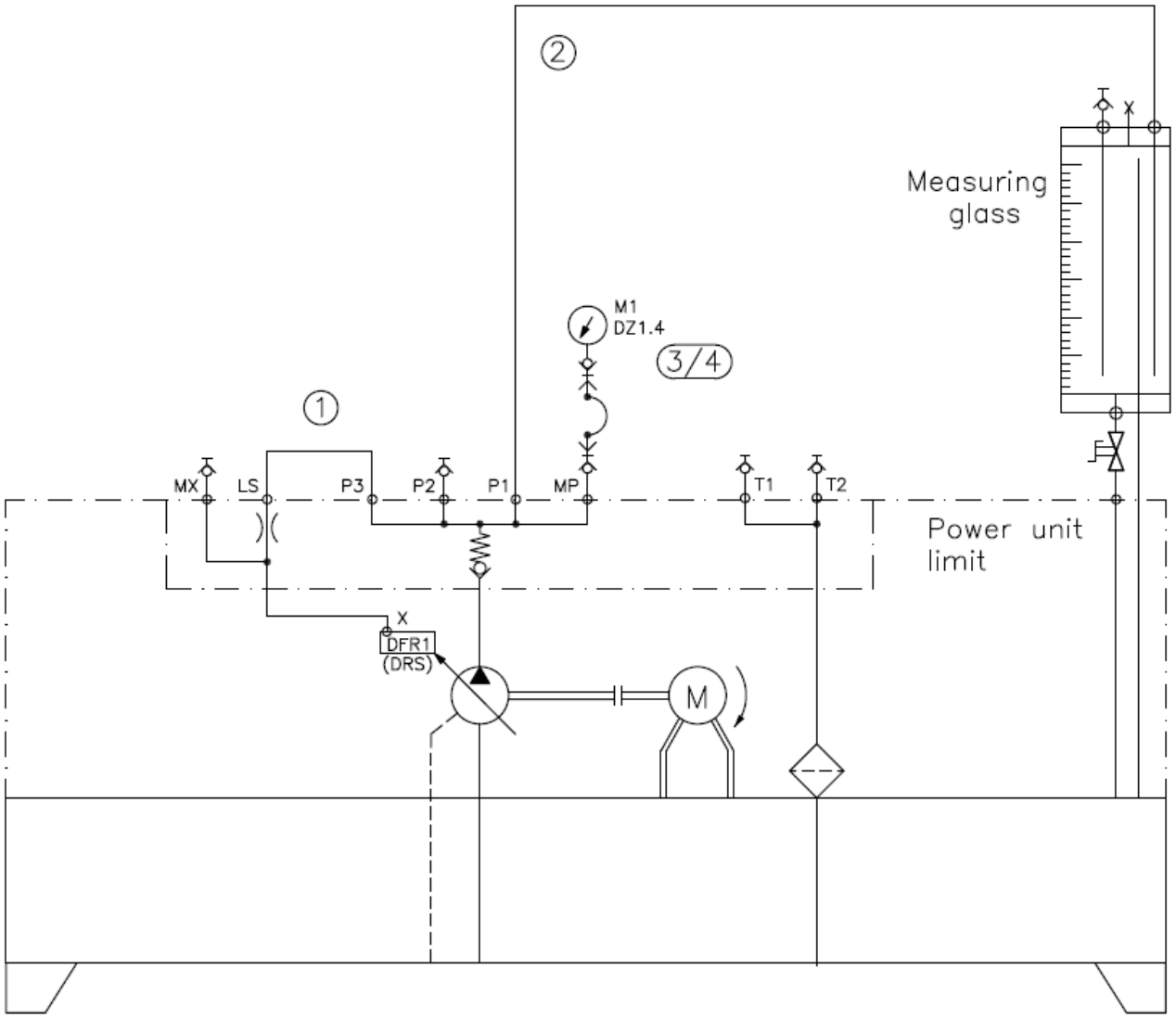
Displacement of a hydraulic pump

Fundamentals:
Pumps can be classified as either positive or non-positive displacement. The pumps which are typically used in hydraulic systems are of the positive displacement variety whereby a defined volume of fluid is delivered with each revolution of the input shaft. In this way pumps can be considered the flow generators in the hydraulic system.

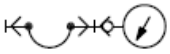
Objective:
Determine the displacement value of the pump which is installed on the hydraulic training stand.

Connections:
Utilizing the schematic below as a guide follow these steps to connect a circuit on the hydraulic trainer.

