SEAL FACE PROPERTIES
FOR A SEAL TO WORK...

FACE FLATNESS

• SEAL FACES ARE TO BE FLAT TO ONE LIGHT BAND OF A HEILIIUM ARC LAMP REFLECTED THROUGH A QUARTZ REFERENCE OPTICAL FLAT

• ONE LIGHT BAND = 0.0000116 INCHES

• OR 11.6 ONE MILLIONTHS OF AN INCH
Optically Flat Faces

Rotary Face

Stationary Face

100 psi

0 psi
FOR A SEAL TO WORK...

FACE LUBRICATION

- BOUNDARY LAYER FILM OF LIQUID FILLS PORES AND IMPERFECTIONS. IT IS PROVIDED BY THE LIQUID IN THE STUFFING BOX.
- DRY RUNNING OF A PUMP SEAL FOR ONLY A FEW SECONDS MAY DESTROY IT.
- UNLESS IT IS DESIGNED THAT WAY!
Microscopic Face Lubrication

Rotary Face

Stationary Face

100 psi

0 psi
Pressure Drop

100 psi

0 psi
Convergent Seal Faces

Rotary Face

Stationary Face

100 psi

0 psi
Convergent Seal Faces

Rotary Face

Stationary Face

100 psi

0 psi
Convergent Seal Faces

Rotary Face

Stationary Face

100 psi

0 psi
Divergent Seal Faces

100 psi

0 psi

Rotary Face

Stationary Face
SEAL BALANCE
• When speaking of “Balance” in reference to mechanical seals, we are not talking about Mechanical or Rotational Balance. Instead, we are referring to Hydraulic Balance.
• Since mechanical seals are subject to stuffing box pressure, this pressure is utilized to achieve and maintain seal face closure in a non-balanced seal.
• If stuffing box pressure is very high, typically over 100psi., then the closing force may be too great to allow the “Boundary Layer Liquid” that lubricates the faces to be sufficient and the faces will wear prematurely.
• A balanced seal compensates for higher pressures by locating the seal faces such that stuffing box pressure has less effect on face closure.
Seal Balance
A non-balanced seal has faces located outside the “Balance Diameter” of the seal. Stuffing box pressure is applied to the faces virtually evenly.
Unbalanced Seal

Face Areas

Green + Red = Pressure Area

Green + Purple = Face Contact Area

Balance Line

Face ID Line

Face OD Line

Green + Red = Pressure Area

Green + Purple = Face Contact Area
The faces of a balanced seal are located so that a portion of the face contact occurs inside the balance diameter resulting in reduced closing force due to stuffing box pressure.
Balanced Seal
Face Areas

Balance Line

Green + Red = Pressure Area
Red + Purple = Balanced Area

Face OD Line
Face ID Line
Most metal bellows seals are balanced.
END SEAL FACE PROPERTIES