



ACCREDITATION SCHEME FOR LABORATORIES

Technical Notes NDT 003

Quality Assurance of Equipment Commonly Used in Non-Destructive Testing Laboratories

1. Introduction

- 1.1 This document recommends the quality assurance activities for equipment commonly used in non-destructive testing laboratories. Other equipment may be added to the list as and when required.
- 1.2 These recommendations are provided as guidelines to the laboratory for its quality assurance programme. The laboratory shall first consult the equipment manuals or test methods before it adopts any of the recommendations in this document.
- 1.3 This document shall be studied in conjunction with ISO/IEC 17025: General requirements for the competence of testing and calibration laboratories and other NDT Series Technical Notes (NDT-001 & NDT-002) published by SAC.

2. Maintenance of Equipment

- 2.1 The laboratory shall institute a preventive maintenance programme to prevent failure of equipment and ensure that the equipment is operating with the reliability required for quality results. The activities include specification checks, calibration, cleaning, lubricating, reconditioning and adjusting by qualified personnel on a regular basis. Proper records shall be maintained for such activities.
- 2.2 The equipment shall be installed and housed in appropriate environmental conditions to eliminate or minimise the potential effects of accommodation on equipment performance. The effecting elements include corrosion, temperature, humidity, vibration, electrical power stability, dust and electromagnetic influences, etc.

3. Calibration of Equipment

- 3.1 Table 1 in this document sets the recommended frequencies for the calibration and performance check of general equipment used in the field of NDT.
- 3.2 It must be stressed that these frequencies of calibration are considered to be the minimum appropriate, provided that the other criteria specified below are met:
 - a) equipment is of good quality and of proven stability, and
 - b) laboratory has both the equipment required, competent staff and expertise to perform adequate internal checks, and
 - c) if any suspicion or indication of overloading or mishandling arises, the equipment will be checked immediately and thereafter at fairly frequent intervals until it can be shown that stability has not been impaired.

- 3.3 Where the above criteria cannot be met or the relevant test methods/equipment manuals have specified more stringent requirements, the more stringent requirement shall be adopted.
- 3.4 Where calibrations have been performed by the staff of a laboratory, full records of these measurements shall be maintained, including details of the numerical results, date of calibration and other relevant observations.
- 3.5 Where the range of temperature measurement has a significant effect on the result of the analysis, such as the development of film, the temperature-measuring devices for film developing baths and developing room shall be used and this daily measurement recorded.

Table 1 below describes the recommended intervals for calibration of NDT equipment

A. Ultrasonic Testing

Type of Equipment	Recommended interval between successive calibrations / verifications	Calibration/ Verification procedure or guidance documents / equipment requirements
1. Probe and sensory electronics (setting up the assembly)	Each time before use	Ultrasonic standard calibration blocks.
2. Standard calibration blocks (material properties)	Initial	As per specific standard method (e.g. EN 27963, AWS, ASME or equivalent,
3. Standard calibration blocks (surface conditions)	Each time before use	Visual examination for deterioration such as corrosion or mechanical damage.
4. Reference standard calibration blocks (radius and other dimensional checks)	Every 5 years	By an accredited calibration laboratory or 'National Metrology Institute (NMI)' as defined in Clause 3.2.1 of SAC-SINGLAS 006.
5. Working standard calibration blocks (radius and other dimensional checks)	Intermediate checks every 2 years	By comparison with reference standard calibration block. If no reference standard calibration block is available, then by an accredited calibration laboratory or 'National Metrology Institute (NMI)' as defined in Clause 3.2.1 of SAC-SINGLAS 006.

