

DIESEL MECHANIC



MINING QUALIFICATIONS AUTHORITY

CODE: HYD - 9

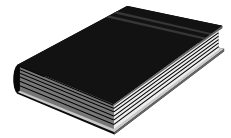
CONSTRUCT A DUAL CIRCUIT

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SOURCE REFERENCES



Demonstration by a competent person, e.g. a Training Officer.

FESTO – Basic Level Textbook

OBJECTIVE

You will be learning towards the outcome “Construct a dual circuit”. Whilst learning towards the outcome you will be required to achieve the following:

- Construct a circuit with the relevant valves.
- Adjust the relief valves and pressure reducing valve so that:
 - ✓ the working pressure in the primary circuit will not exceed 2 500 kPa.
 - ✓ the working pressure in the secondary circuit will not exceed 1 000 kPa.
 - ✓ when the pressure reducing valve fails to operate and is stuck in an open position, the pressure in the secondary circuit will not exceed 1 500 kPa.
- Know the purpose of a pressure reducing valve.

On completion of this module, the learner must be able to:

- Adjust the pressure relief valves in both circuits to open at the prescribed pressures within the limits of ± 100 kPa.
- Adjust the pressure reducing valve to hold the pressure in the secondary circuit at 1500 kPa within the limits of ± 100 kPa.
- State the purpose of a pressure reducing valve.

During this process you must adhere to certain specified requirements as listed in the Module.

ASSESSMENT AND EVALUATION CRITERIA

You will be assessed, when you are confident that you may achieve the outcomes as listed, to determine your competence as measured against the required criteria. This assessment will be in line with accepted best practices regarding assessment.

- Theoretical and practical assessments will be set during the module and must be completed without using reference.
- The learner will be required to answer all the questions without any reference.
- There must not be any damage to any equipment.

HAZARD IDENTIFICATION AND CONTROL (HIAC) FORM**HYD - 9****CONSTRUCT A DUAL CIRCUIT**

STEPS IN OPERATION / PROCESS	POTENTIAL ACCIDENT / INCIDENT	CONTROLS (BY RESPONSIBLE PERSON)
1. Construct a hydraulic circuit.	<ul style="list-style-type: none"> • Improper or careless handling of hydraulic components and pipes can lead to damage of equipment. 	<ul style="list-style-type: none"> • Always handle components and pipes correctly, and with great care.
2. Use of hydraulic oil in a pressurised circuit.	<ul style="list-style-type: none"> • Circuit under pressure. 	<ul style="list-style-type: none"> • Wipe components and panel clean after use and store components. • Ensure circuit is depressurised before removing components or pipes
3. Insure work area is safe	<ul style="list-style-type: none"> • Oil in eyes and laceration of skin. • Slip and fall. 	<ul style="list-style-type: none"> • Wear correct PPE. • Ensure working area is clean and safe. • Wear correct safety boots.

NOTE: Before doing the practical work contained in this module, the learner must study the content of the above HIAC form again and then sign the statement below.

The above risks, which will be encountered in this module, are fully understood and will be controlled during the practical work.

Signature of learner:

Signature of Training Officer:

Date:

1. INTRODUCTION

ITEM / TASK: Pressure reducing valves.

DESCRIPTION:

- A. A pressure reducing valve reduces the input pressure to a specified output pressure.
They are only used to good effect in systems where a number of different pressures are required.
- B. The main branch is known as the primary circuit and the other branch is called the secondary circuit. (Fig 1)
- C. Different types of pressure reducing valves are:
 - a. 2 way pressure reducing valve, and
 - b. 3 way pressure reducing valve.

