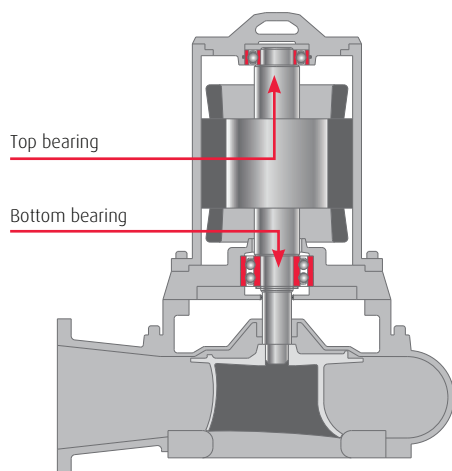


## PREVENTING CREEP ON SUBMERSIBLE PUMP BEARINGS

Submersible pumps are widely used in a variety of industries including construction, wastewater, mining, agriculture, and general industry. Most submersible pumps comprise a vertical electric drive motor coupled directly to the impeller. They are required to operate for long periods with minimal maintenance.



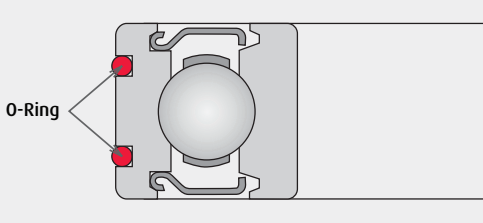
### Traditional submersible pump



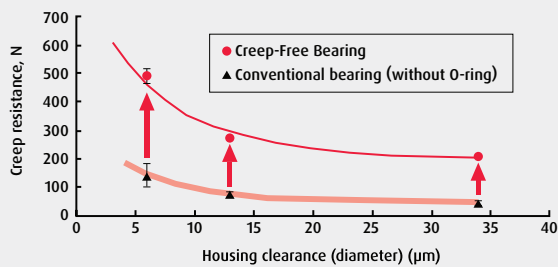
### BEARING ARRANGEMENT

The bottom locating bearing is generally a double-row angular contact ball bearing, or a pair of angular contact bearings. These bear the axial and radial loads generated by the pumped fluid. They are heavily loaded and need to be correctly selected to reach target life. The top free bearing is generally a deep groove ball bearing. This is lightly loaded, and a C3 clearance is generally used to compensate for clearance reduction due to heat generation from the electric motor.

### Structure of the Creep-Free Bearing



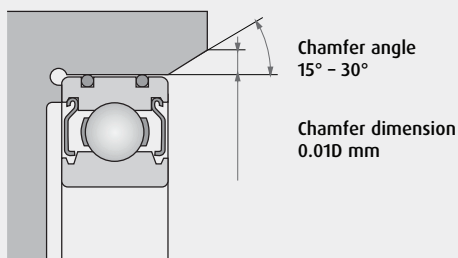
### Creep limit load test (example: 6204)



### Structure And Performance Of Creep-Free Bearings

Compression of the O-rings, which are mounted in two grooves on the outer ring, improve creep prevention. No special machining is required; bearings can be used with the same housing as standard bearings. In creep limit load tests, the more housing clearance is reduced, the greater the improvement in creep prevention. This is due to the compression of the O-ring mounted in the outer ring.

### Housing shape and dimension



### Note on Mounting Creep-Free Bearings

Housing shape and dimension: the housing shape must be in accordance with sketch. We recommend a groove and a chamfer, chamfer angle being between 15° and 30°, and its minimum dimension being 0.01 x Bearing Outer Diameter.

## CREEP PHENOMENON ON TOP BEARINGS

The lightly loaded top bearing should, theoretically, have a very long life. However, this service life can be dramatically reduced by creep. The combined effect of light radial load and loose interference fit in the housing can result in creep between the outer ring and the housing. Creep is a phenomenon where relative slippage occurs between fitted surfaces. Creep produces a polish on the bearing ring surface, occasionally accompanied by scoring or wear.

## COUNTERMEASURES

One common countermeasure used by pump manufacturers is to machine an annular groove in the housing bore and to insert an O-ring. The O-ring prevents creep between bearing outside diameter and housing. Other measures include the use of a thicker outer ring or solid lube film. All these measures incur penalties such as size, weight, and higher cost. An engineered solution was required.

## NSK SOLUTION

NSK Creep-Free bearings feature precision machined grooves in the outer ring and integrated double nitrile rubber O-rings. This results in an excellent interference grip over a broad temperature range, and provides submersible pump manufacturers with the following advantages:

- › Superior interference fit and longer service life
- › Easy assembly
  - › Creep-Free bearings can be fitted with a loose housing bore tolerance
- › Bearings can be easily upgraded since boundary dimensions are identical to standard bearings
- › Housing is re-usable as very little abrasion occurs on the housing bore
- › Cost reduction
  - › Pump manufacturers do not need to machine a groove in the housing bore and insert their own O-ring.