



Worksheet HF02 & Training Record

Pressure Theories and Formulas

Hydraulics Fundamentals

Email:

Course:

Provider:

Learning Objectives/Expected Outcomes: (60-120mins)

1. To learn the relevant physics laws and their implications for fluid power.
2. To perform simple calculations for force and pressure on a cylinder.
3. To be able to calculate orifice pressure drop, seal friction, and total system pressure drop.

Previous Knowledge Required:

Students should have completed worksheet HF01 'General hydraulic theories' along with a basic knowledge of hydraulic components and systems.

Terminology:

Pressure, force, area, cylinder bore, cylinder annulus, orifice, pressure drop, friction.

Record of Achievement:



Click the email icon to post your results, once training is complete. Enter an LRS username and endpoint details or see www.e4training.com/xapi/ for free examples. Keep a record of any written work or worked calculations etc.

Coursework investigation and instructional video



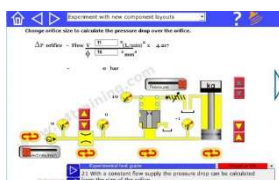
Study the 'Pressure and Force' relationships at

www.e4training.com/hyd_formula/pressure1.php and [pressure2.php](http://www.e4training.com/hyd_formula/pressure2.php)

- Understand the relationship between force, pressure, and area.
- Understand where pressure losses occur in a hydraulic system.
- Consider how cylinder area affects forces and pressures

Complete

Virtual test rig experiments



Experiment with the 'control valve fundamentals' simulation at

www.e4training.com/hyd_formula/pressure3.php

- Follow the suggested exercises and observations list below the simulation.
- Run the experiments, answer the questions, and click the buttons to see the answers.

Explore how supply pressure, cylinder loads, and orifice pressure drops rely on and interact with each other.

Date, score & time:

Tick when posted



Raise and lower heavy object safely with a hydraulic jack. Calculate the forces involved at www.e4training.com/hyd_formula/pressure1.php Understand how mechanical advantage is achieved by using two cylinders with different areas. See how a small mass can lift a large mass with the appropriate cylinder areas.

Submit notes

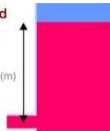
Submit calculations on separate sheet

Pressure due to a head of fluid

$$\text{Pressure head } P = \rho * g * h$$

$$= 860 \text{ (kg/m}^3\text{)} * 9.81 \text{ (m/sec}^2\text{)} * 1.0 \text{ (m)}$$

$$= 0.084 \text{ (bar)}$$



- Calculate the pressure due to a head of fluid.
- Calculate the pressure generated by a load on a cylinder area.
- Calculate the load that a pressure can lift.
- Calculate the pressure drop across an orifice.

See examples www.e4training.com/hyd_formula/pressure1.php

Submit calculations

Submit calculations on separate sheet

Interactive tutorial

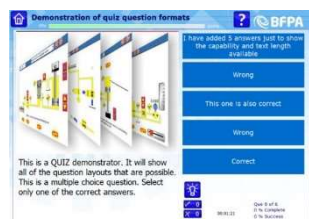


Complete the 'Formulas and Fundamentals' tutorial at www.e4training.com/hydraulic_courses/microtutor1.php?wtformula Complete quick quiz at end and post results.

Date, score & time:

Tick when posted

Interactive quiz to check and reinforce learning



Complete the 'Formulas and fundamentals' questions at www.e4training.com/hydraulic_test2.php?Quiz - Hydraulics part 1 Post result when complete.

Quiz name, date, score

Tick when posted

Key questions / Plenary

- Can you explain the relationship between force, pressure, and cylinder bore area?
- Can you describe why hydraulic systems often dissipate significant energy as heat?
- Can you describe two other areas where small pressure losses may occur?

Submit written answers

Tick when complete



And Finally:

Complete this worksheet and keep for your certification records. Submit any written coursework etc. to your training course provider.

Follow-on Course Worksheets:

Potential follow-on worksheets include:

HF03 – Flow rate and control fundamentals

For more specialist course worksheets visit

www.e4training.com/hydraulic_courses/worksheets1.php