Pneumatic drives

Actuation

Actuation

- **Direct actuation**
  - Simplest possibility
  - Input element = Control element
- **Indirect actuation**
  - Usual type of actuation
  - For cylinders with large diameters
  - In case of large distance between input element and working element

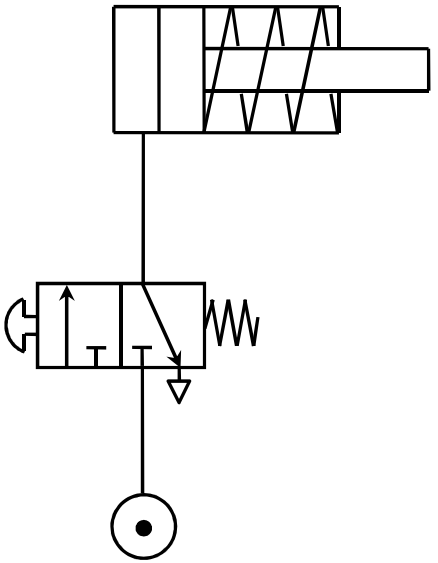
Direct actuation of Single-acting cylinder

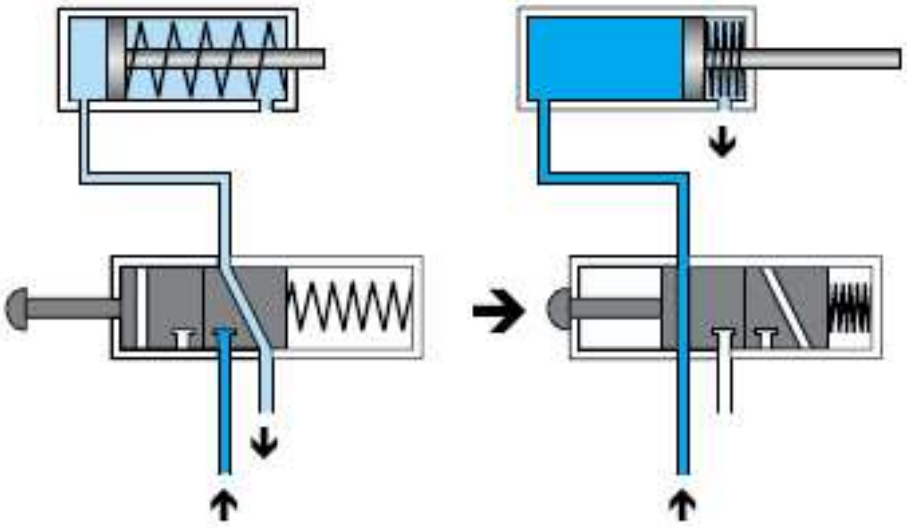
Single-acting cylinder

- Perform work in only one direction
- Return position via spring
- Air supply port, vent hole

3/2-Way valve

- 3 Working ports, 2 switching positions
- Manually actuated, spring return





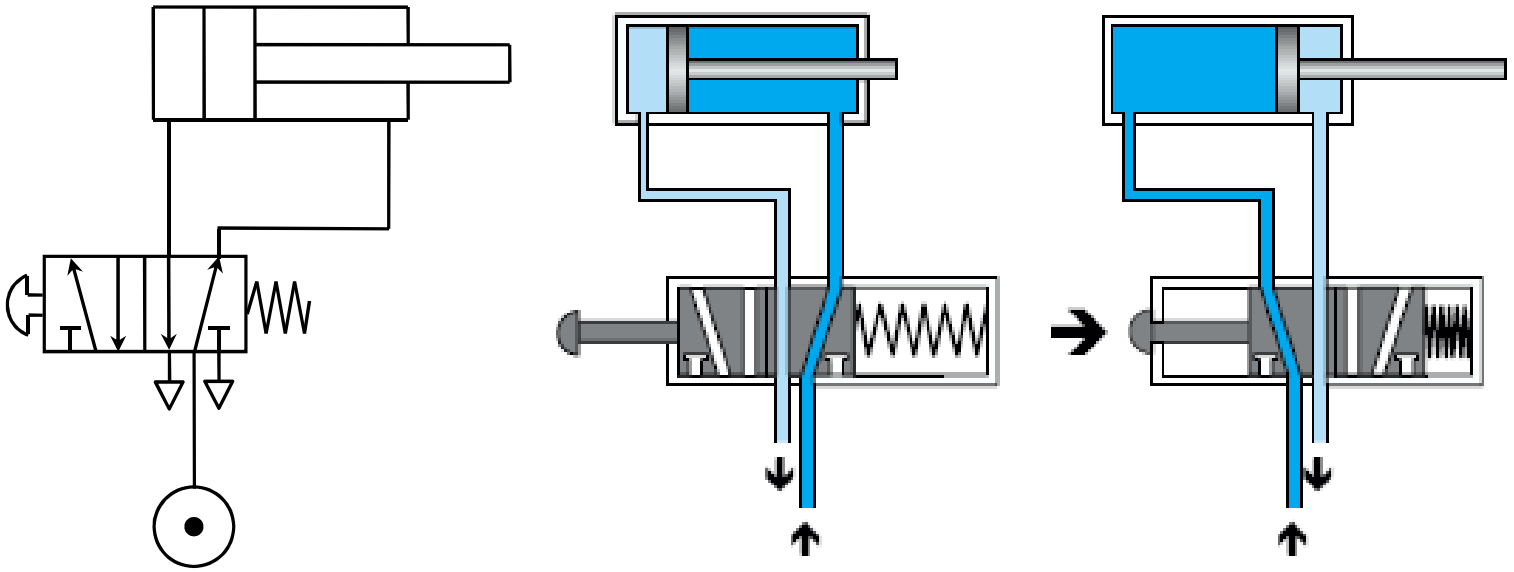
Direct actuation of Double-acting cylinder

