

## **Laboratory Report**

# **Experiment 6: Pneumatic Control**

Programme: Mechatronics Engineering  
Mechatronics Control and Automation Lab (MCTA 3104)

Section 2

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## 6.1

### Objectives

- To understand the operation of a single acting cylinder and its direct control with a way N.C. valve.

### Experiment Setup

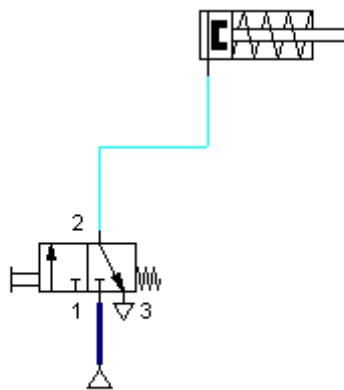


Figure 1: Hydro-pneumatics diagram of experiment 6.1.

### Process Flow

- A pipe is connected from the pressure valve to the pushbutton inlet.
- Another pipe is fitted on the outlet of the pushbutton then connected to the single acting hydraulic cylinder.
- Pressure valve is switched open.

### Results

(Images of results seen under [appendices](#))

Push button is pressed → Cylinder extends

Push button not pressed → Cylinder retracts

## 6.2

### Objectives

- To understand the concept of indirect control.
- To understand the concept of OR operation.
- To understand the concept of Memory valve.

### Experiment Setup

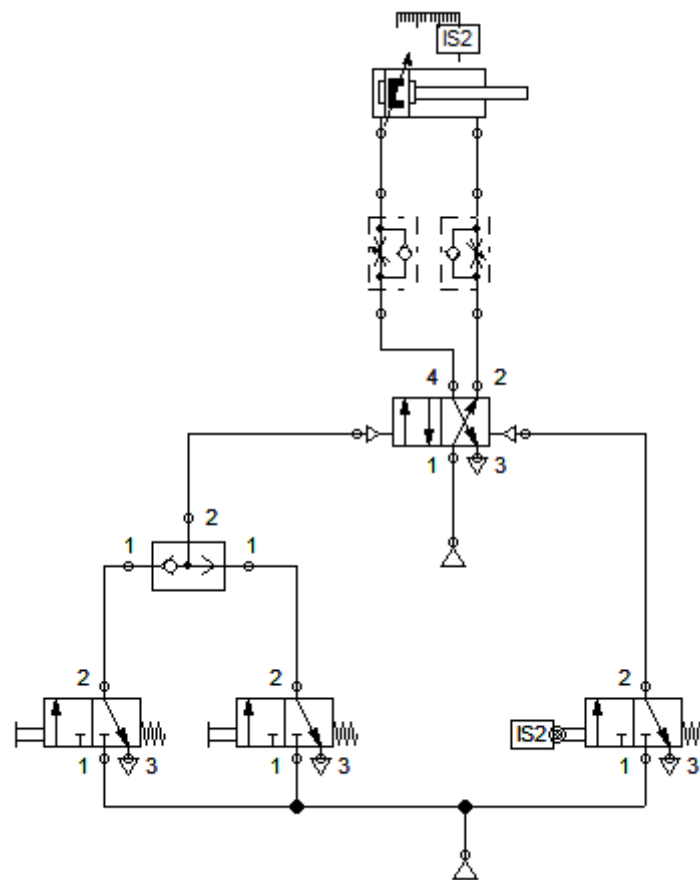


Figure 2: Hydro-pneumatics diagram of experiment 6.2.

## Process Flow

- A pipe is connected from the pressure valve to the green pushbutton inlet.
- Another pipe is connected from the pressure valve to the red pushbutton inlet.
- A pipe is fitted on the outlet of the green pushbutton then connected to the double acting hydraulic cylinder.
- A pipe is fitted on the outlet of the red pushbutton then connected to the double acting hydraulic cylinder.
- Pressure valve is switched open.

## Results

(Images of results seen under [appendices](#))

Green push button is pressed → Cylinder extends

Red push button is pressed → Cylinder retracts

## 6.3

### Objectives

- To understand the concept of AND operation.
- To understand the concept of reciprocating cycle for pneumatic system.
- To understand the use of limit switch valve.

