

Hydraulics & Pneumatics

Chapter 3: Pneumatics (Design of Pneumatic Circuit)

by

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Lesson Outcome

- By the end of this lecture, student should be able to:
 - Design and analyze basic pneumatic circuit for single cylinder

Content

- Pneumatic System Development
- Direct and Indirect Control
- OR and AND Logic

Development of Pneumatics System

- Based on :
 - Understanding the problem by considering **type** and **quantity** of components
 - Number of process*
 - * Each process is represented by one cylinder (actuator)

Development of Pneumatics System

- Understand the problem step by step:
 - Identify **type** of cylinder
 - Identify the **right control valve** for selected cylinder
 - Identify **methods** to **start** the operation
 - Identify **methods** to **stop** the operation
 - Identify other parameters (if needed)

Direct control

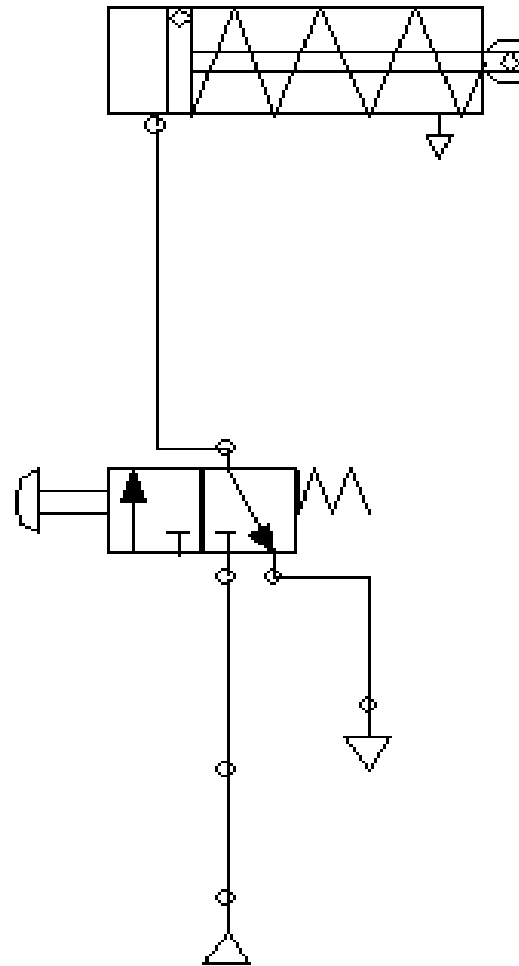


SINGLE
ACTUATOR
CIRCUITS



Indirect control

The circuit design



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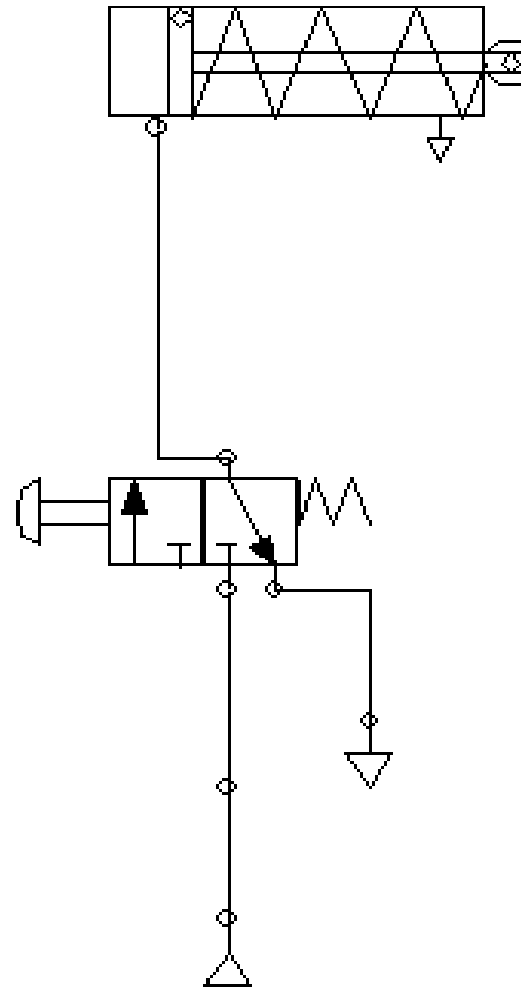
Direct control

- Actuated directly via mechanical valve, without intermediate switching
- Limits:
 1. Piston diameter < 40 mm
 2. Valve with connection size $< 1/4$ "
- When the specification is not mention, the indirect control is used.

