

# Felt Seals

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Unlike lip seals and squeeze packings, felt seals require relative little shaft pressure to function effectively. They are commonly used near ball and roller bearings as lubricant retainers. Advantages of felts seals include:

**Chemical resistance:** Wool felt resists dilute mineral-acid solutions, unless continuously saturated and intermittently dried. It is damaged by alkalis. Untreated, it resists oil, greases, waxes, and most solvents. Mechanically interlocked synthetic-fiber felt seals withstand attack by strong acids and bases and are stable in water, common fuels, lubricants, hydraulic fluids, and solvents.

**Filtration:** Wool felt seals, in a dry state, are highly effective as filters in removing particles of 0.7 $\mu$ m size and larger. When saturated in lubricants, even smaller particles are trapped and retained.

**Oil wicking:** Capillary properties of a felt seal ensure lubrication after long idle periods.

**Oil absorption:** Storage capacity is largely a function of density. However, about 78% of the volume of a felt seal serves as oil storage.

**Resilience:** Felt seals maintain constant sealing pressure in spite of wear, end play, minor misalignment, or out-of-roundness of metal assemblies.

**Shaft speeds:** Top speed for felt seals is usually 2,000 fpm. There are applications operating at speeds as high as 4,000 fpm, where shafts are hard and smooth and where ample lubrication is present in the seal.

**Low friction:** The coefficient of friction averages 0.22 for dry felt against steel and is substantially reduced when felt is presaturated with oil.

**Polishing action:** Felt seals trap abrasive particles, which then penetrate into the felt. Thus, they protect surfaces by polishing them rather than scoring them.

**Temperature limit:** The usual temperature limits of felt seals are -60 to 250°F. However, synthetic-fiber felts offer a wide range of strength and chemical resistance at temperatures up to 400°F.

Felt seals are manufactured in two general types: plain and laminated.

**Plain felt seals** are precision-cut washers fabricated from standard grades of felt. They are usually pre-saturated with lubricants of slightly greater viscosity than that used in the bearing. Plain felt seals afford positive bearing protection and provide a reservoir for lubricant storage -- making it available as needed. If run dry, they protect and polish rather than score a shaft. They seldom fail through aging, embrittlement, or disintegration. At temperatures from -60 to 250°F and operating speeds up to 2,000 fpm, plain felt seals are highly economical and require replacement only when the machines in which they are used are overhauled. These seals should not be used with oils of extremely low viscosity or to retain pressurized lubricants. For these applications, laminated or impregnated felt should be considered.

**Laminated felt seals** are made by combining grades of felt with layers of impervious elastomer. This sandwich construction permits use of two or more felt grades or densities in one seal; one grade for oil retention and a second for dust exclusion. The impervious layers of oil-resistant elastomer also stop leakage of low-viscosity liquids through the felt.

To meet special requirements, either style can be impregnated with one of several materials. Paraffin, petroleum, or colloidal graphite increases the resistance of basic felt to water and mud, improves its resistance to pressurized lubricants, and lowers its coefficient of friction. Before installation, the felt should be saturated with oil or grease of slightly higher viscosity than that used as a lubricant.