

Submitted for recognition as an American National Standard

## Pilot Bearings for Truck and Bus Applications

1. **Scope**—This SAE Recommended Practice describes STANDARD-DUTY and EXTREME-DUTY Pilot Bearing requirements and sizes for class 6, 7, and 8 on-highway trucks and buses that use diesel engines and manual transmissions. The recommendations may apply to a wide range of other pilot-bearing applications, such as agricultural, industrial, and construction equipment.

1.1 **Purpose**—This document establishes standards for pilot-bearing construction, tolerances, installation dimensions, and operating characteristics. It is intended to standardize installation dimensions for engine and transmission manufacturers, and identify minimum operating characteristics to ensure satisfactory bearing life in pilot-bearing application environment.

2. **References**—There are no referenced publications specified herein.

3. **General Information**—This document applies to Pilot Bearings used to locate and support the transmission input shaft to the engine crankshaft rotational center. These bearings are usually located in the engine flywheel, and the pilot diameter of the transmission input shaft slides into them upon installation of the transmission to the engine.

Pilot Bearings described in this document are Conrad type ball bearings and generally conform to normal ball bearing construction and dimensioning practices, except as specified in this document.

The maximum operating temperatures shown in this document reflect temperature ratings for the various materials involved. It is generally agreed that peak temperatures will be short-term events related to duty cycle. Normal continuous operating temperatures will be significantly lower. Continuous operation at maximum temperature rating may result in shortened bearing life. Consult bearing manufacturer for application approval.

3.1 **Standard-Duty Pilot Bearings**—STANDARD-DUTY Pilot Bearings are recommended for applications where the maximum bearing temperature will not exceed 149 °C (300 °F).

### 3.2 Extreme-Duty Pilot Bearings

3.2.1 EXTREME-DUTY Pilot Bearings are recommended for applications where maximum bearing temperatures exceed 149 °C (300 °F) but do not exceed 200 °C (392 °F).

3.2.2 EXTREME-DUTY Pilot Bearings are suitable for use for standard-duty applications.

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### 3.3 Operating Characteristics

- 3.3.1 OPERATING TEMPERATURE—Standard-Duty Pilot Bearings will operate in a temperature range of  $-40$  to  $+149$  °C ( $-40$  to  $+300$  °F). Extreme-Duty Pilot Bearings will operate in a temperature range of  $-40$  to  $200$  °C ( $-40$  to  $392$  °F). All materials shall be capable of operation throughout these respective temperature ranges, and be compatible with each other within these temperature ranges.

Extreme-Duty Pilot Bearings will require special heat stabilization of the steel elements to ensure compatibility with the higher operating temperature.

- 3.3.2 BEARING INTERNAL CLEARANCE—All Pilot Bearings shall have a C5 internal clearance to ensure that no preload exists within the bearing throughout the temperature range and dimensional fits.

- 3.3.3 SEALING—It is required that pilot bearings be sealed on both sides to prevent the ingestion of contaminants and to provide retention of the bearing lubricant. The seals must be capable of operating effectively throughout the established temperature ranges and must be compatible with the lubricant. It is generally accepted that fluorocarbon (Viton) seals, or equivalent, are required for both Standard-Duty and Extreme-Duty applications.

- 3.3.4 BEARING LUBRICANT—The pilot bearing should be permanently lubricated with a grease that is capable of operating throughout the required temperature range, and is compatible with the oil seal materials.

Premium-quality, high-temperature, petroleum-based lubricants may be satisfactory for Standard-Duty Pilot Bearings. Extreme-Duty Pilot Bearings require synthetic-based grease due to their higher operating temperature requirements.

The bearing shall be packed with a sufficient quantity of appropriate lubricant to ensure adequate lubrication, but shall not be overfilled to the point that lubricant will migrate out of the bearing or overcome the seals. It is generally accepted that a 30% fill of the actual sealed volume of the bearing is desired.

- 3.3.5 MAXIMUM ROTATING TORQUE—All pilot bearings require that the maximum torque to rotate the outer race relative to the inner race not exceed  $0.20$  N·m ( $1.77$  in·lb).

Torque shall be measured at ambient temperature  $22$  °C  $\pm$   $6$  °C ( $72$  °F  $\pm$   $11$  °F) while rotating the inner race at  $600$  RPM with the outer race restrained. Bearing should be operated at  $600$  RPM for  $20$  min prior to measurement of maximum torque. Test should be run with no radial load, and with no interference fit to the test fixture that would influence internal bearing clearance.

## 3.4 Pilot-Bearing Sizes and Tolerances—See Figure 1.

BASIC BEARING SIZE	PILOT BEARING WIDTH mm (in)	PILOT SHAFT O.D. mm (in)	PILOT BEARING I.D. mm (in)	PILOT BEARING O.D. mm (in)	FLYWHEEL BORE * I.D. mm (in)
6205	15.000/ 14.880 (0.5906/ 0.5858)	24.9859/ 24.9733 (0.9837/ 0.9832)	25.000/ 24.990 (0.9843/ 0.9839)	52.000/ 51.987 (2.0472/ 2.0467)	51.986/ 51.956 (2.0467/ 2.0455)
6206	16.000/ 15.880 (0.6299/ 0.6252)	29.984/ 29.972 (1.1805/ 1.1800)	30.000/ 29.990 (1.1811/ 1.1807)	62.000/ 61.987 (2.4409/ 2.4404)	61.986/ 61.956 (2.4404/ 2.4392)
6305	17.000/ 16.880 (0.6693/ 0.6646)	24.986/ 24.973 (0.9837/ 0.9832)	25.000/ 24.990 (0.9843/ 0.9839)	62.000/ 61.987 (2.4409/ 2.4404)	61.986/ 61.956 (2.4404/ 2.4392)
6306	19.000/ 18.880 (0.7480/ 0.7433)	29.984/ 29.972 (1.1805/ 1.1800)	30.000/ 29.990 (1.1811/ 1.1807)	72.000/ 71.987 (2.8346/ 2.8341)	71.986/ 71.956 (2.8341/ 2.8329)

- \* Flywheel bore size is in the installed condition with the fasteners torqued to engine manufacturer's specification.  
Flywheel manufacturers may process to different dimension to ensure compliance in the installed condition.

FIGURE 1—PILOT-BEARING SIZES AND TOLERANCES

## 4. Notes

- 4.1 **Marginal Indicia**—The change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

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