Mechanical Drawing Interpretation for Industry – Course Synopsis

Aims & Objectives

The course is delivered as an intensive, two-day programme that focuses on understanding of the fundamental elements, rules and concepts of mechanical engineering drawing as defined **in current ISO-TPD *(Technical Product Documentation)*** set of standards.

Participants will learn about the rules of drawing views presentation, line-types, section views, dimensions, tolerances, surface finish and other common drawing symbols in order to be able to understand and interpret mechanical engineering drawings from a practical point-of-view, find out the pitfalls, ambiguities and misconceptions that rely on the drawings interpretation and gain confidence on how they will be able to overcome them.

This highly-interactive course includes extensive classroom discussions, team exercises and problem-solving sessions. Examples of drawings or components from the client, where available, are used in order to illustrate the course material. Customization of the course to specific participant needs can be discussed.

To maximize the effectiveness of the training, an upper limit to the class size of 10 delegates is recommended.

Please note that topics like *geometrical tolerancing* and *surface texture specification* are only covered in very broad outline, and not in sufficient detail to go into the application and interpretation of these requirements (more extensive courses are available for clients who need to cover these in more detail).

Who it may concern

Anyone who creates, reads or edits mechanical part drawings and models.

Course topics

- Introduction to the graphic universal language of mechanical engineering drawing

  importance and different types of technical drawing, rules and standards for mechanical engineering drawing – Technical Product Documentation (ISO-TPD, EN, DIN, ASME, corporate etc.)

- Mechanical drawing layout

  the three "drawing layers", drawing scales, title blocks, parts list, typical notes on drawings, other types of technical data on mechanical drawings, 2D *vs.* 3D drawing, 3D-CAD Model Based Annotation (MBD) *(as per ISO 16792:2021)* and 3D-PMI

- Views and Orthographic projection

  representation of a projected mechanical component, projection plane, systems of arrangement for the six basic views (ISO-E and ISO-A), auxiliary and partial views, detail views, section views and type of section, section rules, conventional section practices

- Dimensioning principles

  feature types, dimension elements, rules for dimensioning on mechanical drawings, the importance of functional dimensioning, dimensioning for manufacture and dimensioning for inspection

- Drawing representation of standardized Machine Elements

  fasteners types, thread characteristics, thread drawing appearance, drawing bolt, nuts, washers, pins, rivets, keys and keyways, springs, shafts and bearings, retaining rings

  gears terminology, types of gears, simplified representation of gears

- Surface texture indication on mechanical drawings

  surface texture symbols and characteristics, past practices, the new ISO 1302:2022 and ISO 21920-1:2021 standards for surface texture, surface texture inspection basics

- Symbolic representation of welded joints on mechanical drawings
  welding terminology, welding types and symbols as per ISO 2553:2019, dimensioning of welds and of joint preparations, overview of ASME and AWS standards on welding, examples of effective use of symbols on welded constructions
- Indication and dimensioning of edges as per ISO 13715:2017
- Assembly drawings, identification numbers, parts list, bill of materials (BOM), standardized/purchase parts
- Introduction to dimensional and geometrical tolerancing
  axiom of manufacturing imprecision, interchangeability in industry, the role of standardization, tolerance expression, terminology, limits of size, limits and fits as per ISO 286:2010
- General tolerances
  general tolerances as per ISO 2768-1 and ISO 2768-2, ISO 2768 *vs.* DIN 7168, ISO 22081:2021: the new standard on general geometrical specifications and general size specifications
- What is Geometrical Tolerancing?
  benefits and advantages of Geometrical Tolerancing
  major pitfalls of traditional tolerancing and how to overcome them
- The concept of Features and Features-of-Size *(ISO 17450-3:2016)*
- Linear and angular size tolerances clarified
  ISO 14405-1:2016, ISO 14405-2:2018 and ISO 14405-3:2016, Size *vs.* Form: the Envelope Requirement
- The elements of Geometrical Tolerancing – ISO GPS system and Standards
  datum and datum systems *(as per ISO 5459:2011 and ISO/DIS 5459.2:2017)*
  what is a datum and why is it needed? datum *vs.* datum feature, indicating datums on drawings
  geometrical tolerance frames, symbols and modifiers, tolerance frame on drawings
  tolerance characteristics – interrelationships *(what do they really control? – ISO 1101:2017),*
  tolerances of form, orientation, location, runout and profile *(ISO 1660:2017)*

The Trainer

Georgios Kaisarlis, Ph.D., M. Eng., has more than 20 years of teaching and working experience in Geometrical Dimensioning and Tolerancing (GD&T), precision manufacturing and industrial dimensional metrology. His industrial experience comes from his career as a field engineer for the Hexagon MI group and his involvement as lead engineer in numerous specialized technical projects for the manufacturing industry *(reverse engineering, dimensional metrology, product design and development).* He has delivered hundreds of GD&T and dimensional metrology classes for a variety of manufacturing clients throughout Europe and the Middle East.

Dr Kaisarlis is serving as appointed Technical Expert (WG2/WG10/WG17/WG18) and as accredited national delegate (ELOT/NQIS) in ISO TC/213 *"Dimensional and geometrical product specifications and verification".* ISO TC/213 is responsible for the international ISO standards relating to Geometrical Product Specification and Geometrical Tolerancing. He currently holds a research and teaching assistant's position in the School of Mechanical Engineering of the National Technical University of Athens (NTUA), Greece. Dr Kaisarlis holds a M. Eng. Degree in Mechanical Engineering from TU Athens (NTUA) since 1997 and a Ph.D. degree from the same University since 2007.