



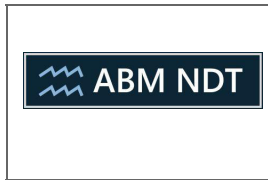
**Procedure For The Ultrasonic Testing  
Of Stainless Steel Flat Products of  
Thicknesses 6mm and Over**

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# ULTRASONIC INSPECTION PROCEDURE

Reference: PROC/GEN/UT/10307:2001 Issue:01 | Date of Issue: 13/02/2018

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## 1. Scope

This procedure covers the manual ultrasonic testing of austenitic and austenitic-ferritic stainless steel flat product of thicknesses between 6mm and 200mm.

This procedure does not cover the testing of plate less than 6mm thick nor does it cover the testing of plate of thicknesses greater than 200mm.

## 2. Application

The examination shall generally take place in the delivery condition; however testing may also 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. 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.

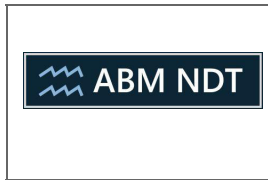
**BS EN 10307:2001** Non-destructive Testing - Ultrasonic testing of austenitic and austenitic-ferritic stainless steel flat products of thickness equal to or greater than 6mm (reflection method).

**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.



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## 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*

Equivalent flat bottom hole

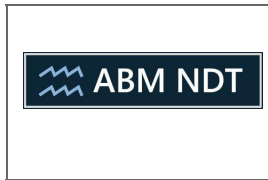
### *DAC*

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.



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## 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.

No.1 Calibration blocks shall comply with BS EN ISO 2400

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

Commercial couplant or water shall be used. Note: Whatever couplant is used the same couplant shall be used for calibration, sensitivity settings and testing.

## 8. Probes

Single and combined double crystal 0 degree compression wave probes, 10-25mm diameter and of nominal frequencies of 1-5 MHz are to be used. Note: Lower frequency probes may be used when the product exhibits high attenuation provided that all other requirements of this procedure are met.

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

The probes shall have frequencies and dimensions such that the required sensitivity can be achieved throughout the extent of the test field.

Single transducer probes shall be such that their deadzone is as small as possible. I.e. 15% of the product thickness or 15mm whichever is smaller.

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

When using combined double crystal probes, the barrier separating the two transducers shall be orientated  $45^{\circ}$  to  $90^{\circ}$  to the scanning direction.

## 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.