SEMETS380

Inspecting Engineering Products by Eddy Current Testing

Overview

This standard identifies the competencies required to carry out eddy current testing (ET) inspection activities on engineering materials, products and plant in accordance with approved procedures. This can involve using both contact and non-contact manual, semi-automatic or fully automatic eddy current flaw detector equipment.
You will be required to prepare products, check equipment and ambient conditions, carry out tests, interpret test indications, prepare NDT test reports and mark up products to indicate flaws. Your responsibilities will require you to comply with organisational policy and procedures and to report any problems with activities or equipment that you cannot resolve or which are outside your permitted authority. You will take personal responsibility for your actions and for the quality and accuracy of the work that you carry out.
You will have a good understanding of your work, and will provide an informed approach to the inspection of engineering products by using Eddy Current testing techniques. You will have adequate uncorrected or corrected vision in accordance with national standards to allow you to competently perform inspections. You will have an appreciation of hazards, safe working practice and safety precautions, have correct vision at all times and you will understand the risks posed by material defects/flaws and the consequences of component failure and how to carry out Eddy Current detection activities and use associated tools and equipment safely.
This standard is for anyone who inspects engineering materials, products or plant using eddy current testing techniques.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety legislation and other relevant regulations, directives and guidelines
2. identify, confirm and carry out specified inspection checks against agreed acceptance criteria
3. prepare testing equipment and materials, checking they comply with specification requirements, are safe to use and fit for purpose
4. comply with relevant regulations, directives, guidelines, organisational policies and procedures for eddy current testing activities
5. follow correct specifications/techniques for products or equipment being inspected, anticipated locations and orientation of flaws
6. prepare environmental conditions, material properties and surface conditions, control electronic / structural noise sources, checking they are all satisfactory for tests to proceed
7. prepare, set up, configure and calibrate testing equipment to achieve specific inspection requirements, scanning index or inspection pitch which will detect flaws of specified maximum lengths
8. carry out specified eddy current testing inspections to meet requirements
9. analyse and evaluate test indications
10. mark up products or equipment to show where there are indications of flaws **
11. record accurately the results of the inspections in the appropriate format and in line with legislative and organisational requirements and pass to designated people
12. deal with problems within your control in line with organisational procedures without delay, reporting problems outside your control to designated people

Knowledge and understanding

You need to know and understand:

1. relevant health and safety and other regulations, directives, national standards and guidelines and your responsibilities to yourself and others including those relating to quality control
2. the hazards associated with eddy current testing activities including electrical contact, moving mechanical parts materials at high temperature during manufacture, temperature increase due to cold working, working with electrical equipment, active plant and associated material, equipment or vehicular movements and component failure
3. safe working practice and specific safety precautions to minimise hazards when carrying out eddy current testing activities on engineering materials, products and plant and using associated tools and equipment including personal protective equipment (PPE) to be used and how to obtain it
4. how to obtain and interpret job instructions/techniques and testing specifications
5. how to interpret and evaluate test results to identify defects or variations from specification
6. how to test components in new manufacture or in-service
7. why products may need to be inspected by a range of different non-destructive testing methods
8. the benefits of using eddy current testing and the range of materials and products to which it is usefully applied, the types of defects/flaws it can detect, the level of defects/flaws that are acceptable and the influence of defects on service/ performance of products, materials and structures
9. how electricity, magnetism and fundamental electromagnetism theory and principles applies to wire, rod, pipes and tubes
10. the basic components and uses of eddy current flaw detection equipment including oscillators, test coils, filters, bridge circuits, amplifiers and their signal display
11. the different test coil configurations including single and double absolute, differential coils and multi-winding coils with separated transmitting and receiving coils, as applicable to both surface probes and encircling coils
12. the values assigned to key inspection parameters and common signal evaluation