Type of Equipment	Recommended interval between successive calibrations / verifications	Calibration/ Verification procedure or guidance documents / equipment requirements
6. Ultrasonic flaw detector (testing units, probes and connection cables)		
a) Visual check for damage	Each time before use	Visual examination of all units and associated equipment.
b) Probe index	Each time before use) Reference Calibration) blocks.
c) Probe beam angle	Each time before use)
d) Probe beam alignment (squint)	Each time before use)
e) Sensitivity and signal to noise ratio	Every 40 hours)
f) Probe beam profile	Every 40 hours)
g) Overall system gain	Every 40 hours)
h) Linearity of time base	Every 40 hours)
i) Calibration of time base	Every 40 hours)
j) Linearity of equipment gain	Every 40 hours)
Note: If the probes are new then the above checks need to be redone		

A1 Phased Array Ultrasonic Testing

Type of Equipment	Recommended interval between successive calibrations / verifications	Calibration/ Verification procedure or guidance documents / equipment requirements
1. Probe and sensory electronics (setting up the assembly)	Each time before use	Ultrasonic standard calibration and qualification blocks
2. Standard calibration blocks (material properties)	Initial	As per specific standard method (e.g. EN 27963, AWS, ASME or equivalent,
3. Standard calibration blocks (surface conditions)	Each time before use	Visual examination for deterioration such as corrosion or mechanical damage.
4. Reference standard calibration blocks (radius and other dimensional checks)	Every 5 years	By an accredited calibration laboratory or 'National Metrology Institute (NMI)' as defined in Clause 3.2.1 of SAC-SINGLAS 006.
5. Working standard calibration blocks (radius and other dimensional checks)	Intermediate checks every 2 years	By comparison with reference standard calibration block. If no reference standard calibration block is available, then by an accredited calibration laboratory or 'National Metrology Institute (NMI)' as defined in Clause 3.2.1 of SAC-SINGLAS 006.
6. Qualification Block (mill test certificate or report and flaws)	Initial	As per ASME code case 2235-9 or relevant specifications

A2 Time of Flight Diffraction Testing (TOFD)

Type of Equipment	Recommended interval between successive calibrations / verifications	Calibration/ Verification procedure or guidance documents / equipment requirements
1. Probe and sensory electronics (setting up the assembly)	Each time before use	TOFD standard calibration blocks.
2. TOFD Standard calibration blocks (material properties)	Initial	As per specific standard method (e.g. ASME Section V or equivalent,
3. TOFD Standard calibration blocks (surface conditions)	Each time before use	Visual examination for deterioration such as corrosion or mechanical damage.
4. TOFD Reference standard calibration blocks (dimensional checks)	Every 5 years	By an accredited calibration laboratory or 'National Metrology Institute (NMI)' as defined in Clause 3.2.1 of SAC-SINGLAS 006.
5. TOFD Working standard calibration blocks (dimensional checks)	Intermediate checks every 2 years	By comparison with reference standard calibration block. If no reference standard calibration block is available, then by an accredited calibration laboratory or 'National Metrology Institute (NMI)' as defined in clause 3.2.1, SAC-SINGLAS 006.
6. Demonstration Block (Dimensional check)	Every 5 years	As per ASME section V article 4
7. Demonstration Blocks	Each time before use	<ul style="list-style-type: none"> - Visual examination for deterioration such as corrosion or mechanical damage. - Level III endorsed Defect Map (Initial Only)

Type of Equipment	Recommended interval between successive calibrations / verifications	Calibration/ Verification procedure or guidance documents / equipment requirements
8. Positional Encoder Check	Each time before use	As per ASME Section V or equivalent standard.
9. Testing units, probes and connection cables		
a) Visual check for damage	Each time before use	Visual examination of all units and associated equipment.
b) Probe index	Each time before use) Reference Calibration) blocks to ASME Section V or equivalent.)))))))))
c) Probe beam angle	Each time before use	
r) Probe beam alignment (squint)	Each time before use	
s) Sensitivity and signal to noise ratio	Every 40 hours	
t) Probe beam profile	Every 40 hours	
u) Overall system gain	Every 40 hours	
v) Linearity of time base	Every 40 hours	
w) Calibration of time base	Every 40 hours	
x) Linearity of equipment gain	Every 40 hours	
y) Encoder Confirmation	Every month	
Note: If the probes are new then the above checks need to be redone		

