



Hydraulic Control Valves

Advanced Manufacturing Hydraulics

Grade Range: Career & Technical Education (CTE)

Lesson Time: 55 minutes

Key Terms

Check valve
Flow control
Pilot
Pressure
Regulator
Relief
Solenoid
Throttle valve

Materials and Resources

Activity Overview

This will be a brief introduction to and overview of hydraulic control valves working within the hydraulic circuit. The main types of valves—pressure, flow, and directional control valves—will be explored in detail. Students will engage with hydraulic control valve images, hydraulic circuit videos, actual valves, and zSpace control valve models.

Essential Question

1. Explain the function of the valve within the hydraulic circuit and then detail the variables associated with those valves.

Objectives

- Students will correctly identify and classify hydraulic control valves into three categories: pressure, flow, and directional control valves.
- Students will describe how hydraulic valves are used in hydraulic circuits.
- Students will successfully assemble a project from a schematic drawing, demonstrating correct usage of hydraulic valves.

Introduction

Prior to this activity, students should be familiar with manufacturing processes and hydraulic systems used within those processes.

zSpace Activity

- Launch Advanced Manufacturing Hydraulics (AP40)
- Select Control Valves.



- Select Pressure Control Valve.



- Select Working Principle.



Teacher Notes: Explain the direction of the fluid flow.

Where are the pilot and the main valves located?

How is the pressure controlled?

- Explore Exploded View



Teacher Note: Explain the relief of pressure. Explain the importance of safety within the hydraulic circuit.

- While exploded, each individual part may be further explored.

Teacher Notes:

- What are the main advantages of the pressure control valve?
- Explain pressure relief.
- Select Section View.



Teacher Note: Explain the machining necessary within the valve.

- Continue to explore the remaining Pressure Control Valve models.
- Select Pilot Operated Sequencing Valve.



Teacher Notes:

What are the advantages of the sequencing valve?

What are sequencing valves used for within the hydraulic circuit?

What are the types of sequencing valves?

- Select Flow Control Valves.



- Select the Working Principles model.
- Select the Exploded View model.
- Select the Section View model.
- Continue to explore the Hydraulic Flow Control models as time allows.
- Be sure to expand the notes in the upper right corner.

Review

- Define and describe the differences among pressure, flow, and directional control valves.
- Define pressure relief.
- Explain the importance of pressure relief valves and check valves as related to safety within the circuit.
- What are the two major types of pressure control valves?
- What are the two major types of flow control valves?
- What is a solenoid?
- What is a check valve?
- What is a regulator and what purpose does it serve in the hydraulic circuit?

Closing

Ask students to name as many hydraulic control valve types as they can. Then ask them to name a few new terms that they have learned that concern hydraulic control valves and circuits.

Differentiation

- Group students heterogeneously to allow students with a strong command of the English language to assist in reading or interpreting questions
- Provide paper copies of diagrams for students to use as a reference
- Provide a handout with a list of vocabulary terms and definitions that will appear in the activity
- Allow students to provide answers that are handwritten, typed, or verbal
- Have students work as partners or in small groups