Double-acting cylinder

- Perform work in both direction
- 2 air supply port

5/2-Way valve

- 5 Working ports, 2 switching positions
- Manually actuated, spring return



Indirect actuation of Single-acting cylinder

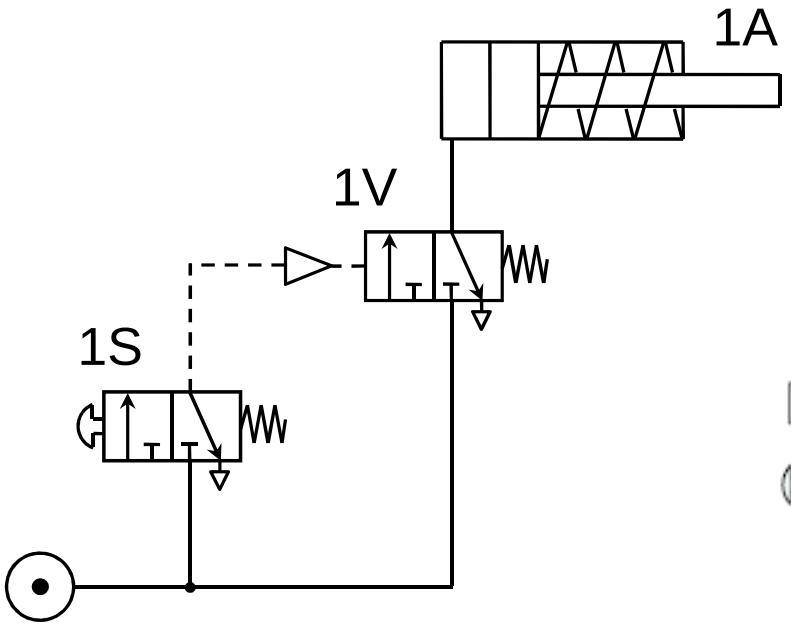
Single-acting cylinder

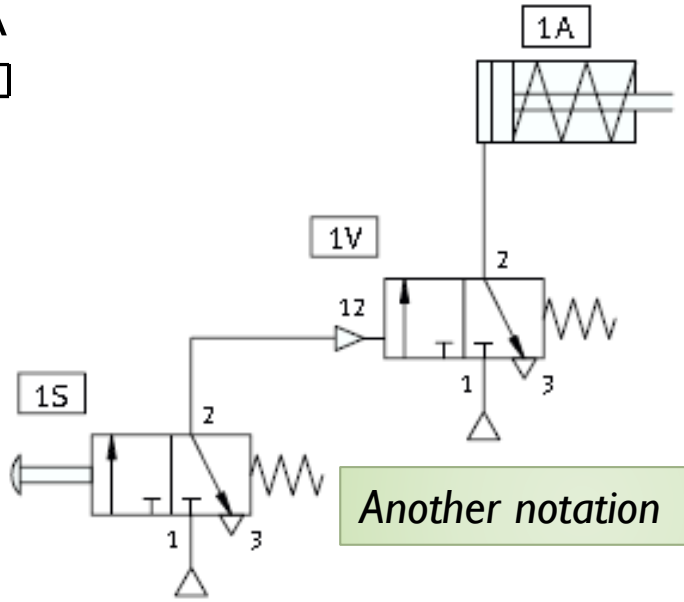
- Perform work in only one direction
- Return position via spring
- Air supply port, vent hole

3/2-Way valve

- 3 Working ports, 2 switching positions
- Pneumatically actuated, spring return

1V	*main Valve*
1S	*Sensor valve*
1A	*Working cylinder*

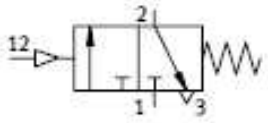


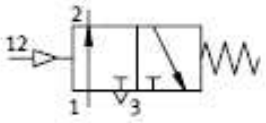


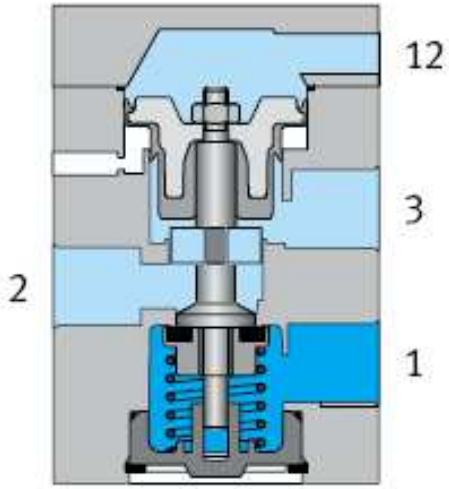
Another notation

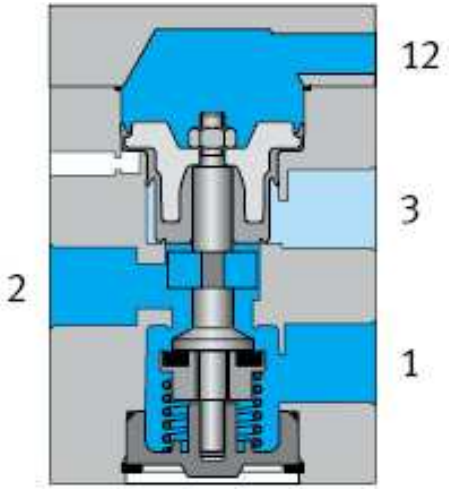
Indirect actuation of Double-acting cylinder

- 3/2-Way valve, pneumatically actuated









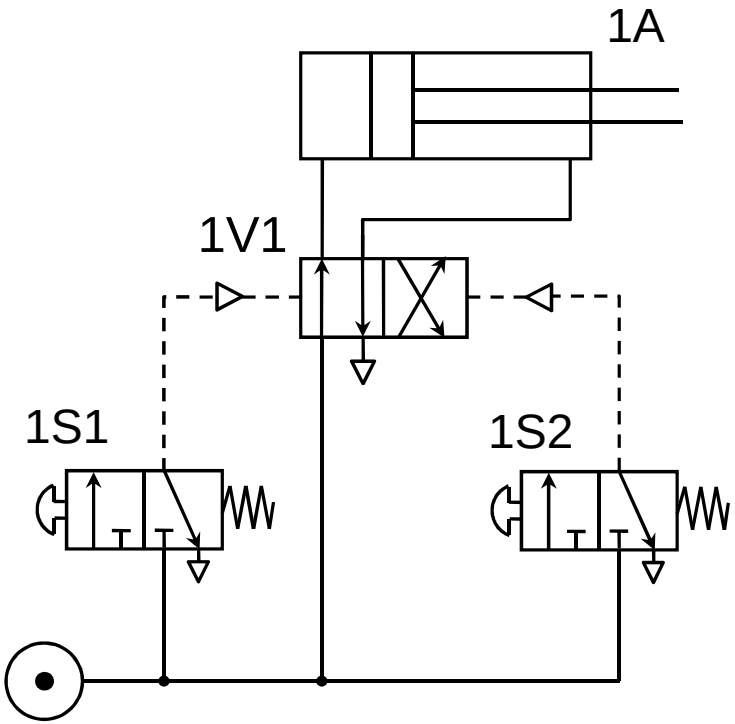
Indirect actuation of Double-acting cylinder

Double-acting cylinder

- Perform work in both direction
- 2 air supply port

5/2-Way valve

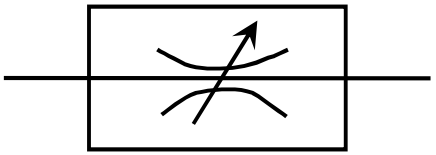
- 5 Working ports, 2 switching positions
- Pneumatically actuated



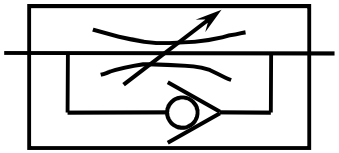
1V1 main Valve
1S1 Sensor valve
1S2 Sensor valve
1A Working cylinder

SPEED CONTROL

- Flow control valve (throttle valve), adjustable



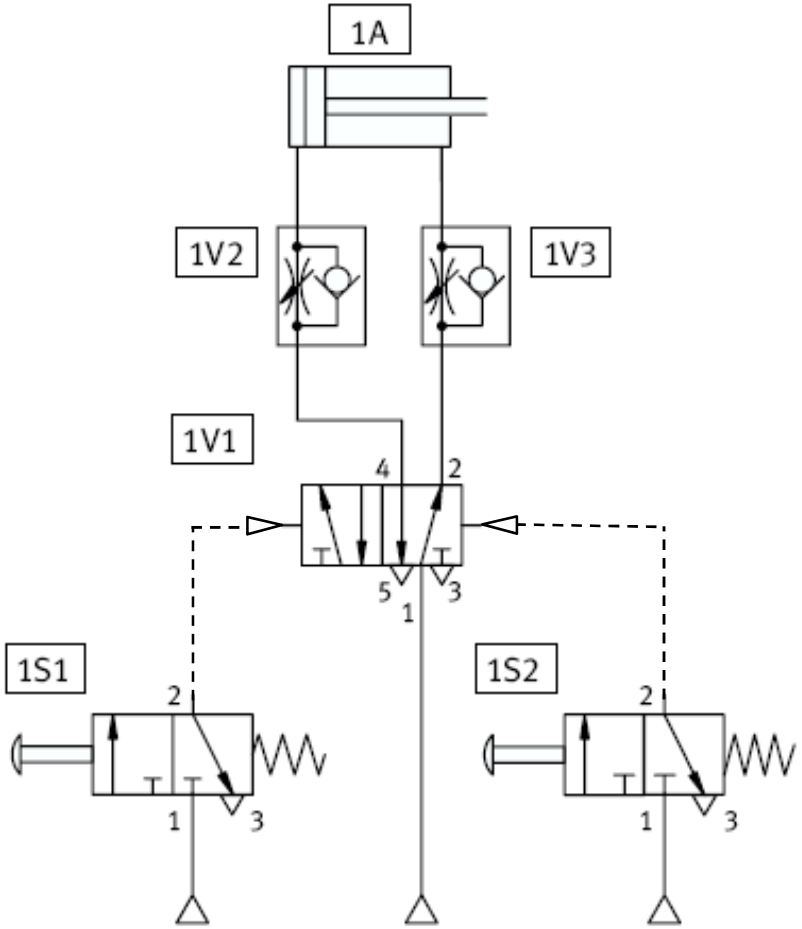
- Non-return valve
  One way flow control valve



