BITS Pilani
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Tutorial 1- Hydraulics

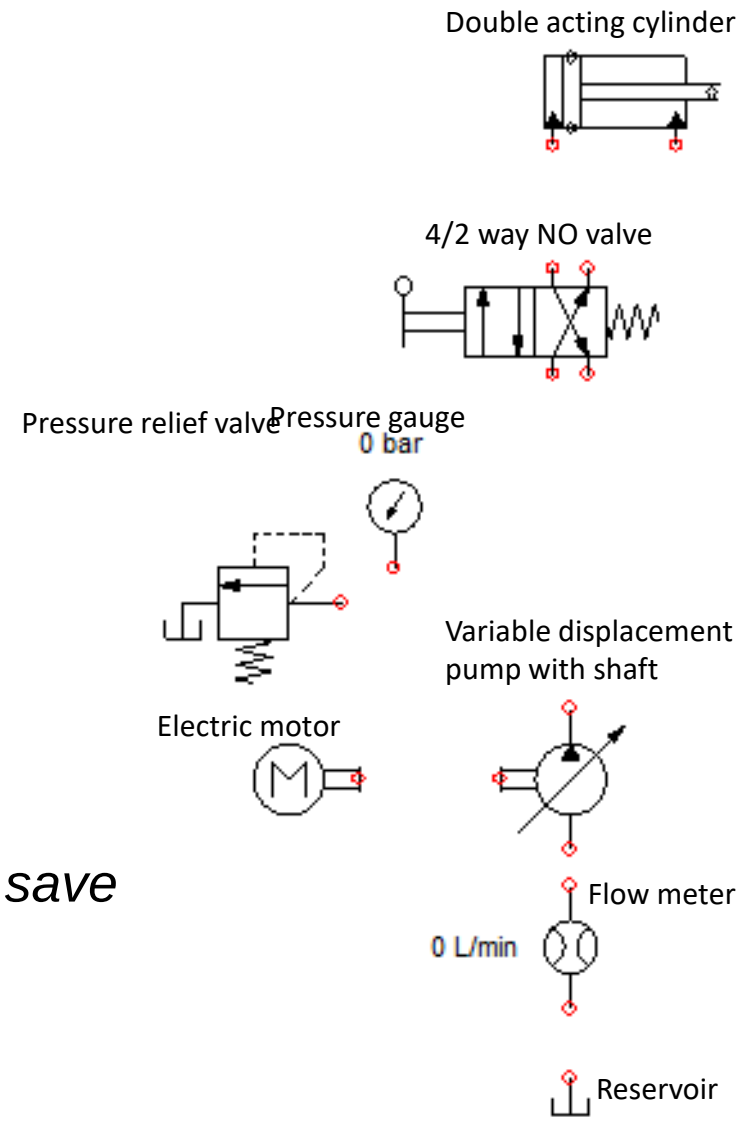
Tutorial Problems

Practice problems for 2 hours of practice in Virtual Lab

- Tutorial 1 Hydraulic Circuits
  - 1A - Basic hydraulic circuit (one cylinder)
  - 1B – Basic hydraulic circuit (two cylinders)
  - 1C - Basic electro-hydraulic circuit
  - 1D - Hydraulic circuit with proportional valves

