

Last date for registration 02 December 2024

INTRODUCTION

The enhanced understanding of measuring jobs and influencing parameters enables measuring technicians to reduce measuring uncertainties and thus to make measurement results more reliable and easier to compare. The minimization of costs and waste is supported.

The seminar lays and consolidates basic knowledge of production metrology for beginners and advanced metrologists. The didactic approach used in the seminar is based on the latest findings. The seminar covers the latest knowledge regarding dimensional tolerancing, programming basics, measurement process planning, and the machine and sensor technology used.

The enhanced understanding of measuring jobs and influencing parameters enables measuring technicians to reduce measuring uncertainties and thus to make measurement results more reliable and easier to compare. The minimization of costs and waste is supported.

The Seminar furthers basic knowledge of production metrology for advanced measuring technicians. The didactic approach used in the seminar is based on the latest findings.

Keeping this in view, Indian Machine Tool Manufacturers' Association is organizing a 5-day training on **"AUKOM Certified Metrologists Level 1 & LEVEL 2" in association with Carl Zeiss (a certified partner of AUKOM).**

Note: -

- **Seat is limited to 12 participants**
- **AUKOM L1 certification is mandatory to attend AUKOM L2 certification**

FOCUS AREAS

CONTENT Level 1

1-1 Units

SI Units, incl. Definition and History, Base Quantities, Derived Quantities, Prefixes of Units, Angles, Conversion Degrees <-> Radian, Conventional Measuring and Test Equipment

1-2 Coordinate Systems

(Mathematical) Drawing Plane, Origin, Cartesian Coordinates, Right-Hand Rule, Translation and Rotation, Polar Coordinates, Cylindrical and Spherical Coordinate System

1-3 Coordinate Measuring Machines

History of Coordinate measuring machines, Cantilever/Bridge/Column/Gantry Types, Differences in the Types, Axis Guide, Measuring Computer and Software, Work Holding Fixture, Accuracy of Coordinate Measuring Machines, CAA Correction, Form Measuring Machines

1-4 Sensors

Sensor selection, Stylus System, Stylus, optical sensors, Image Processing, Laser Triangulation

1-5 Basic definitions

Drawing Entries (Dimensions, Tolerance Symbols), Standard Reference, Differences Nominal Element - Real Element - Extracted Element - Associated Element, Free Form surfaces

1-6 Dimensional Tolerance

Dimensional Tolerances, Taylor's Principle, Standards, Symbols and Drawing Entries, Length Dimensions, Angular Dimensions, Limiting Dimensions and Fits, ISO Fitting/Mating System, Common Tolerances

1-7 Geometric elements

Standard form elements: Plane/ Cylinder/ Cone/ Sphere/ Line/ Circle/ Point/ Ellipse, Vector, Normal Vector, Minimum Number of Points, Projection

1-8 Geometric constructions

Calculation of characteristics out of two geometrical features (distance, angle), Calculation of features out of two geometrical features (Intersection, Symmetry), Calculation of new features out of some geometrical features (Construction)

1-9 Preparing a Measurement on the Coordinate Measuring Machine

Standardized Temperature, Part Cleaning, Temperature Control, Fixturing, (Avoiding Distortion), Fixturing Systems, CMM and Software Startup

1-10 Stylus Selection and Qualification

Stylus System Selection, Stylus Qualification, Reference Sphere, Reference Stylus, Stylus Sphere Radius Correction, Stylus Tip Bending Correction, Mechanical Filter Effect of the Stylus, Errors of Incorrect Qualification,

1-11 Measuring using Coordinate Measuring Machines

Determining part Coordinate System, Difference to Control Coordinate System, Manual and automatic Alignment, Probing, References, Consequences of Collisions, Number of Probing Points and their Distribution, Influences on measuring result

1-12 Evaluation of Measurement and Statistics

Association methods (Gauss, Maximum Inscribed, Minimum Circumscribed, Minimum Zone), ISO 1101, ISO 14405 and ASME, Modifier symbols (ISO), Statistical Parameters, Mean value, range, standard deviation, median, Outliers, Scattering, Histogram Representation

1-13 Inspection planning

Completely defined characteristic, Purpose of the Measurement, Production of workpiece, Function of workpiece, Feature description, Manufacturing Methods and Accuracies, Shape Deviations, Uncertainty Effects, Awareness of Measuring Uncertainty, Inspection planning, Identifying measuring features