Circuit Diagram: 5/2-Way Double Pilot Valve

SPEED CONTOL

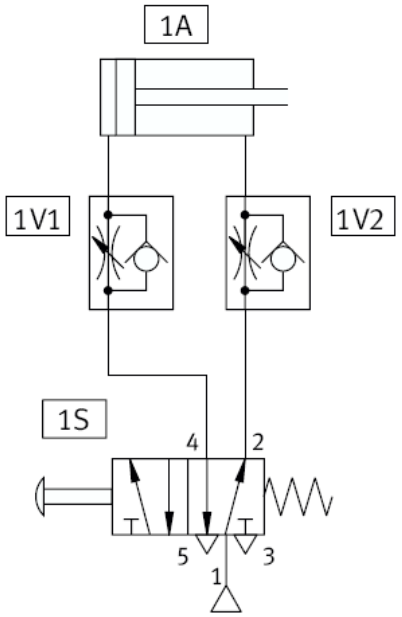
- The piston rod of a double-acting cylinder is to move out upon manual actuation of a 3/2-way valve.
- The piston rod is to remain in its extended position until a second valve is actuated.
- After actuation of the second valve, the piston rod then moves back into its initial position.
- The piston speed should be adjustable in both directions.



Exhaust air flow control

Supply and Exhaust Air Flow Control

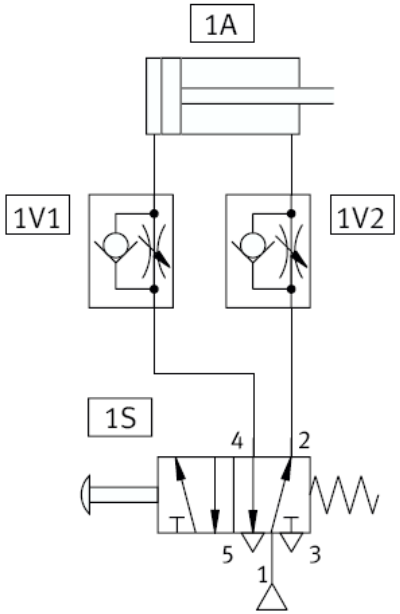
Supply air flow control



- The compressed air flowing to the cylinder is throttled.
- The exhaust air flowing out of the cylinder through the non-return valve is not throttled.
- In the case of load variations on the piston rod (for example, travel over a limit switch), this will cause irregularities in the advance speed.

Use: Single-acting cylinder

Exhaust air flow control

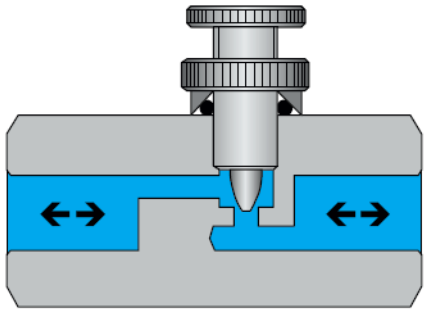


- The compressed air flowing to the cylinder through the non-return valve is not throttled.
- The exhaust air flowing out of the cylinder is throttled.
- The piston is held between two air cushions.
- Improved advance/return stroke behavior

Application: Double-acting cylinder

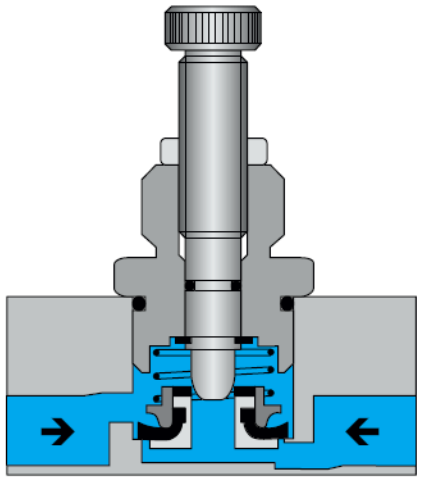
Flow control Valve

Flow Control Valve



- Influences the volumetric flow of compressed air
- Most flow control valves can be adjusted; the adjustment can be set.
- Never close flow control valves completely.
- Supply air or exhaust air throttling of cylinders
- Setting of signal delays

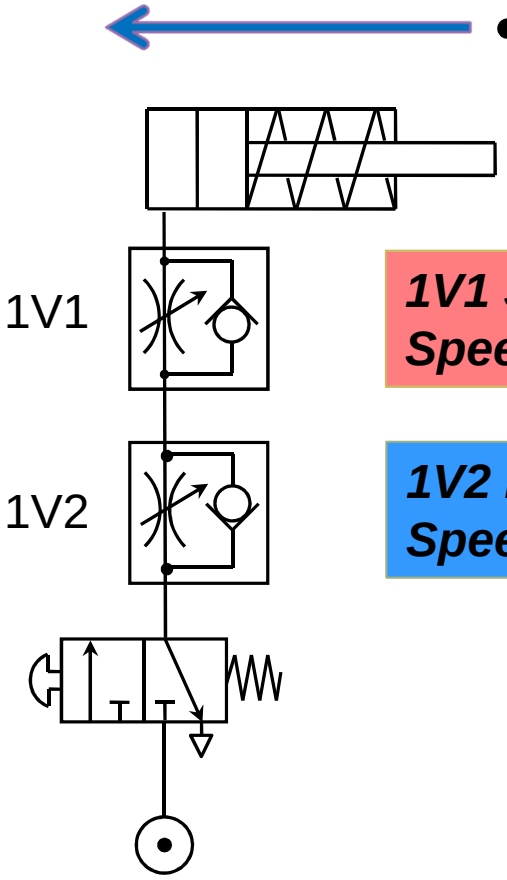
One-Way Flow Control Valve



- Valve combination of a flow control valve and a non-return valve
- Permits free flow in one direction, but the compressed air can only flow through the cross-section set in the opposite direction
- Installation directly on the cylinder or as close as possible to the cylinder