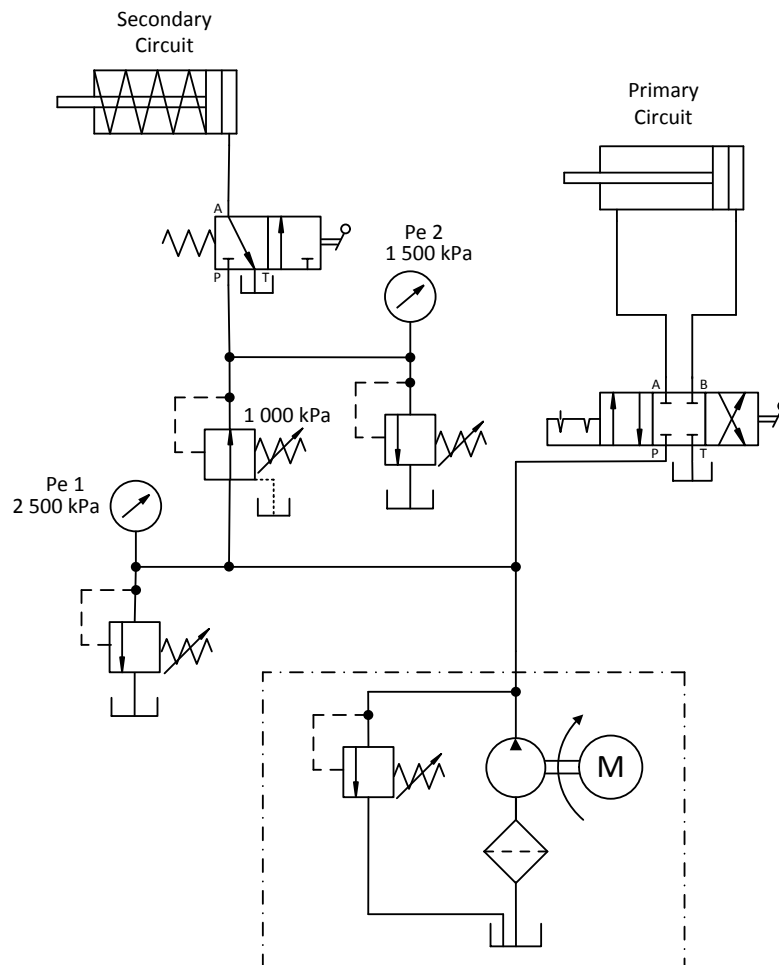


FIG 1.

2. PRESSURE REDUCING VALVES

ITEM / TASK: Construction and operation of a 2 way pressure reducing valve.

DESCRIPTION:

A. The 2 way pressure reducing valve consists of the following parts: (Fig 2)

- a. Housing
- b. Piston
- c. Spring
- d. Set screw

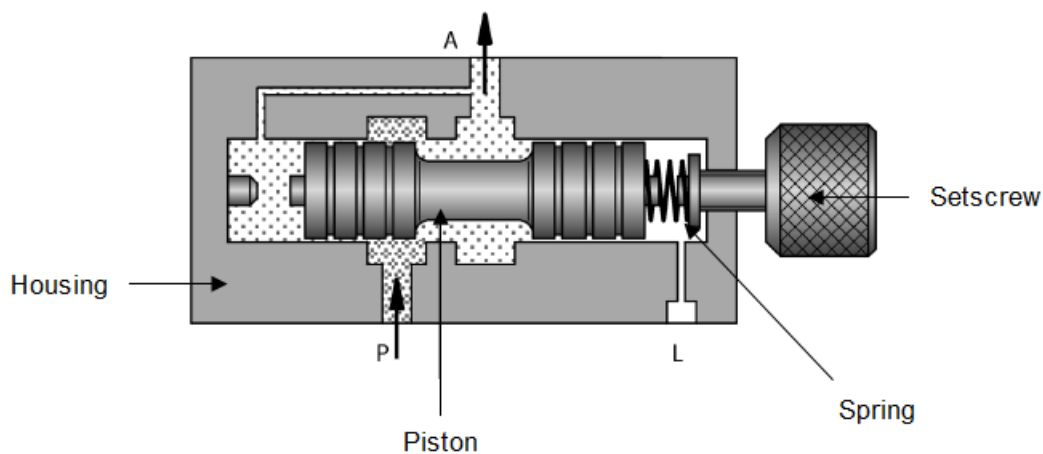


FIG 2.