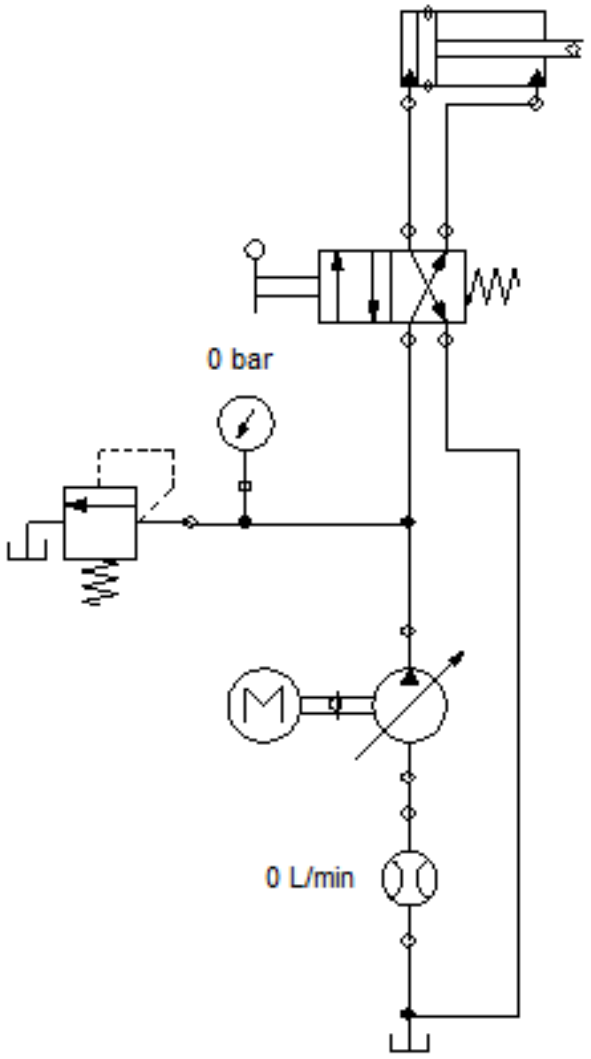
Tutorial 1A- Basic hydraulic circuit (1 cylinder)

- Open Automation Studio 6.3 Educational software
- Click File → New Project (click No for saving the existing project → Default (double click)
- Click Home button once the software opened
- Select Document → Standard Diagram → and Double click Default
- Drag the following components from the library shown in figure
  - Variable displacement pump with shaft Hydraulic (Pumps and Amplifiers)
  - Electric motor and shaft (Power units and mechanical components)
  - Hydro static reservoir (Reservoirs)
  - Double acting cylinder (Actuators)
  - 4/2 way NO valve (Directional valves → 4/2 way valves)
  - Relief valve (Pressure valves → Pressure relief valves → Relief valves)
  - Pressure gauge and flow meter (Measuring instruments)
- Connect the joints and simulate
- Save the project as Tutorial1A and *(create folder with your BITSID and save all projects inside the same folder only)*
- Post processing (next slide)

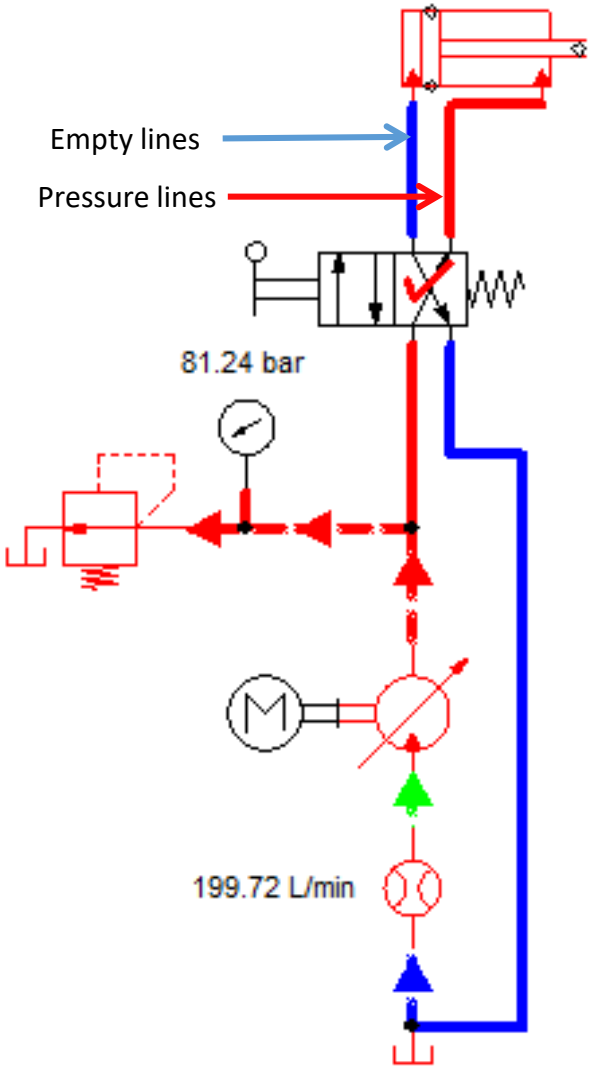


Tutorial 1A- Basic hydraulic circuit (1 cylinder)