Source: FESTO

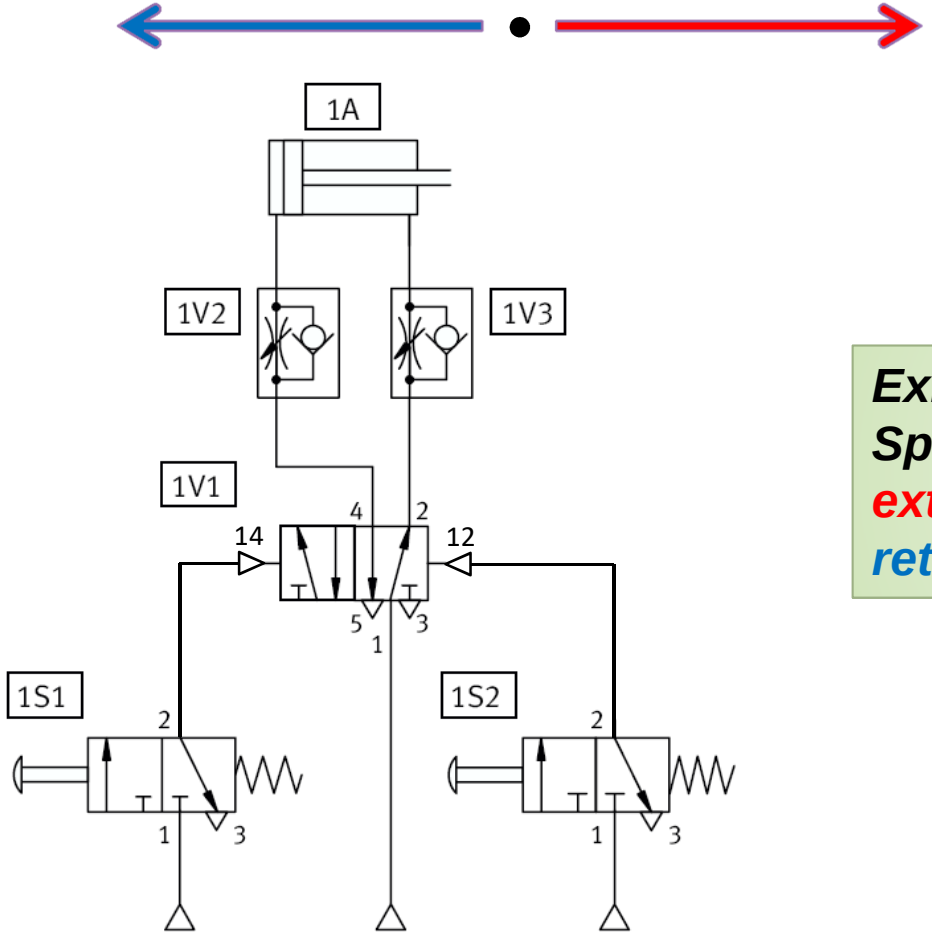
Speed control
Single-acting cylinder



1V1 Supply air flow control
Speed control of extending movement

1V2 Exhaust air flow control
Speed control of retracting movement

Speed control
Double-acting cylinder



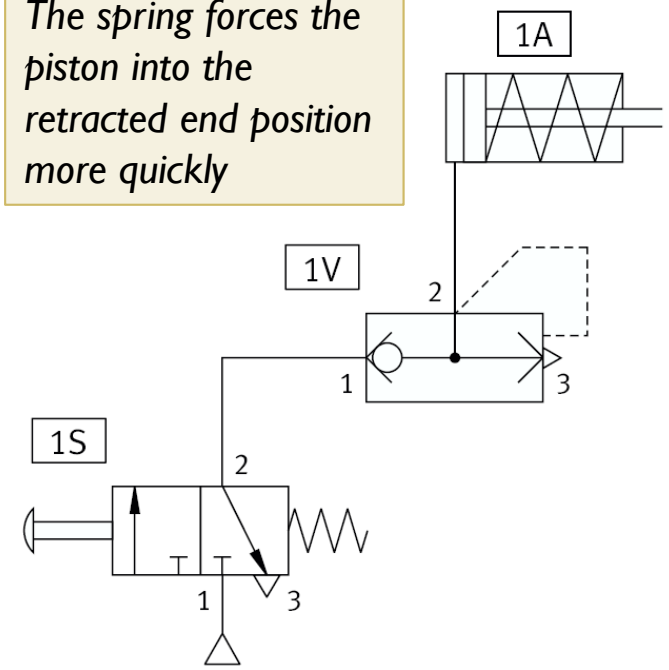
Exhaust air flow control
Speed control of both
***extending* and**
***retracting* movement**

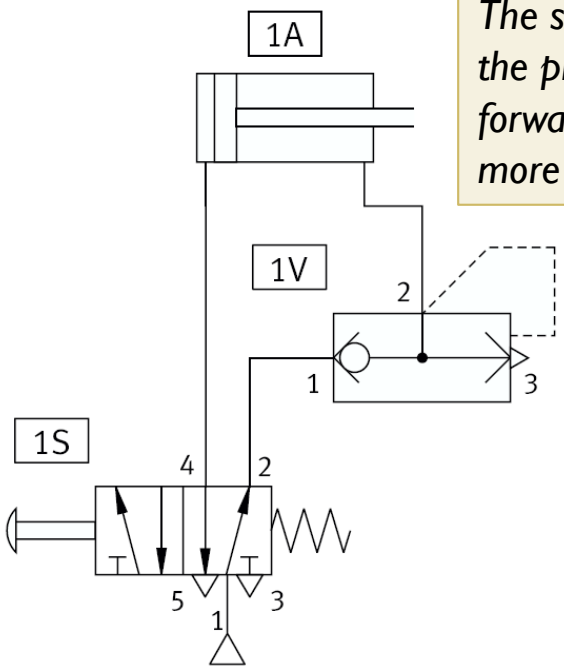
Quick Exhaust Valve

Circuit Diagram

- Increases the piston speed of cylinders
- The flow resistance of the exhaust air is reduced
- Installation – directly on the cylinder
  with a short piece of tubing

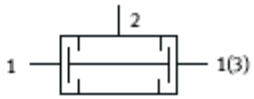
The spring forces the piston into the retracted end position more quickly

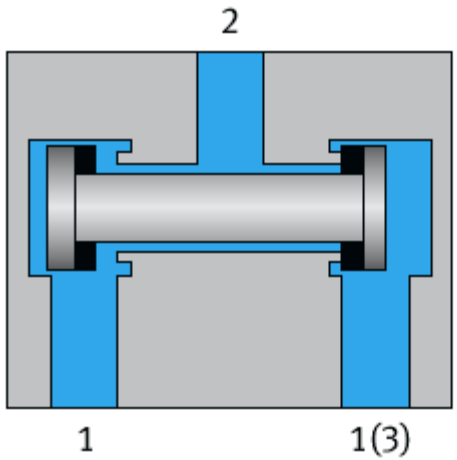


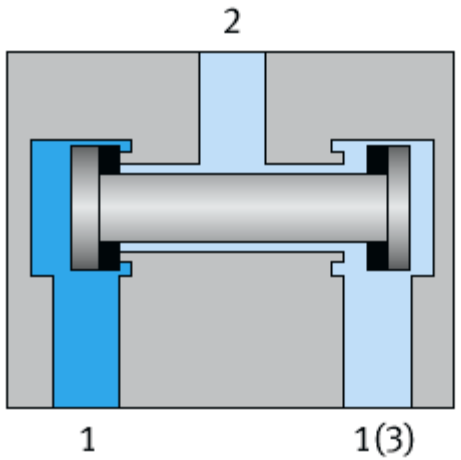


The supply air forces the piston into the forward end position more quickly

Dual-Pressure Valve (AND Function)





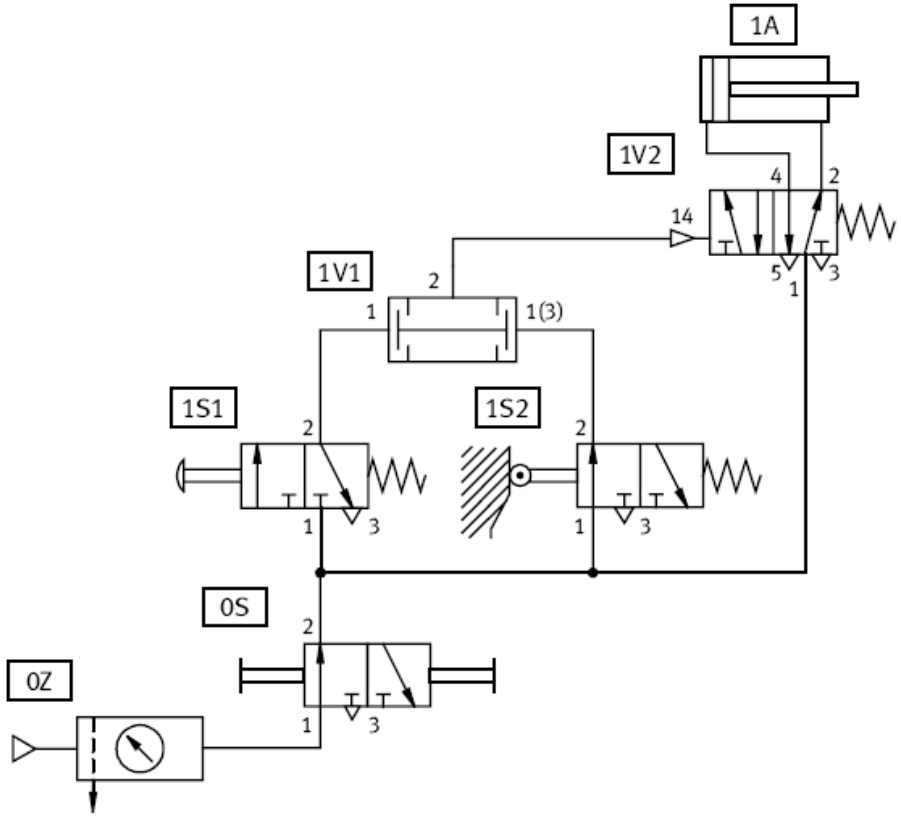


Source: FESTO

Dual-Pressure Valve (AND function)

