FAQs

Engineered Plastic Piston Rings

What are common applications for piston rings?

Piston rings are precision split rings that fit around the circumference of a piston head, between the head and the inner cylinder wall. These rings are found in a variety of applications that use pistons such as lifting elements and control valves and fittings. The hydraulics and pneumatics, transportation, food and beverage, and medical industries, among others, all use piston rings in one or more ways.

What kinds of piston rings are available?

Different kinds of piston rings are available for different applications. The first piston rings—still commonly found in combustion engines—are split metal rings that snap around the piston head.

In other applications strips or stamped tapes of polytetrafluoroethylene (PTFE) polymer are chosen for their malleability and low-friction properties. These tapes may or may not be tailored to the specific application, but can conform to piston heads that don't have a constant diameter.

Engineered plastic rings have the rigidity, temperature resistance, and durability that lets them compete with metal rings while also maintaining the non-reactive, corrosion-resistant, low-friction qualities of PTFE strips. These rings are often wider than metal rings and feature an angled split that allows them to snap into place.

What are engineered plastic piston rings made of?

Piston rings are made from homogeneous mixes of base polymer, reinforcing fibers, and solid lubricant. Homogeneous blending gives the rings uniform mechanical and physical properties across their width and throughout their thickness. The even distribution of reinforcing fibers improves the piston rings' wear characteristics while guaranteeing even wear over their lifetime.

Each type of engineered plastic formulation is specifically designed to perform in a given application environment. Different base polymers can give the piston rings excellent high- or low-temperature performance, low moisture absorption, chemical resistance, or strength among other properties.

The inclusion of solid lubricant within the plastic removes the need for an external lubricant that must be periodically renewed. In comparison, metal rings require regular reapplication of oil or grease or use a polymer lubricant layer that wears away over time—both of which can be problematic in food and beverage and medical applications.

Will engineered plastic rings work in my application environment?

Engineered plastic piston rings use tailored polymer, lubricant, and reinforcement blends to meet the needs of a wide variety of application environments. For example, piston rings made from igus's iglide T500 materials can withstand temperatures from −148°F to 482°F.

Plastic piston rings are not subject to the corrosion that can damage their metal counterparts. Most of the engineered plastics that go into these rings are unaffected or minimally affected by hydrocarbons, greases, fuels, and mild acids and alkalines. Rings made from iglide T500 are not affected by most chemicals except sulfuric and nitric acids in concentrations above 65%.

For very moist or submerged environments, engineers choose engineered plastics with lower levels of moisture absorption or take swelling into account in their designs. Two examples of such materials are iglide H370, which gains less than 0.1% by weight in standard atmosphere and has a saturation limit in water that is also below 0.1%, and iglide J with a 0.3% moisture gain and 1.3% saturation limit.

Food and beverage and pharmaceutical applications may need to choose piston rings that are FDA-compliant if they may come into contact with the product. Engineers choose materials like iglide A180, A350, and A500 for such applications.

How do engineered plastic rings install?

Both engineered plastic and metal piston rings are split to allow them to snap onto the cylinder head. However, where installers of metal rings need to carefully measure the gap that remains after installation to ensure proper cylinder operation, plastic rings use an angled split that removes the need for precise gap measurement.

Engineers still need to consider the inner and outer diameters they require when ordering plastic piston rings. However, once careful design and ordering has been done up front, all installers need to do is to snap the ring over the piston head and slide it into position.

In comparison, PTFE strips must be cut to the desired thickness, wrapped around the piston head, secured, before the installer can slide them into position. Each step adds time and the chance of operator error compared to the installation of plastic piston rings.

How long do engineered plastic rings last?

There are many variables that go into predicting the service life of any part. The application environment is a critical factor, especially if the ring is exposed to media for which it has minimal resistance or if it is operating close to its maximum service temperature. Wear-related variables like the smoothness of the cylinder wall, the presence of debris, speed, oscillation, and vibration also come into play.

Online tools like igus' iglide expert 2.0 and their piston ring configurator can help engineers choose the longest-lasting ring for a particular application. In the product configurator, engineers can select critical application variables such as chemical resistance, moisture absorption, wear resistance, and temperature range to receive customized material recommendations.

How can I make sure I'm getting the right piston ring?

In addition to online configurators and lifetime estimation tools, companies like igus often have other online resources such as downloadable catalogs, data sheets, and white papers. For more personalized help, consider working with the company's product managers and engineers by phone, email, or web chat. In some cases, suppliers can send you a sample piston ring so you can confirm it is a perfect fit before placing a larger order.