



Grooved Pulley, Hoffmann type

02860.00

Operating Instructions



1. PURPOSE AND DESCRIPTION

Hoffmann's grooved pulley is used for exciting oscillations on a tensed string. Standing waves with various wavelengths and forms of polarisation can be produced on the string.

2. DESCRIPTION AND OPERATION

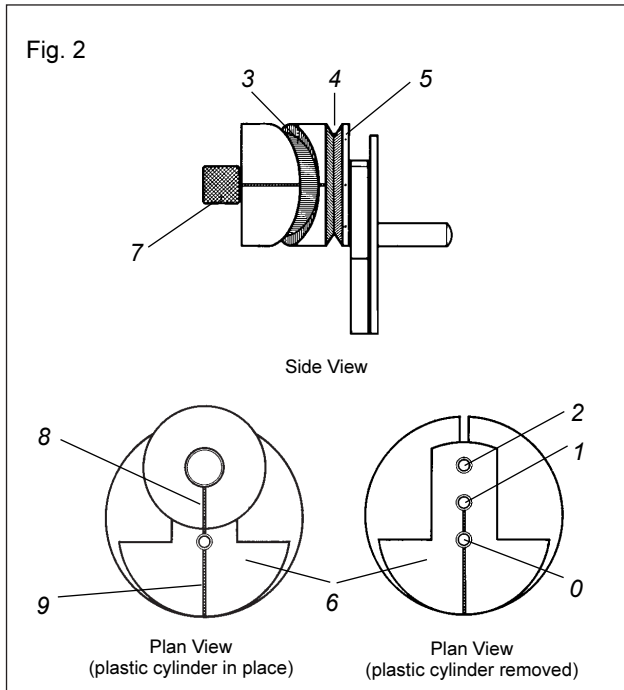
The compensating weight 6 (see Fig. 2) has three holes labelled „0“, „1“ and „2“. If it is moved on the base plate, a thread becomes visible under a hole in which the grooved pulley can be fixed. The grooved pulley is located eccentrically, the degree of which depends on the hole selected. The displacement of the mass is compensated by the compensating weight.

For a **vertical** deflection the string is placed in the **groove 4**; the amplitude  $a_v$  is determined by the hole that is used (see table). For a **horizontal** deflection the string is placed in the **groove 3**; the amplitude  $a_h$  is 10mm. The following excitation amplitudes can be set with the string in the groove 3:

| Hole | $a_v$ | $a_h$ | $a_v / a_h$ |
|------|-------|-------|-------------|
| 0    | 0 mm  | 10 mm | 0:1         |
| 1    | 10 mm | 10 mm | 1:1         |
| 2    | 20 mm | 10 mm | 2:1         |

The phase difference between the horizontal and vertical oscillation components can be altered by turning the plastic cylinder about its axis. To do this, the knurled screw 7 is loosened a little and then retightened. The phase difference 0° is set when the white mark 8 on the plastic cylinder is located over the red line 9 on the compensating weight. In the following the phase differences are given which correspond to the individual marks 5 when set to the line:

| marking                | Phase difference |
|------------------------|------------------|
| white (and white line) | 0°               |
| yellow                 | 45°              |
| black                  | 90°              |
| yellow                 | 135°             |
| white                  | 180°             |
| yellow                 | 225°             |
| black                  | 270°             |
| yellow                 | 315°             |
| white (and white line) | 360°             |



### 3. EXPERIMENTAL SET-UP AND METHOD

The 30:1 gearbox is screwed onto the motor and the motor is held in a support base „PASS“ or fastened to the edge of the bench (cf. Fig. 3). The post of the grooved pulley is firmly screwed into the collet chuck on the gearbox. **Important!** Tighten all fixing screws!

A square-section rubber band about 3-6m long acts as the string. It is extended at one end with a cord about 40cm long (thickness 2-4mm). The joint should be wound with yarn to give a better hold. The free end of the cord is attached such that the cord slopes upwards slightly and is located on the grooved pulley about 5cm from the end. The square rubber can then be stretched across the room.

The direction of motor rotation should be chosen such that the tensile forces due to friction act on the cord and not on the rubber band. The speed is then set so that a clear wave shape is formed. The forms of polarisation that can be set can be taken from the table below.

The standing waves can be observed in slow motion by using a stroboscope.

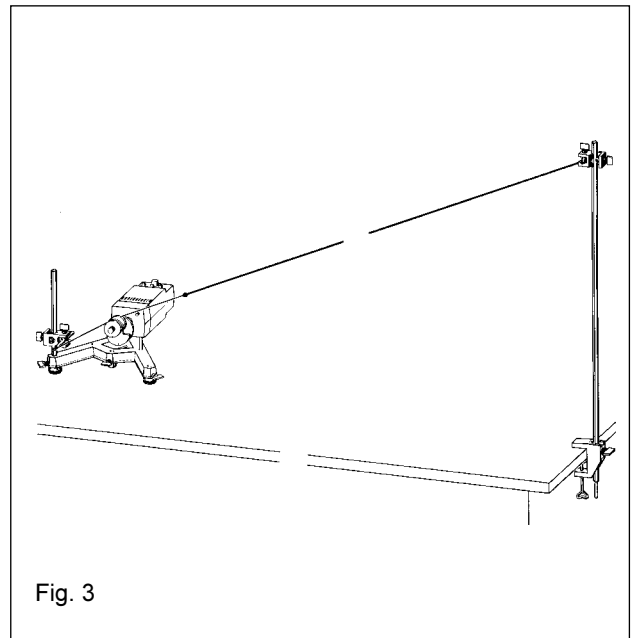


Fig. 3

| Grooved pulley setting |   |        | Wave characteristics |                    |
|------------------------|---|--------|----------------------|--------------------|
| Hole                   | Phase difference                        | Groove | Polarisation         | Oscillation plane  |
| 1 or 2                 | –                                       | 4      | linear               | vertical           |
| 0                      | –                                       | 3      | linear               | horizontal         |
| 1 or 2                 | 0° r 180°<br>(white point)              | 3      | linear               | sloped             |
| 1                      | 90° or 270°<br>(black point)            | 3      | circular             | –                  |
| 2                      | 90° or 270°<br>(black point)            | 3      | elliptical           | main axis vertical |
| 1 or 2                 | 45°, 135°, 225°, 315°<br>(yellow point) | 3      | elliptical           | main axis sloped   |

### 4 EXPERIMENT LITERATURE

Versuchseinheiten Physik,  
Transversalwellen 16050.41

### 5 LIST OF EQUIPMENT

Laboratory Motor, 230V 11030.93  
 Gearing 10:1 for Laboratory Motor 11028.00  
 Square Section Rubber,  $l = 10\text{m}$  03989.00  
 Cotton Cord,  $l = 10\text{m}$  02091.00  
 Stroboscope 21806.93