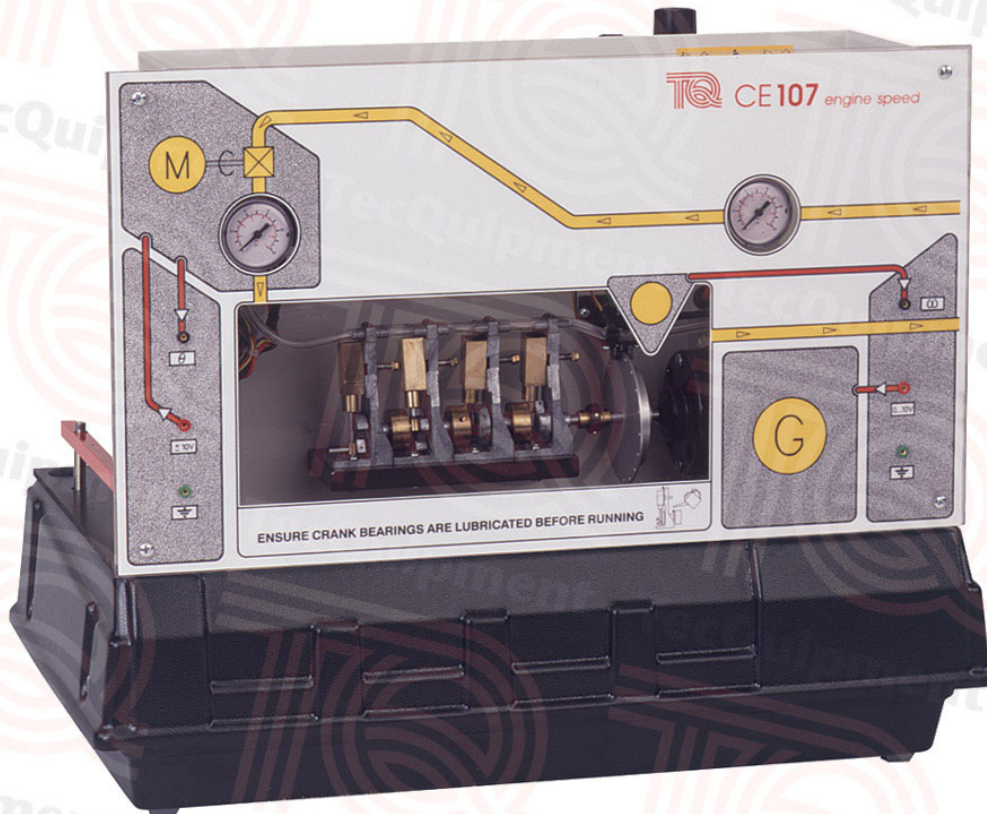


**CE107**

## Engine Speed Control Apparatus

**Compact, self-contained, bench-mounting apparatus to study basic and advanced principles of engine speed control**



- Self-contained and compact bench-mounting unit
- Small-scale compressed air-powered piston engine to mimic a full-size engine with realistic results
- Shows problems of speed control in non-linear systems
- Front panel includes a mimic diagram of the process so students can clearly see what they are controlling
- For basic and advanced experiments with speed control and non-linearity compensation
- Ideal for classroom demonstrations and student project work
- All inputs and outputs buffered for connection to TecEquipment's optional controllers or other suitable controllers

# CE107

## Engine Speed Control Apparatus

### Description

The CE107 Engine Speed Control Apparatus shows the problems of regulating the speed of rotating machines, especially problems with non-linear control systems.

It is a scale-model engine, driven by compressed air (not supplied) for safety. The basic purpose is to adjust a motorised valve to regulate the engine speed under load. A d.c. generator connects to the engine output and loads the engine.

More advanced experiments show:

- Non-linearity compensation using dither signals
- Multiple loop and minor loop feedback
- System modelling from step response information
- P+I control and root locus methods

The engine dynamics are similar to those of a typical ignition compression engine coupled to a dynamometer-controlled test bed. It is an ideal physical model to help engineering students at all academic levels to gain invaluable practical experience.

**Note:** You must use the CE107 with TecQuipment's optional CE120 Controller, the optional CE122 Digital Interface, or other suitable controllers with 10 V inputs and outputs. Details of the CE120 and CE122 are on separate datasheets.

The CE107 includes a set of cables and connectors for connection to other equipment.

All control connections work with 0 to 10 VDC signals.

### Standard Features

- Supplied with comprehensive user guide
- Two-year warranty
- Made in accordance with the latest European Union directives

### Experiments

- The use of dither signals in the compensation of system non-linearities
- The measurement of system dynamics from step response information
- Inner loop feedback compensation
- P+I controller design

The flexible design of the equipment allows the user to develop many other analysis and control exercises to suit their needs. It is good for extended or advanced control experiments, and is ideal for student project work.

### Optional Ancillaries

To accurately calibrate the engine speed in some experiments, you need:

- Optical tachometer (OT1) – a hand-held optical tachometer

### OR

- Stroboscope (ST1)

### Essential Ancillaries

- Controller (CE120) – A controller with analogue and digital controls and instruments **or**
  - Digital Interface (CE122) – An interface which connects between most products in the Control Engineering range and a suitable computer (not included) **or**
  - Other suitable controller with 10 V inputs and outputs
- Both the CE120 and the CE122 include TecQuipment's CE2000 Control Software (see separate datasheet) with editable, pre-made control experiments for use with the CE107.
- Compressor (CE1b)

### Essential Services

*Electrical supply:*

240/110 VAC, 1 A, 50/60 Hz, with earth

Other voltages and frequencies available to special order

*Compressed air supply:*

Minimum 5 bar, maximum 10 bar

Nominal 10 litres/minute

*Bench space needed:*

1 m x 750 mm

### Operating Conditions

*Operating environment:*

Laboratory environment

*Storage temperature range:*

-25°C to +55°C (packed)

*Operating temperature range:*

+5°C to +40°C

*Operating relative humidity range:*

80% at temperatures < 31°C decreasing linearly to 50% at 40°C

### Sound Levels

Less than 70 dB(A)

### Specifications

*Nett dimensions and weight:*

540 x 330 x 420 mm, 22.5 kg

*Packed dimensions and weight:*

0.34 m<sup>3</sup>, 46 kg (approx – packed for export)

*Inputs: 0 to 10 VDC*

- Motorised air valve: 0 to +/- 10 VDC
- Generator load control

*Outputs: 0 to 10 VDC*

- Air valve position: 0 to +/- 10 VDC
- Engine speed