Solve problems

- Solution:
 - Identify type of cylinder
 - Single acting with spring return
 - Identify right control valve for selected cylinder
 - 3/2 way valve (for single acting)
 - Identify methods to start the operation
 - Push button (3/2 way with spring)
 - Identify methods to stop the operation
 - Push button (release the start button)
 - Identify others parameter (if needed)
 - NIL

The circuit design



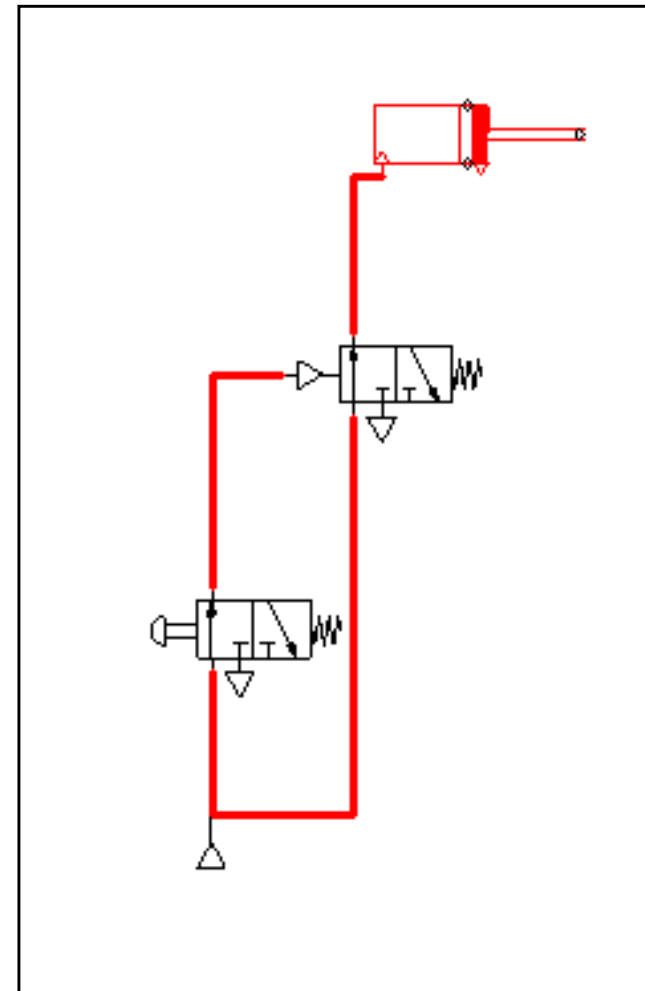
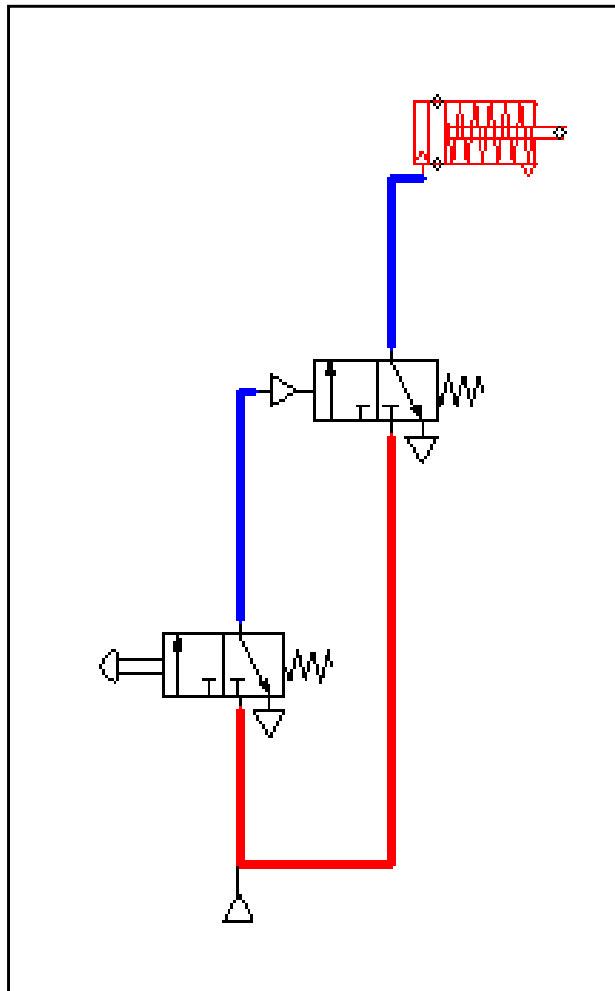
Indirect control