1) Using an appropriate length hose connect from port ‘P3’ directly to port ‘LS’ on the P/T/LS connection block
2) Using an appropriate length hose connect from port ‘P1’ of the P/T/LS connection block to one connection of the measuring glass
3) Mount a pressure gauge ‘DZ1.4’ on the mounting grid where it can be easily read
4) Connect the capillary hose of the pressure gauge to port ‘MP’ on the P/T/LS connection manifold

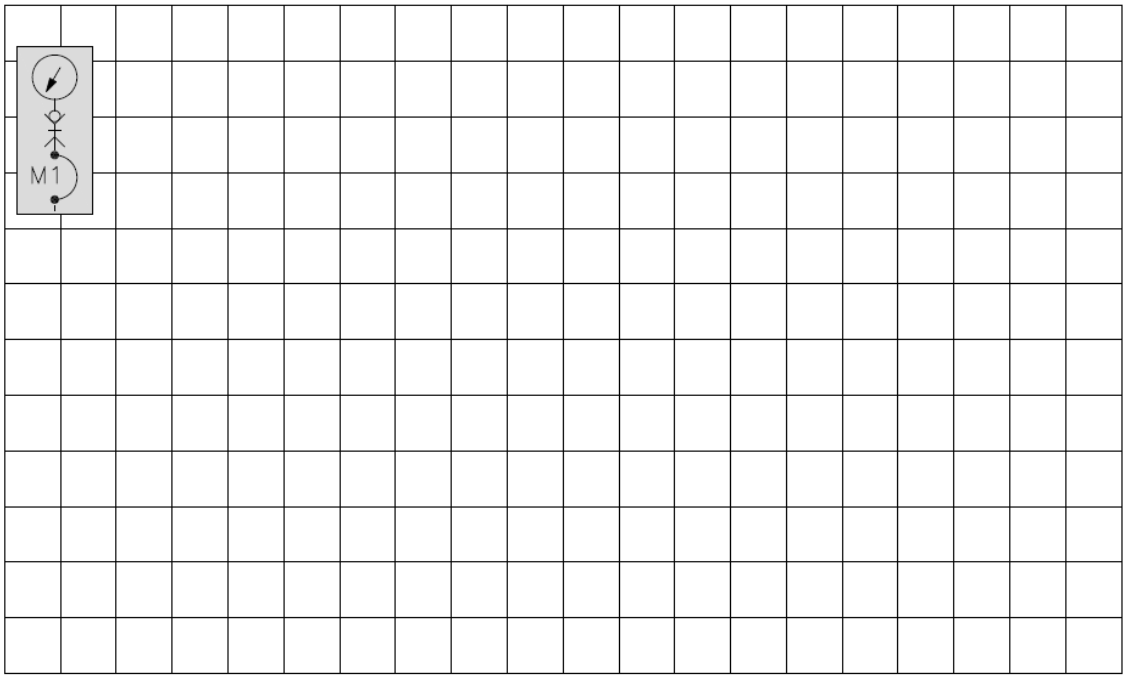


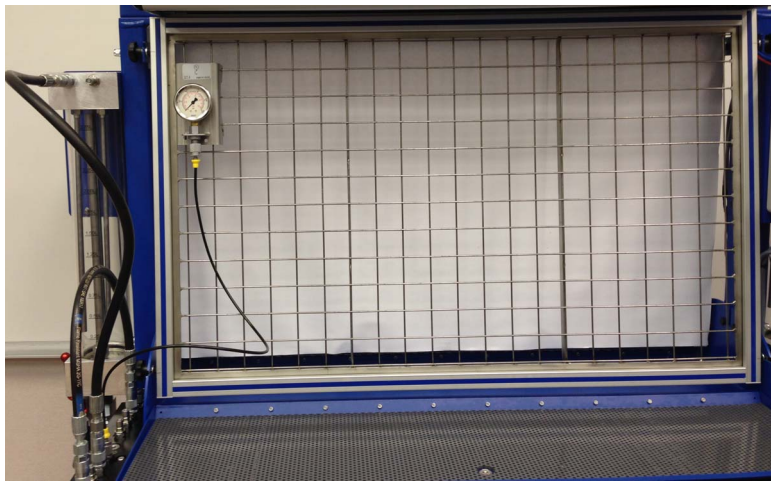
Components:
You will require the following components:

	Hose assembly	
1x	Pressure gauge DZ1.4	

Stop watch

Before beginning the experiment read the **Rules for hydraulic trainer operation** sheet.





Instructions
Utilizing the measuring glass and stopwatch determine the flow rate being delivered by the pump which is installed on the hydraulic trainer.

