

## Module 600: PART INSPECTION & QUALITY

### ***Lesson Description:***

Course includes taking measurements using a rule, square, protractor, micrometer, caliper, and/or other available checking fixtures using simple engineering drawings and actual piece-parts. Students will determine compliance tolerance for the dimensions measured and determine if the part is acceptable (within tolerance) or unacceptable (non-compliant). Students will fill out a data collection sheet with dimensions actually found on the part. Introduction to surface defects and aspects of visual inspection will be introduced. Elements of the control plan relating to part inspection will be discussed. Lesson also includes an introduction to the CMM to optical comparator. In addition, self-study materials and class time will be provided to address various quality issues including – *What is Quality?* – *What is the Meaning of Quality?* – *Who is the Customer?* – *What is ISO/QS-9000 and ANSI?* *Prerequisite:* Module 500, Lesson Two, *Measurements.*

### ***Learning Objectives:***

At the completion of this lesson, the student will be able to:

- ◆ Explain the difference between the first piece inspection, an in-process QC inspection and a final QA inspection.
- ◆ Correctly identify the instrument(s), gages and procedures for measuring a set of parts using a control plan or inspection sheet.
- ◆ Determine tolerance (+/-, max./min. - unilateral or bilateral).
- ◆ Determine the total permissible variation given a basic dimension and tolerance.
- ◆ Measure parts and determine if the measurement is within tolerance given a basic dimension and tolerance.
- ◆ Explain the elements of a Quality Plan that dictate the inspection procedures (includes identification of the correct measuring instruments, interval of measurement, tolerance of critical dimensions and visual quantity requirements).
- ◆ Given 10 parts, measure dimensions and correctly enter findings on a data collection sheet or inspection form to an accuracy of  $1/64^{\text{th}}$  for fractions and/or within 0.001”.
- ◆ Identify different qualities that can be inspected visually.
- ◆ Explain an optical comparator and a CMM (What they do? Why they are used? Who uses them? When they are used?).

### ***Methods of Instruction:***

Lecture, hands-on application exercises, practicals, simulations and real-world examples.

### ***Methods of Evaluation:***

Hands-on demonstrations, written tests, lab practical and exam (*PROficiency Practices and Assessment*) during and after training.

**Lesson Materials Provided by PMA:**

- ◆ *LS Starret Instrument Handouts and Slide Charts – Precision Measuring Tools*
- ◆ *PMAEF Student Study Guide – The Meaning of Quality*
- ◆ *3 LS Starret Videos – The Outside Micrometer, Vernier Caliper & Vernier Height Gage*
- ◆ *PMAEF Video – Attribute Gaging of Piece Parts*
- ◆ Student Handout – Practical Exam
- ◆ PMAEF Parts (2 types) with Matching Prints
- ◆ PMAEF 6” Steel Rules and Protractors  
(Calipers, micrometers and other measuring/gaging devices not provided)
- ◆ *PMAEF Instructor’s Guide with SMART Lesson Plans, Prints/Drawings, Skill Checks and PROficiency Practices & Assessment.*
- ◆ PMAEF Item Banks (assessment questions) for construction of end of lesson examination
- ◆ List of recommended student reading & study materials.

**Lesson Topics & Content Outline:**

- ◆ **The Meaning of “Quality”**
  - ISO, ANSI and QS-9000
  - Part Inspections, Quality Plan and SPC
  - Who is the Customer?
  - Quality Issues, Systems, Control and Values.
- ◆ **Attribute Gaging of Piece Parts**
  - Gage Tickets
  - Types of Gaging and Checking Fixtures Used in Metalforming (Go/No-Go gages - plug, pin and gap gages, window and bar gages and specialty gages)
  - Proper Care of Gaging
  - Proper Part Installation, Fittings and Use of Gaging.
- ◆ **Precision Measurements, Determining Compliance and Recording Findings**
  - Selection of Instruments and Interval of Inspections
  - Take Length, Height and Width/Depth Measurements Using a Metric Rule or Scale
  - Check for Squareness and/or Angularity (or other geometrics)
  - Review Reading a Micrometer, Caliper and Height Gage
  - Inspect Parts According to Sampling/Control Plan, Using a Variety of Measuring Tools and Instruments and Record Results and Determine Compliance
  - Check and Compare Part Features, Attributes and Characteristics Visually
  - Introduction to the CMM and Optical Comparator.

❖ **End of Module Lesson Exam (PROficiency Assessment)**

- ☞ Note: See SMART Lesson Plan contained in the Instructor’s Guide for detailed instruction content, flow of lesson, and in-training assessments. Instructor must provide calipers and micrometers, additional prints/drawings with compliance data and associated piece-parts.