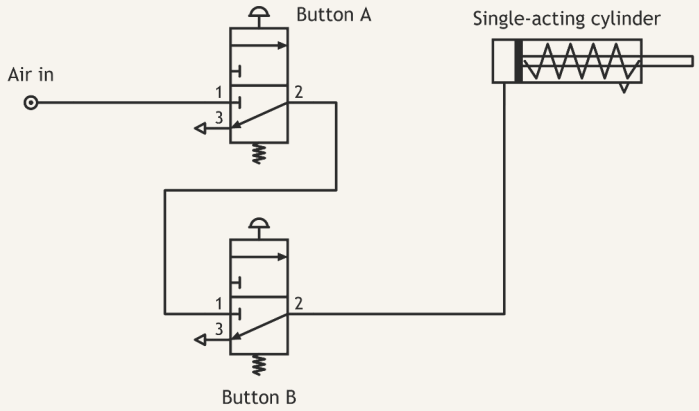
Daily Review

1	**Name** the valve OR needs.	Shuttle valve
2	**State** which buttons work OR.	Either one
3	**Find** P: F = 60 N, A = 300 mm^2.	0.2 N mm^{-2}
4	**State** check 1 when fault-finding.	Regulator at 0
5	Two switches in series: **state** when it is on.	Both closed

AND Control

Two buttons. Both must be pressed.



S3 Engineering Science

By the end of this lesson…



1. I can **build** and **test** an **AND** circuit
2. I can **explain** where the air stops in AND
3. I can **choose** OR or AND for a job

