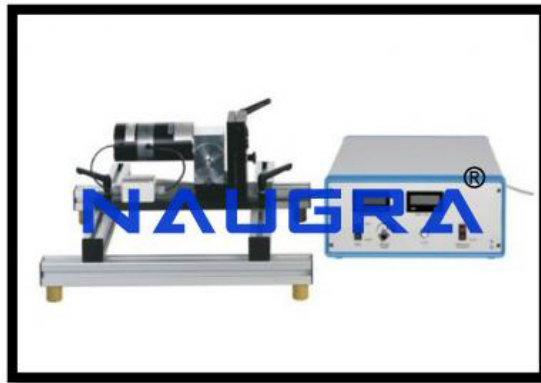


**Product Name :**  
Drive Unit For Tribological Investigations

**Product Code :**  
TN498



**Description :**

Drive Unit For Tribological Investigations

**Technical Specification :**

Drive Unit For Tribological Investigations

The unit is perform the following experiments and investigations:

Learning Objectives / Experiments:

Supplied with experimental units;

Rolling friction in friction wheels

Elasto-hydrodynamic behaviour

Dynamic friction in pin & disk

Frictional vibrations

Dynamic friction in cylindrical pin & roller

Pressure distribution in journal bearings

Specifications:

Base module with drive unit and display and control unit for studying tribological phenomena

Horizontal or vertical position of the drive shaft by means of pivotable motor block

Various experimental units available as accessories

Drive unit and experimental units secured by quick-action chucks

Drive unit comprising dc motor with worm gear

Speed of the dc motor is continuously adjustable

Speed measured by incremental encoder

frictional force measured by force sensor  
force and speed displayed on display and control unit

Technical Data:

DC motor

Rated speed: 3000rpm

Torque: 18,5nm

Worm gear: ratio 15:1

Operating speed: 0...200rpm, electronically controlled

Measuring ranges

Force: 0...50n

Speed: 0...200rpm

230V, 50Hz, 1 phase

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

UL/CSA optional

Dimensions and Weight

Length x Width x Height: 500x450x280mm (base module)

Weight: 10kg

Length x Width x Height: 360x330x170mm (display and control unit)

Weight: 6kg

1. Rolling friction in Friction Wheels

Determine the frictional forces as a function of load, lubrication and operating speed

How slip affects the frictional force

Determine the coefficients of friction

Specifications:

Frictional forces in two rolling friction wheels

Quick and easy assembly of the experimental unit on the frame of the drive unit

Driving wheel is driven by a clampable coupling between drive unit and gear unit

Slip between friction wheels kept constant at 4% by means of gear unit

Load on the friction wheels via lever arm and stepped weights

Friction wheels materials pair: aluminium/rubber

Use of different lubricants

Frictional force measured by force sensor

Displays of force and speed and speed adjustment on the drive unit

Technical Data:

Load application device

Load: 80N

Lever arm ratio: 2:1

Friction wheels

$\tilde{A} \approx 49\text{mm}$

$\tilde{A} \approx 45\text{mm}$ , incl. rubber ring

Gear ratio

i: 0,96, slip 23%

Force sensor for frictional force

0...50N

Weights

1x 5N (hanger)

1x 5N

1x 10N

1x 20N

Dimensions and Weight

Length x Width x Height: 480x250x150mm  
Weight: 7kg

## 2. Elasto-hydrodynamic behaviour

### Learning Objectives / Experiments:

Together with the drive unit

Determine the thickness of the lubricating film at the contact point of a sphere with a plane surface - compare with theoretical value

Study the effect of load and speed on the thickness of the lubricating film

### Specifications:

Elasto-hydrodynamic behaviour of a lubricating film layer between sphere and rotating glass plate

Quick and easy assembly of the experimental unit on the frame of the drive unit

Determine the thickness of the lubricating film by optical interference

Glass plate is driven by a clampable coupling between drive unit and gear unit

Hardened steel sphere, polished

Rotating plane-parallel glass plate with dielectric coating

Continuous load on the sphere via lever arm

Load measured by force sensor

Displays of force and speed and speed adjustment on the drive unit

### Technical Data:

Load application device

Load: 150N

Lever arm ratio: 3:1

Sphere

Diameter: 25,4mm

Hardened steel, polished

Glass plate

Diameter: 150mm, plane-parallel

Coating: bk 7, dielectric,  $r=30\%$

Microscope

Magnification: x50

Halogen lamp: 10w

Force sensor: 0...50N

Dimensions and Weight

Length x Width x Height: 350x250x550mm

Weight: 8kg

## 3. Dynamic friction in pin - disk

Frictional forces in different friction pairs and loads

Frictional forces with different lubrication

Frictional forces at different relative speeds of the friction partners

Wear under different friction parameters and lubrication conditions

### Specifications:

[1] frictional forces in pin and disk, which slide against each other, disk subjected to axial load

