

# TM 632

## Centrifugal governor



### Description

- visualisation of the effect of centrifugal force
- how various centrifugal systems work
- determination of characteristic curves and setting curves of different centrifugal governors

Centrifugal governors use the properties of centrifugal force to control the speed of a machine. Due to centrifugal force, a rotating flyweight mass has the tendency to move away from the axis of rotation and is prevented by counteracting mechanisms. These mechanisms are differentiated into those governors that use weights and those that use springs. Corresponding kinematics cause a deflection proportional to the speed to occur on the governor. Via an actuator, this affects the energy supplied to the machine, thereby controlling the machine's speed.

The TM 632 experimental unit presents centrifugal systems that demonstrate the different principles of operation of both weight and spring-based governors.

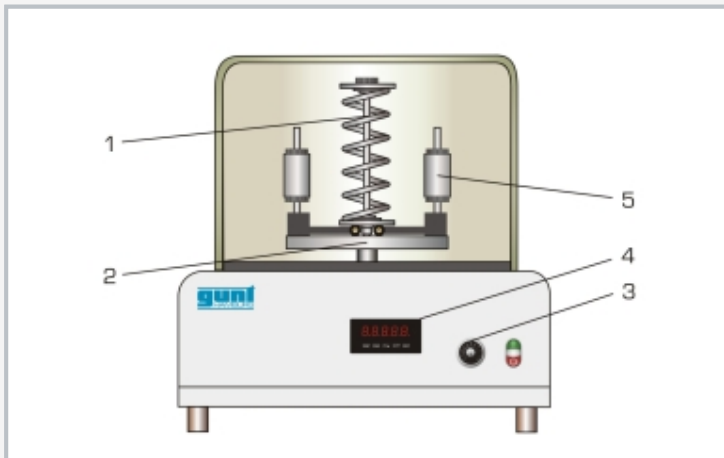
The housing holds the drive with an electronically controlled motor. The speed is continuously adjustable and displayed digitally. The governors are inserted into a chuck on the drive. Centrifugal masses, sleeve forces and spring preload can be varied using the accessories supplied, depending on the governor. The stroke can be read on markings on the governor shaft. A transparent protective cover above the rotating centrifugal governor ensures safety; operation is only possible when the protective cover is properly attached.

### Learning objectives/experiments

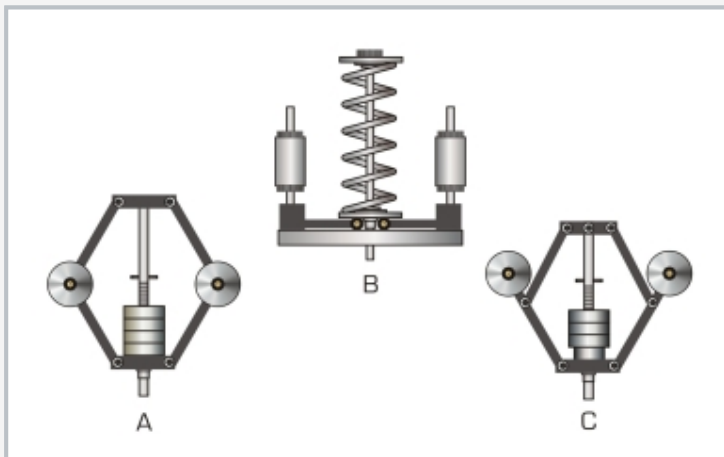
- kinetics and kinematics of the following centrifugal systems
  - ▶ Porter governor
  - ▶ Proell governor
  - ▶ Hartnell governor
- adjustment of centrifugal governors
- recording the governor characteristic curves and setting curves
- calculation of the structural design and adjustment of different governors

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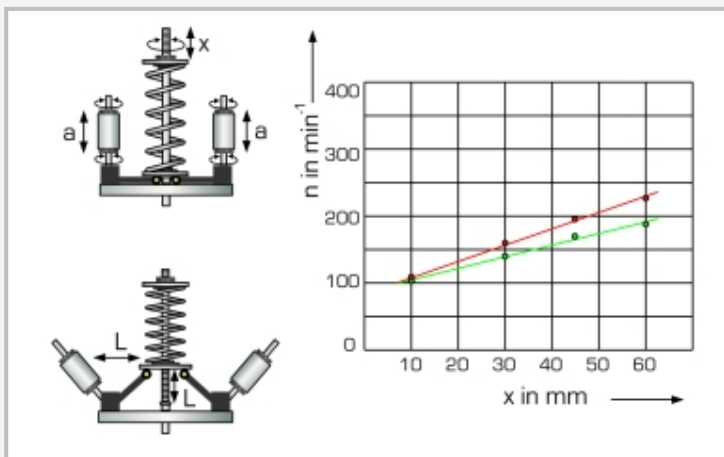
## Centrifugal governor



1 spring, 2 Hartnell governor centrifugal system, 3 control element for adjusting speed, 4 speed display, 5 centrifugal mass



Different centrifugal systems: A Porter governor, B Hartnell governor, C Proell governor



Settings and characteristic of the Hartnell governor at constant centrifugal force lever arm: a centrifugal mass adjustment, l centrifugal force lever arm, n speed, x spring preload; green increasing speed, red decreasing speed

### Specification

- [1] how centrifugal systems work
- [2] three different centrifugal governors: Porter, Proell and Hartnell governors
- [3] versatile range of variations on the governors: adjustment of the centrifugal mass, the sleeve force and the spring preload
- [4] continuous adjustment of speed via a potentiometer
- [5] drive with DC motor
- [6] digital speed display
- [7] protective cover with electronic coupling to the drive ensures safe operation

### Technical data

DC motor

- max. power: 35W

Speed control: 60...400min<sup>-1</sup>

Proell governor

- sleeve mass: 3x 100g
- centrifugal mass: 2x 150g

Porter governor

- sleeve mass: 3x 100g
- centrifugal mass: 2x 400g

Hartnell governor

- centrifugal mass: 2x 400g
- 2 compression springs, adjustable spring preload

Measuring ranges

- speed: 0...600min<sup>-1</sup>

230V, 50Hz, 1 phase

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

UL/CSA optional

LxWxH: 420x420x430mm

Weight: approx. 30kg

### Scope of delivery

- 1 experimental unit
- 3 centrifugal governors
- 1 set of tools
- 1 set of weights
- 1 set of instructional material

# TM 632

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Optional accessories

WP 300.09      Laboratory trolley