

# TM 282

## Friction in journal bearings



### Description

- **fundamentals of hydrodynamic lubrication**
- **friction states under different operating conditions**
- **electronic speed control and digital display of speed and lubricant temperature**

There are many factors that influence the friction states in a hydrodynamic journal bearing. Speed, load and viscosity of the lubricant used are focused on in particular.

TM 282 allows the study of various factors that influence friction. The journal bearing comprises an electrically driven shaft journal that rotates in a freely movable bearing housing. The movement of the oil in the bearing can be observed.

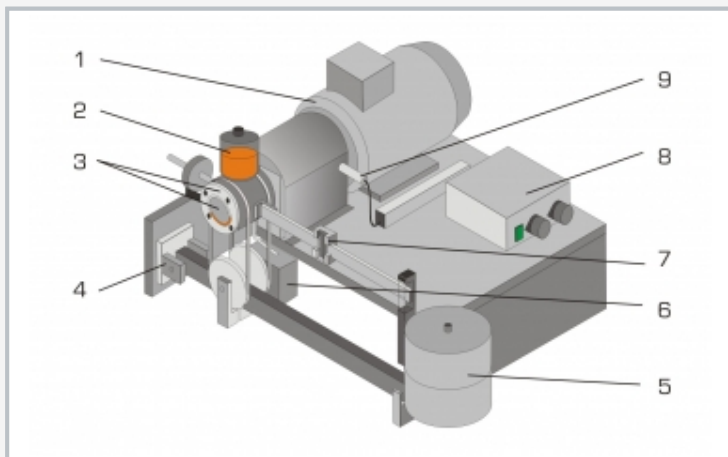
The applied load is transmitted to the bearing housing through a load application device and can be varied by means of weights. The frictional moment is determined by means of a movable weight that balances the moment on a balance beam. The journal is driven by an electric motor at a speed that can be adjusted by a frequency converter. The temperature (and therefore the viscosity) of the lubricant is recorded by a temperature sensor in the bearing shell and shown on a screen on the display and control unit. The lubricant is supplied via a wick oiler that applies the oil via two grooves in the bearing bush. The accumulated leakage oil is collected in a collecting tank.

### Learning objectives/experiments

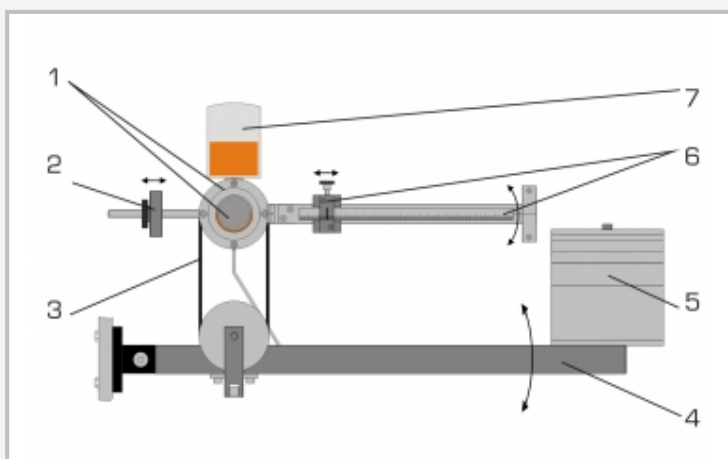
- develop an understanding of technological relationships of hydrodynamic lubrication by experimentation
- frictional moment in a journal bearing as a function of
  - ▶ speed
  - ▶ bearing load
  - ▶ lubricant and lubricant temperature

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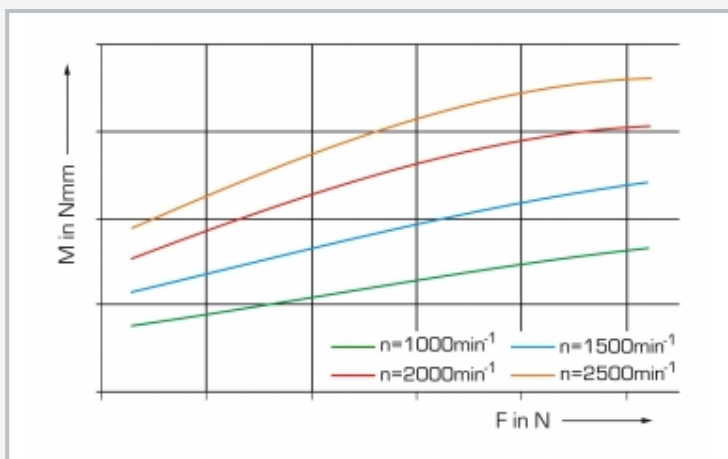
## Friction in journal bearings



1 motor, 2 drip oiler, 3 journal bearing housing with shaft journal, 4 fixed support for loading lever, 5 weights, 6 tank for leak oil, 7 sliding weight to measure frictional moment, 8 switch box, 9 speed sensor



1 journal bearing housing with shaft journal, 2 tare weight, 3 belt to transfer force to the bearing housing, 4 loading lever, 5 weights, 6 measuring lever with scale and sliding weight, 7 drip oiler



Influence of the loading force  $F$  and the speed  $n$  on the frictional moment  $M$

### Specification

- [1] investigation and visualisation of hydrodynamic bearing
- [2] radial journal bearing with stainless steel journal and freely movable bronze bearing shell
- [3] drip lubrication for continuous supply of lubricant (drip oiler)
- [4] journal bearing subjected to load by means of mechanical lever
- [5] variable speed via frequency converter
- [6] frictional moment: measured by level with sliding weight
- [7] inductive speed measurement
- [8] thermocouple in the bearing housing to measure the oil temperature
- [9] display and control unit with digital displays for oil temperature and speed

### Technical data

#### Journal bearing

- shaft diameter:  $\varnothing=30\text{mm}$
- bearing width: 45mm
- friction pair: steel/bronze

Motor: 0,37kW

Oil viscosity grade: ISO VG 32

#### Weights

- 1x 50N, 1x 20N, 2x 10N, 2x 5N, 2x 5N
- lever transmission ratio: 5:1

#### Measuring ranges

- temperature:  $-50\text{...}200^{\circ}\text{C}$
- speed:  $100\text{...}3000\text{min}^{-1}$
- bearing load: max. 525N
- friction moment: max. 295Nmm

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase; 120V, 60Hz, 1 phase

UL/CSA optional

LxWxH: 610x440x360mm (experimental unit)

LxWxH: 360x340x160mm (display and control unit)

Weight: approx. 40kg

### Scope of delivery

- 1 experimental unit
- 1 display and control unit
- 1 set of weights
- 1 oil (0,5L)
- 1 set of instructional material

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Optional accessories

020.30009

WP 300.09

Laboratory trolley