[2] quick and easy assembly of the experimental unit on the frame of the drive unit

[3] disk is driven by a clampable coupling between drive unit and gear unit

[4] fixed pin made of different materials: aluminium, brass or steel

[5] rotating disk made of hardened and ground stainless steel

[6] load on the pin via lever arm and stepped weights

[7] use of different lubricants, e.g. water or oil

[8] frictional force measured by force sensor

[9] displays of force and speed and speed adjustment on the drive unit

Technical Data:

Load application device

- max. load: 80N
- lever arm ratio: 2:1

Disk

- $\tilde{A}$ =50mm
- hardened stainless steel, ground

Pin,  $\tilde{A}$ xH: 4x25mm

- 3x aluminium
- 6x brass

6x steel

Force sensor for frictional force

- 0...50N

Weights

- 1x 5N (hanger)
- 1x 20N
- 1x 10N
- 1x 5N

Dimensions and Weight

Length x Width x Height: 350x430x230mm

Weight: 8kg

4. Frictional vibrations

Observation of the transition from static to dynamic friction

Influence of lubrication on slip-stick phenomenon

Influence of the force between the friction partners on the slip-stick phenomenon

Influence of the relative velocity of the friction partners on the slip-stick phenomenon

Specification:

[1] friction oscillations at static and dynamic friction

[2] quick and easy assembly of the experimental unit on the frame of the drive unit

[3] rotating stainless steel disk

[4] disk is driven by a clampable coupling between drive unit and gear unit

[5] friction ring of different materials: stainless steel, brass or plastic (PA)

[6] friction pair subject to load by stepped weights

[7] frictional force measured by force sensor

[8] displays of force and speed and speed adjustment on the drive unit

Technical Data:

Disk

- $\tilde{A}$ : 60mm
- stainless steel

Friction ring

- outer diameter: 80mm
- inner diameter: 50mm
- 1x stainless steel
- 1x brass
- 1x plastic (PA)

Force sensor for frictional force

- 0...50N

Weights

- 1x 5N

- 3x 10N

Dimensions and Weight

Weight: 7kg

5. Dynamic friction in cylindrical pin - roller

Together with the drive unit

Frictional forces in different friction pairs and loads

Frictional forces with different lubrication

Frictional forces at different relative speeds of the friction partners

Wear under different friction parameters

Specification

[1] frictional forces in cylindrical pin and roller that slide on each other (point contact)

[2] quick and easy assembly of the experimental unit on the frame of the drive unit

[3] rotating roller made of hardened and ground stainless steel

[4] roller is driven by a clampable coupling between drive unit and gear unit

[5] fixed cylindrical pin made of different materials: aluminium, brass or steel

[6] load on the cylindrical pin via lever arm and stepped weights

[7] use of different lubricants, e.g. oil or water

[8] frictional force measured by force sensor

[9] displays of force and speed and speed adjustment on the drive unit

Technical Data:

Load application device

- max. load: 80N

- lever arm ratio: 2:1

Roller

- $\tilde{A}=40\text{mm}$

- hardened stainless steel, ground

Cylindrical pin,  $\tilde{A}\times H$ : 10x20mm

- 3x aluminium

- 6x brass

- 6x steel

Force sensor for frictional force

- 0...50N

Weights

- 1x 5N (hanger)

- 1x 20N

- 1x 10N

- 1x 5N

Dimensions and Weight

Length x Width x Height: 570x100x120mm

Weight: 8kg

6. Pressure distribution in journal bearings

Learning Objectives / Experiments:

Together with the drive unit

Pressure distribution in the journal bearing depending on speed

Pressure distribution in the journal bearing depending on load or bearing gap width

Stability limit as a function of the gap width

Specification

[1] demonstration and visualisation of the pressure distribution in a journal bearing with hydrodynamic lubrication

[2] quick and easy assembly of the experimental unit on the frame of the drive unit

- [3] roller is driven by a clampable coupling between drive unit and gear unit
- [4] bearing housing is completely transparent
- [5] moveable bearing housing, adjustable bearing gap
- [6] 13 radial pressure measuring points on the bearing shell
- [7] radial pressure distribution indicated with 13 tube manometers
- [8] base module required for operation

#### Technical Data

##### Shaft

- diameter: 50mm
- length: 50mm
- material: stainless steel

##### Bearing shell

- diameter: 52,5mm
- bearing gap adjustable from: 0...2,5mm

##### Adjustment mechanism for bearing shell

- graduation: 0,01mm

##### Oil

- ISO viscosity grade: VG 32

##### Measuring ranges

- pressure: 360mm oil column
- speed: 0...200rpm

##### Dimensions and Weight

Length x Width x Height: 350x150x450mm

Weight: 4kg.

## Naugralabequipments

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