- Used when the force should prove too high for manual actuation of valve (for large piston diameter)
- Signal is generated via smaller valve

Solve problems

- Solution:
 - Identify type of cylinder
 - Single acting with spring return
 - Identify right control valve for selected cylinder
 - 3/2 way valve (for single acting)
 - Identify methods to start the operation
 - Push button (3/2 way with spring) activate control valve
 - Identify methods to stop the operation
 - Push button (release the start button)
 - Identify others parameter (if needed)
 - NIL

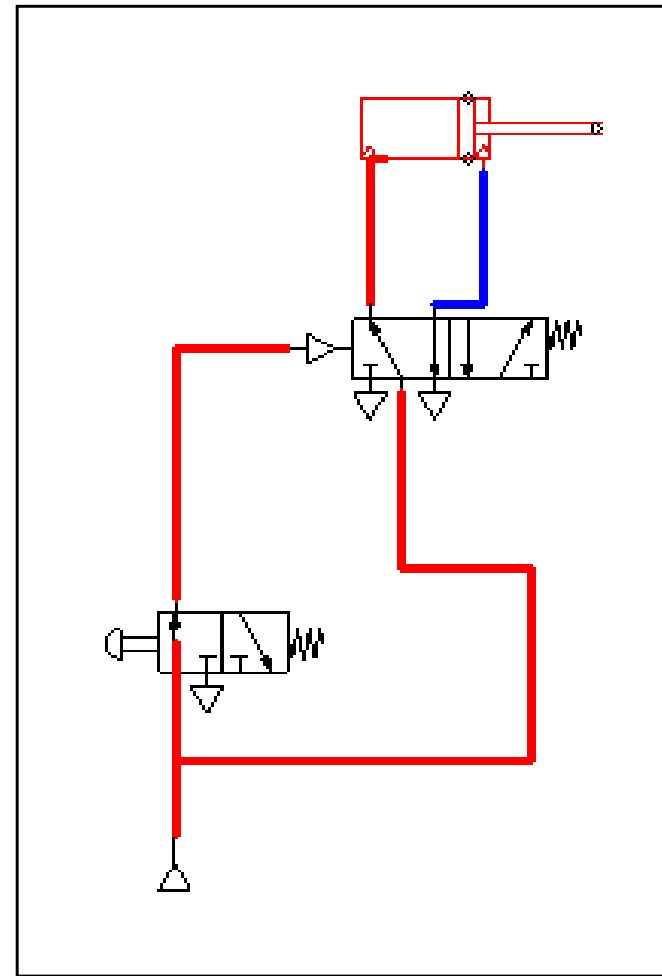
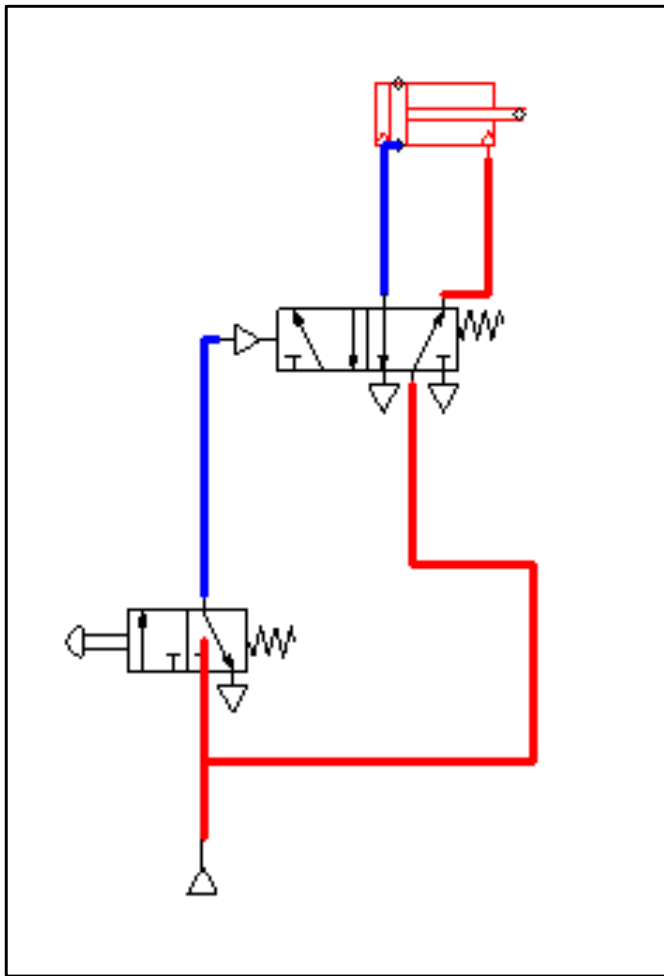
Single Acting Cylinder (3/2 way)



