

1.2 Experimental competition

Exercise A

Follow the acceleration and the deceleration of a brass disk, driven by an AC electric motor. From the measured times of half turns, plot the angle, angular velocity and angular acceleration of the disk as functions of time. Determine the torque and power of the motor as functions of angular velocity.

Instrumentation

1. AC motor with switch and brass disk
2. Induction sensor
3. Multichannel stop-watch (computer)

Instruction

The induction sensor senses the iron pegs, mounted on the disk, when they are closer than 0.5 mm and sends a signal to the stop-watch. The stop-watch is programmed on a computer so that it registers the time at which the sensor senses the approaching peg and stores it in memory. You run the stop-watch by giving it simple numerical commands, i. e. pressing one of the following numbers:

5 - MEASURE.

The measurement does not start immediately. The stop-watch waits until you specify the number of measurements, that is, the number of successive detections of the pegs:

3 - 30 measurements

6 - 60 measurements

Either of these commands starts the measurement. When a measurement is completed, the computer displays the results in graphic form. The vertical axis represents the length of the interval between detection of the pegs and the horizontal axis is the number of the interval.

7 - display results in numeric form.

The first column is the number of times a peg has passed the detector, the second is the time elapsed from the beginning of the measurement and the third column is the length of the time interval between the detection of the two pegs.

In the case of 60 measurements:

8 - displays the first page of the table

2 - displays the second page of the table

4 - displays the results graphically.

A measurement can be interrupted before the prescribed number of measurements by pressing any key and giving the disk another half turn.

The motor runs on 25 V AC. You start it with a switch on the mounting base. It may sometimes be necessary to give the disk a light push or to tap the base plate to start the disk.

The total moment of inertia of all the rotating parts is: $(14.0 \pm 0.5) \cdot 10^{-6} \text{ kgm}^2$.