Meet the Parts: Two Buttons in a Line

Parts

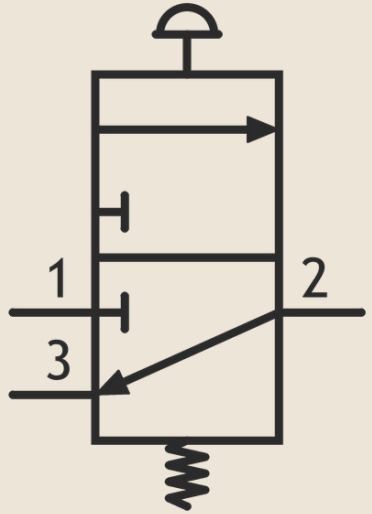
two **push-button** valves

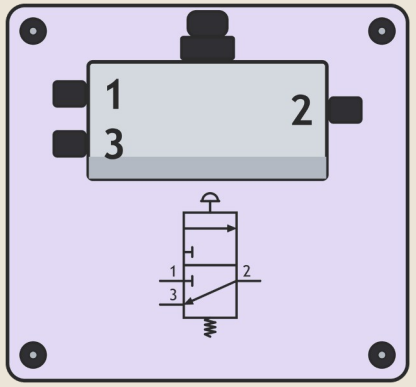
New

how they are **piped**

Out of A

into **B**, then the cylinder

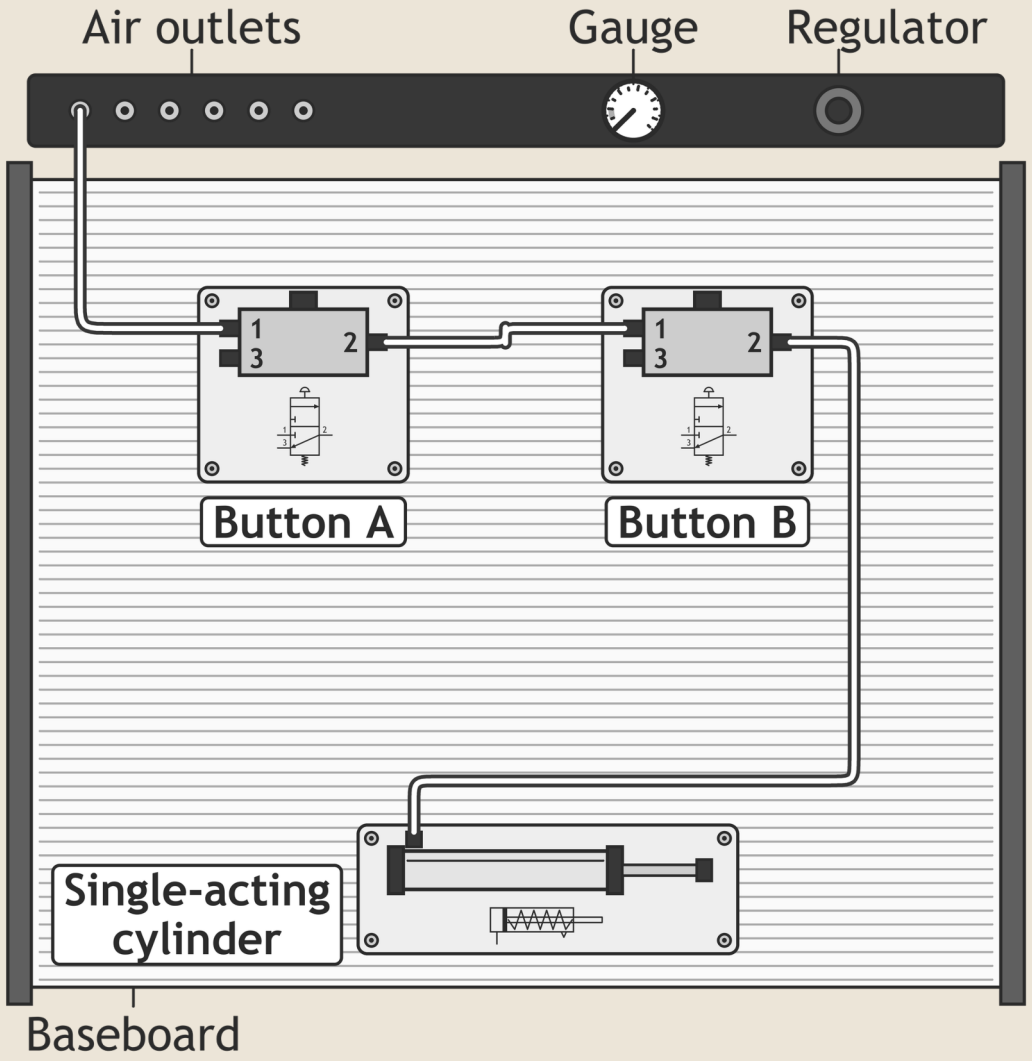