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Double Acting Cylinder (5/2 way)

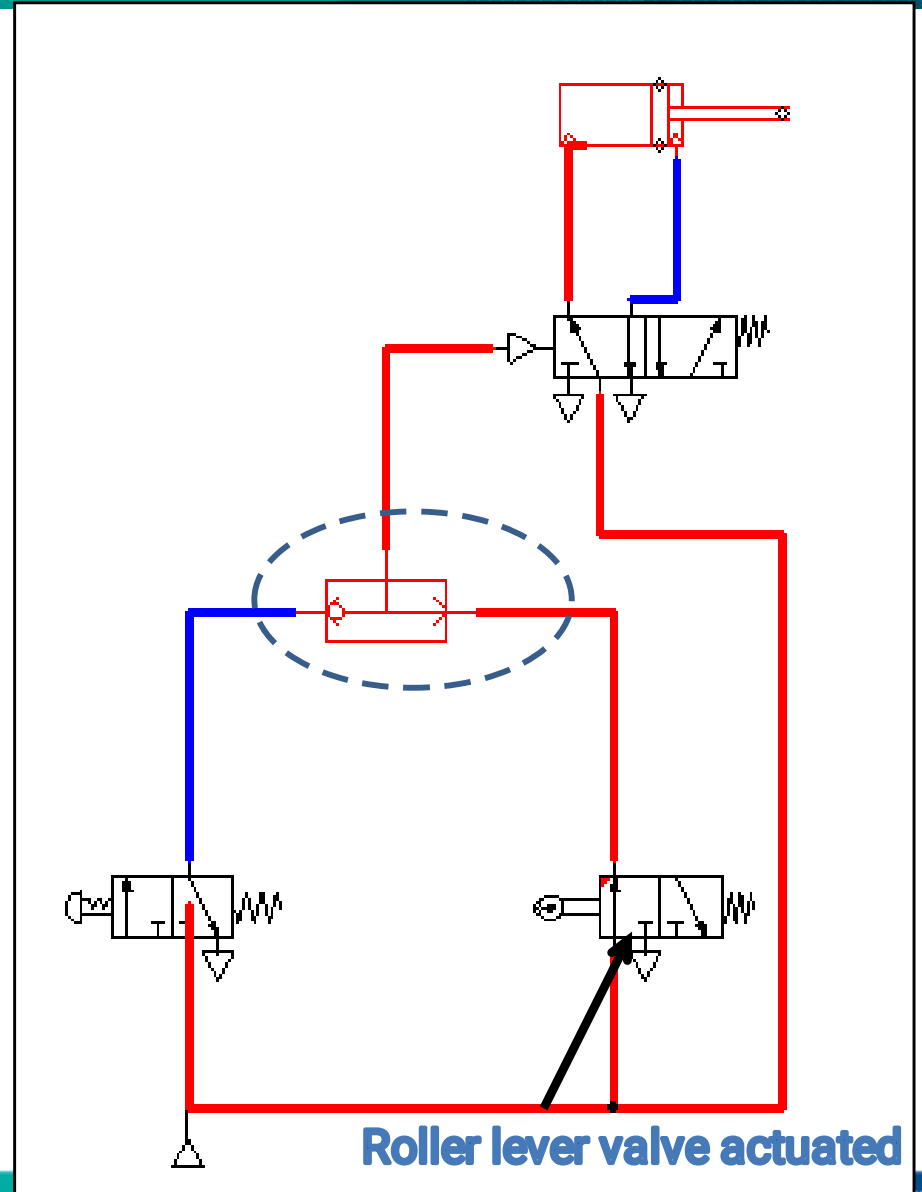
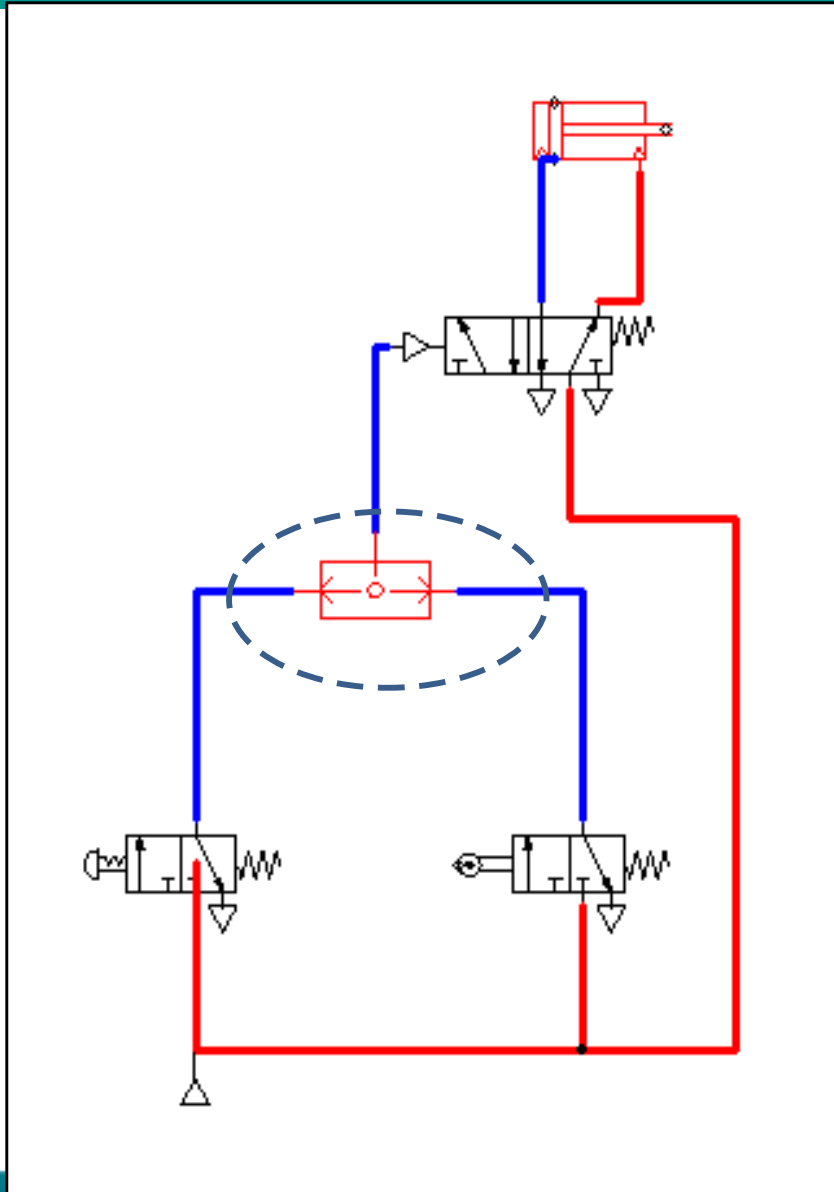


