



CE105/CE105MV

COUPLED TANKS APPARATUS

Compact, self-contained, bench-mounting apparatus to study basic and advanced principles of control of single and coupled tanks



- Self-contained and compact bench-mounting unit that mimics a real industrial process
- Option for second pump with second flow meter to allow multivariable (MV) operation (CE105MV)
- Level control of one and two tanks
- Front panel includes mimic diagram of the process so students can see what they are controlling
- All inputs and outputs buffered for connection to TecQuipment's optional controllers or other suitable controllers
- Includes rotameter-type flow meter so students can see the flow rate

COUPLED TANKS APPARATUS

DESCRIPTION

The Coupled Tanks Apparatus investigates basic and advanced control engineering principles. This includes the study of static and dynamic systems. It is also an ideal system to use with other control strategies such as fuzzy logic.

The CE105 shows fluid transport and liquid level control problems in process control.

The basic control problem is to regulate the liquid level in one of the tanks by varying the speed of the circulating pump. The user guide includes experiments that cover system modelling using static and transient measurements, steady-state error analysis, transient response studies and Ziegler/Nichols tuning methods.

Each tank has a level sensor that gives output signals proportional to the water level in each tank. A scale on each tank allows students to check the level-sensor calibration.

A variable-speed pump forces water into the left-hand tank. A valve connects this tank to a second tank, if needed, for two-tank experiments. A rotameter-type flow meter shows the flow rate. An electronic flow meter measures the flow rate.

The CE105MV Multivariable Coupled Tanks Apparatus gives extra experiments. It is similar to the CE105 but with a second pump and flow meter. This pump forces water into the right-hand tank and works independently of the other pump. This gives more advanced experiments into the principles of multivariable control (both pumps work together to give the correct levels in the two tanks simultaneously).

STANDARD FEATURES

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

LEARNING OUTCOMES

- Calibration of transducer and actuator circuits
- System dynamics in process systems
- Design and operation of analogue proportional, proportional + integral, or proportional + integral + differential control controllers
- Steady-state errors and closed-loop transient responses
- Ziegler/Nichols controllers tuning rules
- Multivariable control
- Step-change tuning
- State feedback
- Flow control

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.

ESSENTIAL BASE UNIT

- 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 TecEquipment's CE2000 Control Software (see separate datasheet) with editable, pre-made control experiments for use with the CE105.

ESSENTIAL SERVICES

ELECTRICAL SUPPLY:

90 VAC to 250 VAC 0.4 A, 50/60 Hz, with earth

BENCH SPACE NEEDED:

1 m x 750 mm

OPERATING CONDITIONS

OPERATING ENVIRONMENT:

Laboratory

STORAGE TEMPERATURE RANGE:

-25°C to +55°C (when packed for transport)

OPERATING TEMPERATURE RANGE:

+5°C to +40°C

OPERATING RELATIVE HUMIDITY RANGE:

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

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SPECIFICATIONS

NETT DIMENSIONS AND WEIGHT:

540 x 330 x 600 mm
17 kg empty; 22 kg with water

APPROXIMATE PACKED DIMENSIONS AND WEIGHT:

0.09 m³, 25 kg (approx – packed for export)

INPUTS (0-10 VDC):

- Pump 1 speed
- Pump 2 speed (MV only)

OUTPUTS (0-10 VDC):

- Flow 1
- Level 1
- Flow 2 (MV only)
- Level 2

OTHER PARTS INCLUDED:

- Connecting cables
- Liquid colouring

SOUND LEVELS

Less than 70 dB(A)