

UNIT 1 - GAGE PRIMER

Lesson 1 - Why Measure?

- Understand the three main reasons why parts are measured.
- Explain the five critical aspects of measuring.

Lesson 2 - Language of Measurement

- Use the language of dimensional measurement.
- Convert English to SI (metric) units of measure and SI to English units.
- Understand basic terminology used on drawings and blueprint.

Lesson 3 - Measurement Standards

- Explain the role of standards in the dimensional measurement field.
- Follow the traceability trail of calibration standards.

Lesson 4 - Precision and Accuracy

- Explain common sources of measurement error.
- Understand the impact of the five categories of measurement error: accuracy, repeatability, reproducibility, stability, and linearity.

Lesson 5 - Datums

- Use a datum to locate the position of part features.
- Identify datum planes, datum points, and datum axis.

Lesson 6 - Introduction to GD&T

- Explain the differences between coordinate tolerancing and geometric dimensioning and tolerancing.
- Interpret feature control frames.
- Use the 14 geometric characteristic controls.
- Identify GD&T modifying symbols.

Lesson 7 - Surface Finishes

- Characterize the finish of a surface.
- Identify the five most common types of surface deviations.
- Use surface symbols to communicate machining instructions.

Lesson 8 - Math for Measuring

- Add and subtract fractions.
- Convert fractions to decimals.
- Calculate the perimeter and area of rectangular shapes and the circumference and area of circular shapes.

Unit Test Challenge

- An assessment of the learner's progress in this unit.

UNIT 2 - USING GAGES

Lesson 1 - Types of Gages

- Explain the differences between direct and transfer measurement gages.
- Identify the line of measurement.
- Apply the 10-times rule of measurement.

Lesson 2 - Calipers

- Use a vernier scale.
- Use a caliper to take measurements.
- Explain the pros and cons of vernier, dial, and digital calipers.

Lesson 3 - Micrometers

- Use a micrometer to take measurements.
- Read precision micrometer scales.
- Identify applications for inside and outside micrometers.

Lesson 4 - Height and Depth Gages

- Use height gages with a surface plate to take direct or comparative measurements.
- Identify height gage accessories used for specialty measuring applications.
- Use depth gages to measure the depth of features.

Lesson 5 - Fixed Gages

- Explain the pros and cons of fixed and variable gages.
- Identify measurement applications for fixed gages.

Lesson 6 - Test Indicators and Dial Indicators

- Use both test indicators and dial/digital indicator for comparative length measurements.
- Select indicator contact points types and test stands to specific measurement applications.

Lesson 7 - Gage Blocks and Surface Plates

- Wring and stack gage blocks.
- Use gage blocks to calibrate variable gages, check the validity of fixed limit gages, and to set comparative-length indicators.
- Use gage blocks with surface plates to make comparative measurements.

Unit Test Challenge

- An assessment of the learner's progress in this unit.

UNIT 3 - GAGING APPLICATIONS

Lesson 1 - Application Overview

- Understand that some dimensional instruments are appropriate and some are not for a specific measuring application.
- Realize that there are common errors and misapplications in measuring and that they can be avoided.

Lesson 2 - Linear Measurements

- Select the appropriate type of gages for common linear measurement applications.
- Measure the position of a hole.
- Measure the differential height between two lands.

Lesson 3 - Roundness and Circularity

- Use two-point contact gages to measure out-of-roundness.

- Recognize limitations of two-point contact gages for shapes that are oval, egg-shaped, irregular or lobed.
- Be exposed to three-point contact gages and sophisticated gages to measure out-of-roundness.

Lesson 4 - Common Misapplications

- 12 common measuring mistakes and misapplications.
- What to look out for and how to prevent these mistakes from happening.

Lesson 5 - Measuring Complications

- 10 systemic problems that can lead to measuring complications.
- An exploration of why each complication may occur with suggested remedies to combat the complication and make the system more robust.

Lesson 6 - Care of Gages

- Apply universal practices to take care of gages.
- Review tips for cleaning and caring for specific instruments.

Unit Test Challenge

- An assessment of the learner's progress in this unit.