

Name _____

Class _____

Date _____

By the end of this worksheet I can...

- ☐ name pneumatic components and draw their symbols
- ☐ describe circuits with the correct terms: actuate, change state, outstroke, instroke
- ☐ identify AND and OR control in pneumatic circuits
- ☐ calculate force, pressure and area in N/mm^2
- ☐ describe speed control and time delays with restrictors and reservoirs

I DO

Worked example

Read how a full-mark answer is built

A single-acting cylinder is controlled by a push-button 3/2 valve.

1 Describe the operation of the circuit. (3 marks)

Full-mark answer each ✓ is one mark

When the push button actuates the 3/2 valve, main air flows from port 1 to port 2 and the piston outstrokes ✓. When the button is released, the spring returns the valve ✓. Air in the cylinder exhausts through port 3 and the spring instrokes the piston ✓.

Why marks are not awarded

"Press the button, the valve opens, air goes in and pushes the piston out. Let go and it goes back."

1 mark at most: "opens", "pushes out" and "goes back" aren't the accepted terms.

WE DO

Guided practice

Use the starters and word bank to help you

Two 3/2 valves are piped in series to control a cylinder.

2 State the type of control and describe why it is used. (2 marks)

Sentence starters

1. ...
2. ...

Word bank

operator's · actuated · valves · two-handed · safety · AND control

Tip: 2 marks = 2 separate, developed points.

YOU DO**On your own** No notes. Check your answers afterwards.**3 Quick check: tick one box for each.**

- a) Two valves piped in series give...
☐ AND control ☐ OR control ☐ NOT control ☐ A time delay
- b) A 12 mm diameter piston: area is about...
☐ 452 mm² ☐ 113 mm² ☐ 37.7 mm² ☐ 144 mm²
- c) Which is an advantage of pneumatics?
☐ No sparks, so safe near flammable materials ☐ Very precise positioning of the piston ☐ Completely silent when it operates ☐ Larger forces than a hydraulic system
- d) How many ports and states does a 5/2 valve have?
☐ 5 states, 2 ports ☐ 2 ports, 5 states ☐ 5 ports, 2 states ☐ 3 ports, 2 states

4 Key terms: write the letter of the matching description next to each term.

- | | | |
|----------------------------|-------|---|
| 1. Semi-automatic circuit | _____ | A One cycle per press: a roller trip returns the piston. |
| 2. Fully automatic circuit | _____ | B Air outstrokes; a spring instrokes. |
| 3. Single-acting cylinder | _____ | C Air drives the piston both ways. |
| 4. Double-acting cylinder | _____ | D 5 ports, 2 states; "changes state"; controls a double-acting cylinder. |
| 5. 3/2 valve | _____ | E 3 ports, 2 states; "actuated". |
| 6. 5/2 valve | _____ | F Roller trips at both ends keep it cycling. |

A cylinder operating at 0.5 N/mm² has a piston area of 800 mm².

5 Calculate the outstroke force. (2 marks)

A press cylinder must outstroke slowly and smoothly.

6 Describe how the circuit can be modified. (2 marks)

A double-acting cylinder is controlled by a 5/2 pilot-operated valve and two 3/2 valves.

7 Describe what happens when valve A is actuated. (2 marks)

Check and reflect

Mark your answers with the answer sheet. Go back to the checklist on the site and re-rate each “I can” statement above. Which one still needs work?