After Connection

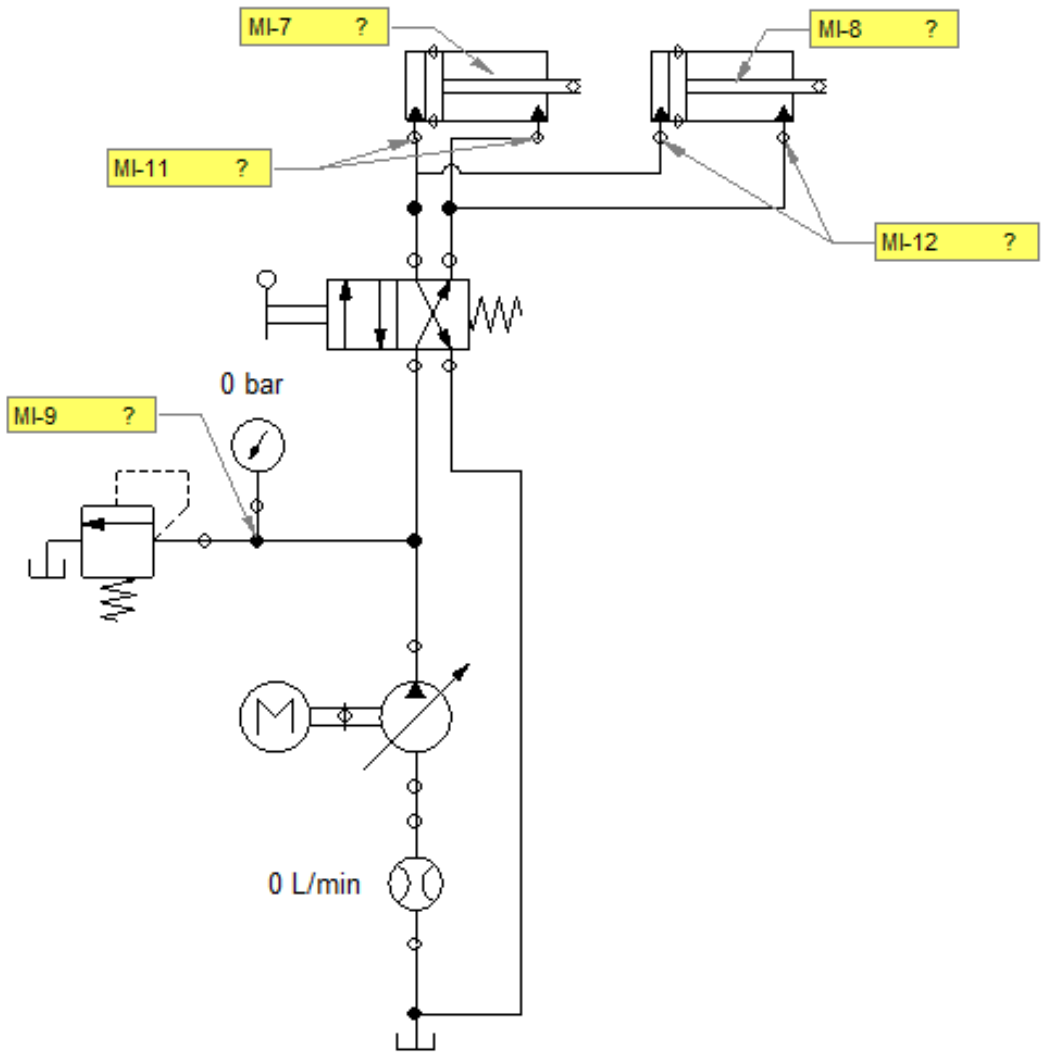


Simulation



- Run the simulation (select the diagram if the simulation button is not visible)
- Post Processing
  1. Change DCV position
  2. Observe the pressure gauge values
  3. Observe the flow meter values
  4. Insert plot and observe the position vs input pressure