The real push-button valve.

Collect, Simulate and Build

Collect the parts on the layout, tubing and goggles.



SAFETY Regulator at 0 to build. 1 to 2 bar to test.

Simulate, **build**, hands up. Then **press** A, then B, then both.

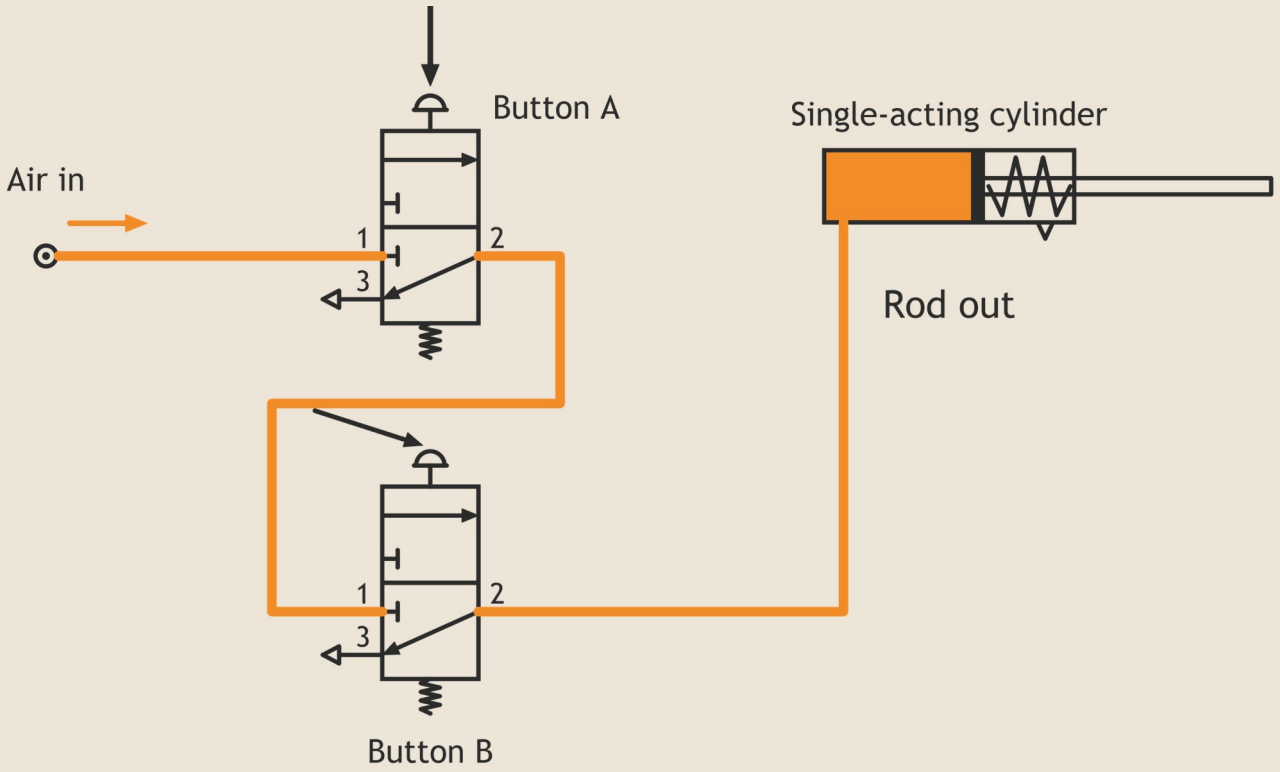
What Did You Find?