B. The pressure reducer operates according to the following principle:

The valve is opened in the normal position. The output pressure at (A) is transmitted to the piston surface via a control line. See Fig 3 on the next page. The resultant force is compared to the set spring force. If the force of the piston surface exceeds the set value, the valve starts to close as the valve slide moves against the spring until an equilibrium of forces exists. This causes the throttle gap to be reduced and there is a fall in pressure. If the pressure at output (A) increases once again, the piston closes completely.

C. The pressure sensing of the valve comes from the outlet side, or the secondary circuit.

This valve operates in the reverse of a relief valve, which senses pressure from the inlet and is closed when not operating.

D. The 2-way pressure regulator is rarely used in practice. Its design does not permit a reduction from a high set pressure to a low pressure.

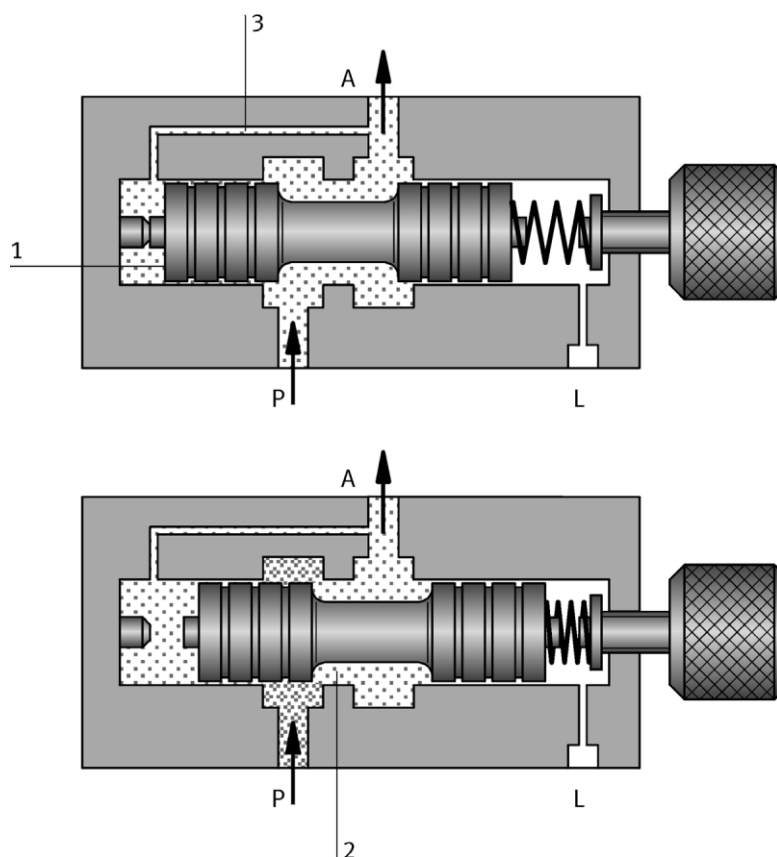


FIG 3.

E. The symbol for a 2 way pressure reducing valve is shown in Fig 4.

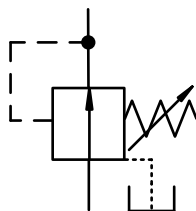


FIG 4.

ITEM / TASK: Construction and operation of a 3 way pressure reducing valve.

DESCRIPTION:

- A. The method of operation of a 3-way pressure reducer is identical to that of a 2-way pressure regulator with respect to flow from P to A.
- B. However, an increase in pressure above that which has been set at output (A) causes a further shift of the piston. ***The built-in pressure relief function comes into force and opens a passage from A to T.*** (Fig 5)