B. Magnetic Particle Testing

Type of Equipment	Recommended interval between successive calibrations / verifications	Calibration/ Verification procedure or guidance documents / equipment requirements
1) Magnetic particle solution (visible/fluorescence)	Each batch	Valid manufacturer's certificate with conformance to a standard (e.g. BS, ASTM or EN).
2) Magnetic inks (for aerosols)	Each batch	Valid manufacturer's certificate with conformance to a standard (e.g. BS, ASTM or EN).
3) Magnetic particle concentration check	Each shift	As per specific standard method (e.g. ASTM, BS)
4) Visible light level intensity checks on the test surface	As per specific standard method (e.g. ASTM, BS)	Check the level of illumination using a calibrated light meter each time before use.
5) Black light level intensity check on the test surface		
6) UV(A) light meter (Reference)	Yearly	By an accredited calibration laboratory or by 'National Metrology Institute (NMI)' as defined in Clause 3.2.1 of SAC-SINGLAS 006
7) White light meter (Reference)		
8) UV(A) light meter (Working)	90 days	By comparison with reference light meter
9) White light meter (Working)	90 days	By comparison with reference light meter
10) Permanent magnet and magnetic yokes	6 monthly	Check by measuring the lifting power or pull-off force in accordance with a relevant standard.
11) Reference Weights (for checking strength of magnet)	Initial	Once calibrated for life. Calibrate by means of a calibrated balance.

Type of Equipment	Recommended interval between successive calibrations / verifications	Calibration/ Verification procedure or guidance documents / equipment requirements
12) Gauss meter	Yearly	By an accredited calibration laboratory or 'National Metrology Institute (NMI)' as defined in Clause 3.2.1 of SAC-SINGLAS 006
13) Ammeter		

C. Penetrant Testing

Type of Equipment	Recommended interval between successive calibrations / verifications	Calibration/ Verification procedure or guidance documents / equipment requirements
1) Non-fluorescent (aerosol) penetrant dyes	Each batch	Valid manufacturer's certificate with conformance to a relevant standard. Where possible verification against Penetrant Comparator Block.
2) Fluorescent dyes	Each batch / per work day	Manufacturer's certificate with conformance to a relevant standard. Where possible verification against Penetrant Comparator Block.
3) Reference UV(A) light meter	Yearly	By an accredited calibration laboratory or 'National Metrology Institute (NMI)' as defined in Clause 3.2.1 of SAC-SINGLAS 006, where available.
4) Reference White light meter		
5) UV(A) light meter (Working)	90 days	By comparison with reference light meter
6) White light meter (Working)	90 days	By comparison with reference light meter

D. Radiographic Testing

Type of Equipment	Recommended interval between successive calibrations / verifications	Calibration/ Verification procedure or guidance documents / equipment requirements
1) Gamma Ray – Source Size X-Ray – Focal Spot Size	Initial	Manufacturer's certification with official record of dimensions.
2) Densitometer	90 days	Calibrate against a reference density strip, which is calibrated by an accredited calibration laboratory or 'National Metrology Institute (NMI)' as defined in Clause 3.2.1 of SAC-SINGLAS 006, where available.
3) Film density strip	1 year / or as manufacturer's recommendation, whichever is earlier.	By an accredited calibration laboratory or 'National Metrology Institute (NMI)' as defined in Clause 3.2.1 of SAC-SINGLAS 006, where available. Note: Date of first usage of strip to be recorded.
4) Survey meters	As required by the Radiation Protection and Nuclear Science Department, National Environment Agency.	As required by the Radiation Protection and Nuclear Science Department, National Environment Agency.
5) Digital Radiography. * Optical Density Step Wedges * Optical Line Pair Test Pattern	Once every 5 years	By an accredited calibration laboratory or 'National Metrology Institute (NMI)' as defined in Clause 3.2.1 of SAC-SINGLAS 006.

E. Eddy Current Testing

Type of Equipment	Recommended interval between successive calibrations / verifications	Calibration/ Verification procedure or guidance documents / equipment requirements
1) Reference Specimen	Initial	Manufacturer's certification, customer's requirements or measurement certificate.
2) Equipment	Before usage and subsequently after 8 hours of usage	Verified against a reference specimen