1	**State** what the rod did when you pressed A only.	Stayed in
2	**State** what the rod did when you pressed B only.	Stayed in
3	**State** what the rod did with both pressed.	Out
4	**State** where the air stopped with A only.	At button B

Second Start

1	**State** which buttons work the AND circuit.	Both
2	**State** where the air stops with A only.	At button B
3	**Name** the valve OR needs.	Shuttle valve
4	**State** which buttons work the OR circuit.	Either one
5	**State** the regulator setting while you build.	0 bar

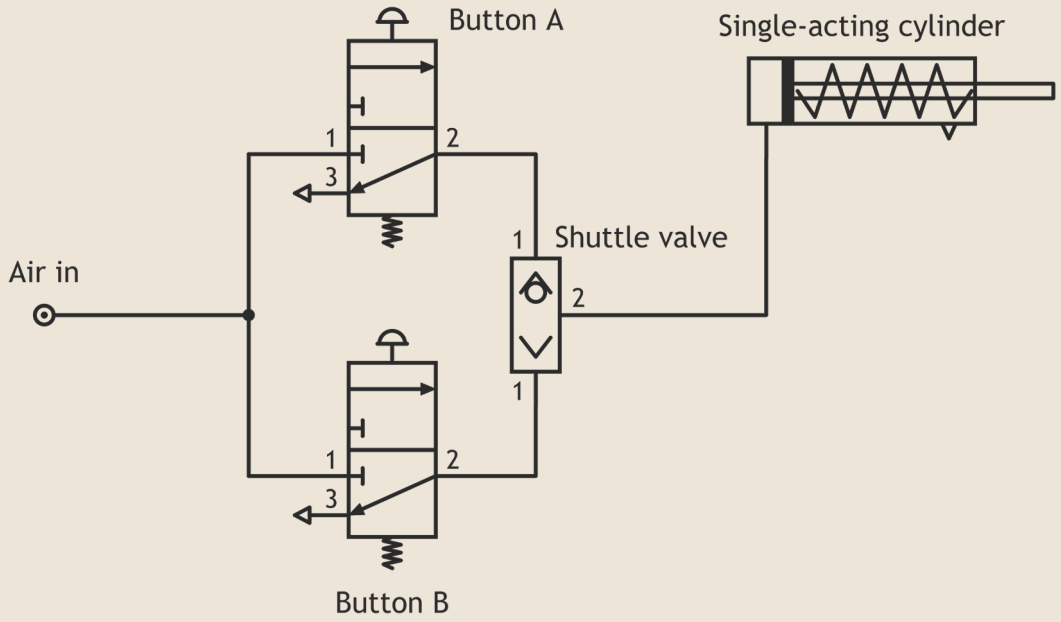
Why: Follow the Air



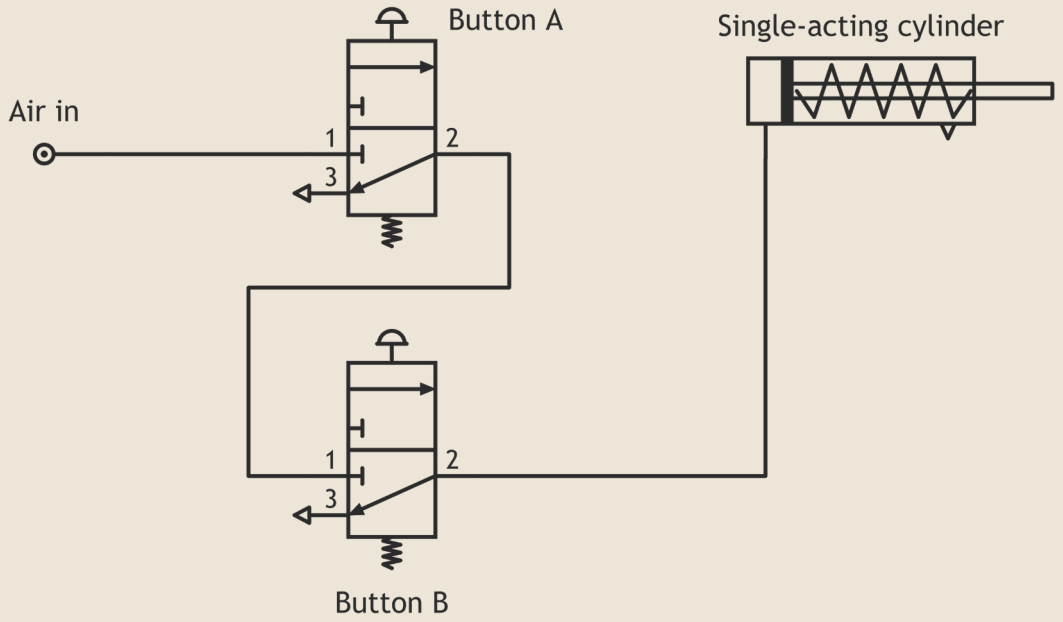
1 Press A only: air goes through A and **stops** at B. Rod **in**.

2 Press A and B: air goes through A, then B. The rod goes **out**.

Same Valves, Different Pipes



OR: side by side



AND: in a line

We Do: OR and AND



Button A	Button B	OR: rod	AND: rod
-	-	In	In
Pressed	-	Out	In
-	Pressed	Out	In
Pressed	Pressed	Out	Out