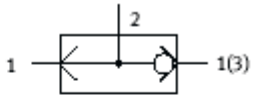
Circuit Diagram

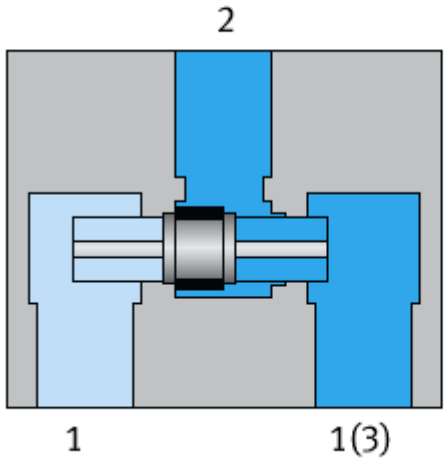
- The piston rod of a double-acting cylinder is to advance when the 3/2-way roller lever valve 1S2 is actuated and the pushbutton of the 3/2-way valve 1S1 is pressed.

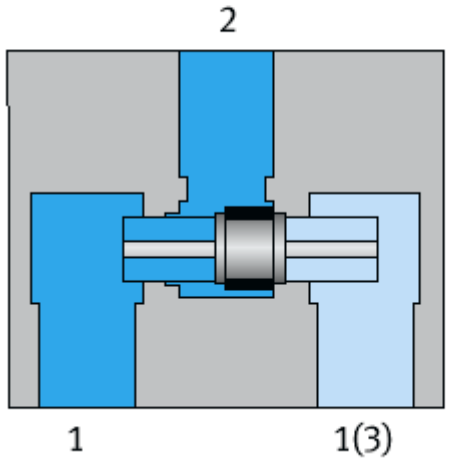


- The cylinder is return to the initial position when the roller lever or the pushbutton is released.

Shuttle Valve (OR Function)





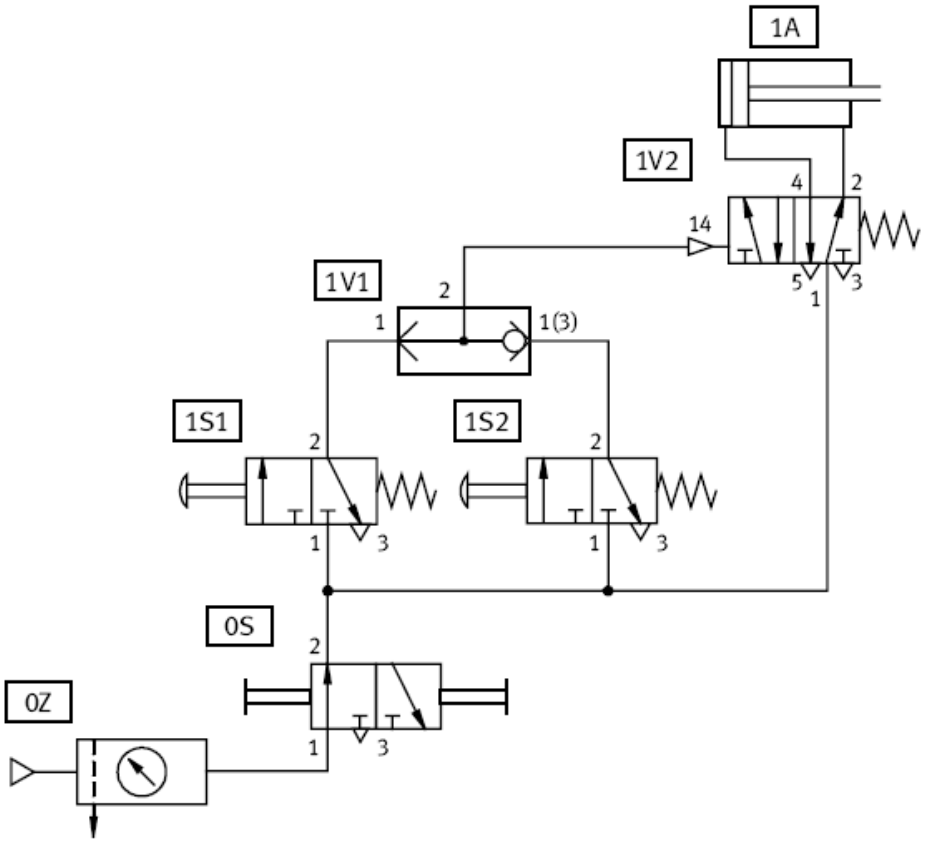


Source: FESTO

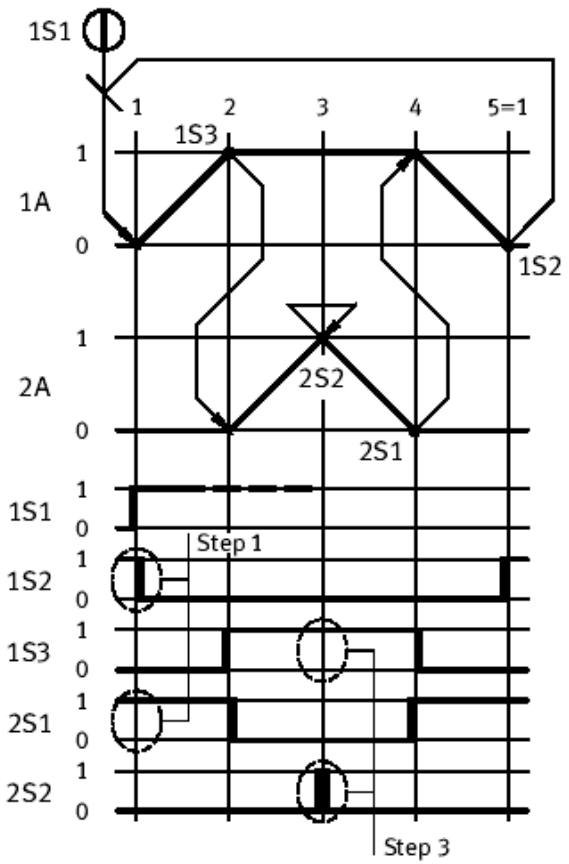
Shuttle Valve (OR Function)

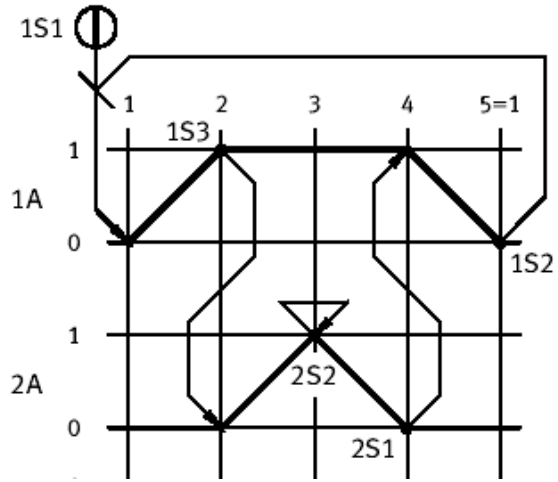
Circuit Diagram

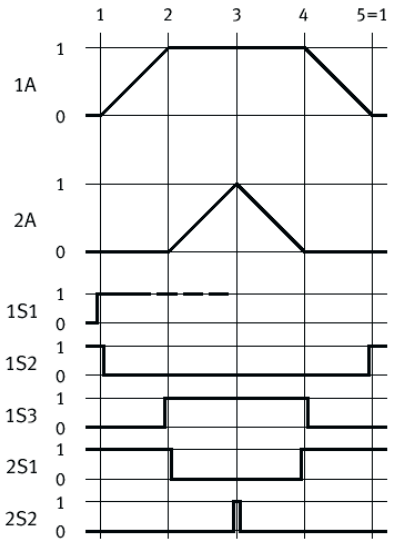
- The piston rod of a double-acting cylinder is to advance if one of the two pushbuttons is actuated.