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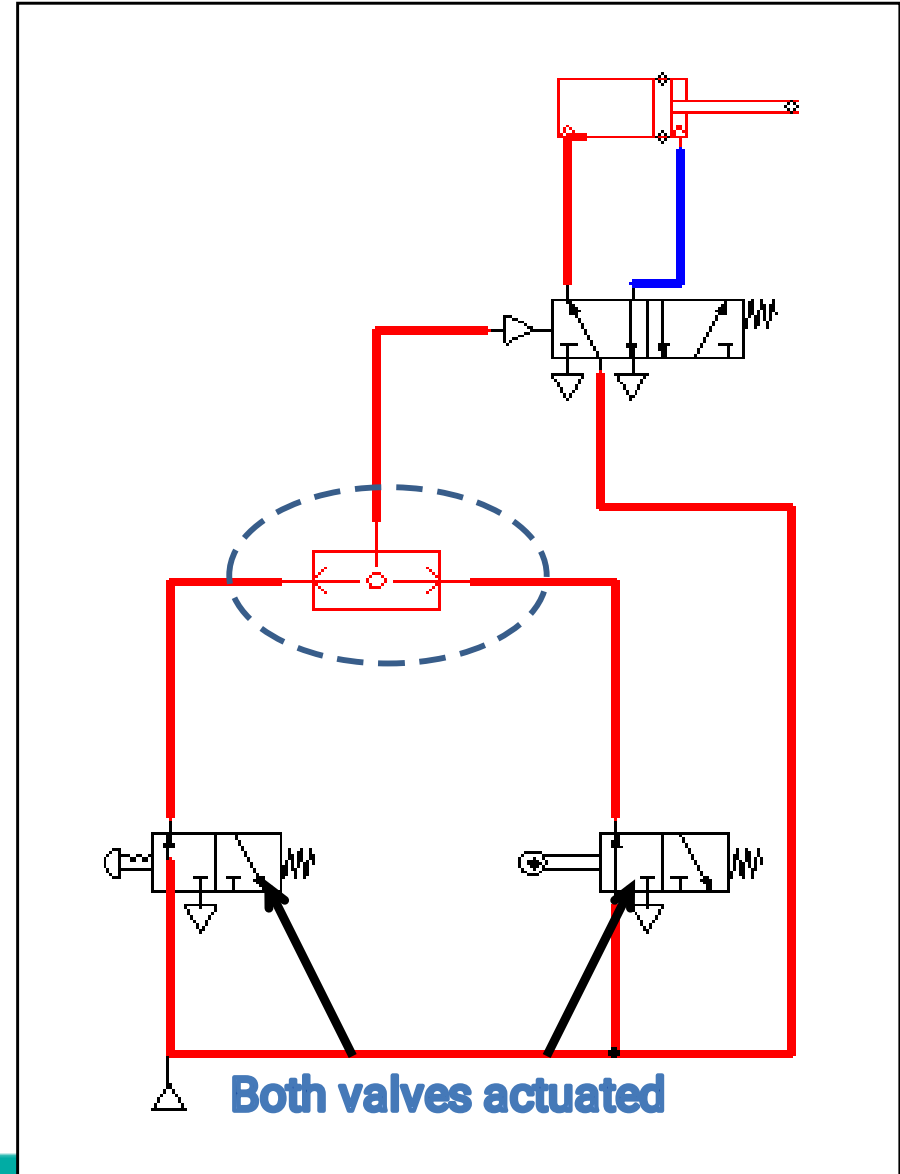