Why: AND Control

AND

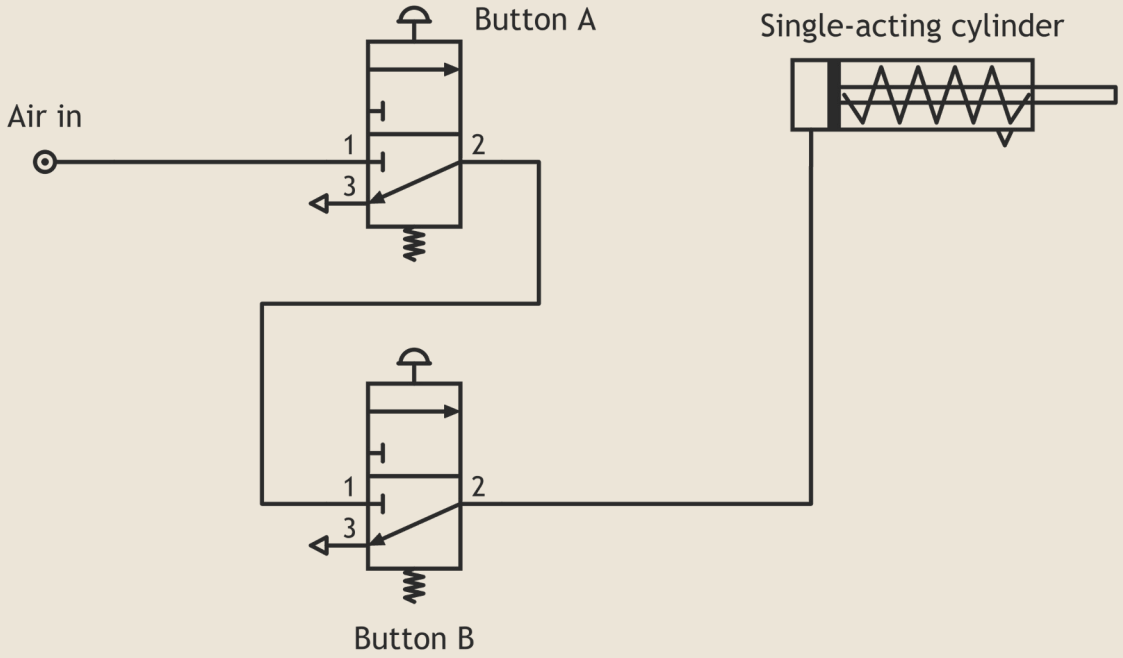
valve A AND valve B, **both** on

Pipes

in a **line**: out of A, into B

Where

a press: **two-hand** safety



Meet the Parts: Pilot Air

Pilot air

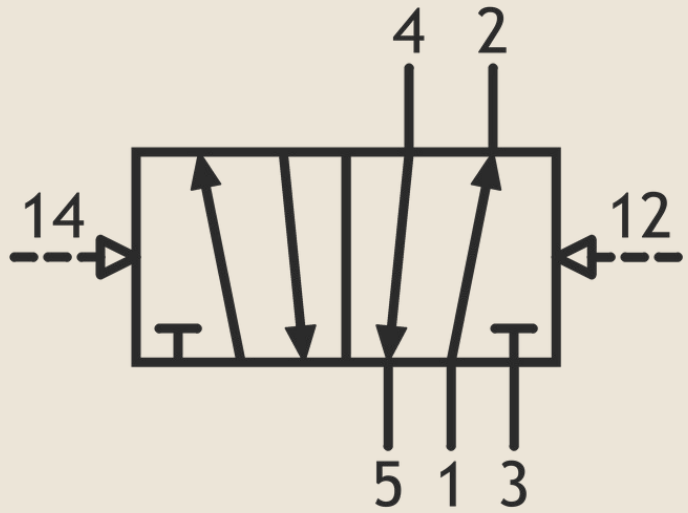
