



TE37

## CONTROL AND INSTRUMENTATION STUDY STATION

A laboratory-scale model of a typical industrial process plant providing the essential facilities to allow flow level temperature and pressure control. Demonstrates applications of advanced control systems using industry-standard instrumentation and controls for the training of plant technicians and process control engineers.



### KEY FEATURES

- Genuine industry-standard instruments and controls
- Patch panel with leads for quick and simple connection between instruments, valves and controls
- Optional distributed computer control (TE37DCS)
- Gives academic and vocational study for process control engineers and plant technicians
- Includes hidden switches to create faults for fault-finding training
- Fully programmable controllers with local and remote set points, and fully programmable proportional, integral and derivative control
- Shows basic and advanced control, from standard flow control to ratio and interactive control



# CONTROL AND INSTRUMENTATION STUDY STATION

## DESCRIPTION

The Control and Instrumentation Study Station uses industry-standard parts to teach industrial process control. It is an excellent tool to help train plant technicians and process control engineers.

Hot and cold water supplies connect to the study station. Two valves (worked by compressed air) control the flow of the water supplies into a process vessel. The process vessel has three jobs:

- A pressure vessel with a pressure-relief valve for safety
- A temperature mixing chamber for the hot and cold water flows
- A liquid-level reservoir with a sight gauge

Transmitters on the pipework and process vessel send flow, level temperature and pressure signals to a patch panel. Other sockets on the patch panel connect to the valves and other instruments. The students use leads (included) with the patch panel to connect the instruments and valves for any particular experiment.

The two flow transmitters are differential pressure transmitters, connected across orifice meters. The hot flow transmitter normally connects to an orifice meter in the hot water inlet. A set of hand-operated two-way valves also allow it to connect to a third orifice meter in the drain pipe from the process vessel.

The study station includes two fully configurable controllers, each with remote or local set point inputs. The controllers are industry-standard, with a choice of different control methods, and fully adjustable proportional, integral and derivative (PID) circuits. Sockets on the patch panel connect to an electronic multi-channel recorder to log changes in process variables.

**NOTE:** The chart recorder is paperless, so you need a suitable computer and colour printer if you need to print out hard copies of the chart recorder traces.

For fault-finding practice, there is a set of hidden switches on the side of the study station. These switches break the electrical circuits from the transmitters, instruments and control valves.

## STANDARD FEATURES

- Supplied with a comprehensive user guide
- Five-year warranty
- Made in accordance with the latest European Union directives
- ISO9001 certified manufacturer

## LEARNING OUTCOMES

- Setting up process transmitters
- Level, pressure, flow and temperature control
- Cascade control
- Coupled and decoupled interactive control
- Ratio control
- Feedforward control
- Feedforward/feedback control
- Split range control
- Fault finding

## ESSENTIAL ANCILLARY

- Service Module (SM37) – This module connects to a suitable cold-water supply and outputs hot and cold water at the correct flow and pressure for the Study Station. It includes an air compressor and storage vessel to supply compressed air to the Study Station valves.

## RECOMMENDED ANCILLARY

- Distributed Control System (TE37DCS) – Refer to separate datasheet

# CONTROL AND INSTRUMENTATION STUDY STATION

## SPECIFICATIONS

TecEquipment is committed to a programme of continuous improvement; hence we reserve the right to alter the design and product specification without prior notice.

### NETT DIMENSIONS AND WEIGHT:

1850 mm x 1100 mm x 750 mm and 272 kg

### PACKED DIMENSIONS AND WEIGHT:

Approximately 3.04 m<sup>3</sup> and 544 kg

### REFERENCE SIGNALS:

2 x adjustable reference signals, 4 to 20 mA

### TRANSMITTERS (ALL USE INDUSTRY-STANDARD 4 TO 20 MA CURRENT LOOP):

- Pressure and temperature transmitters
- Level transmitter (by differential pressure)
- 2 x flow transmitters (by differential pressure at orifice meters). One flow transmitter connects to the hot water inlet or to the process vessel drain.

### CONTROLLERS:

2 x electronic controllers with numeric displays. Remote or local set point and two outputs. Can be set for different control methods:

- Manual
- Proportional (P)
- Proportional and integral (PI)
- Proportional, integral and derivative control (PID)

PID values may be set by the user or found by the controller's automatic tune.

Local set point is at the keypad on the controller. Remote set point and all inputs and outputs are connected at the patch panel.

### COMPUTING RELAYS:

2 x arithmetic units

Each unit has a multiplier (k) and accepts three inputs (A, B and C), to give an output of  $B+k(A-C)$ . All inputs and outputs are connected at the patch panel and operate with a 4 to 20 mA current signal.

### VALVES:

2 x proportional valves

Pneumatically controlled by a positioner and a 4 to 20 mA current signal from the Patch Panel.

### MULTICHANNEL RECORDER:

Six inputs (4 to 20 mA) connected at the patch panel

### PROCESS VESSEL:

Cylindrical steel chamber with hot and cold inputs, outlet (drain) and overflow. Includes a 2 bar pressure-relief valve for safety and a transparent sight gauge to its front.

## ESSENTIAL SERVICES

### ELECTRICAL SUPPLY:

TE37: Single-phase, 230 V or 110 V (determined by order) 50/60 Hz, 250 W

TE37DCS (computer power): To customer's needs

SM37: Three-phase, 50/60 Hz, 415 V or 220 V (determined by order)

### WATER SUPPLY NEEDED FOR THE TE37:

Hot water: 50°C, Nominal 5 L/min at 2 bar

Cold Water: Nominal 5 L/min at 2 bar

Drain: 10 L/min

### WATER SUPPLY NEEDED FOR THE SM37:

Cold water at a Nominal 10 L/min and 1 bar

Drain: Nominal 5 L/min

### AIR SUPPLY NEEDED FOR THE TE37:

Clean, dry compressed air at 2 bar and 0.07 m<sup>3</sup>/min

### FLOOR SPACE NEEDED FOR THE TE37:

3 m x 2 m (to allow access)

### ADDITIONAL SPACE NEEDED FOR THE SM37:

3 m x 2 m (to allow access)

## 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 (ambient)

### OPERATING RELATIVE HUMIDITY RANGE:

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

## SOUND LEVELS

TE37: Lower than 70 dB(A)

SM37: Greater than 80 dB(A). TecEquipment recommend that you wear ear protection if you work near to the Service Module.