

## P3009

### PRESSURE CONTROL APPARATUS

#### 3 TERM PNEUMATIC

#### INTRODUCTION

The primary objective of a control system is to maintain a process variable such as flow, level, temperature, pressure etc. at a required value. Cussons P3009 Pressure Control Apparatus is designed to demonstrate various aspects of control engineering using a pressure controlled system to control the pressure within a pressure vessel. The unit provides students with the opportunity of investigating the effects of a change of controller parameters (proportional band, integral action and derivative time) on the control capability of the system. Of particular benefit to the student is the fact that the unit is made up of typical items of control equipment currently used in industrial applications, thereby providing an excellent opportunity for familiarisation.

The range of investigations which may be carried out are:

- ◆ Manual (or open loop) on-off control
- ◆ Manual proportional control
- ◆ Determination of the characteristics of a first order pressure system
- ◆ Response of a first order pressure system to closed loop proportional control
- ◆ Response of a first order pressure system to two term closed loop control (proportional plus integral and proportional plus derivative)
- ◆ Response of a first order pressure system to three term closed loop control (proportional plus integral plus derivative)

#### DESCRIPTION

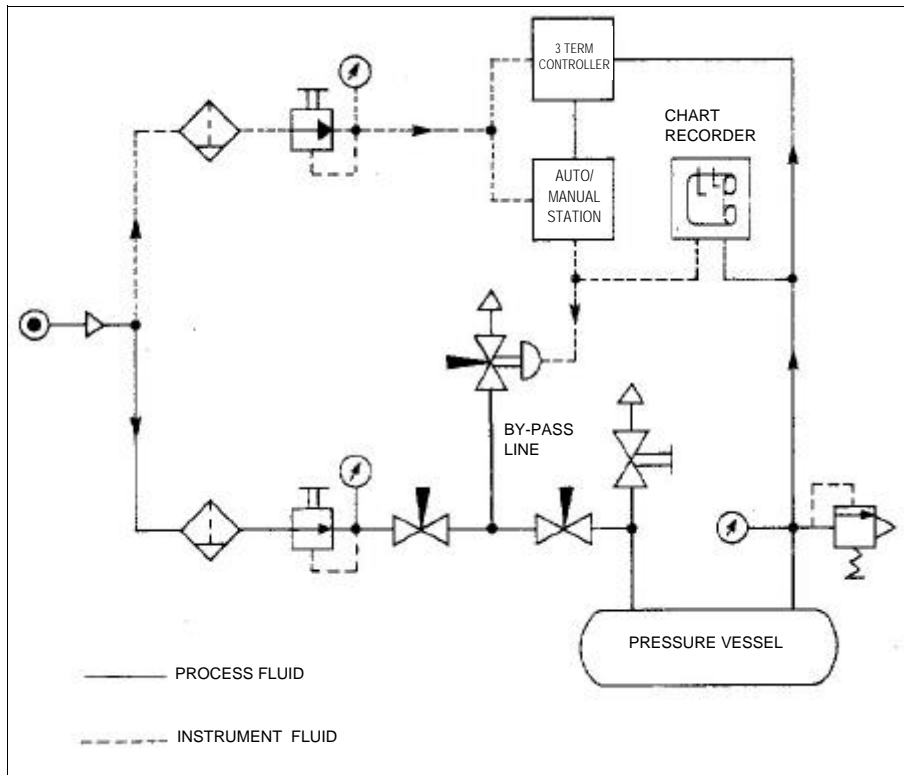
The apparatus consists of a pressure vessel connected to a compressed air supply via an input filter unit. The air line to the pressure vessel incorporates a pressure regulator, pressure gauge and a needle valve at either side of the junction with a by-pass line. The needle valves are used to set up the system and enable various time lags to be imposed upon the system response.

The pressure vessel is fitted with an outlet valve so that changes to vessel pressure can be introduced, a pressure relief valve and pressure gauge, and a flexible line to transfer vessel pressure signal to a three term pneumatic controller. The latter, acting in conjunction with an auto/manual station and a pneumatically operated modulating valve located in the by-pass line, acts to maintain the pressure within the pressure vessel at a desired set point. The proportional, integral and derivative terms of the controller are independently adjustable. Pressure within the pressure vessel may also be adjusted by manual control with the auto/manual station switched to manual mode. The vessel pressure and the controller output values are recorded to a base time on a two pen vertically mounted chart recorder.

#### TENDER SPECIFICATIONS

P3009 PRESSURE CONTROL APPARATUS  
3 Term Pneumatic

Bench Top Pressure Control Apparatus utilising control components typical of current industrial applications.



**SCHEMATIC DIAGRAM**

The apparatus comprises:

1. Steel pressure vessel with outlet valve, pressure relief valve and pressure gauge; vessel air inlet line incorporating inlet filter, regulator, pressure gauge, two needle valves and a by-pass line with a pneumatically operated modulating valve; instrument air line incorporating inlet filter, regulator and pressure gauge.
2. Pneumatic control loop consisting of a three term pneumatic controller with adjustable ranges of 2 to 200%, 0 to 40 repeats per minute and 0 to 20 minutes on the proportional band, integral action, and derivative time respectively and an auto/manual station.
3. 2-pen vertically mounted chart recorder.
4. A welded steel frame and backplate housing the foregoing components.

**SERVICES**

Compressed Air Supply: 3 to 10 bar pressure 1.5m<sup>3</sup>/h  
 Electrical Supply: Single phase 220/240V 50Hz.  
 The unit can be supplied to operate on an alternative electrical supply upon request at the time of order placing.

**DIMENSIONS**

1075 mm wide x 600 mm deep x 870 mm high

**P3006 AIR COMPRESSOR**

Fully automatic and compact air compressor with very low operational noise characteristics. Output 4.5m<sup>3</sup>/h, working pressure 8.5 bar.

**SERVICES**

Electrical Supply: As above.

**DIMENSIONS:**

360 mm wide x 360 mm deep x 560 mm high

**P3009/CK CONSUMABLES KIT**

Consumable Kit comprising:  
 5 rolls x 30 yards chart paper  
 2 red pens  
 2 blue pens