a small air **signal**

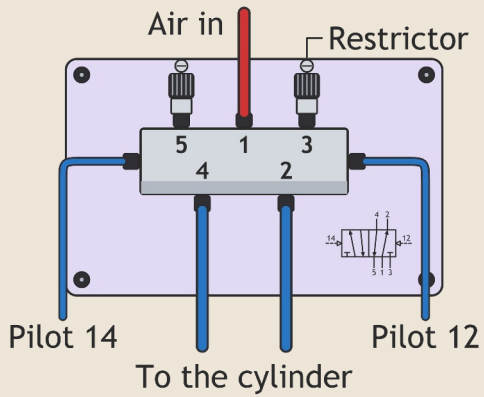
Drawn

as a **dashed** line

Pilot 14, 12

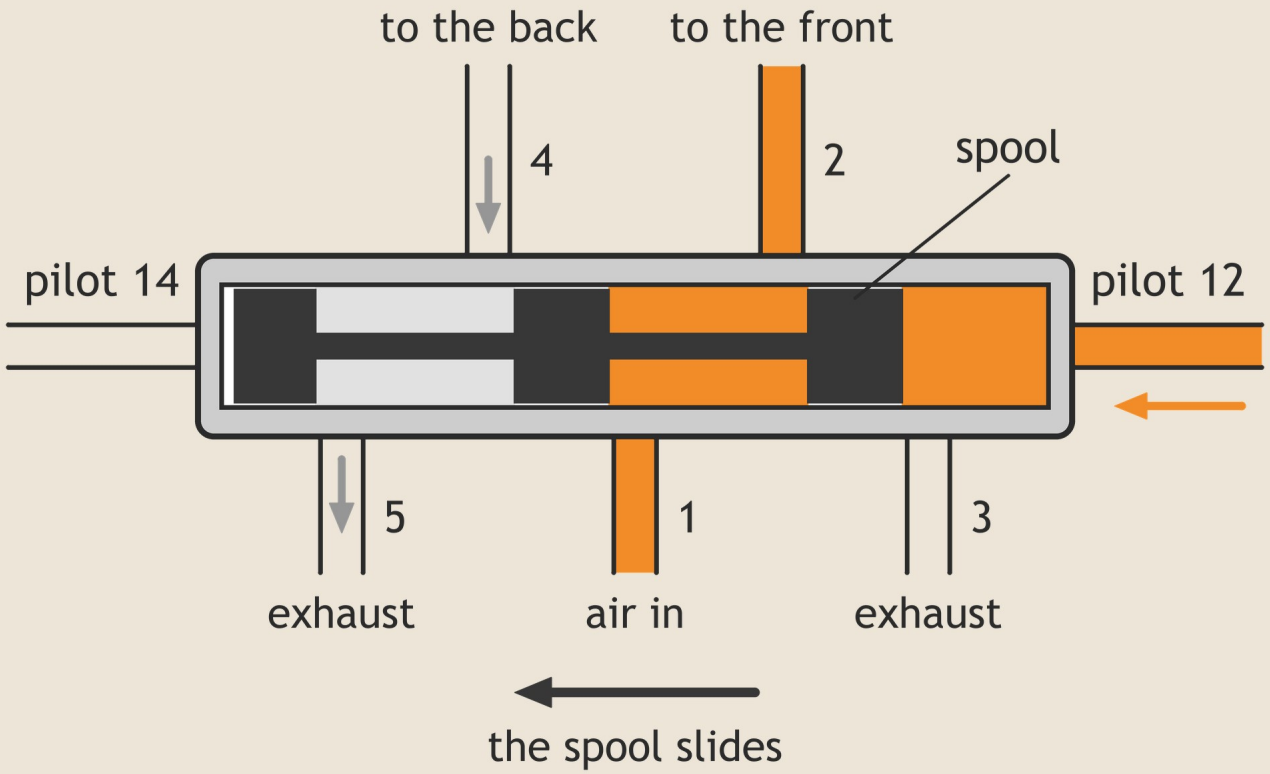
slide the 5/2 valve to its other **state**





The real 5/2 pilot valve.

