MEC-E5003 Fluid Power Basics
Calculation Exercises 1
Spring 2017

EXERCISE 1

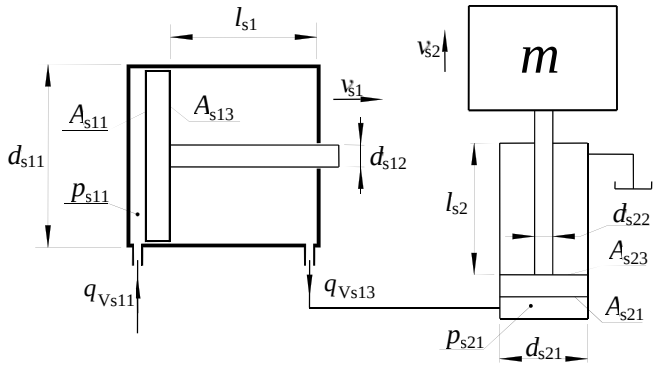
In the adjacent system, the lift cylinder hoisting the load m is operated by utilizing another cylinder (actuating cylinder).

A. Calculate the piston velocities for both cylinders.

B. What would be required for the velocities to be equal?

C. What is the maximum lifting height?

D. What would the maximum lift height be if the stoke length l_{s1} of the actuating cylinder would be doubled?

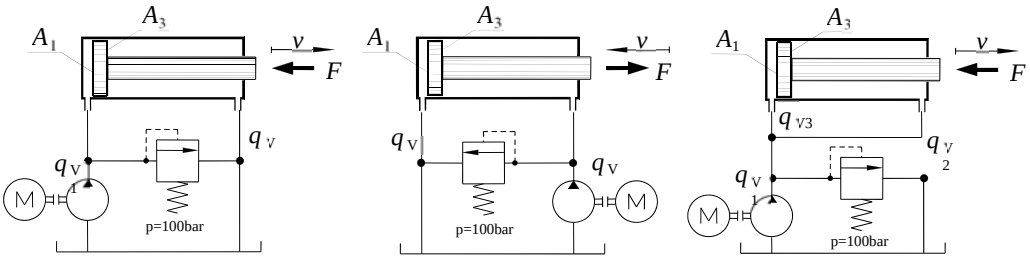


E. Calculate the pressure p_{s11} required for lifting the load (system assumed to be ideal; no losses).

Parameter values: q_{Vs11} = 10 l/min, d_{s11} = 63 mm, d_{s12} = 30 mm, d_{s21} = 40 mm, d_{s22} = 25 mm, l_{s1} = 250 mm, l_{s2} = 500 mm and m = 5000 kg.

EXERCISE 2

Calculate the piston velocities v and the maximum force outputs F of differential cylinder with the three given connection variants. Pump output is q_{V1}= 300 cm^3/s and the system pressure is limited to 100 bars. The piston areas are A_1= 100 cm^2 and A_3= 50 cm^2.



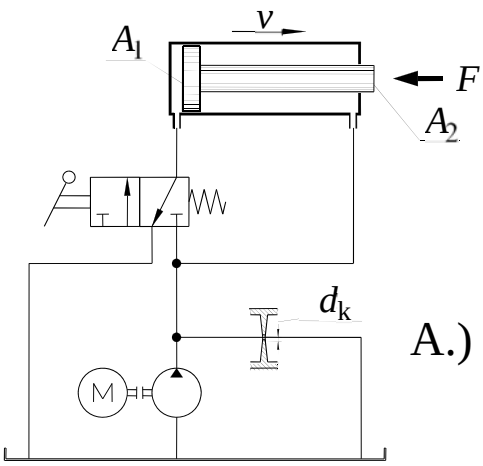
EXERCISE 3

The piston velocity in adjacent system is required to be v = 0.5 m/s in the shown direction. Pump produces flow 50 l/min. The cylinder is frictionless and leakage free.

Calculate the external load force F of the cylinder in cases where the pump outlet is connected tank line through:

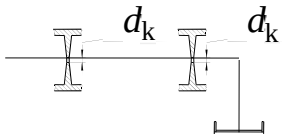
A. one restrictor
B. two restrictors in series
C. two paraller restrictors

A_1 = 0.003 m^2, A_2 = 0.001 m^2,
d_k = 2 mm, C_q = 0.7 and ρ = 860 kg/m^3.



A.)

B.)



C.)