## Experiment Setup

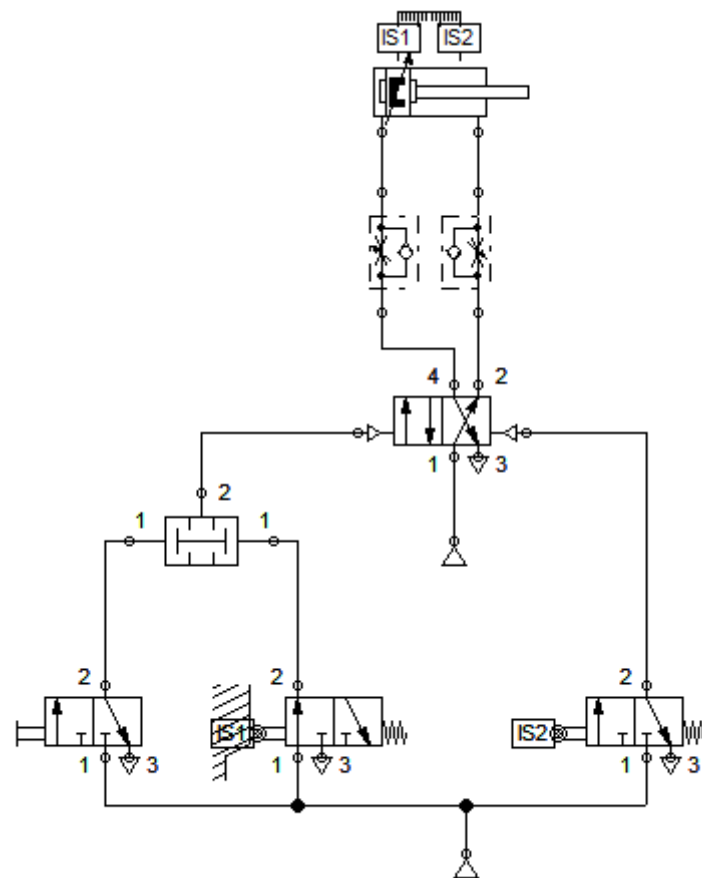


Figure 3: Hydro-pneumatics diagram of experiment 6.3.

## Process Flow

- A pipe is connected from the pressure valve to the green pushbutton inlet.
- A pipe is connected from the pressure valve to the red pushbutton inlet.
- A pipe is connected from the pressure valve to the position selector's switch inlet.
- A pipe is fitted on the outlet of the green pushbutton and another on the outlet of the red pushbutton; these two pipes are then connected to the AND operational valve.
- A pipe is used to connect the outlet of the AND operational valve to the 4/2-way valve.
- Inlet 1 on the 4/2-way valve is connected to the air flow valve.
- Outlet 4 is connected to the double acting hydraulic cylinder.
- Outlet 2 is connected to the double acting hydraulic cylinder.
- The pressure valves are switched open.

## Results

(Images of results seen under [appendices](#))

The cylinder in this experiment only works when the selector switch is turned to select on. Moreover, for the cylinder to extend the two pushbuttons need to be pressed simultaneously. So, if only one of the two pushbuttons is pressed then the cylinder will return to its retracted position. However, if the selector switch is turned to select off while the cylinder is extracted then the cylinder will keep its position even if the pushbuttons are not pressed. This means that when the selector switch is turned to select off the cylinder will stop responding to any of its inputs.

Selector switch is turned → Red push button is pressed & green push button is pressed → Cylinder extends

Selector switch is turned → Red push button is pressed → Cylinder retracts

Selector switch is turned → Green push button is pressed → Cylinder retracts

Selector switch is not turned → Cylinder does not respond

Selector switch is turned → Red push button is pressed & green push button is pressed → Cylinder extends → Selector switch is turned back to off → Cylinder stays extended

## Summary

This lab report explores the operation and control of pneumatic and hydraulic systems through three experiments. The first experiment demonstrates the direct control of a single-acting cylinder using a normally closed (N.C.) valve, where pressing the push button extends the cylinder, and releasing it retracts the cylinder. The second experiment illustrates the concepts of indirect control, OR operation, and memory valve using a double-acting cylinder, which extends when a green pushbutton is pressed and retracts when a red pushbutton is pressed. The third experiment examines the AND operation and reciprocating cycles in a pneumatic system, emphasizing the role of a limit switch valve and selector switch. In this setup, the cylinder extends only when both pushbuttons are pressed simultaneously, retracts when either pushbutton is pressed alone, and retains its position when the selector switch is turned off. These experiments provide a comprehensive understanding of pneumatic and hydraulic control mechanisms.