Why: Pilot Air Moves the Spool



1 Air at **pilot 14**: the spool slides. Air 1 to **4**.

2 Pilot air gone: the spool **stays** put.

3 Air at **pilot 12**: the spool slides **back**. Air 1 to 2.

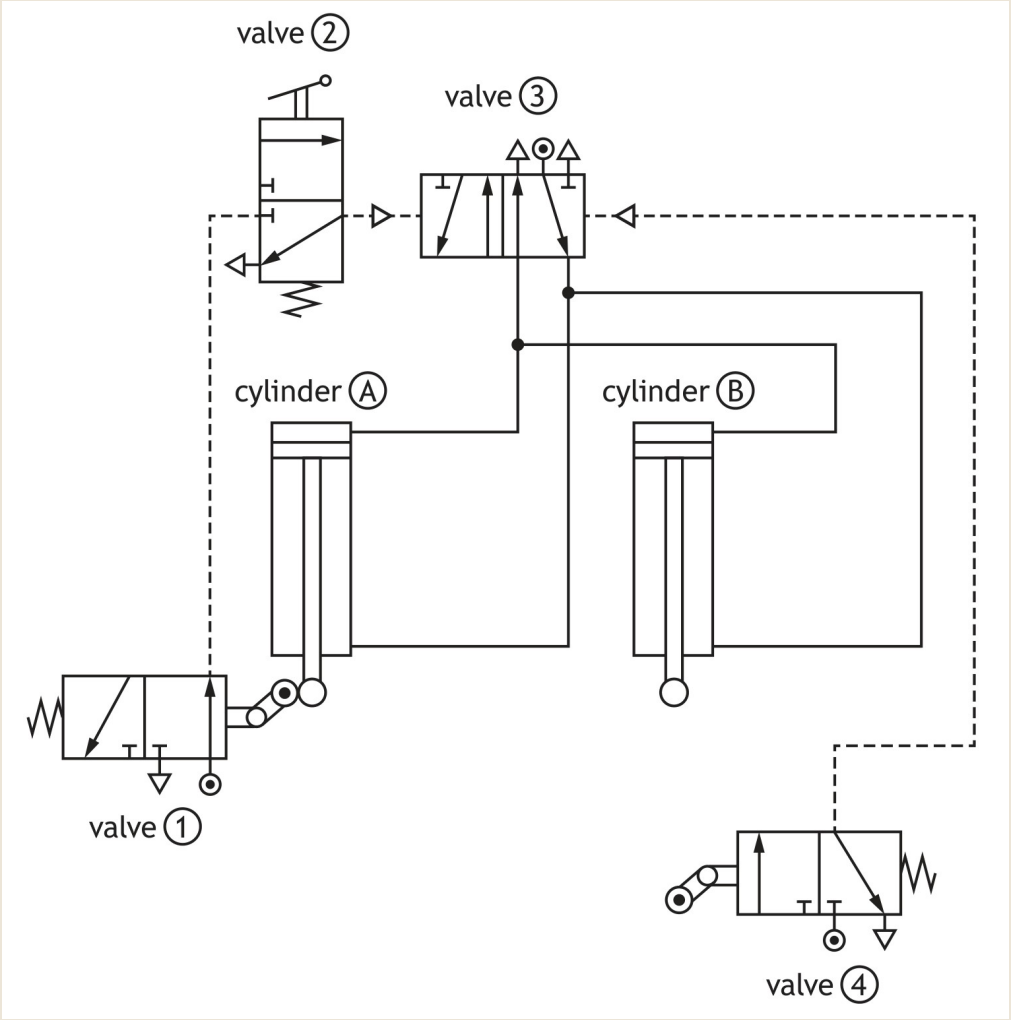
Exam Question: 2025 Q8(a) (1 mark)

State the type of control created by the piping of valves 1 and 2.

Hint

follow the pipe out of valve 1

AND (control) (1)

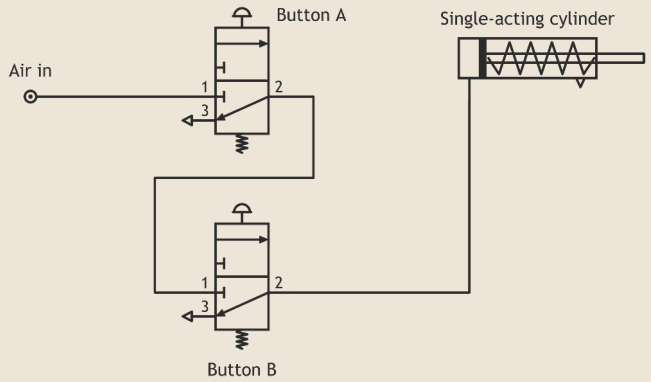


Review Questions

Booklet page 17

Answer Questions 1 to 5 on your own.

Finished? Try the Challenge.



Answers: Review Questions

Question	Answer
1	and
2	B; in
3	line
4	hands; press
5	OR; AND
Challenge	A only: stops at B, rod in (1). Both: rod out (1)

Look back — by the end of this lesson…



1. I can **build** and **test** an **AND** circuit
2. I can **explain** where the air stops in AND
3. I can **choose** OR or AND for a job

Credits

Real part drawings: Sources: kit drawings by R Stewart, from the Matrix CP2080 kit.

Kit layout: Sources: AND circuit, kit layout and air-path drawings by R Stewart, from the Matrix CP2080 kit.

OR and AND circuits: Sources: AND circuit, kit layout and air-path drawings by R Stewart, from the Matrix CP2080 kit.

AND circuit: Sources: AND circuit, kit layout and air-path drawings by R Stewart, from the Matrix CP2080 kit.

Exam Question: 2025 Q8(a): © Qualifications Scotland (SQA). N5 Engineering Science 2025, Question 8(a): the circuit and the marking instructions.

R Stewart - October 2026