13. the effect of test frequency and material properties on the distribution of eddy currents on and below the surface skin of test items and their relative magnitude and phase at increasing depth within test materials at standard depths of penetration
14. factors that will affect the selection of suitable probes, test coils and test configurations
15. how product properties affect the way test equipment performs
16. ways of setting up, configuring and calibrating eddy current flaw detection equipment while taking account of differences in material properties of inspected products and calibration blocks
17. factors that determine effective coupling of test articles to sensing probes or test coils,
18. probable causes of changes in sensor behaviour and equipment displays and signals.
19. how to interpret and investigate changes in sensor behaviour, of flaw identification, flaw sizing and the effect of probe in terms manipulation, material change, fill factor and lift-off
20. how to mark up products, objects or structures and when it is appropriate and safe to do so
21. how to facilitate automatic storage and back-up of digital data to a more accessible server
22. testing equipment performance checks and routine care including checking condition
23. the importance of accurate test reports, the data and information required, organisational formats and how to prepare and complete them
24. the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Scope/range

| --

-- |
|

1. Carry out **all** of the following during the Eddy Current detection activities:

- obtain the required Eddy current detection equipment and materials, and check that they are in a safe and usable condition
- use appropriate personal protective equipment
- comply with job instructions/techniques, NDT testing inspection specifications, risk assessments and other relevant safety standards
- follow the defined testing procedures/techniques, and apply safe working practices and

procedures at all times

- leave the work area in a safe condition on completion of the activities

2. Obtain the correct configuration of equipment, as required by the eddy current test procedures/techniques or work instructions, to include **all** of the following

- set up the flaw detector
- calibrate and use the probe
- use the rotary gun or scanning arm (when applicable).

3. Prior to undertaking an eddy current test inspection, carry out **all** and record the following equipment parameters (where appropriate) that could influence the outcome from the inspection:

- test coil balance
- test frequency
- filter settings
- magnetic state/properties of the test material
- scanning speed and pitch when hand scanning.

4. Preparation prior to commencing an inspection: to include carrying out **5** of the following items

- inspection area
- check that the test areas are correctly prepared for testing
- check for key reference (datum) markings
- compensate for magnetic variations within the material
- deal with potential coupling inefficiencies
- deal with material condition, coatings, heat-treated condition, corrosion and contamination
- check, when appropriate, for surface roughness, scuffing, scratching or marking, which may generate unwanted signals
- deal with electrical noise and/or poor signal-to-noise ratio.
- edge or fill effect depending upon application

- false calls if incorrectly set up

5. Carry out the specified tests, using **all** of the following

- the appropriate scanning procedure and technique
- the specified probes (correct type, size and frequency)
- the correct flaw size measurement technique

6. Carry out eddy current test Inspection on one of the following:

- wrought products
- welds
- pure metals
- alloys
- tubes / pipes
- industrial process plant
- cold-formed products (formed, bending, pressing or rolling)
- heat-treated components
- structures (such as airframes, lifting beams and pressure vessels)
- other specific products

7. Follow the correct procedure for materials or structures which fall into all of the following categories:

- components, materials or structures which meet the specification
- components, materials or structures with identified defects/flaws
- components, materials or structures requiring further investigation
- components, materials or structures requiring other inspection methods

8. Complete the inspection activities, to include carrying out all of the following:

- marking up defective components, materials or structures with all relevant information
- recording all the required details of the inspection in the appropriate format

- handing over the inspection details to the designated people

SEMETS380

Inspecting Engineering Products by Eddy Current Testing

Developed by	Enginuity
Version Number	1
Date Approved	30 Mar 2021
Indicative Review Date	01 Mar 2024
Validity	Current
Status	Original
Originating Organisation	Enginuity
Original URN	SEMETS380
Relevant Occupations	Engineering, Engineering and Manufacturing Technologies, Engineering Technicians
Suite	Non Destructive Testing, Engineering Technical Support Suite 3
Keywords	Non Destructive Testing, Inspecting, Engineering Products,