

LESSON 2: PERFORM MENSURATION AND CALCULATIONS



LEARNING OUTCOMES

By the end of this lesson, you should be able to:

LO 1: Select measuring instruments and carry out measurements.

LO 2: Maintain measuring instruments.

INTRODUCTION TO MENSURATION AND CALCULATIONS

Mensuration refers to the process of measuring the dimensions or size of an object or part. In automotive servicing, accurate measurements are crucial for ensuring that parts fit together properly and function efficiently. Calculations, on the other hand, involve using these measurements to determine quantities, sizes, and tolerances.



KEY POINTS

Definition of Mensuration: The process of measuring dimensions or size of objects.

Importance of Calculations: Helps in ensuring parts and components are properly sized, avoiding malfunctions and improving performance.

Measuring Instruments: The choice of measuring tool plays a significant role in achieving accurate results.



TYPES OF MEASURING INSTRUMENTS

To perform accurate measurements in automotive work, various measuring instruments are used. Here's an overview of the most common tools:



VERNIER CALIPERS

Purpose: Used for measuring internal and external dimensions with great precision.

How it Works: Vernier calipers have a sliding scale and a main scale to give a precise measurement. It can measure small dimensions such as the diameter of a bolt or the thickness of a car part.



MICROMETER CALIPER

Purpose: Similar to vernier calipers but more precise, used to measure smaller objects with very fine tolerance.

How it Works: The micrometer measures the thickness or diameter of small parts like the shaft or engine components.



DIAL GAUGE

Purpose: Measures small distances with high precision, often used for checking the runout of parts, like the rotation of a wheel or shaft.

How it Works: The dial gauge has a needle that moves around a calibrated dial to show precise measurements of any slight gap or variation.



V.O.M.TESTER (VOLT-OHM METER)

Purpose: Used for measuring electrical resistance, voltage, and current in circuits.

How it Works: The tester can be digital or analog, and it measures the electrical properties within a system to ensure proper function.



OTHER TOOLS

Steel Ruler: Used for measuring lengths of materials and parts.

Tape Measure: For measuring larger parts or the distance between objects.

Torque Wrench: Used to measure the tightness of bolts and nuts.



HOW TO PERFORM ACCURATE MEASUREMENTS

Performing accurate measurements requires attention to detail and understanding of how to use each tool properly:

Select the Right Measuring Instrument:

Choose the instrument that fits the task. For example, a Vernier caliper should be used for smaller dimensions, while a tape measure is more suitable for larger dimensions.

Measure Carefully:

When using instruments like the Vernier caliper, ensure the object is properly positioned between the jaws of the tool. For micrometers, ensure the part is held firmly and the tool is calibrated to zero before measuring.



HOW TO PERFORM ACCURATE MEASUREMENTS

Record Measurements:

Always write down the measurements to avoid errors and ensure consistency. Ensure all data is recorded in the correct units (e.g., inches or millimeters).

Recheck Measurements:

When performing critical measurements (such as engine parts), measure multiple times to ensure accuracy and reduce the risk of error.



COMMON CALCULATIONS IN AUTOMOTIVE SERVICING

After taking measurements, calculations are needed to ensure parts will fit together and perform as expected. Some common calculations include:



TOLERANCES AND CLEARANCES

Tolerances refer to the acceptable range of variation in the size of parts. For example, a shaft may have a tolerance of ± 0.01 mm, which means the actual diameter can vary by up to 0.01 mm in either direction.

Clearances are the gaps between parts, such as the gap between the piston and the cylinder.



VOLUME CALCULATIONS

Some automotive parts require volume measurements, such as the oil or fuel tank. You may need to calculate the volume of a cylinder or another shape to determine fluid capacities.

USING FORMULAS

In some cases, automotive work requires the use of formulas. For example:

Area of a circle = $\pi * r^2$ (where "r" is the radius of the circle).

Volume of a cylinder = $\pi * r^2 * h$ (where "r" is the radius and "h" is the height).

TORQUE CALCULATIONS

Torque is a measure of rotational force. In automotive work, a torque wrench is used to ensure bolts are tightened to the correct torque. The torque is calculated as:

$\text{Torque (Nm)} = \text{Force (N)} * \text{Distance (m) from the pivot point.}$



MAINTAINING MEASURING INSTRUMENTS

For continued accuracy, measuring instruments must be properly maintained:

Cleaning:

Keep instruments clean and free of debris. For example, wipe down Vernier calipers with a clean cloth to remove dust and dirt.

Calibration:

Instruments like micrometers and dial gauges should be calibrated regularly to maintain precision. Calibration should be done according to the manufacturer's guidelines.

Storage:

Store measuring instruments in a safe, dry place. Using a protective case for tools like Vernier calipers or micrometers will protect them from dust, moisture, or physical damage.



SAFETY CONSIDERATIONS

Using measuring instruments requires a steady hand and safety awareness:

Wear Protective Gear:

Always wear safety glasses and gloves when working with sharp objects or when measuring small parts that could cause injury.

Check for Accuracy:

After performing measurements, recheck them to ensure consistency and accuracy.

Handle Tools Properly:

Handle delicate tools like micrometers and dial gauges with care. Mishandling could result in damaging the tool, affecting its precision.



CONCLUSION

Performing accurate measurements and calculations is vital in automotive servicing. Properly selecting, using, and maintaining measuring instruments ensures that automotive parts and components are within specifications, contributing to safe and efficient repairs. Regular calibration and careful handling of measuring tools are essential to maintaining accuracy.

REFERENCE

Source: Automotive Servicing Module, K to 12 Technology and Livelihood Education, Department of Education, Philippines

Location: Pages 57-86 of the module, covering the section on "Perform Mensuration and Calculations," including detailed instructions on measuring instruments, calculation techniques, and maintenance of tools.