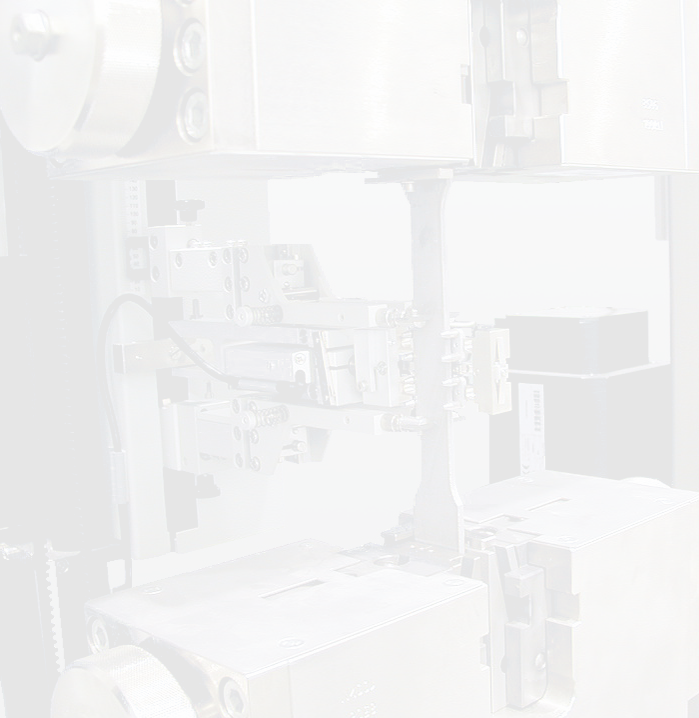


Mechanical Testing Techniques Training Course for Metals

Date: Thursday, 6th July 2023

Key learning objectives:



* Understand the meaning of terms such as strength, ductility, hardness, and toughness.
* Appreciate why compromise between high values of strength and toughness is necessary.
* Understand the metal structure differences that give rise to continuous and discontinuous yielding.
* Be familiar with parameters such as Young’s modulus (E), yield strength, proof stress, UTS, ductility measures, engineering stress-strain, true stress-true strain and work hardening index ‘n’
* Distinguish between ductile, brittle, and intergranular failures.

Section 1: Course introduction

Section 2: Tensile Tests

* + Tensile tests: parameters, sample preparation and types
  + Gripping methods: screw, wedge, hydraulic and pneumatic
  + Contact and non-contact extensometry
  + Continuous and discontinuous yielding; influence of metal structure
  + Further test parameters: engineering and true stress-strain, work hardening index

Section 3: Ductile, brittle, and intergranular failure

* + Deformation of ductile metals
  + Brittle (or cleavage) fracture
  + Ductile-brittle transition
  + Crack propagation and crack arresting mechanisms
  + Intergranular fracture

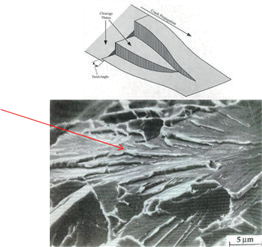
Section 4: Hardness Tests

* + Hardness principles: Brinell, Vickers, Rockwell; indenters and test conditions
  + Relationship between hardness and grain size: Hall-Petch equation
  + Micro-hardness tests: Vickers and Knoop
  + Nano-indentation
  + Hardness conversion

Section 5: Pendulum impact tests

* + Toughness: a definition
  + Charpy and Izod test procedures
  + Sample types: full and sub-sized samples
  + Test results: ductile-brittle transition temperature
  + Role of microstructure
  + Charpy vs Izod



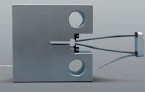


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Section 6: Fatigue and creep testing

* + Fatigue in metals
  + Fatigue testing: axial loading and rotating bend test machines
  + Fatigue testing: stress-life (S-N), strain-life (ε-N) and fatigue crack growth rate (da / dN - ΔK) approaches
  + Stages of creep
  + Creep mechanisms: dislocation climb, Nabarro-Herring and Coble creep
  + Creep and stress rupture testing

Section 7: Fracture mechanics

* + Linear-elastic fracture theories
  + Fracture toughness tests: methods and sample types
  + Factors affecting toughness
  + Realm of application for different fracture mechanics theories; LEFM, EPFM etc.

Course fee:



£250 + VAT per delegate which includes refreshments, lunch, course completion certificate & comprehensive training course manual.

Course venue:

ZwickRoell Ltd

Worcester Six Business Park

Clayfield Road

Worcester

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