## Appendices

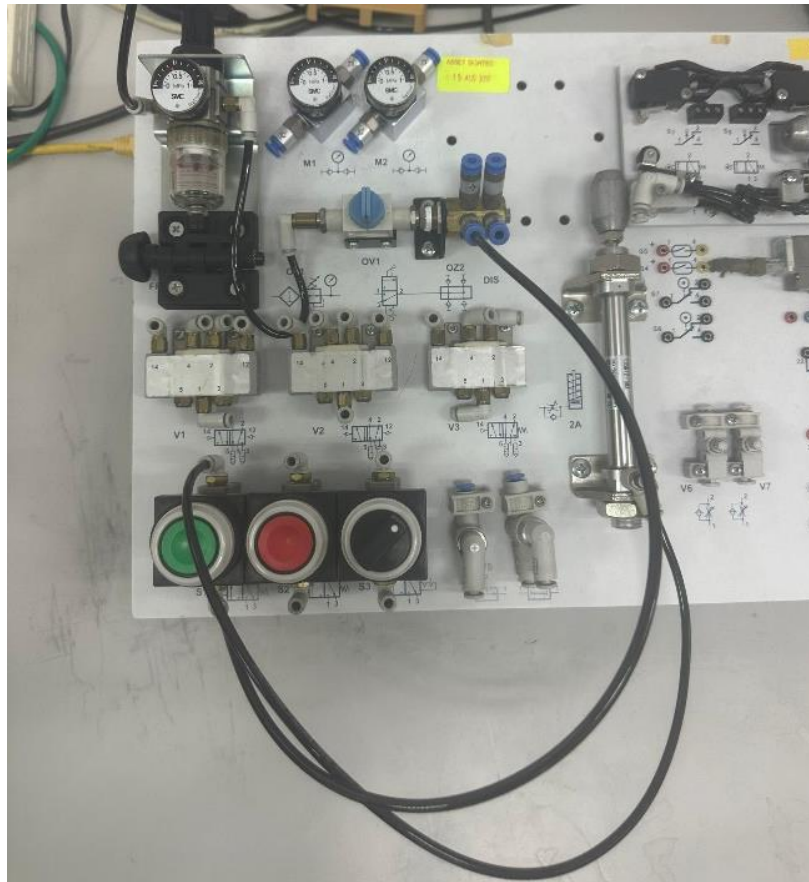


Figure 4: Experiment 6.1 results.