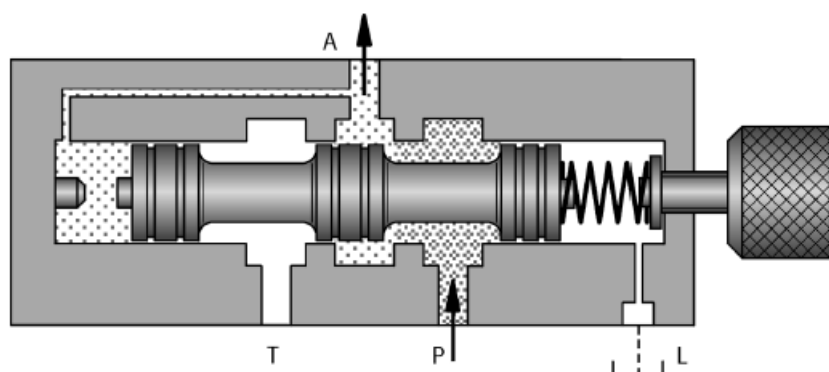


FIG 5.

- C. The symbol for a 3 way pressure reducing valve is shown in Fig 6.

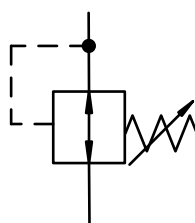


FIG 6.

**DO THE SELF TEST AND PRACTICE ON THE NEXT PAGES
BEFORE CONTINUING WITH THE REST OF THE MODULE.**



SELF TEST 1

1. What is meant by primary and secondary circuits?

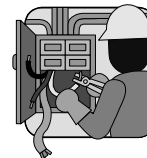
2. What is the function of a pressure reducing valve?

3. What is the operating difference between a pressure reducing valve and a pressure relief valve?

Refer to your notes to check your answers.

Ask your Training Officer to check your work and if it is correct, to sign below.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :

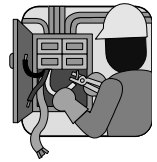


PRACTICE

1. Practice drawing the symbol for 2 way pressure reducing valve.
2. Practice drawing the symbol for a 3 way pressure reducing valve.
3. Identify the different pressure reducing valves from the training panel / equipment.

Ask your Training Officer to check your work and if it is correct, to sign below and then go on to the next section.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :



3. SETTING A PRESSURE REDUCING VALVE IN A CIRCUIT

ITEM / TASK: Adjusting a pressure reducing valve.

DESCRIPTION:

- A. The method of adjusting the valves is explained below: (Fig 7 & 8)
- Determine the pressure rating of the given circuit by studying the specifications in the diagrams.
 - Fit a pressure gauge in the same pressure line as the relief valve in the primary circuit.
 - Place the directional control valve in a neutral position to ensure free flow of oil to the reservoir.
 - Unscrew the set screw to release all the tension in the spring of the pressure relief valve in the primary circuit. (Anti-clockwise)
 - Unscrew the set screw to release all the tension in the spring of the pressure reducing valve in the secondary circuit. (Clockwise)
 - Start the pump.
 - Load the circuit by operating the directional control valve in the primary circuit.
 - Slowly screw in the set screw on the pressure relief valve. (Clockwise)
 - When the gauge Pe1 indicates the specified pressure (2 500 kPa), lock the set screw with the lock-nut.
 - Load the secondary circuit by operating the directional control valve.

NB:



In the circuit shown in both the figures below, the above step will be unnecessary because the control valve is a closed centre valve and therefore the circuit is loaded continuously.

- Slowly screw in the set screw on the pressure reducing valve. (Anti-clockwise)
- When the pressure gauge Pe2 indicates the specified pressure, (2 000 kPa) lock the set screw with the lock-nut.

m. Unload both the circuits by placing the directional control valves in a neutral position.

2 way pressure reducing valve.

Note:

A 4/3 way directional control valve with a blocked port b will function the same as a 3/2 way valve.