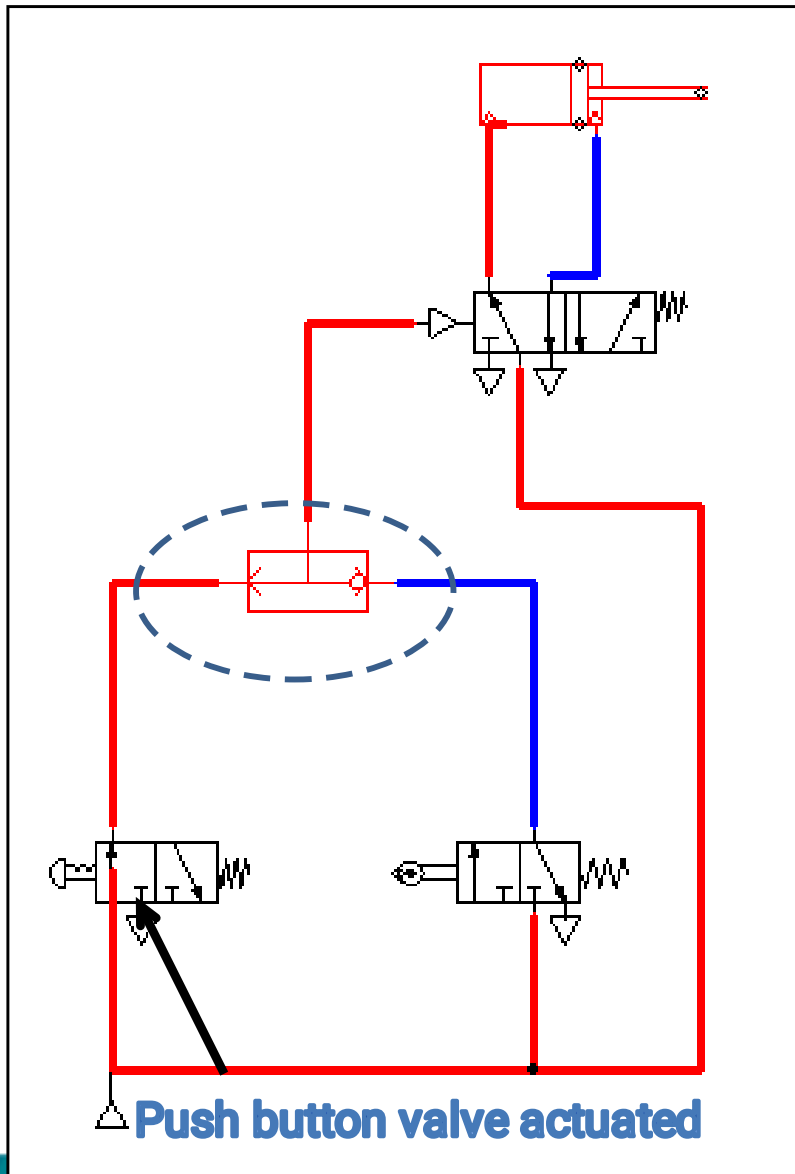
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