Procedure
Steps in the experimental procedure:
1. Has your instructor checked the constructed circuit?
2. Check again that all connection hoses are firmly coupled. (pull/turn to test)
3. Ensure the red E-STOP button is not engaged on either of the starters. (rotate the button to reset)
4. Open the shut-off valve on the bottom of the measuring glass to enable the glass to drain.
5. Switch on the pump via the green START push button.

a) Close the shut-off valve on the measuring glass. Measure the time between oil level readings of 1 litre and 2 litres. Record this time as well as the pressure read at the gauge.

t = 8.1 seconds, p = 2 bar

b) Switch off the pump via the red STOP push button and drain the measuring glass by opening the shut-off valve.
c) Conventionally the flow rate is given as liters per minute (l/min). We will also follow this convention. We can calculate this flow rate using the following formula.

$$Q = \frac{\text{volume (1 litre)}}{\text{measured time (sec)}} \text{ x } \frac{60 \text{ seconds}}{1 \text{ minute}}$$

$$Q = \frac{60}{\text{measured time (sec)}}$$

Q = 7.4 l/min

Determine the speed of the electric motor via either a tachometer or by reading the motor nameplate data.

Calculate the displacement of the pump by using the following formula

$$Vg = \frac{Q \bullet 1000}{n}$$

Vg = displacement in cc/rev

Q = flow rate in l/min

n = pump shaft speed (RPM)

Vg = 6.44 cc/rev

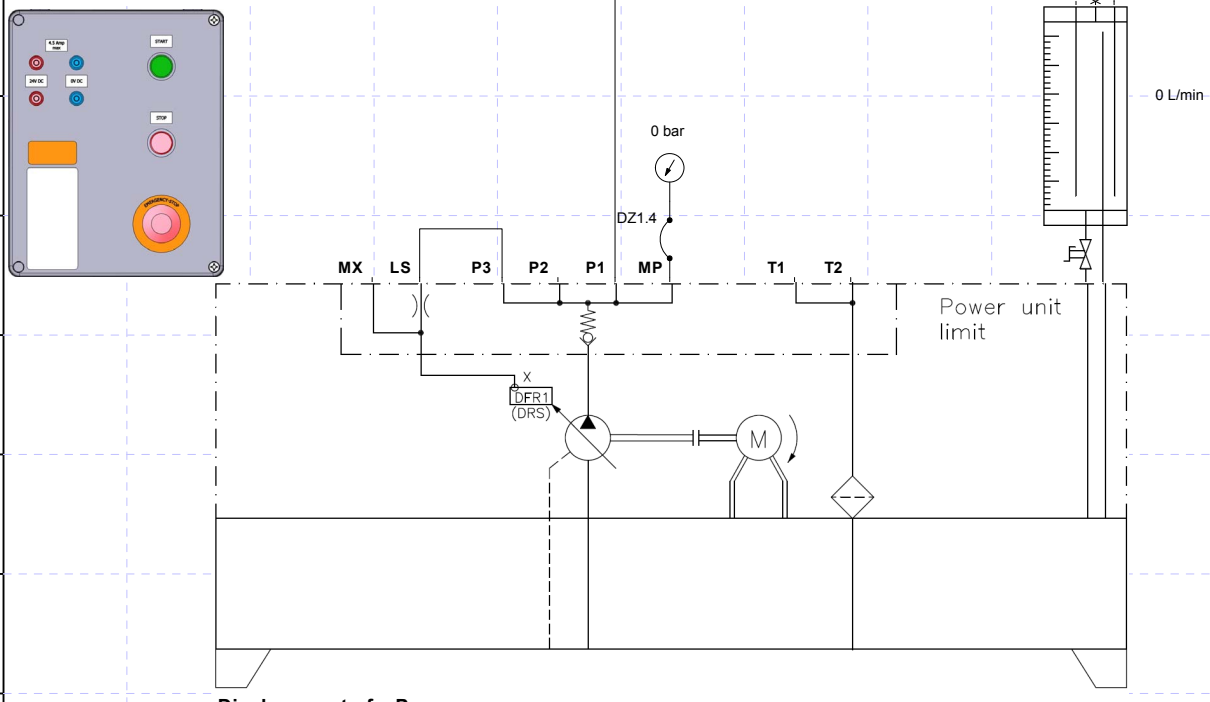
Conclusions:

1) The job of the hydraulic pump is to produce flow.

2) The flow rate produced by a positive displacement pump depends up on the pump size/displacement and the prime mover speed .

3) What was the pressure shown on the gauge? Why?

Pressure is very low. Only resistances caused by the fluid conductors (hose and fittings) are causing this pressure



Displacement of a Pump