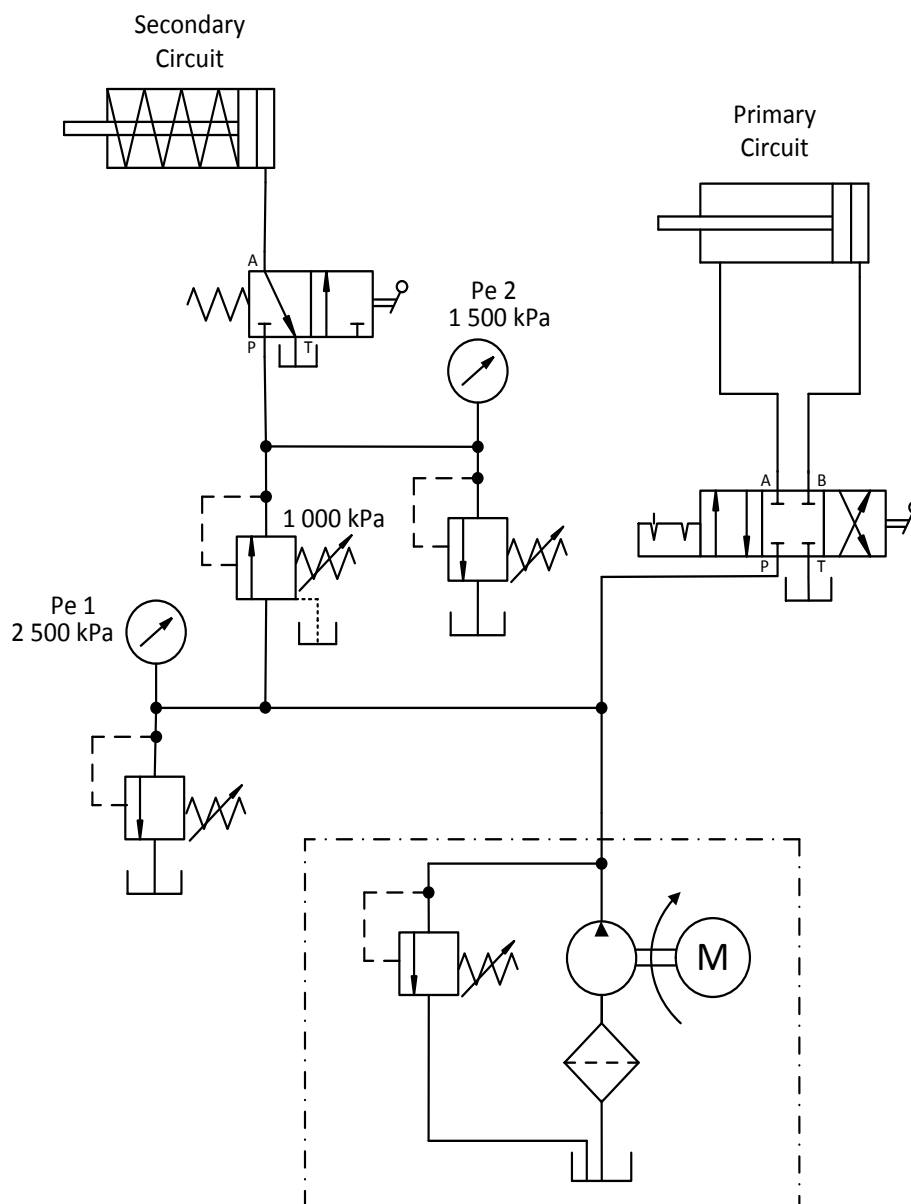


FIG 7.

3 way pressure reducing valve.

Note:

A 4/3 way directional control valve with a blocked port b will function the same as a 3/2 way valve.