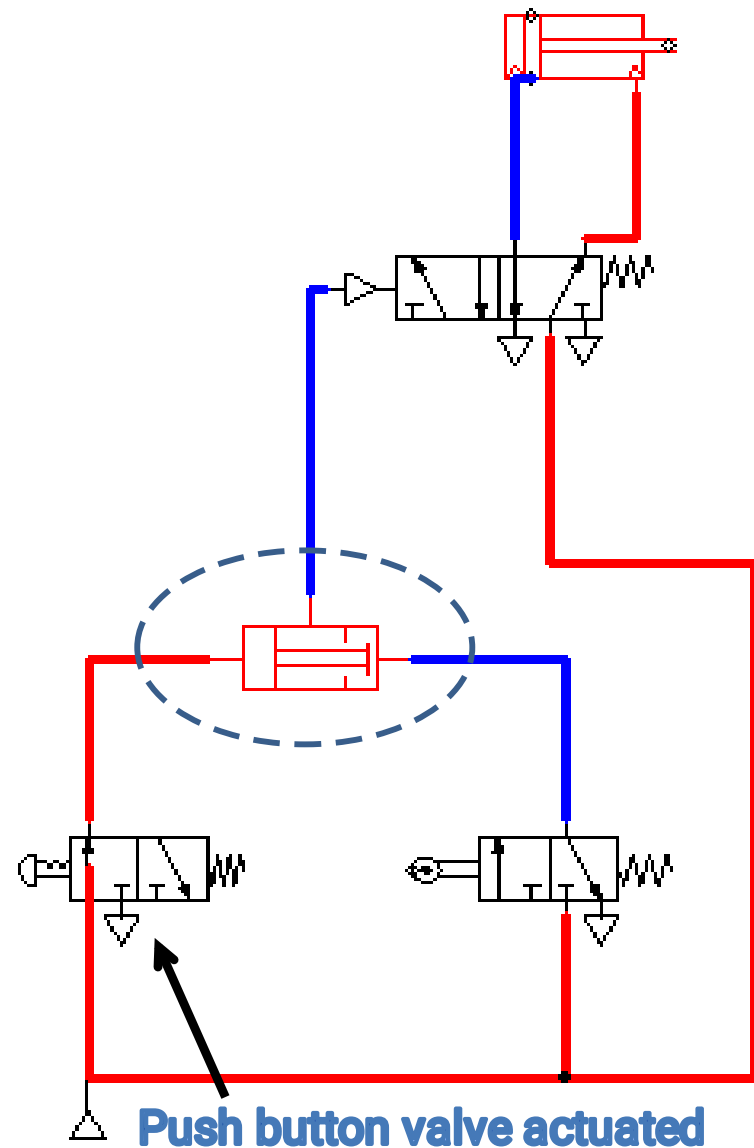
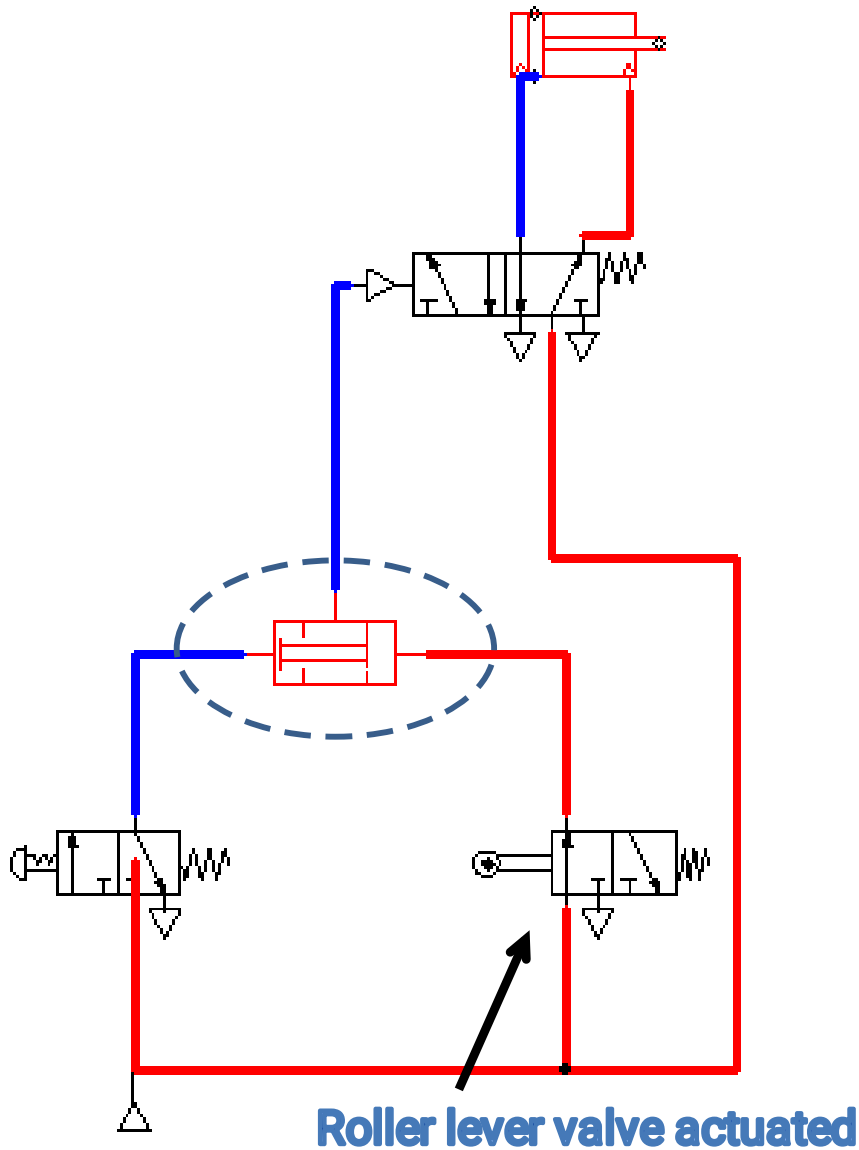
Logic OR function circuit