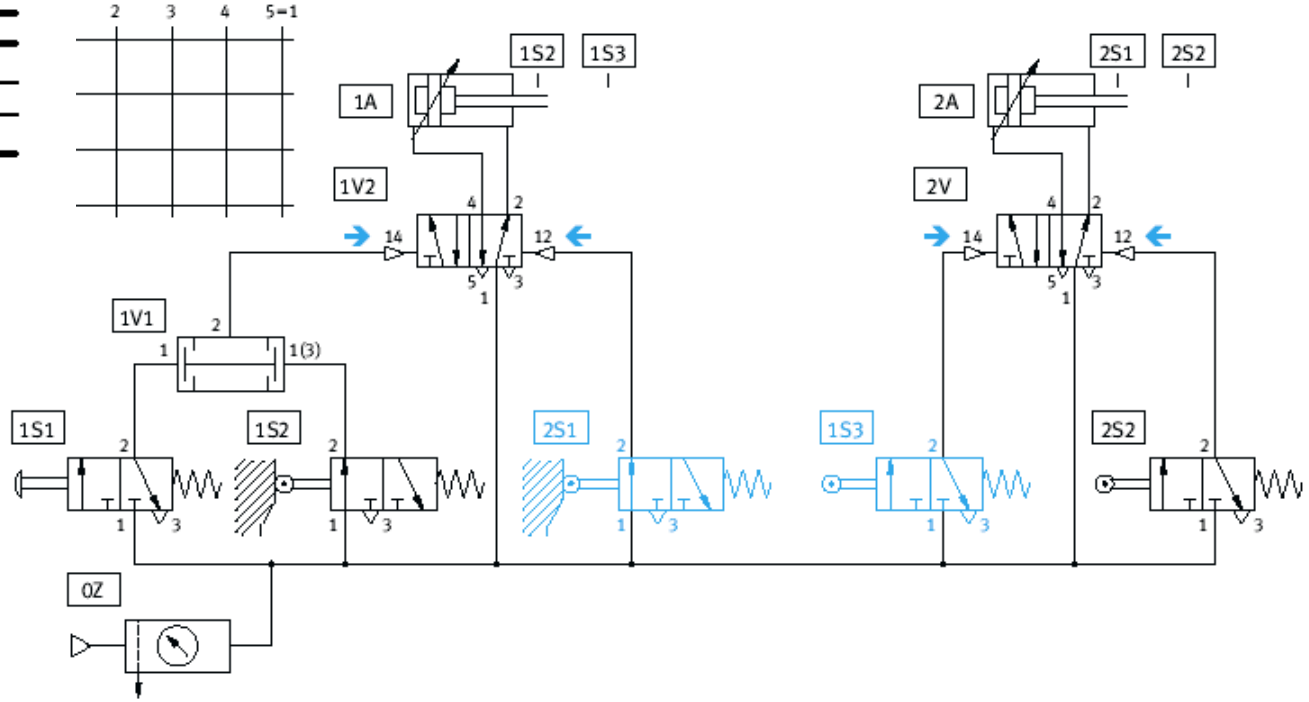
- The piston rod is to return when the pushbutton is released.





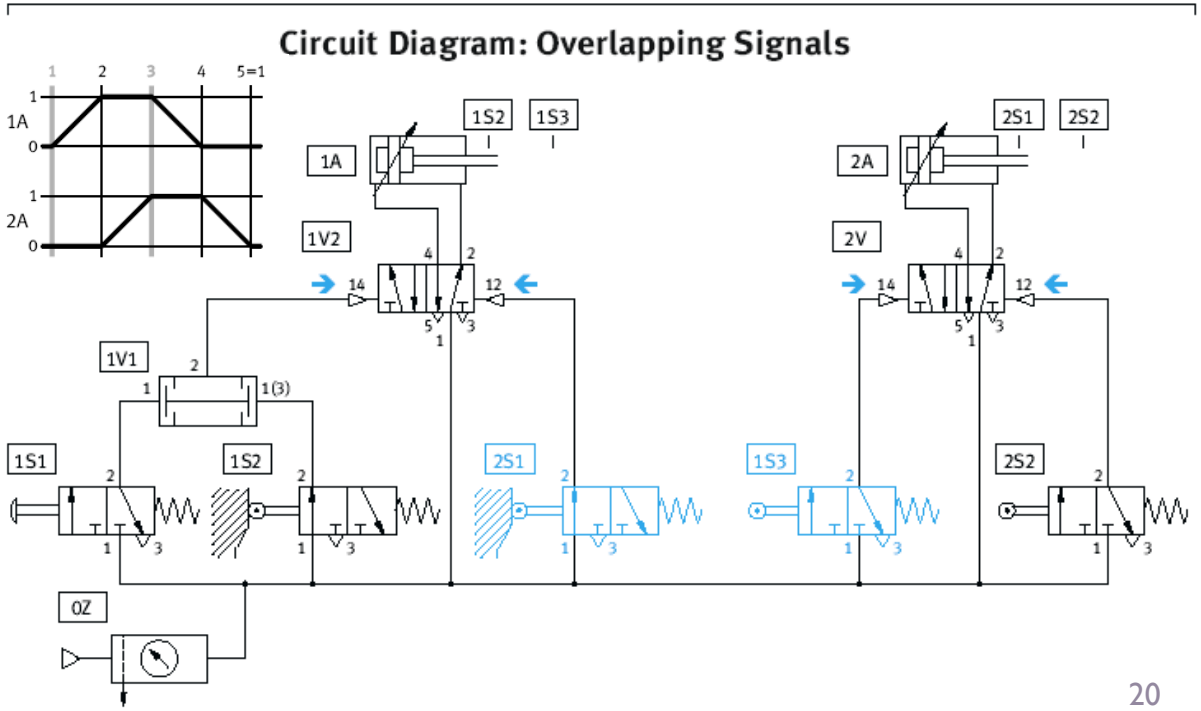


Circuit Diagram: Overlapping Signals



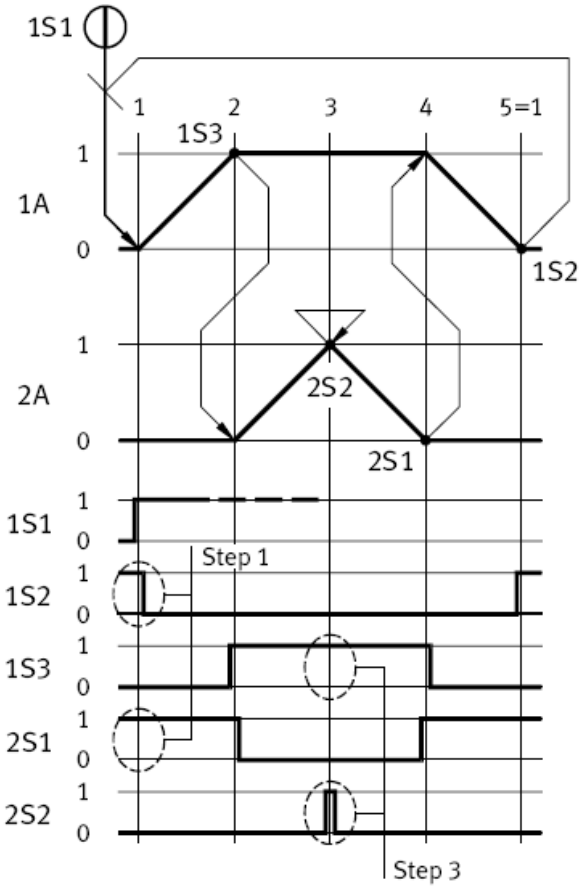
Circuit Diagram: Overlapping Signals

- If signals are applied simultaneously to the two pilot ports of a double pilot valve, the switching of the valve is prevented. This is called signal overlapping. The signal first applied is dominant.
- Possible Solutions
  Signal suppression
  - Differing control surfaces
  - A pressure regulator built into a pilot line
- Signal Switch off
  - Roller lever valve with idle return
  - Signal shortening
  - Reversing valve
  - Sequencer