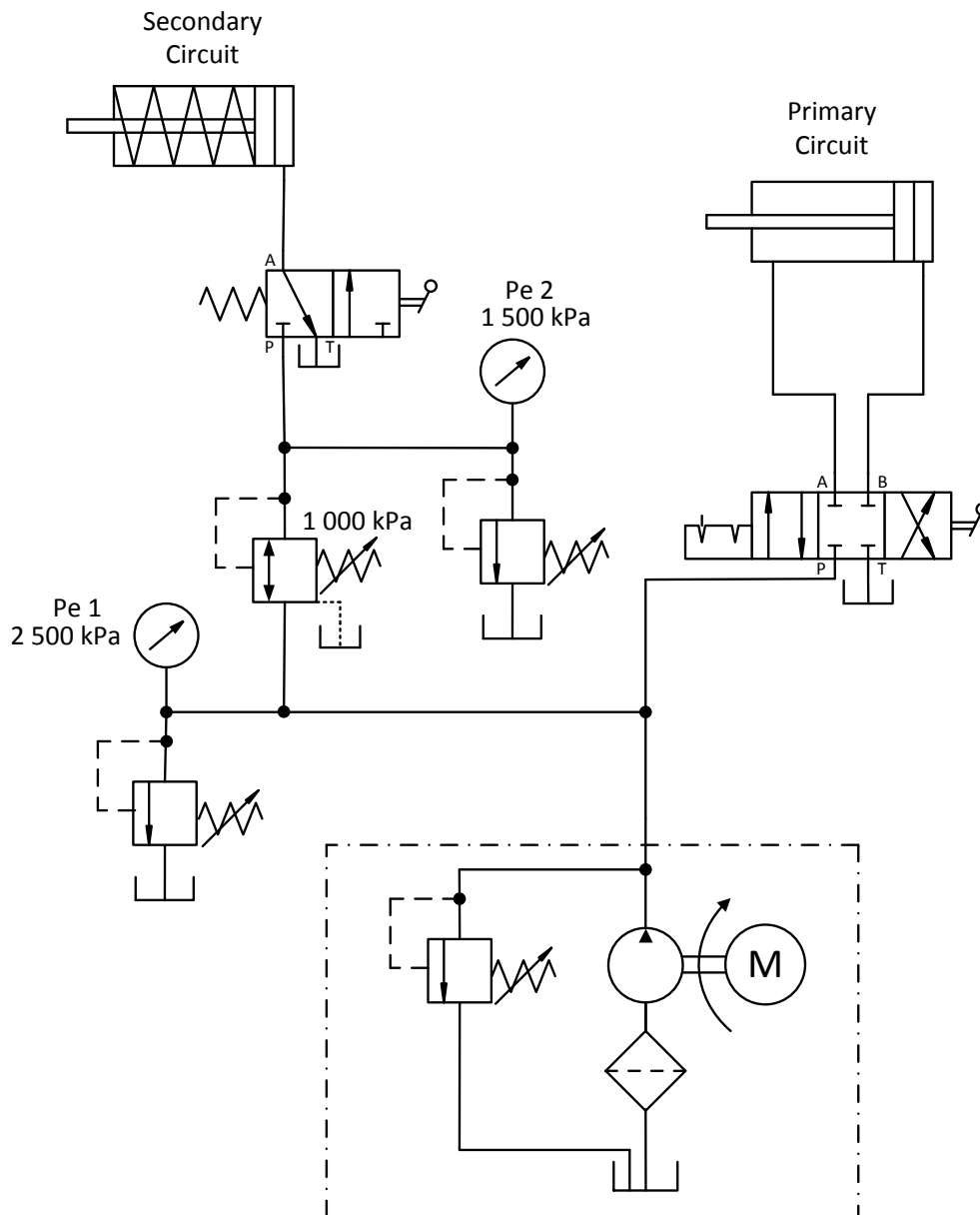
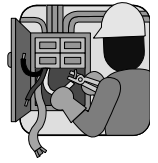