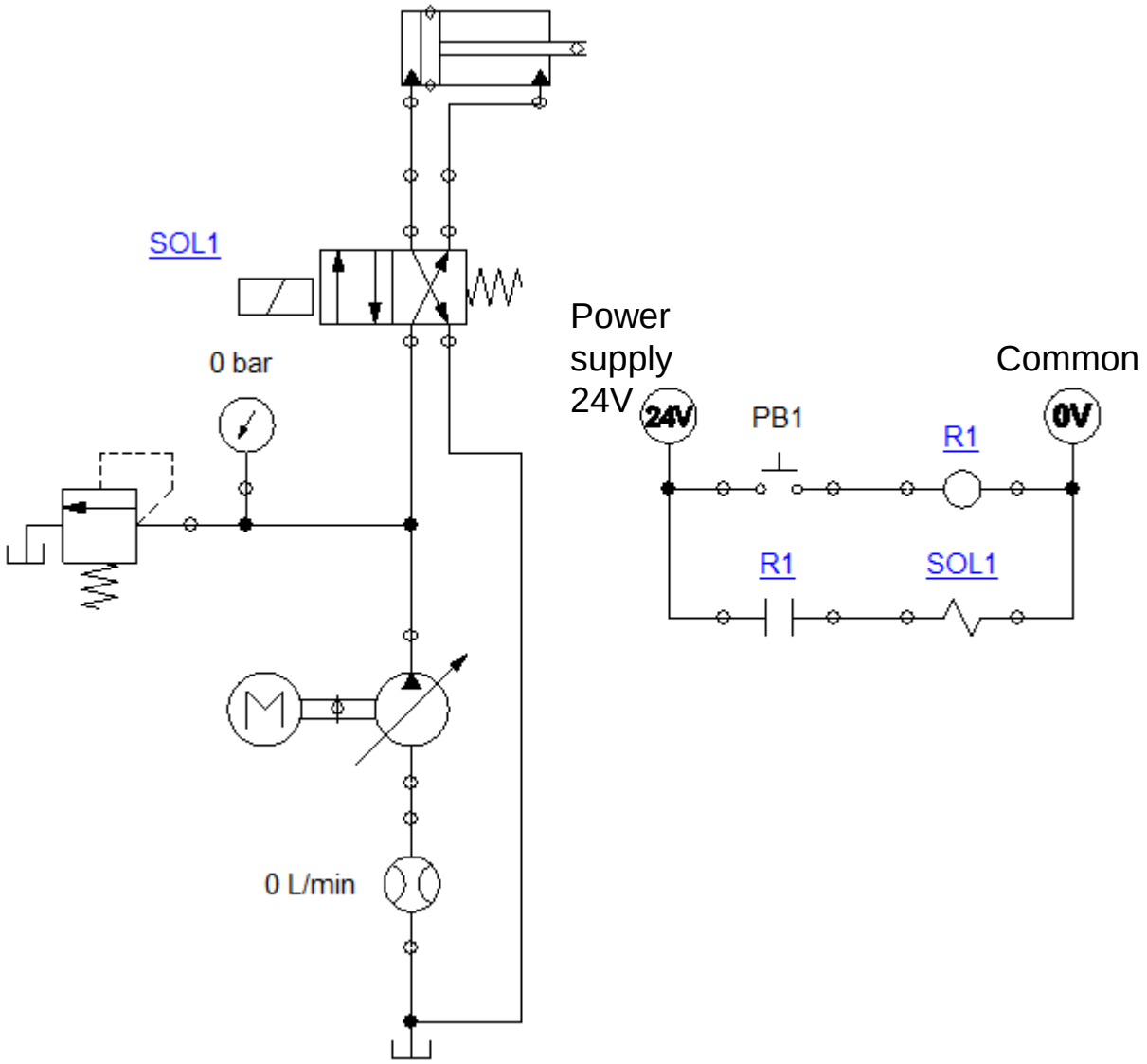
Tutorial 1B- Basic hydraulic circuit (2 cylinders)



