

ULTRASONIC INSPECTION PROCEDURE

Reference: PROC/GEN/UT/10160:1999 Issue:01 | Date of Issue: 05/02/2018



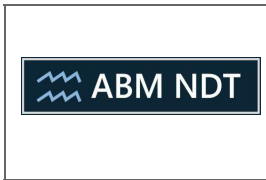
**Procedure For The Ultrasonic Testing
Of Steel Flat Product Of
Thickness Between 6mm And 200mm**

**FULL PROCEDURE AVAILABLE
TO PURCHASE FROM
WWW.N-D-T.COM**

<p>Authored By: A Sample PCN Level 3 (XXXXXX)</p> <p>Signed: <i>A Sample</i> Date: 05/02/18</p>	<p>Authorised For Use By:</p> <p>Signed: Date:</p>
---	--

CONTENTS

1. Scope
 2. Application
 3. References
 4. Definitions & Abbreviations
 5. Personnel Qualification
 6. Surface Finish
 7. Equipment
 8. Probes
 9. Equipment and performance checks
 10. Couplant
 11. General
 12. Calibration & Sensitivity
 13. Assessment of Ultrasonic Indications
 14. Non-conformance
 15. Reporting
- Appendix A** – BS EN 10160 - Table 2
- Appendix B** – BS EN 10160 - Table 3
- Appendix C** – BS EN 10160 - Table 4
- Appendix D** – BS EN 10160 - Table 5
- Appendix E** – Procedure revision history



ULTRASONIC INSPECTION PROCEDURE

Reference: PROC/GEN/UT/10160:1999 Issue:01 | Date of Issue: 05/02/2018

1. Scope

This procedure covers the ultrasonic testing of rolled steel flat product (plates and profiles) of thicknesses between 6mm and 200mm using manual scanning techniques and the pulse-echo method.

This procedure does not cover the testing of steel plate less than 6mm thick.

Steel plate of thickness greater than 200mm may be tested using this procedure but will be subject to agreement between all parties concerned.

2. Application

The examination shall take place at stages defined in the purchasing specification, drawings, Inspection/test plans, etc.

All plates tested in accordance with this procedure shall be examined using longitudinal waves and the manual pulse-echo contact scanning technique. Ultrasonic test equipment shall utilise an A scan presentation.

Plates shall be tested from one side only.

3. References

This procedure makes reference to the following documents:-

BS EN ISO 9712:2012 Non-destructive Testing. Qualification and certification of NDT personnel.

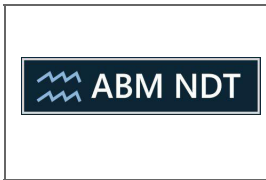
BS EN 10160:1999 Ultrasonic testing of steel flat product of thickness equal or greater than 6mm (reflection method)

BS EN ISO 2400:2012 Non-destructive testing. Specification for calibration block No. 1

BS EN 12668-1:2010 Non-destructive testing. Characterisation and verification of ultrasonic examination equipment. Pt. 1 Instruments

BS EN 12668-2:2010 Non-destructive testing. Characterisation and verification of ultrasonic examination equipment. Pt 2. Probes

BS EN 12668-3:2013 Non-destructive testing. Characterisation and verification of ultrasonic examination equipment. Combined equipment.



ULTRASONIC INSPECTION PROCEDURE

Reference: PROC/GEN/UT/10160:1999 Issue:01 | Date of Issue: 05/02/2018

4. Definitions & Abbreviations

Internal discontinuity - Any imperfection lying within the thickness of the flat product, e.g. planar or laminar imperfection, single plane or multi-plane inclusion bands or clusters.

Defect - Unacceptable internal discontinuity i.e. one exceeding the specified maximum size or population density limits.

Population density - The number of individual internal discontinuities of a size greater than a specified minimum size and less than a specified maximum size per specified area of body or length or edge zone.

Manual or assisted manual testing - Testing by an operator applying an ultrasonic probe, or probes, to the flat surface, manually executing the appropriate scanning pattern on the flat product surface and visually assessing ultrasonic signal indications on the electronic equipment screen either by direct viewing or built-in signal amplitude alarm devices.