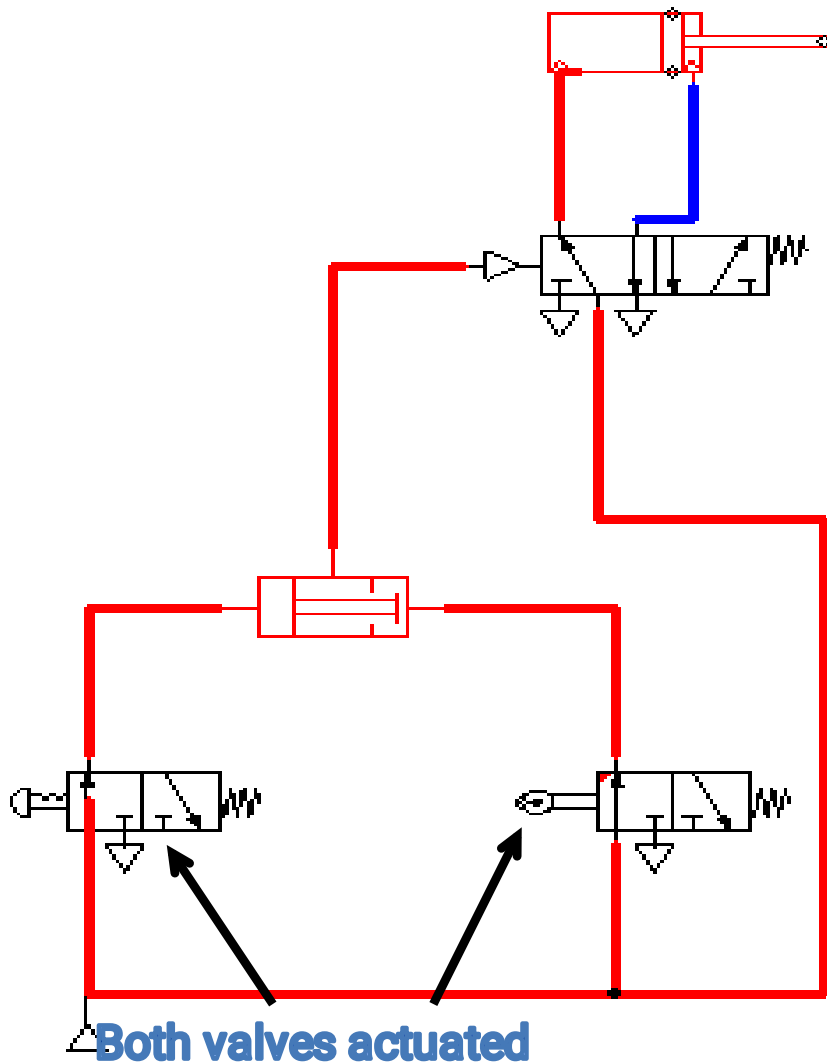
Logic OR function circuit



Logic AND function circuit



Logic AND function circuit



Go to: <http://www.logiclab.hu/index.php>

Lesson Summary

- In this lesson, you have learn how to design and analyze basic pneumatic circuit for single cylinder