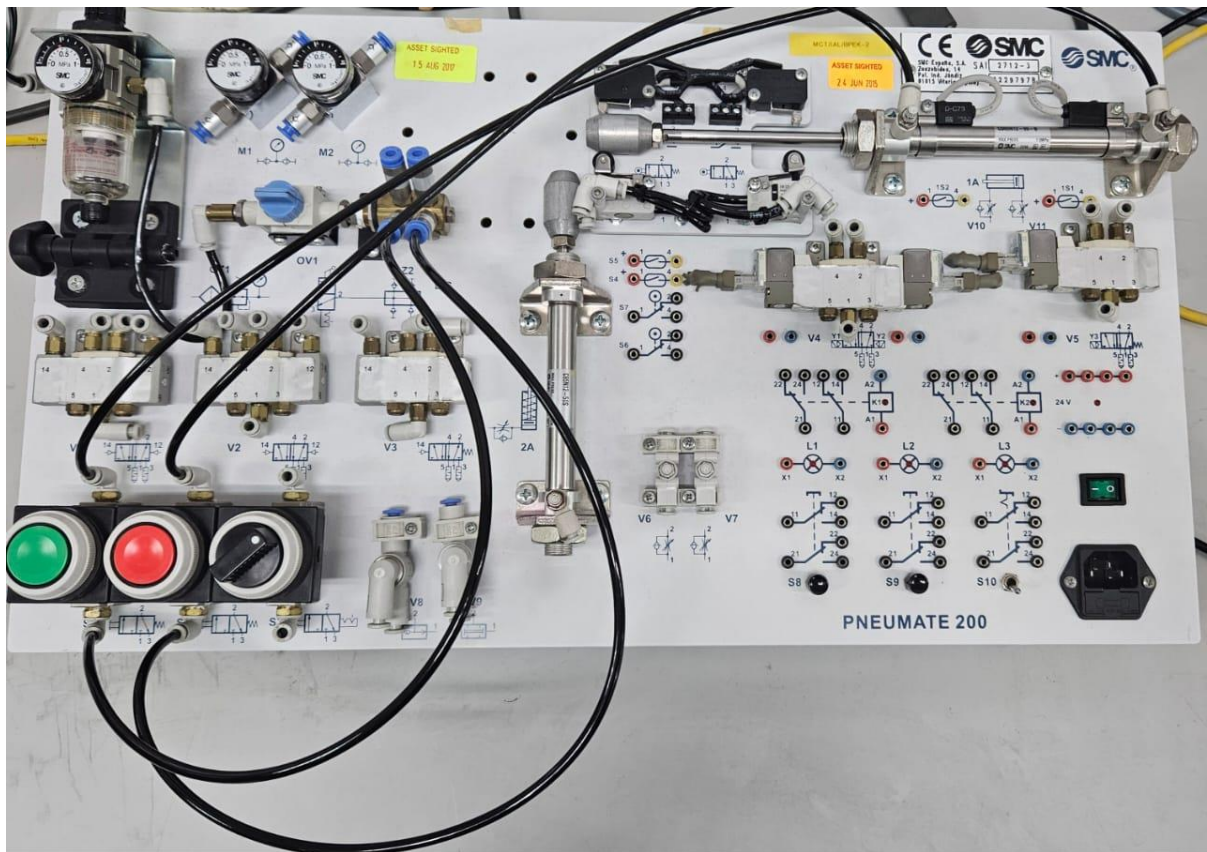


Figure 5: Experiment 6.2 results.

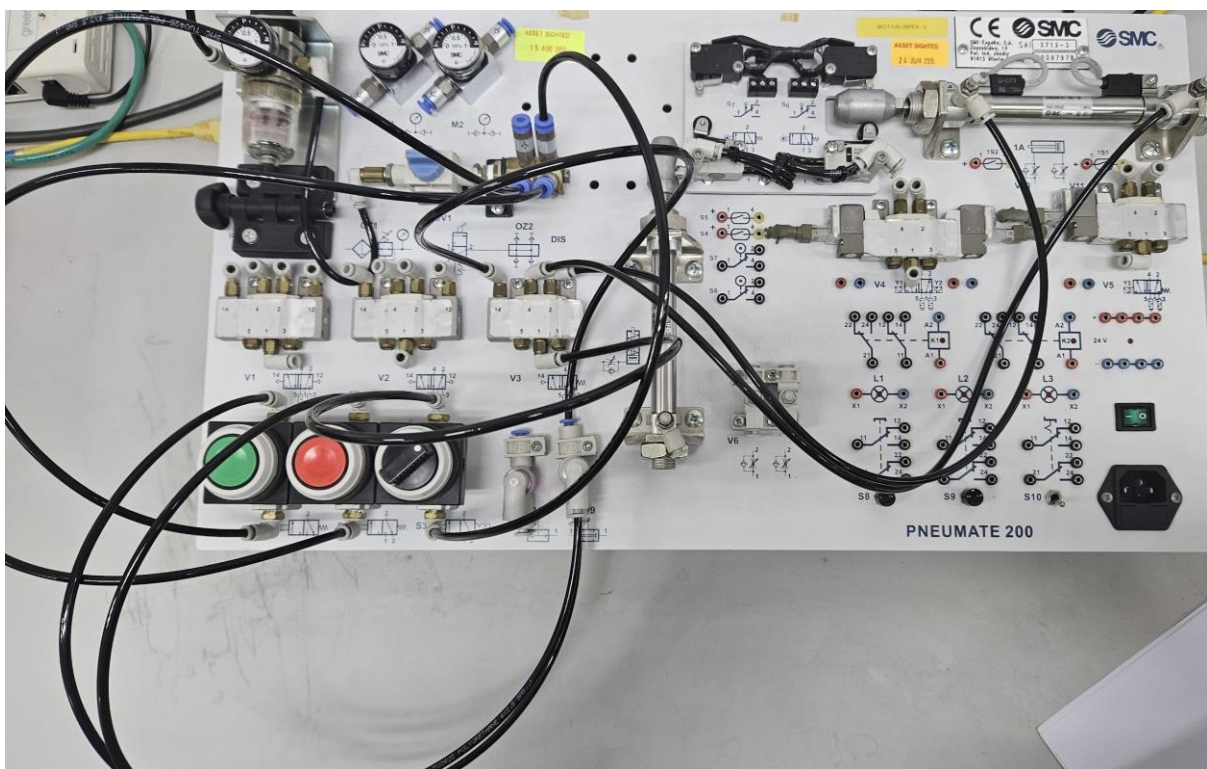


Figure 6: Experiment 6.3 results.