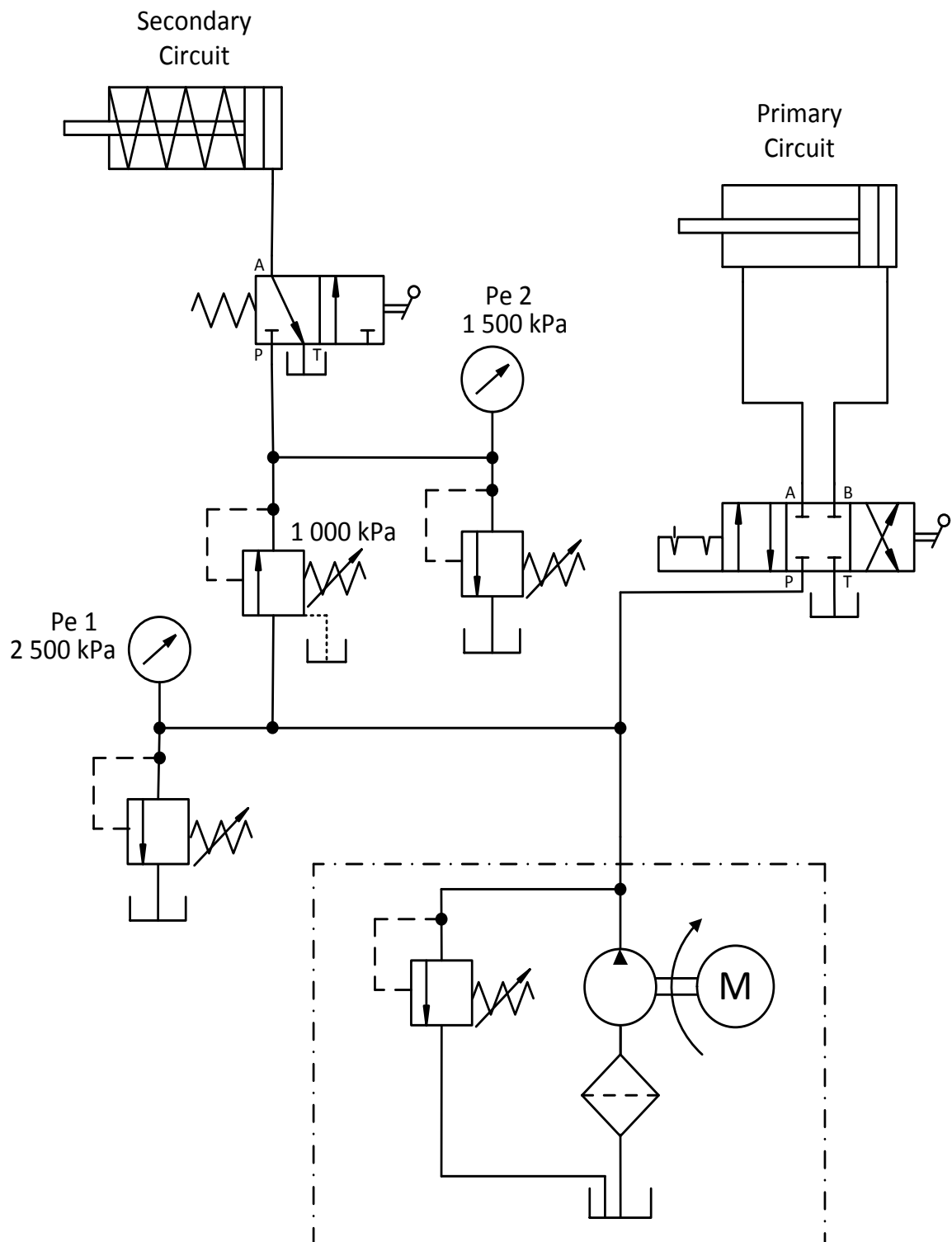
FIG 8.

