



Machine Tool Metrology 101 Training Agenda

IQL - Ashaway, RI

Tuesday

7:30 Registration
8:00 **Module 1 Introduction**
Terminology, Machine Tooling Capability (Boeing Video), Deterministic Method, Rigid Body
Module 2 Linear Axis Motions
Degrees of Freedom, Designs & Constructions, Linear Displacement
Demonstration: Linear Displacement Measurement - Laser
Noon Lunch
Angular Errors
Demonstration: Angular Error Measurement - Levels & Laser
Straightness Errors
Demonstration: Straightness Errors - LVDT & Precision Square
4:30 Close

Wednesday

8:00 **Module 3 Rotary Axis Motions**
Degrees of Freedom, Designs & Constructions, Angular Displacement
Demonstration: Angular Displacement Measurement - Laser
Module 4 Spindle Axis Motions
Degrees of Freedom, Designs & Constructions, Radial & Axial, & Tilt Measurement,
Thermal Error Measurement (Lion Precision Video)
Demonstration: Spindle Performance Measurement
Module 5 Axis Relationships
Degrees of Freedom, Error Nomenclature, Linear to Linear Axis Alignments
Demonstration: Squareness Measurement - Precision Square
Noon Lunch
Rotary to Linear Axis Alignments
Demonstration: Spindle Squareness Measurement
Rotary to Rotary Axis Alignments
Module 6 Static & Dynamic Errors
Static Compliance, Least Increment (Step), Linear Interpolation
Demonstration: Step & Linear Interpolation Measurement
Circular Interpolation
Demonstration: Circular Interpolation Measurement - Ball Bar
5:00 Close

Thursday

8:00 **Module 7 Multi-Axis Performance**
Machining Center One-Day Test, Turning and Grinding Center One-Day Test
Demonstration: Volumetric Performance Measurement - Laser Diagonals
Module 8 Manufacturing Process Error Budget
Method, Process Error Budget, Machine Error Budget
Demonstration: Error Budgeting - Locus CAE
Noon Lunch
Module 9 Optimization & Diagnostics
Module Workpiece Accuracy Error Factors, Sign Conventions, Installation
Demonstration: Earth Leveling
Wear, Design, SuperTune
Module 10 On-Machine Measurement
Probe Types, Lobing Error, Measurement Performance
Wrap-up & Evaluation
4:30 Close