**4.3.1 OBJECTIVE**—To determine retention of the ball stud in the socket at angular positions and to determine the angle of separation.

**4.3.2 PROCEDURE**—The ball stud assemblies should be mounted in a tensile test machine with the test specimen stud held in a fixture which permits unrestricted angular travel. Fig. 2 depicts a typical fixture.

A tensile load is applied to the assembly parallel to the normal load direction when the test stud is in full angular travel. The test is repeated with a new sample, using a compression load. The maximum load and angle induced prior to separating the stud from the socket is recorded.

##### 4.4 Ball Stud Assembly Fatigue and Wear Test

**4.4.1 OBJECTIVE**—To determine fatigue and wear characteristics of ball stud assemblies.

**4.4.2 PROCEDURE**—Use ball stud assemblies which have been tested according to paragraphs 4.1 and 4.2 and found acceptable. Ball stud

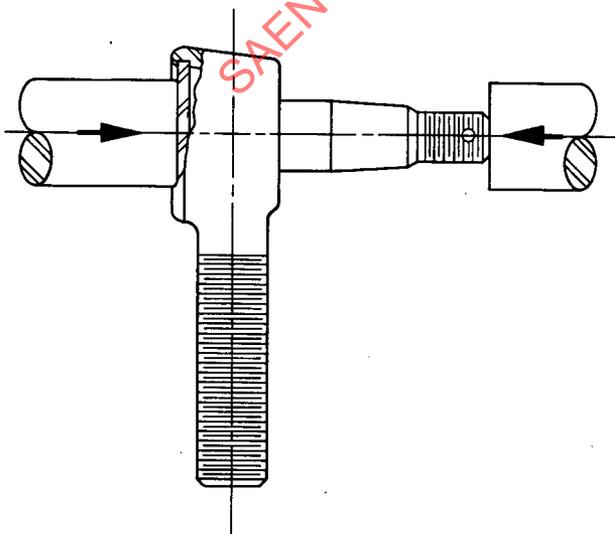


FIG. 1A

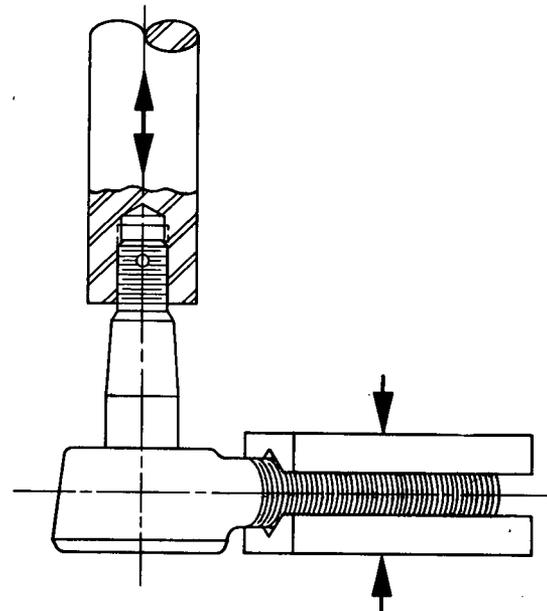


FIG. 1B