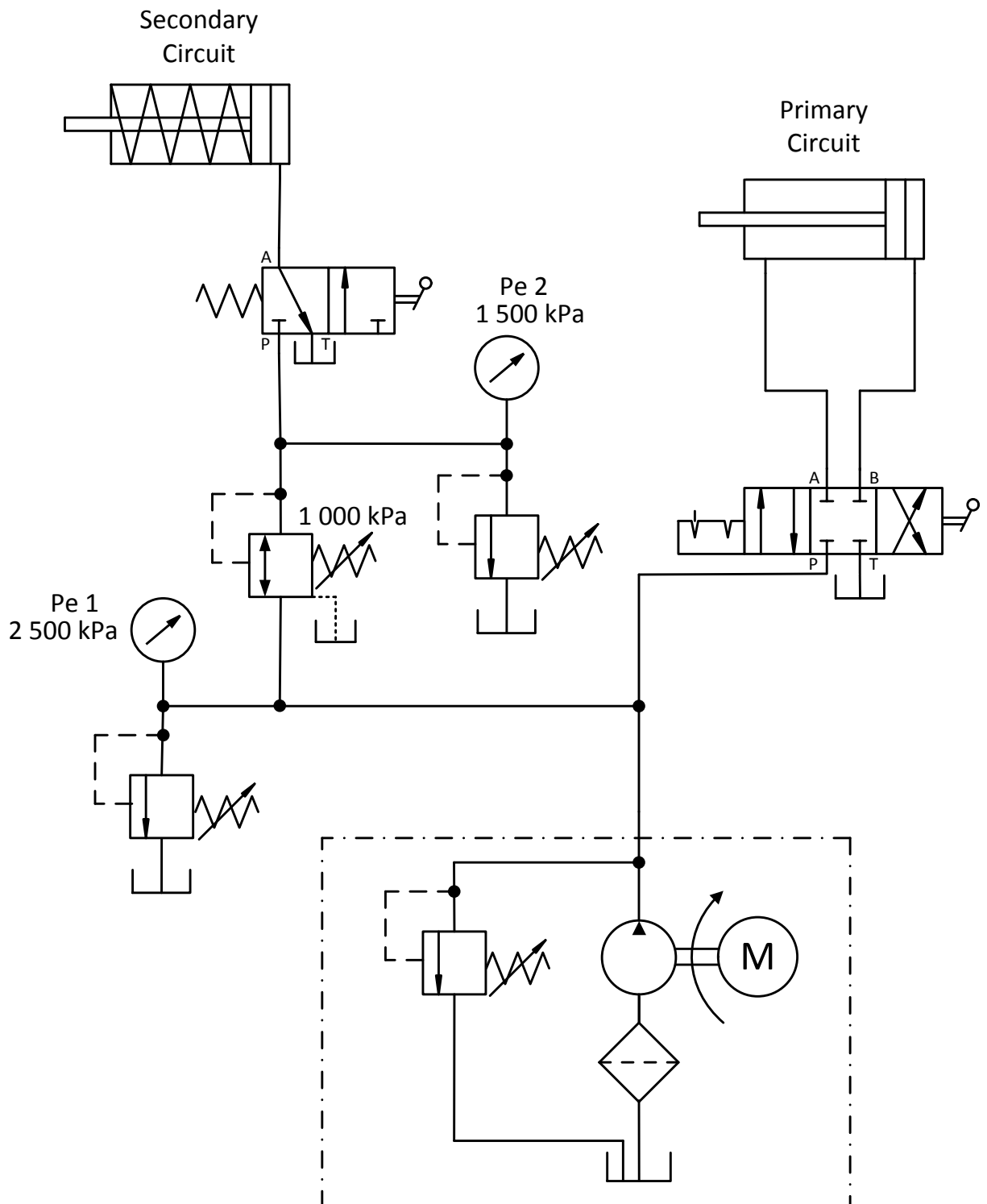
**DO THE PRACTICE ON THE NEXT PAGES
BEFORE ATTEMPTING THE ASSESSMENT.**



PRACTICE

1. Construct either the circuit with a 2 way pressure reducing valve or the circuit with the 3 way pressure reducing valve as shown in the diagrams below onto the training panel.
2. Adjust the pressure relief valve and pressure reducing valve so that the maximum working pressure in:
 - the primary circuit will not exceed 2 500kPa.
 - The secondary circuit will not exceed 1 000kPa.





Ask your Training Officer to check your work and if it is correct, to sign below and then go on to the next section.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :



REMEMBER ALWAYS WORK SAFE

Once you have passed the entire practices,
you are now at liberty to request a Formative
Assessment from your Assessor.