1-14 Documentation and Quality Management

Measurement Reports, Quality Control Charts, Cooperation between Design - Production - Testing, Reproducible and Clear Measurement Documentation, Measuring Strategy documentation

CONTENT Level 2

2-1 Overview of the Entire Measuring Process

Short repetition of the contents of stage 1

2-2 Geometric Overview

Standard Geometric Elements, Surface and Space Points, Punched Hole/Slot, Tetragonal/Hexagonal Hole, Symmetry, Perpendicular, Parallelism, Angle in Space, Coordinate System Transformations

2-3 Form, Orientation and Location Tolerances

Introduction to GD&T (ISO and ASME), Symbols and Drawing Entries, Form Tolerances, Orientation, Location and Runout Tolerances, Principle of independency and envelope requirement, ASME rule #1

2-4 Measuring Strategy

Define Clamping Setups and References (Practical Instructions), Order of Reference and Origin Selection, Iterative Alignment, Alignment According to the 3-2-1 and Best-Fit Methods (3-D Fit), Measuring Element and Auxiliary Elements, Machine Grid Measurements, Contour Measurements, Measurement with Cylinder Surfaces, etc.

2-5 Probing Strategy - Tactile Sensors

Number and Distribution of Probing Points, Probing Force and Speed, incl. Material Properties, Stylus Diameter, Special Styli, Scanning

2-6 Probing Strategy - Image Processing

Single-shot measurement, Multi-shot measurement, Edge finder, contour image processing, local threshold and gradient method, illumination, filter, scanning, auto focus

2-7 Probing Strategy - Distance Sensors

Laser triangulation sensors, Foucault sensor, White light sensor, Light section sensor, autofocus, Photogrammetry, Fringe protection, Influence on the measuring results

2-8 Computer Tomography

Physical principle, tomography on the image, initial samplings, deviations to the nominal geometry, measurement of sections, checking the material structure

2-9 CNC Programming

Types of CNC programming, principles of structured programming, user interfaces, parametric programming, program design - optimizing for cycle time and accuracy, feature-based measurement, offline collision simulation

2-10 Measurement of Free Form Surfaces

Element types in Free Form Surface Metrology, basics, procedures in free form surface metrology, referencing and probing strategies

2-11 Evaluation

Evaluation Criteria: Function-oriented and Manufacturing-oriented Evaluation Methods, Differences in the Association Methods, Constructions, Digital filtering, Measurement Logs

2-12 Effects on the Measurement Result

Effects on the Measurement Result, Reduction of Measurement Uncertainty, Detection and Reduction of Systematic and Random Effects, Temperature Compensation

2-13 Documentation

Principles of Documented and Reproducible Documentation, Graphic Evaluation, Form Plots, Measurement Reports and their improvement, documentation of fixturing, sensors, qualification, clamping and measurement strategy

2-14 Good Measurement Practice

Metrology adds value, Good Measurement Practice, Necessity of Cooperation

KEY TAKE AWAYS

After undergoing the programme, the participants will be able to -

- Develop awareness, knowledge and skills necessary for the reliable measurement application / assessment of measurement quality
- Evaluate correct measuring methods / comparative measurements
- Get Hands-on practice in handling various measuring instruments
- Have overview of advanced measuring systems including CMM
- Obtain thorough knowledge and skills necessary for the reliable measurement application / assessment of measurement quality
- Measure GD&T Parameters
- Usage of different probes and probing methods
- Use different alignments, clamping & fixturing in CMM measurements
- Prepare measurement reports and documents
- **AUKOM certification**

PARTICIPATION FEE

Rs. 8000/-

+18% GST

IMTMA Members/ Micro Companies/ Individuals/ Educational Institutions / Students/ IMTMA Non Members/ Others

USD 3200/-

Overseas Participants

FACULTY

This Program will be conducted by **Aukom Certified Trainer.**

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REGISTRATION : Prior registration for participation is necessary. Number of participants is limited and will be accepted on 'First Come First Serve' basis. A Certificate of participation will be issued to participants.

Important Information : Participation fee includes, course material, working lunch and tea / coffee. Interested companies are requested to register online by clicking on 'REGISTER' button and by filling up the nomination authority and participant's details in specified form.