Related topics

Rotational velocity, use of an interface, data analysis.

Principle and task

The rotational velocity of rotating objects is recorded and represented both in form of large figures and as a function of time.

Equipment

COBRA-interface 2	12100.93	1
PC COBRA data cable RS 232, 2 m	12100.01	1
Movement sensor with cable	12004.10	1
Adapter, BNC-socket/4 mm plug pair	07542.27	1
Adapter, BNC socket - 4 mm plug	07542.20	1
Rubber caps, pack of 20	02615.03	1
Softw. COBRA Rotation (Win)	14295.61	1
Basic Softw. f. PHYWE Windows prog.	14099.61	1

The PHYWE WINDOWS® Basic Software (14099.61) must have been installed once on the used computer for the software to work.

Set-up

— The movement recorder is coupled to the rotating object by means of adequate support material. Two types of coupling are possible:

— Direct coupling to the rotation axis: a blind socket is set on the cylindrical pin of the thread grooves of the movement recorder. The latter is then brought near the rotating object in such a way that the rotating axes of the object and of the movement recorder coincide. Coupling is achieved through slight pressure of the blind socket on the rotating axis of the investigated object.

— Indirect coupling: one of the two thread grooves of the movement recorder touches the belt which drives the rotating object.

— The electronic connection of the movement recorder to the COBRA interface is carried out according to Fig. 2.

Fig. 1: Movement recorder for the COBRA interface.

Procedure

— According to whether the COBRA interface is connected to the computer port COM 1 or COM 2, either RPM_COM 1 or RPM_COM 2 is started by clicking twice on the corresponding icon.

— As soon as the <Start> button has been pressed, the system will start recording measurement values.

— The sampling rate is adjusted by shifting the <Delta t/ms> slide. If the sampling rate is too high, data communication errors will occur, which will be noticeable by an uneven advance of the RPM-t recorder, or through frozen digital figures.
Indication: if data communication breaks down it is necessary to quit and start the programme anew.

— One can switch from the representation of the number of revolutions in form of digital figures to graphic representations with the <Digit> and <Plot> buttons.

— The double button <direct> <indirect>, which appears as soon as the <Start> button is pressed, is used to tell the system how the movement recorder is coupled to the rotating object. <direct> means that the rotating axes of the investigated object and of the movement recorder sensor are identical. One revolution of the object corresponds to one revolution of the sensor.
In case of indirect coupling, the sensor can be calibrated in two ways:

— The object is brought to rotate at a constant and known number of revolutions per second (this may be assessed through direct coupling with the movement recorder). Then <indirect> is clicked at, which causes an input window (RPS...1/s) to appear. The number of revolutions per second assessed (RPS) previously is entered here. Input is confirmed by pressing “Enter” on the keyboard. After the movement recorder has been coupled indirectly, the <Cal> button is now pressed to carry out calibration. The entered RPS value appears at once as actual measurement value. The calibration is taken into account every time the programme is started anew, and must thus not be repeated. The old calibration is only overwritten by a new one.

— The data file “FAK.AFD” is found under the path which contains the programme (e g. C:\PHYWEWIN\COBRA \INC \RPM\). This file contains an ASCII figure f which is calculated according to

$$f = \frac{RPS_0}{RPS}.$$

With

RPS_0 number of revolutions per second of the investigated rotating object

RPS number of revolutions per second of the indirectly coupled movement recorder.

It is possible to calculate *f* mathematically, taking into account the geometry, the diameter of the thread grooves and that of the driving belts. The numerical value of *f* can be entered into the data file “FAK.AFD” by means of a usual editor. The RPM programme is then started and only the <indirect> button is pressed, without using the <Cal> button.

Indications

— Press <Reset> to set the number of recorded measurement points (n) back to zero. The time axis of the plot starts again at 0 s.

— <Save> (green) saves the recorded measurement data (n) as ASCII file on the hard disk or on a floppy disk. These data can be read and processed by usual sheet spread or text processing programmes. The files should have *.AFD as a suffix (**A**SCII **F**ile **D**ata), so the measurement data file can be easily identified. Only the number of measurement data are saved which have been actually entered under “n”. Three figures are saved for every measurement:
t / (s), RPS / (1/s), RPM / (1/min).

— <Load> (green) loads a previously saved measurement file into the RAM memory of the computer. Pressing the double buttons <Exp> and <Load>, the actual measurement can be compared graphically to a loaded measurement. If a loaded measurement is represented, one can switch between the representations revolutions per second and revolutions per minute with the <RPS> and the <RPM> buttons.

— The <. -> x> button introduces the measurement points magnified into the graphic representation, when a loaded measurement is represented graphically.

— The <Hardcopy> button is used to print out the complete contents of the figure on the printer running under WINDOWS®. Before using this button, however, the colour combination of the diagram should be modified in order to save ink ribbon or cartridge. To achieve this, the button with rainbow colours situated on the right side above the graph (to the right next to the <LAB> button) is pressed. The following setting is recommended for print out:

Chart white

Data black.

— Starting from the left side, the other buttons above the graph are used for the following purposes:

  — Extending and compressing the y axis, the arrows do this in steps, the button with the curve allows to enter maximum and minimum values over the keyboard.

  — Shifting the measurement curve in the y direction without changing the scale (arrows).

  — Introduction of horizontal cursor lines which can be moved with the left mouse buttons. The absolute and relative values of each position are displayed below the graph. Connection of the measurement points through polygonal lines.

  — Introduction of a grid, of an origin co-ordinate system or of a single coloured background.

  — Modification of the x and y axis indications.

  — Modification of the graph colours.

— The programme is terminated when the symbol situated in the uppermost left corner of the screen is clicked on twice.

— The used graphic set-up has a resolution of 640×480 pixels. If a monitor with higher resolution is used, the programme will only use a corresponding picture segment on the upper left corner of the monitor. A modification of the graphic card settings to VGA 640×480 is given by the full picture.

Fig. 2: Connection of the movement recorder for the COBRA interface.