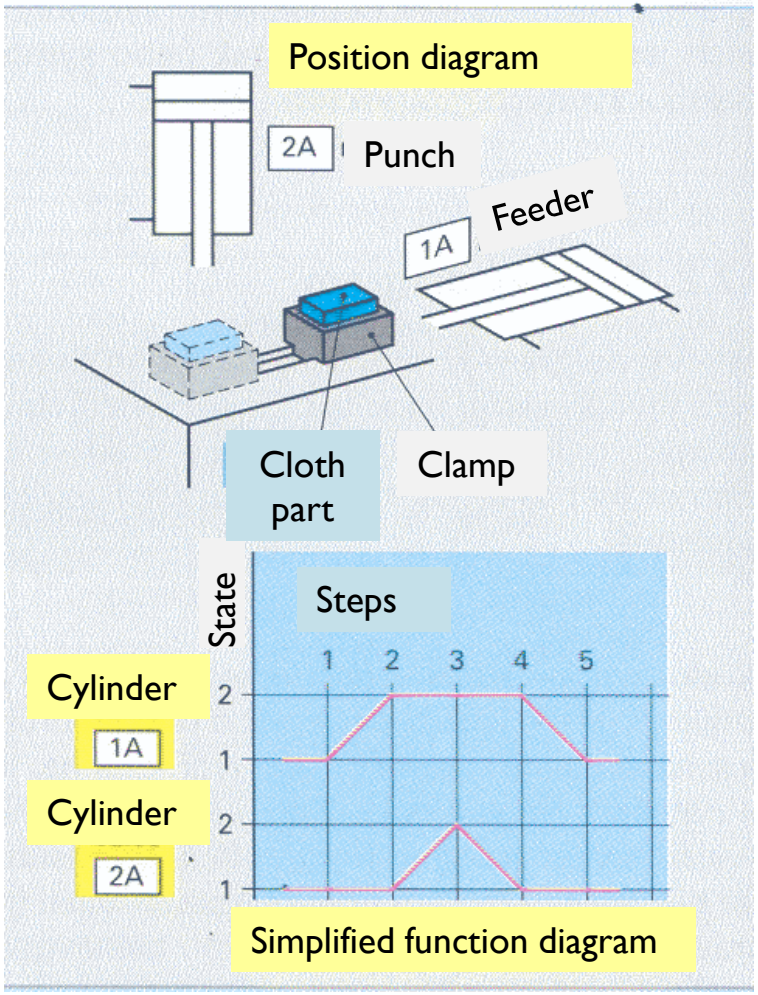


Function Diagram: Overlapping Signal

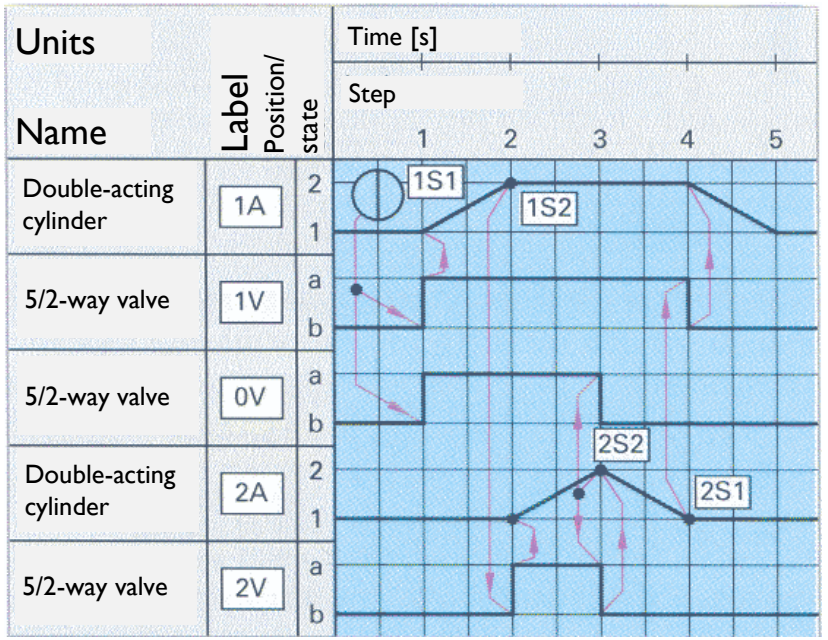
- Step 1
  - Start button 1S1 is actuated; a signal is applied at both inputs of the dual pressure valve 1V1.
  - A signal is applied to pilot port 14 of the control element 1V2.
  - The control element 1V2 cannot switch as a signal is also applied to pilot port 12 by actuating the limit switch 2S1.
- Step 3
  - The extended piston rod of cylinder 2A actuates the limit switch 2S2 and a signal is applied to pilot port 12 of control element 2V.
  - The control element 2V cannot switch as a signal is applied to the pilot port 14 by actuating the limit switch 1S3.

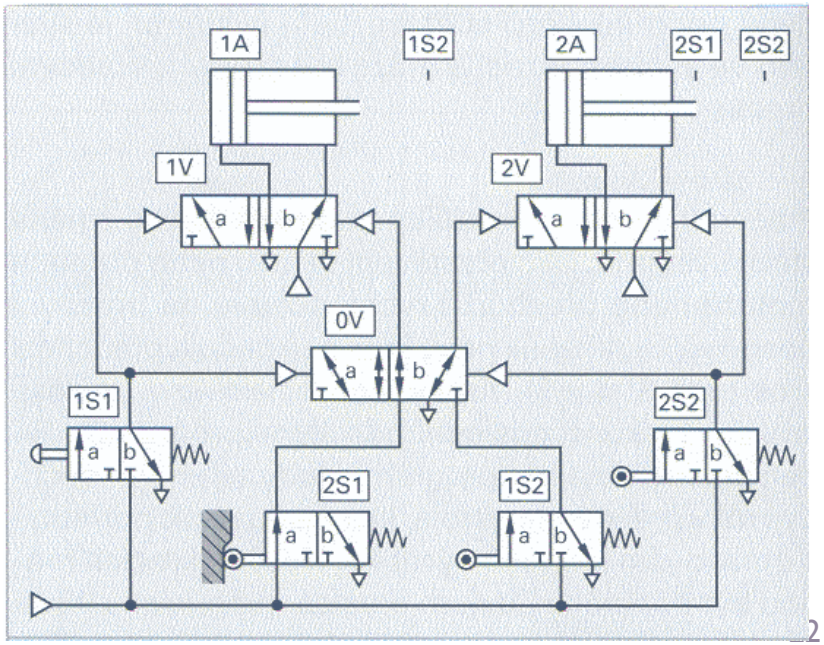


The double-acting cylinder 1A moves the feeder with the clamp into which the cloth part is manually inserted and clamped, which is inserted under the cylinder 2A with a punch that applies decorative press studs. It is extended again after punching and manually removed after releasing the clamp. Design pneumatic control.