After Connection

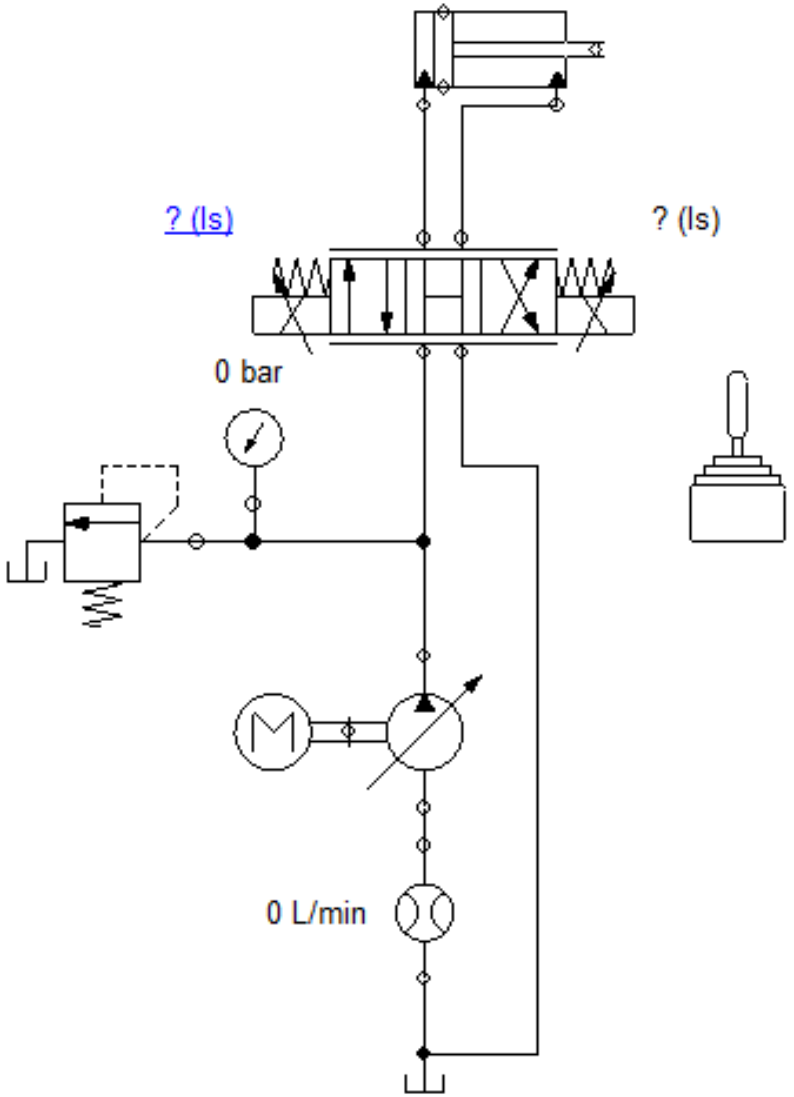
- Add one more double acting cylinder and connect to the DCV output ports
- Run the simulation (select the diagram if the simulation button is not visible)
- Post Processing
  1. Change DCV positions
  2. Observe the pressure gauge values
  3. Observe the flow meter values
  4. Insert node dynamic measuring
     1. For pressure
     2. Linear position of cylinder 1 and 2
  5. Insert differential dynamic measuring
     1. For measuring differential pressure for cylinder 1 and 2
     2. Motor
  6. Insert plot and observe the position vs input pressure
  7. Insert plot for cylinder positions
  8. Change the inclination of the cylinder and record the linear position of the cylinders
  9. Change the push force of the cylinder and record the linear position of the cylinders

Tutorial 1C- Basic electro-hydraulic circuit



- Add the following components in the canvas
  - Power supply 24V (Electrical control – JIC standard)
  - Common (0 Volts) (-do-)
  - Normally open push button (-do-)
  - Solenoid, DC/AC (-do-)
  - Coil (-do-)
  - Normally open contact (-do-)
- Double click on DCV and change the lever to solenoid DC.
- Run the simulation (select the diagram if the simulation button is not visible)
- Post Processing
  1. Change DCV positions
  2. Observe the pressure gauge values
  3. Record the state of push button and the linear position of the cylinder
  4. Record the state of push button and the linear speed of the cylinder

Tutorial 1D Hydraulic with Proportional Valve



- Open Tutorial 1A
- Add joystick (proportional hydraulics) in the canvas
- Replace the DCV with 4 port proportional valve (proportional hydraulics)
- Double click proportional valve, expand H1 and click E1.
- Link InputSupply(Lreal) to JY_X
- Run the simulation (select the diagram if the simulation button is not visible)
- Post Processing
    1. Insert plot and drag cylinder (linear speed) and joy stick (JY_X)
    2. Plot the graph for the x positions (-7 to 8)
    3. Find out the maximum speed, acceleration and deceleration of the piston
    4. Also find out the hydraulic flow changes against the highest speed and acceleration

Thank you