CAT® PRECISION SEALS

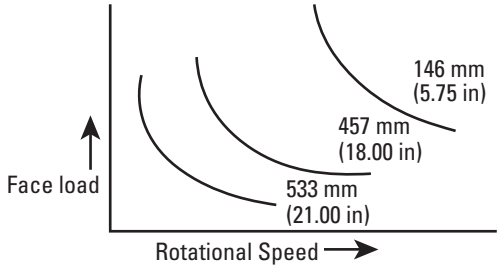
Design Information

Load Deflection

The typical load/deflection graph for a Duo-Cone™ seal has a relatively flat slope, which illustrates that these seals work satisfactorily over a wide range of operating gaps. HDDF seals have different load characteristics than Duo-Cone Seals because of their design and must operate in different ranges to provide satisfactory performance. Load deflection characteristics vary by metal face seal type, load ring material and seal group size. Cat Seals application engineering should be consulted for design assistance concerning proper loading of metal face seals.

Pressure Velocity

Metal face seal performance capability is best described by its Pressure-Velocity (PV) or load/speed rating. The face load required to keep the metal seal rings in contact is related to the allowable speed, as described by the following chart. Many factors influence this relationship, including seal ring material, seal ring diameter, operating temperature, lubricant viscosity, pressure differential across the load rings, and action of centrifugal force on the load ring.



In low speed applications or with light lubricants, face pressures are generally increased to ensure sealing ability. The same is true when seals are exposed to high differential pressures and/or large end play or deflections. Lower face loads are specified for applications producing high rotational speeds or high ambient temperatures. High speeds can produce high temperatures which deteriorates lubricant and changes the properties of the elastomer load rings. Both cases can lead to adverse sealing or failure of the seal group. Always consult Cat Seals application engineering for design assistance concerning appropriate loads for a desired speed.

How Application Variables Affect Design Choices

The selection of the proper metal face seal is contingent on a thorough application review. Differences in operating conditions have a significant impact on the optimum metal face seal for your product. Shown in the table below are some significant application variables and the component of the metal face seal product they affect.

Variable	Design Component
Speed	Metal Seal Ring Material
Internal/External Pressure	Metal Seal Ring Material and Ramp Angle
External Operating Environment	Metal Seal Ring and Elastomer Load Ring Material
Temperature	Elastomer Load Ring Material
Available Space	Metal Face Seal Type
End Play	Metal Seal Type and Seal Ramp Angle

Cat Seals Application Engineering

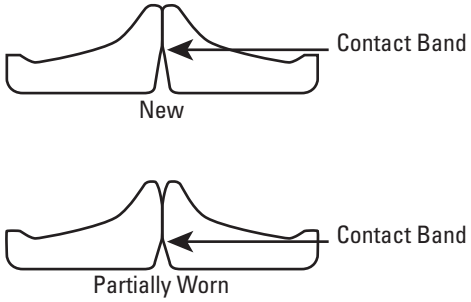
The engineers of Caterpillar can analyze your sealing requirements and recommend the metal face seal/elastomer combination that will best meet your needs. Cat Seals can work with your engineers to help design the application and provide electronic drawings to aid in your design. You need only complete the application data sheet and provide drawings of the area containing the seals.

CATERPILLAR®

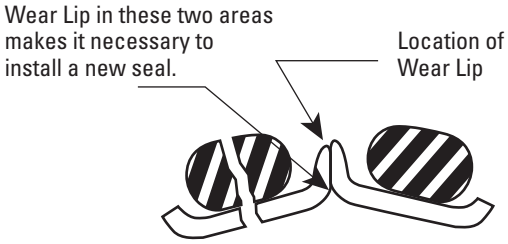
Design Information

Seal Wear

Cast metal face seals by design automatically compensate for wear. The mating faces form a contact band approximately 0.5 to 1.0 mm (0.02 to 0.04 in) wide that retains the oil lubricant and seals out all foreign material. As wear occurs, the contact band will widen slightly and migrate inward until the inside diameter is reached. As depicted in the figure below, over time the contact band of the cast seals migrate down the spherical radius as wear occurs.



Formed seals are more flexible than the cast rings they replace and, as a result, produce a wear pattern different than cast ring designs. Typically, formed seals wear in an axial rather than radial direction, as depicted below, due to their increased flexibility.



Seal Service Life

All seal life expectancies are application specific. Because of the many differences in machine applications, environmental conditions, maintenance and other factors that have a direct effect on the seal, it is difficult to estimate expected life.

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