OMNEX

DRIVING WORLDWIDE BUSINESS EXCELLENCE

Geometric Dimensioning & Tolerancing – GD&T

Training Duration : 4 days

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Seminar Content

This seminar explains the basic concepts of GD&T as well as detailed requirements of GD&T for manufacturing industry of North America as per ASME Y14.5M-2009. The seminar combines abundant real examples of automotive industry to help the understanding and implementation of GD&T on design, production and inspection. The course also compares the major differences between GD&T standard of ASME Y14.5M and related Europe (ISO1101).. The application of GD&T on product design, quality control, gage design and dimension inspection, such as traditional measurement, Vision System and CMM will be explained. GD&T is widely used on design, production and quality area, including blue print reading, meaning and understanding. GD&T is the important tool of product realization process, it's also the professional language to understand the requirements of customer, especially automotive OEMs.

Training Features

Includes abundant case studies of automotive industry as well as provided specific cases from the trainee, explain in details of the content and requirements of GD&T and implementation on design, production Gage Design and Dimension Inspection.

Who Should Attend

Design Engineer, Quality Engineer, Process Engineer, Manufacturing Engineering, Gage Engineer, APQP team member, and Inspector, Sales and Marketing, Purchasing.

Seminar Materials

Omnex Training Material with case studies as well as exercises.

Prerequisites

- Basic knowledge of mechanical blue print reading. Following attendee are recommended: Design Engineer, Quality Engineer, Product Engineer, Manufacturing Engineer, Process Engineer, Inspector, Sales Engineer, Purchasing Engineer, etc.

Training Goals

- Understand the basic knowledge and requirements of GD&T
- Learn how to apply GD&T to understand the design purpose of the customer, improve the reliability of product design and process design.
- Emphasize the understanding principles of verifying GD&T
- Learn the concept of MMC, LMC and RFS
- Use GD&T to improve the dimension verification and inspection, understand the ASME Y14.5M-2009 requirements, such as geometric tolerance, symbols, terms, rules and application
- Understand the differences between GD&T requirements of North America (ASME Y14.5M) and ISO1101of Dimensioning and Tolerances
- Understand the measurement verification of 14 GD&T requirements, include traditional instruments, CMM, datum setup, coordinate system setup, tolerance analysis.

Course Outline

Engineering Drawing/Tolerance

- Engineering Drawing
- Dimensioning
- Dimensioning Standard

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Geometric Dimensioning & Tolerancing – GD&T

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GD&T Introduction, Symbol and Terms

- History, Purpose, Scope
- GD&T Symbol ANSI/ISO
- Measurement Unit
- Tolerance Indication Methode
- Implied Perpendicular
- Differences between GD&T and Coordinate System
- GD&T Hierarchy

Datum

- Datum Definition and Feature
- Datum and Dimension Fluctuation
- Datum Reference Frame
- Datum Precedence Order
- Datum Simulator
- Symbol Placement
- Datum Target
- Datum Target Point
- Datum Target Line
- Datum Area
- Free State
- Datum Shift
- Datum Application: RFS (Datum RFS)
  Datum Application: MMC (Datum MMC)

Feature Control Frame

- Purpose
- Symbol
- Datum Feature References
- Material Condition on FOS Datum Reference
- Datum Sequence and Material Condition
- Types of Feature Control Frame

Rules

- Rule #1, #2
- Bonus Tolerance
- Variation of Dimension
- Variation of Form
- Virtual Condition
- Bonus Tolerance

Form

- Flatness
  Definition, Requirements
- Straightness
  Straightness :Definition, Requirements
  Axis – RFS
  Straightness: Axis – MMC
  Straightness: Center Plane - RFS
  Straightness: Center Plane - MMC
- Roundness
  Definition, Requirements
  Roundness: Cylinder or Cone
  Roundness: Sphere
  Roundness: Nonrigid Parts
- Cylindricity
  Definition, Requirements

Orientation

- Perpendicularity
  Definition, Requirements
  Perpendicularity: Plane Surface
  Perpendicularity: Line and Plane Surface
  Perpendicularity: Center Plane
  Perpendicularity: Axis
  Perpendicularity: RFS (Pin or Boss: RFS)
  Perpendicularity: MMC (Pin or Boss: MMC)
  Perpendicularity: MMC (Zero Tolerance at MMC)
- Parallelism
  Definition, Requirements
  Parallelism: Plane
  Parallelism: Axis
  Parallelism: Axis and Plane
- Angularity
  Definition, Requirements
  Angularity: Plane
  Angularity: Line
  Angularity: Axis
  Angularity: Axis and Plane

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Tangent Plane Position (TOP)

- Definition, Requirements
  TOP: Hole
  TOP: FOS
  TOP: Bidirection Tolerance
  TOP: Elongated Hole
  TOP: Projected Tolerance

Position (TOP)

TOP: Long Holes)
TOP: Sphere)
TOP: Slot Patterns

- Coaxiality
- Concentricity
- Composite Position
- Symmetry

Runout Tolerance

- Definition, Requirements
- To Datum Diameter
- To Collinear Datum Diameter
- Total Runout

Profile

- Definition, Requirements
- Profile of Line
  Profile of Line: Bilateral Tolerance
  Profile of Line: Unilateral Tolerance
  Profile of Line: All Around
- Profile of Surface
  Profile of Surface: Irregular Feature
  Profile of Surface: Conical Feature
  Profile of Surface: Coplanarity Surface
  Profile of Surface: Multiple Surface
- Composite Profile

Fixed and Floating Fasteners

- Fixed Fasteners
- Floating Fasteners

GD&T Function Gage Design Case

- Gage Datum
- Function Go Gage
- Gage Tolerance Analysis
- Gage Risk Analysis

GD&T Measurement: Instruments, Dia Indicator, Profile Projector, CMM

- Measurement Datum Setup
- Measure Error Analysis
- Form Measurement
- Orientation Measurement
- TOP measurement
- TOP datum setup
- Composite TOP Measurement
- TOP with MMC/LMC Measurement, include Bonus Tolerance, Datum Shift
- Profile Measurement
- Profile Datum Setup
- Profile with MMC Measurement, Only Datum Shift

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Case Study, Exercise and Test included

On-site consulting available, include Gage Design, Measurement, Gage and CMM

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