FBH - Flat bottom hole

DAC - Distance amplitude correction curve

5. Personnel Qualifications

All personnel operating to this procedure shall hold a minimum of Level 2 certification in accordance with ISO 9712, in the ultrasonic testing of wrought products. e.g. PCN Level 2

All personnel shall also hold a valid eyesight certificate (meeting the requirements of ISO 9712 Section 7.4) obtained within the last 12 months.

6. Surface Finish

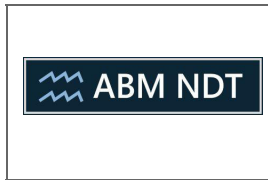
Surfaces from which scanning is carried out shall be such that satisfactory acoustic coupling can be maintained at all times.

Surfaces shall be free from loose scale, foreign material, heavy rust, oil/grease, gouge marks, burning slag residue or any other material that could affect the sensitivity of the test.

7. Equipment

The ultrasonic flaw detector shall comply with the requirements of BS EN 12668-1 and have a calibration certificate obtained within the last year.

Calibration blocks shall comply with BS EN ISO 2400



ULTRASONIC INSPECTION PROCEDURE

Reference: PROC/GEN/UT/10160:1999 Issue:01 | Date of Issue: 05/02/2018

Reference blocks of 5/8/11mm FBH shall be used as required (which shall cover the thickness of the plate to be tested) .

8. Probes

Single and combined double crystal 0 degree compression wave probes, 10-25mm diameter and of nominal frequencies of 2-5 MHz are to be used.

All probes shall comply with the requirements of BS EN 12668-2.

The focusing zone of combined double transducers shall be adapted to the thickness of the flat product.

9. Equipment and Performance Checks

All functional and calibration checks of equipment shall be performed in accordance with BS EN 12668-3

Daily checks to include:-

- Physical state and external aspects.

Weekly checks to include:-

- Timebase linearity
- Amplification linearity
- Probe signal to noise ratio
- Pulse duration

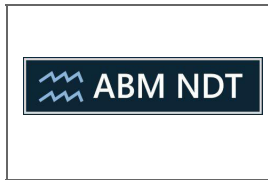
All equipment checks shall be recorded by the operator and shall be made available upon future request.

10. Couplant

Generally water shall be used but other coupling media may be used at the discretion of the supplier.

Couplant used shall not be harmful to the material being tested.

Coupling conditions shall be such that at least two successive back wall echos to be distinguished when the probe is placed on any area free from internal discontinuities.



ULTRASONIC INSPECTION PROCEDURE

Reference: PROC/GEN/UT/10160:1999 Issue:01 | Date of Issue: 05/02/2018

11. General

Prior to ultrasonic inspection the operator shall be provided with the following information: material/alloy/grade type, steel plate dimensions and cast/stock number.

Reference block(s) used for the DAC construction shall be manufactured from a piece of defect free material of a similar composition.

Combined double probes must be used on steel product up to 60mm thickness.

Single or combined double probes can be used on steel product of thicknesses between 60 and 200mm.

When combined double probes are used the orientation of the barrier separating the two transducers shall be perpendicular to the scanning direction.

Unless specified otherwise, scans shall be carried out along grid lines as stated in BS EN 10160 Pt. 8.2. Scanning speed shall not exceed 150mm/s.

When an edge test is required a full examination of the zone, as specified in BS EN 10160 Table 2 (Appendix A), shall be carried out over all edges of the flat product at a speed of no more than 150mm/s and with a 10% overlap between scans.

After testing all couplant shall be removed from the item under test and (if required) any measures specified by the customer to protect the steel shall be taken.

12. Calibration & Sensitivity

A reference DAC curve shall be constructed using the relevant reference block covering the full thickness of the range being tested. Each curve shall be constructed from at least five points distributed over the entire field of use of the probe.

When testing using a combined double probe, a 5mm FBH DAC curve shall be used regardless of testing class.

When testing using single probes the DAC curve used is dependent on the class the product is being tested to

- 11mm FBH for classes S0, S1, E0 and E1
- 8mm FBH for classes S2, E2 and E3
- 5mm FBH for classes S3 and E4