Units / Name	Label	Position/ state
Double-acting cylinder	1A	2 1
5/2-way valve	1V	a b
5/2-way valve	0V	a b
Double-acting cylinder	2A	2 1
5/2-way valve	2V	a b





Next to the button, the **zip fastener** is the most important fastening accessory. For lightweight and fine fabrics plastic zippers should be used. For trousers, the tab of the slider has a locking tooth. Metal zippers for sporting goods are broad and firm. Single and double sided zippers are used in leisure and sportswear.

Velcro® fastenings have one surface covered with small nylon hooks and an opposite surface covered with loops.

Hooks and eyes in a wide range of sizes and types are used for trousers, skirts, dresses and foundation garments.

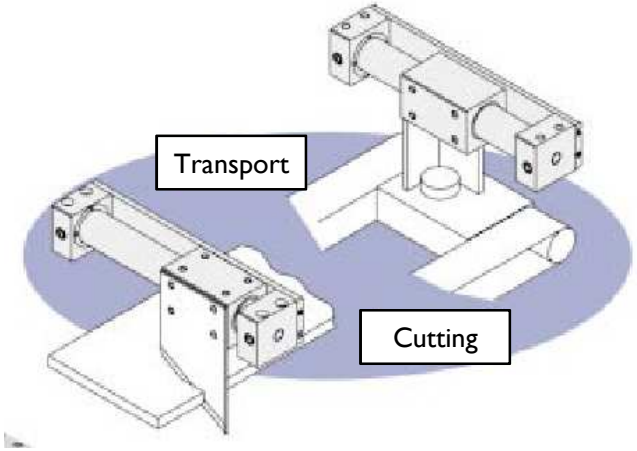
Press studs in various sizes are made from metal or plastic. The type which require no stitching are practical and economic.

Buckles and clasps are made from metal, leather or plastic. They are used to fasten narrow articles such as belts and suspenders.

Rodless Cylinders

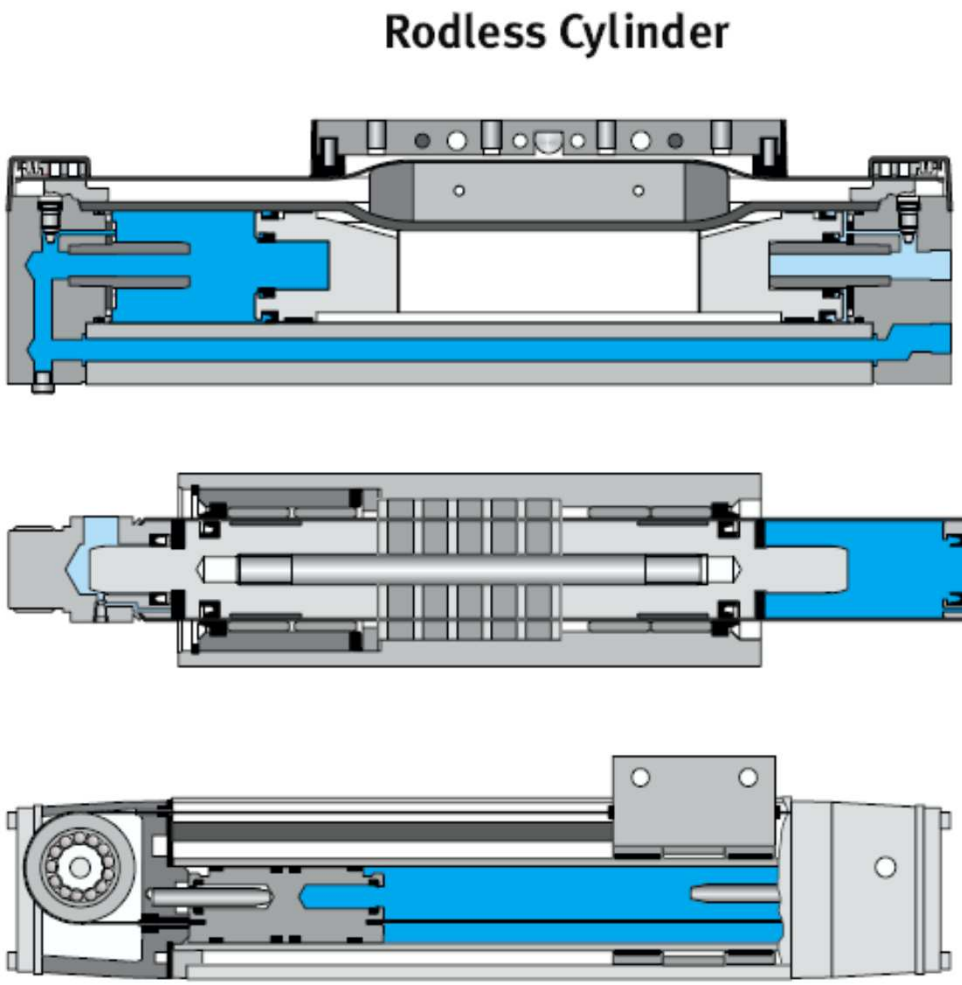
- rodless cylinder - the connection of the piston with the slider on the cylinder tube is ensured by a magnet
- smaller (in straightening with piston rod cylinders), small dimensions in cross section
- the force of the magnetic clutch is about 30% higher than the force of the cylinder at a pressure of 1.0 MPa
- diameters 6 ÷ 63 mm, strokes up to 6 000 mm (depending on type)

http://www.smc.cz



Closed construction

Rodless Cylinder



Sealing band cylinder with slotted cylinder barrel

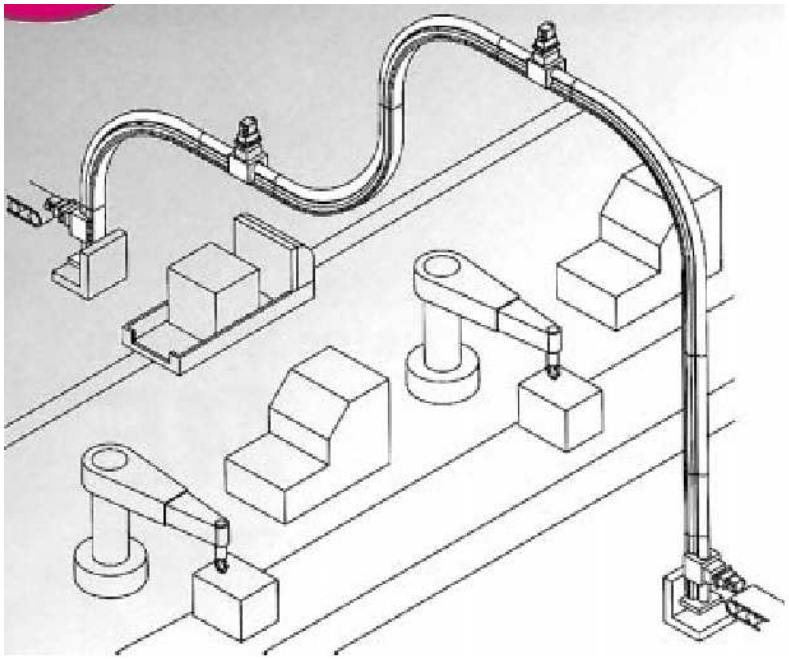
Cylinder with magnetically coupled slide

Belt or cable pulley cylinder

VIDEO *https://learnchannel-tv.com/pneumatics/cylinder/* *4:46 – 7:23*

Three-axis pneumatic conveying system

- *transport system for a route with curves on the principle of a rodless cylinder*
- *great variability thanks to various modular elements*
- *ø 15 mm – max. load 2 kg, ø 32 mm – 10 kg*
- *piston speed 50 ÷ 2 000 mm/s*



Literature

- FESTO Fundamental of Pneumatics TP101. Festo Didactic, study materials